Electric Railway Journal

INDEX
to Volume 74
January to December, 1930

Tenth Avenue at Thirty-sixth Street
New York City
# Getting the Most from the Index

This is essentially a subject index, rather than an index of titles. An article treating a number of different subjects is listed under each of them. In addition, a geographical reference is published wherever the article relates to a particular railway, city, state or country. Entries about an electric railway in the United States or Canada are listed under the name of the city in which the main office of the company is located. Foreign railways are listed under the country.

In the subject index, an alphabetical arrangement is followed. If there is a choice of two or three keywords, the one most generally used has been selected, cross references being supplied. Below is given a list of keywords arranged under a number of major topics.

## Classified List of Keywords

<table>
<thead>
<tr>
<th>Rolling Stock</th>
<th>Rectifiers</th>
<th>General and Miscellaneous</th>
</tr>
</thead>
<tbody>
<tr>
<td>Buses, (See motor buses)</td>
<td>Substations and equipment</td>
<td>Accounting</td>
</tr>
<tr>
<td>Car design and car orders</td>
<td></td>
<td>Book reviews</td>
</tr>
<tr>
<td>Carhouses and storage yards</td>
<td></td>
<td>Brady Safety Award</td>
</tr>
<tr>
<td>Electric equipment of cars</td>
<td></td>
<td>Coffin Award</td>
</tr>
<tr>
<td>Motors</td>
<td></td>
<td>Conspectus of Indexes</td>
</tr>
<tr>
<td>Locomotives</td>
<td></td>
<td>Fare increases and decreases</td>
</tr>
<tr>
<td>Maintenance, general</td>
<td></td>
<td>Financial</td>
</tr>
<tr>
<td>Maintenance practices and devices</td>
<td></td>
<td>Franchises</td>
</tr>
<tr>
<td>Noise reduction</td>
<td></td>
<td>Freight and express</td>
</tr>
<tr>
<td>Trolley bus</td>
<td></td>
<td>Heavy electric traction</td>
</tr>
</tbody>
</table>

**Motor Buses**

| Garages | | Insurance |
| Motor bus design | | Legislation and legal matters |
| Motor buses, general | | Management |
| Motor buses, gas-electric | | Market conditions |
| Maintenance practices and devices | | Modernization |

**Power**

| Electrolysis | | Operating records and costs |
| Maintenance practices and devices | | Patents |
| Overhead contact systems | | Public relations |
| Power, general | | Rapid Transit |
| Power distribution | | Schools |

**Way and Structures**

| Carhouses and storage yards | | Statistics |
| Maintenance practices and devices | | Standardization |
| Pavements | | Stores |
| Track construction | | Taxation |
| Snow and ice removal | | Taxicabs |

**Transportation and Traffic**

| Accidents and accident prevention | | Transportation, general |
| Advertising | | Transportation, metropolitan |
| Employees | | Trolley bus |
| Fares and fare collection | | |
| Merchandising transportation | | |
| Operating records and costs | | |
| Parking of automobiles | | |
| Rapid transit | | |
| Schools | | |
| Signals | | |
| Street traffic congestion | | |
| Traffic regulation | | |
| Transportation, general | | |
| Transportation, metropolitan | | |

As an example of how to use the index, if a reader wishes to locate an article on car design, he would look in the list below at the general topic, "Rolling Stock." Under this topic, the heading, "Car Design and Car Orders," would apply to the article in question. This heading will be found under the letter "C" in the index, with individual articles separately listed.

In addition to the groups of articles covered by these headings, papers and reports from electric railway and other associations are grouped under the names of the various organizations. Biographical information is listed in the personal index.

Signed articles also are indexed by the name of the author. When the name of the author is known to the reader, this supplies the simplest method of locating the article.
Car design and car orders (Continued):
- Aluminum for car construction [Faust], *184.
- Aluminum reduces motor weight, *575.
- Order placed for 500 cars and 10 double-deck buses, 178.
- Rolling stock rehabilitation [Loechl and Clark], *168.
- British Columbia Electric Railway: Aluminum ties reduce weight of new cars, *123.
- Details of new cars, 63.
- Receives new cars, *104.
- Comfort and convenience in cars [Ols], *379.
- Des Moines Railway: Specifications of new cars, 405.
- Detroit & Suburban Railway: Brief description of cars ordered, 333.
- Dresden, Germany: Articulated cars tested, *572.
- Economics of high-speed motors [Bethel], *465.
- Edmund Radial Ry.: New cars ordered, 506.
- Faster schedules in rapid transit service [Carlyle], *364.
- General Car & Coach Co.: New standardized, light weight cars, *767.
- Improvement in the ride is the most effective stimulant of public interest [Gordon], *333.
- Improving design to improve service (ed), *333.
- Increasing speed through analysis (ed), *490.
- Knoxville Power & Light Co.: Specifications of new cars ordered, 353.
- Long Island Railroad: Cars received, 765.
- Orders placed for new equipment, 494.
- Lowering cost by reducing noise [Williams], *376.
- Making faster operation practicable (ed), *730.
- Modern vehicles and equipment [Burlington], *730.
- New braking apparatus demonstrated, 562.
- New York City.
- New subway cars, *488.
- Northern Indiana Railway: Brief description of cars ordered, 298, 335.
- Orders placed during 1829 [van der Stembel], *332.
- Oklahoma railways—cars described, 609.
- Philadelphia Rapid Transit Co.: Sample car of, *741.
- Presidents' Conference Comm. to develop plans for improving design (ed) 428, [Conway].
- Safety devices aid in reducing accidents [Butler], *586.
- St. Louis, Mo. Public Service Co.: Sample car, *106.
- Selection of motor control [Beavers], *575.
- Simpler car parlor proposed, *170.
- Simplicity and utility in design [Graham], *503.
- Speed an essential of street car performance [Rossell], *503.
- Timeliness a bar to progress in design, (ed), *116.
- Wheel, determinable, *110.
- Modern design features Windsor cars, *565.
- Yakima Valley Transportation Co.—new cars, *78.

Car design and car orders (Continued):
- York Railways: Receives three new cars, 785.
- Youngstown Municipal Railway: Details of new cars, 63.
- Speedy, lightweight cars [Graham], *527.
- Carriages and storage yards:
  - Detroit, Mich.: Department of Street Railways—new carriage, *702.
- Central Electric Railway Accountants' Association:
  - Arrangement for meeting, *480.
- Central Electric Railway Association:
  - Meeting—analyzes condition of the industry, *500.
  - More business and how to get it, *89.
- Central Electric Railway Master Mechanics Association:
  - Discuss equipment at meeting, *276.
  - Have varied program, *641.
- Charlotte, N. C.:
  - Control of inner circle bearing [Osborn], *722.
- Chicago, Ill.:
  - New cars ordered, *541.
  - Chicago Rapid Transit Co.: Improvement more approved, *548.
  - New shop unit, *506.
  - Chicago, South Bend & Northern Indiana Railway—financial situation (ed), *277.
  - Reorganized, *146.
  - Chicago, South Shore & South Bend Railroad: New rolling stock started, *500.
- Chicago Surface Lines:
  - Feeder bus controversy to be settled, *59.
  - Largest trolley bus system, *500.
  - Operating statistics prove success of trolley buses [Forty], *503.
  - Orders trolley bus cars, *541.
  - Steel poles used for trolley bus system, *517.
  - Transfer cars desired, *55.
  - Trolley buses received, *784.
  - Co-ordination of system, subway plans (ed), *540.
  - Unification franchise almost ready, *288.
  - Unification franchise approved by voters, *546.
  - Unification ordinance ready for voters, *345.
  - Unified transportation development, *500 (ed), *497.
- Cincinnati, Ohio:
  - Emergency death [Jonas], *160.
  - Modern machinery for better maintenance [Jonas], *118.
  - Negotiations about floating debt, *169.
  - Novel merchandising plan, *697.
  - Connecting rod for centerless motor bearing [Osborn], *283.
- Cleveland, Ohio:
  - Cleveland Railways: Abstract of Coffin Contest brief, *450.
  - Accidental caucuses analyzed, *132.
  - Accurate work schedules, permits speedy track reconstruction [Gore], *278.
  - Adjustable hanger for switch contacters [Brown], *536.
  - Bolt conveyor for leading concrete mixer [Spenzer], *536.
  - Blinker lighting being tested on night work [Roth]. *601.
  - Boring of motor axle bearings started [Gerco], *601.
  - Brake hangers, *50 for drilling [Sussell], *541.
  - Brake lining, selected by test results [Stevens], *617.
  - Bus hood clamp locks easily [Rose], *583.
  - Center control for temporary block signal [Brown], *648.
  - Clamp for installing field coils [Dunsel], *704.
  - Connecting rod boring tool [Rose], *646.
  - Connecting rod for tongue switches [Schenk], *162.

READ THE INSTRUCTIONS AT THE BEGINNING OF THE INDEX

Abbreviations: *Illustrated. e Communications.
Colorado Springs, Col.:—Brady award won by Col. Squs. & Int. R.R., 257.

Columbia, S. C.:—Columbia Railway Gas and Electric Co.: Case before Supreme Court, 110.

Columbus, Ohio:—Columbus Railway, Power & Light Co.: Another fare proposed, 171. Reduction in current rates hinges on fare increase, 259. Scioto Valley Railway & Power Co.: Proposed abandonment under inquiry, 448.

Community Traction Co. (see Toledo, Ohio) 136.

Connecticut Co. (See New Haven, Conn.) 438.

Conspectus of Indexes:—Conspicuous of Indexes, 140, 178, 263, 272, 296, 444, 566, 611, 718.

D

Dallas, Texas:—Dallas Railway & Terminal Co.: Copper and mica dust collected on compressor motor (Heald), 277. Grease rings for ball bearings on ball-bearing motors (Heald), 276. Holder for armature damping (Traw), 104. Preventing loose breaker tips (McGinnis), 252. Test for partial open circuit (Heald), 263. Testing air governors (McGinnis), 260. Wheel grinding economical (Freeman), 241.

Texas Electric Railway:—New locomotives facilitate freight handling (Silver), 260.


Delaware, Lackawanna & Western R.R.:—Electric suburban service planned, 543. Scheduled speed increased by electrification, 584. Switching locomotive added, 276.

Denmark:—Experimental cars for Copenhagen, 710.

Des Moines, Iowa:—Des Moines Railway: Extensive rehabilitation (Winnetter), 276. Specifications of new cars, 495.


Dubuque, Iowa:—Dubuque Street Railway: Seeks to restrain bus competitor, 315.

E

Eastern Massachusetts Street Railway (see Boston, Mass.) 514.

Edmonton, Alberta:—Edmonton Rapid Railway:—New cars ordered, 609.


Electric Railway Association of Equipment Men, Southern Provinces:—Analysis maintenance practices, 118. Semi-annual meeting, 344.


Electrification: (see Heavy Electric Traction):—Electrolysis:—Checked by potential wires in Winnipeg (Newar), 238.


Employees:—Bonus plan works well on N. Y. & Queens County Railway, 513. Cleveland Railway has contributory pension plan, 591. Educational activities lag (ed), 204. First aid graduates in Chicago, 541. Methods of training platform men, 568. Pension plans analyzed, 73. Pension-plan should be on sound basis (ed), 490. Philadelphia rapid transit school (Summers), 132. Worker who wears overalls (ed), 179. School for lineman in Cleveland (Scott), 586. Selling an idea to the foreman (George), 519.

 Erie, Pa.:— Erie Railways:—New storage garage, 310.

F

Faro Deereases:—Boston Elevated Railway:—Fare decrease restored, 507. Cleveland's two-cent fare zone (ed.), 557. Higher revenue with lower fares, 738. New Jersey:—Fare decrease to be restored, 717.

Fare Increases:—Baltimore, Md.:—Fare increase (ed.), 75. Cleveland's two-cent fare zone (ed.), 557. Higher revenue with lower fares, 738. New Jersey:—Fare increase now to be restored, 717.

Faro Railways:—Baltimore, Md.:—Fare increase (ed.), 75. Cleveland, Ohio:—Fare increase, 503. New Jersey:—Fare increase now to be restored, 717.

Faro Traction:—Boston Elevated Railway:—Fare increase (ed.), 75.

Field shining switch, 706.

Lighted weight trolley base, 503.

Regenerative system successful in Paris, 757.

Signal lights for stop warning, 770.

Testing motors for greater speed (Hellers), 535.

Terminal for brush holder leads, 286.

Thermostat for heat control, 770.

Electric Railway Association of Equipment Men, Southern Provinces:—Analysis maintenance practices, 118. Semi-annual meeting, 344.


Electrification: (see Heavy Electric Traction):—Electrolysis:—Checked by potential wires in Winnipeg (Newar), 238.


Employees:—Bonus plan works well on N. Y. & Queens County Railway, 513. Cleveland Railway has contributory pension plan, 591. Educational activities lag (ed), 204. First aid graduates in Chicago, 541. Methods of training platform men, 568. Pension plans analyzed, 73. Pension-plant should be on sound basis (ed), 490. Philadelphia rapid transit school (Summers), 132. Worker who wears overalls (ed), 179. School for lineman in Cleveland (Scott), 586. Selling an idea to the foreman (George), 519.

 Erie, Pa.:— Erie Railways:—New storage garage, 310.
Fare increases (Continued):

Kansas City: Supreme Court refuses fare stay, 655.

Los Angeles, Cal.: Rehearing asked, 59.

Omaha, Neb.: Increase asked for, 344.

Fares and fare collection:

Fares and costs in 1929 (Riehey), 13.

Higher revenues with lower fares, *738.

Milwaukee, Wis.: Christmas shopping pass, 777.

New York City: Multiple coin turnstile, 178.

Pittsburgh, Pa.: Northwestern Public Service Co.—weekly pass, 717.

Rieche fare index revised, 756.

St. Louis Public Service Co.: Results of first year of ticket plan, 655. Tags transfer passengers, 752.

Financial:


Capital structures of public utilities (Forbes), 600.

Chicago, Ill.: Chicago Rapid Transit—temporary financing, 600.

Chicago, South Bend & Northern Indiana Railway—financial situation (ed.), 257, improvement bonds for "L" approved, 658.

Capital expenditures of electric railway properties, 1928-1929, 204.

Determining utility depreciation (Burke), 637.

Electric railway properties, financial reports, 1928-1929, 308.

Equipment trusts and dividend, 774.

Georgia Power Co.: Net revenue increased 400% in five years, 669.

Investment by composition (ed.), 615.


New York City: Begins to realize on its rapid transit investment, 603. Third Avenue RY—coordinated bus operation increases revenues, *600.

Oakland, Cal.: Key System on new basis, 557.

Operating statistics for 1926 (Murphy), 318.

Portland, Ore.: Pacific Northwest Public Service Co.—report, 494.

Seattle, Wash.: Municipal Tramway troubles, 597.

Small city properties appraise assets (ed.), 248.

Solving the problem for small-city systems (ed.), 670.

Statistics for 1929 (Buck), 41.

Survey shows electric railways with full budget program [Killer], 182.

Toledo, Ohio: Unemployment hurts earnings, 488.


Winnipeg Railway—financial report, 506.

Fort Wayne, Indiana:

Fort Wayne-Lima Railroad:

Speeding up freight service, 288.

France:


Paris-Lyon-Mediterranean railway gets heavy locomotives, 570.

Franchises:

Akron, Ohio: Temporary agreement extended 10 months, 345.


Jacksonville, Fla.: Franchise rejected, 116.

New York City: Taxicab regulation recommended, *685.


Springfield, Ohio: Progress reported, 172.

Franchises (Continued):

Toledo, Ohio: Common-car Tract Co.—renewal of grant an issue, 480.

Freight and express:


Attracting freight business [Pontius], *443.

Dallas, Texas: Texas Electric Railway—new locomotives facilitate freight handling, 260.


Recent freight equipment assures a more profitable business [Thomas], *898.

Speeding up service on Fort Wayne & Lima R.R. 288.

G

Garages:

Erie Railways:

New garage built on unit plan, *310.

Georgia Power Co. (See Atlanta, Ga.): 56.

Germany:

Berlin: Street cars washed by machine, *797.

Transportation facilities co-ordinated [Beukenstein], *504.


Elkington steel tv., *554.

Hamburger Hohbahn Aktiengesellschaft: Interchanging bearing repair [Peigen], 127.

Truck springs assembled by pneumatic machine [Korn], *339.

Warning signal insures proper meshing of gears [K. von Pirch], *585.

Grani Rapids, Mich.:

Cars, buses, taxis and planes, 52.

Great Britain:

Hamburg:

New lightweight cars, 719.

Financial report, 719.

Liverpool:

No material changes recommended, 719.

London:

Catches the car riding craze, 719.

Free shoe shine for subway passengers, 236.

London County Council Tramways get low-level cars, *567.

New subway line, 547.

Subway construction approved, 547.

Subway train roller bearings, *515.

"Tube" extensions to cost $50,000,000, 532.

Underground headquarters, highest commercial structure, *115.

Unified public control for transport services, 719.

H

Hammond, Ind.:

Dunham Rys. formed, 56.

Hammond, Whiting & E. Chicago Ry., sold 50.

Hampton, Va.:

Virginia Public Service Co.:

Ice cars advertised product, *632.

Slide valve engine [Wood]. *590.

Rivera, Cuba:

Causes of wheel failure studied [Gottschalk], *107.

Heavy electric traction (Continued):

A.I.R.E. meeting considers railroad electrification, 266.

B. L. & W. R.R.: Scheduled speed increased by electrification, 486.

Heating passenger cars on electric railroads, 755.

Maintaining distribution system N.Y., N.H. & H., R.R. [Barde], *507.

Philadelphia facilities, P.R.R., *606.

Power for Reading electrification [Domb], *747.

Proceeding on merit (ed.), 181.

Insurance, fire:

Improved fire record brings lower insurance rate (ed.), 65.

Lower rates in effect, 74.

Neglect of precautions may prove costly (ed.), *612.

International Tramway & Bus Association:

Warsaw meeting, 523.

Iowa Electric Railway Assn.:

October meeting, *773.

Italy:

Length of electrified lines now 1,075 kilometers, 547.

Rome:

Co-ordinated transit makes progress (ed.), 667.

Roadists car and bus routes [Aceselli], *130.

To have modern subway, 115 (Vallechioli), *556.

Japan:

Electric Railway makes scenic trips, 547.

K

Kansas City, Mo.:

Kansas City Public Service Co.:

Insulating electric projects test points [Krbins], *524.

Spraying destination signs, *592.

Traffic improvements planned, 623.

Knoxville, Tenn.:

Knoxville Power & Light Co.:

Gears for cars, *727.

Trolley buses delivered, 544.

Trolley buses increase patronage, *735.

L

Legislation and legal matters:

Atlanta, Ga.:

Supreme Court upholds lower court's decision, 546.

Baltimore, Md.:

Supreme Court's rate decision, 75 (ed.), 65.

READ THE INSTRUCTIONS AT THE BEGINNING OF THE INDEX

Abbreviations: *Illustrated, o Communications.
M

Madison, Wis.:—Madison Railways:—Demurs on paving, 345.

Maintenance, general:—Awards for first period, *150.

Awards for second period, *209.

Awards for third period, *615.

Bus transportation awards, 715, 719.

Low maintenance contest, 701.


Lubrication (see Maintenance)


Effective maintenance as a revenue producer, 305.

Electric Railway Journal award won by Cleveland Railway, 641.

Getting the most out of improvements (ed).

Maintenance, general (Continued):

—Increased power department responsibility de- signed into present equipment and practices (Bole), *112.

—Materials and labor, 1925-1930, 10.

—Meeting the industry's equipment problem (Conway), 436.

—New contest, 707.

—New Maintenance contest, 701.

—Putting maintenance on a production basis, 729.

—Snow removal practices and equipment, *209.

—Trends in material purchasing analyzed, 200.

Maintenance practices and devices:

—Buses and tracks:

Brake lining selected by test results (Stevens), *223.

Bus hood clamp loose easily (L. Rose), *588.

Bus wheels removed with a clamp (Hall), *762.

Clamp removes bus wheel, simple (Hall), *763.

Connecting rod boring tool (Rose), *446.


Double air shock inflates dual tires [Grant], *120.

Exhaust gas cleaned discharges from roof of bus, *587.

Feeder gages, simple (Stevens), *706.

Lighted hairstyles help clean (Stevens), *230.

Low jack for raising buses, *286.

Lubrication economies in Philadelphia *171.

Pump and heater facilitate transmission filling. (Stevens), *314.

Back portable, for special bus tools (Palmer), *351.

Sand facilitates bus motor adjustment (Stevens), *248.

Towing and spacer bar for disabled buses, *617.

Warning signal informs proper meshing of gears (von Pichl), *548.

Washing buses in record time (MacKay), *734.

Wheel aligner (Faircloth), *244.

Wheel nut wrench (Kohoe), *337.

Wrench for wheel nuts (Kohoe), *337.

—Car equipment:

Aluminum frame reduces railway motor weight, *276.

Ball bearing under brake handle (McAloney), *223.

Cars grounded on crown plate (Munford), *531.

Cup of wheel failure studied at Havana (Gottschalk), *107.

Circuit breakers tested in plans (James), *61.

Cylinder boring device for air compressor (Sobal), *109.

Dash-luminating headlight, *228.

Dolly for broken axles (Jonas), *100.

Dolly, demountable (Hermen), *223.

Hand lever for testing bell rings, *140.

Headlight, dash-luminating, *228.

High voltage test discloses equipment weakness (Wynn), *226.

Hood rims and carshocks reshaped (Davidson), *534.

Interchangeable bearings, repair of (Ferguson), *109.

Jig speeds brake head drilling (Niederer), *651.

Loading plate with patterned surface, *228.

Lubricating car apparatus (Kaufman), *333.

Lubricating prolongs life of control equipment (Beadle), *399.

Preventing loose breaker tips (Gimmiene), *42.

Racket jack, *280.

Radio interference eliminated by choke coil (Warner), *704.

Remodeling cars for one-man operation, *705.

Repairing 900 cars a year in the Boston Elevated shop, *330.

Reverser contacts prevent tampering (Hall), *224.

Rolling stock rehahilitation at Baltimore (Loeke & Hervey), *706.

Seating capacity increased in Winnipeg, *708.

Side valve grinder (Wood), *590.

Supply car for B-M-T system, *237.

Swing broom blocks filled by machine (Seutil), *709.

Thermostat for close heat control, *770.

Tilting bench for conductor repairs (Jonas), *783.

Maintenance and devices and practices:

—Car equipment (Continued):

Tread block—body weight, *583.

Trolley wheel lubricated with composition washer, *602.

Wheel grinding economical (Freemen), *712.

Work car equipped to spread material along track, *703.

—Cleaning, Car and Bus:

Cabs washed by machine in Berkeley, *707.


Car washing speed doubled, *223.

Sand blast cleaning saves time and money, *622.

Seafood for car washing, adjustable (Sohl), *355.

Washing buses in record time (MacKay), *346.

—Electrical shop:

Adjustable banjo for switch contactors (Brown), *708.

Armature bearing, bi-metallic, *538.

Armature cores anchored (Dean), *223.

Armature dipping tank (Traw), *101.

Armature nut wrench (McRae), *235.

Armature removal machine (Seutil), *448.

Bell ringing tester (Brown), *268.

Clamp for installing field coils (Dunkle), *704.

Commutator sander, *255.

Compact field shutting switch, *709.

Compensating winding devices adjusted and installed (Moses), *387.

Copper and nickel dust collected on compressor collectors (Beede), *103.

Dog holds armature pinion (Leary), *418.

Field coil tester, *163.

Field testing and tapering, *163.

Gage to check alignment of commutators (Dean), *258.

Grave prevented from entering armature bearing (Osborn), *224.

Grave ring protects commutators in ball-bearing motors (Beadle), *560.

Hose for dipping armature (Traw), *161.

Hole, light-weight, for electric welding, *604.

Installing and adjusting controller fingers (Moses), *230.

Insulating paste for bolt heads (Ladrey), *708.

Insulating sleeve protects test points (Brindon), *234.

Insulation tested with portable transformer (Flammier), *709.

Lamp cord used for controller testing (Hradley), *108.

Lamp storage during car overhaul (Hall), *706.

Simple cradle for storing armatures, *588.

Terminal for brush-holder leads, *236.

Test for partially open circuit (Beede), *299.

Test, high voltage discloses equipment weaknesses (Williams), *220.

Testing air coolers (McGlonia), *706.

Testing of field coils (Hall), *534.

Two-faced compass determines motor field popularity (Dunkle), *560.

Welder, large-capacity, *694.

—General:

Bearing metal, steel-backed, *712.

Bead for 1930, *96.

Effective maintenance as a revenue producer (ed), 303.

Hand grinders, portable, *713.

Hand tools, portable electric, *538.

Inspection lamps, electrically heated (Henderson), *236.

Modern machinery for better maintenance (Jonas), *178.

Multi-tool, portable electric, *538.

Pressure regulator for oxy-acetylene apparatus, *529.

Production basis urged (ed), *170.

Safety wins for coal and sand bins (App. 1, *96).

Shop efficiency improved by unit replacement system.

Shovel truck for bulk material, *654.

Steel plate safety shoes fitted to ladders (Seutil), *580.

Thawing frozen water and conduit pipes (Brown), *217.

Whistle post made by old rail (Hysam), *591.

READ THE INSTRUCTIONS AT THE BEGINNING OF THE INDEX

Abbreviations: *Illustrated. e Communications.

January-December, 1930] ELECTRIC RAILWAY JOURNAL—INDEX VII
VIII

Electric Railway Journal—Index

[Vol. 74

Maintenance practices and devices (Continued):

—Line:

Blinker light projects linemen on night shift jobs [Knuckles], *651.
Cable roller for stringing feeder wire, *557.
Catenary clip, *287.
Contact line renewal [Scott], *701.
Crossovers, temporary [Scott], *533.
Equipment for overhead line maintenance, *554.
Flashling danger lights on tower trucks [Brown], *282.
Hanger for switch contactors, adjustable [Brown], *282.
Increasing height of span wire poles, *222.
Loosening tight wires in conduit [B. & O.], *222.
Low records in trolley wire breaks in nine cities, *148.
Lubrication of overhead trolley wire, *284.
Maintenance of distribution system on New Haven (B&O), *607.
Marathon car reduces wheel and wire wear, *504.
Poles lengthened by splicing, *531.
Potential wires check electrolysis [Stewart], *339.
Preventing loose breaker tips [McGinnis], *248.
Records of trolley wire breaks, 48.
Signal bell on tower truck [Brown], *221.
Stringing trolley wire [Nor], *216.
Tower ladder, triangular, *537.
Use of dynamometer successful in stringing trolley wire [Scott], *251.
Warning lights on tower wagon [Scott], *339.

—Lubrication:

Center bearing lubrication [Williams], *595.
Gun used for electric track switch lubrication [Brown], *280.
Lubricating car apparatus [Kaufman], *333.
Precision lubrication, door engine used for [Horns], *222.

—Machine shop:

Babbitting, correct [Dean], *532.
Bearing jig, axe and armature, *108.
Boring of motor axle bearing seats [Greer], *280.
Chuck, spindle equipped with roller bearings, *229.
Connecting rod bailing tool [Rose], *416.
Cylinder boring device for air compressor [Stevens], *342.
Feeder gates [Stevens], *700.
Filling sweeper blook brooks by machine [Stevens], *342.
Grinder, slide valve [Wood], *500.
Grinders, portable sand, *713.
Grinding of wheels [Freeman], *241.
Hammer operated by compressed air [Partick], *255.
Ingenious jig speeds brake head drilling [Niedera], *651.
Jig for drillite brake hangers [Scullin], *347.
Jig for turning axle and armature bearings [Jones], *108.
Modern machinery a sound investment [Jones], *119.
Oversize bearing housings bored in jig [Niedera], *650.
Portable base for finishing bearings [Paisgeman], *160.
Spraying designation signs at Kansas City, *225.
Testing air governors [McGinnis], *766.

—Motors:

Aluminum frame reduces railway motor weight, *570.
Anchoing armature core bands [Dean], *221.
Armature nut wrench [McIlroy], *285.
Bimetallic armature bearing, *538.
Boring of motor axle bearing sets [Greer], *609.
Commutor sander, adjustable, *235.
Convenient machine for armature removal [Scullin], *362.
Deg hooks armature pin [Leary], *616.
Field shunting gives cars new pep [Moses], *710.

Maintenance practices and devices:

—Motors (Continued):

Field shunting switch, compact, *706.
Gage to check alignment of commutators [Dean], *580.
Grease entrance into armature bearings prevented [Gurban], *216.
Grease ring protects commutator on ball bearing motors [Hieddle], *500.
Insulating paste for bolt heads [Lackey], *796.
Oversized bearing housings bored in jig [Niedera], *650.
Proper fit for bushes reduces chatter [Warren], *104.
Selection of motor controls [Beers], *575.
Shunting motors to obtain greater speed [Rice], *207.
Terminal for brush holder leads, *290.
Two face compass determines motor field polarity [Dunke], *506.

—Paint shop:

Protection against corrodion, *711.
Spray painting outfit, *110.
Spraying designation signs at Kansas City, *607.
Window guard painting machine [Scullin], *283.

—Track and way:

Built-up compromise joints [Harrat], *292.
Center control for temporary block signal [Brown], *648.
Combination tie plate for various rails [Vente], *185.
Compromise joint for rail [Harrat], *282.
Concrete mixer has belt conveyor for loading [Spenzer], *536.
Concrete track built with minimum interruption [Boston], *101.
Connecting rod for tongue switches [Spenzer], *105.
Detecting broken rails [Evans], *223.
Disconnection of locked tongues of electric track switches [Graen], *101.
Double-nailing rail heads to prevent cupping at joints [George], *109.
Double-track branch off [Yearst], *334.
Drainage, center subdrainage system, *533.
Elliptical steel tie, *604.
Grade crossing for heavy vehicular traffic, *705.
Gun used for electric track switch lubrication [Brown], *280.
Heavy-duty circular saw for track work, *110.
Installing safety zone markers [Davis], *341.
Iron rod used as dam for weld metal [Habbez], *341.
Leveing box facilitates joint alignment [Anthony], *591.
Lour level, one man [Evans], *104.
Maco template for registering rail contours, *504.
Max floor of switches redesigned [Davis], *534.
Old rail used as whistle post [Hysom], *501.
Pavement straight edge [Costello], *104.
Portable motor flow pumpulator, *287.
Portable oxyacetylene apparatus [Copeland], *226.
Portable sand dredger and mix reheater, *203.
Pulsator for track work under traffic, *712.
Rail bond of steel and copper, *537.
Rail joint, flexible, Providence, 107.
Rail preheater, *736.
Reclaimed crank case oil for curving and switches [Illout], *163.
Renailing at Atlanta, economical, [Barnes], *767.
Sand for tracks stored by compressed air [Yearst], *500.
Single line vs. renewable track, *101, 274.
Spray equipment for weed killing [Pirkle], *104, Correction, *163.
Switch, rail, lead, and tone [Scennier], *336.
Switch heater supplied with gas fuel, *232.
Switch tongues built up by welding [Picklesimer], *285.
Switches for portable crossovers repaired [Spencer], *275.
Track construction methods [Delglish], *130.
Track without ties [Mall], *154.

Maintenance practices and devices:

—Track and way (Continued):

Prestied ties safely handled [Evans], *519.
Welding and cutting equipment [Hayes], *162.
Work car spills material along track, *765.
Work schedules permit speedy track reconstruction [George], *278.

—Trucks:

Demountable dolly used in San Diego [Horns], *222.
Dolly for broken axle [Jonsal], *160.
Gage makes wheel mounting easy [Scullin], *708.
Increasing truck-law life [Mondoux], *562.
Fabrication of center bearing [Williams], *385.
Removing trucks from cars on hoists [Wilford], *284.
Springs assembled by pneumatic machine [Korn], *330.

—Welding:

Holder for electric welding, lightweight, *538.
Larger capacity welder, *504.

Management:

—Favorable results of Des Moines rehabilitation, *705.
—Getting the most out of improvements (ed), *731.
—Research demanded (ed), *731.
—Research department of Pittsburgh Rys., *732.

Market conditions:

—Material prices, 124, 178, 244, 360, 354, 360, 410, 608, 728.

Maryland Utilities Association:

—Operators discuss latest developments, *601.

Memphis, Tenn.:

—Wage scale renewed, 233.

Merechanisation transportation:

—Popularising interurban service [Pontius], *443.
—Cincinnati Street Railway: "Saves by riding street cars—see more shows," *607.
—Des Moines improves service, *736.
—El Paso Electric Co.: Selling tickets from house to house, 233.
—Higher revenue with lower fares, *739.
—Service best means of winning confidence (ed), *729.
—Solving the problem for small-city systems used, *707.
—Virginia Electric & Power Co.: Sales promotion work done by trainmen [Womack], *251.

Middle Atlantic States Equipment Men:

—Meets at Norfolk, *775.

Mid-West Electric Railway Association:

—Annual meeting, *717.

Milwaukee, Wis.:

—Christmas Shopping Fares, *777.
—Rate ease under way, *423.

Minneapolis, Minn.:

—Twin City Rapid Transit Co.: Snow removal practices, *676.

Missoula, Mont.:


Mobile, Ala.:

—Mobile Light & Railroad Co.: Bids for patronage with clean cars, close headway and smooth track [Faust], *538.
—New cars ordered, *354.

READ THE INSTRUCTIONS AT THE BEGINNING OF THE INDEX

Abbreviations: *Illustrated. 6 Communications.

New Bedford, Mass.: —Union Street Railway: Abstract of CDDN Contest brief, 448.


N


Nordfolk, Va.: —Virginia Electric & Power Co.: Bus wheels removed with a simple clamp [Hall], *703. Field coil testing [Hall], *34. Sale of autovision work by traunnex [Womack], *52. Storage of lamps during car overhaul [Hall], *459.

Oakland, Cal.: —Key System on new financial basis (ed), 557. Ohio Edison Co. (See Akron, Ohio)

Oklahoma City, Okla.: —Oklahoma Railway: Description of new cars, 500.

Omaha, Neb.: —Omaha & Council Bluffs Street Railway: Citizens to vote on bond issue, 658. Fare increase asked, 344. New re-routing, 236. Recruiting plan in Omaha changed, 169.


P

Pacific Electric Railway (See Los Angeles, Calif.): Pacific Northwest Public Service Co. (See Portland, Ore.)


Public relations:
- Higher revenue with lower fares, 730.
- Improvement in the ride is the most effective stimulant of public interest [Gordon], 309.
- Lowering costs and bettering public relations by reducing noise [Williams], *376.
- Mobile Light & Railroad Co. bids for patronage with clean cars, close roadbed, smooth track [Fausel], *558.
- Speed essential to street car performance [Rossel], *508.

Puget Sound Power & Light Co. (See Seattle, Wash.)

R

Rapid transit:
- Attaining faster schedules [Clardy], *257.
- No speeding in U. S., 10.
- Growing need for rapid transit [Dana], *391.
- Paris, France: Subway system expands, 277.
- Philadelphia, Pa.: Instruction for trainmen [Summers], *133.
- Proposed for Montreal, 721.
- Rome to have modern subway [Vallerechi], *556.

Reading, Pa.:
- Reading Transit Co.: Radio interference from cars eliminated by choke coil [Warner], *764.

Recyclers:
- Mercury arc recyclers meet transportation demands [Boeken], *311.
- Montreal Tramways installs rectifier substations [de Anzola], *577.

Richmond, Va.:
- Virginia Electric & Power Co.: Bus-wheel aligner [Farrell], *224.

Roanoke, Va.:
- Roanoke Railway & Electric Co.: Circulating sales manager, 233.

Rochester, N. Y.:
- Rochester-Buffalo Coach Lines: Bus order modified, 541.
- Rochester, Niagara Falls & Buffalo Coach Lines: Buses to replace railway service, 425.

S

Safety (See Accident prevention)

St. Louis, Mo.:
- People's Motor Bus Co.: Terms of settlement of bus strike, 201.

Salt Lake City, Utah:
- Combination traffic and warning signal, *571.
- Salt Lake & Utah Railroad: Rails, detecting breaks [Evans], *223. Reconditioning to be speeded, 245. Service improvement, 245.

Schenectady, N. Y.:
- Schenectady Railway: Commission authorizes buses on two lines, 425.

Schools:
- Cleveland Railway: Instruction school for linenmen (Scotti), *568.
- Methods of training platform men, 498. Selling an idea to the foremost [George], *519.
- Educational activities lag (ed), 301.
- P.R.T. gives instruction for trainmen [Summers], *133.

Seattle, Wash.:
- Problems of city ownership (ed), 613.
- Puget Sound Power & Light Co.: Sale ordered, 290.


Shreveport, La.:

Signals (See also Traffic regulations):
- Highway crossing signals with mechanical contactors, *765.
- Railroad crossing signals should be distinctive [Nash], *99.
- Traffic signals controlled by street cars, *752.
- Two-color or three-color signals [Rose], *98.

Snow and ice removal:
- Survey of methods used on numerous properties, *676.

Society of Automotive Engineers:
- National Transport Meeting program, 541.

South Bend, Ind.:

Springfield, Mass.:

Standardization:
- Simplification of materials and supplies [Cooper], *323.

Stark Electric Railway (See Alliance, Ohio)

Straits:
- Accelerated progress forecast (ed), 1.
- Annual figures encouraging (ed), 305.
- Bus operation by electric railways and subsidiary companies [Stauffer], *20.
Statistics (Continued):
- Canadian Electric Railway Ass'n:
  Report on industry, 630.
- City and interurban electric railroads and electric
  steamed lines, 6.
- Condensed financial reports of electric rail-
  way properties 1829-1828 (Tables), 304.
- Construction work in heavy electric traction in
  1929, 46.
- Costs and fares in 1929 (Richie), 13.
- Electric railways doing well compared to
  other industries, 355.
- Electric railway financial reports, financial
  1929-1928, 308.
- Expenditures for materials and plant (Faust),
  33.
- Financial situation in 1929 (Buck), 41.
- Key in more favorable position, 3.
- Operating statistics for 1929 (Murphy), 318.
- Railways proceeding with full budget program
  [Miller], 82, (ed) 179.
- Rapid transit lines in U. S., 10.
- Richie fare index revised, 756.
- Rolling stock ordered during 1929 [van der
  Stempel], 33.
- Track extensions, reconstruction and abandon-
  ments in 1929 [Miller], 15.
- Trends in material purchasing analyzed (ed),
  181, *290.
- Trolley bus operation in U. S. and Canada.
- Urban transportation facilities in 1930 (ed),
  609.
Stores:
- Elimination of waste [Duncan], 407.
- Relations of purchasing and engineering
  [Harter], 404.
- Simplification of materials and supplies
  [Cooper], 325.
- Trends in material purchasing analyzed, 200.
Street traffic congestion:
- Kansas City traffic improvements planned, 623.
- Preferential traffic rights for street cars
  [Daniels], 218, (ed), 181.
- St. Louis:
  Auto does not justify its use in streets, 472.
Substations and equipment:
- Baltimore station wins architectural distinc-
  tion, *121.
- Cleveland Union Terminals Co.:
  Motor generators supply power for terminal
  electrification [McDonald], *503.
- Increased power department responsibility dem-
  ands proper equipment and practices
  [Bake], *412.
- Montreal Tramways:
  Installs third automatic rectifier substation
  [de Andreis], *577.
- Reading Co.:
  Reliability features power supply [Dub],
  *571.
Switzerland:
- 478 miles to be electrified, 115.
- Scene railway electrified, *81.
Tampa, Fla.:
- Tampa Electric Co.:
  Accident prevention, *71.
Taxation:
- Road builders recommend relief of paving
  obligations, 143.
- Utility taxation (Lock), 442.
Taxicabs:
- As a public utility (ed), 670.
- City transit problems better understood (ed),
  498.
Taxiub (Continued):
- Control of 400 cabs acquired by Pub. Serv.
- Defining the place (ed), 125.
- Regulation to Providence, R. I. (ed), 456.
- Regulation as a public utility recommended
  in N. Y., *685.
- Undermining an essential service (ed), 731.
Toledo, Ohio:
- Community Traction Company:
  Abstract of Cupp Content brief, *252.
  Displays its warve, 601.
- Revamping of Milner ordinance, 655.
- Unemployment fur earnings, 488.
- Toledo, Bowling Green & Southern:
  Granting certificate, 659.
- Toledo, Fostoria & Findlay:
  Granted authority to suspend, 659.
Toronto, Ont.:
- Toronto Transportation Commission:
  Armature cut wrench [McRae], *285.
- Care essential in stringing trolley wire,
  [Nield], *216.
- Disappearing switch tongues [Grant],
  161.
- Trolley wire break record, *18.
Track construction:
- Boston Elevated Ry.:
  Building concrete track with minimum
  interruption of service, *101.
- Building better track [Wyser], *403.
- Cleveland Railway:
  Accurate time schedules permit speedy
  track reconstruction [George], *278.
- One-man level [Eaves], *104.
- Straight edge for pavement [Coestl0],
  *104.
- Extensions, reconstruction and abandonments
  in 1929 [Miller], 12.
- Georgia Power Co.:
  Economical railings [Bernan], *706.
- Good layouts facilitate routing, *672.
- Mortar flow pulley, *287.
- New Orleans Public Service, Inc.:
  Track with tiles [Mail], *154.
- Pulisator for work under traffic, *712.
- Rail preheater, *558.
- Ratchet jack, *269.
- Sand drier portable, *503.
- San Francisco Municipal Ry.:
  Extensive paving [Boston], *25.
- Selling an idea to forumon [George], *510.
- Special work built in place [Yestal], *339.
- Statistics for 1929, 10.
- Track in paving:
  - Washington, D. C.:
    - Two imbedded in pre-mixed concrete
      [Daildahl], *150.
Trackless trolley (See Trolley bus)
Trolley Regulation:
- Compulsion or persuasion of pedestrians (ed),
  301.
- Correct timing of signals essential in traffic
  regulation [Mason], 82.
- Kansas City:
  Improvements planned, 623.
- New York City:
  New pedestrion control, 344.
  Taxicab regulation recommended, *685.
- Preferential traffic rights for street cars,
  [Daniels], 218, (ed) 181.
- Progressive signal system aids movement in
  Pittsburgh [Stauff and Marsh], *201.
- Short signal cycles speed traffic and reduce
  accidents [Bibbin], 601.
- Signals:
  Combination traffic and warning signal used
  at Salt Lake City, *571.
  Two color vs. three color [Rose], 68.
- Street markers in Washington, D. C., 712.
- Survey in Washington, 318.
- Transportation:
  - Chicago Surface Lines:
    Suspend trailer operation, *640.
    - Dropping the trailer (ed), 613.
  - Growing need for public transportation
    (ed), *567.
  - Making faster car operation practicable
    (ed), 730.
  - 1920's challenge to transportation
    [Shoup], *431.
  - Pillar up bricks and trouble (ed), 303.
  - Serviceable but not suitable (ed), 245.
  - Serving the suburban commuter [Buck], *407.
  - Suez increased through detailed analysis,
    400.
  - Too many self-appointed experts (ed), 302.
  - Transportation men are community builders
    [Currie], 443.
  - Transportation, metropolitan:
    - Berlin, Germany, transportation facilities
      coordinated [Breslausier], *304.
    - Chicago, Ill.:
      Unified transportation development, *500.
    - City transit problems are becoming better
      understood (ed), 498.
    - Co-ordinated transit makes progress (ed),
      126.
    - Cut-rate tax a menace (ed), 731.
    - Development of bus for mass transportation
      [Warner], *245.
    - Merchants—hitting them in the pocketbook,
      *557.
    - Modern vehicles and equipment for urban
      transportation [Hilson], 466.
    - Piece of the bus in mass transportation
      [Warner], *712.
    - Public transportation gaining steadily in
      large cities (ed), 125.
    - Roads readjusts car and bus routes [Ascarelli],
      *136.
  - St. Louis, Mo.:
    Coordination of transit facilities proposed,
    *198.
  - Solving the problem for small-city systems
    (ed), *970.
  - Survey of Baltimore to show shifts of bus
    traffic, 319.
  - Surveys often valueless (ed), 271.
  - Taxicabs as a public utility (ed), 670.
  - Population (ed), 609.
  - Urban transportation facilities keep pace with
    Trolley Bus:
- Brooklyn & Queens Transit Corp.:
  Asks permission to use trolley buses, 126.
  Inaugurates trolley bus service, 553.
- Chicago Surface Lines:
  Drill deliveries vehicles, *784.
  Largest trolley bus system, *272.
  More vehicles ordered, 420.
  Operating statistics prove success of trolley
  lines in Chicago [Forty], *590.
  Orders placed, 244.
  Steel poles used for trolley bus system, *317.
- Cost analyses indicate field of the trolley bus
  [Clardy], *622.
- Detroit Dept. of Street Railways:
  Operation proves advantageous, *753.
  Plans for inauguration, 450.
  Proposed for use, 195.
- Improved trolley bus [Richardson], *317.
- Knoxville Power & Light Co.:
  Increase patronage, *758.
  Vehicles delivered, 244.
- Naming the new baby (ed), 729.
- New Orleans Public Service Co.:
  Installs on shuttle line [Batonville], *111.
  Tax and license rulings, 332.
- Operations in U. S. and Canada, 37.
- Rockford Electric Co.:
  - System to be operating soon, 715.
  - Successful operation demands suitable over-
    head [Bower], *603.
- Utah Light & Traction Co.:
  - To be used on Capital St., 598.
- Electric Railway Journal—Index

Abbreviations:
- Illustrated, c Communications.
WASHINGTON, D. C.:—
- Capital Traction Co. (Continued):
  - Trees imbedded in premixed concrete [Dalgleish]. 130.
- Track construction methods [Dalgleish]. 139.
- Experiments with new markers. 742.
- Washington Railway & Electric Co.:
  - New rates benefit railways. 657.

WASHINGTON, D. C.:
- Ties imbedded in premixed concrete [Dalgleish]. 130.

WASHINGTON, D. C. (Continued):
- Surrounding men with convenience [McCarthy]. 583.

WASHINGTON, D. C.:
- Receives new cars. 496.

WASHINGTON, D. C.:
- Repeated tests checked [Stewart]. 338.

WASHINGTON, D. C.:
- Financial report. 600.
- Seating capacity of cars increased. 708.
- Snow removal practice. 676.
- Track improvements. 64.

WASHINGTON, D. C.:
- Receives new cars. 496.

WASHINGTON, D. C.:
- Receives new cars. 785.

WASHINGTON, D. C.:
- Receives new cars. 496.

WASHINGTON, D. C.:
- Receives new cars. 785.

WASHINGTON, D. C.:
- Receives new cars. 496.

WASHINGTON, D. C.:
- Receives new cars. 785.

WASHINGTON, D. C.:
- Receives new cars. 496.

WASHINGTON, D. C.:
- Receives new cars. 785.

WASHINGTON, D. C.:
- Receives new cars. 496.

WASHINGTON, D. C.:
- Receives new cars. 785.

WASHINGTON, D. C.:
- Receives new cars. 496.

WASHINGTON, D. C.:
- Receives new cars. 785.

WASHINGTON, D. C.:
- Receives new cars. 496.

WASHINGTON, D. C.:
- Receives new cars. 785.

WASHINGTON, D. C.:
- Receives new cars. 496.

WASHINGTON, D. C.:
- Receives new cars. 785.

WASHINGTON, D. C.:
- Receives new cars. 496.

WASHINGTON, D. C.:
- Receives new cars. 785.

WASHINGTON, D. C.:
- Receives new cars. 496.

WASHINGTON, D. C.:
- Receives new cars. 785.

WASHINGTON, D. C.:
- Receives new cars. 496.

WASHINGTON, D. C.:
- Receives new cars. 785.

WASHINGTON, D. C.:
- Receives new cars. 496.

WASHINGTON, D. C.:
- Receives new cars. 785.

WASHINGTON, D. C.:
- Receives new cars. 496.

WASHINGTON, D. C.:
- Receives new cars. 785.

WASHINGTON, D. C.:
- Receives new cars. 496.

WASHINGTON, D. C.:
- Receives new cars. 785.

WASHINGTON, D. C.:
- Receives new cars. 496.

WASHINGTON, D. C.:
- Receives new cars. 785.

WASHINGTON, D. C.:
- Receives new cars. 496.

WASHINGTON, D. C.:
- Receives new cars. 785.

WASHINGTON, D. C.:
- Receives new cars. 496.

WASHINGTON, D. C.:
- Receives new cars. 785.

WASHINGTON, D. C.:
- Receives new cars. 496.

WASHINGTON, D. C.:
- Receives new cars. 785.

WASHINGTON, D. C.:
- Receives new cars. 496.

WASHINGTON, D. C.:
- Receives new cars. 785.

WASHINGTON, D. C.:
- Receives new cars. 496.

WASHINGTON, D. C.:
- Receives new cars. 785.

WASHINGTON, D. C.:
- Receives new cars. 496.

WASHINGTON, D. C.:
- Receives new cars. 785.

WASHINGTON, D. C.:
- Receives new cars. 496.

WASHINGTON, D. C.:
- Receives new cars. 785.

WASHINGTON, D. C.:
- Receives new cars. 496.

WASHINGTON, D. C.:
- Receives new cars. 785.

WASHINGTON, D. C.:
- Receives new cars. 496.

WASHINGTON, D. C.:
- Receives new cars. 785.

WASHINGTON, D. C.:
- Receives new cars. 496.

WASHINGTON, D. C.:
- Receives new cars. 785.

WASHINGTON, D. C.:
- Receives new cars. 496.

WASHINGTON, D. C.:
- Receives new cars. 785.

WASHINGTON, D. C.:
- Receives new cars. 496.

WASHINGTON, D. C.:
- Receives new cars. 785.

WASHINGTON, D. C.:
- Receives new cars. 496.

WASHINGTON, D. C.:
- Receives new cars. 785.

WASHINGTON, D. C.:
- Receives new cars. 496.

WASHINGTON, D. C.:
- Receives new cars. 785.

WASHINGTON, D. C.:
- Receives new cars. 496.

WASHINGTON, D. C.:
- Receives new cars. 785.

WASHINGTON, D. C.:
A

Anthony, William:
—Leveling bar facilitates joint alignment, *201.

App. J.:
—Safety arm for coal and sand bins, *649.

Aschaffenburg and Dean J. Locke:
—Home roadways and bus routes, *136.

Atwell, C. A.:
—Attachment of single-motor drive for gas-electric buses, *164.

B

Baker, C. E.:
—New cars; are recifiers meet transportation demands, *311.

Bald, L. D.:
—Increased power department responsibility demands proper equipment and practices, *112.

Barlo, B. F.:
—Maintaining the distribution system of an electrified railroad, *567.

Beadle, H. J.:
—Copper and mica dust collected on collector commutators. *586.

Beebe, D. S.:
—Copper rings protect commutators on battery-driven motors, *350.

—Test for partially open circuit, *535.

Beers, R. B.:
—New Albany car includes many innovations, *78.

—Selection of motor controls depends on circumstances. *654.

—Shunting motors to obtain greater speed, *535.

Berman, D. S.:
—Economical restarting at Atlanta, *706.

Bethel, C.:
—Economies of high-speed motor and drive, *465.

Bibb, H. J.:
—Electric code case oil for curves and switch, *163.

Bowser, G. W.:
—Successful trolley bus operation demands suitable overhead, *693.

Brazel, H.:
—Build-up compromise joint, *382.

Bredesen, T. E.:
—Insulating sleeve protects test points, *224.

Brown, H. A.:
—Adjustable hanger for switch contacts, *708.

—Center control for temporary block signal, *648.

—Failing danger lights on trolley trucks, *298.

—Gun used for electric track lubrication, *435.

—Neuralry on tower truck, *221.

—Thawing frozen water and conduit pipes, *217.

Brown, L. M.:
—Military wiring unique because it ceased developing, *66.

Buck Morris:
—Improvement in financial situation, *41.

Buck, John W.:
—Determining utility depreciation on a local basis, *69.

—Utility valuation demands local treatment, *64.

Burleson, D. A.:
—Modern vehicles and equipment for urban transportation, *467.

Butler, F. L.:

Clancy, W. J.:
—Aluminum master schedules in rapid transit service, *551.

—Cables indicated field of the trolley bus, *622.

Clark, T. E. and Dean J. Locke:

Conway, Thomas, Jr.:
—Meeting the industry's equipment problem, *179.

Cooper, George A.:
—Underground overhead, *323.

Copeland, A. B.:
—Portable track geometry apparatus, *226.

Costello, P. H.:
—Practically straight edge, *104.

Curris, John E.:
—Transportation men are community builders, *449.

Dalgliesh, R. H.:
—New track construction methods prove speedy and economical, *110.

Dana, Edward:
—Answering a growing need for adequate rapid transit, *391.

Davis, W. T.:
—Preferential traffic rights for street cars, *218.

Davison, James:
—Road lines and car lines reshaped by machine, *163.

Davis, H. A.:
—Air-magnetic brakes make quick stops, *256.

—Insulating safety zone markers, *341.

—Redesigned mate floor prevents derailments, *524.

Dean, J. S.:
—Anchored armature core bands, *221.

—Gage to check alignment of commutators, *828.

—Tests show importance of correct babbitting, *529.

DeAngelis, M. L.:
—Montreal Tramways install third automatic rectifier system, *577.

DeForest, A. T.:
—Engineering influence in Western developments, *463.

De Vis, C.:
—Reliability features Reading's power supply, *747.

Dunke, R.:
—Clamp for installing field coils, *701.

—Two-fledged compass determines motor field polarity, *660.

Dunne, A. S.:
—Elimination of waste, *467.

Evans, Carl W.:
—Detecting broken rails, *223.

Evans, R. B.:
—One-man long lead, *104.

—Treated ties safely handled, *619.

F

Fairefobject, W. R.:
—Bus wheel aligner, *224.

Faus, Clifford A.:
—Aluminum gaging in favor for car construction, *757.

—Detroit express service gains popularity, *85.


—Mobile bids for patronage with clean cars, close headway and smooth track, *558.

Feigelman, Max A.:

Forbes, John F.:

Forty, P. A.:

Fremor, W. P.:
—Grinding of wheels makes maintenance economical, *341.

George, Howard H.:
—Accurate work schedules permit speedy track reconstruction, *753.

—Double-milling rail head to prevent cupping at joints, *627.

—Selling an idea to the foreman, *518.

—Improvement in wound commutator, *569.

—Causes of wheel failure studied at Havana, *107.

Graham, R. N.:
—Obtaining an attractive appearance with simplicity and economy in design, *383.

—Speedy, light-weight cars placed in service in recuperation, *160.

Grant, G. I.:
—Improving geked tongues of electric track switches, *161.

Grant, Richard:
—Double air track inflatable dual tires easily, *160.

Greer, John:

Halbert, F. B.:
—Iron rod acts as dam for weld metal, *225.

Hall, Benjamin H.:
—Reverses protectors prevent tampering, *224.

Hall, C. B.:
—Bus wheels removed with a simple clamp, *706.

—Storage of lamps during car overhaul, *589.

—Testing of field coils, *531.

Hanna, J. A.:
—Cooperative effort is greatest need, *357.

Harris, Frank M.:
—Routings of purchasing and engineering, *494.

Hayes, W. H.:
—Winding and cutting equipment combined, *162.

Helmuth, G. T.:
—Maintaining investigation reduces fraudulent claims, *409.

Hern Charles:
—Removable dolly used in San Diego, *223.

—Engine used for pressure lubrication, *222.

Hyman, Joseph M.:
—Old rail makes satisfactory whirly post, *591.

Inglis, J. G.:

James, R. W.:

Jones, E. J.:

—Modern machinery for better maintenance, *418.

—Tilting bench for controller repairs, *283.

K

Kahn, Samuel:
—Spreading up service, *442.

Kahn, H. L.:
—Lubricating car apparatus, *333.

Kline, Frank:
—Wrench for wheel nuts, *337.

Killion, Frank:
—Electric superflings assembled by pneumatic machine, *339.

Lock, M. D.:

Lockey, E. W.:
—Insulating paste for bolt heads, *766.

Legg, M. J.:
—Dog holds armature pinion, *548.

Locke, Dean J. and A. T. Clark:

M

McAloney, W. H.:
—Double milled running brake handle, *223.

McCarty, H. W.:

—Securing the facts is the basis of accident investigation, *479.

McDonald, G. R.:
—Motor generators supply power for Cleveland Terminal electrification, *853.

READ THE INSTRUCTIONS AT THE BEGINNING OF THE BINDING
McIntosh, R. S.:—Loosening tight wires in conduit. *587.
MaceMurray, G. J.:—It’s sand that keeps the wheels from slipping. *27.
Mall, I. O.:—Track without ties built at New Orleans, *154.
—National survey shows electric railways proceeding with full budget plan. *183.
Moises, G. L.:—Installation and adjustment of compensating controller fingers. *287.
—Motor field shunting gives old cars new pep. *710.
—Provides lubrication prolongs life of control equipment. *190.
Mosedale, J.:—Cars grounded on crown plate. *531.
—Lining well used for controller testing. *706.
—Removing trucks from cars on beams. *284.
Murphy, Edmund J.:—1929 was a successful year for the electrical railways. *318.

N

Nabholz, Carl P.:—Railway crossing signals should be distinctive. *119.
Neal, J. P.:—Care essential in stringing trolley wire. *216.
—Inspecting jigs for brake head drilling. *591.
—Oversize bearing housings used in jig. *750.
Osborne, W. B.:—Preventing grease from entering armature. *224.
Otis, H. A.:—Meeting the passengers’ demand for greater comfort and convenience. *379.

P

Palmer, Stewart:—Portable rack for special bus tools. *531.
Piekenstein, M. E.:—Switch tongue built up with welds. *283.
—Spray equipment effective for weed killing. *104.

Pookha, William:—Towing and spacer bar for disabled buses, *287.
Rainville, W. S. Jr.:—Trolley buses installed on New Orleans shuttle line. *141.
Reinke, Christ:—Blinder light protects linemen on night work. *651.
—Electrically heated inspection lamps. *161.
Ross, L.:—Bus hood clamp lacks ease. *588.
Roux, O.:—Two-color and three-color signals. *68.

S

—Instruction school for linemen. *586.
—Use of dynamometer successful in stringing trolley wire, *281.
—Waring lehrs on lower wagons. *339.
—When should contact line be renewed? *706.
Scullin, Terence:—Convenient machine for armature removal, *141.
—Gage makes wheel mounting easy. *708.
—Hose for drilling brake hangers. *341.
—Steel plate safety shoes fitted to ladders. *580.
Sclater, Herbert:—Axle and armature bearing jig. *108.
Sheep, Paul:—Co-operation is essential to meet 1930’s challenges to transportation. *119.
—How the convention will benefit the industry. *314.
—Cylinder boring device for air compressor, *621.
—Improved connecting rod for tongue switches, *105.
Stauffer, J. R.:—Bus operations are steadily expanded by electric railways. *90.
—De luxe bus finds-wide application in interurban service. *144.
—Improving service for patrons in De Luxe bus operation, *91.
—Flexible progressive signal system aids traffic movement in downtown Pittsburgh, *80.

READ THE INSTRUCTIONS AT THE BEGINNING OF THE INDEX
Abbreviations: * Illustrated, c Communications,

Stevens, Hoy:—Brake lining selected by test results. *417.
—Simple feeder gates. *706.
—Stand facilitates bus motor adjustment. *284.
Stokes, Carl W.:—Improving the bus to increase its usefulness. *387.

Tauman, A.:—Insulation tested with portable transformer. *284.
Taylor, Clarence F.:—Traffic officers as transportation men. *128.
Thomas, David R.:—Recent freight equipment trends assure a more profitable business. *398.

V

Valleechi, Ugo:—Rome to have modern subway. *526.
van der Stangel, Th. M.:—Rolling stock purchases largely increased. *33.

W

Westinghouse Memorial dedicated. *699.
Williams, E. Bryan:—St. Louis tags transfer passengers. *752.
—Center bearing lubrication simplified. *578.
—High voltage test discloses equipment weakness. *275.
Williams, H. S.:—Lowering costs and bettering public relations by reducing noise. *76.
Wingertser, Laurence:—Extensive rehabilitation places Des Moines in favorable position. *739.
Wommack, F. C.:—Effective sales promotion work by trammen of Norfolk, *521.
Wright, G. L.:—Reading Company’s Philadelphia suburban electrification making rapid progress. *152.

Y

Yeates, W. S.:—Combination tie plate for various rails. *106.
—Emergency special work built in place. *339.
—Track sand stored by compressed air. *590
<table>
<thead>
<tr>
<th>Name</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>D. R.</td>
<td>61</td>
</tr>
<tr>
<td>Protzeller, H. W.</td>
<td>596</td>
</tr>
<tr>
<td>Pulcipher, K. D.</td>
<td>548</td>
</tr>
<tr>
<td>Quick, C. H.</td>
<td>179</td>
</tr>
<tr>
<td>Quill, C. J.</td>
<td>60</td>
</tr>
<tr>
<td>R</td>
<td></td>
</tr>
<tr>
<td>E. H., Jr.</td>
<td>295</td>
</tr>
<tr>
<td>Rahnquist, Nelson L.</td>
<td>174</td>
</tr>
<tr>
<td>Reynolds, A. E.</td>
<td>732</td>
</tr>
<tr>
<td>R. J.</td>
<td>203</td>
</tr>
<tr>
<td>Rich, J.</td>
<td>240</td>
</tr>
<tr>
<td>Rich, J. W.</td>
<td>254</td>
</tr>
<tr>
<td>Richardson, Guy A.</td>
<td>257</td>
</tr>
<tr>
<td>Riddle, Samuel</td>
<td>351</td>
</tr>
<tr>
<td>Ridgway, Robert</td>
<td>548</td>
</tr>
<tr>
<td>Robbins, N. C.</td>
<td>241</td>
</tr>
<tr>
<td>Robertson, W. A.</td>
<td>120</td>
</tr>
<tr>
<td>Roosevelt, Charles J.</td>
<td>151</td>
</tr>
<tr>
<td>See, P. C.</td>
<td>776</td>
</tr>
<tr>
<td>Schie, R. H.</td>
<td>485</td>
</tr>
<tr>
<td>Seymour, John A.</td>
<td>721</td>
</tr>
<tr>
<td>Sharkey, John J.</td>
<td>862</td>
</tr>
<tr>
<td>Shaw, Glenn H.</td>
<td>546</td>
</tr>
<tr>
<td>Shelter, C. M.</td>
<td>120</td>
</tr>
<tr>
<td>Shephard, J. B.</td>
<td>237</td>
</tr>
<tr>
<td>Shephard, John H.</td>
<td>603</td>
</tr>
<tr>
<td>Sherman, Hugh</td>
<td>161</td>
</tr>
<tr>
<td>Sigrist, Hugh A.</td>
<td>62</td>
</tr>
<tr>
<td>Slocap, E. L.</td>
<td>177</td>
</tr>
<tr>
<td>Small, G. A.</td>
<td>230</td>
</tr>
<tr>
<td>Smith, E. B.</td>
<td>729</td>
</tr>
<tr>
<td>Smith, H. W.</td>
<td>556</td>
</tr>
<tr>
<td>Smith, P. F. W.</td>
<td>491</td>
</tr>
<tr>
<td>Smith, R. R.</td>
<td>174</td>
</tr>
<tr>
<td>Smith, Walter</td>
<td>550</td>
</tr>
<tr>
<td>Snyder, J. R.</td>
<td>341</td>
</tr>
<tr>
<td>South, E. S.</td>
<td>606</td>
</tr>
<tr>
<td>Spencer, A. L.</td>
<td>230</td>
</tr>
<tr>
<td>Spencer, W. B.</td>
<td>697</td>
</tr>
<tr>
<td>Sperry, Elmer A.</td>
<td>403</td>
</tr>
<tr>
<td>Spink, Glen C.</td>
<td>348</td>
</tr>
<tr>
<td>Springer, W. A.</td>
<td>175</td>
</tr>
<tr>
<td>Squire, A. C.</td>
<td>355</td>
</tr>
<tr>
<td>Stanton, W. J.</td>
<td>664</td>
</tr>
<tr>
<td>Stanton, Wm. P.</td>
<td>666</td>
</tr>
<tr>
<td>Stark, L. K.</td>
<td>351</td>
</tr>
<tr>
<td>Stearns, R. B.</td>
<td>121</td>
</tr>
<tr>
<td>Steffens, T. H.</td>
<td>336</td>
</tr>
</tbody>
</table>

**READ THE INSTRUCTIONS AT THE BEGINNING OF THE INDEX**

Abbreviations: *Illustrated. c Communications.
In and out—and around other vehicles—the G-E equipped trolley bus is blazing new trails to bigger profits—quietly, smoothly, and economically. The trolley bus is no longer an experiment; it is comfortable and attractive; it has won its place in the modern system of coordinated transportation. Investigate G-E equipment; there are now five installations—all interesting.
A faster getaway with VA Control

With higher accelerating, running, and decelerating rates of speed essential to the present-day traffic conditions, Westinghouse recommends the new VA (Variable Automatic) Control for increased comfort, speed and safety in city street car operation.

Following are some of the operating features of VA Control:

- Smooth acceleration
- Rapid acceleration
- Variable rates of acceleration
- Variable tractive effort
- Quick response
- Effective notching
- Emergency brake
- Hand-operated reverser
- Simplicity and reliability

(Each of these features is fully described in S.P. 1863, Westinghouse Electric Railway Equipment for Speedy and Comfortable Transportation Service).

If you are interested in giving your patrons the benefits of the latest practices in comfortable and safe control, allow our engineers to analyze your equipment and make recommendations relative to the use of Variable Automatic Control.
Contents of This Issue

JANUARY, 1930

Coming!

DURING 1930
A survey of de luxe bus operations by electric railways
Unit replacement system in railway shops
Analyses of transportation problems in small cities
Statistics of electric railways in foreign countries
Timing of traffic signals

McGraw-Hill
Publishing Company, Inc.
Tenth Avenue
at 36th Street
New York, N. Y.

CABLE ADDRESS:
"MACHINIST, N. Y."

James H. McGraw, Chairman of the Board
Malcolm Murr, President
James H. McGraw, Jr., Vice-President and Treasurer
Edward J. Phelan, Vice-President
Marion Britton, Vice-President
Edward Edgell, Vice-President
Harold W. McGraw, Jr., Vice-President
H. C. Parmele, Editorial Director
C. H. Thompson, Secretary

Member A.B.C.
Member A.B.P.

1929
Official correspondent in the United States for Union Internationale de Tramways et Chemins de fer d'Intérêt local et de Transports Publics Automotora.

New York, District Office, 255 Madison Avenue
Washington, National Press Building
Chicago, 180 North Michigan Avenue
Philadelphia, 1500 Arch Street
Cleveland, Guardian Building
Boston, 1137 State Building
Greenville, S. C., 1201 Woodward Building
Detroit, 422 General Motors Building
St. Louis, Bell Telephone Building
San Francisco, 255 Mission Street
Los Angeles, 655 Chamber of Commerce Bldg.
London, 8 Euston Road, London, E. C. 1

Number of Copies Printed This Issue, 6,460

Editorial—Accelerated Progress Forecast by Record of Past Year .......................................................... 1

Electric Railway Industry in More Favorable Position ................................................................. 3

Expenditures and Improvements Mount Upward ................................................................. 8

By Clifford A. Faust

Electric Railway Costs and Fares in 1929 .................................................................................. 12

By Albert S. Richey

Industry Strengthened by Trackage Readjustment ..................................................................... 15

By John A. Miller, Jr.

Rapid Transit Situation Shows Little Change ............................................................................. 19

Bus Operations Are Steadily Expanded by Electric Railways .............................................. 20

By J. R. Stauffer

It's Sand That Keeps the Wheels from Slipping ......................................................................... 27

By G. J. MacMurray

Rolling Stock Purchases Largely Increased ............................................................................. 33

By Th. M. van der Stempel

Interest Revived in Trackless Trolley Operations .................................................................... 37

Great Improvement in Financial Situation .............................................................................. 41

By Morris Buck

Much Construction Work Features Heavy Electric Traction in 1929 ......................................................... 46

Low Records Made in Trolley Wire Breaks ............................................................................ 48

Monthly Statistics of the Industry ............................................................................................. 50

News of the Industry ..................................................................................................................... 52
A big blowout ... without coils

The simplicity of this control switch has won popularity even beyond the expectation of its designers. The fact that a powerful blowout action is obtained without the use of blowout coils strongly appeals to operators.

This assertion is supported by the highly satisfactory operation of more than 3500 switches sold during the past two years.

We offer you, at a reasonable price, a simple, sturdy, and reliable switch for 600 volts, current up to 25 amperes. For compressor service the maximum current rating is 12 amperes.

The nearest Westinghouse representative will be glad to furnish you with further information and literature.

WESTINGHOUSE ELECTRIC & MANUFACTURING CO.
EAST PITTSBURGH PENNSYLVANIA
SALES OFFICES AND SERVICE SHOPS IN ALL PRINCIPAL CITIES
The list grows longer --

ONE after another electric railway companies, large and small throughout the country over, continue to place their names upon the roster of users of Westinghouse-Nuttall quiet gears.

The intense interest which has followed this revolutionary improvement since its introduction scarcely two years ago, is reflected in the fact that at present more than 30 properties have specified these gears both for replacements and as part of new equipment. Among these are many of the largest orders for new cars placed during the past year.

Such ever-increasing use of Westinghouse-Nuttall quiet gears is a significant indorsement of their importance as a fundamental requirement wherever quiet car operation is to be secured.

The Westinghouse-Nuttall noise-eliminating feature may be applied to either helical or spur gears.

The nearest Westinghouse transportation representative gladly will give you details.
Improved Atlas Rail Grinder

Eureka Radial Rail Grinder

Imperial Track Grinder

Ajax Electric Arc Welder

For a prosperous year
Money can’t buy everything—unless you have a lot of it, but you don’t need much money to have some very worth-while things... smooth track, for instance. And, that as most street railway men now know, is the very foundation of good service.

Only good track makes new cars act their age and old cars hide theirs.

You can’t harvest a bumper crop of fares on bumpy track.

You can tell your public how good you are, but you can’t sell them if your track refutes your words.

Good track, worth so much, costs so little if you’ll only use modern track grinding and electric arc-welding equipment.

*Here it is—yours for a prosperous year*

**Railway Track-work Co.**

3132-48 East Thompson Street, Philadelphia

**AGENTS**

Chester F. Gailor, 50 Church St., New York

Chas. N. Wood Co., Boston

H. P. McEnerny, 206 S. LaSalle St., Chicago

F. P. Bodier, San Francisco, Cal.


Equipment & Engineering Co., London
How Over 125 Electric Railways Secure Efficient Rail Bonding

O-B Titon Bonds, Installed with Duron Welding Rod, Improve Reliability of Return Circuit.

From coast to coast, from Canada to Mexico and in many foreign countries, operators of electric railway properties have solved many rail bonding problems by installing Titon Bonds.

In the few short years since Titons were first offered to the industry, experience shows a marked reduction in maintenance and replacements, with vastly improved efficiency due to the longer life and permanently lower resistance possible with properly-installed Titon Bonds.

Proper installation requires, in addition to a bond of correct design, a welding rod of definite characteristics. A dense weld, free from gas bubbles, which form a homogeneous union with the rail, is absolutely necessary to long life and low resistance.

The use of O-B Duron Welding Rod provides such a weld. Compare the above microphotographs of sheared sections. Why the weld made with O-B Duron Rod will and does render far better service than is possible with less efficient material is obvious to the critical eye. A resistance welder, with negative rail polarity is used.

The service rendered by O-B Titon Rail Bonds throughout the industry is definite proof that this design, regardless of the welding material, is greatly improving performance. With the use of O-B Duron Welding Rod even this improved performance is bettered.

If you, too, have rail bond problems—if you want lower return circuit resistance, greater reliability and much longer life, why not investigate O-B Titon Rail Bonds?

Ohio Brass Company, Mansfield, Ohio
Canadian Ohio Brass Co., Limited
Niagara Falls, Canada

Ohio Brass Co.
NEW YORK PITTSBURGH PHILADELPHIA BOSTON CHICAGO CLEVELAND ST. LOUIS ATLANTA SAN FRANCISCO LOS ANGELES DALLAS

PORCELAIN INSULATORS LINE MATERIALS RAIL BONDS CAR EQUIPMENT MINING MATERIALS VALVES
A Buying Record that Service is Building for MARATHON EARS

In 1924 O-B Marathon Ears were first offered to the electric railway industry. Service tests, at that time, showed that more than double the mileage of other types could be expected. That there was a definite need for such an improved ear is indicated by the fact that during that first year, enough O-B Marathon Ears were purchased to take care of nearly 5,000 miles of wire.

From the beginning, the industry proved to itself that double mileage was the rule with O-B Marathon Ears—that 400,000 and more car passes were not unusual. Records on one property showed as high as 700,000.

As a result, year by year, more and more overhead superintendents have learned of and have chosen O-B Marathon Ears. And it is a significant fact that 1929 shows a continuation of this progress, as evidenced by a 12% increase over 1928; a 75% increase over 1924.

Certainly extraordinary service must be the reason. If you are not now using O-B Marathon Ears, may we suggest that you investigate this long lived, time and money saving device for your 1930 ear requirements?

Ohio Brass Company, Mansfield, Ohio
Canadian Ohio Brass Co., Limited
Niagara Falls, Canada

Ohio Brass Co.

NEW YORK  PITTSBURGH  PHILADELPHIA  BOSTON
CHICAGO  CLEVELAND  ST. LOUIS  ATLANTA
SAN FRANCISCO  LOS ANGELES  DALLAS
Do you have your copy?

You have, no doubt, been following our series of advertisements dealing with the seven factors that influence stopping distance. . . . The interest manifested in this series by street railway men throughout the country has indicated an eagerness for better brake performance. . . . These advertisements have now been reprinted in booklet form for ready reference and connected study by those interested. If you have not already received a copy, write for one now. Ask for Publication 9073.

Remember, also, that our engineers are always available for assistance in solving your braking problems.

WESTINGHOUSE TRACTION BRAKE CO.
General Office and Works . . . . WILMERDING, PA.
STEP ON IT

TAKE THE EASIEST WAY OUT
J-M Brake Blocks are making unusual performance records on Bus Lines...

MORE than 650,000 safe, quick, quiet stops is an unbelievable record for any braking material. Yet the J-M Brake Blocks shown in the photograph below made this record in 25,000 miles of service...and this set of blocks is still good for thousands of miles additional cost-free braking service.

This is not an isolated record of the money-saving, safe service that J-M Brake Blocks give the bus operator. More than sixty companies have tested this friction material with uniformly successful results.

J-M Brake Blocks, adaptable to many types of equipment, have been specially designed to meet the operating conditions of modern bus service.

J-M Brake Blocks, made of moulded asbestos, resist the action of oils and greases. They reduce costs by giving thousands of miles of extra service, by reducing shop time for adjustments, by increasing tire life through smooth gripping and by eliminating road delays. J-M Brake Blocks provide quiet and positive braking action. They allow higher running speeds and quicker stopping with absolute safety. They are particularly recommended for use on alloy or high-carbon drums.

From the standpoint of safety, efficiency and reduced cost of operation we ask that you test this J-M friction material. The coupon will bring you further information and performance facts.

J-M Brake Blocks are recommended for use on air brakes which may be either of the diaphragm type, requiring a tank pressure of 60 lbs. or of the wheel cylinder type, requiring a pressure of from 100 to 110 lbs. They are also applicable to mechanical brakes, with vacuum boosters. These may be two wheel or four wheel brakes, the latter being used extensively on 17-21 passenger coaches. The size of the friction material in each instance runs from 1-4" to 7-8" thick. In the manufacture of J-M Brake Blocks, composition, density, hardness and dimensions are carefully controlled.

BUS & CAR INSULATION  REFRACTORY & INSULATING CEMENTS  FIBRE CONDUIT  ASBESTOS EXHAUST PIPE COVERING
PACKINGS  TRANSITE  BUILT-UP & READY-TO-LAY ROOFING  ASPHALT PLANK TILE FLOORING  POWER PLANT INSULATIONS
MASTIC & TRUSS PLATE FLOORING  ELECTRICAL INSULATING MATERIALS  FRICTION TAPE  BRAKE BLOCKS & LININGS

JOHNS-MANVILLE CORPORATION
Address near you
New York  Chicago  Cleveland  San Francisco  Montreal (Branches in all large cities)

Please send me further information about your Brake Blocks.

Name
Address
Look for Comfort

One has only to look around with a penetrating eye to know that comfort is being sold.

How does the successful hotel attract steady patronage? Why are theatres so luxurious? What appeals most to people when riding in motor cars? Why has deeply upholstered furniture displaced the old-fashioned straight back chair and hair-cloth sofa.

The answer is “comfort.” People look for comfort. They pay to be comfortable. It pays to make them comfortable.

Comfort is a commodity that is building increased patronage for many a progressive railway. The foundation of riding comfort is a seat that is really restful.

HALE & KILBURN SEATS

“A BETTER SEAT FOR EVERY TYPE OF MODERN TRANSPORTATION”

HALE & KILBURN CO.

General Office and Works: 1800 Lehigh Avenue, Philadelphia

SALES OFFICES:

Hale & Kilburn Co., Graybar Bldg., New York
Hale & Kilburn Co., McCormick Bldg., Chicago
E. A. Thornwell, Candler Bldg., Atlanta

Frank F. Bodler, 903 Monadnock Bldg., San Francisco
W. L. Jeffries, Jr., Mutual Bldg., Richmond

H. M. Rater, 146 N. Sixth St., Portland, Oregon
Time Tested and...

Golden Glow Railway Car Headlights

Golden Glow Bus Headlights

Keystone Trolley Catchers

Type 129 Hunter Sign—mechanism

Typical Hunter Illuminated Sign

Dome Type A Keystone-Ivahoe Fixture

Type T Lighting Fixtures

Dome Type S Keystone-Ivahoe Fixture

Keystone Roof Type Bus Ventilator

Faraday Push Buttons

Faraday Buzzers

Oakdale

Huntley & Palmers, Inc.

SIGNAL SYSTEM

Faraday Car Signal Systems

Electric Servi

Home office and manufacturing plant located at 15th and Cambria Streets, Philadelphia, Pa.; District offices are located at 111 North Canal Street, Chicago, Ill. and 50 Church Street, New York City.
Long experience in meeting the needs of Electric Railway Transportation Companies since the infancy of the industry enables us to serve you as specialists in car equipment unsurpassed in design, material and workmanship.

These long years of experience in manufacturing electrical equipment have prepared us to meet the needs of the latest development in mass transportation—the modern bus.

For Car Equipment—Refer to Catalog No. 7.
For Bus Equipment—Refer to Catalog No. 9.
A Review of Recent

(Above) The Chicago Surface Lines specified PCM control and G-E air brakes for 100 new cars. Forty are equipped with GE-301, low-wheel motors.

PCM control provides smooth, quick acceleration. It is simple, compact, and reliable.

G-E equipped trolley buses have won their place in the modern transportation system.

(Above) The Gary Railway Company of Gary, Ind., operates 17 G-E equipped street cars. Several are of this modern type.

(Above) G-E magnetic track brakes are designed to prevent accidents.

(Left) G-E motors, PCM control, and G-E magnetic track brakes are responsible for unusual performance of the car, operated by the Midland Traction Co., Albany, N.Y.
[N recent years, the necessity of realizing every possible economy in operation and maintenance has become increasingly important. Now—more than ever before—the railway industry has opportunities, through the use of General Electric equipment, to effect sound economies and also to provide better service for the public.

(Above) Automatic switching equipment for mercury-arc rectifiers, Piedmont and Northern Railway. (Below) 1,000-kw., 600-volt, mercury-arc rectifiers, Philadelphia Rapid Transit Co.

(Above) The Public Service Coordinated Transport of New Jersey now operates more than 1,000 G-E equipped gas-electric buses.

(Above) One 4,000-kw. and two 2,000-kw., 650-volt, manually controlled, synchronous-converter units, Brooklyn-Manhattan Transit Corp.

(Left) G-E line-material products include overhead equipment for trolley-bus operation.

(Left) The G-E non-resonant gear contributes much toward quiet car operation.

ELECTRIC
SALES OFFICES IN PRINCIPAL CITIES
Power to Start to Stop

SPEED, with safety, and comfort characterize this new G-E equipped car operated by the United Traction Company of Albany, N.Y. It is powered with four GE-265 motors (35 hp. each); it has a free running speed of 32 miles per hour at 550 volts. A smooth, quick acceleration (3 1/2 mi. per hr. per sec.) is obtained with foot-operated PCM control, the operator selecting his desired running speed by means of a pedal instead of the usual hand controller. Two sets of brakes—G-E air brakes and the new G-E magnetic track brakes, both foot-operated—provide the utmost safety regardless of rail conditions. This equipment makes possible an emergency braking rate of from 6 to 8 mi. per hr. per sec.

This car permits an increase of 15 per cent in schedule speed. Such all-round performance attracts patronage and reduces operating costs. For complete information, address the General Electric Company, Schenectady, N.Y. or the G-E sales office nearest you.

The magnetic track brakes are located between the wheels, next to the track.
Accelerated Progress

FORECAST BY RECORD OF PAST YEAR

FIRM FAITH in the future is shown by the intention of the electric railways to spend almost $375,000,000 during the next twelve months for extensions, betterments and maintenance. Building slowly but surely on a firm foundation, the industry has steadily improved its position in recent years until today it looks forward with renewed confidence. Figures received by this paper from companies representing more than 97 per cent of the electrified track mileage of the United States and Canada show that the record of 1929 is more encouraging in nearly every way than the record of any other recent year. Estimates for 1930 indicate that even greater progress may be expected during the year just beginning.

Operating Results Improved

FINANCIAL results of operations in 1929 were notably better than in 1928. The total number of passengers carried by the cars and buses of the electric railways last year was slightly greater than during the preceding year. The average fare increased a fraction of a cent. Gross earnings showed a moderate gain. On the other hand, wages and construction costs remained fairly steady, and more efficient operation permitted a substantial reduction in expenses. As a result, net income was considerably improved. Apparently the recent disturbance in the stock market has had little, if any, harmful effect upon the electric railways. Despite some uncertainty concerning the general business outlook, indications are that revenue will be as good in 1930 as in 1929, or perhaps slightly better, and that operating expenses may be still further reduced.

Budget Figures Show Gain

EXPENDITURES made during 1929 for new plant and equipment, maintenance materials and supplies, and construction and maintenance labor, totaled more than $355,000,000. This total is about 4 per cent higher than the figure of similar expenditures made during the preceding year, and is slightly more than was forecast by this paper last January.

Estimates for expenditures during 1930 reflect clearly a recognition of the continuing need for rail service. An increase of $3,000,000, is indicated in expenditures for new cars, making a total of about $32,000,000. Way and structures expenditures will be increased $7,000,000 to a total of more than $88,000,000, not including the cost of regular maintenance work. The power and line budget shows a similar but somewhat smaller increase. At the same time continued expansion of bus operation is forecast by expenditures of some $20,000,000 estimated under that heading.

Rolling Stock Purchases Increased

APPROXIMATELY 1,400 cars were bought by the electric railways in 1929 as compared with less than 900 in 1928. Cars designed for carrying heavy loads in the larger
cities pre-dominated in the purchases last year, but it is notable that a considerable number of companies operating in the smaller cities are also found in the list of purchasers. Included in the total is one order for 300 rapid transit cars for New York City and several orders totaling more than 200 cars for multiple-unit operation in electrified suburban service. One hundred trail freight cars were bought by the electric railway industry, and 77 electric locomotives. Moreover, some 2,300 old cars were scrapped during the year.

**Bus Operations Expanded**

The number of new buses bought last year was even larger than the number of new cars, being over 1,800. At the same time nearly 400 additional buses were acquired through the purchase by the railways of independent lines already in operation, making a total gain of about 2,200 buses. This increase is only a little less than that which occurred in 1928, a year of notable expansion in the bus operations of the electric railways. Some 700 buses were scrapped or otherwise disposed of. It is interesting to note that this is equivalent to 70 per cent of the number of buses bought by the electric railways five years ago. Extensions to existing bus routes and new routes added during 1929 totaled nearly 4,000 miles, a considerably larger increase than occurred during the preceding year.

Particularly significant is the increase in the number of trackless trolleys operated by the electric railways. After a promising beginning about ten years ago this type of transportation waned in popularity until it appeared to be on the verge of disappearing entirely. More recently, however, important improvements in the design of the vehicle have restored it to favor. While it is too early as yet to prophesy how far the adoption of trackless trolleys is likely to go in the future, it is evident that this type of vehicle has promising possibilities for rendering efficient transportation service under the conditions to which it is suited.

**Volume of Trackwork Large**

Extensions and reconstruction of electrified tracks totaled over 1,050 miles last year. Of this amount more than 850 miles represented increases and improvements to the trackage of the urban and interurban electric railways, and some 200 miles represented electrification of lines formerly operated by steam. While these figures show a slight decrease from the corresponding figures for 1928, they are considerably above the average for the past ten years.

Coincident with the additions made to the trackage and equipment of the electric railways, certain decreases also have occurred. Considerable track was abandoned during the year just ended, the total being approximately 1,000 miles. This is substantially less than the mileage of abandonments which occurred in 1928. Moreover, there was a marked reduction in the number and mileage of properties that were entirely abandoned.

Partial abandonments by companies which continued rail operation on other routes constituted by far the larger part of the decrease in mileage which occurred last year. From this it is evident that real progress is being made in co-ordination, rail service being retained where it is justified by the relationship between revenue and expense, and bus service being instituted in its place where conditions are more favorable for that type of operation.

**Industry Strengthened By Readjustment**

As a net result of these changes the electric railways find themselves at the beginning of the new year with a slightly reduced mileage of track, and a slightly smaller number of cars, but with a substantially larger number of buses and mileage of bus routes. Without doubt, this readjustment has greatly strengthened the position of the industry by enabling it more effectively to meet the transportation demands of the traveling public. That further readjustment along similar lines will occur during 1930 appears certain. From this it is not to be inferred, however, that wholesale substitution of buses for cars is in prospect. Substitutions will continue to be made where they appear to be advantageous, but the necessity for rail service on heavy traffic lines is steadily becoming more widely recognized.

These facts furnish convincing evidence that the industry is in a fundamentally sound condition. Notable progress was made during the year just ended and every indication points to an even greater advance in the year now beginning.
Electric Railway Industry in More Favorable Position

With revenues approximately the same as in the previous year, the companies have been able to make readjustments for reduced operating expenses, making the net revenue for 1929 the largest in the history of the industry. Statistics show the progress made over a period of years.

With another year added to the record, the electric railway industry is found in a more stable position than it has been in for some time. It has continued during 1929 along lines similar to those followed in the previous year. The results of a number of influences that have been at work for some time are, however, only beginning to make themselves apparent, so that the industry has been able to make readjustment to the end that greater net revenues have been obtained. The increase in the number of automobiles used for private, urban and suburban transportation has continued at a pace only slightly retarded from its maximum of a few years ago. Even with this the revenues of the electric railways have held up. At the same time it has been found possible to introduce economies, some of them of a major character, so that expenses have not increased. As a result of these two trends acting together, the net income of the electric railway properties for the year, according to the preliminary estimates now available, actually will be the highest the industry has known.

Financial results for the past year's operations, shown graphically on the right edge of Fig. 1, may be compared at a glance with those of past years. This chart, which has been prepared with the assistance of the American Electric Railway Association, shows the financial history of the industry since 1907. The figures for the years 1907 to 1922, inclusive, are from the United States census of street and electric railways, and the others are from the association's records. Inspection of the chart shows that from a net income in 1907 of $40,000,000 retained out of gross revenues of $430,000,000, the business done by the electric railway properties has expanded so that last year the net earned was approximately $83,000,000 out of total revenues amounting to slightly less than $1,130,000,000. On a per cent basis the return has diminished considerably, the net income being 9.4 per cent of the gross in 1907 and only 7.4 per cent in 1929. However, the net income has been increasing steadily each year since 1924, when it was only 4.2 per cent of the gross. This change is of immense importance when the status of the industry as a going concern is under consideration. It is reflected in the improved standing of electric railways with financial interests generally. The approximate figures for the distribution of the expenses for the past year are: wages $424,000,000; other operating expenses,
$357,000,000; rents, taxes, interest and similar charges, $264,000,000. Wages thus represent 37.6 per cent of the total revenue. Other operating expenses are 31.6 per cent, and rents, interest, etc., are 23.4 per cent of the gross revenue. The ratio of operating expenses to gross revenue stood at 69.2 per cent, which is less than the operating ratio in any recent year.

**Passenger Traffic Almost Constant**

In number of passengers carried the industry has shown but little change from year to year for some time. In a number of the smaller communities there has been a reduction in riding on street cars, but this has been balanced to a large extent by an increase in the riders on buses operated by the street railway interests. In some of the larger cities there has been a gain in both car and bus passengers. Fig. 2 shows the total number of passengers carried on the vehicles operated by the electric railway companies from 1917 on, separated into car and bus riders. In this chart the figures for electric railway passenger traffic are based on the 1917 and 1922 United States censuses of electric railways, while those for other years are estimates of the American Electric Railway Association. The total number of passengers carried in 1929 was approximately 15,830,000,000, of which 14,740,000,000 were car passengers and the remaining 1,090,000,000 were bus riders.

**Miles of Route Covered Expanded Greatly in Ten Years**

The track mileage and mileage of bus routes operated by electric railway companies are shown graphically in Fig. 3. During the period from 1917 down to the present there has been an increase of enormous proportions in the length of streets, highways and private rights-of-way over which street and electric railway cars and buses are run. The chart shows that in 1918 there were some 45,000 miles of electric railway tracks and 2,630 miles of electrified steam railroad in the United States. At that time there were no bus routes, and none were recorded until 1920, when there were about 1,000 miles. From year to year there have been minor suspensions of service on tracks which were non-productive, or where buses could be used to replace the cars to advantage. These abandonments have been offset to some extent by extensions of track. In practically every instance where such extensions have been made they were justified economically, as it now is possible to use the bus for extensions of service into territory where there is uncertainty of the need for it. In a number of instances the necessity for maintaining track and rehabilitating it has disappeared, since it is possible to use buses to replace it to good advantage without continuing the liability for excessive taxation and paving charges which in the past have been assessed against the electric railway companies and have proved a severe handicap to successful operation. Where service is not too heavy this plan has proved advantageous.

In other instances abandonment of track has resulted from the need for more direct routing. Many lines were laid out without regard to obtaining the most direct or fastest service, but were distorted to satisfy real estate operators and others who for one reason or another demanded a deviation from the best route. In such instances the bus has usually been accepted as a substitute over the route which best serves the patrons at the present time. The abnormal rise in construction costs without a corresponding rise in revenue caused a situation due to which some of the smaller railway companies were unable to survive the onslaught of much higher operating expenses without an adequate amount of traffic. Then, too, the advent of the private automobile took away sufficient traffic that certain lines became unremunerative.

It is a matter of common understanding that in the heyday of the promotion of electric railway lines 20 to 30 years ago many miles of track were constructed that never should have been built. The territory in which they were placed was not, and could not be, productive of sufficient traffic to warrant them. Although they were a drag on the system, the remainder brought in sufficient revenue to carry the loss. When the war came, bringing in its wake greatly increased costs of operation and maintenance, and when the number of passenger automobiles increased to a total undreamed of in the days of the promoters, all within the space of a few years, such unwarranted railway lines were wiped out. Some of them were replaced by bus lines, but in other instances no public transportation of any sort is now given. While the process has been going on for several years, it is not yet completed. There still is some rail-
way track that was uneconomically located at the beginning, and which is a drag on the more prosperous portions of the systems.

Little Change in Number of Vehicles but Capacity Increases

Despite the large numbers of cars and buses that are retired annually, there has been little change in the total number for the last several years. At present there are approximately 111,000 cars and buses in use in the United States, of which 73,768 are passenger cars and 11,854 are buses. The remainder are divided between electric locomotives, freight, service, and miscellaneous cars. It is noteworthy in this connection that the improvement in electric railway cars has made possible the retirement of large numbers of obsolete vehicles and their replacement by a smaller number of new, fast, light-weight cars that are operated today to give an increased number of car-miles. The buses likewise are vastly improved from those that were first introduced, so that comparisons of numbers alone do not give an adequate picture of the change that has been wrought in the past ten years or so. Fig. 4 merely indicates the increase in vehicles that has taken place from 1917 to the present time.

A measure of the actual service rendered by the industry is given in Fig. 5, which shows the vehicle-miles of the cars and buses operated by electric railway systems for the past thirteen years. More and more service is being rendered to the public year by year, as will be noted by a comparison of the vehicle-miles in this chart and the number of passengers carried in Fig. 2. When it is remembered that the modern cars and buses are larger, and not only have more seats but more standing room, the increase becomes even more noteworthy.

Traffic Holds Up Despite Unfavorable Industrial Situation

Another trend which may be noted with considerable interest is the relation between industrial employment and riding. During the four years shown in Fig. 6 there has been comparatively little change in the employment index, save for a relatively brief period in 1928. In the summer of that year the index fell to a low figure of 93.1, where it remained for two months, recovering to a present high of 98.5, as compared with 101.2 in the fall of 1926. Passenger traffic, on the contrary, has not followed this trend directly, if at all. It reached its high value of 104.43 in March, 1927, falling gradually and with minor fluctuations to 97.37, the index for October, 1929. There was no drop in riding corresponding with the low employment figure of 1928, and hence there was no corresponding rise during the present year with the improvement in the labor situation.

Undoubtedly a long period of depression would have a more marked effect on the riding habit. On the other hand, it probably would cause a reduction in the use of automobiles, as the operating cost of the motor vehicle would in that instance require a more careful analysis by its owner, who today is interested far more in its convenience as compared with public transportation. As there has been no such period of depression since the automobile has become a large factor in local transportation, the best estimates of what would happen in such an event are little more than guesses. It appears probable, judged by past depressions, that the loss of riding would be decidedly less than the reduction in employment, and under today's conditions there might even be an increase. That, however, is purely a matter of conjecture.

Automobile Affects Riding Less than Popularly Supposed

Many writers have laid all the ills of the transportation industry to the growth in use of the passenger automobile. Fig. 7 shows how far from the truth is the idea that the industry has received a death-blow from this source. The riding habit, or number of rides per capita, is the best measure available for the use made of transportation vehicles. In the period shown it has ranged between 101 and 116, the high figure being reached in 1923, which was the banner year for street car riding. Contrasted with this is the increase in the registration of automobiles, which has gone up from 35 per thousand of population in 1917 to 189 in the year just closed. Naturally it might be expected that the great increase in a new mode of transit would cause a reduction in riding on public vehicles so great that their operation, even in large cities, would be unprofitable. Instead, with a 50 per cent increase in registrations since 1923, the reduction in car and bus riding has been from

Fig. 4—Cars and buses of the electric railways of the United States
Figures compiled by Electric Railway Journal.

Electric Railway Journal—January, 1930
### Statistics of City and Interurban Electric Railways and Electrified Steam Lines

(As of January 1, 1930)

<table>
<thead>
<tr>
<th>Region</th>
<th>Operating Companies</th>
<th>Miles of Track</th>
<th>Passenger Cars</th>
<th>Electric Locomotives</th>
<th>Freight Cars</th>
<th>Service Cars</th>
<th>Buses Operated</th>
<th>Miles of Bus Route</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>New England States</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Connecticut</td>
<td>8</td>
<td>1,290.51</td>
<td>1,395</td>
<td>105</td>
<td>146</td>
<td>54</td>
<td>8</td>
<td>214</td>
</tr>
<tr>
<td>Maine</td>
<td>12</td>
<td>422.93</td>
<td>321</td>
<td>8</td>
<td>7</td>
<td>25</td>
<td>69</td>
<td>94</td>
</tr>
<tr>
<td>Massachusetts</td>
<td>25</td>
<td>1,912.67</td>
<td>3,773</td>
<td>288</td>
<td>6</td>
<td>23</td>
<td>12</td>
<td>752</td>
</tr>
<tr>
<td>New Hampshire</td>
<td>11</td>
<td>125.03</td>
<td>172</td>
<td>2</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>30</td>
</tr>
<tr>
<td>Rhode Island</td>
<td>3</td>
<td>301.74</td>
<td>266</td>
<td>9</td>
<td>15</td>
<td>0</td>
<td>1</td>
<td>30</td>
</tr>
<tr>
<td>Vermont</td>
<td>4</td>
<td>20.10</td>
<td>7</td>
<td>0</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td><strong>Eastern States</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Delaware</td>
<td>1</td>
<td>70.02</td>
<td>113</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>15</td>
</tr>
<tr>
<td>District of Columbia</td>
<td>5</td>
<td>395.06</td>
<td>862</td>
<td>24</td>
<td>6</td>
<td>2</td>
<td>13</td>
<td>109</td>
</tr>
<tr>
<td>Maryland</td>
<td>5</td>
<td>667.75</td>
<td>1,277</td>
<td>156</td>
<td>3</td>
<td>28</td>
<td>95</td>
<td>148</td>
</tr>
<tr>
<td>New Jersey</td>
<td>13</td>
<td>1,164.16</td>
<td>2,679</td>
<td>100</td>
<td>5</td>
<td>0</td>
<td>5</td>
<td>327</td>
</tr>
<tr>
<td>New York</td>
<td>71</td>
<td>5,275.54</td>
<td>16,056</td>
<td>2,773</td>
<td>203</td>
<td>196</td>
<td>87</td>
<td>1,524</td>
</tr>
<tr>
<td>Pennsylvania</td>
<td>78</td>
<td>3,889.03</td>
<td>6,876</td>
<td>261</td>
<td>9</td>
<td>117</td>
<td>82</td>
<td>931</td>
</tr>
<tr>
<td>West Virginia</td>
<td>13</td>
<td>677.30</td>
<td>684</td>
<td>61</td>
<td>16</td>
<td>10</td>
<td>7</td>
<td>82</td>
</tr>
<tr>
<td><strong>Central States</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Illinois</td>
<td>49</td>
<td>3,245.18</td>
<td>6,327</td>
<td>975</td>
<td>80</td>
<td>88</td>
<td>2,767</td>
<td>766</td>
</tr>
<tr>
<td>Indiana</td>
<td>24</td>
<td>2,496.17</td>
<td>1,619</td>
<td>89</td>
<td>23</td>
<td>426</td>
<td>519</td>
<td>436</td>
</tr>
<tr>
<td>Iowa</td>
<td>23</td>
<td>984.32</td>
<td>614</td>
<td>43</td>
<td>39</td>
<td>13</td>
<td>1,036</td>
<td>193</td>
</tr>
<tr>
<td>Kentucky</td>
<td>7</td>
<td>495.49</td>
<td>731</td>
<td>71</td>
<td>0</td>
<td>24</td>
<td>0</td>
<td>126</td>
</tr>
<tr>
<td>Michigan</td>
<td>22</td>
<td>1,273.30</td>
<td>2,288</td>
<td>295</td>
<td>27</td>
<td>57</td>
<td>153</td>
<td>254</td>
</tr>
<tr>
<td>Minnesota</td>
<td>8</td>
<td>694.71</td>
<td>1,198</td>
<td>26</td>
<td>2</td>
<td>8</td>
<td>4</td>
<td>99</td>
</tr>
<tr>
<td>Missouri</td>
<td>14</td>
<td>1,152.26</td>
<td>2,281</td>
<td>186</td>
<td>4</td>
<td>14</td>
<td>2</td>
<td>338</td>
</tr>
<tr>
<td>Ohio</td>
<td>49</td>
<td>3,267.08</td>
<td>3,475</td>
<td>585</td>
<td>26</td>
<td>173</td>
<td>577</td>
<td>645</td>
</tr>
<tr>
<td>Wisconsin</td>
<td>15</td>
<td>767.03</td>
<td>1,199</td>
<td>54</td>
<td>8</td>
<td>8</td>
<td>4</td>
<td>42</td>
</tr>
<tr>
<td><strong>Southern States</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Alabama</td>
<td>10</td>
<td>329.53</td>
<td>397</td>
<td>62</td>
<td>2</td>
<td>3</td>
<td>0</td>
<td>61</td>
</tr>
<tr>
<td>Arkansas</td>
<td>7</td>
<td>119.23</td>
<td>233</td>
<td>10</td>
<td>0</td>
<td>2</td>
<td>0</td>
<td>17</td>
</tr>
<tr>
<td>Florida</td>
<td>7</td>
<td>209.82</td>
<td>362</td>
<td>2</td>
<td>0</td>
<td>2</td>
<td>0</td>
<td>24</td>
</tr>
<tr>
<td>Georgia</td>
<td>7</td>
<td>370.42</td>
<td>614</td>
<td>43</td>
<td>39</td>
<td>13</td>
<td>1,036</td>
<td>193</td>
</tr>
<tr>
<td>Louisiana</td>
<td>8</td>
<td>285.65</td>
<td>787</td>
<td>47</td>
<td>0</td>
<td>2</td>
<td>0</td>
<td>78</td>
</tr>
<tr>
<td>Mississippi</td>
<td>7</td>
<td>24.00</td>
<td>55</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>North Carolina</td>
<td>8</td>
<td>321.97</td>
<td>269</td>
<td>10</td>
<td>0</td>
<td>2</td>
<td>0</td>
<td>17</td>
</tr>
<tr>
<td>South Carolina</td>
<td>4</td>
<td>60.16</td>
<td>72</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>Tennessee</td>
<td>9</td>
<td>455.01</td>
<td>593</td>
<td>53</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>71</td>
</tr>
<tr>
<td><strong>Western States</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Arizona</td>
<td>3</td>
<td>24.46</td>
<td>33</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>California</td>
<td>26</td>
<td>3,464.55</td>
<td>4,093</td>
<td>229</td>
<td>103</td>
<td>67</td>
<td>2,953</td>
<td>428</td>
</tr>
<tr>
<td>Colorado</td>
<td>9</td>
<td>342.70</td>
<td>366</td>
<td>127</td>
<td>9</td>
<td>22</td>
<td>0</td>
<td>86</td>
</tr>
<tr>
<td>Idaho</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Kansas</td>
<td>15</td>
<td>431.47</td>
<td>268</td>
<td>23</td>
<td>14</td>
<td>66</td>
<td>28</td>
<td>38</td>
</tr>
<tr>
<td>Montana</td>
<td>8</td>
<td>705.15</td>
<td>105</td>
<td>14</td>
<td>50</td>
<td>35</td>
<td>1,430</td>
<td>32</td>
</tr>
<tr>
<td>Nebraska</td>
<td>4</td>
<td>183.88</td>
<td>452</td>
<td>20</td>
<td>3</td>
<td>1</td>
<td>0</td>
<td>67</td>
</tr>
<tr>
<td>North Dakota</td>
<td>25</td>
<td>25.34</td>
<td>42</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>4</td>
<td>9</td>
</tr>
<tr>
<td>Oklahoma</td>
<td>11</td>
<td>375.84</td>
<td>231</td>
<td>27</td>
<td>19</td>
<td>83</td>
<td>67</td>
<td>340</td>
</tr>
<tr>
<td>Oregon</td>
<td>5</td>
<td>684.73</td>
<td>609</td>
<td>76</td>
<td>24</td>
<td>4</td>
<td>1,181</td>
<td>59</td>
</tr>
<tr>
<td>South Dakota</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Texas</td>
<td>22</td>
<td>1,025.84</td>
<td>1,314</td>
<td>46</td>
<td>5</td>
<td>28</td>
<td>16</td>
<td>142</td>
</tr>
<tr>
<td>Utah</td>
<td>7</td>
<td>472.45</td>
<td>262</td>
<td>60</td>
<td>14</td>
<td>4</td>
<td>344</td>
<td>58</td>
</tr>
<tr>
<td>Washington</td>
<td>18</td>
<td>1,293.08</td>
<td>936</td>
<td>64</td>
<td>47</td>
<td>203</td>
<td>128</td>
<td>69</td>
</tr>
<tr>
<td>Wyoming</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td><strong>U. S. Total</strong></td>
<td>671</td>
<td>42,451.40</td>
<td>66,767</td>
<td>7,001</td>
<td>945</td>
<td>1,628</td>
<td>11,342</td>
<td>8,724</td>
</tr>
<tr>
<td><strong>U. S. Possessions</strong></td>
<td>5</td>
<td>125.39</td>
<td>268</td>
<td>0</td>
<td>1</td>
<td>29</td>
<td>0</td>
<td>25</td>
</tr>
<tr>
<td><strong>Canada</strong></td>
<td>57</td>
<td>2,505.86</td>
<td>3,851</td>
<td>368</td>
<td>65</td>
<td>244</td>
<td>469</td>
<td>449</td>
</tr>
<tr>
<td><strong>Grand Total</strong></td>
<td>735*</td>
<td>45,062.65</td>
<td>70,866</td>
<td>7,369</td>
<td>1,011</td>
<td>2,101</td>
<td>11,811</td>
<td>9,198</td>
</tr>
</tbody>
</table>

*Includes 55 companies which now operate only buses.

**FIGURES** presented in this table are based on reports received by Electric Railway Journal during December 1929, from companies representing more than 97 per cent of the total electrified track mileage of the United States and Canada, supplemented by reports previously received from other companies. The number of companies shown is the number of actual operating companies and does not include subsidiaries whose physical property has been absorbed by merger, etc., or holding companies which do not operate under their own names. Track mileage and equipment data of inter-state companies are listed according to the actual location of track. In addition to the number of cars shown in this table there are in the United States and Canada a total of 3,374 miscellaneous cars which have not been listed by states.
116 to 101. Furthermore, with the automobile registration standing at virtually one for every five people, little additional competition from this source is likely, and an increase in the riding habit on account of the difficulty of operating motor vehicles in the modern city may be looked for from now on.

**Readjustment of Fares Has Been Gradual**

While it is not possible to make a complete analysis of the fare situation in a review of this nature, the trend of fares in the past thirteen years can be seen clearly in Fig. 8. Before the war practically all the city companies had a basic 5-cent cash fare, frequently supplemented with reduced rate tickets. By 1917, when the chart begins, 271 out of the 297 companies included still had the 5-cent base charge. One had zone fares, 24 had 6-cent cash fares, and the remaining company 7 cents. In the next year many companies went to 6 cents, several to 7 cents, and a few to 8 cents. The 10-cent cash fare appeared in 1919 and the 9-cent fare in 1920. In that year all but 64 of the companies had obtained a cash fare higher than 5 cents. The succeeding years have seen the growth of the 10-cent base rate and a still further reduction of the 5-cent fare, as at the end of 1929 only 33 companies retained the low rate. The 6-cent fare also has fallen from popularity, being confined to 13 properties. Seven cents is charged on 56 systems, 8 cents on 44, 9 cents on only one and 10 cents on 126, while zone fares are in use on 24 systems. Attention should be called to the fact that reduced rate fares of one form or another are in use on a considerable number of the companies included in the chart, which would reduce the average fare considerably. On the contrary, no bus rates are included. Since in the majority of instances the bus rates are higher than the street car fares the number of higher rate companies would be augmented if they were included.

**Industry Statistics Presented**

Statistics of the industry have been compiled by this paper, and are presented in the table on page 6. The figures have been obtained from a canvass of the individual companies, supplemented by information previously published in the McGraw Electric Railway Directory. The new information, however, covers more than 97 per cent of the systems of the United States and Canada. It may be accepted as the best available information extant.

At the beginning of this year there are 671 operating electric railways in the United States. They have 42,431 miles of track and approximately 24,000 miles of bus routes. The number of cars owned includes 73,768 passenger cars, 945 electric locomotives, 13,170 freight cars, and about 12,000 service and miscellaneous cars. In addition these companies or their subsidiaries own nearly 12,000 buses.
Expenditures for Improvements

Continuing the upward climb which started in the year of 1928, following the low ebb of 1927, the total expenditures for new plant and equipment and maintenance materials in the electric railway industry in 1929 again exceeded those for the preceding year. Moreover, it is noteworthy that the expenditures of 1930 will exceed those of 1929 by an even greater margin. During the years 1925, 1926 and 1927 the totals receded steadily. The figure for 1927, however, represented a smaller decrease than attended the previous figures and it was predicted at the time that the next year would show a slight increase and the following years slightly greater increases. This trend has been borne out, not only for 1928 and again for 1929, but also in the forecast for the new year, 1930. From $225,271,000 for 1927 to $225,730,000 in 1928 and to $236,005,000 for 1929 are the actual figures. $459,000 and $10,275,000 are the increases for the respective years. Budgets for 1930 submitted by the electric railways indicate that the total will soar to $251,530,000, representing an increase of $15,525,000 or 6.58 per cent.

In view of the somewhat disturbed condition of general business brought about by the recent market crash, the figures of 1929 and the forecast of 1930, both showing increases, are of real significance. They emphasize again the fundamental stability of the electric railway industry and its relative immunity to fluctuations in trade. Expenditures for the past year were not curtailed in any instance and most of the electric railways reporting showed increases for 1930.

In a survey made by the American Electric Railway Association for President Hoover the railways reported the same plans. It was stated in the association’s announcement, following the survey that the railways would spend more than $1,000,000 a day for equipment and various construction activities in 1930. Actual figures show that the total amount will be $371,220,000, representing $149,050,000 for new plant and equipment, $102,480,000 for maintenance materials and $119,690,000 for maintenance labor.

As mentioned in the interpretation of the budget figures last year, the electric railways had been planning extensive improvement programs for some time, but hesitated in carrying them through because of trifling uncertainties. With the great improvements in car design of the past few years and the reassurance that local transportation cannot be dispensed with, many properties have gone ahead with rehabilitation plans. It was stated last year that the purchasing power of the industry was rapidly being restored and that a steady climb could reasonably be looked for in the following years. This forecast was borne out in 1929 and in the budgets for 1930.

Perhaps the outstanding trend indicated by the figures, aside from the continued climb in the total, is

### Purchases Planned by Electric Railways for 1930, Compared with Actual Figures for Past Years Compiled by “Electric Railway Journal”

#### New Plant and Equipment—Capital

<table>
<thead>
<tr>
<th></th>
<th>1925</th>
<th>1926</th>
<th>1927</th>
<th>1928</th>
<th>1929</th>
<th>Forecast 1930</th>
</tr>
</thead>
<tbody>
<tr>
<td>Way and structures</td>
<td>$53,400,000</td>
<td>$51,200,000</td>
<td>$77,350,000</td>
<td>$90,050,000</td>
<td>$81,890,000</td>
<td>$88,400,000</td>
</tr>
<tr>
<td>Cars</td>
<td>50,400,000</td>
<td>40,000,000</td>
<td>34,750,000</td>
<td>18,900,000</td>
<td>28,710,000</td>
<td>31,800,000</td>
</tr>
<tr>
<td>Buses</td>
<td>15,680,000</td>
<td>17,540,000</td>
<td>14,360,000</td>
<td>19,100,000</td>
<td>17,300,000</td>
<td>19,000,000</td>
</tr>
<tr>
<td>Power equipment</td>
<td>5,150,000</td>
<td>7,640,000</td>
<td>3,561,000</td>
<td>7,300,000</td>
<td>7,570,000</td>
<td>8,950,000</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>$123,650,000</strong></td>
<td><strong>$116,380,000</strong></td>
<td><strong>$130,052,000</strong></td>
<td><strong>$135,350,000</strong></td>
<td><strong>$135,470,000</strong></td>
<td><strong>$149,050,000</strong></td>
</tr>
</tbody>
</table>

#### Maintenance Materials—Operating

<table>
<thead>
<tr>
<th></th>
<th>1925</th>
<th>1926</th>
<th>1927</th>
<th>1928</th>
<th>1929</th>
<th>Forecast 1930</th>
</tr>
</thead>
<tbody>
<tr>
<td>Way and structures</td>
<td>$36,900,000</td>
<td>$30,000,000</td>
<td>$40,517,000</td>
<td>$31,040,000</td>
<td>$35,800,000</td>
<td>$35,790,000</td>
</tr>
<tr>
<td>Cars</td>
<td>54,700,000</td>
<td>47,800,000</td>
<td>36,941,000</td>
<td>35,200,000</td>
<td>36,350,000</td>
<td>36,520,000</td>
</tr>
<tr>
<td>Buses</td>
<td>7,370,000</td>
<td>7,500,000</td>
<td>9,451,000</td>
<td>15,040,000</td>
<td>17,925,000</td>
<td>19,650,000</td>
</tr>
<tr>
<td>Power equipment</td>
<td>22,650,000</td>
<td>11,370,000</td>
<td>8,310,000</td>
<td>9,100,000</td>
<td>10,460,000</td>
<td>10,520,000</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>$141,620,000</strong></td>
<td><strong>$116,670,000</strong></td>
<td><strong>$95,219,000</strong></td>
<td><strong>$90,380,000</strong></td>
<td><strong>$100,535,000</strong></td>
<td><strong>$102,480,000</strong></td>
</tr>
</tbody>
</table>

#### Total of New Plant and Equipment, and Maintenance Materials

<table>
<thead>
<tr>
<th></th>
<th>1925</th>
<th>1926</th>
<th>1927</th>
<th>1928</th>
<th>1929</th>
<th>Forecast 1930</th>
</tr>
</thead>
<tbody>
<tr>
<td>Way and structures</td>
<td>$109,300,000</td>
<td>$101,200,000</td>
<td>$117,882,000</td>
<td>$121,090,000</td>
<td>$117,690,000</td>
<td>$124,190,000</td>
</tr>
<tr>
<td>Cars</td>
<td>105,100,000</td>
<td>87,800,000</td>
<td>71,699,000</td>
<td>54,100,000</td>
<td>65,000,000</td>
<td>68,320,000</td>
</tr>
<tr>
<td>Buses</td>
<td>23,050,000</td>
<td>25,040,000</td>
<td>23,819,000</td>
<td>34,140,000</td>
<td>32,225,000</td>
<td>39,550,000</td>
</tr>
<tr>
<td>Power equipment</td>
<td>27,800,000</td>
<td>19,010,000</td>
<td>11,871,000</td>
<td>16,400,000</td>
<td>18,030,000</td>
<td>19,470,000</td>
</tr>
<tr>
<td><strong>Grand total</strong></td>
<td><strong>$265,250,000</strong></td>
<td><strong>$233,050,000</strong></td>
<td><strong>$225,271,000</strong></td>
<td><strong>$225,730,000</strong></td>
<td><strong>$235,055,000</strong></td>
<td><strong>$251,530,000</strong></td>
</tr>
</tbody>
</table>
Mount Upward

the buying movement in rolling stock, following and now accompanying a period of great track activity. Last year's low mark of $18,900,000 for cars and the high mark of $90,050,000 for way and structures indicated that operators were preparing for the extensive purchase of new equipment by conditioning their track. Their budgets submitted a year ago also showed the same trend, giving an estimate of approximately $30,000,000 for cars in 1929 and slightly under $80,000,000 for way and structures. Actual expenditures in 1929 of $28,710,000 for cars and $81,890,000 for way and structures bear out the trend as foreseen. The predicted increases of 7.95 per cent for way and structures and 10.76 per cent for cars indicate a return to normalcy in the relation of these two accounts. Surveying the past trends in both the expenditures of 1929 and the forecasts for 1930, it is evident that the buying of cars will increase slowly but steadily and be accompanied by reasonably large amounts for track reconstruction.

**CAR PURCHASES INCREASED 51.8 PER CENT**

Actual expenditures for new cars during 1929 totaled $28,710,000, an increase of $9,810,000, or 51.8 per cent, over 1928. Definite information received last year indicated that several large orders for car equipment would be placed. All of these and several others were placed during the year. Among the outstanding orders of the year were 300 subway cars for the City of New York, 141 suburban motor cars for the Delaware, Lackawanna & Western Railroad, 106 for the Cleveland Railway, 101 for the City of Detroit, 101 for the Brooklyn & Manhattan Transit Corporation, 100 for the Chicago Surface Lines, 50 for the Montreal Tramways and 25 for the Market Street Railway. Other large orders were 42 locomotives for the New York Central Railroad and 22 heavy passenger locomotives for the Cleveland Union Terminals Company. Total orders of new equipment for the year were 77 electric locomotives and approximately 1,400 cars, including freight, express and service cars.

That the large number of cars purchased in 1929 is not an unusual number is indicated in the budgets of 1930, which show that cars purchased in that year will even exceed in value those of 1929. Definite orders totaling 522 were shown on the budgets submitted. Of this number 417 will be ordered by nine companies in lots of 135, 66, 60, 50, 32, 23, 20, 16 and 15, respectively. An important evident trend is that many of the smaller companies will order cars in 1930, increasing their percentage which in the past years has not been very high. In view of the fact that the smaller cities are having more difficulty than the larger ones this is particularly encouraging. Although no definite announcements have been made of large orders for rapid transit or steam road electrification equipment, it is not unlikely that at least one or two such orders will be placed. Considering the low figure for 1928, when car purchases were at an ebb, there is much reason for optimism with the present outlook. It appears that the extensive experimentation and development of modern equipment, which delayed car purchases for a time, will be rewarded in a normal resumption of buying.

As forecast a year ago the expenditures for way and structures, charged to capital accounts, showed a recession in 1929. The total dropped from $90,080,000 to $81,890,000, a comparatively small amount considering the large increase in car purchases. It also should be remembered that the figure for 1928 was a high mark for this account, since these figures were first compiled in 1923, and that the 1929 figure of $81,890,000 exceeds all other totals except the one for 1928. That this activity in track is to continue is indicated in the forecast for 1930 of $88,400,000, an increase of $6,510,000. No doubt the way and structures account will continue to exceed the $80,000,000 mark in succeeding years.

During the past year more than 700 miles of track was rebuilt, over 165 miles of track extension was made and approximately 200 miles of steam railroad lines was electrified. These figures compare with slightly more than 800 miles of rebuilt track in 1928 and 230 miles of extensions. Structures, of course, account for an appreciable percentage of the total way.
Distribution by individual accounts of new plant and equipment and maintenance materials, for the years 1925 to 1929, inclusive, and the forecasts for 1930. Note the upward turn following 1927.

and structures figure. Since structures and track are not segregated on the budget blanks it is impossible to give the exact proportions of the two.

As mentioned previously, way and structures will total $88,400,000 in 1930. It was definitely indicated on the budget blanks that 22 companies would alone expend $17,110,000 for this account. Representing the larger programs, five companies will spend a total of $9,000,000, in amounts of $3,000,000, $2,500,000, $1,300,000, $1,000,000 and $1,000,000. Seven programs under $1,000,000, totaling $4,942,000, are $889,000, $800,000, $700,000, $685,000, $655,000, $633,000 and $580,000. Ten smaller programs, totaling $3,168,000, are $487,000, $466,000, $367,000, $350,000, $349,000, $261,000, $250,000, $229,000, $209,000 and $200,000. These programs in many instances are accompanying large orders for equipment. Others are probably the forerunners of rolling stock buying, just as many orders of 1929 followed the extensive track rehabilitation in 1928.

Falling slightly short of the high mark for buses in 1928, but practically equaling the second highest mark for 1926, expenditures for new buses during 1929 totaled $17,300,000. This figure compares with $19,110,000 for 1928, $14,368,000 in 1927 and $17,540,000 for 1926. The actual number of new buses bought totaled more than 1,800 in 1929 as compared with approximately 2,100 in 1928. An increase of $2,600,000, however, is forecast by the electric railways for 1930. This increase, together with increases of practically the same percentages in the other three capital accounts indicates a steady and normal expansion in every department.

Adding 1,800 new buses during 1929 brings the total now being operated by electric railways to more than 12,400. Since a large number of these have been in service for more than five years a considerable proportion of the buses bought this year were for replacement. This proportion should increase in the following years. With the steady expansion which has charac-

**Maintenance Materials and Labor**

<table>
<thead>
<tr>
<th>Year</th>
<th>Way and Structures</th>
<th>Cars</th>
<th>Buses</th>
<th>Power</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1927 Expenditures</td>
<td>Material: $40,570,000</td>
<td>$36,941,000</td>
<td>$89,451,000</td>
<td>$8,310,000</td>
<td>$95,219,000</td>
</tr>
<tr>
<td></td>
<td>Labor: $6,874,000</td>
<td>$44,932,000</td>
<td>$6,392,000</td>
<td>$5,244,000</td>
<td>$126,662,000</td>
</tr>
<tr>
<td></td>
<td>Total: $47,444,000</td>
<td>$81,873,000</td>
<td>$95,843,000</td>
<td>$13,554,000</td>
<td>$221,881,000</td>
</tr>
<tr>
<td>1928 Expenditures</td>
<td>Material: $31,040,000</td>
<td>$35,200,000</td>
<td>$75,400,000</td>
<td>$8,100,000</td>
<td>$118,740,000</td>
</tr>
<tr>
<td></td>
<td>Labor: $5,400,000</td>
<td>$45,300,000</td>
<td>$11,076,000</td>
<td>$5,240,000</td>
<td>$185,606,000</td>
</tr>
<tr>
<td></td>
<td>Total: $36,440,000</td>
<td>$80,500,000</td>
<td>$86,476,000</td>
<td>$13,340,000</td>
<td>$209,356,000</td>
</tr>
<tr>
<td>1929 Expenditures</td>
<td>Material: $35,800,000</td>
<td>$36,350,000</td>
<td>$75,295,000</td>
<td>$8,460,000</td>
<td>$100,355,000</td>
</tr>
<tr>
<td></td>
<td>Labor: $5,280,000</td>
<td>$49,380,000</td>
<td>$13,340,000</td>
<td>$5,730,000</td>
<td>$121,450,000</td>
</tr>
<tr>
<td></td>
<td>Total: $41,080,000</td>
<td>$85,730,000</td>
<td>$88,635,000</td>
<td>$18,190,000</td>
<td>$221,985,000</td>
</tr>
<tr>
<td>1930 Estimated expenditures</td>
<td>Material: $35,700,000</td>
<td>$36,520,000</td>
<td>$75,650,000</td>
<td>$8,520,000</td>
<td>$102,840,000</td>
</tr>
<tr>
<td></td>
<td>Labor: $5,160,000</td>
<td>$50,620,000</td>
<td>$12,470,000</td>
<td>$5,660,000</td>
<td>$119,690,000</td>
</tr>
<tr>
<td></td>
<td>Total: $40,860,000</td>
<td>$86,220,000</td>
<td>$88,120,000</td>
<td>$14,180,000</td>
<td>$222,170,000</td>
</tr>
</tbody>
</table>

*Bus maintenance materials include replacement parts, tires and tubes.*
vious articles that 1928 would be the low year, and it was. Mounting to $46,010,000 the total for 1929 exceeded that for 1928 by $8,010,000 and almost reached the combined figure for 1927. It is of particular significance that the total for cars and buses in 1930 will continue to climb, reaching $51,700,000. This figure will be an increase of $5,690,000 over 1929 and will exceed the totals for the three previous years.

Expenditures for new power equipment in 1929 were $7,370,000, exceeding the 1928 figure by $270,000. Because of several rather extensive programs being planned and under way the total for 1930 will amount to $8,950,000. Among the larger expenditures for new power equipment of the past year were those for the Cleveland Union Terminal electrification and the Lackawanna project.

Following a slight recession in the year 1928 the total of maintenance materials, charged to operating accounts, showed an increase of $10,155,000, or 11.2 per cent. All of the accounts showed increases, the first time since these figures have been compiled. The new total was $100,535,000, compared with $90,380,000 for 1928. Way and structures showed an increase of $4,700,000; cars, $1,150,000; buses, $2,885,000; and power equipment, $1,360,000. The way and structures increase is accounted for in the increased expenditure in track maintenance accompanying the decreased amount of track reconstruction. During 1928, when the new plant and equipment for way and structures showed a large increase, the maintenance materials dropped. In 1929 the two accounts were reversed, the capital account showing a decrease and maintenance an increase. During 1930 maintenance materials for way and structures will remain practically the same, varying only $10,000.

One of the most encouraging results of all the maintenance figures is the increase shown in maintenance materials for cars. From the time these figures were first compiled car maintenance materials have decreased each year. Although the increase shown in 1929 is not a very large one it does indicate that the downward turn has been stemmed. The decrease in 1928 was much smaller than in any previous year, which indicated that no doubt the low point would be reached in the first part of 1929 and then go upward. The actual total for 1929 and the forecast for 1930, showing another increase, proved that this theory was true.

Exceeding the previous high mark of $15,040,000 by $2,885,000 the 1929 total of bus maintenance materials reach a new high mark at $17,925,000. This figure includes replacement parts, tires and tubes, but not fuel and lubricants. Bus maintenance materials have shown a steady climb, the increases being almost in direct proportion with the number of buses being used by the electric railways. During 1930 the total will again increase, reaching $19,650,000.

Bus operating supplies, including fuel and lubricants, totaled $20,720,000 for the year. This figure is the first one obtained on the budget blanks, so that no comparison can be made with previous years. However, this figure should increase more nearly in proportion with the number of buses in operation than the maintenance materials. In 1930 this account will increase to $22,510,000. It is interesting to note that fuel and lubricants actually exceed the cost of replacement parts, tires and tubes.

Maintenance materials for power equipment showed an increase of $1,360,000, reaching the figure of $10,460,000. In 1930 materials for power plant, substation and line maintenance will show another increase. It appears from the figures for the past three years and the forecast for 1930 that this account will vary but little each year.

With the exception of power all departments showed an increase in 1929 of expenditures for maintenance labor. Way and structures showed an increase of $2,400,000, cars an increase of $80,000, and buses one of $1,670,000. These increases brought the total for maintenance materials for 1929 up to $121,450,000, an increase of $3,300,000. The most consistent increases are shown by buses, this account mounting from $6,592,000 in 1927 to $11,870,000 in 1928 and $13,540,000 in 1929. The forecasts for 1930 indicate that maintenance labor for every account will remain practically the same.

Because all of the maintenance materials accounts showed increases in 1929 over 1928 and maintenance labor varied little, the combined total for both maintenance materials and labor showed an increase. From the previous figure of $208,530,000 the total mounted to $221,985,000. The combined total for 1930 is set by the industry at $222,170,000. It is of real significance that the totals for each account increased. Maintenance figures ordinarily do not fluctuate because maintenance practices on individual properties do not vary much within a period of twelve months. Increases in every account, therefore, can only indicate that the railways are bettering their standards of maintenance.

In the article of last year the percentages were computed of maintenance materials to the total of materials and labor. Budgets for 1929 indicated that the percentages were practically the same as for 1928, being 40.3 for way and structures, 41.2 for cars, 57.0 for buses, 64.5 for power and 45.3 for the total.

Outstanding Facts Revealed by the Budget Data

**DURING 1929**

The total for new plant and equipment and maintenance materials showed an increase of $10,275,000.

Car purchases totaled $28,710,000, an increase of $9,810,000, or 51.8 per cent.

Power equipment expenditures for both new plant and maintenance material increased.

Total maintenance materials increased from $90,380,000 to $100,535,000.

**DURING 1930**

The total of all expenditures for new equipment and maintenance materials will increase more than in 1929, reaching the mark of $251,530,000.

Car purchases will again be high and will exceed those of 1929.

Both buses and power equipment will increase.

Maintenance materials and labor will not vary much from the 1929 figures.
### Trend of Construction and Operating Costs, Wages, and Fares, 1914-1929

1. Electric railway construction costs (according to American Electric Railway Association).
2. Electric railway operating materials costs (Richey). Includes fuel for power, weighted according to average use in maintenance of operation.
3. Electric railway wages (Richey). Maximum hourly wages of platform men, weighted according to number of men.

#### AVERAGE FARES AND COSTS 1913-1929

<table>
<thead>
<tr>
<th>Street Railway Fares and Costs (Richey)</th>
<th>1913</th>
<th>1914</th>
<th>1915</th>
<th>1916</th>
<th>1917</th>
<th>1918</th>
<th>1919</th>
<th>1920</th>
<th>1921</th>
<th>1922</th>
<th>1923</th>
<th>1924</th>
<th>1925</th>
<th>1926</th>
</tr>
</thead>
<tbody>
<tr>
<td>Elec. Ry. Operating Materials Costs</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>Wholesale Prices</td>
<td>99.5</td>
<td>99.5</td>
<td>99.5</td>
<td>99.5</td>
<td>99.5</td>
<td>99.5</td>
<td>99.5</td>
<td>99.5</td>
<td>99.5</td>
<td>99.5</td>
<td>99.5</td>
<td>99.5</td>
<td>99.5</td>
<td>99.5</td>
</tr>
</tbody>
</table>

#### MONTHLY INDEX OF FARES AND COSTS FOR PAST FOUR YEARS

<table>
<thead>
<tr>
<th>Street Railway Fares and Costs (Richey)</th>
<th>1926</th>
<th>1927</th>
<th>1928</th>
<th>1929</th>
</tr>
</thead>
<tbody>
<tr>
<td>Elec. Ry. Operating Materials Costs</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>Wholesale Prices</td>
<td>99.5</td>
<td>99.5</td>
<td>99.5</td>
<td>99.5</td>
</tr>
</tbody>
</table>

---

*Base 1926 = 100.*
Fares and wages continue to increase, but in a smaller measure than during 1928 and 1927. Commodity prices and construction costs maintain a level practically the same as during the past three years.

Electric Railway Costs and Fares in 1929

FOR several years past the Electric Railway Journal has published monthly in its financial and corporate section a series of index numbers compiled by the writer under the heading of "Conspectus of Indexes." This conspectus is made up of indexes showing the trends of street railway fares and of the costs of electric railway wages and materials entering into electric railway operation; costs of construction, both electric railway and general; wholesale commodities in general; retail food; cost of living, and some others. In the annual statistical numbers of the Journal, the first issue in January each year, beginning in 1923, charts and tables have been presented showing the trend since 1913 of the most important of these indexes as affecting electric railway operation. In Fig. 7 herewith is shown a similar chart indicating the trend of five of these indexes from January, 1914, through the latest available figures for 1929. The indexes there shown are: (1) Electric Railway Construction Costs, as computed by the formula of the American Electric Railway Association; (2) Electric Railway Operating Materials Costs, including fuel for power; (3) Electric Railway Wages; (4) Street Railway Fares; (5) Wholesale Prices of All Commodities, as computed by the U. S. Bureau of Labor Statistics.

The methods used in the computation of these five indexes were described fully on page 37 of the Journal for Jan. 2, 1926, in an article which also contained a tabulation showing the numerical values of the various indexes monthly from January, 1920, through December, 1925. The earlier monthly numerical values, from January, 1914, through December, 1919, may be found on page 19 of the Journal for Jan. 5, 1924. A tabulation herewith shows the numerical value of six of the indexes yearly from 1913 through 1929, and monthly beginning with January, 1926, and these six indexes also are shown graphically for the past four years on a somewhat larger scale than in Fig. 7 by the charts Figs. 1 to 6, inclusive.

The weighted average street railway fare, as shown by the Richey index in Fig. 1, has increased during 1929 from 7.71 cents to 7.78 cents, an increase of 0.8 per cent during the year. This is a slowing up of the rate of increase in the average fare, as this index showed a 2 per cent gain in 1928 following a 2 per cent gain in 1927. Ten of the 143 cities which affect this index reported increases in street railway fares during 1929, the most important of these increases being in Louisville, Minneapolis and St. Paul. Other changes were of less importance as affecting the index, either on account of the smallness of the changes or the relatively small population involved. It will be noted that the index of the American Electric Railway Association, which is also shown in Fig. 1, shows not only a higher average

Fig. 1—Street Railway Fares (1913 = 4.8425 cents)

Electric Railway Journal—January, 1930
with the populations of the cities; further, for each city where reduced rate tickets are used consideration is given to both cash and ticket rates, except that children’s or workmen’s tickets or other forms of special reduced rates are not included.

Electric railway wages, as shown by the indexes in Fig. 2, have continued the gradual upward trend which started in 1923. The Richey index which includes wages on 130 street and interurban railways, weighted in accordance with the number of trainmen employed on such railways, shows an increase of about 0.6 per cent during 1929 and now stands at 231. The principal increases in wages have been in Chicago, St. Louis, Indianapolis, Cincinnati, Louisville, Ft. Wayne, Toledo, Wilmington and Memphis, these cities being named in the order of the effect of the 1929 wage change on the index. The American Electric Railway Association Wage Index uses wages on 85 railways and is unweighted with respect to the number of men employed. Both indexes indicate about the same measure of increase in trainmen’s wages during the past four years.

A computation of an index of “real wages” of electric railway trainmen as compared with 1913 and 1914 may be made by dividing the index of wages by the index of the cost of living. This indicates an index of “real wages” (on the base of 1913-14) of 141.5 at the end of 1929, which may be compared with 141 at the end of 1928 and 138 at the end of 1927. Such increases in the “real wages” index for street railway employees show their steadily increasing opportunity to better their standard of living.

The cost of electric railway operating materials was maintained at a fairly uniform level during 1929. This index, as shown by Fig. 3, declined from a high of 159 in December, 1926, to a low of 139.5 in February, 1928, and recovered to practically its present level by November, 1928. It should be borne in mind that in the make-up of this index, fuel for power enters into it with a weighting of 40 per cent.

Electric railway construction costs have remained very steadily at about their present level since the middle of 1923, as indicated by the American Electric Railway Association Construction Cost Index, shown on page 12 and on a larger scale for the past four years in Fig. 4. This index of electric railway construction costs may be compared with the general construction cost index of the Engineering News-Record, which is shown in Fig. 5 for the past four years. The latter includes structural steel and other building materials in a considerably greater weighting than such materials are used in the Electric Railway Construction Cost Index, which is somewhat stabilized by the heavier weighting of steel rail, the price of which has remained constant since October, 1922. The Electric Railway Construction Cost Index has, however, a heavier weighting of the common labor rate, which started the year at about 56 cents, dropped to 53 cents during the summer months, and has recovered to 56 1/2 cents at the end of the year.

The Wholesale Commodity Index of the United States Bureau of Labor Statistics is shown for the past four years in Fig. 6, and from 1916 on in the large chart. Its level during 1929 has been not greatly different from that of 1928. This index is the only one of those presented here which has a base other than the year 1913. The base of 1913 = 100 for the Wholesale Commodity Index was discontinued in August, 1927, and since then it has been calculated on the base of 1926 = 100 and is so shown in the accompanying tables and charts.

Favorable indications in the index figures are the even trends of prices for several years, continuing through 1929, along with an increase in fares. The only disturbing element is the upturn of wages, making them an increasing item in operating cost. Otherwise all the indications for the coming year are favorable.
Industry Strengthened by Trackage Readjustment

By
JOHN A. MILLER, JR.
Managing Editor
Electric Railway Journal

Survey of changes which have occurred during past ten years shows that extensions made by electric railways have largely offset abandonments of unprofitable lines. Despite the steady growth of bus operation the net decrease in electric trackage has been less than 10 per cent. Mileage of extensions and also of abandonments decreased in 1929 as compared with 1928. Volume of track reconstructions continued large on both urban and interurban properties.

Many changes in physical plant have been made by the electric railways in recent years to meet the changing transportation requirements of the public. Although somewhat smaller in extent, the changes which occurred in 1929 were similar in character to those of other recent years. During the past decade a considerable amount of track has been abandoned where operation proved unprofitable. At the same time the electric railways have been active in adding to their trackage in profitable territory. The net result of these changes has been a decrease of about 9½ per cent in the total electrified track mileage in the United States and Canada. Undoubtedly the readjustment of trackage by abandonments in some localities and extensions in others has greatly strengthened the position of the industry.

In all, approximately 1,050 miles of track was built or rebuilt in 1929. Extensions of electric trackage made during the year totaled nearly 380 miles. This total was divided almost equally between additions to the trackage of the local transportation systems and additions to the total electrified track mileage in the United States and Canada. Undoubtedly the readjustment of trackage by abandonments in some localities and extensions in others has greatly strengthened the position of the industry.

In all, approximately 1,050 miles of track was built or rebuilt in 1929. Extensions of electric trackage made during the year totaled nearly 380 miles. This total was divided almost equally between additions to the trackage of the local transportation systems and additions to the

Electric Railway Journal—January, 1930
electrified trackage of the steam railroads. Extensions made to rapid transit track mileage were relatively unimportant.

While the mileage of extensions made in 1929 was somewhat below that of the preceding year, it was slightly above the average for the past ten years. Since January 1, 1920, the urban and interurban electric railways of the United States and Canada have added a total of 2,337.08 miles of track to their systems. Approximately 70 per cent of these extensions were made by the urban railways and 30 per cent by the interurbans. During the same period the steam railroads added 1,166.43 miles to their electrified trackage. Thus the total increase in electric railway track has been approximately 3,500 miles or an average of about 350 miles per year. The mileage of extensions is summarized by years in an accompanying table.

Some 80 electric railways made extensions to their trackage last year. Among the important additions reported by these companies are 16.48 miles built by the Department of Street Railways, Detroit, 11.52 miles by the Montreal Tramways, 10.94 miles by the Cleveland Electric Railway, 10.45 miles by the Milwaukee Electric Railway & Light Company, 5.21 miles by the Pacific Electric Railway, 19.98 miles by the Sacramento Northern Railway, and 23.76 miles by the Oklahoma Railway. Numerous other extensions were made, ranging in length from a fraction of a mile to 5 miles. The complete list of extensions made in 1929 is tabulated below. A number of additions made to the electrified track mileage of the steam railroads are discussed in greater detail elsewhere in this issue.

### Track Extensions in 1929

<table>
<thead>
<tr>
<th>Name of Company</th>
<th>Miles</th>
<th>Name of Company</th>
<th>Miles</th>
<th>Name of Company</th>
<th>Miles</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Alabama</strong></td>
<td></td>
<td><strong>California</strong></td>
<td></td>
<td><strong>Michigan</strong></td>
<td></td>
</tr>
<tr>
<td>Birmingham Elec. Co.</td>
<td>0.02</td>
<td>Market St. Ry., San Francisco</td>
<td>0.30</td>
<td>Dept. of Street Ry., Detroit</td>
<td>16.48</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Pacific Elec. Ry.</td>
<td>0.21</td>
<td>Eastern Michigan Ry.</td>
<td>1.50</td>
</tr>
<tr>
<td><strong>Connecticut</strong></td>
<td></td>
<td>Peninsula Ry., New Haven</td>
<td>0.75</td>
<td>Duluth Street Ry.</td>
<td>0.59</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Sacramento Northern Ry.</td>
<td>0.98</td>
<td>Twin City Rapid Trans Co.</td>
<td>4.00</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Visalia Elec. R.R.</td>
<td>0.16</td>
<td>Minnesota</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td><strong>Missouri</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Kansas City Public Service Co</td>
<td>1.14</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>St. Louis Public Service Co</td>
<td>1.10</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Nebraska</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Omaha &amp; Council Bluffs Street Ry.</td>
<td>0.97</td>
</tr>
<tr>
<td><strong>Illinois</strong></td>
<td></td>
<td></td>
<td></td>
<td><strong>New York</strong></td>
<td></td>
</tr>
<tr>
<td>Chicago, Aurora &amp; Elgin R.R.</td>
<td>0.25</td>
<td></td>
<td></td>
<td>International Ry., Buffalo</td>
<td>0.45</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Chicago City Ry.</td>
<td>0.07</td>
<td>New York, Westchester &amp; Boston Ry.</td>
<td>2.92</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Chicago Ry.</td>
<td>0.23</td>
<td>Niagara Junction Ry</td>
<td>0.60</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Chicago, North Shore &amp; Milwaukee R.R.</td>
<td>4.45</td>
<td>Third Avenue Railway</td>
<td>0.13</td>
</tr>
<tr>
<td></td>
<td></td>
<td>St. Louis &amp; Belleville Elec. Ry.</td>
<td>0.41</td>
<td>Steinway Railway</td>
<td></td>
</tr>
<tr>
<td><strong>Indiana</strong></td>
<td></td>
<td></td>
<td></td>
<td><strong>North Dakota</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Northern States Power Co, Fargo</td>
<td>0.14</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td><strong>Ohio</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Cincinnati Street Ry.</td>
<td>0.18</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Community Tract Co.</td>
<td>0.21</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Cleveland Ry.</td>
<td>10.94</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Ohio Public Service Corp</td>
<td>0.11</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Pennsylvania-Ohio Pwr. &amp; Lt Co</td>
<td>0.27</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Toledo Western Ry.</td>
<td>0.19</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Oklahoma</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Oklahoma Railway</td>
<td>23.76</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Oklahoma Union Ry.</td>
<td>0.82</td>
</tr>
<tr>
<td><strong>Kentucky</strong></td>
<td></td>
<td></td>
<td></td>
<td>Oregon</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Portland Electric Power Co</td>
<td>2.00</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td><strong>Pennsylvania</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Conestoga Traction Co</td>
<td>0.43</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Harrisburg Ry.</td>
<td>0.28</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Philadelphia Rapid Trans Co</td>
<td>3.32</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Pittsburgh Railways</td>
<td>2.91</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>York Railways</td>
<td>0.27</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td><strong>Rhode Island</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>United Elec. Ry., Providence</td>
<td>0.27</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td><strong>Tennessee</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Memphis Street Ry.</td>
<td>0.0</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Texas</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Dallas Ry. &amp; Terminal Co.</td>
<td>0.28</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Eastern Texas Elec. Co</td>
<td>0.23</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Houston North Shore Ry.</td>
<td>0.33</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Texas Electric Ry.</td>
<td>1.50</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Utah</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Salt Lake &amp; Utah R.R.</td>
<td>1.64</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td><strong>Virginia</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Lynchburg Tract &amp; Light Co</td>
<td>0.35</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Virginia Public Service Co</td>
<td>0.10</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Washington</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Seattle Municipal Street Ry.</td>
<td>0.13</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Spokane, Coeur d'Alene &amp; Palouse Rys.</td>
<td>0.12</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Tacoma Ry. &amp; Power Co</td>
<td>0.17</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Yakima Valley Transportation Co</td>
<td>0.06</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td><strong>West Virginia</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Monongahela West Penn., Pub. Serv Co.</td>
<td>0.08</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td><strong>Wisconsin</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Milwaukee Elec. Ry. &amp; Light Co</td>
<td>10.45</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Wisconsin Gas &amp; Elec. Co.</td>
<td>0.38</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td><strong>Canada</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>British Columbia Elec. Ry.</td>
<td>0.30</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Cornwall Street Ry. &amp; Light &amp; Power Co</td>
<td>0.50</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Hamilton Street Ry.</td>
<td>0.00</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Montreal Tramways</td>
<td>11.52</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Niagara, St. Catharine &amp; Toronto Ry.</td>
<td>0.20</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Nova Scotia Light &amp; Power Co</td>
<td>0.48</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Oshawa Ry.</td>
<td>1.20</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Sheridan Elec. Ry. &amp; Power Co</td>
<td>0.11</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Winnipeg Elec. Co</td>
<td>3.27</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td><strong>Total</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>167.71</td>
</tr>
</tbody>
</table>
the volume of track reconstruction done last year as compared with the preceding year was to be expected, however, as the budget figures published in the Jan. 12, 1929, statistical issue of Electric Railway Journal showed a slight reduction in the expenditures planned for way and structures in 1929 as compared with 1928. Indications from similar reports during the past few weeks are that the volume of trackwork which will be done during the coming year will show a considerable increase.

The largest single program of track reconstruction reported for the year 1929 was that of the Department of Street Railways, Detroit, which rebuilt more than 42 miles of track. Next in size were the programs of the Pittsburgh Railways Public Service Co-ordinated Transport and the Philadelphia Rapid Transit Company which rebuilt about 32, 26 and 25 miles of track, respectively. Other urban railways reporting more than 10 miles of reconstruction during the past year include the Connecticut Company, Chicago Surface Lines, Twin

**Track Reconstruction in 1929**

<table>
<thead>
<tr>
<th>Name of Company</th>
<th>Miles Reconstructed</th>
<th>Paved</th>
<th>Open</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alabama Power Co., Anniston</td>
<td>0.76</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Alabama Power Co., Montgomery</td>
<td>0.86</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Alabama Power Co., Tuscaloosa</td>
<td>0.15</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Birmingham, &amp; T&amp;P Ry.</td>
<td>2.35</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Birmingham &amp; Edgewood Elec. Ry.</td>
<td>0.37</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mobile Light &amp; R.R. Co.</td>
<td>5.537</td>
<td>7.21</td>
<td></td>
</tr>
<tr>
<td>Texarkana Street Railway</td>
<td>0.20</td>
<td></td>
<td></td>
</tr>
<tr>
<td>California</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Key System Transit Co.</td>
<td>2.18</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Los Angeles Rapid Transit Co.</td>
<td>2.32</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Market St., San Francisco</td>
<td>22.2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Municipal Rapid Transit, Milwaukee</td>
<td>5.20</td>
<td>5.19</td>
<td></td>
</tr>
<tr>
<td>Pacific Elec. Ry.</td>
<td>3.361</td>
<td>11.4</td>
<td></td>
</tr>
<tr>
<td>Southern Pacific Belt R.R.</td>
<td>3.844</td>
<td>4.6</td>
<td></td>
</tr>
<tr>
<td>Colorado</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Denver &amp; Interurban R.R.</td>
<td>0.04</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Denver Tramway</td>
<td>1.60</td>
<td>1.23</td>
<td></td>
</tr>
<tr>
<td>Connecticut Co.</td>
<td>10.90</td>
<td>1.07</td>
<td></td>
</tr>
<tr>
<td>Delaware Elec. Power Co.</td>
<td>0.66</td>
<td></td>
<td></td>
</tr>
<tr>
<td>District of Columbia</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Capital Traction Co.</td>
<td>1.63</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Washington R.R.</td>
<td>4.07</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Florida</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gulf Power Co., Pensacola</td>
<td>0.110</td>
<td>0.06</td>
<td></td>
</tr>
<tr>
<td>Jacksonville Traction Co.</td>
<td>1.71</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tampa Electric Co.</td>
<td>1.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Georgia</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Georgia Power Co., Atlanta</td>
<td>6.14</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Illinois</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Calumet &amp; South Chicago Ry.</td>
<td>0.86</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chicago &amp; Indiana Ry.</td>
<td>12.06</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chicago City Ry.</td>
<td>9.1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chicago Ry.</td>
<td>14.3</td>
<td>0.23</td>
<td></td>
</tr>
<tr>
<td>Chicago &amp; Joliet Elec. Ry.</td>
<td>1.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chicago, St. Louis &amp; Milwaukee R.R.</td>
<td>12.8</td>
<td>10.05</td>
<td></td>
</tr>
<tr>
<td>Indiana, &amp; Electric Traction, Indianapolis</td>
<td>0.69</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Illinois Power &amp; Light Corp., Chicago</td>
<td>0.04</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Illinois Electric Traction, Indiana</td>
<td>6.07</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Illinois Power &amp; Light Corp., Peoria</td>
<td>1.60</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Illinois Power &amp; Light Corp., St. Louis</td>
<td>9.35</td>
<td>6.48</td>
<td></td>
</tr>
<tr>
<td>St. Louis &amp; Alton Ry.</td>
<td>1.93</td>
<td></td>
<td></td>
</tr>
<tr>
<td>St. Louis &amp; Belleville Elec. Ry.</td>
<td>0.41</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Indiana</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Beech Grove Traction Corp.</td>
<td>1.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chicago, S. Bend &amp; Northern Ind. Ry.</td>
<td>1.25</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chicago, S. Shore &amp; S. Bend R.R.</td>
<td>2.70</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Indianapolis, St. Ry.</td>
<td>1.467</td>
<td>1.13</td>
<td></td>
</tr>
<tr>
<td>Indiana Traction &amp; Electric Co.</td>
<td>0.55</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Laclede Street Railway</td>
<td>1.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Traction Co., Inc.</td>
<td>0.05</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Union Traction Co.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Kansas</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Kansas Power &amp; Light Co.</td>
<td>0.76</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wichita R.R. &amp; Light Co.</td>
<td>0.50</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Kentucky</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Louisville Ry.</td>
<td>2.00</td>
<td>0.88</td>
<td></td>
</tr>
<tr>
<td>Louisville &amp; Interurban Ry.</td>
<td>0.11</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Louisiana</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>New Orleans Public Service, Inc.</td>
<td>3.58</td>
<td>3.35</td>
<td></td>
</tr>
<tr>
<td>Bidded &amp; Sozo R.R.</td>
<td>1.50</td>
<td></td>
<td></td>
</tr>
<tr>
<td>York Utilities Co.</td>
<td>0.62</td>
<td>0.90</td>
<td></td>
</tr>
<tr>
<td>Maryland</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Potomac Edison Co.</td>
<td>0.38</td>
<td></td>
<td></td>
</tr>
<tr>
<td>United Ry. &amp; Elec. Co., Baltimore</td>
<td>7.63</td>
<td>1.33</td>
<td></td>
</tr>
<tr>
<td>Massachusetts</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Berkshire Ry.</td>
<td>0.04</td>
<td>0.17</td>
<td></td>
</tr>
<tr>
<td>Boston Elevated Ry.</td>
<td>5.60</td>
<td>2.76</td>
<td></td>
</tr>
<tr>
<td>Boston Elevated Ry., &amp; Lynn R.R.</td>
<td>4.02</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Boston, Worcester &amp; New York R.R.</td>
<td>15.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Oregon</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Portland Electric Power Co.</td>
<td>1.25</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pennsylvania</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Allegheny Valley Street Railway</td>
<td>0.10</td>
<td>3.30</td>
<td></td>
</tr>
<tr>
<td>Beaver Valley Traction Co.</td>
<td>1.60</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rhode Island</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>United Elec. Ry., Providence</td>
<td>7.50</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tennessee</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Knoxville Power &amp; Light Co.</td>
<td>0.21</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Memphis St. Ry., &amp; L.C.</td>
<td>8.10</td>
<td></td>
<td></td>
</tr>
<tr>
<td>San Antonio Public Service Co.</td>
<td>0.72</td>
<td>0.11</td>
<td></td>
</tr>
<tr>
<td>Texas</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dallas R., &amp; Terminal Co.</td>
<td>1.28</td>
<td>0.50</td>
<td></td>
</tr>
<tr>
<td>Galveston Elec. Co.</td>
<td>0.59</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Houston Elec. Ry.</td>
<td>0.65</td>
<td>1.28</td>
<td></td>
</tr>
<tr>
<td>Utah</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Salt Lake &amp; Utah R.R.</td>
<td>0.75</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Utah Light &amp; Traction Co.</td>
<td>0.20</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Virginia</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gray's Harley Ry. &amp; Co.</td>
<td>0.71</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Roanoke Rly. &amp; Elec. Co.</td>
<td>0.65</td>
<td>1.28</td>
<td></td>
</tr>
<tr>
<td>Virginia Public Service Co.</td>
<td>0.19</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Washington</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Seattle Municipal Rly. &amp; Co.</td>
<td>2.70</td>
<td>2.09</td>
<td></td>
</tr>
<tr>
<td>Tacoma Rly. &amp; Pwr. Co.</td>
<td>2.92</td>
<td>2.87</td>
<td></td>
</tr>
<tr>
<td>West Virginia</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Charleston Interurban R.H.</td>
<td>0.25</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Monongahela West Penn Pub. Serv. Co.</td>
<td>0.32</td>
<td>0.16</td>
<td></td>
</tr>
<tr>
<td>Wheeling Traction Company</td>
<td>3.00</td>
<td>1.30</td>
<td></td>
</tr>
<tr>
<td>Wisconsin</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Milwaukee Elec. Ry. &amp; L.C.</td>
<td>1.30</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Northern States Power Co., Eau Claire</td>
<td>1.00</td>
<td>2.30</td>
<td></td>
</tr>
<tr>
<td>Wisconsin Valley Elec. Co.</td>
<td>0.70</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hawaiian Islands</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Honolulu Rapid Transit Co.</td>
<td>0.63</td>
<td></td>
<td></td>
</tr>
<tr>
<td>British Columbia Elec. Rly.</td>
<td>2.17</td>
<td>1.55</td>
<td></td>
</tr>
<tr>
<td>Cape Breton Elec. Co.</td>
<td>0.75</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Corunna Central Rly. Co.</td>
<td>0.25</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Edmonton Radial Rly.</td>
<td>0.86</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Duluth &amp; Winona R.R.</td>
<td>0.07</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hydro-Electric Rys., Ga., &amp; W.</td>
<td>0.50</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hydro-Electric Rys., Windsor</td>
<td>1.10</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hudson Valley Rys.</td>
<td>0.30</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lehigh Valley Rys.</td>
<td>1.50</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Long Island Rys.</td>
<td>10.37</td>
<td>0.25</td>
<td></td>
</tr>
<tr>
<td>Montreal Tramway</td>
<td>10.00</td>
<td>0.25</td>
<td></td>
</tr>
<tr>
<td>New Brunswick Power Co.</td>
<td>0.64</td>
<td>0.34</td>
<td></td>
</tr>
<tr>
<td>Nova Scotia Light &amp; Power Co.</td>
<td>0.30</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ottawa Electric Railway</td>
<td>3.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Saginaw Municipal Rly.</td>
<td>1.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sherbrooke Elec. Rly. &amp; Power Co.</td>
<td>0.60</td>
<td>0.45</td>
<td></td>
</tr>
<tr>
<td>Valentine Transportation Co.</td>
<td>5.04</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Winnipeg Elec. Co.</td>
<td>1.32</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>4720728827</td>
</tr>
</tbody>
</table>
City Rapid Transit Company, Mobile Light & Rapid Transit Company, International Railway at Buffalo, Cincinnati Street Railway, Milwaukee Electric Light & Rail Company, Los Angeles Railway, Third Avenue Railway and the Montreal Tramways. Among the interurbans, the Pacific Electric Railway, the Pittsburgh, Harmony, Butler & New Castle, the Boston, Worcester & New York Street Railway, the Indiana, Columbus & Eastern Traction Company, the Lima & Toledo Railroad and the Chicago, Aurora & Elgin Railroad reported more than 10 miles of reconstruction done during the past year.

Less track was permanently abandoned by the electric railways during 1929 than in other recent years. In all, about 750 miles of track was abandoned by companies which continued to operate the major portions of their rail systems. Reasons for such abandonments were the same as those which have acted similarly in the past—light traffic which did not produce sufficient revenue to meet operating costs or the necessity to make large expenditures for rehabilitation, or both. In many instances bus operation under the management of the railway was inaugurated to replace the rail service formerly given. In some instances, where traffic was extremely thin, it was not deemed advisable to supply service of any kind.

The number of electric railways which abandoned all rail operation was smaller in 1929 than in any other recent year, as was also the mileage involved. Altogether, there were fewer than twenty such companies operating only about 300 miles of track. Among these the Westchester Street Railway, the Burlington Traction Company, the Sioux Falls Traction System and the Hamilton Radial Electric Railway, all replaced their rail service by bus service under their own auspices. The Bethlehem Transit Company abandoned rail operation, and bus service is now furnished by the Lehgh Valley Transit Company. All rail operations were abandoned in the small cities of Plattsburg, N. Y., and Santa Barbara, Cal., without the substitution of any other organized transportation service. Other complete abandonments of the year include the Manhattan Bridge 3-Cent Line of New York City and the Van Brun & Erie Basin Railroad in Brooklyn. Prior to their abandonment the service rendered by these companies had been superseded to a large extent by under-river tunnels and rapid transit service.

Analysis of the conditions surrounding the abandonment of some 150 electric railway systems during the past decade show that the great majority have occurred in small communities. The average size of the population served was approximately 10,000 and the average length of the rail system was about 8.5 miles. Nearly half of

### Partial Track Abandonments in 1929

<table>
<thead>
<tr>
<th>Name of Company</th>
<th>Miles</th>
<th>Name of Company</th>
<th>Miles</th>
<th>Name of Company</th>
<th>Miles</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dahut St. Ry.</td>
<td>0.05</td>
<td>Kansas</td>
<td>8.24</td>
<td>Community Traction Co.</td>
<td>7.29</td>
</tr>
<tr>
<td>Delaware</td>
<td>0.20</td>
<td>Kentucky</td>
<td>2.20</td>
<td>New York &amp; L. &amp; P. Co.</td>
<td>0.65</td>
</tr>
<tr>
<td>Detroit</td>
<td>0.00</td>
<td>Louisiana</td>
<td>4.23</td>
<td>Northern Ohio Power &amp; L. Co.</td>
<td>65.04</td>
</tr>
<tr>
<td>District of Columbia</td>
<td>11.76</td>
<td>Maine</td>
<td>16.22</td>
<td>Ohio Railroad &amp; P. Co.</td>
<td>9.15</td>
</tr>
<tr>
<td>Galveston</td>
<td>1.81</td>
<td>Massachusetts</td>
<td>32.68</td>
<td>Pioneer Transportation, Inc.</td>
<td>1.75</td>
</tr>
<tr>
<td>Georgia</td>
<td>2.26</td>
<td>Michigan</td>
<td>6.33</td>
<td>Youngstown Municipal Ry.</td>
<td>4.54</td>
</tr>
<tr>
<td>Illinois</td>
<td>2.21</td>
<td>Missouri</td>
<td>19.54</td>
<td>Northeast Ohio R.R.</td>
<td>0.60</td>
</tr>
<tr>
<td>Indiana</td>
<td>4.16</td>
<td>Nebraska</td>
<td>2.07</td>
<td>Pennsylvania Co.</td>
<td>44.90</td>
</tr>
<tr>
<td>Iowa</td>
<td>1.50</td>
<td>New Jersey</td>
<td>13.52</td>
<td>Texas</td>
<td>0.68</td>
</tr>
<tr>
<td>Kentucky</td>
<td>0.09</td>
<td>New York</td>
<td>13.52</td>
<td>Texas Traction Co.</td>
<td>3.70</td>
</tr>
<tr>
<td>Massachusetts</td>
<td>1.50</td>
<td>New York &amp; L. &amp; P. Co.</td>
<td>0.80</td>
<td>San Antonio Public Service Co.</td>
<td>2.57</td>
</tr>
<tr>
<td>Michigan</td>
<td>0.00</td>
<td>Ohio</td>
<td>5.27</td>
<td>Utah</td>
<td>0.25</td>
</tr>
<tr>
<td>Minnesota</td>
<td>0.00</td>
<td>Oregon</td>
<td>1.75</td>
<td>Utah Light Traction Co.</td>
<td>5.71</td>
</tr>
<tr>
<td>New Jersey</td>
<td>14.39</td>
<td>Pennsylvania Co.</td>
<td>1.75</td>
<td>Virginia</td>
<td>0.75</td>
</tr>
<tr>
<td>Ohio</td>
<td>0.99</td>
<td>Pennsylvania Co.</td>
<td>0.75</td>
<td>Washington</td>
<td>3.46</td>
</tr>
<tr>
<td>Pennsylvania Co.</td>
<td>0.00</td>
<td>Portland &amp; W. Co.</td>
<td>0.75</td>
<td>Wyoming</td>
<td>0.25</td>
</tr>
<tr>
<td>Rhode Island</td>
<td>0.00</td>
<td>Powhatan</td>
<td>0.75</td>
<td>Zacata Co.</td>
<td>23.28</td>
</tr>
<tr>
<td>Texas</td>
<td>0.00</td>
<td>West Virginia</td>
<td>0.75</td>
<td>Zacata Co.</td>
<td>3.70</td>
</tr>
<tr>
<td>Utah</td>
<td>0.00</td>
<td>Zacata Co.</td>
<td>0.75</td>
<td>Zacata Co.</td>
<td>23.28</td>
</tr>
<tr>
<td>Zacata Co.</td>
<td>0.00</td>
<td>Zacata Co.</td>
<td>0.75</td>
<td>Zacata Co.</td>
<td>3.70</td>
</tr>
</tbody>
</table>

---

**Electric Railway Journal—Vol.74, No.1**

18
these companies and half of the total miles of track were in towns having an average population of less than 5,000 persons. Only 10 per cent of the abandoned railways were located in towns of over 20,000 population.

A considerable number of other abandoned electric railway systems were so located that exact determination of the population served is impossible. From the fact that in many instances no organized transportation service has replaced the abandoned rail service, however, it may be inferred that the population formerly served by these lines also was exceedingly small.

Bus service has replaced rail service over about two-thirds of the abandoned mileage. In many instances this is being given by the same management which formerly gave rail service, but in some instances new management has come in. On some 1,300 miles of track where the traffic was so light that it became necessary to discontinue rail service, no organized transportation service of any kind is now given.

Rapid Transit Situation Shows Little Change

New York, Boston, Philadelphia and Chicago are the only ones in which regular high-speed subway and elevated service is given.

NOTWITHSTANDING widespread interest in transit in many cities, there are only four metropolitan centers in the United States where lines devoted exclusively to rapid transit passenger movement has been constructed. These are New York, Boston, Philadelphia and Chicago. The accompanying table gives the route and track mileages and the number of cars operated, as compiled from available sources.

New York, on account of the immense concentration of population in a limited area, naturally has the greatest rapid transit mileage. Two separate companies give both subway and elevated service in the boroughs of Manhattan, Brooklyn and Queens. The Interborough system alone operates in the Bronx, and the Staten Island Rapid Transit Company, which is an electrification of the steam railroad which has been in operation for many years, serves the Borough of Richmond ("Staten Island"). Besides these lines, the Hudson & Manhattan Railroad, popularly known as the Hudson Tubes, operates an underground system beneath Sixth Avenue, Manhattan, which crosses the Hudson River to reach points in Jersey City and Hoboken.

A second route runs from the Hudson Terminal at Church and Dey Streets, Manhattan, to Jersey City and continues on surface tracks of the Pennsylvania Railroad to Newark. While the Hudson & Manhattan is an interstate line, and as such comes under the supervision of the Interstate Commerce Commission, its service differs but little from rapid transit.

For years the Long Island Railroad has been serving the urban population of New York City with suburban transit. It operates into the heart of Manhattan and supplements to a large extent the subway and elevated lines. The same is true to a lesser extent of the suburban services of the New York Central, New York, New Haven & Hartford, and New York, Westchester & Boston.

In Boston the rapid transit service is given by the trains of the Boston Elevated Railway. In addition there are several routes of surface cars operating on elevated or subway tracks. The most important of these is the Boylston Street subway, which runs from Kenmore to Park Street at the edge of the Boston Common. Another route runs on an elevated track from Lechmere Square to North Station, the surface cars continuing into the Tremont Street Subway to Park Street.

The Boston, Revere Beach & Lynn Railroad is a narrow-gage line operating on its own right-of-way between East Boston and Lynn, Mass. Its method of operation differs but little from the rapid transit lines of the Boston Elevated Railway, and for that reason it is included.

Besides these lines there are several instances where electric railways and electrified steam lines give service comparable with that already described. The Northwestern Pacific Railroad, and the Key System Transit Company, operating across the bay from San Francisco, are examples of this class of service. The Illinois Central Railroad runs a suburban service in the city of Chicago and its suburbs that is comparable to rapid transit. Beginning in the near future certain lines centering in the Cleveland Union Terminal will furnish suburban service, principally within the city of Cleveland, differing but little from rapid transit.

In the city of Cincinnati a rapid transit subway has been constructed, but the stations never have been built nor track laid. For that reason it is impossible to include it in the tabulation.

**Table: Entire Electric Railway Properties Abandoned in 1929**

<table>
<thead>
<tr>
<th>Name of Company</th>
<th>Miles of Track</th>
</tr>
</thead>
<tbody>
<tr>
<td>Atlantic City &amp; Suburban Ry.</td>
<td>16.00</td>
</tr>
<tr>
<td>Augustus L. Hammond Railway Co.</td>
<td>15.10</td>
</tr>
<tr>
<td>Boststeen Transit Co.</td>
<td>7.25</td>
</tr>
<tr>
<td>Commission of Public Docks, Portland, Ore.</td>
<td>1.50</td>
</tr>
<tr>
<td>Detroit, Jackson &amp; Chicago Ry.</td>
<td>69.14</td>
</tr>
<tr>
<td>Hamilton Rapid Transit Ry.</td>
<td>16.00</td>
</tr>
<tr>
<td>Lima &amp; Defiance R.R., Ohio.</td>
<td>15.00</td>
</tr>
<tr>
<td>Lowell &amp; Fitchburg St. Ry.</td>
<td>14.81</td>
</tr>
<tr>
<td>Manhattan Bridge 3c., Line.</td>
<td>4.50</td>
</tr>
<tr>
<td>Plymouth Traction Co.</td>
<td>7.50</td>
</tr>
<tr>
<td>Port of Sound Power &amp; Light Co., Southern District</td>
<td>6.66</td>
</tr>
<tr>
<td>Santa Barbara &amp; Suburban Ry.</td>
<td>8.99</td>
</tr>
<tr>
<td>M.H. Falls Traction System</td>
<td>14.50</td>
</tr>
<tr>
<td>Vermont Co.</td>
<td>12.02</td>
</tr>
<tr>
<td>Van Brunt Street &amp; Erie Basin R.R.</td>
<td>2.78</td>
</tr>
<tr>
<td>Warren &amp; Jamestown St. RY.</td>
<td>20.38</td>
</tr>
<tr>
<td>West Chester Street Railway</td>
<td>28.00</td>
</tr>
</tbody>
</table>

* Bus service substituted under same management.

**Table: Data on Rapid Transit Lines in United States**

<table>
<thead>
<tr>
<th>Route Miles</th>
<th>Subway Elevated</th>
<th>Total Track Miles</th>
<th>Cars</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chicago, Ill.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chicago Rapid Transit Co.</td>
<td>0.0</td>
<td>81.1</td>
<td>229.5</td>
</tr>
<tr>
<td>Boston, Mass.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Boston Elevated Railway</td>
<td>12.2</td>
<td>10.0</td>
<td>57.5</td>
</tr>
<tr>
<td>Boston, Revere Beach &amp; Lynn R.R.</td>
<td>0.0</td>
<td>13.0</td>
<td>31.0</td>
</tr>
<tr>
<td>New York, N. Y.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Brooklyn-Manhattan Transit Co.</td>
<td>40.0</td>
<td>89.0</td>
<td>389.0</td>
</tr>
<tr>
<td>Interborough Rapid Transit Co.</td>
<td>44.6</td>
<td>115.0</td>
<td>350.7</td>
</tr>
<tr>
<td>Hudson &amp; Manhattan R.R.</td>
<td>8.5</td>
<td>0.0</td>
<td>20.0</td>
</tr>
<tr>
<td>Staten Island Rapid Transit Co.</td>
<td>0.0</td>
<td>21.0</td>
<td>44.7</td>
</tr>
<tr>
<td>Philadelphia Rapid Transit Co.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Market St.-Frankford Elevated</td>
<td>2.6</td>
<td>11.8</td>
<td>39.0</td>
</tr>
<tr>
<td>12th St. Subway</td>
<td>6.1</td>
<td>0.0</td>
<td>20.9</td>
</tr>
</tbody>
</table>

* Operates a high-speed line on the surface on private right-of-way.
* Operates a subway line and leases a high-speed surface line on the private right-of-way of the Pennsylvania Railroad to Newark, N. J.

**Table: Electric Railway Journal**

January, 1930

19
CONTINUED activities in the co-ordination of bus and trolley operations, substitution of buses for cars on small, unprofitable lines that did not warrant rehabilitation, and the merging of numerous independent units into stronger unified systems were the dominant features in the development of bus operations by electric railways in 1929.

These adjustments involved the purchase of nearly 2,200 buses during the past year and the extension and installation of bus routes of approximately 4,000 miles, bringing the total number of buses now operated by the electric railways of the United States and Canada to 12,451 and the total number of bus-miles covered to 24,937. In comparison with the 1928 survey, purchases of bus equipment were slightly lower in 1929, but extensions to bus mileage were greater, excluding the mileage added in 1928 by the Southern Pacific Motor Transport Company in special long-haul service.

Bus Operations Are Steadily Expanded

By J. R. STAUFFER
Assistant Editor Electrical Railway Journal

Bus Operation by Electric Railways and Subsidiary Companies

<table>
<thead>
<tr>
<th>No. Buses</th>
<th>Jan. 1, 1930</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alabama Power Co.</td>
<td>4</td>
</tr>
<tr>
<td>Alabama Power Co.</td>
<td>2</td>
</tr>
<tr>
<td>Birmingham Electric Co.</td>
<td>5</td>
</tr>
<tr>
<td>*Selma Electric Ry.</td>
<td>50</td>
</tr>
<tr>
<td>Arizona</td>
<td>385</td>
</tr>
<tr>
<td>Phoenix Street Ry.</td>
<td>6</td>
</tr>
<tr>
<td>Tuscon Rapid Transit Co.</td>
<td>6</td>
</tr>
<tr>
<td>*Warren Co.</td>
<td>6</td>
</tr>
<tr>
<td>Arkansas</td>
<td>112</td>
</tr>
<tr>
<td>Arkansas Power &amp; Light Co.</td>
<td>63</td>
</tr>
<tr>
<td>Interest Terminal Railway</td>
<td>9</td>
</tr>
<tr>
<td>California</td>
<td>5</td>
</tr>
<tr>
<td>Bakersfield &amp; Kern Electric Ry.</td>
<td>5</td>
</tr>
<tr>
<td>Eureka Street Ry.</td>
<td>5</td>
</tr>
<tr>
<td>Key System Transit Co.</td>
<td>5</td>
</tr>
<tr>
<td>Los Angeles Motor Bus Co.</td>
<td>6</td>
</tr>
<tr>
<td>Marketh Street Ry.</td>
<td>6</td>
</tr>
<tr>
<td>Municipal Ry. of San Francisco</td>
<td>8</td>
</tr>
<tr>
<td>Pacific Electric Ry.</td>
<td>8</td>
</tr>
<tr>
<td>Pacific Gas &amp; Electric Co.</td>
<td>8</td>
</tr>
<tr>
<td>Peninsula Ry.</td>
<td>8</td>
</tr>
<tr>
<td>Sacramento Northern Ry.</td>
<td>8</td>
</tr>
<tr>
<td>San Diego Electric Co.</td>
<td>10</td>
</tr>
<tr>
<td>San Francisco, Napa &amp; Calistoga R.R.</td>
<td>20</td>
</tr>
<tr>
<td>San Jose Railroads</td>
<td>30</td>
</tr>
<tr>
<td>Southern Pacific Co. (Electric Division)</td>
<td>52</td>
</tr>
<tr>
<td>*Union Traction Co.</td>
<td>5</td>
</tr>
<tr>
<td>Colorado</td>
<td>5</td>
</tr>
<tr>
<td>Colorado Springs &amp; Interurban Ry.</td>
<td>5</td>
</tr>
<tr>
<td>*Denver &amp; Interurban Motor Co.</td>
<td>5</td>
</tr>
<tr>
<td>*Denver &amp; South Platte Transportation Co.</td>
<td>5</td>
</tr>
<tr>
<td>*Denver Tramway Co.</td>
<td>22</td>
</tr>
<tr>
<td>*Bus Transportation Co.</td>
<td>22</td>
</tr>
<tr>
<td>*Allston Bus &amp; Tux Co.</td>
<td>22</td>
</tr>
<tr>
<td>*Grand River Motor Ry.</td>
<td>5</td>
</tr>
<tr>
<td>Public Service Co. of Colo.</td>
<td>5</td>
</tr>
<tr>
<td>Connecticut</td>
<td>165</td>
</tr>
<tr>
<td>Connecticut Co.</td>
<td>165</td>
</tr>
<tr>
<td>*Dushbury Power &amp; Transportation Co.</td>
<td>17</td>
</tr>
<tr>
<td>*Groton &amp; Stonington Traction Co.</td>
<td>14</td>
</tr>
<tr>
<td>*Jerilderie Ry.</td>
<td>13</td>
</tr>
<tr>
<td>New Haven &amp; Shore Line Ry.</td>
<td>13</td>
</tr>
<tr>
<td>Waterbury &amp; Middletown Tramway</td>
<td>3</td>
</tr>
<tr>
<td>Delaware</td>
<td>22</td>
</tr>
<tr>
<td>Delaware Electric Power Co.</td>
<td>22</td>
</tr>
<tr>
<td>Delaware Tram Co.</td>
<td>22</td>
</tr>
<tr>
<td>District of Columbia</td>
<td>42</td>
</tr>
<tr>
<td>Capital Traction Co.</td>
<td>161</td>
</tr>
<tr>
<td>Washington Ry. &amp; Electric Co.</td>
<td>161</td>
</tr>
<tr>
<td>Washington &amp; Old Dominion Ry.</td>
<td>161</td>
</tr>
<tr>
<td>Florida</td>
<td>4</td>
</tr>
<tr>
<td>Jacksonville Traction Co.</td>
<td>4</td>
</tr>
<tr>
<td>*Key West Electric Co.</td>
<td>4</td>
</tr>
<tr>
<td>Miami Beach Ry.</td>
<td>4</td>
</tr>
<tr>
<td>Municipal Ry. of St. Petersburg</td>
<td>4</td>
</tr>
<tr>
<td>Tampa Electric Co.</td>
<td>4</td>
</tr>
<tr>
<td>Georgia</td>
<td>22</td>
</tr>
<tr>
<td>Columbus Electric &amp; Power Co.</td>
<td>22</td>
</tr>
<tr>
<td>Columbus Transit Co.</td>
<td>22</td>
</tr>
<tr>
<td>*Georgia Power Co.</td>
<td>22</td>
</tr>
<tr>
<td>Savannah Electric &amp; Power Co.</td>
<td>22</td>
</tr>
<tr>
<td>Idaho</td>
<td>11</td>
</tr>
<tr>
<td>*Boise Street Car Co.</td>
<td>11</td>
</tr>
<tr>
<td>Illinois</td>
<td>5</td>
</tr>
<tr>
<td>Alton Ry.</td>
<td>5</td>
</tr>
<tr>
<td>Aurora, Elgin &amp; Fox River Electric Co.</td>
<td>5</td>
</tr>
<tr>
<td>*Central Illinois Public Service Co.</td>
<td>10</td>
</tr>
<tr>
<td>Chicago, Aurora &amp; Elgin R.R.</td>
<td>10</td>
</tr>
<tr>
<td>Western Motor Coach Co.</td>
<td>10</td>
</tr>
<tr>
<td>Chicago City Ry.</td>
<td>10</td>
</tr>
<tr>
<td>Chicago &amp; Illinois Valley Ry.</td>
<td>10</td>
</tr>
<tr>
<td>Chicago &amp; Joliet Electric Ry.</td>
<td>10</td>
</tr>
<tr>
<td>Chicago &amp; Joliet Transit Co.</td>
<td>10</td>
</tr>
<tr>
<td>Chicago, North Shore &amp; Milwaukee R.R.</td>
<td>10</td>
</tr>
<tr>
<td>Metropolitan Motor Coach Co.</td>
<td>10</td>
</tr>
<tr>
<td>Chicago Ry.</td>
<td>10</td>
</tr>
<tr>
<td>Chicago &amp; Wauwatosa Ry.</td>
<td>10</td>
</tr>
<tr>
<td>East St. Louis &amp; Suburban Ry.</td>
<td>10</td>
</tr>
<tr>
<td>East St. Louis Ry.</td>
<td>10</td>
</tr>
<tr>
<td>Evanston Ry.</td>
<td>10</td>
</tr>
<tr>
<td>Evanston &amp; Wilmette Ry.</td>
<td>10</td>
</tr>
<tr>
<td>Illinois Power Co.</td>
<td>10</td>
</tr>
<tr>
<td>Illinois Terminal R.R.</td>
<td>10</td>
</tr>
<tr>
<td>*Joliet, Plainfield &amp; Aurora Transit Co.</td>
<td>10</td>
</tr>
<tr>
<td>Kewanee Public Service Co.</td>
<td>10</td>
</tr>
<tr>
<td>Rockford Electric Co.</td>
<td>10</td>
</tr>
<tr>
<td>Rockford &amp; Interurban Co.</td>
<td>10</td>
</tr>
<tr>
<td>Tri-City Ry. of Ill.</td>
<td>10</td>
</tr>
<tr>
<td>Indiana</td>
<td>23</td>
</tr>
<tr>
<td>Beech Grove Traction Corp.</td>
<td>23</td>
</tr>
<tr>
<td>Chicago, South Shore &amp; South Bend R.R.</td>
<td>23</td>
</tr>
<tr>
<td>Shore Line Motor Coach Co.</td>
<td>23</td>
</tr>
<tr>
<td>Evanston &amp; Oak Park Ry.</td>
<td>23</td>
</tr>
<tr>
<td>Gary Roadway, Inc.</td>
<td>23</td>
</tr>
<tr>
<td>Indianapolis, Columbus &amp; Southern Trac. Co.</td>
<td>23</td>
</tr>
<tr>
<td>Indianapolis Street Ry.</td>
<td>23</td>
</tr>
<tr>
<td>Peabody Motor Coach Co.</td>
<td>23</td>
</tr>
<tr>
<td>Indianapolis &amp; Southern Ind. R.R.</td>
<td>23</td>
</tr>
<tr>
<td>*Indianapolis Electric Service Co.</td>
<td>23</td>
</tr>
<tr>
<td>Interstate Public Service Co.</td>
<td>23</td>
</tr>
<tr>
<td>Northern Indiana Power Co.</td>
<td>23</td>
</tr>
<tr>
<td>Southern Indiana Gas &amp; Electric Co.</td>
<td>23</td>
</tr>
<tr>
<td>Southern Michigan Ry.</td>
<td>23</td>
</tr>
<tr>
<td>Terre Haute, Indianapolis &amp; Eastern Trac. Co.</td>
<td>23</td>
</tr>
<tr>
<td>Indianapolis Motor Transit Co.</td>
<td>23</td>
</tr>
<tr>
<td>T. H. L. E. (Terre Haute Div.)</td>
<td>23</td>
</tr>
<tr>
<td>Union Traction Co. of Indiana</td>
<td>23</td>
</tr>
<tr>
<td>Iowa</td>
<td>5</td>
</tr>
<tr>
<td>Cedar Rapids &amp; Iowa City Ry. R.R.</td>
<td>5</td>
</tr>
<tr>
<td>Clinton, Davenport &amp; Muscatine Ry.</td>
<td>5</td>
</tr>
<tr>
<td>Des Moines &amp; Central Iowa R.R.</td>
<td>5</td>
</tr>
<tr>
<td>*Des Moines Electric Light Co.</td>
<td>5</td>
</tr>
<tr>
<td>Fort Dodge, Des Moines &amp; Southern R.R.</td>
<td>5</td>
</tr>
<tr>
<td>Fort Dodge, Des Moines &amp; South Transp. Co.</td>
<td>5</td>
</tr>
<tr>
<td>Louisiana</td>
<td>3</td>
</tr>
<tr>
<td>Baton Rouge Electric Co.</td>
<td>3</td>
</tr>
<tr>
<td>*Lowe's Elec. Co.</td>
<td>3</td>
</tr>
<tr>
<td>Municipal Street Ry. &amp; Co.</td>
<td>3</td>
</tr>
<tr>
<td>New Orleans Public Service, Inc.</td>
<td>3</td>
</tr>
<tr>
<td>Maine</td>
<td>5</td>
</tr>
<tr>
<td>York Utilities Co.</td>
<td>5</td>
</tr>
<tr>
<td>Maryland</td>
<td>13</td>
</tr>
<tr>
<td>*Cumberland &amp; Westernport Transit Co.</td>
<td>13</td>
</tr>
<tr>
<td>Potomac Edison Co.</td>
<td>13</td>
</tr>
<tr>
<td>*Blue Ridge Transportation Co.</td>
<td>13</td>
</tr>
<tr>
<td>United Rys. &amp; Electric Co.</td>
<td>13</td>
</tr>
<tr>
<td>Baltimore Coach Co.</td>
<td>13</td>
</tr>
<tr>
<td>Massachusetts</td>
<td>36</td>
</tr>
<tr>
<td>Berkshire Street Ry.</td>
<td>36</td>
</tr>
<tr>
<td>Boston Elevated Ry.</td>
<td>36</td>
</tr>
<tr>
<td>Boston &amp; Maine Ry.</td>
<td>36</td>
</tr>
<tr>
<td>Poole Street Ry.</td>
<td>36</td>
</tr>
<tr>
<td>Boston, Worcester &amp; New York Street Ry.</td>
<td>36</td>
</tr>
<tr>
<td>Eastern Massachusetts Street Ry.</td>
<td>36</td>
</tr>
<tr>
<td>East Taunton Street Ry.</td>
<td>36</td>
</tr>
<tr>
<td>Fitchburg &amp; Leominster Street Ry.</td>
<td>36</td>
</tr>
<tr>
<td>Gardner-Templeton Street Ry.</td>
<td>36</td>
</tr>
<tr>
<td>Holyoke Motor Co.</td>
<td>36</td>
</tr>
<tr>
<td>Interstate Traction Co.</td>
<td>36</td>
</tr>
<tr>
<td>*Leominster &amp; Boston Street Ry.</td>
<td>36</td>
</tr>
<tr>
<td>*Milford, Framingham, Hopedale &amp; Ubridge Coach Co.</td>
<td>36</td>
</tr>
<tr>
<td>Northampton Street Ry.</td>
<td>36</td>
</tr>
</tbody>
</table>

(Tabulated on page 82)
Expanded by Electric Railways

Of the 2,194 buses bought last year, 1,813 were new equipment while 381 were used and were acquired, in most cases, in the absorption of independent bus companies by the railways. Similarly, the figure of 775 buses which were sold or scrapped during the year includes a large number of transferred equipment as a result of the merging of interests.

Still maintaining its position as the largest operator of motor buses in the United States, Public Service Co-ordinated Transport, of New Jersey, increased its fleet to a total of 2,337 buses. During 1929 this company purchased 638 buses, of which 374 were new and 264 were second-hand. Practically all of these buses were of the semi-deluxe or deluxe, 29 to 33-passenger type. Approximately 1,100 miles of bus routes was added to the existing routes, bringing the total to 2,852 miles.

Other large purchasers of bus equipment were: United Electric Railways, Providence, R. I., which bought 72 new buses from 29 to 37-passenger capacity; Toronto Transportation Commission, which added 51 buses ranging in seating capacity from 17 to 33 passengers; New York State Railways, which purchased 50 buses of the 30 to 38-passenger type; Northern Ohio Power & Light, which bought 46 buses of large seating capacity and the Manila Electric Company, which more than doubled its fleet, adding 46 new small type buses to the 36 it already owned. The Boston Elevated Railway, Detroit Street Railways, Cleveland Railway, Virginia Electric & Power Company and the Third Avenue Railway in New York each purchased more than 25 new buses during 1929.

Bus mileage changes during the year include 3,825 miles of extensions and 670 miles of abandoned route. Of the extensions made, only 425 miles replaced former trolley operations, and in almost every case substitution of bus service was made on lines which were due for renewal of tracks or subject to municipal paving demands. The Wheeling Traction Company, through its acquisition of the White Star Lines, extended its bus operations by 197 miles; Wisconsin Power & Light Company extended its bus routes 168 miles, replacing all trolley car service in the city of Janesville, Wis., and 1.75 miles in Oshkosh, Wis. An exchange was made with the Royal Rapid Bus Company whereby three lines—Berlin to Juneau, 51 miles; Plymouth to Elkhart Lake, 7 miles, and Madison to Prairie du Sac, 35 miles—were traded for a 114-mile route from Madison, Wis., to Dubuque, Iowa. The Potomac Edison Company extended its routes 150 miles with bus service, of which 6.69 miles replaced trolley car route; Northern Ohio Power & Light Company extended its bus opera-

Purchases of new buses and extensions of bus mileage during the past year denote normal and healthy progress. Almost 2,200 buses were bought and nearly 4,000 miles of route was added during the year. The total mileage was 25,000 miles.
### Bus Operations by Electric Railways and Subsidiary Companies (Continued)

<table>
<thead>
<tr>
<th>State</th>
<th>City</th>
<th>Company</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Minnesota</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Duluth</td>
<td></td>
<td>16</td>
</tr>
<tr>
<td></td>
<td>Duluth Suburban</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Twin City Rapid Transit Co.</td>
<td></td>
<td>101</td>
</tr>
<tr>
<td></td>
<td>Twin City Motor Bus Co.</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Mississippi</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Mississippi Power Co.</td>
<td></td>
<td>35</td>
</tr>
<tr>
<td></td>
<td><em>Hattiesburg Division</em></td>
<td></td>
<td>7</td>
</tr>
<tr>
<td></td>
<td><em>Mississippi Division</em></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td><em>Vicksburg Division</em></td>
<td></td>
<td>4</td>
</tr>
<tr>
<td><strong>Missouri</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Kansas City, Clay County &amp; St. Joseph Ry.</td>
<td></td>
<td>12</td>
</tr>
<tr>
<td></td>
<td>Kansas City Public Service Co.</td>
<td></td>
<td>76</td>
</tr>
<tr>
<td></td>
<td>Missouri Power &amp; Light Co.</td>
<td></td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Springfield Electric Ry.</td>
<td></td>
<td>11</td>
</tr>
<tr>
<td></td>
<td>St. Joseph Ry., Lt., Ht. &amp; Per. Co.</td>
<td></td>
<td>20</td>
</tr>
<tr>
<td></td>
<td>St. Louis Public Service Co.</td>
<td></td>
<td>32</td>
</tr>
<tr>
<td><strong>New Hampshire</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Dover, Somersworth &amp; Rochester St. Ry.</td>
<td></td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>Keene Electric Ry.</td>
<td></td>
<td>7</td>
</tr>
<tr>
<td></td>
<td><em>Laconia Ry. &amp; Coach Co.</em></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Laconia Transit Co.</td>
<td></td>
<td>22</td>
</tr>
<tr>
<td></td>
<td>Nashua Street Ry.</td>
<td></td>
<td>9</td>
</tr>
<tr>
<td></td>
<td>Portsmouth Electric Ry.</td>
<td></td>
<td>12</td>
</tr>
<tr>
<td><strong>New Jersey</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Atlantic City &amp; Shore R.R.</td>
<td></td>
<td>18</td>
</tr>
<tr>
<td></td>
<td>Bayonne Suburban Ry.</td>
<td></td>
<td>24</td>
</tr>
<tr>
<td></td>
<td>Bergen County Transit Co.</td>
<td></td>
<td>27</td>
</tr>
<tr>
<td></td>
<td>Camden County Traction Co.</td>
<td></td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Central New York Line Co.</td>
<td></td>
<td>10</td>
</tr>
<tr>
<td></td>
<td><em>Atlantic City, Camden County &amp; St. Joseph's Ry. Co.</em></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Empire State Ry.</td>
<td></td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>Forest Hills &amp; Queens R.R.</td>
<td></td>
<td>31</td>
</tr>
<tr>
<td></td>
<td><em>Geneva, Seneca Falls &amp; Auburn R.R.</em></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Hanover Railway</td>
<td></td>
<td>16</td>
</tr>
<tr>
<td></td>
<td><em>Hoboken &amp; Passaic Co.</em></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Hudson Street Ry.</td>
<td></td>
<td>16</td>
</tr>
<tr>
<td></td>
<td>Huntington Coach Corp.</td>
<td></td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>International Ry.</td>
<td></td>
<td>90</td>
</tr>
<tr>
<td></td>
<td><em>International Bus Corp.</em></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Janesville Motor Bus Co.</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td></td>
<td><em>Jamestown Motor Bus Co.</em></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Kingston Consolidated R.R.</td>
<td></td>
<td>11</td>
</tr>
<tr>
<td></td>
<td><em>Kingsport Motor Coach Co.</em></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td><em>Kingsport Traction Co.</em></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td><em>Locust Valley &amp; Rockaway R.R.</em></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Livingston &amp; Westfield Bus Co.</td>
<td></td>
<td>52</td>
</tr>
<tr>
<td></td>
<td>New York Central Ry. (Rochester)</td>
<td></td>
<td>84</td>
</tr>
<tr>
<td></td>
<td>Rochester Interurban Bus Co.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Rochester Motor &amp; Coach Co.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td><em>Rockford Electric &amp; Line Co.</em></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>New York State Ry. (Syracuse)</td>
<td></td>
<td>18</td>
</tr>
<tr>
<td></td>
<td>New York State Ry. (Utica)</td>
<td></td>
<td>32</td>
</tr>
<tr>
<td></td>
<td>New York State Ry. (Utica) Utes Ry.</td>
<td></td>
<td>14</td>
</tr>
<tr>
<td></td>
<td>Utica Ry. &amp; Ord., Bus Lines</td>
<td></td>
<td>53</td>
</tr>
<tr>
<td><strong>New York</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Niagara Forge R.R.</td>
<td></td>
<td>29</td>
</tr>
<tr>
<td></td>
<td><em>Peekskill Lighting &amp; R.R. Corp.</em></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Port Jervis Transit Co.</td>
<td></td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Rough, Moxey &amp; Westchester Ry.</td>
<td></td>
<td>63</td>
</tr>
<tr>
<td></td>
<td>Rochester &amp; Syracuse R.R.</td>
<td></td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>Schenectady R.R.</td>
<td></td>
<td>24</td>
</tr>
<tr>
<td></td>
<td>Schenectady &amp; Western Ry.</td>
<td></td>
<td>11</td>
</tr>
<tr>
<td></td>
<td>Syracuse &amp; Eastern R.R.</td>
<td></td>
<td>6</td>
</tr>
<tr>
<td></td>
<td><em>Syracuse &amp; Utica R.R.</em></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Buffalo &amp; Southern Ry.</td>
<td></td>
<td>10</td>
</tr>
<tr>
<td></td>
<td>Genesee Valley Ry.</td>
<td></td>
<td>20</td>
</tr>
<tr>
<td></td>
<td>Saginaw Transit Co.</td>
<td></td>
<td>37</td>
</tr>
<tr>
<td><strong>North Carolina</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Carolina Power &amp; Light Co.</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Durham Public Service Co.</td>
<td></td>
<td>19</td>
</tr>
<tr>
<td></td>
<td><em>Greensboro Holding Co.</em></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td><em>Lemoyne Ry.</em></td>
<td></td>
<td>2</td>
</tr>
<tr>
<td></td>
<td><em>Menominee &amp; Marquette Light &amp; Tract. Co.</em></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Menomonee River Lighting Co.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Menomonee River Electric Ry.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Nelsonville-Athens R.R.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Nelsonville-Athens Co.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>North Carolina Power Co.</td>
<td></td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Northern States Power Co.</td>
<td></td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Northern States Power Co.</td>
<td></td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>[No. Buses Jan. 1, 1930]</td>
<td></td>
<td>64</td>
</tr>
<tr>
<td><strong>Ohio</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>City of Ashland—Division of Street R.</td>
<td></td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Cincinnati Hamilton &amp; Dayton Ry.</td>
<td></td>
<td>4</td>
</tr>
<tr>
<td></td>
<td><em>Cincinnati, Lawrenceburg &amp; Aurora Electric Street Ry.</em></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Cincinnati Street Ry.</td>
<td></td>
<td>98</td>
</tr>
<tr>
<td></td>
<td>Cleveland &amp; Western Ry.</td>
<td></td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>Cleveland, St. Louis &amp; Western Ry.</td>
<td></td>
<td>20</td>
</tr>
<tr>
<td></td>
<td>Columbus, Delaware &amp; Marion Elec. Ry.</td>
<td></td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Columbus &amp; Indianapolis Light &amp; Ry. Co.</td>
<td></td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>Community Traction Co.</td>
<td></td>
<td>12</td>
</tr>
<tr>
<td></td>
<td>Dayton Street Ry.</td>
<td></td>
<td>128</td>
</tr>
<tr>
<td></td>
<td>Dayton &amp; Xenia Ry.</td>
<td></td>
<td>28</td>
</tr>
<tr>
<td></td>
<td>Indios, Columbus &amp; Eastern Traction Co.</td>
<td></td>
<td>28</td>
</tr>
<tr>
<td></td>
<td>Dayton &amp; Columbus Traction Co.</td>
<td></td>
<td>13</td>
</tr>
<tr>
<td></td>
<td>Lake Shore Electric Ry.</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Lorrain St. Ry.</td>
<td></td>
<td>8</td>
</tr>
<tr>
<td></td>
<td>Maumee Valley Co.</td>
<td></td>
<td>13</td>
</tr>
<tr>
<td></td>
<td>Maumee Valley Transp. Co.</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Nelsonville—Athens Electric Ry.</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Nelsonville Transp. Co.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Northern Ohio Power &amp; Light Co.</td>
<td></td>
<td>283</td>
</tr>
<tr>
<td></td>
<td>Ohio Public Service Co.</td>
<td></td>
<td>56</td>
</tr>
<tr>
<td></td>
<td><em>Penn-Ohio Electric Co.</em></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Pioneer Transportation Co.</td>
<td></td>
<td>50</td>
</tr>
<tr>
<td></td>
<td>Columbus &amp; Kansas Transp. Co.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Portsmouth Public Service Co.</td>
<td></td>
<td>11</td>
</tr>
<tr>
<td></td>
<td>Springfield Electric Ry.</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Steubenville, East Liverpool &amp; Beaver Valley Traction Co.</td>
<td></td>
<td>90</td>
</tr>
<tr>
<td></td>
<td>West End Traction Co.</td>
<td></td>
<td>69</td>
</tr>
<tr>
<td></td>
<td>Youngstown Munipal &amp; Suburban Ry.</td>
<td></td>
<td>13</td>
</tr>
<tr>
<td></td>
<td>Youngstown Suburban Traction Co.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Columbus Ohio Co.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Columbus Suburban Transportation Co.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Columbus Suburban Tourist Lines</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Oklahoma</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Northern Oklahoma R.R.</td>
<td></td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Oklahoma Ry.</td>
<td></td>
<td>48</td>
</tr>
<tr>
<td></td>
<td>Oklahoma Union Ry.</td>
<td></td>
<td>83</td>
</tr>
<tr>
<td></td>
<td>Oklahoma Union Ry.</td>
<td></td>
<td>83</td>
</tr>
<tr>
<td></td>
<td>United Traction Co.</td>
<td></td>
<td>30</td>
</tr>
<tr>
<td><strong>Oregon</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Commission of Public Utilities, Portland</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Oregon Electric Ry.</td>
<td></td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Portland Electric Co.</td>
<td></td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>Oregon City Motor Bus Co.</td>
<td></td>
<td>11</td>
</tr>
<tr>
<td><strong>Pennsylvania</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Allentown &amp; Reading Traction Co.</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Allentown &amp; Lebanon Electric Ry.</td>
<td></td>
<td>33</td>
</tr>
<tr>
<td></td>
<td>Logan Valley Bus Co.</td>
<td></td>
<td>9</td>
</tr>
<tr>
<td></td>
<td>Beaver Valley Traction Co.</td>
<td></td>
<td>22</td>
</tr>
<tr>
<td></td>
<td><em>Bennett Motor Bus Co.</em></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td><em>Chamberlain &amp; Shippepens Ry.</em></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td><em>Chambersburg &amp; Shippenburgs Ry.</em></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td><em>Citizens Traction Co.</em></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Citizens Traction Co.</td>
<td></td>
<td>33</td>
</tr>
<tr>
<td></td>
<td>Constoga Transportation Co.</td>
<td></td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Constoga Transportation Co.</td>
<td></td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Eastern Penn Traction Co.</td>
<td></td>
<td>9</td>
</tr>
<tr>
<td></td>
<td>Eastern Penn Traction Co.</td>
<td></td>
<td>9</td>
</tr>
<tr>
<td></td>
<td>Erie Ry.</td>
<td></td>
<td>34</td>
</tr>
<tr>
<td></td>
<td>Erie Coach Co.</td>
<td></td>
<td>24</td>
</tr>
<tr>
<td></td>
<td><em>Franklin Traction Co.</em></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td><em>Johnstown &amp; Somersworth Ry.</em></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Rhode Island</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Newport &amp; Providence Ry.</td>
<td></td>
<td>34</td>
</tr>
<tr>
<td></td>
<td>United Electric Ry.</td>
<td></td>
<td>40</td>
</tr>
<tr>
<td><strong>South Carolina</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>South Carolina Gas &amp; Electric Co.</td>
<td></td>
<td>8</td>
</tr>
<tr>
<td></td>
<td>Spartanburg Suburban Ry.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Southern Public Utilities Co.</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td><strong>South Dakota</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td><em>Sout Falls Traction System</em></td>
<td></td>
<td>27</td>
</tr>
<tr>
<td><strong>Tennessee</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Knoxville Power &amp; Light Co.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Nashville Electric R.R.</td>
<td></td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>Nashville Electric R.R.</td>
<td></td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>Nashville &amp; Electric Ry.</td>
<td></td>
<td>18</td>
</tr>
<tr>
<td></td>
<td>Tennessee Electric Ry.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Union Traction Co.</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td><strong>Texas</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Atleon Traction Co.</td>
<td></td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>Austin City Ry.</td>
<td></td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>Bryan College Traction Co.</td>
<td></td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Dallas Ry. &amp; Terminal Ry.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Eastern Texas Electric Co.</td>
<td></td>
<td>23</td>
</tr>
<tr>
<td></td>
<td><em>G. L. Hallock Sub Line Bus</em></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td><em>El Paso Electric Ry.</em></td>
<td></td>
<td>7</td>
</tr>
<tr>
<td></td>
<td>Houston Electric Ry.</td>
<td></td>
<td>7</td>
</tr>
<tr>
<td></td>
<td>Houston Electric Ry.</td>
<td></td>
<td>75</td>
</tr>
<tr>
<td></td>
<td>Houston Traction Co.</td>
<td></td>
<td>27</td>
</tr>
<tr>
<td></td>
<td>Nashville Traction Co.</td>
<td></td>
<td>27</td>
</tr>
<tr>
<td></td>
<td>Nashville Traction Co.</td>
<td></td>
<td>27</td>
</tr>
<tr>
<td></td>
<td>Nashville Traction Co.</td>
<td></td>
<td>27</td>
</tr>
<tr>
<td></td>
<td><em>North Texas Traction Ry.</em></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td><em>Oklahoma Valley Transportation Co.</em></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>San Antonio Public Service Co.</td>
<td></td>
<td>88</td>
</tr>
<tr>
<td></td>
<td>San Antonio Public Service Co.</td>
<td></td>
<td>88</td>
</tr>
<tr>
<td></td>
<td><em>San Antonio Valley Transportation Co.</em></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Texas Electric Ry.</td>
<td></td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>Wichita Falls Traction Co.</td>
<td></td>
<td>11</td>
</tr>
<tr>
<td><strong>Utah</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Bamberger Electric I.R.</td>
<td></td>
<td>2</td>
</tr>
<tr>
<td></td>
<td><em>Bamberg Transportation Co.</em></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td><em>Brammer Electric Ry.</em></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td><em>Burlington Rapid Transit Co.</em></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td><em>Two State Gas &amp; Electric Co.</em></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Virginia</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Lynchburg Traction &amp; Light Co.</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Lynchburg Traction &amp; Light Co.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Roanoke &amp; Electric Ry.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Roanoke &amp; Electric Ry.</td>
<td></td>
<td>37</td>
</tr>
<tr>
<td></td>
<td>Virginia Electric Ry.</td>
<td></td>
<td>22</td>
</tr>
<tr>
<td></td>
<td>Virginia Public Service Co.</td>
<td></td>
<td>5</td>
</tr>
<tr>
<td></td>
<td><em>Citizen's Rapid Transit Corp.</em></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

---

**Note:** The table above lists bus operations by electric railways and subsidiaries as of 1930. The entries include various transit and electric companies operating in different states, with ranges of services and routes indicated in the table.
Bus Operations by Electric Railways and Subsidiary Companies—(Concluded)

<table>
<thead>
<tr>
<th>Washington</th>
<th>Wisconsin</th>
</tr>
</thead>
<tbody>
<tr>
<td>North River Transportation Co.</td>
<td>Milwaukee Valley Public Service</td>
</tr>
<tr>
<td>Lewiston-Clarkson Transit Co.</td>
<td>Auglaize Valley Electric Co.</td>
</tr>
<tr>
<td>Pacific Northwest Traction Co.</td>
<td>Yakima Valley Transportation Co.</td>
</tr>
</tbody>
</table>

**Western Virginia**

| Charleston Interurban R.R. | Wheeling Electric Co. | Porto Rico |
| Midland Tract Transit | Ohio Valley Bus Line | Porto Rico |
| New River Transit | Wheeling Public Service Co. | Porto Rico |
| Redbird | Wheeling Public Service Co. | Porto Rico |

**Oregon**

*Oregon Electric Co.*

<table>
<thead>
<tr>
<th>No. Buses</th>
<th>Jan. 1, 1930</th>
</tr>
</thead>
<tbody>
<tr>
<td>Washington</td>
<td>Wisconsin</td>
</tr>
<tr>
<td>North River Transportation Co.</td>
<td>Milwaukee Electric Ry. &amp; Light Co.</td>
</tr>
<tr>
<td>Tenbio, Inc.</td>
<td>Milwaukee Valley Public Service</td>
</tr>
<tr>
<td>Lewiston-Clarkson Transit Co.</td>
<td>Wisconsin Motor Bus Lines.</td>
</tr>
<tr>
<td>People's Light &amp; Power Co.</td>
<td>Wisconsin Midland Power Co.</td>
</tr>
<tr>
<td>Penn-Sound Power &amp; Light Co.</td>
<td>Auglaize Valley Electric Co.</td>
</tr>
<tr>
<td>Portland-Soldt Stage Co.</td>
<td>Pacific Northwest Traction Co.</td>
</tr>
<tr>
<td>Pacific Northwest Traction Co.</td>
<td>Seattle &amp; Sanich Valley Ry.</td>
</tr>
<tr>
<td>Pacific Northwest Traction Co.</td>
<td>Tacoma &amp; National Belt Line</td>
</tr>
<tr>
<td>Pacific Northwest Traction Co.</td>
<td>Yakima Valley Transportation Co.</td>
</tr>
<tr>
<td>Pacific Northwest Traction Co.</td>
<td>Pacific Northwest Traction Co.</td>
</tr>
<tr>
<td>Seattle &amp; Sanich Valley Ry.</td>
<td>Tacoma &amp; National Belt Line</td>
</tr>
<tr>
<td>Tacoma Ry. &amp; Power Co.</td>
<td>Yakima Valley Transportation Co.</td>
</tr>
<tr>
<td>Pacific Northwest Traction Co.</td>
<td>Tacoma &amp; National Belt Line</td>
</tr>
<tr>
<td>Pacific Northwest Traction Co.</td>
<td>Yakima Valley Transportation Co.</td>
</tr>
<tr>
<td>Pacific Northwest Traction Co.</td>
<td>Pacific Northwest Traction Co.</td>
</tr>
<tr>
<td>Seattle &amp; Sanich Valley Ry.</td>
<td>Tacoma &amp; National Belt Line</td>
</tr>
<tr>
<td>Tacoma Ry. &amp; Power Co.</td>
<td>Yakima Valley Transportation Co.</td>
</tr>
<tr>
<td>Pacific Northwest Traction Co.</td>
<td>Tacoma &amp; National Belt Line</td>
</tr>
<tr>
<td>Pacific Northwest Traction Co.</td>
<td>Yakima Valley Transportation Co.</td>
</tr>
</tbody>
</table>

**Oregon**

*Oregon Electric Co.*

<table>
<thead>
<tr>
<th>No. Buses</th>
<th>Jan. 1, 1930</th>
</tr>
</thead>
<tbody>
<tr>
<td>Washington</td>
<td>Wisconsin</td>
</tr>
<tr>
<td>North River Transportation Co.</td>
<td>Milwaukee Electric Ry. &amp; Light Co.</td>
</tr>
<tr>
<td>Tenbio, Inc.</td>
<td>Milwaukee Valley Public Service</td>
</tr>
<tr>
<td>Lewiston-Clarkson Transit Co.</td>
<td>Wisconsin Motor Bus Lines.</td>
</tr>
<tr>
<td>People's Light &amp; Power Co.</td>
<td>Wisconsin Midland Power Co.</td>
</tr>
<tr>
<td>Penn-Sound Power &amp; Light Co.</td>
<td>Auglaize Valley Electric Co.</td>
</tr>
<tr>
<td>Portland-Soldt Stage Co.</td>
<td>Pacific Northwest Traction Co.</td>
</tr>
<tr>
<td>Pacific Northwest Traction Co.</td>
<td>Seattle &amp; Sanich Valley Ry.</td>
</tr>
<tr>
<td>Pacific Northwest Traction Co.</td>
<td>Tacoma &amp; National Belt Line</td>
</tr>
<tr>
<td>Pacific Northwest Traction Co.</td>
<td>Yakima Valley Transportation Co.</td>
</tr>
<tr>
<td>Pacific Northwest Traction Co.</td>
<td>Tacoma &amp; National Belt Line</td>
</tr>
<tr>
<td>Seattle &amp; Sanich Valley Ry.</td>
<td>Tacoma &amp; National Belt Line</td>
</tr>
<tr>
<td>Tacoma Ry. &amp; Power Co.</td>
<td>Yakima Valley Transportation Co.</td>
</tr>
<tr>
<td>Pacific Northwest Traction Co.</td>
<td>Tacoma &amp; National Belt Line</td>
</tr>
<tr>
<td>Pacific Northwest Traction Co.</td>
<td>Yakima Valley Transportation Co.</td>
</tr>
</tbody>
</table>

In contrast to these abandonments, ten companies inaugurated bus operations for the first time. The Street Railway of Phoenix, Ariz., purchased buses to cover a new route of 7,775 miles; City Light & Traction Company, Sedalia, Mo., replaced 7,2 miles of car route with buses; the Berkshire Street Railway, Pittsfield, Mass., substituted 21-passenger buses for the trolley car service formerly rendered by the Vermont company, and the Mississippi Power & Light Company, Greenville division, replaced 8.5 miles of trolley service with bus service. In Canada, the Brantford & Hamilton Electric Railway used buses for the first time this year.

Two important and interesting changes in bus operations were effected in 1929. First was the purchase of the companies previously controlled by the O. G. Schultz Management operating in southern New Jersey by Public Service Co-ordinated Transport, Newark, N. J. Twenty-one companies operating eighteen lines were involved in the sale.

The second large step in the unification of all surface transportation of a community was effected in St. Louis with the purchase of the People's Motor Bus Company by the City Utilities Company and the subsequent agreement for co-ordinated operation between this latter company and the St. Louis Public Service Company, now operating all trolley service. Although the People's Motor Bus Company will for the present be operated independently, it will be in friendly co-operation with the electric railway system and the Public Service Company will have the right to purchase the bus company when financial and franchise situations in St. Louis shall warrant.

The City Utilities Company recently acquired 38 per cent of the common stock of the St. Louis Public Service Company and now the purchase of the People's Motor Bus Company gives it a monopoly on the major transportation facilities of the city.

Further co-ordination of car and bus operations, with a number of minor substitutions of buses for cars, is practically assured for the near future. Many properties are continuing to operate some unprofitable lines which will soon require new track, overhead or paving and the question of substitution of bus service on these routes will have to be considered. In some cases it will be found to be economically sound to rebuild the present structure, while again, in many instances, buses will be...
### Buses Bought by Railways During 1929

<table>
<thead>
<tr>
<th>Name of Company</th>
<th>Total</th>
<th>Type</th>
<th>Chassis</th>
<th>Body</th>
<th>Seating Capacity</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Alabama</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Alabama Power Co. (Caddo Div.)</td>
<td>4</td>
<td>4</td>
<td>White</td>
<td>Bender</td>
<td>29</td>
</tr>
<tr>
<td><strong>Arizona</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Phoenix Street Railway</td>
<td>12</td>
<td>2</td>
<td>Twin Coach</td>
<td>Yellow Coach</td>
<td>24</td>
</tr>
<tr>
<td>Tucson Rapid Transit Co.</td>
<td>1</td>
<td>1</td>
<td>Twin Coach</td>
<td>Mack</td>
<td>25</td>
</tr>
<tr>
<td><strong>California</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Los Angeles Motor Bus Co.</td>
<td>2</td>
<td>2</td>
<td>Twin Coach</td>
<td>White</td>
<td>21</td>
</tr>
<tr>
<td>Los Angeles Railway</td>
<td>2</td>
<td>2</td>
<td>Twin Coach</td>
<td>White</td>
<td>21</td>
</tr>
<tr>
<td><strong>District of Columbia</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Capital Transit Co.</td>
<td>12</td>
<td>4</td>
<td>Yellow Coach</td>
<td>Yellow Coach</td>
<td>25</td>
</tr>
<tr>
<td><strong>Illinois</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chicago &amp; Illinois Valley R.R.</td>
<td>3</td>
<td>3</td>
<td>Yellow Coach</td>
<td>Yellow Coach</td>
<td>28</td>
</tr>
<tr>
<td>Chicago North Shore &amp; Milwaukee R.R.</td>
<td>10</td>
<td>5</td>
<td>White</td>
<td>Bender</td>
<td>23</td>
</tr>
<tr>
<td>Chicago &amp; West Towns R.R.</td>
<td>5</td>
<td>5</td>
<td>White</td>
<td>Bender</td>
<td>15</td>
</tr>
<tr>
<td>Evanston Railway</td>
<td>10</td>
<td>5</td>
<td>White</td>
<td>Bender</td>
<td>20</td>
</tr>
<tr>
<td><strong>Mississippi Valley R.C.</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Champaign.</td>
<td>2</td>
<td>2</td>
<td>White</td>
<td>Bender</td>
<td>20</td>
</tr>
<tr>
<td><strong>New Jersey</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Beech Grove Trac Co.</td>
<td>5</td>
<td>5</td>
<td>White</td>
<td>Bender</td>
<td>25</td>
</tr>
<tr>
<td>Indianapolis, Columbus &amp; Southern Trac Co.</td>
<td>2</td>
<td>2</td>
<td>White</td>
<td>Bender</td>
<td>20</td>
</tr>
<tr>
<td>Indianapolis Street Railway</td>
<td>18</td>
<td>18</td>
<td>White</td>
<td>Bender</td>
<td>20</td>
</tr>
<tr>
<td><strong>Tennessee</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Beech Grove Trac Co.</td>
<td>5</td>
<td>5</td>
<td>White</td>
<td>Bender</td>
<td>25</td>
</tr>
<tr>
<td><strong>New York</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Port Jody, Delaware &amp; Southern R.R.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Ohio</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Studebaker Coach</td>
<td>21</td>
<td>21</td>
<td>Yellow Coach</td>
<td>Yellow Coach</td>
<td>21</td>
</tr>
<tr>
<td><strong>Pennsylvania</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Southern Indiana Gas &amp; Electric Co.</strong></td>
<td>7</td>
<td>7</td>
<td>White</td>
<td>Bender</td>
<td>20</td>
</tr>
<tr>
<td><strong>Wisconsin</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Studebaker Coach</td>
<td>21</td>
<td>21</td>
<td>Yellow Coach</td>
<td>Yellow Coach</td>
<td>21</td>
</tr>
</tbody>
</table>

**Iowa**

<table>
<thead>
<tr>
<th>Name of Company</th>
<th>Total</th>
<th>Type</th>
<th>Chassis</th>
<th>Body</th>
<th>Seating Capacity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cedar Rapids &amp; Iowa City R.R.</td>
<td>8</td>
<td>8</td>
<td>White</td>
<td>Bender</td>
<td>28</td>
</tr>
<tr>
<td>Clinton, Davenport &amp; Moline Ry.</td>
<td>21</td>
<td>21</td>
<td>White</td>
<td>Bender</td>
<td>20</td>
</tr>
<tr>
<td>Dows, DeMiero &amp; Southern R.R.</td>
<td>5</td>
<td>5</td>
<td>White</td>
<td>Bender</td>
<td>20</td>
</tr>
<tr>
<td><strong>Kentucky</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Kentucky &amp; Southern Utilities Co.</td>
<td>1</td>
<td>1</td>
<td>White</td>
<td>Bender</td>
<td>20</td>
</tr>
<tr>
<td><strong>Louisiana</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>St. Louis &amp; Southern R.R.</td>
<td>2</td>
<td>2</td>
<td>White</td>
<td>Bender</td>
<td>20</td>
</tr>
<tr>
<td><strong>Maine</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Marlboro</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Mississippi Valley R.C.</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>New York</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Port Jody, Delaware &amp; Southern R.R.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Ohio</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Pennsylvania</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Southern Indiana Gas &amp; Electric Co.</strong></td>
<td>7</td>
<td>7</td>
<td>White</td>
<td>Bender</td>
<td>20</td>
</tr>
<tr>
<td><strong>Wisconsin</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Studebaker Coach</td>
<td>21</td>
<td>21</td>
<td>Yellow Coach</td>
<td>Yellow Coach</td>
<td>21</td>
</tr>
<tr>
<td><strong>Michigan</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Detroit Street Railway</td>
<td>27</td>
<td>27</td>
<td>White</td>
<td>Bender</td>
<td>20</td>
</tr>
<tr>
<td><strong>Minnesota</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Studebaker Coach</td>
<td>21</td>
<td>21</td>
<td>Yellow Coach</td>
<td>Yellow Coach</td>
<td>21</td>
</tr>
</tbody>
</table>

**Mississippi Valley R.C.**

<table>
<thead>
<tr>
<th>Name of Company</th>
<th>Total</th>
<th>Type</th>
<th>Chassis</th>
<th>Body</th>
<th>Seating Capacity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Studebaker Coach</td>
<td>21</td>
<td>21</td>
<td>Yellow Coach</td>
<td>Yellow Coach</td>
<td>21</td>
</tr>
</tbody>
</table>

**Missouri**

<table>
<thead>
<tr>
<th>Name of Company</th>
<th>Total</th>
<th>Type</th>
<th>Chassis</th>
<th>Body</th>
<th>Seating Capacity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Studebaker Coach</td>
<td>21</td>
<td>21</td>
<td>Yellow Coach</td>
<td>Yellow Coach</td>
<td>21</td>
</tr>
</tbody>
</table>

**Mississippi Valley R.C.**

<table>
<thead>
<tr>
<th>Name of Company</th>
<th>Total</th>
<th>Type</th>
<th>Chassis</th>
<th>Body</th>
<th>Seating Capacity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Studebaker Coach</td>
<td>21</td>
<td>21</td>
<td>Yellow Coach</td>
<td>Yellow Coach</td>
<td>21</td>
</tr>
</tbody>
</table>

**New Jersey**

<table>
<thead>
<tr>
<th>Name of Company</th>
<th>Total</th>
<th>Type</th>
<th>Chassis</th>
<th>Body</th>
<th>Seating Capacity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Atlantic City &amp; Utilities R.R.</td>
<td>9</td>
<td>9</td>
<td>White</td>
<td>Bender</td>
<td>25</td>
</tr>
<tr>
<td>Atlantic City &amp; Utilities R.R.</td>
<td>8</td>
<td>8</td>
<td>White</td>
<td>Bender</td>
<td>20</td>
</tr>
<tr>
<td>Atlantic City &amp; Utilities R.R.</td>
<td>8</td>
<td>8</td>
<td>White</td>
<td>Bender</td>
<td>20</td>
</tr>
</tbody>
</table>

**New York**

<table>
<thead>
<tr>
<th>Name of Company</th>
<th>Total</th>
<th>Type</th>
<th>Chassis</th>
<th>Body</th>
<th>Seating Capacity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Studebaker Coach</td>
<td>21</td>
<td>21</td>
<td>Yellow Coach</td>
<td>Yellow Coach</td>
<td>21</td>
</tr>
<tr>
<td><strong>Ohio</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Pennsylvania</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Southern Indiana Gas &amp; Electric Co.</strong></td>
<td>7</td>
<td>7</td>
<td>White</td>
<td>Bender</td>
<td>20</td>
</tr>
<tr>
<td><strong>Wisconsin</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Studebaker Coach</td>
<td>21</td>
<td>21</td>
<td>Yellow Coach</td>
<td>Yellow Coach</td>
<td>21</td>
</tr>
</tbody>
</table>
### Buses Bought by Railways During 1929—(Continued)

<table>
<thead>
<tr>
<th>Name of Company</th>
<th>Total</th>
<th>Type</th>
<th>Body</th>
<th>Seating Capacity</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>New York</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Trenton Transit Co.</td>
<td>4</td>
<td>Twin Coach</td>
<td>Twin Coach</td>
<td>40</td>
</tr>
<tr>
<td><strong>North Carolina</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Carolina Power &amp; Light Co.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Raleigh Div.</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Durham Public Service Co.</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>New York State Railways, Rochester</td>
<td>18</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Ohio</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cincinnati Street Railway</td>
<td>22</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>City of Ashland (Div. of Street Line)</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cleveland Railway</td>
<td>25</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cleveland, Southwestern Railway &amp; Light Co.</td>
<td>15</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Rhode Island</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Newport &amp; Providence Ry.</td>
<td>4</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>United Electric Railways</td>
<td>72</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>South Dakota</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sioux Falls Traction System</td>
<td>6</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Tennessee</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Knoxville Power &amp; Light Co.</td>
<td>6</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tennessee Electric Power Co.</td>
<td>5</td>
<td>Twin Coach</td>
<td>Twin Coach</td>
<td>40</td>
</tr>
<tr>
<td><strong>Texas</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Aultman Traction Co.</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dallas Ry. &amp; Terminal Co.</td>
<td>16</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Virginia</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lynchburg Traction &amp; Light Co.</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Petersburg, Hопewell &amp; City Point Railway Co.</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Washington</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pacific Northwest Traction Co.</td>
<td>4</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>West Virginia</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Monongahela West Penn Public Service Co.</td>
<td>12</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Wisconsin</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Milwaukee Electric Ry. &amp; Light Co.</td>
<td>20</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Wisconsin, U.S. Possessions</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Horizons Rapid Transit Co.</td>
<td>4</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Pennsylvania</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Allentown &amp; Reading Traction Co.</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Altoona &amp; Logan Valley Electric Ry.</td>
<td>5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Beaver Valley Traction Co.</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Citizens Traction Co.</td>
<td>9</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>East Penn Traction Co.</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Erie Railways</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Johnstown Traction Co.</td>
<td>7</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lehigh Traction Co. &amp; North Branch Bus Co.</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Philadelphia &amp; Western &amp; Traction Co.</td>
<td>7</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pittsburgh Railways</td>
<td>37</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Electric Traction Journal—January, 1930

25
Buses Brought by Railways in 1929—(Concluded)

<table>
<thead>
<tr>
<th>Name of Company</th>
<th>Total</th>
<th>Type</th>
<th>Body Builder</th>
<th>Seating Capacity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Canada</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Branford &amp; Hamilton Electric Railway</td>
<td>5</td>
<td>5</td>
<td>White</td>
<td>Bender</td>
</tr>
<tr>
<td>Branford Municipal Ry.</td>
<td>1</td>
<td>1</td>
<td>White</td>
<td>Yellow Coach</td>
</tr>
<tr>
<td>Dominion Power &amp; Transmission Co.</td>
<td>5</td>
<td>5</td>
<td>White</td>
<td>Bender</td>
</tr>
<tr>
<td>London Transportation Commission</td>
<td>5</td>
<td></td>
<td>White</td>
<td>Yellow Coach</td>
</tr>
<tr>
<td>Niagara Falls &amp; Toronto Ry.</td>
<td>5</td>
<td>5</td>
<td>White</td>
<td>Bender</td>
</tr>
<tr>
<td>Ottawa Electric Ry.</td>
<td>5</td>
<td>5</td>
<td>White</td>
<td>Bender</td>
</tr>
<tr>
<td>Sherbrooke Ry. &amp; Transport Co.</td>
<td>2</td>
<td>2</td>
<td>White</td>
<td>Yellow Coach</td>
</tr>
<tr>
<td>Winnipeg Electric Co.</td>
<td>2</td>
<td>2</td>
<td>White</td>
<td>Yellow Coach</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Name of Company</th>
<th>Total</th>
<th>Type</th>
<th>Body Builder</th>
<th>Seating Capacity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Montana</td>
<td>100</td>
<td>100</td>
<td>White</td>
<td>Bender</td>
</tr>
<tr>
<td>United Railways &amp; Electric Co.</td>
<td>15</td>
<td>15</td>
<td>White</td>
<td>Yellow Coach</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Name of Company</th>
<th>Total</th>
<th>Type</th>
<th>Body Builder</th>
<th>Seating Capacity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Berkshires, Inc.</td>
<td>28</td>
<td>28</td>
<td>White</td>
<td>Bender</td>
</tr>
<tr>
<td>Boston Elevated Railway Co.</td>
<td>35</td>
<td>35</td>
<td>White</td>
<td>Bender</td>
</tr>
<tr>
<td>Eastern Massachusetts Street Ry.</td>
<td>20</td>
<td>20</td>
<td>White</td>
<td>Bender</td>
</tr>
<tr>
<td>Feeders, Inc.</td>
<td>20</td>
<td>20</td>
<td>White</td>
<td>Bender</td>
</tr>
<tr>
<td>Garland Co.</td>
<td>20</td>
<td>20</td>
<td>White</td>
<td>Bender</td>
</tr>
<tr>
<td>Lean &amp; Co.</td>
<td>20</td>
<td>20</td>
<td>White</td>
<td>Bender</td>
</tr>
<tr>
<td>Miss.</td>
<td>30</td>
<td>30</td>
<td>White</td>
<td>Bender</td>
</tr>
<tr>
<td>Missouri Power &amp; Light Co. (Greenvill)</td>
<td>6.50</td>
<td>6.50</td>
<td>White</td>
<td>Bender</td>
</tr>
<tr>
<td>Nebraska</td>
<td>6.80</td>
<td>6.80</td>
<td>White</td>
<td>Bender</td>
</tr>
<tr>
<td>Omaha &amp; Council Bluffs Street Ry.</td>
<td>6.80</td>
<td>6.80</td>
<td>White</td>
<td>Bender</td>
</tr>
<tr>
<td>New York</td>
<td>1.01</td>
<td>1.01</td>
<td>White</td>
<td>Bender</td>
</tr>
<tr>
<td>Pennsylvania</td>
<td>1.50</td>
<td>1.50</td>
<td>White</td>
<td>Bender</td>
</tr>
<tr>
<td>Philadelphia &amp; West Chester Traction Co.</td>
<td>1.00</td>
<td>1.00</td>
<td>White</td>
<td>Bender</td>
</tr>
<tr>
<td>Pittsburgh, Harmony, Butler &amp; N. Castle Ry.</td>
<td>1.50</td>
<td>1.50</td>
<td>White</td>
<td>Bender</td>
</tr>
<tr>
<td>Baltimore &amp; Ohio Railway Co.</td>
<td>4.80</td>
<td>4.80</td>
<td>White</td>
<td>Bender</td>
</tr>
<tr>
<td>Pocono Motor Coach Co.</td>
<td>3.00</td>
<td>3.00</td>
<td>White</td>
<td>Bender</td>
</tr>
<tr>
<td>West Penn Railway</td>
<td>11.50</td>
<td>11.50</td>
<td>White</td>
<td>Bender</td>
</tr>
<tr>
<td>Rhode Island</td>
<td>1.14</td>
<td>1.14</td>
<td>White</td>
<td>Bender</td>
</tr>
<tr>
<td>Utah Light &amp; Traction Co.</td>
<td>1.14</td>
<td>1.14</td>
<td>White</td>
<td>Bender</td>
</tr>
<tr>
<td>Vermont</td>
<td>24.70</td>
<td>24.70</td>
<td>White</td>
<td>Bender</td>
</tr>
<tr>
<td>Virginia</td>
<td>24.70</td>
<td>24.70</td>
<td>White</td>
<td>Bender</td>
</tr>
<tr>
<td>Washington</td>
<td>24.70</td>
<td>24.70</td>
<td>White</td>
<td>Bender</td>
</tr>
<tr>
<td>Pacific Northwest Traction Co.</td>
<td>28.00</td>
<td>28.00</td>
<td>White</td>
<td>Bender</td>
</tr>
<tr>
<td>Seattle Municipal Street Ry.</td>
<td>5.10</td>
<td>5.10</td>
<td>White</td>
<td>Bender</td>
</tr>
<tr>
<td>Missouri</td>
<td>48.77</td>
<td>48.77</td>
<td>White</td>
<td>Bender</td>
</tr>
<tr>
<td>Montana</td>
<td>35.57</td>
<td>35.57</td>
<td>White</td>
<td>Bender</td>
</tr>
<tr>
<td>Wisconsin</td>
<td>124.77</td>
<td>124.77</td>
<td>White</td>
<td>Bender</td>
</tr>
<tr>
<td>Milwaukee Electric Ry. &amp; Light Co.</td>
<td>168.00</td>
<td>168.00</td>
<td>White</td>
<td>Bender</td>
</tr>
<tr>
<td>Wisconsin</td>
<td>2.40</td>
<td>2.40</td>
<td>White</td>
<td>Bender</td>
</tr>
<tr>
<td>Wyoming</td>
<td>6.50</td>
<td>6.50</td>
<td>White</td>
<td>Bender</td>
</tr>
<tr>
<td>California</td>
<td>30.90</td>
<td>30.90</td>
<td>White</td>
<td>Bender</td>
</tr>
<tr>
<td>Montana</td>
<td>35.57</td>
<td>35.57</td>
<td>White</td>
<td>Bender</td>
</tr>
<tr>
<td>Wisconsin</td>
<td>168.00</td>
<td>168.00</td>
<td>White</td>
<td>Bender</td>
</tr>
<tr>
<td>California</td>
<td>30.90</td>
<td>30.90</td>
<td>White</td>
<td>Bender</td>
</tr>
<tr>
<td>Montana</td>
<td>35.57</td>
<td>35.57</td>
<td>White</td>
<td>Bender</td>
</tr>
<tr>
<td>Wisconsin</td>
<td>168.00</td>
<td>168.00</td>
<td>White</td>
<td>Bender</td>
</tr>
</tbody>
</table>

solve the financial and service problems by extending the present lines into new territory or rerouting them through more thickly populated districts. Utilization of the bus as a feeder to existing rail arteries is now recognized as sound practice and many railway companies have come out of the red figures into the black by careful readjustment of bus and trolley services.

As to the type of buses purchased this year, approximately 65 per cent were of a capacity seating 29 to 40 passengers, 25 per cent had a seating capacity of from 21 to 28 passengers, and 10 per cent were of less than the 21-passenger type. Of the more than 1,800 new buses purchased, approximately 200 were of the electric type. Although a large number of the buses purchased were for use on new de luxe routes, such as interurban and intercity service, many companies are now purchasing a finer type of equipment for selected city service lines. This kind of bus appeals to a new class of rider, the automobile owner, and on week ends and holidays allows a surplus of de luxe equipment for special and chartered work.
SOME TIME ago a wit remarked that in these United States too many persons were riding around in Lincolns who ought to be using Fords and that too many others were using Fords who ought to be pushing wheelbarrows. This, of course, was exaggeration for the sake of emphasis, but back of it was the scintilla of common sense so often spoken in jest. Anyway, a lot of us have learned that we have to do more than give ourselves a close shave each morning in order to be prepared for the day's grind. This ought to be encouraging to local transportation managers and disheartening to taxicab drivers. There ought to be some cheer in the fact that 1929 the local transportation industry did a gross business in excess of $1,000,000,000, but then some pessimist will arise to ask what the net was, not realizing that to a considerable degree the net depends on the individual. The pessimists are like the black little boy who stood straight and stiff and still beside the front of the house whose dead master was about to be buried. When the minister arrived, a lady whispered to this straight, still, little boy: "Dere's de preacher. Service gwine to start now. Ain't you gwine in?" "Ah can't, mum," mumbled the boy. "Ah's de crépe." These fellows are the crépe. Crépe and crépehangers are all right in their place, but they haven't any place in the local transportation industry. The need is for more men conscious of their powers—more men like the Irishman at the dinner where every guest had to make a speech, sing a song or tell a story. "Well, when this Irishman's time came, he said:

Atlantic City on New Jersey's shore!
Its boardwalk free, but nothing more!
To which sweet spot each year or so
A. E. R. A. decides to go
To hold a bus and street car show,
Converse and hear dear Old Bill Wise
Socratic facts clothed in disguise—
How good 'tis now this all to ponder
And then to sit at ease and wonder
When transportation's apogee will come
As a result of all that's said and done.
So once again with pen in hand
We scan the facts from all the land
To glean good cheer for all the crew
Rigidly to start the year anew,
With shining thoughts for June's debate
Under Paul Shoup at the Golden Gate.

It's Sand That Keeps the Wheels from Slipping

By
G. J. MacMURRAY
News Editor Electric Railway Journal
Taxi rate wars didn't help the taxis much. Springfield, Mass., and Philadelphia were among the cities to see the folly of unrestrained taxi operation.

Historical and commercial subjects were included in a film of Virginia's development made by the utility at Richmond as a contribution to the state's progress.

When Mexicans across the border from El Paso got careless with firearms, the cars run over the international bridge scooted for the U. S. A.

41,367 cars which disregarded Detroit parking rules were hauled to the Public Pound in 60 towing days.

City officials at Chicago sleep while reports on the transportation situation accumulate. The pile is now 6 ft. high, weighs 200 lb. and cost $1,500,000.

Los Angeles has a lot of Sunny Jims, people who realize that the increased fare allowed there is going to react to their benefit.
“Friends, I can’t make a speech, or sing a song, or tell a story, but I’ll fight any man in the room.”

That man was conscious of his powers. Local transportation men, who do know transportation, need more of this Irishman’s will to do. After all, a grapefruit is only a lemon that has been given a chance and taken advantage of it.

Statistical facts appear to indicate that the industry is very much like Hiram, Mary’s beau. “Mary,” began Hiram, “you know I got a clearin’ over than an’ a team and wagon and some hawgs an’ cows an’ I calc’late on buildin’ a house this fall an’—”

Just then he was interrupted by Mary’s mother in the kitchen.

“Mary,” she called in a loud voice, “is that young man that’s a-going to get married?”

Back came the answer, “No, ma, but he’s gettin’ thar.”

And the local transportation service is getting there. Let’s look at the facts. Rail service is being modernized, buses are being co-ordinated with cars, city-wide taxicab fleets taken over, and in a few instances, airplanes used in supplemental service. The private motor remains the most serious competitor of the co-ordinated services. Buses no longer are considered as serious competitors. Most of the important urban bus lines have been absorbed by rail line management, about 12,500 buses being operated by the electric railways in conjunction with 80,000 passenger rail cars. Most of the independent bus operators are now found running inter-state service. That’s how things have changed. The American drug store isn’t what it used to be, and neither is the local transportation business. It would not do for a drum major to have an inferiority complex.

Fares are at the peak for all time, averaging approximately 88 cents for the entire country. The greatest single unit of cash fare is 10 cents. Less than a score of cities have a nickel fare, and most of them are small. Where 5-cent fares obtain, special reasons are responsible. In New York, Subway deficits are paid from taxes. In New Jersey a zone ride system obtains. On the municipal system in San Francisco taxes are refunded. There are a few small cities in which the interurbans charge 5 cents within the city limits as a part of a higher fare for service outside of the town.

Wages have held an even keel, there being a change of less than 4 cent an hour during the last year. Little change in taxes is noted. Net revenue for the first six months of 1929 has been 1.75 per cent higher for the entire country than it was during 1928. This is due to increased fares. Traffic for the same corresponding period is off 7 per cent for the entire co-ordinated systems. The total of passengers carried last year was 16,000,000,000, divided 15,000,000,000 rail cars and 1,000,000,000 buses. Expenses are 1.0 per cent lower.

The number of car-miles run is off only 4 per cent. In this business, if you’re going to survive, you’ve just got to be undaunted and adaptable, like the piano tuner a traveler met in the West some time ago. It was the fellow traveller and not the piano tuner who was unimaginative.

“Surely,” said the commiserative one, “I shouldn’t imagine that pianos were very plentiful in this region.”

“No, they are not,” said the piano tuner, “but I make a pretty fair income tightening up barbed wire fences.”

As Ed Wickwire said in Atlantic City, “Remember that Noah floated the ark when the rest of the world was in liquidation.” There are some things we don’t have to prove. You admit them, as the student did who was asked if he could prove that the square of the hypotenuse is equal to the sum of the squares of the legs of the triangle. Didn’t Jack Shannahan on behalf of the association tell Mr. Hoover at the conference in Washington that statistics indicated that this industry was spending more than $1,000,000 a day during 1929 and probably would equal or even exceed this amount during the year 1930?

With all due respect to Mr. Wickwire, the ben mot of the Atlantic City convention was the remark by President Barnes that it was the task of the industry today to provide the bones of transportation facilities and clothe them with the flesh of service. That may not be a perfect figure of speech, but it states the idea succinctly. Incidentally, Jim Barnes showed Louisville how he proposed to carry out the idea when he exhibited his four experimental cars. Second perhaps to Mr. Barnes in the forcefulness of his remarks came Thomas N. McCarter, who said that there had been a change in the character of the service which people want, but there had been no abatement in the total demand for local transportation. Certainly he has lived up to the idea of co-ordination, one of the latest moves of his company being to take over a large bus system in southern New Jersey.

It took a whole issue of the JOURNAL and four little daily journals to tell the story of the A. C. convention. We can’t afford to get started on that subject, other than to say that we hope to greet Paul Shoup, the new president, out in San Francisco next June.

So much for that. The number of interesting facts about this industry is legion. At least the JOURNAL’s index makes it appear so. But nobody is ever satisfied with this review—no more satisfied than was the owner of the hen who had by mistake been fed sawdust instead of oatmeal. This hen laid twelve eggs, sat on them and when they hatched, eleven of the chickens had wooden legs and the twelfth was a woodpecker. What, for instance, can I consistently make out of the fact that the Baltimore fare case is still pending, that Los Angeles got its fare increase, that Cleveland intends to advance

Charles Gordon was installed in the office of managing director

Endicott Railway Journal—January, 1930
its fares, that Louisville got a fare boost, that out in Oregon the Portland Electric Power Company needs a fare advance, and that in Cincinnati the demands of outlying sections for increases in service, if granted, would jeopardize the present fares under service at cost.

On cars and fares it leads me to wonder:

What is a street car? Who can say?
Its face uplifted in recent years
Fills old timer's eyes with tears.
O'er the shattered ideal of the one-horse shay.

What is a street car? A faithful chariot
Entrusted to a faithful manager's care
To be run by him from here to there
At a fare that is adequate.

And what is the fare? Not even the prophets know.
Answer they can not, for it all depends
On what the management can achieve.
Whether the earnings may be made to show
Something left over for dividends.
That stockholders may not be left to grieve.

One of the most interesting things on fares contained in the year's news was the summary of the California Railroad Commission's report on results in that state rendered to the Commission for the District of Columbia where not only the question of fares but the matter of the consolidation of the two local railways is being agitated. In Illinois the Governor signed the bill looking toward unification in Chicago. Progress has been made in the windy city, but not to the extent that was expected. Samuel Insull lays the blame on politics. Chicago has sufficient facts to guide it. Subway reports and plans for a unified system there, made since 1900 at a cost of $1,500,000, stand 6 ft. high and weigh more than 200 lb. But Cleveland has gone right ahead. The Cleveland Railway, under Joe Alexander and the Van Sweringens, has actually developed a program of co-ordination which contemplates articulation of suburban trunk line operation, city street railway service, service by bus, transportation by taxi, and a rapid transit system. This development was the subject of a six-page story in the May issue. It is in the working out of this program that former Association Secretary Welsh will have a hand. Guy C. Hecker, who succeeded Mr. Welsh with the association, had his baptism of fire as secretary at the convention last October. St. Louis also appears to be coming along promisingly. The Transit Survey Commission there under R. F. Kelker, Jr., favors unification. If, as, and when the program is carried out, the recent purchase of the independent bus system by the holding company which controls the railway will be advantageous. There the skip-stop plan has been extended successfully by the railway. In San Francisco the purchase of the Market Street Railway by the city and the unification of that property with the lines of the present municipal railway are still under discussion, with the purchase price the chief stumbling block. Mr. O'Shaughnessy, the city engineer, did not gloss over the facts about the financial condition of the municipal railway. Seattle is still talking about articulation, regulation of taxis and what to do with the municipal railway. The municipal railway system is badly run down. It has borrowed from the water fund. Still the city raised trainmen's wages only to turn around and arrange with Stone & Webster for a two-year moratorium on the payment of the principal sum of the purchase so as to obtain funds for rehabilitation. The Mayor hopes eventually to refinancing the entire purchase on a long-term basis. The original purchase plan contemplated that the city would pay for the system out of earnings. The ills of the Seattle system are blamed on the two experiments with 5-cent fares. In other words, Seattle was to settle on the pay-as-you-go plan, but it isn't going anywhere. While we are wandering around, there's the Detroit municipal system. The jitneys have been restrained. Service installed by the city to replace them—a service with small-capacity vehicles—seems to be highly satisfactory. City officials at Detroit are apparently undaunted by the defeat of the proposal to build a subway. In the matter of dealing with the parkers, Detroit apparently has been the agent. And relieved itself of its traffic plight. How it refused longer to be fooled. Was told to you by Harold Gould.

In New York the new subway to be run by the municipality is nearing completion. As Phillips put it in the New York Sun the streets are so torn up for subway construction that the wags are beginning to...
speak of it as a holey city. Wisely the city decided to purchase power for the new lines rather than to attempt to generate its own current. It is this system which will be unified with the privately-owned lines if a legislative program can be enacted satisfactorily to Sam Untermyer, Jimmy Walker, Tammany Hall and the officers of the railways, including President Hedley of the Interborough. Well, the surface lines in Brooklyn were brought together by a consolidation in which the Brooklyn & Queens Transit Corporation was created. Incidentally, Clint Morgan, the former chief operating official of the Brooklyn City Railroad, jumped from the management end of the business to the selling end, with the Cincinnati Car Corporation. The United States Supreme Court remanded the Interborough's suit for a 7-cent fare back to the state courts. Meanwhile, Mr. Amster, as head of the stockholders' protective committee of the Manhattan Railway, and Mr. Hedley continue their passages at arms. In Philadelphia

On banks, trolleys, buses and cabs
Mitten Management still keeps tabs.
It does it quite well beyond all doubt
For it knows exactly what it's about
Although old Philly's daily newspapers
Claim to have uncovered some company capers.

Mr. Storrs, the chairman of the executive committee of the United Railways & Electric Company, Baltimore, did a good stroke in arranging new financing for that company. Baltimore, too, grappled successfully with the parking problem, and a milk company ordered its drivers to respect the rights of the street cars. Buses are being run there successfully in a 25-cent service. A new franchise was awarded in Youngstown, Ohio, and in Toledo the Milner service-at-cost grant was modified.

With one or two exceptions things were quiet in the South. Employees of the New Orleans Public Service, Inc., took it into their heads suddenly to strike on Aug. 2, during negotiations looking toward a new working agreement. After being on strike many weeks, and after the company felt it could no longer keep open the offer it made for the men to return, the strikers voted to accept the company's terms. This did not happen, however, until the men had sorrowfully learned that in ignoring the good offices of President Mahon and officials of the American Federation of Labor they had followed local labor prophets into the wilderness. There was also a little fracas in El Paso, Tex. The railway there operates over the international bridge into Juarez, Mexico. Suddenly the Mexicans staged a shooting bee. Just as suddenly the cars scooted for home, there to remain until the insurrection had died down. This incident recalls the case of the Mayor who frantically wired to the Governor for Texas Rangers, to restore peace after a reign of terror started by gunmen. A special train came down from the capital and one lonely ranger stepped out.

"Where's the rest of the outfit?" demanded the Mayor and the sheriff.

"Rest, hell," replied the ranger mildly, "you ain't got but one riot going on here, have you?"

Jack Shannahan is doing quite well in Omaha. Remember the good-natured editorial, headed "The Miracle Man," in the Morning World-Herald. Even the New York Times had a feature about him. He's been adopted into the Ogallala Sioux Indian Tribe and given the tribal name of Houniska-Kle Ska, or spotted breeches. Mr. Shannahan still has his hands full with the question of the sale of the bridge between Omaha and Council Bluffs, owned by his company, to the cities, but promise is ahead for a settlement. He has cleared up the franchise matter, and has put into effect a rerouting plan, based on the survey by Ross Harris. That's working out well now, but, as is natural in a major move of this kind, there was some dissatisfaction and much good-natured joking at first. So it happened that on the evening of the first day of the change the Ad-Sell League met. Since some of its members were affected by the rerouting the following song was received with enthusiasm:

"Show us the way to go home,
We've tired and want to go to bed;
We had a little ride about an hour ago
But we didn't know where it led.
We've got a dizzy dome,
No more do we want to roam
In Mr. Shannahan's merry-go-round
Show us the way to go home."

The Des Moines property changed hands and the men agreed to the modification of the terms of a long-time wage agreement which contained an iron-clad clause against one-man cars. It would appear now that a program of rehabilitation for Des Moines is ahead, no less efficacious than the one now under way in Omaha.
Roanoke Railway & Electric Company has also done some unusual things in rehabilitating its property and in selling the service to the public, notably in its house-to-house campaigns. The Boston Elevated Railway has been quick to seize the opportunities presented by the traffic problem to win back many of its passengers. In this work it has turned to advertising for assistance.

Posters and printed matter played a prominent part in putting over the idea of the Pittsburgh campaign, which was called "Kolisi Testimonial Week." The slogan, "For the Love of Mike Be Careful," was reproduced on an attractive placard which was posted at all carhouses during the week.

Penn-Ohio won the Class A Safety Medal for 1929, while the Brady Award in Class B went to the Tampa Electric Company and in Class C to the Tide Water Power Company. Many other companies did effective newspaper advertising, particularly safety advertising. A very effective piece of advertising was the historical and industrial film prepared by the Virginia Electric & Power Company to stimulate home interest in Virginia and the industries of Virginia. Fred Cummings, of the Eastern Massachusetts, made a notable contribution to the subject of merchandising with his article in the issue of Sept. 14.

According to Secretary of Commerce Lamont, traffic congestion costs the nation $2,000,000,000 a year. The full story of Chicago's effort to curtail parking was told in detail by Charles Gordon in an elaborate article in the Journal for Feb. 23. The victory in securing proper traffic control and in abating the parking menace is not going to be won in a day. Of course, restrictions will help, but better yet will it be when drivers realize the significance of the little poem run by the Northern Ohio Power & Light Company, Akron, in Service News:

I'm blocked in front, I'm blocked behind,
Till I'm afraid I'll lose my mind.
The hours that I have spent right here,
Watching street cars pass so near,
Have taught me what I won't forget—
This parking business is all wet.

The Pittsburgh car was a notable contribution to the art during the year, as were the new cars for Louisville, Albany and Detroit. Comment on cars would not be complete without reference to the increase in the interest in the trackless trolley, reflected in the added installations in Salt Lake City and New Orleans, and in the numerous proposals for the use of this vehicle, notably in Chicago and Detroit.

One of the best studies of the interurban problem was the paper by Dr. Thomas Conway, president of the Cincinnati, Hamilton & Dayton Railway, entitled "Courage, Faith and Vision Will Advance Interurbans," presented at the Atlantic City convention. There have been several instances of the extension of the pick-up and delivery service by the interurbans, in the Central West and the roads on the Coast notably on the system at Los Angeles.

In most large cities, and many small ones as well, all business faces the problems of congestion and deficiency in efficient local transportation. These are community and public problems that require the application of sound principles for their solution. Electric railways are endeavors to improve their facilities and service despite a long period of inadequate earnings and consequent restricted credit. That's preparedness for you and preparedness is merely the act of wearing spectacles to breakfast, when you know you're going to have grapefruit.

An officer once reported to Lord Kitchener that he had been unable to carry out an assigned task and gave his reason. Kitchener made this reply: "Your reason for not doing it is the best I ever heard. Now go ahead and do it." In this industry at this time it's the courage of the Vikings that's needed. It was not the Roman army that conquered Gaul, but Caesar. It was not the Carthaginian army that made Rome tremble in her gates, but Hannibal. It was not the Macedonian army that reached Indus, but Alexander. The problems of economics are not settled by oratory.
Rolling Stock Purchases

LARGELY INCREASED

Nearly 1,300 passenger cars, 130 freight and service cars and 77 electric locomotives were bought during 1929 by the electric railways. Cars for handling heavy traffic on city surface lines predominated. Large car orders also were placed for rapid transit lines and for electrified suburban service. Interurbans purchased comparatively few new cars.

By
TH. M. van der STEMPLE
Assistant Editor Electric Railway Journal

PURCHASES of new rolling stock by the electric railways during 1929 exceeded those of 1928 by a large amount. A total of 1,496 new cars and locomotives were bought last year as compared with 897 the year before. Included in the total for 1929 are 663 for city surface lines, 300 for rapid transit lines, 240 for electrified suburban service and 79 for interurbans. More than 130 freight and miscellaneous cars were ordered during the year just ended and 77 electric locomotives. In 1928, a total of 601 cars were bought for city surface lines and 93 for interurban service. In that year orders were placed for 171 freight and service cars and 32 electric locomotives.

A total of 58 electric railway companies are listed among the purchasers in 1929 as compared with 46 the preceding year. Of this number 49 are located in the United States and nine in Canada. Of the number of purchasers in this country 24 bought cars for city service and fifteen for interurban service. In Canada the figures are eight and two respectively. Three companies in the United States added new equipment for electrified suburban service.

The largest single purchase of cars during the year just ended was 300 for the city-owned rapid transit lines in New York City. Next in size was the order for 141 multiple-unit cars for the electrified suburban service of the Lackawanna Railroad. Among the large orders for surface line cars placed last year were 106 for the Cleveland Railway, 101 for the Brooklyn & Queens Transit Corporation and 100 each for the Department of Street Railways, City of Detroit, and the Chicago Surface Lines. The Montreal Tramways placed an order for 50 cars, of which 25 are motorized and 25 trail. The only other order placed during 1929 for trail cars was that of the Washington, Baltimore & Annapolis Electric Railroad for nine such units, making the total for the year 34 as compared with 20 trailers ordered in 1928. The Market Street Railway of San Francisco built 25 cars in its own shops. The Lynchburg Traction & Light Company bought 20 cars for city service. Besides the purchase of passenger cars already mentioned, three orders of 15 cars each were placed during the year, one of 13 cars, seven of 10, one of 7, two of 6, five of 5, one of 4, three of 3, four of 2 and eleven orders for single cars.

Large capacity double-truck cars for two-man operation predominated in the purchases last year. The 307 cars ordered for Cleveland, Detroit and Chicago are straight two-man cars. The 25 motor cars purchased by the Montreal Tramways are designed to operate as one-man cars during non-rush hours but are used for train service at rush hours with the 25 trail cars bought by the same railway. All of the 101 cars ordered by the Brooklyn & Queens Transit Corporation are designed for one-man operation, as also were those for the Lynchburg Traction & Light Company. The other orders were divided between one-man and one-man two-man design. Only two single-truck cars were bought, one by the Third Avenue Railway and the other by the railway in Porto Rico.

Summary of Car Purchases

<table>
<thead>
<tr>
<th>Category</th>
<th>United States</th>
<th>Canada</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>CITY SERVICE</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Single truck</td>
<td>49</td>
<td>9</td>
<td>58</td>
</tr>
<tr>
<td>Double truck</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Trailers</td>
<td>851</td>
<td>86</td>
<td>937</td>
</tr>
<tr>
<td>Total for city service</td>
<td>852</td>
<td>111</td>
<td>963</td>
</tr>
<tr>
<td>INTERURBAN SERVICE</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Motor cars</td>
<td>59</td>
<td>10</td>
<td>69</td>
</tr>
<tr>
<td>Trailers</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Express and freight</td>
<td>130</td>
<td>10</td>
<td>140</td>
</tr>
<tr>
<td>Miscellaneous</td>
<td>7</td>
<td>1</td>
<td>8</td>
</tr>
<tr>
<td>Total for interurban service</td>
<td>205</td>
<td>11</td>
<td>216</td>
</tr>
<tr>
<td>MULTIPLE-UNIT SUBURBAN CARS</td>
<td>240</td>
<td></td>
<td>240</td>
</tr>
<tr>
<td>ELECTRIC LOCOMOTIVES</td>
<td>77</td>
<td></td>
<td>77</td>
</tr>
<tr>
<td>Grand total</td>
<td>1,374</td>
<td>122</td>
<td>1,496</td>
</tr>
</tbody>
</table>

Electric Railway Journal January, 1930
## Rolling Stock Ordered During 1929

<table>
<thead>
<tr>
<th>Name of Company</th>
<th>No.</th>
<th>Class</th>
<th>Type of Service</th>
<th>Motor or Trailer</th>
<th>Single or Double Track</th>
<th>Length Over All Fl. In.</th>
<th>Total Weight Lbs.</th>
<th>Number of Motors</th>
<th>Seating Capacity</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>California</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>San Francisco, Napa &amp; Calistoga Ry.</td>
<td>12</td>
<td></td>
<td>Bag &amp; Mail</td>
<td>Interurban</td>
<td>50 — 6</td>
<td>41—9</td>
<td>120,000</td>
<td>4</td>
<td>44</td>
</tr>
<tr>
<td>Pacific Gas &amp; Electric Co., Sacramento R.R.</td>
<td>1</td>
<td></td>
<td>Bag &amp; Mail</td>
<td>Interurban</td>
<td>50 — 6</td>
<td>41—9</td>
<td>120,000</td>
<td>4</td>
<td>44</td>
</tr>
<tr>
<td><strong>Connecticut</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>New York, New Haven &amp; Hartford R.R.</td>
<td>10</td>
<td></td>
<td>Passenger</td>
<td>Interurban</td>
<td>44 — 10</td>
<td>30,000</td>
<td>4</td>
<td>40</td>
<td>44</td>
</tr>
<tr>
<td><strong>Delaware</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Delaware Electric Power Co.</td>
<td>10</td>
<td></td>
<td>Passenger</td>
<td>Interurban</td>
<td>44 — 10</td>
<td>30,000</td>
<td>4</td>
<td>40</td>
<td>44</td>
</tr>
<tr>
<td><strong>Illinois</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chicago Surface Lines</td>
<td>100</td>
<td></td>
<td>Passenger</td>
<td>Interurban</td>
<td>44 — 10</td>
<td>30,000</td>
<td>4</td>
<td>40</td>
<td>44</td>
</tr>
<tr>
<td>Illinois Traction Co.</td>
<td>100</td>
<td></td>
<td>Passenger</td>
<td>Interurban</td>
<td>44 — 10</td>
<td>30,000</td>
<td>4</td>
<td>40</td>
<td>44</td>
</tr>
<tr>
<td>Gary Ry.</td>
<td>2</td>
<td></td>
<td>Passenger</td>
<td>Interurban</td>
<td>44 — 10</td>
<td>30,000</td>
<td>4</td>
<td>40</td>
<td>44</td>
</tr>
<tr>
<td>Indianapolis &amp; South Bend R.R.</td>
<td>3</td>
<td></td>
<td>Passenger</td>
<td>Interurban</td>
<td>44 — 10</td>
<td>30,000</td>
<td>4</td>
<td>40</td>
<td>44</td>
</tr>
<tr>
<td><strong>Iowa</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Des Moines Railway</td>
<td>10</td>
<td></td>
<td>Passenger</td>
<td>Interurban</td>
<td>44 — 10</td>
<td>30,000</td>
<td>4</td>
<td>40</td>
<td>44</td>
</tr>
<tr>
<td>Fort Dodge, Des Moines &amp; So. R.R.</td>
<td>10</td>
<td></td>
<td>Passenger</td>
<td>Interurban</td>
<td>44 — 10</td>
<td>30,000</td>
<td>4</td>
<td>40</td>
<td>44</td>
</tr>
<tr>
<td><strong>Kentucky</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Kentucky Traction &amp; Terminal Co.</td>
<td>1</td>
<td></td>
<td>Passenger</td>
<td>Interurban</td>
<td>44 — 10</td>
<td>30,000</td>
<td>4</td>
<td>40</td>
<td>44</td>
</tr>
<tr>
<td><strong>Louisville</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Maryland</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Washington, Baltimore &amp; Annapolis R.R.</td>
<td>9</td>
<td></td>
<td>Passenger</td>
<td>Interurban</td>
<td>44 — 10</td>
<td>30,000</td>
<td>4</td>
<td>40</td>
<td>44</td>
</tr>
<tr>
<td><strong>Massachusetts</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Greenfield &amp; Montague Transportation Area</td>
<td>2</td>
<td></td>
<td>Passenger</td>
<td>Interurban</td>
<td>44 — 10</td>
<td>30,000</td>
<td>4</td>
<td>40</td>
<td>44</td>
</tr>
<tr>
<td>United Street Railway, New Bedford</td>
<td>12</td>
<td></td>
<td>Passenger</td>
<td>Interurban</td>
<td>44 — 10</td>
<td>30,000</td>
<td>4</td>
<td>40</td>
<td>44</td>
</tr>
<tr>
<td><strong>Michigan</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Department of Street Rys., Detroit</td>
<td>1</td>
<td></td>
<td>Passenger</td>
<td>Interurban</td>
<td>44 — 10</td>
<td>30,000</td>
<td>4</td>
<td>40</td>
<td>44</td>
</tr>
<tr>
<td><strong>Missouri</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>St. Louis Public Service Co.</td>
<td>1</td>
<td></td>
<td>Passenger</td>
<td>Interurban</td>
<td>44 — 10</td>
<td>30,000</td>
<td>4</td>
<td>40</td>
<td>44</td>
</tr>
<tr>
<td><strong>New Jersey</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Delaware, Lackawanna &amp; Western R.R.</td>
<td>141</td>
<td></td>
<td>Passenger</td>
<td>Interurban</td>
<td>44 — 10</td>
<td>30,000</td>
<td>4</td>
<td>40</td>
<td>44</td>
</tr>
<tr>
<td><strong>New York</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Brooklyn &amp; Queens Transit Corp.</td>
<td>100</td>
<td></td>
<td>Passenger</td>
<td>Interurban</td>
<td>44 — 10</td>
<td>30,000</td>
<td>4</td>
<td>40</td>
<td>44</td>
</tr>
<tr>
<td>City of N. Y. Board of Transportation</td>
<td>300</td>
<td></td>
<td>Passenger</td>
<td>Interurban</td>
<td>44 — 10</td>
<td>30,000</td>
<td>4</td>
<td>40</td>
<td>44</td>
</tr>
<tr>
<td>New York Central R.R.</td>
<td>140</td>
<td></td>
<td>Passenger</td>
<td>Interurban</td>
<td>44 — 10</td>
<td>30,000</td>
<td>4</td>
<td>40</td>
<td>44</td>
</tr>
<tr>
<td>Third Avenue Ry.</td>
<td>42</td>
<td></td>
<td>Passenger</td>
<td>Interurban</td>
<td>44 — 10</td>
<td>30,000</td>
<td>4</td>
<td>40</td>
<td>44</td>
</tr>
<tr>
<td>United Traction Co., Albany</td>
<td>1</td>
<td></td>
<td>Passenger</td>
<td>Interurban</td>
<td>44 — 10</td>
<td>30,000</td>
<td>4</td>
<td>40</td>
<td>44</td>
</tr>
<tr>
<td>Long Island R.R.</td>
<td>140</td>
<td></td>
<td>Passenger</td>
<td>Interurban</td>
<td>44 — 10</td>
<td>30,000</td>
<td>4</td>
<td>40</td>
<td>44</td>
</tr>
<tr>
<td><strong>North Carolina</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>North Carolina Pub. Serv. Co., Greensboro</td>
<td>5</td>
<td></td>
<td>Passenger</td>
<td>City</td>
<td>Motor Double</td>
<td>41 — 5</td>
<td>34,200</td>
<td>4</td>
<td>41</td>
</tr>
<tr>
<td><strong>Ohio</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cincinnati, Hamilton &amp; Dayton R.R.</td>
<td>20</td>
<td></td>
<td>Passenger</td>
<td>Interurban</td>
<td>44 — 10</td>
<td>30,000</td>
<td>4</td>
<td>40</td>
<td>44</td>
</tr>
<tr>
<td><strong>Pennsylvania</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Altoona &amp; Logan Valley Electric Ry.</td>
<td>5</td>
<td></td>
<td>Passenger</td>
<td>City</td>
<td>Motor Double</td>
<td>41 — 5</td>
<td>34,200</td>
<td>4</td>
<td>41</td>
</tr>
<tr>
<td>Pennsylvania Railroad</td>
<td>56</td>
<td></td>
<td>Passenger</td>
<td>City</td>
<td>Motor Double</td>
<td>41 — 5</td>
<td>34,200</td>
<td>4</td>
<td>41</td>
</tr>
<tr>
<td>Pittsburgh Railways</td>
<td>1</td>
<td></td>
<td>Passenger</td>
<td>City</td>
<td>Motor Double</td>
<td>41 — 5</td>
<td>34,200</td>
<td>4</td>
<td>41</td>
</tr>
<tr>
<td>Scranton Railway</td>
<td>10</td>
<td></td>
<td>Passenger</td>
<td>Suburban</td>
<td>Motor Double</td>
<td>41 — 5</td>
<td>34,200</td>
<td>4</td>
<td>41</td>
</tr>
<tr>
<td>York Railways</td>
<td>1</td>
<td></td>
<td>Passenger</td>
<td>Suburban</td>
<td>Motor Double</td>
<td>41 — 5</td>
<td>34,200</td>
<td>4</td>
<td>41</td>
</tr>
<tr>
<td>Nashville Interurban Ry.</td>
<td>2</td>
<td></td>
<td>Passenger</td>
<td>Interurban</td>
<td>44 — 2</td>
<td>39,000</td>
<td>4</td>
<td>45</td>
<td></td>
</tr>
<tr>
<td>Lynchburg Traction &amp; Light Co.</td>
<td>20</td>
<td></td>
<td>Passenger</td>
<td>Interurban</td>
<td>44 — 2</td>
<td>39,000</td>
<td>4</td>
<td>45</td>
<td></td>
</tr>
<tr>
<td>Washington</td>
<td>4</td>
<td></td>
<td>Passenger</td>
<td>Interurban</td>
<td>44 — 2</td>
<td>39,000</td>
<td>4</td>
<td>45</td>
<td></td>
</tr>
<tr>
<td><strong>Wisconsin</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Milwaukee Electric Ry. &amp; Light Co.</td>
<td>15</td>
<td></td>
<td>Passenger</td>
<td>Motor Double</td>
<td>45 — 0</td>
<td>38,840</td>
<td>4</td>
<td>41</td>
<td></td>
</tr>
<tr>
<td>Wisconsin Power &amp; Light Co.</td>
<td>1</td>
<td></td>
<td>Locomotive</td>
<td>Motor Double</td>
<td>45 — 0</td>
<td>38,840</td>
<td>4</td>
<td>41</td>
<td></td>
</tr>
<tr>
<td>Porto Rico</td>
<td>1</td>
<td></td>
<td>Locomotive</td>
<td>Motor Single</td>
<td>45 — 0</td>
<td>38,840</td>
<td>4</td>
<td>41</td>
<td></td>
</tr>
<tr>
<td><strong>Dominion of Canada</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>British Columbia Electric Ry.</td>
<td>15</td>
<td></td>
<td>Passenger</td>
<td>Motor Double</td>
<td>46 — 2</td>
<td>39,200</td>
<td>4</td>
<td>45</td>
<td></td>
</tr>
<tr>
<td>Calgary Municipal Ry.</td>
<td>6</td>
<td></td>
<td>Passenger</td>
<td>Motor Double</td>
<td>46 — 2</td>
<td>39,400</td>
<td>4</td>
<td>45</td>
<td></td>
</tr>
<tr>
<td>Hamilton Street Ry.</td>
<td>12</td>
<td></td>
<td>Passenger</td>
<td>Motor Double</td>
<td>46 — 2</td>
<td>39,400</td>
<td>4</td>
<td>45</td>
<td></td>
</tr>
<tr>
<td>Hydro-Electric Power Commission</td>
<td>1</td>
<td></td>
<td>Passenger</td>
<td>Motor Double</td>
<td>46 — 2</td>
<td>39,400</td>
<td>4</td>
<td>45</td>
<td></td>
</tr>
<tr>
<td>Montreal Traction</td>
<td>25</td>
<td></td>
<td>Passenger</td>
<td>Interurban</td>
<td>45 — 2</td>
<td>38,700</td>
<td>4</td>
<td>41</td>
<td></td>
</tr>
<tr>
<td>Quebec Railway, Light &amp; Power Co.</td>
<td>6</td>
<td></td>
<td>Passenger</td>
<td>Interurban</td>
<td>45 — 2</td>
<td>38,700</td>
<td>4</td>
<td>41</td>
<td></td>
</tr>
<tr>
<td>Regina Municipal Ry.</td>
<td>6</td>
<td></td>
<td>Passenger</td>
<td>Interurban</td>
<td>45 — 2</td>
<td>38,700</td>
<td>4</td>
<td>41</td>
<td></td>
</tr>
<tr>
<td>Saskatoon Municipal Railway</td>
<td>5</td>
<td></td>
<td>Passenger</td>
<td>Interurban</td>
<td>45 — 2</td>
<td>38,700</td>
<td>4</td>
<td>41</td>
<td></td>
</tr>
<tr>
<td>Winnipeg Electric Co.</td>
<td>1</td>
<td></td>
<td>Passenger</td>
<td>Motor Double</td>
<td>45 — 2</td>
<td>38,700</td>
<td>4</td>
<td>41</td>
<td></td>
</tr>
</tbody>
</table>

*Converted from steam to electric.  †Motorized trailers.

**Electric Railway Journal** — Vol.74, No.1
As is usual, there was considerable variation in the dimensions, weights and seating capacities of the cars ordered last year. The length of the double-truck cars for city service varies between 33 ft. 5 in. and 53 ft. 6 in., the average being about 43 ft. 6 in. Weights for this type of car range from 26,000 lb. to 47,000 lb., with an average of approximately 36,500 lb. Seating capacities vary from 36 to 62 per car. Among the interurban motor passenger cars there is less variation, the average length being about 48 ft. 8 in. with a weight of 40,916 lb. The cars purchased for New York rapid transit service have a length of 60 ft. 6 in. and weigh 85,000 lb. Even larger than these are the cars bought for the electrified suburban service of the Lackawanna Railroad, their length being 71 ft. and their weight 148,000 lb. Other additions to motorized cars for electrified suburban service are 39 cars which are being converted by the Pennsylvania Railroad from steam operation to electric operation, and 40 cars of the Long Island Railroad which are being motorized.

### New Rolling Stock Ordered Since 1907

<table>
<thead>
<tr>
<th>Year</th>
<th>Passenger Cars</th>
<th>Freight and Miscellaneous</th>
<th>Electric Cars</th>
<th>Locomotives</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1907</td>
<td>3,463</td>
<td>1,327</td>
<td>1,406</td>
<td>(a)</td>
<td>6,216</td>
</tr>
<tr>
<td>1908</td>
<td>2,208</td>
<td>1,227</td>
<td>176</td>
<td>(a)</td>
<td>3,111</td>
</tr>
<tr>
<td>1909</td>
<td>2,377</td>
<td>1,245</td>
<td>1,175</td>
<td>(a)</td>
<td>4,997</td>
</tr>
<tr>
<td>1910</td>
<td>3,571</td>
<td>990</td>
<td>820</td>
<td>(a)</td>
<td>5,381</td>
</tr>
<tr>
<td>1911</td>
<td>2,884</td>
<td>626</td>
<td>505</td>
<td>(a)</td>
<td>4,015</td>
</tr>
<tr>
<td>1912</td>
<td>4,511</td>
<td>783</td>
<td>687</td>
<td>(a)</td>
<td>6,081</td>
</tr>
<tr>
<td>1913</td>
<td>3,620</td>
<td>547</td>
<td>1,147</td>
<td>(a)</td>
<td>5,514</td>
</tr>
<tr>
<td>1914</td>
<td>2,142</td>
<td>384</td>
<td>479</td>
<td>(a)</td>
<td>3,010</td>
</tr>
<tr>
<td>1915</td>
<td>2,072</td>
<td>393</td>
<td>374</td>
<td>(a)</td>
<td>2,839</td>
</tr>
<tr>
<td>1916</td>
<td>3,046</td>
<td>374</td>
<td>491</td>
<td>31</td>
<td>3,942</td>
</tr>
<tr>
<td>1917</td>
<td>1,948</td>
<td>185</td>
<td>223</td>
<td>49</td>
<td>2,455</td>
</tr>
<tr>
<td>1918</td>
<td>1,642</td>
<td>255</td>
<td>278</td>
<td>44</td>
<td>2,419</td>
</tr>
<tr>
<td>1919</td>
<td>2,129</td>
<td>128</td>
<td>172</td>
<td>18</td>
<td>2,447</td>
</tr>
<tr>
<td>1920</td>
<td>2,689</td>
<td>227</td>
<td>465</td>
<td>17</td>
<td>3,359</td>
</tr>
<tr>
<td>1921</td>
<td>1,059</td>
<td>129</td>
<td>81</td>
<td>1</td>
<td>1,274</td>
</tr>
<tr>
<td>1922</td>
<td>2,910</td>
<td>187</td>
<td>405</td>
<td>34</td>
<td>3,536</td>
</tr>
<tr>
<td>1923</td>
<td>2,915</td>
<td>425</td>
<td>395</td>
<td>92</td>
<td>4,927</td>
</tr>
<tr>
<td>1924</td>
<td>3,985</td>
<td>538</td>
<td>1,330</td>
<td>31</td>
<td>5,092</td>
</tr>
<tr>
<td>1925</td>
<td>1,054</td>
<td>320</td>
<td>238</td>
<td>47</td>
<td>1,659</td>
</tr>
<tr>
<td>1926</td>
<td>1,249</td>
<td>309</td>
<td>304</td>
<td>60</td>
<td>1,915</td>
</tr>
<tr>
<td>1927</td>
<td>824</td>
<td>121</td>
<td>363</td>
<td>143</td>
<td>1,348</td>
</tr>
<tr>
<td>1928</td>
<td>601</td>
<td>93</td>
<td>171</td>
<td>32</td>
<td>897</td>
</tr>
<tr>
<td>1929</td>
<td>963</td>
<td>319</td>
<td>157</td>
<td>77</td>
<td>1,496</td>
</tr>
</tbody>
</table>

(a) Included in "Freight and Miscellaneous Cars."

New York led all other states in the amount of new rolling stock purchased for electric railway operation last year with a total of 411 cars and 42 electric locomotives. This numerical superiority was due largely to the big order for rapid transit cars and the order of 101 surface cars for Brooklyn. Ohio was second with a total of 146 cars and 26 electric locomotives. Other states which bought more than 100 cars included New Jersey, Michigan and Illinois.

At the same time that the electric railways bought these 1,404 cars, 2,325 old cars were junked or otherwise disposed of. This is by far the largest number that has been scrapped in anyone year of record. The next highest
number reported was 1,853 in 1924, followed closely by 1,819 in 1928. The relative number of cars scrapped in each of the last seven years is shown in an accompanying diagram.

**Interesting Developments in Design**

Aside from the trends of the past year as shown by the statistics prepared in accompanying tables, interesting developments have occurred in design. Much effort has been spent by the manufacturers in the development of lighter and quieter trucks. Particular attention has been paid to securing faster acceleration and retardation. Some of the new cars equipped with high-speed motors accelerate at a rate of 3 m.p.h.p.s. and can attain a free running speed as high as 40 m.p.h. Improvements in braking have made it possible to secure a rate of retardation as high as 3½ or 4 m.p.h.p.s. without discomfort to the passenger. Foot control and automatic acceleration appear to be regarded favorably.

In several instances the cars ordered during the year represent a radical departure from established precedent. While the majority of the orders are for equipment that follows more or less standard design, more attention has been given than ever before to improved general appearance. Designers have made a serious effort to create vehicles that are in keeping with their surroundings on the modern city street, but which will be an outstanding and desirable element in the picture. Attention has been directed to the balance in the general proportions, to lines and colors, to the curves of the roof, proportions of windows, shape of the ends, and to innumerable minor details that a few years ago were given little or no attention.

Greater attention also has been given to interior design and appointments, as well as to the exterior. Seats have been improved. Lines and colors have been selected to harmonize and to create a favorable impression in the mind of the rider. Care has been taken to facilitate entrance and exit, and to eliminate congestion near the doors and fare box.

**Car Weights Greatly Reduced**

Weights of cars purchased during the year have been reduced a great deal from the practice of a few years ago. Among the extremely light cars are one for Louisville which weighs 29,000 lb. and seats 47 passengers, or 620 lb. per passenger; the Union Street Railway of New Bedford, Mass., which weighs 32,000 lb. and seats 52 passengers, or 616 lb. per passenger; Pittsburgh Railways, weighing 27,000 lb. and seating 42 passengers, or 640 lb. per passenger; Scranton Railways, weighing 35,900 and seating 54 passengers, or 665 lb. per passenger. By far the lightest car listed is that built for the Brooklyn & Queens Transit Corporation, which, with a weight of 27,500 lb., seats 52 passengers, making the weight per passenger 530 lb.

While these examples of light-weight cars are in general sample designs, enough have been built to show that it is practicable to use in their construction those principles which have been expounded by the advocates of radical improvements. Practically all the car builders are represented in the list of these improved designs, and all the builders are using methods once considered revolutionary. Among these is the use of light-weight metals for structural parts as well as for trimmings. It is by the use of such methods that the weights have been reduced so radically.

It is not felt that the ultimate in weight reduction has been reached, by any means. Further study will make it possible not only to use light-weight metals as they have been employed in recent designs, but to modify other parts such as motors, controllers and air brake equipment to a greater extent than anything that has yet been attempted. Such changes will be possible on account of the very much lower weight of the body itself. The trucks are capable of redesign for less weight, as has been demonstrated in a few sample units. These changes in turn make it possible to increase the rates of acceleration and braking, even beyond the limits which have been referred to earlier in this article, and to do it without the necessity of having recourse to more powerful equipment.

**Much Interest Shown in Special Designs**

The purchase of special designs of cars has been made in larger quantities during the year just closed than in any similar period. This indicates that the interest taken in the subject is not merely a passing fancy, but that managements are becoming more and more alert to the necessity for taking advantage at once of the possibilities that lie in such changes. At the close of the year it is to be expected that more information as to the performance of these units in service will be available, and will form a basis on which to judge the merits of the several innovations incorporated in the recent designs. Such results are awaited with interest by all live operating men. It is not easy to predict in advance the exact effect of changes in design in passenger carrying vehicles but it is evident from past experience that the progress in car improvement has been productive of beneficial results.

Statistics given in the accompanying tables of rolling stock were obtained from replies to questionnaires sent to all electric railways in the United States and Canada. Replies were received from companies representing more than 97 per cent of the total track mileage. Through the co-operation of the manufacturers, lists of cars built by them during the year were furnished so that the replies received from railways could be checked very carefully. In a few cases where replies were not received from electric railways themselves, the information furnished by the car manufacturers has been used. Replies were received from all car manufacturers. In addition to the information obtained from these two sources, the files of Electric Railway Journal have been used extensively. Particular care has been used to verify figures which appeared doubtful and it is believed that the final data are complete and accurate.
Interest Revived in Trackless Trolley Operations

During the past two years this type of service has enjoyed a marked increase in popularity. More trackless trolleys were bought in 1929 than in any recent year. Seven companies are now operating 65 such vehicles. A synopsis of all operations since the first installation in 1910 is presented.

DEVELOPMENTS of the past year indicate that the trackless trolley is again finding favor as a local transportation vehicle. Eight years ago it was the subject of considerable experimentation and much interest was shown in its possibilities. Numerous systems were established at the time by the railroads, but abandonments during the period from 1923 to 1927 showed that it was losing popularity. With the coming of 1928, however, the manufacturers of equipment brought out new designs, resulting in a revival of interest in the trackless trolley. Indeed, the new models were so far removed from the old vehicles known as trackless trolleys that the manufacturers were reluctant to call them as such and termed them "electric coaches" and "trolley buses."

On Sept. 9, 1928, the Utah Light & Traction Company, Salt Lake City, placed ten electric coaches in service on a route 3.45 miles in length, replacing a former street car line. So successful did this original line prove to be, that the management on Dec. 4, 1929, added a second line, 4.74 miles in length, using fifteen additional vehicles.

New Orleans Established Line in 1929

A second recent installation of trolley buses in the United States is that of the New Orleans Public Service, Inc., which started a shuttle route of 1.37 miles in November, 1929, using two vehicles. Knoxville is expected to have the third installation when it opens up a route of approximately 5 miles the latter part of February or early in March, using four electric coaches.

Several other electric railways are considering installations in the near future. Of the pending plans, those of the Chicago Surface Lines to install trackless trolleys on two feeder lines in the northwest part of Chicago stand out as of particular significance. If this company obtains the desired permission to serve this district, it will purchase from 60 to 100 vehicles. Another city, in the South, is also awaiting only a court decision to start an operation of electric coaches.

It was recently announced by the general manager of the Department of Street Railways, Detroit, Mich., that he intended to propose the purchase of a number of trackless trolleys for trial purposes in that city. Should the experiment prove successful, the management plans to extend the use of trackless trolleys. Reports received by this paper from three other large properties and three smaller ones state that they are considering similar installations.

New Equipment Responsible for Renewed Interest

It has long been felt by many operators that the trackless trolley has a definite place in the field of local transportation. Until recently, however, there was a strong feeling that the equipment available was not satisfactory. As a result, only a few of the installations made with earlier equipment are now in operation. Awkward in appearance, hard riding and subject to many mechanical troubles, the early trackless trolley was a very unattractive vehicle. Development of the Versare, Twin Coach and A.C.F. Metropolitan type of buses removed the principal objections to the earlier designs, so far as the riding qualities and arrangement of equipment were concerned. At the same time light-weight, high-speed motors and control suitable for this type of vehicle became available as a result of developments in car design. Further refinements in the collection of current and the overhead removed several other objections.

Seven Railways Now Using Trackless Trolleys

At the present time seven companies are operating trackless trolleys in the United States, its possessions and Canada. These companies are operating 65 vehicles over 27.95 miles of one-way route. When service is started in Knoxville, the operating companies will be increased to eight, the number of vehicles to 69 and the mileage to approximately 33. Cities now operating are Baltimore, Md.; Philadelphia, Pa.; Rochester, N. Y.; Cohoes, N. Y.; Manila, P. I.; Salt Lake City, Utah, and New Orleans, La.

During the year 1929 a total of 20 vehicles were purchased, fourteen by the Utah Light & Traction Company, Salt Lake City; two by the New Orleans Public Service, Inc., and four by the Knoxville Power & Light Company. All of these except those for Knoxville are now in operation. Route extensions for the year totaled 6.11 miles, 1.37 miles of this being accounted for in the new line in New Orleans and 4.74 miles being the second line established by the Utah Light & Traction Company.

Of the seven companies now operating trackless trolleys, the system of the United Railways & Electric Com-
pany of Baltimore is the oldest. This line, established in July, 1922, is 6.6 miles in length and uses three vehicles, two of which are in active operation and one of which is held in reserve. They are used in feeder service between the end of a car line and a sparsely settled section in the country, known as Randallstown. Trackless trolleys were selected for this service largely, as an experiment and also because of their low cost. Real estate owners in the territory to be served requested that a permanent form of transportation be installed to aid in the development of the section and the company complied with their wishes.

Philadelphia has the second oldest system in the country with a line which was established on Oct. 14, 1923. This route of 2.8 miles serves a rapidly developing industrial and residential district in the southern part of the city. Ten vehicles are used. Need for the immediate service was the reason that prompted the Philadelpia Rapid Transit Company to install the trackless trolley system on a street having steam railroad tracks. These would have required considerable time for removal before electric railway tracks could have been installed. Also, because the district was not yet fully developed, the cost of an electric railway system would have been prohibitive.

Closely following the Philadelphia installation was that of the New York State Railways at Rochester, N. Y. It established a crosstown service through a densely populated and important industrial section on Nov. 1, 1923. Twelve vehicles are used on the 3.5-mile route. Since the line passes through a densely populated district and crosses five street car lines, the company felt that trackless trolleys would provide the most economical form of transportation.

**BELT CAR LINE REPLACED IN COHOES**

On Nov. 2, 1924, the Capitol District Transportation Company, a subsidiary of the United Traction Company of Albany, started operation of a 2.53 mile route in Cohoes, N. Y., with four vehicles. The company was faced with a large expenditure for street reconstruction and paving over a considerable part of a belt line, and substituted the electric coaches for this reason. It also selected this form of transportation partly so that it could shorten the distance taken by certain lines in reaching the business center of the city. Reducing the track and paving maintenance costs was also a factor. Immediate need for reconstructing the street car tracks on one of its lines and the high cost of gasoline in the Philippines caused the Manila Electric Company

### Present Trackless Trolley Operations in the U. S., its Possessions and Canada

<table>
<thead>
<tr>
<th>Company</th>
<th>City</th>
<th>Equipment Number and Type</th>
<th>Present One-Way Mileage</th>
<th>Date Started</th>
<th>Type of Service</th>
<th>Reason for Selection</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>United Railways &amp; Electric Company of Baltimore</td>
<td>Baltimore, Md.</td>
<td>3 Brill (2 in active operation, 1 held in reserve)</td>
<td>6.60</td>
<td>July, 1922</td>
<td>Feeder service, between end of a car line and Randallstown, a sparsely settled section in the country</td>
<td>Selected largely as an experiment and because of their low operating cost. Territory was not densely populated but real estate owners desired a permanent form of transportation.</td>
<td>Performance of these trackless trolleys is satisfactory.</td>
</tr>
<tr>
<td>Philadelphia Rapid Transit Company</td>
<td>Philadelphia, Pa.</td>
<td>9 Brill B-3 type, 25 pass.</td>
<td>2.80</td>
<td>Oct. 14, 1923</td>
<td>Crosstown service in south part of city, serving docks and industrial plants in rapidly developing industrial and residential sections.</td>
<td>Because of abandoned steam railroad tracks in street it would have taken too long to substitute street car tracks. Tyre water tanks, employing 2,000, and other plants needed service immediately. Also, territory was not sufficiently developed to warrant investment in tracks.</td>
<td>No supplement or curtailment since original installation. Good performance has been quite satisfactory. Gas-electric bus built to have advantages in flexibility and economy. Performance satisfactory.</td>
</tr>
<tr>
<td>New York State Railways</td>
<td>Rochester, N. Y.</td>
<td>12 Brookways, 25 pass. (Originally had electric motors and 7 gasoline engines. All equipped with motors now.)</td>
<td>3.50 (Originally only 3.06)</td>
<td>Nov. 1, 1923</td>
<td>Crosstown city service. Connects large industrial and residential sections on either side of a river. Crosses 5 car lines.</td>
<td>Economical operation principal reason.</td>
<td>Company satisfied with their performance.</td>
</tr>
<tr>
<td>Capitol District Transportation Company</td>
<td>Cohoes, N. Y.</td>
<td>4 Brookway chassis, Wason bodied.</td>
<td>2.53</td>
<td>Nov. 2, 1924</td>
<td>City.</td>
<td>Replaced belt street car line. Company was faced with larger expenditure for street reconstruction along considerable part of line. Change in route brought many residents closer to center of city. Also to reduce track and paving upkeep.</td>
<td>Performance satisfactory.</td>
</tr>
<tr>
<td>Manila Electric Company</td>
<td>Manila, P. I.</td>
<td>8 Twin Coaches, 40 pass.</td>
<td>2.96</td>
<td>April, 1928</td>
<td>Feeder service on heavy traffic street from city limits to two street car lines which are routed to business center of city.</td>
<td>Replaced street cars on a line the tracks of which needed reconstructing. Economy of electric operation as compared to gasoline in Philippines influenced choice of trolley buses.</td>
<td>Giving satisfactory service at low costs, both operating and fixed.</td>
</tr>
<tr>
<td>Utah Light &amp; Traction Company</td>
<td>Salt Lake City, Utah</td>
<td>36-total. 18 Versares, 6 Twin Coaches. (7 Versares of Cincinnati Car Corporation and 5 Twin Coaches added in 1929)</td>
<td>8.19 total First line 3.45 Second line 4.74</td>
<td>Sept. 9, 1928</td>
<td>City service in well built up residential districts and main business district of city.</td>
<td>Necessity of reconstructing and repaving four miles of track. Attendant future paving liabilities. Company believed electric coach to be most economical type of vehicle, at same time offering comfort and speed in a new, attractive, at 55 to 60 m.p.h.</td>
<td>Company and public so pleased with first line that second was added. Operating costs low. Riding increased.</td>
</tr>
<tr>
<td>New Orleans Pub. Service, Inc.</td>
<td>New Orleans, La.</td>
<td>1 Twin Coach, 40 pass. 1 American Car &amp; Foundry Motors Corp., 42 pass.</td>
<td>1.37</td>
<td>Nov. 1, 1929</td>
<td>Short order from industrial plants in Southport, through residential district to street car line.</td>
<td>Substituted for street car line. Travel too light on line to operate street cars profitably.</td>
<td>Not in service long enough for a report of operation.</td>
</tr>
<tr>
<td>Knoxville Power &amp; Light Company</td>
<td>Knoxville, Tenn.</td>
<td>4 Versares of the Cincinnati Car Corp., ordered</td>
<td>To be operated in 3 miles.</td>
<td>To start late in Feb. 1930, or early in March.</td>
<td>City.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
to select trolley buses for the replacement of street cars on one of its lines. Although the line is a feeder, it passes through a heavily populated district, so that the company felt trolley buses would be more efficient and provide satisfactory service. Eight Twin Coaches were purchased for use on the 2.96-mile route.

As mentioned previously, the Utah Light & Traction Company placed ten Versare electric coaches in service on a 3.45-mile route in Salt Lake City on Sept. 9, 1928. The necessity of reconstructing and repaving 4 miles of track led to the investigation of the new type of vehicle. It was felt by the management that the electric coach would be the most economical type to use, and that it would also offer attractive, comfortable and speedy service. Operating costs were very low on the new line, and both the company and public were well pleased. As a result, a second line, 4.74 miles in length, was started on Dec. 4, 1929.

Like the first line, this second one serves a well built up residential district and reaches the central business district of the city. Fourteen new vehicles were ordered for the extension, seven Versares of the Cincinnati Car Corporation and seven Twin Coaches. In addition to the ten original coaches the company secured one more Versare and a Twin Coach in 1928, making a total of 12 in operation at the end of 1928 and 26 at the end of 1929.

The line established in November, 1929, by the New Orleans Public Service, Inc., is a short feeder, 1.37 miles in length, connecting several industrial plants with a street car line. Two vehicles were purchased for this service, one a Twin Coach and the other an A.C.F. The vehicles are being operated partly as an experiment, and more may be placed on lines which do not have sufficient patronage to warrant a street car line.

Late in February, 1930, or early in March, the Knoxville Power & Light Company will place four electric coaches in service on a line approximately 5 miles in length. Full details of this installation are not yet available.

**Most Abandonments Caused by Poorly Designed Equipment**

During the years 1921, 1922 and 1923 eight installations of trackless trolleys were made in the United States and Canada. Of this number only three are still in existence. The cities in which the operations were abandoned were New York, N. Y.; Toronto, Ont.; Minneapolis, Minn.; Windsor, Ont., and Petersburg, Va. Abandonment of earlier installations occurred in Greenwich, Conn., many years ago; in Laurel Canyon, near Los Angeles, Cal., in 1910; and in Merrill, Wis., in 1913. Little information is known about the Greenwich, Conn., installation, which, it is reported, was operated before any electric street cars made their appearance. Likewise, no definite information is available concerning the installation in Laurel Canyon in 1910. Details of all the other abandonments are known, however, and are presented in an accompanying table. It will be noted from the table that in almost every case the operations

### Abandoned Trackless Trolley Operations in the U. S. and Canada

<table>
<thead>
<tr>
<th>Company</th>
<th>City</th>
<th>Date Started</th>
<th>Type of Service</th>
<th>Equipment</th>
<th>Date Abandoned</th>
<th>Reasons for Abandonment</th>
<th>Service Substituted</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pacific Electric Railway</td>
<td>Laurey Canyon, near Los Angeles, Cal.</td>
<td>1910</td>
<td>City</td>
<td>One vehicle with a 500-volt motor. Was sold to West End Street Railway, Boston.</td>
<td>Dec, 1913</td>
<td>Proved a failure.</td>
<td>Buses</td>
</tr>
<tr>
<td>Merrill Railway &amp; Light Company</td>
<td>Merrill, Wis.</td>
<td>Jan., 1913</td>
<td>City</td>
<td>One vehicle purchased from Merrill Railway &amp; Let Co.</td>
<td>1916</td>
<td></td>
<td></td>
</tr>
<tr>
<td>West End Street Railway</td>
<td>Southcist Neck, Mass.</td>
<td>1916</td>
<td>City</td>
<td>First installed 8 trolley busses by the Atlas Track Company with O. E. equipment.</td>
<td>July 31, 1927</td>
<td>Excessive operating costs.</td>
<td>Buses</td>
</tr>
<tr>
<td>Staten Island - Midland Railway, operated by Department of Plant and Structures, City of New York</td>
<td>Staten Island, New York, N. Y.</td>
<td>Oct. 8, 1921</td>
<td>Feeder, The two original lines extended from the end of a Richmond trolley line.</td>
<td>One Brill; 1 built by Company.</td>
<td>April, 1923</td>
<td>Operating costs excessive. Trouble with trolley poles and control, due to jamming. Residents objected to overhead. Accidents high. Restricted to fixed route.</td>
<td>Street cars on first. Buses on second.</td>
</tr>
<tr>
<td>Toronto Transportation Commission</td>
<td>Toronto, Ont.</td>
<td>Fall, 1921</td>
<td>City</td>
<td>Four</td>
<td>Fall, 1923</td>
<td>Were operated under adverse conditions and were purely experimental.</td>
<td>Buses</td>
</tr>
<tr>
<td>Hydro Electric Railway</td>
<td>Windsor, Ont.</td>
<td>May, 1922</td>
<td>City</td>
<td>Four</td>
<td>First because of track extension. Second, because of infrequency.</td>
<td>Street cars on first. Buses on second.</td>
<td></td>
</tr>
<tr>
<td>Virginia Electric &amp; Power Company, its predecessor</td>
<td>Petersburg, Va.</td>
<td>June, 1923</td>
<td>Original line a feeder of 0.6 mile from a residential sec. to a trolley line. Later extended to business section, replacing street car line. Length 3.3 miles.</td>
<td>Total of five, Two for original installation.</td>
<td>Dec, 31, 1926</td>
<td>Had to pay for and operate on narrow strip of concrete in center of street. Vehicles uncomfortable. Overhead objectionable to residents and expensive to maintain. Operating costs high.</td>
<td>Buses</td>
</tr>
</tbody>
</table>
were suspended because of unsatisfactory performance of the equipment. The rapid development of the bus also was responsible for the replacement of some of these lines.

What can probably be called the pioneer trackless trolley installation in the United States and Canada was that of the Merrill Railway & Light Company, Merrill, Wis. E. S. King, president and general manager of the company, had seen a storage battery operated bus of a large department store in Chicago, and conceived the idea of building a similar bus equipped with a 500-volt motor and trolley poles, to serve a ward of the city which required transportation service. This ward was located on the west banks of the Wisconsin River and could not be reached by street car because the bridge joining this section with the main part of the city was too narrow and not strong enough to support heavy equipment. Mr. King planned to extend his trackless trolley operation if it proved successful, but abandoned the line after maintaining service during the year 1913. The vehicle was purchased by the West End Street Railway of Boston, and operated by this company for a short period at Scoticut Neck, Mass.

With much ceremony, the city of New York introduced trackless trolley transportation to the residents of two sections of Staten Island, on Oct. 8, 1921. Two lines were established, both feeding a trolley line. A total of eight trolley buses was used in this service over the 7 miles of route. On Nov. 4, 1922, the city added a third line on Staten Island, extending a distance of 9 miles and using fifteen trolley buses. Operation on all three lines was suspended on July 31, 1927, when the power company cut off its supply to the city, because of a large unpaid debt for energy consumed. The vehicles, however, were worn out and operating costs were so excessive that the city had been negotiating for some time previous for the substitution of buses.

Details of the systems established by the Toronto Transportation Commission, the Twin City Rapid Transit Company, the Hydro-Electric Railways at Windsor and the Virginia Railway & Power Company are given in the accompanying table of abandonments. Unsatisfactory equipment was responsible for most of these failures.

Many Experiments in Early Years

Tests were made by the Virginia Railway & Power Company in June, 1921, of a trolley bus manufactured by the Atlas Truck Company, with General Electric equipment, over a 1-mile route in Richmond. Later in the year the same company experimented with a trolley bus in a residential district of Norfolk. Detroit was the scene of two tests in 1921, one of a trackless trolley with a Brill body, a Packard chassis and Westinghouse equipment, and the other of St. Louis Car Company manufacture. Tests of equipment also were made in the year by the J. G. Brill Company at Philadelphia, the General Electric Company at Schenectady and the St. Louis Car Company at St. Louis. Later, experiments were made in Los Angeles in 1922, in Norfolk during July, 1923, and at Detroit in the summer of 1924. In Norfolk a Brill trackless trolley was run free to demonstrate its practicability. The Detroit tests were to compare two different types of vehicles, one a Brill, with one General Electric motor, and the other a St. Louis Car Company vehicle, with two Westinghouse motors.

It is interesting to note, through the period of these several experiments and installations, the many proposals in other cities for the installation of trackless trolleys. A few of these, selected at random, are: Greenville, Tex., April, 1921; Akron, Ohio, July, 1921; Buffalo, N. Y., August, 1921; Detroit, Mich., August, 1921; Seattle, Wash., September, 1921; St. Louis, Mo., September, 1921; Milwaukee, Wis., January, 1922; Orange, Tex., March, 1923; Toledo, Ohio, January, 1924; Detroit, Mich., April, 1924; and Albany, N. Y., September, 1924.

From the history of installations, abandonments, experiments and proposals, herewith recorded, it is not difficult to trace the cycle through which the trackless trolley has passed since its first inception. Casual experiments previous to 1921 led up to a great period of activity in the two years following. Installations made in the years from 1921 to 1923 were not entirely successful in all the cities where installed and the next few years saw a waning of popularity. During 1927, however, radically different designs of vehicles made their appearance and there followed two important installations, one at Manila, P. L., and one at Salt Lake City, Utah. At present, it appears that the trolley bus is entering upon another period of much activity. Seven companies are now operating this type of vehicle, another will begin in February or March of 1930, and a few others are planning installations in the near future. Upon the activities of the year 1930 will depend, possibly, the outcome of this type of vehicle and whether it will form for itself a definite place in the field of transportation.

---

**Significant Figures of Past Year in Electric Railway Industry**

<table>
<thead>
<tr>
<th>Description</th>
<th>Figures</th>
</tr>
</thead>
<tbody>
<tr>
<td>Expenditures for new plant and equipment</td>
<td>$135,470,000</td>
</tr>
<tr>
<td>Expenditures for maintenance materials</td>
<td>$100,535,000</td>
</tr>
<tr>
<td>Expenditures for maintenance labor</td>
<td>$121,450,000</td>
</tr>
<tr>
<td>Number of new cars bought</td>
<td>1,419</td>
</tr>
<tr>
<td>Mileage of track extensions</td>
<td>161.71</td>
</tr>
<tr>
<td>Mileage of track reconstruction</td>
<td>700.14</td>
</tr>
<tr>
<td>Number of new buses bought</td>
<td>1,813</td>
</tr>
<tr>
<td>Miles of bus route extension</td>
<td>3,825</td>
</tr>
</tbody>
</table>
Great Improvement in Financial Situation

With restoration of the industry's credit refunding has been easier in the past year, and maturities are being taken care of on nearly all properties. The receivership status is the most encouraging for any year since the record has been kept by this paper

By

MORRIS BUCK
Engineering Editor Electric Railway Journal

FINANCIALLY speaking, to a greater extent than in any recent year the electric railway industry put its house in order during 1929. Not only was the number of receiverships entered into greatly reduced, but many roads that had been in receivership for a number of years were restored to their owners. Besides this, the total of bonds of electric railway properties in default of interest was reduced almost $40,000,000. Out of a total of $26,668,000 of securities maturing last year, $18,342,000 were retired, and $7,141,000 of bonds, maturing in 22 years or more, were called at prices ranging from 101 to 105. These are the outstanding facts of a record that has not been made by the electric railways for many years, not, in fact, since this paper has been presenting the statistics in its annual reviews.

During the year the major pieces of financing amounted to $18,310,000, as is indicated in Table I. This compares with $8,800,000 in 1928 and $39,676,000 in 1927. By far the largest single transaction in the year was that of the Brooklyn-Manhattan Transit Corporation, which placed an issue of $13,500,000 three-year secured 6 1/2 per cent notes at 98 1/2, or a yield of 7.06 per cent to maturity. The Insull properties placed two issues, one for the South Shore Line and one for the North Shore Line. The South Shore securities were $810,000 of 5 1/2 per cent equipment trust certificates, and the North Shore were $1,500,000 of three-year 6 per cent notes. The latter were placed at 97 1/4 to yield 6.84 per cent. The other large issue was that of the United Railways & Electric Company of Baltimore. It was divided into two parts, the first being $1,500,000 of first consolidated 4's due in 1949. These bonds, which are part of an issue authorized a number of years ago, were floated at 58. The other issue was $1,000,000 of first and refunding 6 1/2 per cent bonds due in 1957. These were sold at 80. The yields of the two issues were 8.35 per cent and 8.36 per cent respectively.

Electric Railway Journal—January, 1930
Table I—Eleven-Year Record of New Electric Railway Financing Involving Bond or Note Issues of More Than $400,000

<table>
<thead>
<tr>
<th>Year</th>
<th>City and Suburban</th>
<th>City</th>
<th>Interurban</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1919</td>
<td>$22,800,000</td>
<td>$2,179,000</td>
<td>$200,000</td>
<td>$25,000,000</td>
</tr>
<tr>
<td>1920</td>
<td>2,250,000</td>
<td>2,180,000</td>
<td>2,000,000</td>
<td>6,430,000</td>
</tr>
<tr>
<td>1921</td>
<td>1,274,000</td>
<td>2,200,000</td>
<td>2,000,000</td>
<td>5,474,000</td>
</tr>
<tr>
<td>1922</td>
<td>665,000</td>
<td>2,000,000</td>
<td>2,000,000</td>
<td>4,665,000</td>
</tr>
<tr>
<td>1923</td>
<td>14,362,000</td>
<td>6,300,000</td>
<td>2,000,000</td>
<td>22,662,000</td>
</tr>
<tr>
<td>1924</td>
<td>50,797,000</td>
<td>21,731,000</td>
<td>6,300,000</td>
<td>78,828,000</td>
</tr>
<tr>
<td>1925</td>
<td>23,016,000</td>
<td>6,300,000</td>
<td>2,000,000</td>
<td>31,316,000</td>
</tr>
<tr>
<td>1926</td>
<td>2,100,000</td>
<td>6,300,000</td>
<td>2,000,000</td>
<td>9,400,000</td>
</tr>
<tr>
<td>1927</td>
<td>30,956,000</td>
<td>6,300,000</td>
<td>2,000,000</td>
<td>39,256,000</td>
</tr>
<tr>
<td>1928</td>
<td>4,400,000</td>
<td>6,300,000</td>
<td>2,000,000</td>
<td>12,700,000</td>
</tr>
<tr>
<td>1929</td>
<td>13,360,000</td>
<td>2,500,000</td>
<td>2,500,000</td>
<td>18,460,000</td>
</tr>
</tbody>
</table>

Table II—Comparison of Maturities in the Electric Railway Field

<table>
<thead>
<tr>
<th>Year</th>
<th>Guaranteed Deb.</th>
<th>Non-Guaranteed Deb.</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1930</td>
<td>$49,274,000</td>
<td>$27,316,000</td>
<td>$76,580,000</td>
</tr>
<tr>
<td>1931</td>
<td>$28,324,000</td>
<td>$16,015,000</td>
<td>$44,339,000</td>
</tr>
<tr>
<td>1932</td>
<td>$21,989,000</td>
<td>$13,613,000</td>
<td>$35,602,000</td>
</tr>
<tr>
<td>1933</td>
<td>$14,562,000</td>
<td>$10,000,000</td>
<td>$24,562,000</td>
</tr>
<tr>
<td>1934</td>
<td>$7,550,000</td>
<td>$6,500,000</td>
<td>$14,050,000</td>
</tr>
<tr>
<td>1935</td>
<td>$1,989,000</td>
<td>$6,500,000</td>
<td>$8,488,000</td>
</tr>
</tbody>
</table>

They attracted considerable attention at the time they were issued on account of being part of a mortgage authorized a number of years ago, and on account of the ease with which they were absorbed by investors.

The major portion of the financing during the past year was for city railways, principally on account of the incumbrance of the Brooklyn issue. On the other hand, the interurban and combination city and suburban properties handled issues totaling approximately the average in classifications for the past five years. This shows that it is still possible to obtain funds for the two latter classes of properties if the security is good.

In the present year the maturities will be almost double what they were during 1929. The total for 1930 as given in the table is $49,274,000, as compared with $27,316,000. With the improving position of the electric railways in the eyes of the investing public little difficulty should be involved in the refunding. No very large individual amounts are included, the largest items being the Louisville Railway consolidated 5's, $6,000,000, due in July; Newark Passenger Railway consolidated 5's, $5,849,000, also due in July; and Portland Railroad, of Portland, Ore., refunding 5's and 4's, $5,670,000, due in November.

Table III—Disposition of Electric Railway Maturities in 1929

<table>
<thead>
<tr>
<th>Company and Issue</th>
<th>Amount Disposition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interborough Rapid Transit Co.</td>
<td>$1,449,000</td>
</tr>
<tr>
<td>New Bedford, Middleboro &amp; Brockton St. Ry., Ist</td>
<td>$324,000</td>
</tr>
<tr>
<td>Eastern Massachusetts St. Ry., refunding</td>
<td>$300,000</td>
</tr>
<tr>
<td>Brooklyn City Railroad equipment trust</td>
<td>$375,000</td>
</tr>
<tr>
<td>South Shore &amp; Boston St. Ry., Ist</td>
<td>$331,000</td>
</tr>
<tr>
<td>Philadelphia Rapid Transit Co., equipment trust</td>
<td>$227,000</td>
</tr>
<tr>
<td>Pittsburgh Railways, equipment trust</td>
<td>$200,000</td>
</tr>
<tr>
<td>Marion City Railway, Ist</td>
<td>$328,000</td>
</tr>
<tr>
<td>June</td>
<td>$250,000</td>
</tr>
<tr>
<td>East Side Traction Co., Ist</td>
<td>$250,000</td>
</tr>
<tr>
<td>July</td>
<td>$1,398,000</td>
</tr>
<tr>
<td>LaCrosse City Railway, Ist</td>
<td>$900,000</td>
</tr>
<tr>
<td>Central Traction Co., Ist</td>
<td>$353,000</td>
</tr>
<tr>
<td>Akron-Youngstown Valley, Ist</td>
<td>$220,000</td>
</tr>
<tr>
<td>August</td>
<td>$3,029,500</td>
</tr>
<tr>
<td>Atlantic &amp; Suburban Railway, Ist</td>
<td>$591,000</td>
</tr>
<tr>
<td>Philadelphia Rapid Transit Co., equipment trust</td>
<td>$213,500</td>
</tr>
<tr>
<td>Aroostook Valley Railway, Ist</td>
<td>$200,000</td>
</tr>
<tr>
<td>Brooklyn-Monmouth Transit Co., Ist</td>
<td>$100,000</td>
</tr>
<tr>
<td>September</td>
<td>$2,724,000</td>
</tr>
<tr>
<td>Wilkinsburg &amp; East Pittsburgh, Ist, Refunded</td>
<td>$1,095,000</td>
</tr>
<tr>
<td>Erie Traction Co., Ist</td>
<td>$425,000</td>
</tr>
<tr>
<td>Richmond, Indianapolis &amp; Eastern Traction Co., ref.</td>
<td>$300,000</td>
</tr>
</tbody>
</table>

Table IV—Principal Electric Railway Maturities in 1930

<table>
<thead>
<tr>
<th>Date</th>
<th>Company and Issue</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>January</td>
<td>Syracuse Rapid Transit Co.</td>
<td>$7,870,000</td>
</tr>
<tr>
<td>February</td>
<td>Chicago, North Shore &amp; Milwaukee R.R., 3-Yr.</td>
<td>$5,870,000</td>
</tr>
<tr>
<td>March</td>
<td>United Railways &amp; Electric Co. of Baltimore, 3-Yr.</td>
<td>$5,900,000</td>
</tr>
<tr>
<td>April</td>
<td>Rochester Railway</td>
<td>$5,719,000</td>
</tr>
<tr>
<td>May</td>
<td>Duluth Street Railway</td>
<td>$2,322,000</td>
</tr>
<tr>
<td>June</td>
<td>City &amp; Suburban Railway</td>
<td>$2,778,000</td>
</tr>
<tr>
<td>July</td>
<td>Louisville Railway</td>
<td>$5,641,000</td>
</tr>
<tr>
<td>August</td>
<td>Worcester Consolidated Street Railway</td>
<td>$5,455,000</td>
</tr>
<tr>
<td>September</td>
<td>Hartford Street Railway</td>
<td>$5,342,000</td>
</tr>
<tr>
<td>October</td>
<td>Pittsburgh, Allegheny &amp; Manchester Traction Co.</td>
<td>$1,316,000</td>
</tr>
<tr>
<td>November</td>
<td>Portland (Or.) Railway</td>
<td>$2,570,000</td>
</tr>
<tr>
<td>December</td>
<td>Detroit United Railway</td>
<td>$770,000</td>
</tr>
<tr>
<td>Total for 1930</td>
<td></td>
<td>$49,274,000</td>
</tr>
</tbody>
</table>

In the matter of securities defaulted, the year has shown a remarkable improvement. At the beginning of 1929 the total of such securities was $262,953,875. At the close of the year there were only $223,672,275 of...
bonds in default. The situation is the more encouraging when it is seen that included in these totals are items of $156,169,475 of bonds of the Chicago Surface Lines constituent companies, defaulted on account of the unsatisfactory political situation which prevented a renewal of the operating franchises early in 1927. As a result it was not possible to refinance and the bonds are technically in default, although interest is being paid regularly on them, and the principal undoubtedly will be paid off or refunded as soon as an agreement with the city is reached. Apart from these securities the total of defaulted bonds a year ago was $106,784,400. At the end of the year just closed the amount had been reduced to $67,602,800. In other words, more than a third of the issues in default, except for Chicago, had been adjusted. This excellent record speaks well for the soundness of the industry.

The receivership record of 1929 would be good at any time, but is particularly noteworthy after the record of the past twenty years. When conditions in the industry were normal, in the five years before the World War began, the receiverships averaged nineteen per year, with an average of 500 miles of track each year, and with securities averaging $24,700,000 in stock and $39,000,000 in bonds. As the war progressed the situation became worse, the 1919 record reaching the tremendous figure of 48 roads with 3,781 miles of track thrown into receivership, involving $321,000,000 of stocks and $312,900,000 of bonds. From that point the receiverships diminished gradually until only eight roads became involved in 1928. But the record for last year, when only five roads with a total of 510 miles of track, and with $18,473,000 of stocks and $21,173,700 of bonds went into the hands of receivers, is the best since 1925. It is also noteworthy that one of these roads was able to satisfy its creditors and the arrangements for ending the receivership were made during the year.

There has also been a material reduction in the number and importance of roads remaining insolvent. Notable among the reorganizations were several properties that have been in trouble for several years. The Des Moines City Railway is one of these. This 100-mile system was sold at foreclosure and taken over by a new group, headed by W. J. Cummings of Chicago. The long-standing source of difficulty has been a contract between the company and its trainmen which prohibited the use of one-man cars. This has now been abrogated, and it is expected that operating economies that will make the system successful can be introduced.

Another important system that was reorganized during the year is the Detroit United system. This property, which was the interurban portion of the old Detroit United remaining when the city of Detroit

Table V—New Bond and Note Financing in 1929
Offered Publicly in Amounts of More Than $250,000

<table>
<thead>
<tr>
<th>Issue</th>
<th>Price</th>
<th>Maturity</th>
<th>Yield</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chicago, South Shore &amp; South Bend R.R. Equipment Trust C-31</td>
<td>1930-39</td>
<td></td>
<td>$810,000</td>
<td></td>
</tr>
<tr>
<td>Brooklyn-Manhattan Transit Corporation 3-yr, secured notes, 6%</td>
<td>98.50</td>
<td>1932</td>
<td>7.06</td>
<td>13,500,000</td>
</tr>
<tr>
<td>Chicago, North Shore &amp; Milwaukee R.R. 3-yr, notes, 6%</td>
<td>97.75</td>
<td>1932</td>
<td>6.84</td>
<td>1,500,000</td>
</tr>
<tr>
<td>United Railways &amp; Electric Co. of Baltimore 1st consolidated 4s</td>
<td>58.00</td>
<td>1949</td>
<td>8.35</td>
<td>1,500,000</td>
</tr>
<tr>
<td>United Railways &amp; Electric Co. of Baltimore 1st and refunding 6s</td>
<td>80.00</td>
<td>1957</td>
<td>8.36</td>
<td>1,000,000</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
<td></td>
<td>$8,310,000</td>
</tr>
</tbody>
</table>

Table VI—Electric Railway Securities Called in 1929

<table>
<thead>
<tr>
<th>Month</th>
<th>Company</th>
<th>Maturity</th>
<th>Amount</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>February</td>
<td>Wilmington &amp; Philadelphia Traction Co. 5s</td>
<td>1929</td>
<td>$5,041,000</td>
<td>105</td>
</tr>
<tr>
<td>March</td>
<td>Cleveland, Elyria &amp; Western Ry. 6s</td>
<td>1929</td>
<td>1,073,000</td>
<td>101</td>
</tr>
<tr>
<td>March</td>
<td>Wilmington City Ry. 1st 7s</td>
<td>1929</td>
<td>600,000</td>
<td>105</td>
</tr>
<tr>
<td>March</td>
<td>Cleveland &amp; Elyria Div. 6s</td>
<td>1929</td>
<td>200,000</td>
<td>101</td>
</tr>
<tr>
<td>March</td>
<td>Cleveland, Berea, Elyria &amp; Oberlin 6s</td>
<td>1929</td>
<td>127,000</td>
<td>101</td>
</tr>
<tr>
<td>March</td>
<td>Cleveland &amp; Oberlin Div. 6s</td>
<td>1929</td>
<td>100,000</td>
<td>101</td>
</tr>
</tbody>
</table>

Table VII—Electric Railway Receiverships—1929

<table>
<thead>
<tr>
<th>Miles of Single Track</th>
<th>Capital Stock</th>
<th>Funded Debt</th>
<th>Receiver's Certificate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hammond, Whiting &amp; East Chicago Ry., Hammond, Ind.</td>
<td>34.16</td>
<td>$8,000,000</td>
<td>$1,788,000</td>
</tr>
<tr>
<td>New York State Railways</td>
<td>254.14</td>
<td>23,014,900</td>
<td>26,087,000</td>
</tr>
<tr>
<td>Boston, N.Y.</td>
<td>United Traction Co., Albany</td>
<td>112.10</td>
<td>12,500,000</td>
</tr>
<tr>
<td>Oklahoma Union Railway, Tulsa, Okla.</td>
<td>18.9</td>
<td>81,500,000</td>
<td>$750,000</td>
</tr>
<tr>
<td>Sunbury &amp; Selinsgrove Railway, Selinsgrove, Pa.</td>
<td>6.2</td>
<td>220,100</td>
<td>13,400</td>
</tr>
<tr>
<td>Total for 1929</td>
<td>425.50</td>
<td>$39,035,000</td>
<td>$35,138,400</td>
</tr>
</tbody>
</table>

Maturities for 1930 show an increase above last year, but are relatively small in the aggregate.
Table VIII—Outstanding Electric Railway Bonds in Default of Interest

| Amount | Defaulted
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>$1,725,000</td>
<td>April, 1929</td>
</tr>
<tr>
<td>$1,500,000</td>
<td>May, 1929</td>
</tr>
<tr>
<td>$2,000,000</td>
<td>Aug., 1926</td>
</tr>
<tr>
<td>$300,000</td>
<td>Aug., 1926</td>
</tr>
<tr>
<td>$300,000</td>
<td>July, 1926</td>
</tr>
<tr>
<td>$75,000</td>
<td>July, 1926</td>
</tr>
<tr>
<td>$125,000</td>
<td>Feb., 1927</td>
</tr>
<tr>
<td>$107,000</td>
<td>Feb., 1926</td>
</tr>
<tr>
<td>$110,000</td>
<td>May, 1926</td>
</tr>
<tr>
<td>$150,000</td>
<td>Sept., 1928</td>
</tr>
<tr>
<td>$1,000,000</td>
<td>June, 1929</td>
</tr>
<tr>
<td>$1,500,000</td>
<td>June, 1929</td>
</tr>
<tr>
<td>$1,500,000</td>
<td>Oct., 1929</td>
</tr>
<tr>
<td>$1,000,000</td>
<td>Jan., 1929</td>
</tr>
<tr>
<td>$500,000</td>
<td>Feb., 1929</td>
</tr>
<tr>
<td>$250,000</td>
<td>Apr., 1929</td>
</tr>
<tr>
<td>$250,000</td>
<td>May, 1929</td>
</tr>
<tr>
<td>$250,000</td>
<td>June, 1929</td>
</tr>
<tr>
<td>$250,000</td>
<td>Aug., 1929</td>
</tr>
<tr>
<td>$250,000</td>
<td>Oct., 1929</td>
</tr>
<tr>
<td>$250,000</td>
<td>Dec., 1929</td>
</tr>
</tbody>
</table>

The purchased the city lines, finally was able to work out a plan for satisfying its creditors. It now has been reorganized as the Eastern Michigan Railways. Incidentally, this was the largest road remaining in receivership at the beginning of last year, comprising 639 miles of track and involving $45,000,000 of securities.

Table IX—Record of Electric Railway Receiverships

<table>
<thead>
<tr>
<th>Number of Companies</th>
<th>Miles of Track Involved</th>
<th>Outstanding Securities</th>
</tr>
</thead>
<tbody>
<tr>
<td>1909</td>
<td>558.00</td>
<td>$29,962,200</td>
</tr>
<tr>
<td>1910</td>
<td>696.61</td>
<td>$12,590,400</td>
</tr>
<tr>
<td>1911</td>
<td>373.88</td>
<td>$19,410,700</td>
</tr>
<tr>
<td>1912</td>
<td>373.88</td>
<td>$19,410,700</td>
</tr>
<tr>
<td>1913</td>
<td>373.88</td>
<td>$19,410,700</td>
</tr>
<tr>
<td>1914</td>
<td>373.88</td>
<td>$19,410,700</td>
</tr>
<tr>
<td>1915</td>
<td>373.88</td>
<td>$19,410,700</td>
</tr>
<tr>
<td>1916</td>
<td>373.88</td>
<td>$19,410,700</td>
</tr>
<tr>
<td>1917</td>
<td>373.88</td>
<td>$19,410,700</td>
</tr>
<tr>
<td>1918</td>
<td>373.88</td>
<td>$19,410,700</td>
</tr>
<tr>
<td>1919</td>
<td>373.88</td>
<td>$19,410,700</td>
</tr>
<tr>
<td>1920</td>
<td>373.88</td>
<td>$19,410,700</td>
</tr>
<tr>
<td>1921</td>
<td>373.88</td>
<td>$19,410,700</td>
</tr>
<tr>
<td>1922</td>
<td>373.88</td>
<td>$19,410,700</td>
</tr>
<tr>
<td>1923</td>
<td>373.88</td>
<td>$19,410,700</td>
</tr>
<tr>
<td>1924</td>
<td>373.88</td>
<td>$19,410,700</td>
</tr>
<tr>
<td>1925</td>
<td>373.88</td>
<td>$19,410,700</td>
</tr>
<tr>
<td>1926</td>
<td>373.88</td>
<td>$19,410,700</td>
</tr>
<tr>
<td>1927</td>
<td>373.88</td>
<td>$19,410,700</td>
</tr>
<tr>
<td>1928</td>
<td>373.88</td>
<td>$19,410,700</td>
</tr>
<tr>
<td>1929</td>
<td>373.88</td>
<td>$19,410,700</td>
</tr>
</tbody>
</table>

Table X—Record of Electric Railway Sales

<table>
<thead>
<tr>
<th>Number of Companies</th>
<th>Miles of Track Involved</th>
<th>Stocks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1910</td>
<td>488.00</td>
<td>$22,265,700</td>
</tr>
<tr>
<td>1911</td>
<td>774.36</td>
<td>$19,106,613</td>
</tr>
<tr>
<td>1912</td>
<td>638.42</td>
<td>$19,533,550</td>
</tr>
<tr>
<td>1913</td>
<td>618.22</td>
<td>$20,299,700</td>
</tr>
<tr>
<td>1914</td>
<td>618.22</td>
<td>$20,299,700</td>
</tr>
<tr>
<td>1915</td>
<td>618.22</td>
<td>$20,299,700</td>
</tr>
<tr>
<td>1916</td>
<td>618.22</td>
<td>$20,299,700</td>
</tr>
<tr>
<td>1917</td>
<td>618.22</td>
<td>$20,299,700</td>
</tr>
<tr>
<td>1918</td>
<td>618.22</td>
<td>$20,299,700</td>
</tr>
<tr>
<td>1919</td>
<td>618.22</td>
<td>$20,299,700</td>
</tr>
<tr>
<td>1920</td>
<td>618.22</td>
<td>$20,299,700</td>
</tr>
<tr>
<td>1921</td>
<td>618.22</td>
<td>$20,299,700</td>
</tr>
<tr>
<td>1922</td>
<td>618.22</td>
<td>$20,299,700</td>
</tr>
<tr>
<td>1923</td>
<td>618.22</td>
<td>$20,299,700</td>
</tr>
<tr>
<td>1924</td>
<td>618.22</td>
<td>$20,299,700</td>
</tr>
<tr>
<td>1925</td>
<td>618.22</td>
<td>$20,299,700</td>
</tr>
<tr>
<td>1926</td>
<td>618.22</td>
<td>$20,299,700</td>
</tr>
<tr>
<td>1927</td>
<td>618.22</td>
<td>$20,299,700</td>
</tr>
<tr>
<td>1928</td>
<td>618.22</td>
<td>$20,299,700</td>
</tr>
<tr>
<td>1929</td>
<td>618.22</td>
<td>$20,299,700</td>
</tr>
</tbody>
</table>

The Indiana, Columbus & Eastern Traction Company, which came into receivership in 1921, finally adjusted its difficulties and was merged with the Cincinnati, Hamilton & Dayton Railway. The plan was worked out in 1928, but was not consummated until last year.

With these roads and a number of others out of

Table XI—Receiverships Terminated and Foreclosure Sales During 1929

<table>
<thead>
<tr>
<th>Miles of Track Involved</th>
<th>Capital</th>
<th>Funded Receiver's Receivers'</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>$3,600,000</td>
<td>$2,600,000</td>
<td>$1,650,000</td>
<td>Sold at receiver's sale in 1928. Receiver discharged.</td>
<td></td>
</tr>
<tr>
<td>$500,000</td>
<td>None</td>
<td>$500,000</td>
<td>None</td>
<td></td>
</tr>
<tr>
<td>$600,000</td>
<td>None</td>
<td>$600,000</td>
<td>None</td>
<td></td>
</tr>
<tr>
<td>$2,500,000</td>
<td>None</td>
<td>$2,500,000</td>
<td>None</td>
<td></td>
</tr>
<tr>
<td>$1,300,000</td>
<td>None</td>
<td>$1,300,000</td>
<td>None</td>
<td></td>
</tr>
<tr>
<td>$1,500,000</td>
<td>None</td>
<td>$1,500,000</td>
<td>None</td>
<td></td>
</tr>
<tr>
<td>$1,300,000</td>
<td>None</td>
<td>$1,300,000</td>
<td>None</td>
<td></td>
</tr>
<tr>
<td>$1,000,000</td>
<td>None</td>
<td>$1,000,000</td>
<td>None</td>
<td></td>
</tr>
<tr>
<td>$1,000,000</td>
<td>None</td>
<td>$1,000,000</td>
<td>None</td>
<td></td>
</tr>
<tr>
<td>$1,000,000</td>
<td>None</td>
<td>$1,000,000</td>
<td>None</td>
<td></td>
</tr>
<tr>
<td>$1,000,000</td>
<td>None</td>
<td>$1,000,000</td>
<td>None</td>
<td></td>
</tr>
<tr>
<td>$1,000,000</td>
<td>None</td>
<td>$1,000,000</td>
<td>None</td>
<td></td>
</tr>
<tr>
<td>$1,000,000</td>
<td>None</td>
<td>$1,000,000</td>
<td>None</td>
<td></td>
</tr>
<tr>
<td>$1,000,000</td>
<td>None</td>
<td>$1,000,000</td>
<td>None</td>
<td></td>
</tr>
<tr>
<td>$1,000,000</td>
<td>None</td>
<td>$1,000,000</td>
<td>None</td>
<td></td>
</tr>
<tr>
<td>$1,000,000</td>
<td>None</td>
<td>$1,000,000</td>
<td>None</td>
<td></td>
</tr>
<tr>
<td>$1,000,000</td>
<td>None</td>
<td>$1,000,000</td>
<td>None</td>
<td></td>
</tr>
<tr>
<td>$1,000,000</td>
<td>None</td>
<td>$1,000,000</td>
<td>None</td>
<td></td>
</tr>
<tr>
<td>$1,000,000</td>
<td>None</td>
<td>$1,000,000</td>
<td>None</td>
<td></td>
</tr>
<tr>
<td>$1,000,000</td>
<td>None</td>
<td>$1,000,000</td>
<td>None</td>
<td></td>
</tr>
</tbody>
</table>
receivership, the record has been greatly improved. Apart from the New York State properties, which were taken over by the courts on Dec. 30, the only system of any size remaining in receivership is the Union Traction Company of Indiana. With 445.5 miles of track and $27,300,000 of securities involved, it represents a large item in the total of receiverships at the end of the year. Various plans have been proposed for its reorganization, but up to date none of them has been accepted.

One of the most searching analyses of an industry ever made was that conducted recently for the Investment Bankers Association by its public service securities committee, and just released by the association. In general it believes in the inherent soundness of this class of properties, although it issues a warning against over-inflation of prices of some of the outstanding classes. On the specific subjects of the electric railway properties the report in part is as follows:

The street railway industry is laboring to recover its former position of prestige, to which the community benefits it confers entitle it. When the source of income of any industry is not increasing—fé, in fact, too frequently decreasing—then it cannot raise its capital advantageously, and the market position of its securities suffers accordingly. Increase in fares and reduction in operating expenses have their limits; and net earnings dependent for their increase on such factors spell sooner or later an unsuccessful business. All this is unfortunate, for the street railway is an indispensable service, especially in large communities. It behooves the owner of street railway property, and the would-investor in them, to gauge if possible the reasons for the existing situation and the possible remedies for it.

The public policy is to take over these operations (which your committee believes to be a wrong policy to pursue), and tax the whole community for such service as it elects to give, it must change its attitude toward the street railway and recognize it as a public servant conferring definite and large community benefits, and relieve it of inequitable financing burdens. Why should a street railway pay large pension payments, and snow removal costs, for general public advantage? Why should not subway and similar costs be borne by the benefited property, as are other street improvements, for a subway is nothing but street extension? It is the fair cost of service that the car rider should pay, under careful precautions, and should be made attractive less, easy to board and leave. Public taste and convenience must be catered to. This done, the great advantage of the street car

| Table XII—Electric Railway Receiverships as of Dec. 31, 1929 |
|-----------------|-----------------|-----------------|-----------------|
| Illinois        | Year of Receivership | Miles of Single Track | Capital Stock | Funded Receivers’ Debt |
| Chicago, Illinois, 1926 | 507.06 | $8,000,000 | $2,440,000 |
| New York, Illinois, 1926 | 42.50 | 717,950 | 1,960,750 |
| Indiana         | Year of Receivership | Miles of Single Track | Capital Stock | Funded Receivers’ Debt |
| Chicago, South End, Northern Indiana Ry., South Bend, 1927 | 125.00 | 7,500,000 | 4,955,000 |
| Frankfort & Vicinity, 1927 | 42.50 | 717,950 | 1,960,750 |
| Hammond, Whiting & East Chicago Ry., Hammond, Ind. (1) | 34.16 | 1,000,000 | 1,785,000 |
| Southern Indiana, 1927 | 34.16 | 1,000,000 | 1,785,000 |
| Union Traction Co. of Indiana, Anderson, 1924 | 451.67 | 11,500,000 | 15,848,000 |
| Missouri        | Year of Receivership | Miles of Single Track | Capital Stock | Funded Receivers’ Debt |
| Des Moines City Ry., Des Moines (9) | 103.10 | 3,019,100 | 4,821,000 |
| Mississippi Valley Electric Co., Iowa City, 1926 | 6.00 | 538,420 | 148,000 |
| Kentucky        | Year of Receivership | Miles of Single Track | Capital Stock | Funded Receivers’ Debt |
| Owensboro Ry. E. L. Owensboro, 1923 | 11.95 | 75,000 | 400,000 |
| Michigan        | Year of Receivership | Miles of Single Track | Capital Stock | Funded Receivers’ Debt |
| Detroit & Port Huron Shore Line Ry., Detroit (8) | 125.00 | 2,000,000 | 2,500,000 |
| Huron County Traction Co., Houghton, 1924 | 32.15 | 937,200 | 600,000 |
| Michigan Railroad, Jackson (3) | 156.71 | 4,000,000 | 4,000,000 |
| Minneapolis, Anoka & Cuyuna Range Ry., Minneapolis, 1926 | 29.25 | 300,000 | 204,000 |
| St. Paul Southern Ry. (10), 1918 | 17.34 | 638,125 | 304,700 |
| Missouri        | Year of Receivership | Miles of Single Track | Capital Stock | Funded Receivers’ Debt |
| Hannibal Missouri & Eastern Co., Hannibal, 1927 | 6.90 | 111,165 | 102,500 |
| Southwest Missouri R. R., Webb City, 1926 | 90.00 | 5,000,000 | 2,141,000 |
| New York        | Year of Receivership | Miles of Single Track | Capital Stock | Funded Receivers’ Debt |
| Aurora & Northern Electric R. R., Syracuse (7), 1928 | (9) | (b) | 236,000 |
| Binghamton Ry., Binghamton (3), 1925 | 47.31 | 928,995 | 2,877,200 |
| Buffalo & Lake Shore Ry., Buffalo (7) | 95.54 | 1,800,000 | 1,800,000 |
| Buffalo & Lackawanna Traction Co., Buffalo, 1918 | 8.08 | 85,000 | 1,000,000 |
| Eighth and Ninth Avenues Ry., New York, 1927 | 27.61 | 2,925,000 | 2,740,000 |
| Empire State R. R., Troy, 1927 | 21.72 | 200,000 | 200,000 |
| Hamburg Ry., Buffalo, 1920 | 21.72 | 200,000 | 200,000 |
| Harris Traction Co., Troy, 1922 | 12.00 | 400,000 | 250,000 |
| New York & Queens County Ry., Jackson Heights, New York State, 1926 | 34.94 | 2,325,000 | 1,300,000 |
| Second Avenue R. R., New York (4), 1926 | 354.14 | 2,314,900 | 26,087,000 |
| States Island R. R., 1926 | 29.26 | 1,000,000 | 1,000,000 |
| Steuben Ry., New York, 1922 | 31.11 | 100,000 | 100,000 |
| Syracuse & Rochester Ry., 1924 | 32.15 | 121,000 | 4,990,000 |
| United Traction Co., Albany, N. Y., 1929 | 112.10 | 12,500,000 | 6,500,000 |
| Ohio            | Year of Receivership | Miles of Single Track | Capital Stock | Funded Receivers’ Debt |
| Indiana, Columbus & Eastern Traction Co., Springfield (3), 1921 | 153.25 | 4,025,000 | 4,600,000 |
| Springfield Ry., Springfield, 1920 | 40.54 | 1,500,000 | 1,335,000 |
| Ohio            | Year of Receivership | Miles of Single Track | Capital Stock | Funded Receivers’ Debt |
| Lawton Railway & Light Co., Lawton (6), 1927 | 6.31 | 100,000 | 100,000 |
| Oklahoma Union Ry., 1929 | 18.90 | 1,500,000 | 750,000 |
| Pennsylvania    | Year of Receivership | Miles of Single Track | Capital Stock | Funded Receivers’ Debt |
| Schuylkill Ry., Girardville, 1927 | 34.00 | 400,000 | 1,350,000 |
| Sunbury & Selinsgrove, Sunbury, 1929 | 6.20 | 2,000,000 | 1,500,000 |
| Utah            | Year of Receivership | Miles of Single Track | Capital Stock | Funded Receivers’ Debt |
| Salt Lake & Utah & Salt Lake City, 1925 | 97.55 | 5,043,700 | 2,532,320 |
| Washington      | Year of Receivership | Miles of Single Track | Capital Stock | Funded Receivers’ Debt |
| Puget Sound Electric Ry., Tacoma, 1928 | 57.10 | 3,116,200 | 7,332,000 |

Net receiverships Dec. 31, 1929: 3,142,611 104,860,390 216,999,625 $505,259

(a) Included with Empire State R. R. figures.
(b) Ineligible for refinancing.
(c) Sold at foreclosure in 1927. Receiver not yet discharged.
(d) Sold at receiver’s sale in 1928. Receiver not yet discharged.
(e) Sold at foreclosure organized as Triple Joint Traction Co.
(f) Reorganized as Second Avenue Railroad Corp. Receiver not yet discharged.
(g) Sold at receiver’s sale. Receiver not yet discharged.
(h) Sold at receiver’s sale. Receiver not yet discharged.
(i) Sold at receiver’s sale. Company out of existence.
(j) Sold at public auction in 1928. Receiver not yet discharged.
(k) Sold at public auction in 1928. Receiver not yet discharged.
(l) This is the only subsidiary company of the Detroit Union Ry., now operating under receivership. The Detroit, Jackson & Culver Ry., has discontinued service and the Detroit Union Ry., and the Detroit, Monroe and Toledo R. R. 21st Nov. and Toledo R. R. 1st Nov. were sold at foreclosure and reorganized as the Eastern Michigan Ry., 21st Nov.
(m) Sold at receiver’s sale. No receiver appointed. None now in receivership.
(n) Sold at foreclosure sale. Receiver not yet discharged.
(o) 25,000 shares. No par value. Based on market quotation.
broad generalizations, though what has already been said seems too germane to the industry as a whole to be overlooked.

The aggregate figures of investment and income for the industry are impressive. They show an industry that must survive in the public interest. The new brains in the industry, looking ahead and discarding the past, will accomplish much, and may accomplish a revolution in the business if they be given time and support.

On the other hand, some unfavorable comment has been heard concerning the financial status of the industry. Only recently a spokesman for one of the investment services warned against the purchase of electric railway bonds. His words were widely circulated. They should be taken cum grano salis, but they certainly did not help the situation. In an appeal to bondholders of the New York State Railways and other properties for the conversion of their securities, H. C. Hopson, president of the Associated Gas & Electric Company, made a number of statements which are not reassuring to present holders and can have only a bad effect on any prospective purchasers of railway securities. The situation on the properties in New York State has been acute for some time, and culminated in their receivership a few days ago. But to generalize about the railway financial situation as a whole from the status of these companies is entirely unjustified.

As the Investment Bankers Association points out, the street railway is a much more essential service than one might be led to believe if he were to accept at face value all that the adverse commentators have said about it. Too often, far too often, the railways have been made the football of politics. This is Mr. Insull's comment in his recent penetrating remarks about Chicago. Companies with which he is identified have made a financial success not only in interurban operation, but in operation in the more moderate sized cities, the ones in which it is held that successful operation is most difficult. Not even the committee on electric railway financing of the A.E.R.A., which reported several years ago after an extended investigation, sought to mitigate the condition which exists of a need for recasting of financial structures of many properties. It is regrettable that more companies have not followed out these recommendations, but the comments of Mr. Hopson and others may properly be characterized as representing the extreme point of view. It is more nearly true, as Mr. Insull said of the Chicago situation, that with proper set-up of the financial plan, founded on true economic principles, money necessary will pour in from securities, both senior and junior—bonds, preferred and common stock.

---

**Much Construction Work Features Heavy Electric Traction in 1929**

**CONSTRUCTION** work on projects already authorized occupied the major attention of electrical engineers during the year just past. The conversion has continued at a rate foreshadowed by the announcements made public during 1928. While comparatively little track was opened to electric operation during the year, the present year will witness the fulfillment of many of the projects under way.

Chief among the installations being made is that of the Pennsylvania Railroad, which is actively at work on extension of its electric system to cover the territory between New York and Washington. The section between Philadelphia and Wilmington is now using electric power for local service over 52.6 miles of route. The sections comprising the line between Philadelphia and New York will follow next. The obstacle to electrification of the line between Wilmington and Washington, the series of tunnels in Baltimore, has now been removed by the action of the city to permit the construction of new tunnels to supplement the present ones. In all, a total of 325 miles of route and 1,300 miles of track has been authorized. Following the completion of the New York-Washington line, it is rumored that the Pennsylvania will proceed at once with preparations for the electrification of the route over the Allegheny Mountains between Philadelphia and Pittsburgh, a project which has been considered for years.

The Cleveland Union Terminal Company has virtually completed the equipment of the new terminal at the Public Square in Cleveland and the approaches of the several roads entering it, so that electric operation will begin in the immediate future.

The Delaware, Lackawanna & Western Railroad is making rapid progress with the conversion of its suburban lines out of New York for electric service. The construction is well under way and the equipment is on order. The work probably will be completed during the present year.

The Reading Company is proceeding with plans for the electrification of its Philadelphia terminal and the suburban lines running out of it. The authorization was made late in 1928, and construction work is just beginning.

**Steam Railroad Electrification Reported for 1929**

<table>
<thead>
<tr>
<th>Miles of Track</th>
<th>Cleveland, Cincinnati, Chicago &amp; St. Louis Railroad, Cleveland...</th>
<th>4.25</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Cleveland Union Terminals Company, Cleveland...</td>
<td>4.01</td>
</tr>
<tr>
<td></td>
<td>Illinois Central Railroad, Chicago and vicinity...</td>
<td>25.88</td>
</tr>
<tr>
<td></td>
<td>Long Island Railroad, New York and vicinity...</td>
<td>9.23</td>
</tr>
<tr>
<td></td>
<td>New York Central Railroad, Cleveland...</td>
<td>3.51</td>
</tr>
<tr>
<td></td>
<td>New York Central Railroad, New York and vicinity...</td>
<td>3.46</td>
</tr>
<tr>
<td></td>
<td>New York, Chicago &amp; St. Louis Railroad, Cleveland...</td>
<td>5.32</td>
</tr>
<tr>
<td></td>
<td>New York, New Haven &amp; Hartford Railroad, New York and vicinity...</td>
<td>1.59</td>
</tr>
<tr>
<td></td>
<td>Pennsylvania Railroad, Philadelphia-Wilmington...</td>
<td>150.06</td>
</tr>
<tr>
<td></td>
<td>Virginia Railway, Roanoke, Va.-Mullens, W. Va.</td>
<td>0.13</td>
</tr>
</tbody>
</table>

While the construction work was completed in 1928, electric operation of the new tunnel of the Great Northern Railway through the Cascade Mountains was opened in January of last year. This replaces the former short electrification of the old tunnel, and brings the electrified track on this system up to 87.5 miles.

During the year extensions to the Illinois Central electric zone in Chicago were made totaling 25.88 miles. This road also ordered four electric locomotives for freight switching in the Chicago terminal division. Figures for extensions to electrified track are given in one of the tables.

Among the new projects which have been discussed during the past year the outstanding one is that of the New York Central. Plans have been prepared in some
detail for the electrification of the system between New York and Buffalo. This is a section of dense traffic which ultimately, it is said, will have to be powered with some form of energy other than steam. No definite announcements have been made, but it is understood that the work as planned will cost in the neighborhood of $150,000,000.

The Lehigh Valley Railroad has received bids from the leading electrical manufacturers on the equipment of 75 miles of route of its main line between Mauch Chunk and Wilkes-Barre, Pa. The cost of this project would be between $7,000,000 and $10,000,000, and would assist traffic on the ruling grades of the system. The section is through mountainous territory, and the use of electricity would make possible the movement of more and longer trains at greater speed than is possible with steam.

In foreign countries the progress in electrification is in line with that in this country. The Central Argentine Railway was authorized in 1929 to proceed with the extension of its suburban electrification out of Buenos Aires. The new project involves a total of 26 miles. The Central Terminal Railway of Buenos Aires is constructing 54 miles of double-track subway into the main business district of the city, with the intention of operating its passenger trains to a new terminal to be built in the business district.

The New South Wales Government Railway is converting to electric traction its suburban services at Sydney. It is expected that the project, involving about 400 track-miles, will be completed this year.

Work is in progress on the electrification of the divisions of the Great Indian Peninsula Railway between Kalyan and Poona and Igtapuri. With the main line from Bombay to Kalyan already completed, the total electrification will comprise about 180 miles of route.

Electrifications are also planned in the Netherlands, Sweden, Germany, Italy, France and Spain. In England and Austria plans have been deferred for economic reasons. The principal Swiss railways already have been converted to electric operation, and comparatively few lines demand a change to electric power at present.

### Mileage of Steam Railroads Electrified and Total Weight of Active Electric Locomotives in Tons

<table>
<thead>
<tr>
<th>Year</th>
<th>Electric Mileage</th>
<th>System</th>
<th>Electric Locomotives</th>
<th>Daily Trains</th>
<th>Annual Car-Miles</th>
</tr>
</thead>
<tbody>
<tr>
<td>1900</td>
<td>35</td>
<td>R.R.</td>
<td>12</td>
<td>13</td>
<td>142,190</td>
</tr>
<tr>
<td>1901</td>
<td>45</td>
<td>R.R.</td>
<td>12</td>
<td>13</td>
<td>1,297,900</td>
</tr>
<tr>
<td>1902</td>
<td>55</td>
<td>R.R.</td>
<td>12</td>
<td>13</td>
<td>2,115,172</td>
</tr>
<tr>
<td>1903</td>
<td>65</td>
<td>R.R.</td>
<td>12</td>
<td>13</td>
<td>3,183,396</td>
</tr>
<tr>
<td>1904</td>
<td>75</td>
<td>R.R.</td>
<td>12</td>
<td>13</td>
<td>4,042,607</td>
</tr>
<tr>
<td>1905</td>
<td>85</td>
<td>R.R.</td>
<td>12</td>
<td>13</td>
<td>4,732,144</td>
</tr>
<tr>
<td>1906</td>
<td>95</td>
<td>R.R.</td>
<td>12</td>
<td>13</td>
<td>5,216,144</td>
</tr>
<tr>
<td>1907</td>
<td>105</td>
<td>R.R.</td>
<td>12</td>
<td>13</td>
<td>5,598,745</td>
</tr>
<tr>
<td>1908</td>
<td>115</td>
<td>R.R.</td>
<td>12</td>
<td>13</td>
<td>5,864,796</td>
</tr>
<tr>
<td>1909</td>
<td>125</td>
<td>R.R.</td>
<td>12</td>
<td>13</td>
<td>6,014,796</td>
</tr>
<tr>
<td>1910</td>
<td>135</td>
<td>R.R.</td>
<td>12</td>
<td>13</td>
<td>6,096,172</td>
</tr>
<tr>
<td>1911</td>
<td>145</td>
<td>R.R.</td>
<td>12</td>
<td>13</td>
<td>6,117,900</td>
</tr>
<tr>
<td>1912</td>
<td>155</td>
<td>R.R.</td>
<td>12</td>
<td>13</td>
<td>6,097,172</td>
</tr>
<tr>
<td>1913</td>
<td>165</td>
<td>R.R.</td>
<td>12</td>
<td>13</td>
<td>6,074,172</td>
</tr>
<tr>
<td>1914</td>
<td>175</td>
<td>R.R.</td>
<td>12</td>
<td>13</td>
<td>6,036,172</td>
</tr>
<tr>
<td>1915</td>
<td>185</td>
<td>R.R.</td>
<td>12</td>
<td>13</td>
<td>5,986,172</td>
</tr>
<tr>
<td>1916</td>
<td>195</td>
<td>R.R.</td>
<td>12</td>
<td>13</td>
<td>5,914,172</td>
</tr>
<tr>
<td>1917</td>
<td>205</td>
<td>R.R.</td>
<td>12</td>
<td>13</td>
<td>5,822,172</td>
</tr>
<tr>
<td>1918</td>
<td>215</td>
<td>R.R.</td>
<td>12</td>
<td>13</td>
<td>5,716,172</td>
</tr>
<tr>
<td>1919</td>
<td>225</td>
<td>R.R.</td>
<td>12</td>
<td>13</td>
<td>5,592,172</td>
</tr>
<tr>
<td>1920</td>
<td>235</td>
<td>R.R.</td>
<td>12</td>
<td>13</td>
<td>5,442,172</td>
</tr>
<tr>
<td>1921</td>
<td>245</td>
<td>R.R.</td>
<td>12</td>
<td>13</td>
<td>5,268,172</td>
</tr>
<tr>
<td>1922</td>
<td>255</td>
<td>R.R.</td>
<td>12</td>
<td>13</td>
<td>5,070,172</td>
</tr>
<tr>
<td>1923</td>
<td>265</td>
<td>R.R.</td>
<td>12</td>
<td>13</td>
<td>4,848,172</td>
</tr>
<tr>
<td>1924</td>
<td>275</td>
<td>R.R.</td>
<td>12</td>
<td>13</td>
<td>4,596,172</td>
</tr>
<tr>
<td>1925</td>
<td>285</td>
<td>R.R.</td>
<td>12</td>
<td>13</td>
<td>4,312,172</td>
</tr>
<tr>
<td>1926</td>
<td>295</td>
<td>R.R.</td>
<td>12</td>
<td>13</td>
<td>4,004,172</td>
</tr>
<tr>
<td>1927</td>
<td>305</td>
<td>R.R.</td>
<td>12</td>
<td>13</td>
<td>3,664,172</td>
</tr>
<tr>
<td>1928</td>
<td>315</td>
<td>R.R.</td>
<td>12</td>
<td>13</td>
<td>3,300,172</td>
</tr>
<tr>
<td>1929</td>
<td>325</td>
<td>R.R.</td>
<td>12</td>
<td>13</td>
<td>2,904,172</td>
</tr>
<tr>
<td>1930</td>
<td>335</td>
<td>R.R.</td>
<td>12</td>
<td>13</td>
<td>2,504,172</td>
</tr>
<tr>
<td>1931</td>
<td>345</td>
<td>R.R.</td>
<td>12</td>
<td>13</td>
<td>2,104,172</td>
</tr>
<tr>
<td>1932</td>
<td>355</td>
<td>R.R.</td>
<td>12</td>
<td>13</td>
<td>1,700,172</td>
</tr>
<tr>
<td>1933</td>
<td>365</td>
<td>R.R.</td>
<td>12</td>
<td>13</td>
<td>1,300,172</td>
</tr>
<tr>
<td>1934</td>
<td>375</td>
<td>R.R.</td>
<td>12</td>
<td>13</td>
<td>904,172</td>
</tr>
<tr>
<td>1935</td>
<td>385</td>
<td>R.R.</td>
<td>12</td>
<td>13</td>
<td>500,172</td>
</tr>
<tr>
<td>1936</td>
<td>395</td>
<td>R.R.</td>
<td>12</td>
<td>13</td>
<td>100,172</td>
</tr>
<tr>
<td>1937</td>
<td>405</td>
<td>R.R.</td>
<td>12</td>
<td>13</td>
<td>0</td>
</tr>
<tr>
<td>1938</td>
<td>415</td>
<td>R.R.</td>
<td>12</td>
<td>13</td>
<td>0</td>
</tr>
<tr>
<td>1939</td>
<td>425</td>
<td>R.R.</td>
<td>12</td>
<td>13</td>
<td>0</td>
</tr>
<tr>
<td>1940</td>
<td>435</td>
<td>R.R.</td>
<td>12</td>
<td>13</td>
<td>0</td>
</tr>
<tr>
<td>1941</td>
<td>445</td>
<td>R.R.</td>
<td>12</td>
<td>13</td>
<td>0</td>
</tr>
<tr>
<td>1942</td>
<td>455</td>
<td>R.R.</td>
<td>12</td>
<td>13</td>
<td>0</td>
</tr>
<tr>
<td>1943</td>
<td>465</td>
<td>R.R.</td>
<td>12</td>
<td>13</td>
<td>0</td>
</tr>
<tr>
<td>1944</td>
<td>475</td>
<td>R.R.</td>
<td>12</td>
<td>13</td>
<td>0</td>
</tr>
<tr>
<td>1945</td>
<td>485</td>
<td>R.R.</td>
<td>12</td>
<td>13</td>
<td>0</td>
</tr>
<tr>
<td>1946</td>
<td>495</td>
<td>R.R.</td>
<td>12</td>
<td>13</td>
<td>0</td>
</tr>
<tr>
<td>1947</td>
<td>505</td>
<td>R.R.</td>
<td>12</td>
<td>13</td>
<td>0</td>
</tr>
<tr>
<td>1948</td>
<td>515</td>
<td>R.R.</td>
<td>12</td>
<td>13</td>
<td>0</td>
</tr>
<tr>
<td>1949</td>
<td>525</td>
<td>R.R.</td>
<td>12</td>
<td>13</td>
<td>0</td>
</tr>
<tr>
<td>1950</td>
<td>535</td>
<td>R.R.</td>
<td>12</td>
<td>13</td>
<td>0</td>
</tr>
<tr>
<td>1951</td>
<td>545</td>
<td>R.R.</td>
<td>12</td>
<td>13</td>
<td>0</td>
</tr>
<tr>
<td>1952</td>
<td>555</td>
<td>R.R.</td>
<td>12</td>
<td>13</td>
<td>0</td>
</tr>
<tr>
<td>1953</td>
<td>565</td>
<td>R.R.</td>
<td>12</td>
<td>13</td>
<td>0</td>
</tr>
<tr>
<td>1954</td>
<td>575</td>
<td>R.R.</td>
<td>12</td>
<td>13</td>
<td>0</td>
</tr>
<tr>
<td>1955</td>
<td>585</td>
<td>R.R.</td>
<td>12</td>
<td>13</td>
<td>0</td>
</tr>
<tr>
<td>1956</td>
<td>595</td>
<td>R.R.</td>
<td>12</td>
<td>13</td>
<td>0</td>
</tr>
<tr>
<td>1957</td>
<td>605</td>
<td>R.R.</td>
<td>12</td>
<td>13</td>
<td>0</td>
</tr>
<tr>
<td>1958</td>
<td>615</td>
<td>R.R.</td>
<td>12</td>
<td>13</td>
<td>0</td>
</tr>
<tr>
<td>1959</td>
<td>625</td>
<td>R.R.</td>
<td>12</td>
<td>13</td>
<td>0</td>
</tr>
<tr>
<td>1960</td>
<td>635</td>
<td>R.R.</td>
<td>12</td>
<td>13</td>
<td>0</td>
</tr>
</tbody>
</table>

**Installations of Electrical Operation of Steam Railroads in the United States**

Based on original data, supplemented by reports of the American Electric Railway Engineering Association and the National Electric Light Association.
Low Records Made in
Trolley Wire Breaks

Continued improvement over previous figures was shown in 1929. Survey shows average reduction of more than 60 per cent accomplished during past eight years.

DATA compiled by various of the leading electric railway systems in the United States and Canada show that the number of trolley wire breaks per year is steadily decreasing. Notable achievements in this direction have been made by the railways in Chicago, Detroit, Cleveland, Baltimore, Boston, Birmingham, Louisville, New Orleans and Toronto. Although the number of car-miles operated has remained practically constant for the group of properties included in this survey, the number of breaks has been reduced more than 60 per cent during the past eight years.

Reasons for failure can be classified under two main headings, namely, those due to uncontrollable causes and those due to inherent characteristics. Among the uncontrollable causes are burnouts by shovels, grinders, welders, foreign wires, and fires, while the causes of inherent failures are such as worn wire, defective fittings, burnt spots, crystallization or fatigue, flaws in wire and worn fittings. Reductions have been made under both classifications by systematic inspection and maintenance methods.

Differentiation between so-called uncontrollable causes and defects and wear varies somewhat on different properties. According to the classifications used in Boston, Detroit and Cleveland it appears that slightly more breaks are due to defects and wear than to uncontrollable causes, the ratio being about 60-40. Figures for breaks occurring on these properties in 1928 are summarized in the following table:

<table>
<thead>
<tr>
<th>Causes of Trolley Wire Breaks</th>
<th>Boston</th>
<th>Detroit</th>
<th>Cleveland</th>
<th>Total</th>
<th>Per Cent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Defective and wear...........</td>
<td>45</td>
<td>38</td>
<td>8</td>
<td>91</td>
<td>58</td>
</tr>
<tr>
<td>Uncontrollable................</td>
<td>23</td>
<td>22</td>
<td>20</td>
<td>65</td>
<td>42</td>
</tr>
<tr>
<td>Total..........................</td>
<td>68</td>
<td>60</td>
<td>28</td>
<td>156</td>
<td>100</td>
</tr>
</tbody>
</table>

Regular inspections are made either on a time basis or on the basis of the number of car passes. In Baltimore, for example, the entire overhead system is inspected once a month. In Chicago inspection is made after approximately 60,000 car passes and in Cleveland after 50,000. On lines where cars operate on a short headway this results in comparatively frequent inspection, while on the less heavily traveled lines the period between inspections is longer.

Since 1927 the Chicago Surface Lines has had a crew inspecting sections every 60,000 car passes. This crew also renews cars and other miscellaneous small fittings.

If, however, the line crew finds any of the larger elements of the overhead system to be in need of replacement or repair and the crew cannot take care of the job themselves, they report this to the superintendent, who assigns a regular repair crew to make the required repairs. This company renewed an average of 173 miles of trolley wire per year from 1914 to 1927 but in 1928 replacements were reduced to 78 miles and during the first 9 months of 1929 only 74 miles was replaced. The Chicago Surface Lines has found also that the use of underslung cars and armor has been an important factor in the reduction of trolley breaks.

The Cleveland Railway considers it of great benefit to the maintenance of its overhead system to give the line crews a thorough training. Samples of wire in different stages of wear are shown to the men, and they are instructed as to just how far this wear may progress until the defective section has to be replaced in order to prevent a wire break and a consequent delay and tie-up of traffic. Cleveland line crews are provided with gages for inspecting the wire, thus enabling them to determine accurately just when a certain piece of wire has to be replaced. If a wire is reported to be in need of substitution a special line inspector makes a careful examination and submits a report. The decision as to the action to be taken is then left to the superintendent, who from his experience determines whether replacement is necessary or not.

The average length of wire maintained by each line crew of the United Railways & Electric Company of Baltimore is approximately 60 miles. The New Orleans Public Service and several others, however, allot 100 miles to each crew. As a rule, repairs on fittings are made during the day but replacement of wire, except for actual breakdowns, takes place during the night on most properties.

Line crews in Baltimore are available for 24 hours. During the day they are not kept at their stations but inspect continually the overhead system. They are required to call the dispatcher at regular intervals, informing him as to their location so that in case of emergency they can be located at once. Each crew is assigned a certain portion of the system for which it has sole responsibility, and is held accountable for the up-keep and general condition of the overhead structures. In this way the entire system is covered thoroughly not less than once a month.

In Baltimore it also has been found desirable to study the form of trolley wheel, as this has been responsible
for many of the breaks. As a result the U-groove type of wheel has replaced the V-type formerly in use on the property, with a reduction in the number of replacements of ears to about one-fourth of what they were four years ago.

Research in overhead construction characteristics has been carried on extensively by the Cleveland Railway. It has been observed that the cars which are near car stops, beyond the point where the car comes to a standstill, are most subject to burndowns due to the starting arc. These cars usually have to be replaced every inspection period. Ears farther away from the car stop will last three or four inspection periods. Ears located before car stops will only wear out on account of mechanical causes, as the current is almost always cut off as the trolley passes over them prior to coming to a stop and they will only be worn out by the friction of the collector.

**Maintenance of Span Wires Important**

Several railways included in this survey believe that best results are obtained when the contact wire is kept taut and the span wires comparatively slack. Proper maintenance of the span wires and ears is of great importance and has direct influence on the number of trolley wire breaks. Experience of the United Railways & Electric Company of Baltimore indicates that it is advantageous to have the ends of the ears taper ground to afford the trolley wheel an unobstructed approach and run-off, thereby increasing the wear on the wire itself. Another matter of vital importance is the use of only high quality material in the overhead structure.

Much attention is given also to the proper maintenance and inspection of the collecting devices on car equipment. Loose trolley wheels or shoes not only disturb the passengers by their abnormal noisiness but also cause more rapid wear of the contact wire. Many companies have enlisted the aid and co-operation of building contractors and others who move loose building equipment, shovels, etc., across car lines, and they thus reduce considerably the number of wires burned out or pulled down. One company has gone so far as to ask all contractors in its city to notify it when shovels or other equipment have to be moved across car lines, and a special line crew is assigned to assist them in crossing the track.

It is worthy of note that on all of these properties which have made excellent records in reduction of trolley wire breaks the improvement has not been made with a sacrifice of economy. Instead, the total cost has in nearly every instance been reduced. The line crews, instead of taking all their time in making emergency repairs that can only be considered temporary, now spend more effort in making permanent renewals of trolley wire as a matter of routine. The work is then done with more care and as a result the tendency to failure in service is greatly reduced. More efficient methods of stringing trolley wire have been devised in several of the cities mentioned. These have been noted in this paper from time to time. Reclamation of materials also is practiced to a large extent and considerable savings are made in maintenance expense.

Apart from any direct saving in cost of carrying on the work of the line department, all of the companies have made large savings in transportation expense on account of fewer delays to cars. There has also been a greater gross revenue due to the very small number of tie-ups as compared with the records of past years when the work of the line department was not organized as efficiently as it is at present.
<table>
<thead>
<tr>
<th>Operating Expenses</th>
<th>Operating Revenue</th>
<th>Gross Income</th>
<th>Net Income</th>
</tr>
</thead>
</table>

**Key System Transit Co., Oakland, Cal.**
- October, 1929: 617,781
- December, 1929: 63,900
- October, 1930: 4,079,511
- November, 1930: 3,618,489

**Market Street Railway, San Francisco, Cal.**
- November, 1929: 799,843
- December, 1929: 525,789
- November, 1930: 2,386,766
- December, 1930: 2,455,871

**Capital Traction Co., Washington, D. C.**
- October, 1929: 378,108
- November, 1929: 777,303
- October, 1930: 3,613,504
- November, 1930: 795,190

**Jacksonville Traction Co., Jacksonville, Fla.**
- October, 1929: 96,472
- November, 1929: 69,945
- October, 1930: 1,156,146
- November, 1930: 1,219,114

**Honolulu Rapid Transit Co., Honolulu, T. H.**
- November, 1929: 85,384
- November, 1930: 982,543
- November, 1930: 5,246,124
- November, 1930: 10,208,025

**Dolmes City Railway, Dell Mones, Iowa**
- October, 1929: 100,198
- August, 1929: 177,305

**United Railways & Electric Co., Baltimore, Md.**
- October, 1929: 1,466,072
- November, 1929: 1,383,333
- October, 1930: 1,432,451
- November, 1930: 1,482,766

**United Railways & Electric Co., Baltimore, Md.**
- October, 1929: 1,466,072
- November, 1929: 1,383,333
- October, 1930: 1,432,451
- November, 1930: 1,482,766

**Boston Elevated Railway, Boston, Mass.**
- October, 1929: 2,925,491
- October, 1928: 2,980,077
- October, 1928: 50,904

**Eastern Massachusetts Ry. Street, Boston.**
- October, 1929: 545,465
- October, 1928: 520,382
- October, 1928: 615,830
- October, 1928: 625,928

**Middlesex & Boston Street Railway, Newtonville, Mass.**
- October, 1929: 648,451
- October, 1928: 635,401
- October, 1928: 697,038
- October, 1928: 705,038

**Department of Street Railways, Detroit, Mich.**
- November, 1929: 1,932,988
- December, 1929: 7,466,607
- October, 1930: 8,005,825

**Duluth Superior Traction Co., Duluth, Minn.**
- October, 1929: 404,096
- October, 1929: 404,096
- October, 1929: 745,116
- October, 1929: 1,440,423

**Kansas City Public Service Co., Kansas City, Mo.**
- See E. B. J-D. Dec.
- November, 1929: 761,938
- October, 1929: 7,454,116
- October, 1929: 745,116
- October, 1929: 745,116

**Lincoln Traction Co., Lincoln, Neb.**
- October, 1929: 394,582
- October, 1929: 395,552
- October, 1929: 92,080
- October, 1929: 92,080

**Fonda, Johnstown & Gloversville R. R., Gloversville, N. Y.**
- October, 1929: 403,476
- October, 1929: 403,476
- October, 1929: 403,476
- October, 1929: 403,476

**Jamestown, Westfield & Northwestern R. R., Jamestown, N. Y.**
- September, 1929: 224,690
- September, 1929: 107,926

**Brooklyn-Manhattan Transit Corporation, New York, N. Y.**
- October, 1929: 6,387,991
- October, 1929: 6,387,991
- October, 1929: 6,387,991
- October, 1929: 6,387,991

**Brooklyn & Queens Transit Corporation, New York, N. Y.**
- October, 1929: 5,761,938
- October, 1929: 5,761,938
- October, 1929: 5,761,938
- October, 1929: 5,761,938

**Hudson & Manhattan R. R., New York, N. Y.**
- November, 1929: 1,059,113
- November, 1929: 1,059,113
- November, 1929: 1,059,113
- November, 1929: 1,059,113

**Interborough Rapid Transit Co., New York, N. Y.**
- October, 1929: 6,131,600
- October, 1929: 6,131,600
- October, 1929: 6,131,600
- October, 1929: 6,131,600

**Long Island Railroad, New York, N. Y.**
- October, 1929: 3,578,672
- October, 1929: 3,578,672
- October, 1929: 3,578,672
- October, 1929: 3,578,672

**New York, New York, N. Y.**
- October, 1929: 2,923,057
- October, 1929: 2,923,057
- October, 1929: 2,923,057
- October, 1929: 2,923,057

**New York, Westchester & Boston R. R., N. Y.**
- October, 1929: 209,377
- October, 1929: 209,377
- October, 1929: 209,377
- October, 1929: 209,377

**New York, New York, N. Y.**
- October, 1929: 2,923,057
- October, 1929: 2,923,057
- October, 1929: 2,923,057
- October, 1929: 2,923,057

**Staten Island Rapid Transit Co., New York, N. Y.**
- October, 1929: 2,225,217
- October, 1929: 2,225,217
- October, 1929: 2,225,217
- October, 1929: 2,225,217

**Third Avenue Railway, New York, N. Y.**
- October, 1929: 3,135,099
- October, 1929: 3,135,099
- October, 1929: 3,135,099
- October, 1929: 3,135,099

**New York, Westchester & Boston R. R., New York, N. Y.**
- September, 1929: 5,331,638
- September, 1929: 5,331,638
- September, 1929: 5,331,638
- September, 1929: 5,331,638

**New York, New York, N. Y.**
- October, 1929: 255,269
- October, 1929: 255,269
- October, 1929: 255,269
- October, 1929: 255,269

**New York, New York, N. Y.**
- October, 1929: 255,269
- October, 1929: 255,269
- October, 1929: 255,269
- October, 1929: 255,269
<table>
<thead>
<tr>
<th>Operating Revenue</th>
<th>Operating Expenses</th>
<th>Taxes</th>
<th>Gross Profit</th>
<th>Net Income</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cincinnati Street Railway, Cincinnati, Ohio</td>
<td>$721,404</td>
<td>$490,905</td>
<td>$46,498</td>
<td>$186,990</td>
</tr>
<tr>
<td>Community Traction Co., Toledo, Ohio</td>
<td>$204,768</td>
<td>$244,958</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Lebanon Valley Street Railway, Lebanon, Pa.</td>
<td>$324,341</td>
<td>$236,855</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Philadelphia &amp; Western Ry., Norristown, Pa.</td>
<td>$27,555</td>
<td>$37,374</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Philadelphia &amp; Western Ry., Norristown, Pa.</td>
<td>$27,555</td>
<td>$37,374</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Galveston-Houston Electric Railway, Houston, Texas</td>
<td>$46,398</td>
<td>$26,557</td>
<td>2,276</td>
<td>12,125</td>
</tr>
<tr>
<td>Houston Electric Co., Houston, Texas</td>
<td>$289,119</td>
<td>$174,675</td>
<td>27,114</td>
<td>85,529</td>
</tr>
<tr>
<td>Pacific Northwest Traction Co., Seattle, Wash.</td>
<td>$401,910</td>
<td>$343,507</td>
<td>25,167</td>
<td>28,003</td>
</tr>
<tr>
<td>Seattle Municipal Railway, Seattle, Wash.</td>
<td>$483,615</td>
<td>$405,651</td>
<td>76,271</td>
<td>26,368</td>
</tr>
<tr>
<td>Calgary Municipal Railway, Calgary, Alta.</td>
<td>$854,757</td>
<td>$726,611</td>
<td>128,146</td>
<td>30,625</td>
</tr>
<tr>
<td>Edmonton Radial Railway, Edmonton, Alta.</td>
<td>$69,803</td>
<td>$47,253</td>
<td>22,549</td>
<td>201</td>
</tr>
<tr>
<td>British Columbia Electric Railway, Vancouver, B. C.</td>
<td>$784,976</td>
<td>$476,296</td>
<td>308,680</td>
<td>35,620</td>
</tr>
<tr>
<td>British Columbia Electric Railway, Vancouver, B. C.</td>
<td>$1,355,255</td>
<td>$766,769</td>
<td>588,486</td>
<td>0</td>
</tr>
<tr>
<td>Guelph Radial Railway, Guelph, Ont.</td>
<td>$44,712</td>
<td>$41,225</td>
<td>3,487</td>
<td>187,777</td>
</tr>
<tr>
<td>Ontario Hydro-Electric Railways, Essex District</td>
<td>$1,162,094</td>
<td>$855,272</td>
<td>346,822</td>
<td>4,592</td>
</tr>
<tr>
<td>Regina Municipal Railway, Regina, Sask.</td>
<td>$343,579</td>
<td>$212,973</td>
<td>130,605</td>
<td>12,671</td>
</tr>
<tr>
<td>Saskatoon Municipal Railway, Saskatoon, Sask.</td>
<td>$318,437</td>
<td>$203,385</td>
<td>12,849</td>
<td>97,502</td>
</tr>
</tbody>
</table>

More Than 3,000,000,000 a Year Carried in New York

RIDERS on the various transit lines in the city of New York totaled more than 3,317,400,000 passengers in the 1929 fiscal year, according to the annual report of the New York Transit Commission. During the year ended June 30, 1929, the rapid transit and street surface lines in the city carried a total of 2,972,400,000 passengers, an increase of 33,500,000 or 1.1 per cent over the preceding fiscal year. In addition the Hudson & Manhattan Railroad carried 111,800,000 passengers, and bus companies (exclusive of the Tompkins Bus Corporation and the municipal bus lines) 111,200,000 passengers, an increase of 58,000,000 or 1.9 per cent over the preceding year. The traffic of the Tompkins Bus Corporation is not included in the above comparison as no figures are available for the fiscal year 1928. This company carried 14,500,000 passengers in 1929. Traffic on the municipal bus lines, which do not report to the commission, has been estimated at 107,500. The total traffic, therefore, during the year ended June 30, 1929, on the rapid transit lines, Hudson tubes, street surface cars and bus lines, was more than 3,317,400,000 passengers.

The distribution of this traffic by class of service was as follows:

<table>
<thead>
<tr>
<th>Division of Passenger Traffic, New York Transportation Lines</th>
<th>Per Cent of Total Traffic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interborough Rapid Transit Co.</td>
<td>28.11</td>
</tr>
<tr>
<td>Elevated division</td>
<td>10.51</td>
</tr>
<tr>
<td>Total, L. R. T.</td>
<td>39.62</td>
</tr>
<tr>
<td>New York Rapid Transit Corporation</td>
<td>20.82</td>
</tr>
<tr>
<td>Total, rapid transit lines</td>
<td>59.44</td>
</tr>
<tr>
<td>Street surface lines</td>
<td>5.79</td>
</tr>
<tr>
<td>Hudson &amp; Manhattan Railroad</td>
<td>5.34</td>
</tr>
<tr>
<td>Municipal bus lines (estimated)</td>
<td>100.00</td>
</tr>
</tbody>
</table>

Rapid transit traffic alone amounted to 1,971,800,000 passengers, or 53,300,000 (2.8 per cent) more than in 1928. The following tabulation shows the distribution by boroughs of the ticket sales or fare collections at all of the rapid transit stations, both Interborough Rapid Transit Company and New York Rapid Transit Company (Brooklyn-Manhattan Transit System), during the fiscal years ended June 30, 1929 and 1928:

<table>
<thead>
<tr>
<th>Stations in</th>
<th>1929</th>
<th>1928</th>
<th>Increase</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manhattan...</td>
<td>1,149,260,509</td>
<td>1,137,237,354</td>
<td>12,023,155</td>
</tr>
<tr>
<td>Boroughs...</td>
<td>215,740,575</td>
<td>204,925,969</td>
<td>10,814,606</td>
</tr>
<tr>
<td>Queens.....</td>
<td>119,650,512</td>
<td>110,167,414</td>
<td>9,483,098</td>
</tr>
<tr>
<td>Unallocated...</td>
<td>1,446,767</td>
<td>1,376,628</td>
<td>70,139</td>
</tr>
<tr>
<td>Total.......</td>
<td>1,971,845,199</td>
<td>1,918,754,765</td>
<td>53,090,434</td>
</tr>
</tbody>
</table>

Fare collections at the Times Square subways during the two fiscal years were as follows:

<table>
<thead>
<tr>
<th>Fiscal Year</th>
<th>1929</th>
<th>1928</th>
<th>Increase</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manhattan...</td>
<td>14,023,155</td>
<td>1,24</td>
<td></td>
</tr>
<tr>
<td>Boroughs...</td>
<td>10,424,479</td>
<td>5,099</td>
<td></td>
</tr>
<tr>
<td>Queens.....</td>
<td>9,483,098</td>
<td>8,61</td>
<td></td>
</tr>
<tr>
<td>Unallocated...</td>
<td>70,139</td>
<td>5,10</td>
<td></td>
</tr>
<tr>
<td>Total.......</td>
<td>33,940,021</td>
<td>10,938,058</td>
<td>2,301,963</td>
</tr>
</tbody>
</table>
Eight-Cent Cash Fare
Announced in Cleveland

New Rate in the Ohio City Went
Into Effect on Jan. 1. Tickets
Sell at Rate of Seven for 50 Cents

The Cleveland Railway, Cleveland, Ohio, on Dec. 26, announced an increase in the rate of fare from 7 to 8 cents, effective on Jan. 1. The increase had been predicted, following a decision against the company by the United States District Court of Appeals in an income tax case.

Under the new rate of fare, tickets will be sold in strips of seven for 50 cents. In East Cleveland and Cleveland Heights, the two areas which pay a service-at-cost fare based on the Cleveland rate, the cash fare will advance from 9 to 10 cents, but the ticket rate will continue at five cents.

The result of the company's announcement was an immediate revival of agitation for adoption of a zone system of fares urged by the company a year ago but tabled by the Cleveland Railway committee of the City Council. President Alexander said:

"For many months the interest fund has been at a figure which would have made an increase necessary had we not been hopeful of a favorable decision in our long-pending income tax suit. The decision of the United States Court of Appeals, while a partial victory, makes impossible the continuance of the present rate until we can have appealed the case and have had a final adjudication.

"It is regrettable that the city did not agree with us at the beginning of the year on some application of the zone system which would make fares more equitable to riders. As it is, the increase falls largely on the city rider, whose ticket rate, as well as cash rate, is advanced.

The East Cleveland and Cleveland Heights riders, generally, will pay no increase, only the cash rate and local fare being changed.

Lakewood, of course, advances with Cleveland, although retaining its local rate. Perhaps with the differential between city and suburbs reduced to approximately 1 cent, except in cash rates, the making of a new franchise by Lakewood will be possible."

Cincinnati-Lake Erie Line Opened

The Cincinnati & Lake Erie Railroad, formed recently through the consolidation of some of the outstanding lines in Dayton, Cincinnati & Lakesville, and the Lima-Toledo Railroad, opened its electric line, linking the Ohio River with Lake Erie, on Dec. 31. The new system, announced by Dr. Thomas Conn should be a strong direct electric interurban line in the world. It covers a route of 220 miles.

The new line will offer high-speed passenger and freight service with improved equipment. New types of motors have been developed for cars in this service which, under tests, have attained a speed of 75 m.p.h.

Consolidation of the three interurban lines was engineered by the Cincinnati, Hamilton & Dayton Railway under the direction of Mr. Thomas Conway, president of that line.

Officers of the new Cincinnati & Lake Erie Railroad, besides President Con- way, are William L. Butler, Philadelphia, executive vice-president; J. H. McClure, Dayton, vice-president in charge of public relations; Richard Breckinridge, Cincinnati, vice-president in charge of traffic; H. C. Donecker, Day- ton, vice-president in charge of research, and W. D. Gordon, Philadelphia, secretary and treasurer.

Cars, Buses, Taxis and Planes
in Grand Rapids

A municipal transportation system which ties up street cars, buses, taxicabs and airplanes, has been effected in Grand Rapids, Michigan, by the Grand Rapids Railroad. The move is looked upon by Louis J. DeLamarre, general manager, as one of the outstanding steps in city transportation service. He points out that the combined services of street car, bus and taxicab automatically will help each other to serve further the residents of the city, permitting the city's prin...
principal transportation organization to meet every citizen's needs.

While the railroad has not taken over an urban service, the Furniture Capital Air Service, Inc., has taken offices in the street railroad building and a fleet of planes is to be available at all times for intercity transportation service from Grand Rapids to any other city in the state with a landing field.

Special attention will be paid to emergency and commercial calls, which may be filed with the railway central office. The system has been worked out so completely that a person wishing plane service may call for a cab to the airport and his taxi driver will have his ticket for the flight when he arrives. The entire system will be under municipal regulation.

The railroad plans a special school of instruction for the cab drivers. A similar school long has been in operation for trainmen.

The company also has announced it will spend approximately $100,000 in 1932 on improvements. Twenty new electric coaches will be placed in service as soon as possible, Mr. De Lamarre asserts.

Richardson Hard Hit by Storm

The recent cold wave, which froze up private automobiles and even made the average home in and around Richmond, Va., uncomfortable at times, was not in the least partial to the Virginia Electric & Power Company. The movement of cars and buses, which is ordinarily according to carefully worked out schedules, became exceedingly irregular. Frequent stoppages, slippery sidewalks, abandoned cars, and other causes contributed to the confusion. On Dec. 28 there were 21 fire alarms. General Manager Penick said: "The other day we had a trotty break, the second in a year, and service was crippled temporarily over a considerable area, but the ice and sleet were the main contributors to irregular service."

"We are not citing the difficulties with which we have to contend as alibis for failures of our service, but we want our patrons to know that whenever they know, we feel sure they will bear with us under such conditions."

Edward Dana on the Air

Edward Dana, general manager of the Boston Elevated Railway, Boston, Mass., gave the first of a series of radio broadcasts on Dec. 10 from Station WCR, in the broadcast is identified as the "El Service Hour" intended to give the public a better insight into and understanding of the problems and difficulties confronting present-day transportation companies. Mr. Dana said in part: "We hope to make clear matters which cause misunderstandings, and demonstrate that our only aim is successful operation and satisfactory service to the patrons of the Boston Elevated Railway is modern in every respect. It compares favorably with the best in use anywhere in the country. By reason of this modern equipment your trips on the Elevated system have been made more comfortable, speedier and safer."

Mr. Dana explained that the elevated carried 1,000,000 passengers daily. He said the company would do its utmost to render efficient service in all respects and under all circumstances.

City and Company Co-operate on Buffalo Improvements

The International Railway, Buffalo, N. Y., has been instructed by the Buffalo City Council to undertake track reconstruction and roadbed improvements on streets covering 32 miles of single-track and involving an expenditure of approximately $920,000 for 1930. The tentative program was suggested by the municipal authorities at a conference attended by B. J. Yungbluth, president of the railway. President Yungbluth expressed the belief that this program was too much for the company to undertake in a single year, but consented to cooperate with the City Council in reaching an agreement on streets where the work is most essential.

Denver Fare Ordinance Advanced

With only one change, boosting from $10,000 to $15,000 in the amount to be paid for use of city streets, the Denver Tramway Corporation ordinance, asking higher fares and permission to substitute buses for cars on any one or all of its 82 lines, was passed on first reading by the City Council of Denver, Col., on Dec. 23.

A second passage Jan. 5 will make the bill operative, carrying provisions for 10-cent fares, or three tokens for 25 cents, and a cross-town bus route, in addition to a cross-routes bus service for districts in which it seems desirable to supplement cars.

Two formal protests, representing 1,200 residents of East Denver and Montclair, were registered prior to passage of the ordinance. The protestor does not believe buses will provide adequate transportation in their areas, and their tax assessments are to be eliminated. On other phases of the bill there were no objections.

New Jacksonville Franchise

Up Jan. 14

The Miller draft of the proposed franchise of the Jacksonville Traction Company, Jacksonville, Fla., to take the place of the one under which it now operates but which expires in 1932, will go to the company officially at once. The grant was placed on first reading at a special session of the City Council on Dec. 19, and referred to the laws and rules and public service committees jointly, with instructions to the recorder that copies be sent the company, along with a copy of the report and recommendations of the public service committee that this action be taken.

Under the recommendations of the public service committee the company will be asked to make a written reply to the proposed franchise and other views on the proposed franchise, as drafted by City Attorney Austin Miller, not later than Jan. 14, the next meeting date of the Council.

Louisville Situation Reviewed

President Barnes Goes Over the Accomplishments During His Regime in Southern City—System Returned to Dividend-Paying Basis

President J. P. Barnes, of the Louisville Railway, Louisville, Ky., issued a statement to the stockholders on Dec. 7 regarding the condition of the company. When Mr. Barnes became president of the company it was laboring under the handicap of a 5-cent fare, under an eighteenth-century type of franchise ordinance. Eventually a 7-cent cash fare was secured; then under federal injunction fares were advanced to 10 cents cash with three tickets for 25 cents.

The number of passengers carried has fallen off, due in part to higher fares, but also in part because there is considerable unemployment in Louisville at this time. Moreover, the property is operating at the rate of 2 miles for 25 cents, and we are carrying four passengers for a single fare.

The increase in revenue under the new fare rates became effective too late to affect financially 1929 operations. The belief was expressed, however, that when normal conditions of employment and business in Louisville are restored, the company's earnings will show a material improvement over the conditions under the ordinance regulations in effect at that time neither legal right nor our ability to earn was sufficiently maintained to assure economical re-financing.

"When the present management took charge in 1920 no dividends, preferred or common, had been paid for two years, and the company's total liabilities exceeded its total assets by more than $1,000,000. By 1929 our earnings had so improved that we were able to begin paying off accrued dividends from funds we had not until then. The result was that we have paid not only these dividends, but we have declared additional dividends of $582,652 common dividends, and the total dividend payments have amounted to $2,332,652. At the
close of 1928 there had been accumulated a corporate surplus of $686,328. The report of Humphrey Robinson & Company, accountants, made as of Dec. 31, 1928, shows the company to have a book value of $110 a share.

Refinancing Ahead

Our constant effort has been to build up a regular, dependable net earning capacity sufficient to meet the bankers' requirements for refunding operations.

"Since 1923 there have been added to the company's property 121 freight cars, 4 buses and numerous smaller items of equipment. Many renewals and improvements of carhouses and track have been made."

Pensacola, Fla.—Gulf Power Company forces are completing construction of the new tracks in the western section of the city for the Bayshore line. Under an agreement with the Frisco Railway, when that road purchased parts of the Bayshore line, the power company will operate its Bayshore cars into the city over the spur line. The Frisco Railway is improving the portion of the Bayshore line purchased.

Seattle, Wash.—Residents of the White River Valley, through which the abandoned Seattle-Tacoma interurban line is routed, have organized to formulate plans for re-establishing the electric system might be effected. A second meeting has been scheduled for Jan. 15 in the Auburn City Hall. Stage schedules were declared inadequate to serve transportation needs of valley residents. T. J. Ferguson, Auburn, is active in the movement.

Chicago, Ill.—Failure of the City Council of Chicago to initiate action in the matter of the new subway and disputes among officials of the elevated and the surface lines as to whether the proposed surface subway shall be for elevated trains or for both "L" and surface cars are cited as the two major causes of delay. In fact that the $57,000,000 railroad fund, accumulated out of payments made by the surface company to the city, is now represented in the main by paper, chiefly tax anticipation warrants, is another obstacle in the way of an underground for the Windy City. One definite step toward settling some of these problems was taken recently by a Council sub-committee which will seek to have the telephone company and the Commonwealth Edison company contract with the city to place their underground wires and mains in gallery space in the subway.

Far Rockaway, N.Y.—The Transit Commission of New York City Board of Transportation are holding a series of conferences for the purpose of working out a co-ordinated policy with respect to the Rockaway Branch of the Long Island Railroad. This is the branch which the company is desirous of selling to the city. The city cannot immediately answer the negotiation count. It will probably be five years

"In view of this growth in earnings, addition to capital and improvement of property, there can be little doubt that the present low market quotations of Louisville Railway securities are due to uncertainty in the minds of investors as to the refunding of the $6,000,000 first mortgage bonds due July 1, 1930. We are continuing negotiations for this refunding. Several plans are under consideration and, therefore, it is impossible to state at this time just what the final proposal will be. It may be that no refinancing plan will be perfected until after the decision of the city's case, which will be argued in the circuit court at Cincinnati on Jan. 6, 1930. As soon as positive recommendations can be made, I shall advise you fully."

Waverly, N. Y.—Permission has been granted the Waverly, Sayre & Athens Traction Company by the New York Public Service Commission to operate buses in place of the electric cars on the New York-Pennsylvania state line at Cayuta Avenue in Waverly, N.Y., over the 18-mile north line of Ashby Avenue, is now being undertaken by the Key System Transit Company, according to the announcement of Alfred J. Lundberg, president.

Richmond, Va.—Continued operation of the Richmond-Ashland Railway is possible only if citizens serve by the road rally to its support. A committee of stockholders has been named to lay the matter before the people in territory taken up by the 18-mile electric line. Due to loss of revenue and large expenses incurred in making emergency repairs to the viaduct leading into the station on Broad Street, it is not expected to be able to meet in full the interest payment on the mortgage bonds due on Jan. 1.

Pasadena, Cal.—Elimination of every grade crossing in Pasadena, eventual electrification of the railroad, elevation of tracks, and installation of tracks from Los Angeles to San Bernardino are plans which the Santa Fe Railroad is said to be about ready to make public.

Ithaca, N. Y.—The Public Service Commission has decided to defer action on the application of the Ithaca Railway, Inc., for approval of the exercising of rights and construction under a franchise granted to it by the city of Ithaca on Aug. 7, 1929. This action will give the petitioner an opportunity of applying to the commission for approval of a reorganization following the sale of the property and franchise to the Ithaca Railway Company in 1928. The sale was made, pursuant to an order of the Supreme Court, to Sherman Peer, as agent of a corporation to be formed, who operated the railway until it was turned over to the Ithaca Railway, Inc. The commission held that the reorganization should first be authorized by the commission before the company is in a position to receive the approval which it seeks in the present application.

South Bend, Ind.—Sale of the Chicago, South Bend & Northern Indiana Railway and the Southern Michigan Railway under foreclosure was postponed on Dec. 28 until Feb. 1. Bankruptcy proceedings were entered to satisfy the claims of several mortgage holders.

Athens, Ga.—After Jan. 1 people who had protested against non-operating of the city limits of Athens will be liable to prosecution by the city. Under the new law no one will be allowed to ask for auto parking spaces on the sidewalks. Any speech, motion or gesture to an autotoist for a ride will be considered a violation of the law.

(Continued on Page 87)
Bridge Line Rolling Stock to Be Sold

Commissioner Albert Goldman of the Department of Plant and Structures of New York City, through whom, as the custodian of bridges, the deal with respect to the terminal line was transacted, the writer reports that very soon he proposes to dispose of the seventeen cars under the hammer. He will advertise them for a period and then knock them down to the highest bidder. The cars constituted the rolling stock of the defunct Manhattan Bridge 3-Cent Line, which went out of business on Nov. 13, when the city handed its owners a check for $206,750.29 in return for which the company abandoned its operation over the Manhattan Bridge and Flatbush Avenue extension between Fulton Street, Brooklyn, and the Bowery, in Manhattan, re- turned its franchise to the city and deeded the municipality its tracks, poles, trolley wires and cars—all it owned save some real estate on which is located its carhouse in Brooklyn.

$25,000,000 Expenditure Ahead for St. Louis

Stanley Clarke, president of the St. Louis Public Service Company, St. Louis, Mo., has informed the St. Louis Transportation Survey Commission that the company would spend $25,000,000 or more for additional equipment and other betterments to service, including extensions, if it could raise the money to the end that this may be accomplished the commission has created a finance committee to work out a plan to enable the company to make the expenditures suggested by R. K. Kellner, Jr., consulting engineer for the commission. In a recent report to the commission Mr. Kellner suggested the company spend $25,776,000 as follows: Rerouting car lines, $726,000; extensions, $1,338,000; feeder buses, $512,000; 800 new cars, $1,314,000; 200 additional cars, $1,400,000, and street-paving between car tracks, $6,000,000. He also recommended elimination of hundreds of stops and the ultimate driving of cars or "limuses.

Mr. Clarke is a non-voting member of the Transportation Survey Commission.

B. E. Sunny Sees Chicago Settlement Ahead

B. E. Sunny, chairman of the prospective committee of the Chicago City & Connecting Railway collateral trust bonds, in a letter to the depositors of bonds says:

"In the letter of June 11, 1929, your protective committee reported that the necessary enabling legislation had been approved by the State. The sub-committee of the local transportation committee of the city of Chicago, in charge of working out a new ordinance, has taken action to give the constructive draft of the proposed new franchise.

"The sub-committee left blank three or four sections dealing with the question of the capital account of the new company, amortization and sinking fund. The draft of these sections was deferred till the views of the reorganization committee could be obtained.

"As soon as the views of this committee on the question of rate of return, amortization, sinking funds and other like problems can be obtained, it is hoped that the drafting of the franchise would be prompt and sent to the City Council for consideration and approval, subject, of course, to a referendum. It is held that the franchise can be passed and ample time given for a thorough discussion of the provisions of the ordinance so that a return bond would have in the spring or early summer of next year."

Seattle Council Has Two-Year Moratorium Proposal

The City Council of Seattle, Wash., is now ready to take the last step necessary to make the two-year moratorium on the municipal railway bond redemption effective. Two ordinances have been introduced at a special Council session, and can be brought up immediately for passage. The plan is to limit payments to the bondholders to interest during 1930 and 1931 so as to enable the city, during the next few weeks, to repay fully the loan from the Water Department that was used to make the payments for 1929 on the purchase bonds. The Water Department loan should be wiped out before March. With the floating debt of the municipal railway wiped out, funds for the purchase of new cars and a modest return bond redemption out of surplus can begin to accumulate. There has been no decision as to whether track improvements or new cars shall take precedence, though there is some general agreement that the track work should take precedence.

Mayor Frank Edwards has declared that this is the first dividend ever given to the riders whose money is paying for the railway system, and he has demanded the best rolling stock within the shortest time. The Mayor has repeatedly urged that in providing new cars as much work as possible be done in Seattle. He said: "In the interest of the car riders are entitled to first consideration, because it is their patronage which makes the purchase of the railway system possible and their money that keeps it going."

Inquiry Into Ownership of New York Properties

The Public Service Commission of New York by order issued on Dec. 27 directed the United Traction Company, the New York Transit and the Schenectady Railway to produce before it in Albany, on Jan. 8, records in an inquiry instituted by the commission, on its own motion, to determine the ownership of the capital stock of the companies.

Whether any transfer or assignment of capital stock has been made in violation of the public service commission law.

Whether the company has made or recorded upon its books any transfer or assignment of capital stock in violation of the provisions of the public service commission law.

The latter directs each of the three companies to produce at the hearing "its stock book and any and all other records showing or tending to show the present ownership of its capital stock and any and all transfers or assignments thereof" by the United Traction Company since June 17, 1927, by the New York Transit and by the Schenectady Railway since Jan. 1, 1929.

Speeding Up the Louisville Service

The recent experiment by the Louisville Railway, Louisville, Ky., of allowing motormen on Market Street to disregard running time on outbound trips in certain territory has proved successful. As a result, the company is pleasing passengers by enabling them to reach their destination in a shorter period of time. In consequence the company has announced that, beginning at once on specified lines and at locations indicated, motormen may disregard running time and go on to the end of the line as soon as they can do so safely. Leaving time at the ends of the line and at all places other than those designated must be strictly observed.

The territory in which motormen are allowed to disregard the time schedule, cars are operated with the proper slow-downs for dangerous street crossings. The exceptions that have been made to the regular running rules are solely to prevent the cars from having to drag in order to observe the schedule religiously.

Chicago Transfer Demand Deferred

The Chicago City Council's committee on local transportation has decided not to initiate before the Illinois Commerce Commission proceedings to obtain transfers between the elevated and elevated lines. The resolution to this effect presented by Alderman John A. Massen eighteen months ago has been referred to the subcommittee, which has been drafting the proposed new franchise.

Committee members who opposed such proceedings since before the state commission declared that to do might interfere with the negotiations with the companies for a new ordinance. All agreed that better service is imperative, and favored incorporating the universal transfers in the new ordinance. At the same time, a subcommittee of five members was appointed to go before the commission with a request that the Surface Lines be permitted to use a part of the $18,000,000 street improvement fund to build 125 miles of double-track extensions and to install feeder bus service.

The companies point out that the draft is as binding as possible on this point, and that the entire question of whether or not the companies will carry out the promised program depends on their ability to get the $200,000,000 of new monies required.

Other objections of the Aldermen to the proposed ordinance draft had to do with its failure to determine which faction shall pay for building the connection between the elevated system and the subway. The companies wish the city to do this, but the subcommittee desires that the companies reconsider the matter.
Public Service Fare Decision
Based on Valuation

Newark Paper Analyzes Operation of New Jersey Company So Its Readers May Be Adequately Informed

W HEN the Public Utilities Commission of New Jersey handed down the fare decision in the Public Service Co-ordinated Transport operation, the finding for the company granting a 10-cent cash fare with ten tokens for 50 cents, which went into effect Jan. 1, was based upon failure to earn a 7 per cent return. The valuation of the property was fixed by Judge Haight, who was master in chancery in the company's application of 1921. In a letter to President McCarter, the commission stated that the company's operating income last year fell short by $3,300,000 of what a return of 7 per cent would have been upon the Haight valuation brought down to date. However, the earning power of the property, the company's operating revenue fell approximately $1,900,000 short of a 7 per cent return upon its own valuation at the same time brought down to date.

An analysis of the earnings of the Public Service Co-ordinated Transport and its predecessors, the Public Service Railway and the Public Service Transportation Company, was made in a special article appearing recently in the Newark Evening News. The article points out that the only things about which the commission is concerned in its present decision are the operating income, that portion of the revenue remaining after deducting operating expenses, depreciation and taxes, and the valuation of the property placed on it by the authorities. The company's capitalization is not in any sense a factor, and it is only necessary that the company be allowed to earn a reasonable return upon the value of the property.

Nobody knows conclusively what a fair value of Public Service Co-ordinated Transport is, according to the article. There has been no valuation of the property since 1921, at least by the commission or the courts. In the 1921 case, there was a wide variance in the valuations submitted. The company claimed a value of approximately $200,000,000. An appraisal by Ford, Bacon & Bradley and the Legislator, placed the value at $125,000,000. Mark Wolff, a utility expert, made a study resulting in an estimate of $100,000,000 higher cost. Other valuations were submitted.

After a study, the utilities commission finally decided that $82,000,000 was the value for rate-making purposes. The company carried the case to the federal courts and Judge Haight, as special master, found a value of not less than $110,000,000. These last two figures stand out, the one as the commission's findings and the other as the court's final decree.

Since 1921 there has been a revolution in the company's transportation methods. Buses have come to the fore and have replaced the old trolley cars. Trolley lines have been abandoned and replaced by buses. How much remains of the original trolley inventory no one outside of the company or itself knows. Therefore, nothing short of a new inventory and appraisal would establish what would be a fair value today.

Public Service has spent millions of dollars in acquiring bus lines and in purchasing new buses. It is debatable whether the company is entitled to a return upon the difference between a fair price for the buses and what it actually paid.

<table>
<thead>
<tr>
<th>Year</th>
<th>Operating Income (P.U.C.)</th>
<th>P.I.C.</th>
<th>Valuation (Intangible)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1922</td>
<td>$7,235,001</td>
<td>$12,300,000</td>
<td>$4,925,000</td>
</tr>
<tr>
<td>1923</td>
<td>$6,712,000</td>
<td>$13,700,000</td>
<td>$3,588,000</td>
</tr>
<tr>
<td>1924</td>
<td>$6,055,025</td>
<td>$15,700,000</td>
<td>$2,733,000</td>
</tr>
<tr>
<td>1925</td>
<td>$5,073,220</td>
<td>$15,700,000</td>
<td>$2,733,000</td>
</tr>
<tr>
<td>1926</td>
<td>$3,456,933</td>
<td>$15,700,000</td>
<td>$2,733,000</td>
</tr>
<tr>
<td>1927</td>
<td>$3,258,494</td>
<td>$15,700,000</td>
<td>$2,733,000</td>
</tr>
<tr>
<td>1928</td>
<td>$2,992,252</td>
<td>$15,700,000</td>
<td>$2,733,000</td>
</tr>
</tbody>
</table>

In the first column of the accompanying tabulation is shown the operating income that Public Service actually has received, by years, through operation of its trolley cars and buses, exclusive of the Public Service Railroad and interstate buses. These figures, by themselves, give no answer to the question of whether the company has been receiving a fair return upon the fair value of its properties. Using the several valuations, and bringing them down to date, the computation of earnings becomes simply a matter of mathematics.

Making the proper adjustment in the company's capital account for dividends, withdrawals and retirements, and for accrued depreciation, the 7 per cent return on the basis of Judge Haight's decision has been figured out. This is shown in the second column of the tabulation. This exceeds by $2,000,000 to $4,000,000 the actual operating income of the company in the seven years examined.

If the original valuation made by the Public Utilities Commission, which was $82,000,000 in 1921, be used as a rate base, with proper changes year by year, the 7 per cent return would be as shown in the third column of the tabulation. This amount was virtually equal to the actual operating income. For each succeeding year, the deficiency in income has been greater. Even on this low basis the deficiency for 1928 was approximately $1,800,000.

Another computation has been made, with deductions for the so-called intangible value of buses. It was the practice of the company, up to 1928, to divide the cost of buses between tangible and intangible value. The tangible value represented what the company believed the buses to be worth. The balance between that and the price actually paid represented the intangible value. This intangible value, by years, has been between $2,000,000 and $4,500,000. Making a computation of earnings of 7 per cent upon the board's base valuation of 1921, with deductions for intangible bus value, the figures given in the last column are obtained. Even using this basis, there is a deficiency in earnings in every year except 1922, varying from about $1,000,000 and $2,500,000.

Summarized, a 7 per cent return upon Judge Haight's valuation of $110,000,000, as would total $88,813,483 for the period 1922-28. The total upon the board's valuation with inclusion of bus intangibles would be $48,609,480, the total of all intangible bus values, the total for the period would be $42,943,380. The operating income of the company during that period has been $32,241,649.

Chicago Suburban Line Sold Under Foreclosure

The Hammond, Whiting & East Chicago Railway was sold at auction on Dec. 26 to a syndicate of business men headed by Morse Dell'Piani, president of the Northern Indiana Public Service Company. The sale was conducted by Ernest Force, special master in chancery, who acted under a decree of Federal Judge Slick. The sale price was $21,000,000.

A mortgage of $1,788,000 had previously been foreclosed on the property. The sale was approved on Dec. 26 by Judge Slick. An announcement of the pending sale was noted by the newly organized Calumet Railways, Inc., will take over the property. The Calumet Railways, Inc., seeks to obtain franchises from the three cities involved. If it is successful in doing this, the Insull organization will provide money for rehabilitation.

Ohio Interurban Sells Its Power Lines

Sale of all its power lines and poles, and the rights-of-way for such lines to the Ohio Edison Company, Springfield, Ohio, was announced on Dec. 26 by the Cincinnati & Lake Erie Railroad Company. The railroad, through electric railway system formed by the merger of the lines of the Cincinnati, Hamilton & Dayton Railway, the Indiana, Columbus & Louisville and the Lima-Toledo Railway lines recently. The sale price was $350,000. Coincident with the announcement of the sale, the company also revealed that it was entering into a contract with the Springfield company whereby, in the future, the Ohio Edison Company will supply all of the power for the railway company.

Electric Railway Journal—Vol.74, No.1
56
News Briefs
Continued from Page 54

South Bend, Ind.—steadily increasing patronage has unqualifiedly approved the operation of Chicago, South Shore & South Bend Railroad de luxe trains. Reports show that the traveling public indorses the operation of parlor cars on dining car trains, for parlor car patronage on de luxe trains has increased from month to month since the line instituted this service last July.

Trenton, N. J.—The Trenton Transit Company has been organized as the successor to the Delaware, NJ, & Mercer County Traction Corporation. The new company really represents the consolidation of the two railways, with the most of the old bus subsidiary, the Central Transportation Company.

Allentown, Pa. — A bill for foreclosure of the first mortgage of $150,000 on the property of the Bethlehem & Nazareth Passenger Railway has been filed in the commonwealth District Court in Philadelphia by the Guaranty Trust Company, New York, trustee for the bondholders. The bill was filed because the company is unable to pay the 7.5 per cent payment in bonds which matured May 1, 1929. The railway is being operated under lease by the Lehigh Valley Transit Company.

Chicago, Ill.—The Illinois Commerce Commission on Dec. 18 approved the issuance by the Chicago, North Shore & Milwaukee Railroad of $700,000 Series G equipment trust certificates, partially amounting to $252,000 to cover the cost of 25 additional all-steel motor cars, delivery of which is to start on Feb. 1. It also approved the issuance of $522,000 first mortgages, paying 5 per cent bond to reimburse the company treasury for expenditures made in the latter part of 1929 for improvements.

New Orleans, La.—Racing fans desiring quick and efficient transportation to the tracks this season are invited to use the service of the Orleans-Kenner Tramway Company, which is one of the quickest in the city and has an added advantage in that its cars stop only a few feet from the grandstand entrance of the race track. L. J. D'Aubin, general superintendent of the Orleans-Kenner Tramway Company, has suggested that the patrons want speedy, efficient and comfortable service, which the company renders.

Hampton, Va.—Norman E. Drexler, general manager of the Public Service Company, has asked the Hampton City Council to subsidize expert drivers and substitute buses for trolley cars on the east Hampton line.

Jamestown, N. Y.—The Jamestown Motor Bus Transportation Company, a subsidiary of the Jamestown Street Railway, plans to extend its Fairmount line to the terminus in Lakewood, N. Y., to the village of Ashville, making the one-way distance of that line 9 miles, instead of 6 as at present. The line is planned in direct rivalry to the Jamestown-Misias line, which will continue its service between Jamestown and Ashville, the bus line being intended to augment the trolley service.

Portsmouth, Ohio.—The Public Utilities Commission has authorized the Portsmouth Public Service Company to abandon service for a period of one year to the villages of Portsmouth, Ironton and Ironton. The abandonment will be effective after 30 days notice to the public.

Springfield, Mass.—A through bus service from Springfield to Boston, Mass. Is to be started about Jan. 8 by the Springfield Street Railway in conjunction with the Worcester Consolidated and the Boston, Worcester & New York companies. Three round trips daily are proposed. This service is in addition to buses already in operation by the same agencies and will follow routes already authorized by state and municipal authorities, with the exception of a minor change in Springfield.

San Diego, Calif.—The San Diego Electric Railway has obtained the consent of San Diego and National City that it has applied to the Railroad Commission for abandonment of its lines and to dispose of the property to Southern Pacific Company and Newton Avenue, San Diego, and thence on a private right-of-way through El Paso and to San Antonio and to the general freight line of the Southern Pacific Company. The company recently acquired the Sutherland Stages operating between National City and San Diego.

Brooklyn, N. Y.—Irving Lee Bloch, vice-president of the Long Island Title & Guarantee Company, suggests the building of a four-track subway underneath the Atlantic Avenue route of the Long Island Railroad, the tearing down of all existing railroad tracks and the rebuilding of Atlantic Avenue into a motor parkway with direct egress from Jamaica, and the connection of such a facility with Brooklyn and the existing Flatbush Avenue terminal with the existing systems leading to other parts of Brooklyn and Manhattan.

Kansas City, Mo.—Due to the Kansas City election and delay in the state valuation of the Kansas City Public Service Company, the street car fare issue before the Public Service Commission is about to be continued into April. The company has a 10-cent fare schedule on file at Jefferson City and the last six-month suspension ordered by the commission expires on Jan. 12. The Missouri statutes permit the commission to suspend a filed schedule twice before it must be denied or affirmed. Valuation will probably be completed in February.

St. Louis, Mo. — The General Cab Company of Kansas City, and Los Angeles, Calif., on Jan. 4 will begin operations with a fleet of $4 Ford taxis. The fare will be 10 cents for flag pull and 10 cents for each additional half-mile compared with a 25-cent flag pull and 7½ cents a mile charged by other companies in the St. Louis field. The new taxicab company plans to increase its fleet to 100 cars within a very few months.
Receivers for Albany, Syracuse and Rochester Lines

Federal Judge Frederick H. Bryant, at Malone, N. Y., on Dec. 28 appointed receivers for the United Tracton Company of Albany, Troy and Cohoes, and for the New York State Railways, serving Rochester, Syracuse and Utica. Towner, both of Albany, were named receivers for the United Tracton, while Benjamin E. Tilton of Utica, and Wallace F. Nichols of Plattsburg were named receivers for the New York State Railways.

The receivership was forced by an action of the General Finance Company, which alleged that United Tracton owed about $195,000 on one note and $3,500,000 on another. The company also had some miscellaneous accounts, which was stated, amounting to about $100,000. There was a mortgage of $420,000 due Jan. 1 and some miscellaneous interest. The United Tracton is said to have an accumulated deficit of about $10,000,000. Earnings for the last year were represented by counsel for the plaintiff as showing a deficit of more than $600,000. The allegation also asserted that the company had defaulted interest amounting to $80,000 on Nov. 1.

The Finance Company stated that the New York State Railways owed about $400,000 on seven accounts and about $260,000 on labor claims and taxes. Robert C. Watson, president of the Rochester Trust & Safe Deposit Company and member of the protective committee formed by bondholders of the Rochester Railway, which was taken over by the New York State Railways, characterized the receivership as a "modest move by the management of the railway lines to gain more time" and he said that the activities of the protective committee will be pressed with the greatest vigor. He said that he would make no attempt to interpret the legal phases of the receivership, but he viewed it as another means of "intimidating the bondholders to accept an unreasonable and unfair offer of reorganization or their securities into those of the Association Gas & Electric Company." He is said to have charged that the attitude of the present management of the railroads toward the bondholders shows that they are "wreckers, not builders." J. H. Pardee, chairman of the New York State Railways, has sent a letter to the bondholders of the Rochester Railway outlining the status of the holders under the terms of the mortgages covering that property. The statement is technical and mostly of direct interest to the actual holders of the securities, but the following excerpt is of general interest:

"The service-at-cost plan expires on July 31 next. The plan provides, if it were to be extended, notice of extension should be filed one year before the expiration date. No notice of extension was given and so far as we know there is no part of the city of Rochester that will extend the service-at-cost plan for any longer period. If it is not extended and the Quinby decision upheld by the courts, the situation will be serious. We have had a statement made by the treasurer of the Rochester Electric company that the number of revenue passengers carried for the year ended October, 1929, to see what the income statement would be if that line had been in service for the twelve-month period, with these results:

Operating expenses, maintenance, depreciation and taxes, $3,520,517
Operating revenue, other income, 2,717,788
Operating loss before provision for bond interest, 1,445,059

"The erroneous impression also seems to prevail that the Rochester Railway lines can be seized by the Rochester Railway first and second mortgage bondholders and the Third Mortgage Bondholders of the New York State Railways. This cannot be done since substantial amounts of the equipment, as well as other property necessary for operations, is mortgaged to the first lien of our consolidated mortgage."

Under date of Dec. 21, 1929, H. C. Hopson, president of the Associated Gas & Electric Companies, which made an offer of exchange to bondholders, issued a statement in which he referred to the dangers of receivership. After reviewing briefly the history of the early days of the company Mr. Hopson says that "most astute bankers and able students have for years worried about its future and greatly doubted its ability to survive. It came to be a true thing when that no well-informed person willingly invested a dollar in street railway securities unless he got the best security available at the time, and then only on a basis which he thought would compensate him for the risk being taken."

He goes on to say that "the Electric System did not want the transportation system; that in fact it "unavoidably became the largest security holders of the transportation system," Mr. Hopson says.

"As a result of acquisitions of electric and gas properties a few months ago, our interests also unavoidably became the largest bond holder of the tracking system in which you are a bondholder. We did not value our interest at much, if anything; but on the other hand our predecessors with less experience in the industry than ourselves had hope for it. Their advisors and the operators in charge of the properties were still optimistic that something might come out of it. It has been done to change the course of events. * * * It is obvious that those who have purchased securities of an enterprise which is primarily engaged in the light and power business cannot be expected to be willing to have their money invested in another industry without which most investors feel decidedly pessimistic."

Later the offer of exchange for Albany Railway's $5 was made 90 per cent of the face value in 1926-27. Special dividends to bondholders was announced then, as well as the creation of a plan for the purchase of property and the operation of the company and of the value of the real estate subject to the lien of the mortgage securing the bonds which you hold. The new offer is made retroactive.

Conspicuous of Indexes for December, 1929
Compiled for Publication in Electric Railway Journal by ALBERT S. RICHIE

<table>
<thead>
<tr>
<th>Index Name</th>
<th>Latest</th>
<th>Month</th>
<th>Year</th>
<th>Age</th>
<th>High</th>
<th>Low</th>
<th>Last Five Years</th>
</tr>
</thead>
<tbody>
<tr>
<td>Street Railway Fares*</td>
<td>1913 = 4.46</td>
<td>Dec. 29</td>
<td>1929</td>
<td>1928</td>
<td>7.76</td>
<td>7.24</td>
<td>111.2 Nov. 28 Dec. 28 1929 1928 96.9 94.0 99.7 103.8 101.7 122.5</td>
</tr>
<tr>
<td>Electric Railway Materials*</td>
<td>1913 = 100</td>
<td>Dec. 29</td>
<td>1929</td>
<td>1928</td>
<td>215.9</td>
<td>210.4</td>
<td>144.9 Nov. 28 Dec. 28 1929 1928 144.9 144.9 144.9 144.9 144.9 144.9</td>
</tr>
<tr>
<td>Electric Railway Wages*</td>
<td>1913 = 100</td>
<td>Dec. 29</td>
<td>1929</td>
<td>1928</td>
<td>208.5</td>
<td>205.1</td>
<td>144.9 Nov. 28 Dec. 28 1929 1928 144.9 144.9 144.9 144.9 144.9 144.9</td>
</tr>
<tr>
<td>Electric Ry. Construction Cost</td>
<td></td>
<td>Dec. 29</td>
<td>1929</td>
<td>1928</td>
<td>208.5</td>
<td>205.1</td>
<td>144.9 Nov. 28 Dec. 28 1929 1928 144.9 144.9 144.9 144.9 144.9 144.9</td>
</tr>
<tr>
<td>General Construction Cost</td>
<td></td>
<td>Dec. 29</td>
<td>1929</td>
<td>1928</td>
<td>208.5</td>
<td>205.1</td>
<td>144.9 Nov. 28 Dec. 28 1929 1928 144.9 144.9 144.9 144.9 144.9 144.9</td>
</tr>
<tr>
<td>Wholesale Commodities</td>
<td></td>
<td>Dec. 29</td>
<td>1929</td>
<td>1928</td>
<td>208.5</td>
<td>205.1</td>
<td>144.9 Nov. 28 Dec. 28 1929 1928 144.9 144.9 144.9 144.9 144.9 144.9</td>
</tr>
<tr>
<td>Wholesale Commodities</td>
<td></td>
<td>Dec. 29</td>
<td>1929</td>
<td>1928</td>
<td>208.5</td>
<td>205.1</td>
<td>144.9 Nov. 28 Dec. 28 1929 1928 144.9 144.9 144.9 144.9 144.9 144.9</td>
</tr>
<tr>
<td>Bank Clearings</td>
<td></td>
<td>Dec. 29</td>
<td>1929</td>
<td>1928</td>
<td>208.5</td>
<td>205.1</td>
<td>144.9 Nov. 28 Dec. 28 1929 1928 144.9 144.9 144.9 144.9 144.9 144.9</td>
</tr>
<tr>
<td>Business Failures</td>
<td></td>
<td>Dec. 29</td>
<td>1929</td>
<td>1928</td>
<td>208.5</td>
<td>205.1</td>
<td>144.9 Nov. 28 Dec. 28 1929 1928 144.9 144.9 144.9 144.9 144.9 144.9</td>
</tr>
</tbody>
</table>

*The three index numbers marked with an asterisk are compiled by Mr. Ritchie, as follows: Fares index is average street railway fare in all United States cities with population of 50,000 or over outside New York City, and weighted according to population. Street Railway Materials index is relative average price of materials (including fuel) used in street railway operation and maintenance, weighted according to average use of such materials. Wages index is relative average maximum hourly wage of motormen, conductors and operatives on 13 of the largest and interurban railways operated in the United States, weighted according to the number of such men employed on these roads.

Electric Railway Journal - Vol.74, No.1 58
Another Hearing on Rochester-
Buffalo Service

Opposition on the part of the Interna-
tional Railroad on the Buffalo Transit
Company, Buffalo, to the application of
the Rochester, Niagara Falls & Buffalo
Coach Lines, Inc., for a certificate to
operate buses between Rochester and
Buffalo has prompted the Public Service
Commission to adjourn the hearing ago-
ern Jan. 20.

Much of the testimony taken by Com-
misioneer Pooley at the first adjourned
hearing held in Buffalo centered about
loser electric trolley lines. In the last
years of the system, the Rochester would
obtain satisfactorily the interchange of
traffic with the Rochester, Lockport & Buffalo
line, which now operates buses be-
 tween Lockport and Buffalo, wants the
Rochester, Niagara Falls & Buffalo
Coach Lines, Inc., restricted from carry-
ing local passengers in territory now
covered by its bus service.

The Rochester application for autho-
rization of the proposed new line is $100,000.
Authority is asked by the Rochester, Lockport & Buffalo
Railway for permission to acquire the entire capital stock.

Substitution in Fishkill

The Public Service Commission has
granted a petition by the Fishkill Elec-
tric Railway to substitute buses for
trolley cars on part of its system in
Beacon, N. Y., the city consenting to
the substitution. Operation of trolley
service in Fishkill is no longer com-

The special commission created by
the legislature to investigate the aboli-
tion of grade crossings has filed its final report with the
General Court. The report recommends the estab-
lishment of an entirely new method for
the abolition of such crossings.

In brief, the special commission
would appoint a committee to do the work to
the State through the Public Utilities
Commission. A second innovation would be in
the apportionment of the cost, which
a majority believes should be

The Railway Journal

The City of Los Angeles and the Cali-
ifornia Railroad Commission on Dec. 23 ap-
poved to the United States Supreme Court
for a rehearing of the case in which the
high court upheld a fare increase from
5 to 7 cents.

Early in December the Supreme Court

Morgan Report Awaited at

A report showing that the Detroit
 Municipal Railway Commission is
running at a loss, despite the monthly financial
statements indicating a profit, has been
prepared by John H. Morgan, auditor, of
the Street Railway Commission.

As Mr. Morgan explained the matter,
he had made a report on questions raised by Senator Couzens and trans-
mittted to him by Frank Couzens, mem-
er of the Street Railway Commission. He
also said that he had completed a re-
port on railway department insurance,
which work progressed during the
resignation of G. Ogden Ellis, who had
served for many years as chairman.

The Mayor of Detroit in 1921 Senator
James Couzens brought about the con-
solidation of all lines under city man-
agement. Since then he has shown a
real interest in the manner in which
the system operated. The appointment
of his son, Frank, to the Detroit
Street Railway Commission, followed closely the
primary elections of October and the
resignation of G. Ogden Ellis, who had
served for many years as chairman.

It is expected that the Morgan report
will become an active issue as soon as Mayor-

New Edition of Engineering
Manual Ready Soon

The 1929 edition of the Engineering
Manual, which is the electric railway
man's handbook of standards, recom-
mands and miscellaneous methods and
practices that have been approved by
the American Electric Railway Engi-
neers Association, is now available.

It is very desirable that all users of
the Engineering Manual obtain the 1929
issue, so that errors will not be made in
using specifications that have been re-
vised, withdrawn or superseded. Even
when accompanied by the 1927 and 1928
supplements, the 1926 edition cannot be
considered up-to-date, since the revised and
added material approved during 1929
would not be included. All new material
from that year is included in the new edition
of the Manual has been printed there
without first appearing in any supple-
ments.

Several months ago association head-
quarters distributed an order blank to
every operating member company. In
addition to every order received the association will receive a separate letter, calling at-
tention to the new edition. Others who
desire the Manual may address their re-
quests to association headquarters.

No price on the new edition has been
definitely set, but it is probable that the
price will not change from that for the
1926 edition. It is estimated that the new edition will sell
for $7.50 per copy to mem-
ers $10 to non-members.
B. E. Tilton President of
New York State Railways

Succeeds James F. Hamilton as Chief Executive at
Rochester. E. K. Miles Manager in Syracuse. Many
Other Changes on Central New York Systems

IMPORTANT changes in the executive
personnel of the New York State Rail-
ways, made necessary by the resignation of James F. Hamilton as president, have
been announced. Mr. Hamilton leaves the
electric railway industry to become head
of a large aircraft combine, the Aviation
Corporation of America.

Benjamin E. Tilton, Syracuse, first vice-
president, succeeds Mr. Hamilton as president.

H. B. Weatherwax, for many years vice-
president of the United Tracton Company,
operating in the Capitol district, becomes
president of the United Tracton Company
and the Schenectady Railway, posts for-
merly held by Mr. Hamilton.

Ernest Murphy, general manager of the
United Company, will continue in that ca-
pacity, taking in addition the position of
general manager of the Schenectady
company.

Roy R. Hadsell, in charge of operations of
the Schenectady company, becomes man-
ger of that system and Ernest K. Miles,
superintendent of transportation at Syrac-
use, will be appointed general manager of
the Syracuse lines.

John F. Uffert, general superintendent of
transportation at Utica, is promoted to be general
manager there. Howard L. Reichart,
secretary-treasurer, and Joseph M. Joel,
general solicitor of the group, remain in
the same positions.

Headquarters of the New York State
Railways will remain in Rochester.

Besides Mr. Hamilton, president of the New York State Railways, Mr. Hamilton was presi-
dent and a director of eighteen subsidiary
bus and railway companies, all controlled by
the Associated Gas & Electric Company, with headquarter in New York.

William F. Stanton, assistant to Mr.
Hamilton, will go with his chief to the
new post.

Mr. Hamilton, now in his 52d year,
began his career in the electric railway
field as a motorman on the International
Railway lines in Buffalo. He went to
Rochester in 1917. Previously he was as-
sistant superintendent of the Schenectady
Railway, rising to the presidency in 1918.
In 1919 he became general superintendent
of the United Tracton Company of Albany
and in the following year general manager
of both the United and Schenectady lines.
He went to the New York State Railways
as general manager. In 1918 he was made
vice-president and assumed the presidency
a few months later.

During his regime, the service-at-cost
contract was negotiated between the city of
Rochester and the railways. This grant
has been in effect for the past ten years.
It was said of Mr. Tilton as far back as
1922 that no task is ever likely to master
him that can be accomplished by the
application of a combination of tact, tenacity
and technology. Mr. Tilton brought all
three of these adjuncts to bear on his first
job down in Porto Rico with the govern-
ment service making geodetic and coast
surveys and he has been using the com-
binated with success ever since. And with
every new application of them by Mr. Tilt-
on has come added ease in their use and
greater success to their possessor through
their application.

The government work in Porto Rico
was Mr. Tilton's first job after he was
graduated from Cornell in 1897. He was
in Porto Rico for three years. And then
came to Mr. Tilton the call of private
enterprise. It was a loud call, and he
heeded it to become engineer of construc-
tion of the Pennsylvania Lines West and
was located at Fort Wayne and Cleveland
for six years. At Cleveland Mr. Tilton's
fine work attracted the attention of the
management of the Cleveland Railway and
he was induced to join the select circle of
very able men who administer that prop-
erty. His title there was engineer of main-
tenance of way. Then and there Mr. Tilt-
on was won over to the electric railways.
He fitted connection with the Roch-
ester Railway & Light Company as engi-
neer of maintenance of way of city and
suburban lines. The Rochester lines are
tied in with the New York State Railways
and so it was in reality only a step for
Mr. Tilton in his upward climb to go from
that post in Rochester to the position of
general manager of the Syracuse Rapid
Transit Company, Utica & Mohawk Val-
ley Railway and the Oneida Railway. His
election as vice-president followed quite
logically. In this dual post at Syracuse
Mr. Tilton had jurisdiction over the Oneida
and the Utica lines. He is steeped in a
knowledge of the history and affairs of
the New York State Railways and his se-
lection for the post of president followed
just logically as did his other promo-
tions with the company.

F. J. Tew in Another Foreign Post

F. J. Tew has resigned as superintendent of shops and equipment of the Sacramento
Northern Railway, Sacramento, Cal., to
accept a position with Empresas Elec-
tricas Brasileiras, S. A., at Rio de Janeiro,
Brazil, South America.

Mr. Tew received his early training in
electric railway work with the Twin City
Rapid Transit Company, having been em-
ployed in the Snelling Avenue shops from
1904 to 1912 inclusive in various capacities in
the different departments.

November, 1912, he accepted the posi-
tion of superintendent of shops and car-
houses with the Manila Electric Railroad
Light Company at Baguio, P. I., where
he remained until 1920, at which time he
returned to the United States.

Upon his arrival in California from
Manila, Mr. Tew accepted the position of
superintendent of shops of the Sacra-
mento Northern Railway. At both Manila
and Sacramento he was in entire charge of
all mechanical and electrical shop work in
connection with the maintenance of roll-
ing stock, including city, suburban, inter-
urban passenger and freight cars and
heavy electric locomotives.

C. J. Quill With North
Coast Company

C. J. Quill has succeeded H. R. Leigh as superintendent of the North Coast Trans-
portation Company, Seattle, Wash. Mr.
Quill's transportation experience dates back
to June, 1912, when he entered the employ
of the Tacoma Railway & Power Com-
pany. He continued with this company
until he enlisted for military service in
1917. Returning from military duty he re-
entered the service of the Tacoma Rail-
way & Power Company, which he served
in several positions. In February, 1927,
he was made general passenger agent for
the North Coast Lines. On June 1, 1927,
he was appointed assistant superintendent
of the North Coast Lines, in which capacity
he has since continued.

G. S. Wills, former general manager
of the Wheeling Traction Company, Wheeling, W. Va., and former general
superintendent of the Steubenville, East
Liverpool & Beaver Valley Traction
Company, is now associated with the
Pharo Engineering Company, Pitts-
burgh, Pa.
W. T. Rossell Vice-President of New Brooklyn System

W. T. Rossell, who has been general manager of the Pittsburgh Railways, Pittsburgh, Pa., has resigned to become vice-president of the Brooklyn & Queens Transit Corporation, Brooklyn, N. Y. which includes more than 500 miles of surface railroad making up the Brooklyn City Railroad and the surface lines of the Brooklyn-Manhattan Transit Corporation.

Mr. Rossell has served as general manager at Pittsburgh since September, 1920. He succeeded F. R. Phillips in that post. He had previously been superintendent of the Pittsburgh Railways and general superintendent in charge of maintenance and engineering who has demonstrated his managerial ability.

The new Brooklyn vice-president was born in Memphis, Tenn., and was educated at Staten Island Academy, Staten Island, N. Y., from which he graduated in 1904. Later he entered the United States Military Academy at West Point.

W. T. Rossell

August, 1908, he became assistant engineer of track and structures for the Cincinnati Traction Company and the following year was connected with the York Manufacturing Company, York, Pa. In October, 1909, he returned to the Cincinnati Traction Company where he remained until 1910, when he became superintendent of track and structures for the Cincinnati, Newport & Covington Railway, operating out of Covington, Ky. Following his discharge from the army in June, 1919, as a captain of engineers, Mr. Rossell returned to the Cincinnati, Newport & Covington Railway as superintendent of way and structures, in which capacity he continued until his appointment as superintendent of way of the Pittsburgh Railways in July, 1924.

Thomas Fitzgerald, who has been vice-president of the Pittsburgh Railways, Pittsburgh, Pa., takes over in addition the title of general manager.

Billy Mathewson Retires After Forty Years

Billy Mathewson of the United Electric Railway, Providence, R. I., has retired on pension. Mr. Mathewson entered the employ of the old Union Railroad in May, 1884, as a horse car driver, reporting at the Olneyville carhouse. After about five years service as a driver, he became assistant to Ellis R. Swan, superintendent at Olneyville at that time. Mr. Mathewson continued in this position until 1902, at which time he became superintendent of the Olneyville carhouse under the late Robert I. Tedd, then general manager. He was superintendent of this carhouse for about fifteen years, going to the Riverside division in 1917. From Riverside Mr. Mathewson took charge of the newly established East Providence Division on March 30, 1924.

Mr. Mathewson continued there until November, 1929, when he was transferred to the Mount Pleasant division upon the retirement of B. D. Sweet. He remained in the Mount Pleasant division until he retired on pension.

L. E. Thorne With Gulf States Utilities

Lawrence E. Thorne, general superintendent of the Northern Texas Traction Company, will take charge of the Fort Arthur division of the Gulf States Utilities Company, Fort Worth, Tex., a Stone & Webster subsidiary. Mr. Thorne studied electrical engineering at Texas Agricultural & Mechanical College. He entered the employ of the Northern Texas Traction Company in 1911 as chief engineer. In 1916 he transferred to 1925 as general superintendent V. W. Berry to the Virginia Power & Light Company, Mr. Thorne was made general superintendent of the local company.

Messrs. Davis, Savage and Sherman With Car Company

C. E. Morgan, president, has announced a number of changes in the personnel of the Cincinnati Car Company, Cincinnati, Ohio. Lewis J. Davis has been made assistant to the president; Hugh Savage, superintendent of production, and Hugh K. Sherman, purchasing agent. The appointments as announced in an official bulletin are as follows:

L. J. Davis, assistant to the president, in charge of engineering and production, vice J. H. Elliott resigned.

Hugh Savage, superintendent of production, reporting to Mr. Davis.

C. J. Ellis, chief engineer, reporting to Mr. Davis.

H. K. Sherman, purchasing agent, in charge of the purchase of materials and supplies, as well as the handling and dispensing of scrap and other materials. Mr. Sherman will also have charge of the general storeroom.

F. A. Latsch, assistant purchasing agent, reporting to Mr. Sherman.

C. F. Schmitten, general storekeeper, reporting to Mr. Sherman.

R. MacDonald, in charge of the service department.

L. A. Kasemer of continuing as vice-president, in charge of sales department.

Mr. Davis was assistant to Mr. Morgan as general manager of the Brooklyn City Railroad and, with the merging of the Brooklyn City lines with the Brooklyn-Manhattan Transit Corporation, became car engineer for the latter company.

Mr. Savage was formerly superintendent of equipment of the Brooklyn City Railroad and previously going to Brooklyn was superintendent of shops of the Detroit United Railway.

Mr. Sherman was purchasing agent of the Brooklyn City Railroad from Nov. 1, 1925, to July 1, 1929. Previous to that he was purchasing agent of the Michigan Electric Railway and the Michigan Railroad.

W. H. Gibson Purchasing Agent in Brooklyn

William H. Gibson has been appointed purchasing agent of the Brooklyn-Manhattan Transit system, to succeed the late Lincoln Van Cott. Mr. Gibson became connected with the Brooklyn companies in October, 1903, and advanced through the ranks in the purchasing department to his present position.

Mr. Gibson was born in Belleville, N. J., 49 years ago and after completing courses at the Belleville schools and a Newark business school he entered the employ of the Sprague Electric Company as a stock clerk. During his employment with the Sprague Company, Mr. Gibson advanced to the position of storekeeper and then accepted a similar position on the Manhattan Elevated Railway in New York City. He remained with the Manhattan "L" system for two years and then joined the staff of a hardware firm located in Manhattan.

In October, 1903, Mr. Van Cott selected Mr. Gibson to take charge of the store-room at East New York for the Brooklyn Rapid Transit Company, predecessor to the present company. This was shortly after the consolidation of the Kings County "L" lines and the Brooklyn "L" lines as part of the Brooklyn Rapid Transit system. The work of converting the old "L" cars for electrical operation was then in progress at East New York and Mr. Gibson remained in charge of the store-room there until the completion of that work.

He then spent a year on the staff of the late John F. Calderwood, general manager of the B. R. T. system at that time. Later he was appointed assistant general storekeeper for the B. R. T. system, under C. S. Waters, storekeeper. In 1906, when Mr. Waters took charge of the storerooms of the New York Municipal Railway Corporation following the signing of the dual subway contracts with the city of New York, Mr. Gibson was made general storekeeper. He was finally advanced to the position of assistant purchasing agent and general storekeeper in 1920 and continued as Mr. Van Cott's assistant until the latter's death.

R. A. Pritchard, assistant superintendent of the railway at Little Rock, Ark., has been decorated with a pin denoting 25 years of service with the railway department of the Arkansas Power & Light Company. Mr. Pritchard entered the service of the railway in 1904 as conductor. Prior to that, at the age of nineteen, he went to work at a carhouse.
in Knoxville, Tenn. At the time of the Spanish-American War he volunteered for service with Company F, First Alabama Infantry. He served under Gen. Fitzhugh Lee, of the 27th Corps, and helped clear the site for Miami, Fla., while the troops were there. After the close of the Spanish-American War he went to Little Rock as a conductor. In 1911 he was appointed supervisor and in 1923 was made assistant superintendent of the railway department.

+ New Assistant to President at Richmond

I. Reid Carlisle has been appointed assistant to the president of the Virginia Electric & Power Company with headquarters in Richmond, Va., succeeding R. C. Hopkins, who was recently transferred to the Boston office of Stone & Webster. Mr. Reid assumed his duties on Dec. 9. He came to Virginia from Beaumont, Tex., where he was assistant to J. F. McLaughlin, formerly district manager in that territory, and recently promoted to be vice-president of the Stone & Webster organization, with offices in Boston.

+ Herman Russell Succeeds the Late Robert M. Searle

Herman Russell, for seven years executive vice-president of the Rochester Gas & Electric Corporation, Rochester, N. Y., has been named president of the company to succeed the late Robert M. Searle.

Mr. Russell, a native of Michigan, has been connected with the gas and electric corporation and its predecessor, the Rochester Railway & Light Company, for 23 years.

A graduate of the University of Michigan, he entered the public utility field with the Detroit Gas Company in 1900. Two years later he was made assistant superintendent of that company.

In 1903 he became superintendent of the gas manufacturing plant of the San Francisco Gas Company and a year later went to Cincinnati to take the post of assistant superintendent of the Cincinnati Gas & Electric Company.

For eight years, from 1906 to 1914, Mr. Russell served as assistant superintendent in Rochester, being elevated to the superintendency of the gas division in the latter year. He was appointed general manager in 1919 and was elected vice-president and director in 1922.

J. A. Davis Assistant at Norfolk

John A. Davis, Jr., who came to the Virginia Electric & Power Company in the capacity of a student engineer two years ago, has been promoted to be assistant to F. Carter Womack, manager of transportation in Norfolk, Va., in which territory service by electric railway and bus is co-ordinated. Mr. Davis left Richmond on Dec. 9 to assume his new duties. He is a native of Richmond and a graduate of the Virginia Polytechnic Institute. He joined the Stone & Webster forces in 1927.

Mr. Davis formerly held the post of acting assistant to the president of the company, taking over the work of R. C. Hopkins, who was recently transferred to Boston and who on Dec. 9 was succeeded by I. Reid Carlisle.

+ S. L. Williams Promoted by Westinghouse Air Brake

S. L. Williams has been appointed district engineer for the Eastern district of the Westinghouse Air Brake Company at New York. Mr. Williams was graduated from the Massachusetts Institute of Technology as a mechanical engineer in 1923, and immediately entered the employ of the Westinghouse Air Brake Company as special apprentice in the Wilmerding works. After serving for several months as inspector in Boston and New York, he was made assistant to the district engineer at the latter place in 1925. In 1928 he was transferred to the West Coast and promoted to be assistant district engineer of the Pacific District at San Francisco. This position he held until his recent promotion.

+ OBITUARY

W. W. Briggs

Wallace W. Briggs, since 1925 vice-president in charge of operation for the Grays Harbor Railway & Light Company, Aberdeen, Wash., and also general manager and purchasing agent, died in that city, Dec. 9. His death was preceded by an immediate illness of only two days.

Mr. Briggs was well known in the West. For a number of years he was San Francisco district manager for the Westinghouse Electric & Manufacturing Company and later became general manager of the Great Western Power Company of California. In 1918 he joined the Westinghouse organization in New York and subsequently became affiliated with the Federal Light & Traction Company, which controls the Grays Harbor company.

About the middle of 1925 he was sent from New York to become the operating head of the Grays Harbor property.

A genial, kindly man, he was "Wally" to all who knew him. An annual custom of his was to give a "Kids' Party" in the Electric Park power station grounds on his birthday to all the children of the community.

Mr. Briggs had become a very important figure in his community in the last four years, taking an active interest in civic affairs.

W. W. Briggs

Hugh A. Siggins, whose father, the late David Siggins, in 1892 incorporated the Warren Street Railway and the Warren & James town Street Railway, Warren, Pa., died on Dec. 24 after a brief illness. With the retirement of his father from active management of the transportation lines, Mr. Siggins headed the two companies until they were sold to the Associated Gas & Electric Company several years ago. He was 52 years of age.

Ormel W. Pierce, founder and president of the Railroad Trolley Guard Company, Olean, N. Y., died at his home in that city on Dec. 28, following a short illness. He was also head of the City Tile Molding Company and was an officer of a number of other local industrial concerns. He was 63 years old.

Mrs. Carrie Alexander Bahrenburg, widow of Henry Alexander, founder of the local railway at Belleville, Ill., and its operator for several years after her husband's death, died in Belleville, on Nov. 24. She was 68 years old.
Big Merger in Car Building Field

Plans involving an important expansion in the manufacturing activities of the Pullman company, through the acquisition by purchase of the Standard Steel Car Company and the Osgood Bradley Car Company, have been announced. CAR and AC have been announced, the entire trans-

action calling for an exchange of stock and cash to the amount of $50,000,000. Action on the merger will probably be confirmed at a meeting of the stockholders of Pullman, Inc., to be held in Wilmington, Del., on Jan. 31.

Standard Steel Car and Osgood Bradley Car own and operate plants manufacturing railway passenger and freight cars, street railway cars, steel forgings, gray iron cast-
ings, etc., at the following locations: Butler, Pa.; Hammond, Ind.; Baltimore; St. Paul; Richmond; Worcester; Sac-

ramento. Melbourne, Australia; Antwerp, Belgium; and Rio de Janeiro. Besides these properties, Pullman, Inc., is acquiring sales offices in New York, Chicago, Pittsburgh, St. Paul, Baltimore, Richmond, London, Paris, Rio de Janeiro, Sao Paulo, Buenos Aires and Cape Town. The Pullman Car Company, itself, operates a car assembling plant at Rio de Janeiro, while Entreprises Industrielles Charentaises owns and operates a freight and passenger car plant at La Rochelle, France, equipped to handle a general ex-

port business.

LANDS AND BUILDINGS INCLUDED

In addition to the manufacturing plants and sales offices, Pullman, Inc., is acquiring certain lands, housing properties, owned by Standard Steel Car or subsidiaries. The inventories, receivables, etc., connected with the manufacturing plants are to be acquired for cash or equivalent in se-

curities.

The properties being acquired will be operated by a newly incorporated subsidi-
ary of Pullman, Inc., to be wholly owned by that company but to be operated separ-
ately from the Pullman's present manu-
facturing subsidiary, the Pullman Car & Manufacturing Corporation.

Entrance of the Mellon interests into Pullman's affairs is indicated by the elec-
tion of R. K. Mellon as a director. Pittsburgh interests, including the Mellons, were largely interested in Standard Steel Car.

Freight Terminal Planned for South Bend, Ind.

The Chicago, South Shore & South Bend Railroad has acquired an 111-acre tract in South Bend, Ind., as a site for a new freight terminal. The property was pur-

chased in the name of the Indiana Indus-
trial Land Company, and is adjacent to the tracks of the new York Central Railroad.

This is a further step in the improve-

ment program begun four years ago when the present management took over the rail-
road, an attempt to develop the Chicago-

and-carload freight business in that period is the foundation for this new expansion. The acquisition and development of this property, as part of the plans of the line, will enable the South Shore Line to offer shippers prompter and more convenient service, will eliminate the movement of freight over South Bend streets and will open up highly desirable sites for industries.

The South Shore Line will develop the site as a freight terminal and industrial site with inbound and outbound freight tracks and buildings. Detailed plans for the instal-

lation of trackage and the reconditioning and construction of buildings on the prop-

erty are being drawn up.

When the new terminal is completed, the South Shore Line will abandon its present freight terminal on La Salle Street east of the Michigan River, and will discontinue

the present method of handling less-than-
carload freight in trailer-trailers over South Bend streets from the old freight house now located at Orange and Olive Streets.

Recent Rolling Stock Orders and Deliveries Include Thirty Units

CANADIAN as well as United States properties figured in a number of car orders and deliveries which were announced during the closing weeks of the year. The Ottawa Car & Manufacturing Company has received an order from the Hydro-Electric Power Commission of Ontario for four motor cars and one trial car for interurban service, delivery of which is to be made early in the new year. The motor cars will be of the four-motor, double-truck, double-end, one-man type, with seats for 50 passengers. Over-all length of the cars is 66 ft. 7 in.; over-all width, 8 ft. 4 in.; and total weight of bodies, trucks and equipment is expected to approximate 58,000 lb. The trial car is of the same general dimen-
sions, with an estimated weight of 44,500 lb. Both motor and trial cars will be of

Details of Recent Rolling Stock Orders

<table>
<thead>
<tr>
<th>Name of railway</th>
<th>Company</th>
<th>Type</th>
<th>Number of units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hydro Electric Power</td>
<td>Canadian Car &amp; Manufacturing</td>
<td>Motor Car</td>
<td>4</td>
</tr>
<tr>
<td>Commission of Ontario</td>
<td>Company</td>
<td>Trial Car</td>
<td>1</td>
</tr>
<tr>
<td>Windsor, Ont.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ottawa Car Mfg.</td>
<td>St. Paul, Minn.</td>
<td>Freight Car</td>
<td>1</td>
</tr>
<tr>
<td>Commission of Ontario</td>
<td>Electionville, Ind.</td>
<td>Freight Car</td>
<td>3</td>
</tr>
<tr>
<td>Westinghouse, Pa.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pullman, Inc.</td>
<td>Westinghouse, Ind.</td>
<td>Freight Car</td>
<td>2</td>
</tr>
<tr>
<td>National Locomotive</td>
<td>Huntley Locomotive Co.</td>
<td>Freight Car</td>
<td>1</td>
</tr>
<tr>
<td>Manufacturing Co.</td>
<td>National Pneumatic</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Company</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Folding</td>
<td>General Electric</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Folding</td>
<td>Golden Glow</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Huntington, Ind.</td>
<td>Columbus Electric Co.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Folding</td>
<td>Cleveland Electric Co.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cleveland, Ohio</td>
<td>National Pneumatic</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Indianapolis, Ind.</td>
<td>Folding, Cleveland Electric Co.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Kansas City, Mo.</td>
<td>Folding, Port Columbus Electric</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Meat Packing, Ind.</td>
<td>Folding, Chicago Electric Co.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Toledo, Ohio</td>
<td>Folding, Indian Electric Co.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Westinghouse, Ind.</td>
<td>Folding, Wisconsin Electric Co.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pubic Works, Ind.</td>
<td>Folding, Chicago Electric Co.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Republic, Ind.</td>
<td>Folding, Chicago Electric Co.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chicago, Ill.</td>
<td>Folding, Chicago Electric Co.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>St. Louis, Mo.</td>
<td>Folding, Chicago Electric Co.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Milwaukee, Wis.</td>
<td>Folding, Chicago Electric Co.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chicago, Ill.</td>
<td>Folding, Chicago Electric Co.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>St. Louis, Mo.</td>
<td>Folding, Chicago Electric Co.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Milwaukee, Wis.</td>
<td>Folding, Chicago Electric Co.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chicago, Ill.</td>
<td>Folding, Chicago Electric Co.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>St. Louis, Mo.</td>
<td>Folding, Chicago Electric Co.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Milwaukee, Wis.</td>
<td>Folding, Chicago Electric Co.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chicago, Ill.</td>
<td>Folding, Chicago Electric Co.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>St. Louis, Mo.</td>
<td>Folding, Chicago Electric Co.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Milwaukee, Wis.</td>
<td>Folding, Chicago Electric Co.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chicago, Ill.</td>
<td>Folding, Chicago Electric Co.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>St. Louis, Mo.</td>
<td>Folding, Chicago Electric Co.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Milwaukee, Wis.</td>
<td>Folding, Chicago Electric Co.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
semi-steel construction, with end doors and arch roofs.

The Canadian Car & Foundry Company, of Montreal, recently delivered to the British Columbia Electric Railway fifteen motor coaches, double-deck; four single-deck, double-track motor cars for city service in Vancouver, B. C. The cars, which are of the pay-as-you-ride type, with single treads, exit door at center and at rear end, are of all-steel construction, with the exception of some members, which are made of duramul to foam rubber. Over-all length is 66 ft. 2 in., and total weight is about 38,000 lb. Arch roof construction is employed.

The California Electric Railway has placed an order with the Kuhlman Car Company, Cleveland, for thirteen one-man, double-end, double-track motor cars for city service in Younglesia, delivery of which is to be made Feb. 1. Steel, wood and aluminum are used in the body construction, and it is expected that the total weight of these cars will be held down to 28,000 lb. There will be end doors and arch roofs.

Bus Manufacturers Close Year with

FOR extension of existing facilities and for replacement purposes, orders and deliveries of a considerable number of buses have been recorded lately by electric railway companies.

The Brooklyn Bus Corporation, subsidiary of the Brooklyn & Queens Transit Company, has received ten Twin Coaches, six all-steel metropolitan type coaches, and two yellow 38-passenger buses, a number of which have been placed in service on the Manhattan Bridge route, pending the further-consideration of rights by the city of New York. The Los Angeles Motor Bus Company, operated jointly by the Los Angeles Railway and the Pacific Electric Railway, has received twelve Twin Coaches of the urban type, bringing its total number of vehicles of this type to 26. Other recent deliveries of Twin Coaches include ten to the Northern Texas Traction Company, of Fort Worth, five to the San Diego Electric Railway, and three to the Utah Electric Railway Company, all of the urban type, seating 40 passengers. The Twin Coach Corporation has also delivered six trackless trolleys to the Los Angeles Railway Company for service in Salt Lake City, and one rail street car of 52-passenger capacity to the Brooklyn & Queens Transit Corporation for trial operation.

A notable recent installation is that of the North Coast Transportation Company, one of the Stone & Webster transportation lines operating out of Seattle, which has received four 37-passenger parlor observation coaches, mounted on ACF 264-in. wheelbase chassis and equipped with 177-hp four-cylinder, 60-degree, oil-cooled engines. Other deliveries of ACF equipment include two 23-passenger urban coaches to Pioneer Transportation, Inc., two 33-passenger urban coaches to the Interstate Street Railway, of Attleboro, Mass., and one 40-passenger, all-steel metropol-itan, semi-steel, double-deck, parlor coach, for the San Diego Electric Power Company, the San Diego Electric Railway, and the New Orleans Public Service Company.

The General Motors Truck Corporation reports the delivery of Mack buses to the following electric railway companies: four six-cylinder, 25-passenger parlor car buses to the Cincinnati Street Railway, one four- cylinder 29-passenger city type bus to the Denver Tramway Company, and one four- cylinder 177-hp. chassis to the Brill Motor Coach Company, of Indianapolis, the last named being a subsidiary of the Indianapolis Street Railway. Orders for Mack buses are also reported from the Lehigh Valley Transit Company and the Cincinnati Street Railway, which is adding ten 29-passenger city type buses, powered with six-cylinder oil engines, to its fleet. General Motors Truck Company reports delivery of one Type W city service bus to the Springfield Traction Company, Springfield, Mo.; three Type W observation buses to the Fort Dodge, Des Moines & Southern Railroad, Boone, Iowa; two Type W city service buses to the Oklahoma Railway, Oklahoma City; one Type Z 29-passenger bus to the Cumberland & Westernport Transportation Company, Cumberland, Md.; and six buses to the Georgia Power Company. Public Service Co-ordinated Transport has taken delivery of ten 38-passenger yellow coaches, mounted with 110-hp. Continental engines. The United Avenue Coach Company, of New York, has placed an order with the General Motors Truck Company for 100 Type Z 225 chassis, for double deck bodies. These buses are being ordered to replace obsolete equipment, and delivery is to start early in the year.

Alliance System Being Improved

A moving picture camera is being used by C. E. Sperow, general manager of the Stark Electric Railroad, Alliance, Ohio, to record improvements being made on the system. Whenever new work is being done Mr. Sperow is on hand to record its various phases. These records are kept for future reference. The Stark Electric is completing its 1929 rehabilitation program which includes considerable work over the 35-mile line of the Alliance & Rootstown Electric Railway which has been replaced with steel bridges. Ten thousand new ties were installed. There was a similar number of new ties last winter, while the 1930 program calls for 15,000.

New overhead wires were placed on most of the line in Alliance. About half a mile of 100-lb. rails was installed with thermit-weld joints throughout. In the business district, sections of old rail were replaced with new rails, all joints being welded.

In addition to this work, the company constructed a new track on Liberty Avenue, and this street was being repaved by the city.

Converter Substations for Wilkes-Barre

The Wilkes-Barre Railway, Wilkes- Barre, Pa., recently changed its policy of generating its own electrical energy and now intends to purchase power from three local power companies. The power companies will supply power to eight new synchronous converter substations, equipments being built by the Westinghouse Electric & Manufacturing Company.

There will be six 750-kw. synchronous converter substations and two 500-kw. converter substations. Two of the 750- kw. stations and one 500-kw. station will be for automatic operation, while the others will be the manually controlled type.

All of the synchronous converters will be of the shunt wound type. They will operate in conjunction with transformers having 8 per cent reactance. This type of machine was specified by the purchaser to obtain superior voltage and power factor characteristics, and also to afford stability to the substations while operating together on a common feeder network.

Signal Equipment Being Installed on Gary Railways

Work of modernizing the signal equipment of Gary Railways, Gary, Ind., which has been in progress for more than a year, is proceeding apace. The cost of the 96 block signals alone will be approximately $65,000, and the cost of wire and labor will be over $100,000. Most of the recent installations have been between Valparaiso and Woodville. When the Valparaiso division is finished there will be only the Crown Point and Hobart divisions. Signals for these sections have been ordered and work will get under way shortly after the first of the year.

Improving Winnipeg

Track improvements involving a total expenditure of over $340,000 have been made during the past year by the Winnipeg Electric Company.

The biggest item was the Main Street trackage, where double tracks were laid inside the old tracks, thus allowing more space at the sides for other vehicular traffic. This work cost $135,000. The track is 115-lb. steel laid on steel ties. The work was done sometime ago in Winnipeg. Elastite filler alongside the rail to absorb shock, and thermite-welded joints were two of the modern devices in track construction used.

Double track extension on Stafford, from Grosvenor to Lorette, cost $104,000. The main reason for the extension was the double track. The extension on Corydon, from Lilac to Wilton, was 2,900 ft., and cost $81,760. The extension on Valley Avenue of 2,000 ft. from Midland to Worth on Notre Dame Avenue cost $10,615.
1930

MODERNIZATION PROGRAMS INCLUDE

"PEACOCK"

REG. U. S. PAT. OFF.

STAFFLESS BRAKES

The electric railway industry, including all types of service, has cast an overwhelming majority vote for Peacock Staffless. Follow the installations of modern cars. In almost every instance you will find Peacock Staffless Brakes.

National Brake Co., Inc.
890 Ellicott Sq. Buffalo, N. Y.

General Sales Office:
The Ellcon Co., 50 Church St., New York

Canadian Representative:
Lyman Tube & Supply Company, Limited, Montreal, Canada
70,000,000 miles of

33-passenger City Type Bus

Pennjersey Garage in the Camden District
scientific lubrication
on America's largest
bus property

Company: Public Service Coordinated
Transport
Number of Vehicles: 2406
Yearly Bus Mileage: 70,000,000 miles
Passengers Carried Yearly: 350,000,000
in both suburban and inter-urban service
Cities Service Products Used:
Koolmotor Bus Oils
Koolmotor Transmission Oil (Extra Heavy)
Koolmotor Universal Grease (Heavy)
Cities Service Grease Guns.

CITIES SERVICE
COMPANY
NEW YORK CITY

KOOLMOTOR PRODUCTS

ROUTES OPERATED BY
PUBLIC SERVICE
COORDINATED TRANSPORT
IN NEW JERSEY
Today's Speed demands today's Braking Method

featuring

1. Less journal, journal box, and pedestal wear.
2. Permits wheels to freely follow track irregularities.
3. Divides energy absorption between two shoes; reducing heating effect from brake application, resulting in higher coefficient of friction.
4. Reduced frequency of brake shoe replacement lessens maintenance costs.
5. An efficient, balanced brake.

Makers of Davis One Wear Wheels

AMERICAN NEW YORK
Speed is today's byword. Greater Speed, faster service, better schedules—these are the demands on practically every transportation organization today.

Without a doubt deceleration is as important a factor in maintaining schedules as acceleration or running speed. It's the most important factor where speed with safety is concerned.

Simplex Multiple Unit Clasp Brakes offer today's method of braking to meet today's demands in speed. Two brake shoes per wheel double the braking area and halve the wear on braking equipment.

Balanced braking has many advantages. Study the features outlined here. Details and blueprints will be sent at your request.
TYPICAL RECORDS DENOTING
the OUTSTANDING SUPERIORITY
of
Firestone
GUM-DIPPED
TRUCK & BUS BALLOON

That Firestone Gum-Dipped Truck and Bus Balloon Tires out-run, out-wear and out-perform any other tires on the market today is clearly indicated by the following typical records, selected at random from the hundreds of owners' statements in our files.

1 Raymond Bros. Motor Transportation of Minneapolis, report record-breaking mileage, as high as 90,000 miles, from Firestone Gum-Dipped Tires on their 25 freight trucks.

2 Parker Stage Lines of Salem, Oregon, have obtained the exceptional average of 50,000 miles from the Firestone Tires on their buses — including a high record of 58,000 miles.

3 The Everett-Marysville Stage Co. of Everett, Washington, add another great record, reporting 76,123 miles from Firestone Gum-Dipped Tires on their stage line.

4 The Wisconsin Public Service Corp. of Green Bay, report a total of 395,225 miles from the six Firestone Gum-Dipped Tires on their bus No. 301, for the amazing average of 65,871 miles.

You, too, can increase your mileage and decrease operating costs by equipping your vehicles with these strongest, safest, toughest tires built. The Firestone Tire Dealer Will Save You Money and Serve You Better.
THE North Carolina Public Service Company is just another company that, wishing to give its patrons the utmost in comfort, efficiency and safety in transportation, has selected "Thomas-Built Cars."

Thomas-Built Cars are designed with sufficient strength to meet all requirements and yet not be of excessive weight. Structural simplicity, combined with lasting strength and fine appearance, makes the Thomas-Built Car ideal for satisfactory service.

This construction, typical of our cars, is an important feature in that it helps to cut the cost of maintenance.

PERLEY A. THOMAS CAR WORKS
HIGH POINT, N. C.
A Truly Metropolitan Store

First In Pittsburgh Pittsburgh's First Store

JOSEPH HORNE CO.

Car Card Advertising Almost Everywhere
PROGRESSIVE merchants use advertising to build business. They depend on modern transportation facilities to bring this business to their stores. As advertising develops more business the greater is the need for transportation. Thus Collier Service car cards benefit the Electric Railway Line as well as the merchants and the riding public.
The "DIE-HARDS" stuck to the stagecoach

The superior transportation offered by the iron horse was no inducement to the die-hards—not because of any reason, but merely because they were die-hards.

For the resistance of the die-hards lingers on long after the merits of a new product have been proved beyond any reasonable doubt.

To the "DIE-HARDS" in the electric railway industry

The day of the mercury arc power rectifier is here. Its performance record in hundreds of important installations has established it with the whole electrical industry as dependable, economical equipment. It converts current without noise, without vibration, without rotating parts, without special buildings, and without special foundations.

Its operation may be completely automatic and it may be controlled from a distance. At our Camden plant are engineers who figured prominently in the early development of the rectifier. Their services are at your disposal.

American Brown Boveri Co., Inc.
Camden, N. J.

AMERICAN BROWN BOVERI
De Luxe Reclining Chair!

The 155-P is one of the most luxurious and comfortable reclining bus chairs ever produced. As shown above, in a smart upholstery combination of leather and plush, this modern seat offers long, satisfying wear, as well as a distinctive appearance. Both the cushion and back on this style are designed and pitched for restful comfort. The soft, spring-filled back is concave and has a pillow-type headroll. The back may be reclined to three positions by pressure on the handily located lever at the side of the chair. Write to the nearest Heywood-Wakefield sales office for complete details of the 155-P and other popular bus seats in our line.

HEYWOOD - WAKEFIELD COMPANY
BOSTON, MASSACHUSETTS

If you have not received a copy of our new Bus Seat Catalogue, write for it.

516 West 34th St., New York City
J. R. Hayward, Liberty Trust Bldg., Roanoke, Va.

439 Railway Exchange Bldg., Chicago, Ill.
A. W. Arlin, Delta Bldg., Los Angeles, Calif.
The G. F. Cotter Supply Co., Houston, Texas

The Railway and Power Engineering Corporation
133 Eastern Ave., Toronto; Montreal; Winnipeg, Canada
Exhausting equipment is just as important as the spray-painting equipment. Speed, character of result, operating cost all depend upon the suitability and efficiency of the exhausting equipment and the way in which its installation is engineered.

DeVilbiss has intensively specialized in the exhausting requirements of all industries. DeVilbiss provides all types of exhausting outfits from the ordinary wall fan to the great departments built for car shops and bus terminals. DeVilbiss can render valuable help in the design, location and installation of your exhausting facilities. We will gladly give you the benefits of an almost infinite experience and study of this important phase of the spray-finishing operation.

EVERYTHING for SPRAY-PAINTING and SPRAY-FINISHING

Spray guns of various types and sizes.
Pressure feed paint tanks and containers.
Spray booths, exhaust fans, and approved lighting fixtures.
Air compressing equipment.
Air transformers and accessories.
Complete outfits from the smallest hand-operated units, to the largest industrial installations.

Write for catalog of the DeVilbiss spray equipment that fits your individual need.
True Temper Tapered Rail Joint Shim

The Remedy for Low Joints caused by wear

The above shows Joint Shim in position with angle bar removed.

The above shows Joint Shim in position between Bar and Ball of Rail.

Other True Temper Products for Electric Railway Use:

Safety Rail Forks
Railroad Scuffle Hoes
Ice Chisels

Road, Gravel and Cleaning Rakes
Sidewalk Cleaners

Send for a free copy of our Catalog RAD1, which describes these and other True Temper Products for Electric Railway use.

THE AMERICAN FORK & HOE COMPANY
General Offices: CLEVELAND, OHIO; Factory: NORTH GIRARD, PA.
District Offices

Representatives at
Boston, Denver, Detroit, Minneapolis, St. Louis and San Francisco

Foreign Representatives
That 1930 BUDGET

When expediency demands that tracks be renewed, economy also demands that permanency be a vital consideration. Can these factors of expediency and economy be combined safely in your 1930 budget? READ

Dayton Mechanical Ties depend upon no factors other than their own inherent merit, to successfully bear the burden of traffic without danger to track substructure or excessive rail wear.

In every single instance of installation over a period of seventeen years, where time has been more than sufficient to demonstrate their worth . . . these facts stand out . . . FIRST that Dayton Ties cut maintenance costs to a minimum . . . SECOND that track substructure and pavement remain absolutely intact.

Dayton Ties not only introduce the vibration absorbing feature of wood ties in gravel ballast but also provide a supporting structure to pavement that positively and permanently protects it from destruction by traffic. Before specifying any tie for your 1930 work ask yourself this simple question:

Are you sure that any other tie is quite as safe?

Rail Vibration cannot be safely buried in a track structure without placing in the track structure an agent that will counteract its destructive effect. "VIBROLITION" (demolition of substructure as a result of rail vibration) can be prevented only through the use of Dayton Ties. They are the only ties that successfully utilizes a vibration absorbing element. This element absorbs rail vibration and gives positive and permanent protection to substructure and pavement. To specify Dayton Ties is to insure the permanence of your track construction. Our new 1930 catalogue is now ready. Your request will bring full details promptly.

THE DAYTON INTEGRAL SYSTEM OF TRACK AND PAVING STRUCTURE

THE DAYTON MECHANICAL TIE CO., Dayton, Ohio
GREETINGS
1930

Headquarters for
Electric Car Heaters
Window Sill Heaters
Thermostats
Pneumatic Door Operating Equipments
Automatic Treadle Doors
Safety Door Relays

Safety Reversing Doors
Safety Heater Switches
Motorman's Signal Lights
Buzzers and Bells
Automatic Ventilators
Steam Heaters for Buses

Plant of
Consolidated Car-
Heating Company,
Albany, N. Y.

CONSOLIDATED CAR-HEATING COMPANY, INC.

NEW YORK
ALBANY
CHICAGO
Here is the greatest testimonial of all!

MONTH after month we have published in these pages the reports of motor coach operators who use Goodyear Tires.

Impressive facts—but here is one which totals all the rest.

In motor coaches, all over the world, more people ride on Goodyear Tires than on any other kind!

The simple and powerful reason for this fact is that more coach fleets are equipped with these tires—more operators have found by practical experience that Goodyear Tires deliver what they need, in surplus measure.

Here is the vote of companies like your own—operating passenger coaches under your type of operating conditions. On level city boulevards—on hilly city streets—in city to city service up and down the east coast—or on desert and mountain trails in the far west—Goodyears are serving and satisfying more motor transportation companies than any other tires.

They must show their greater economy on cost records—they must demonstrate their greater vitality on fast long trips—they must prove their greater traction on every type of road—otherwise they would not have and hold this outstanding position.

What can you find in other tires, which you will not find in greater measure in Goodyears?

ON YOUR NEXT COACHES, SPECIFY GOODYEARS

THE GREATEST NAME IN RUBBER
PREFERENCE OF PATRONS

HIGH

COSTS

LOW
Your costs low –

Dodge Brothers
your patrons pleased with Dodge Coaches

No operator asks for more—no motor coach can provide more » » »

You can conclusively determine how well Dodge Motor Coaches fit your needs. Simply judge them in the light of essentials: for their ability to serve at low cost and please your patrons.

Contributing in ample measure to the low cost operation of Dodge Coaches, you find power, economy, dependability, speed and acceleration. From the standpoint of low cost, also consider their practical sizes—21-passenger capacity in the Street Car Coach and 16-passenger capacity in the Parlor Coach. Sizes that permit of shorter headway during brief peak periods and fewer empty seats during the long off-peak hours.
Contributing to low maintenance costs

ROOF, of Haskelite, supported by laminated ribs, is strong and weave-proof. Heavy felt padding between top covering and wood effectively protects the covering.

INSULATED BODY WIRING is carried in channel in dome-light rail. Greater protection and ease of access result.

DRIP MOULDING is amply deep and of heavy construction. It provides the needed protection to insure efficient drainage in all weather.

CADMIUM PLATED SCREWS, exclusively, are used in construction of body. These rust-resisting screws prevent premature destruction of the wood at points used.

ALL WOOD PARTS are of oak, thoroughly lead primed. Body will endure for a longer period.

EACH OUTSIDE METAL PANEL overlaps the one immediately below it. All joints are covered with half-oval aluminum moulding. Such care insures in design and construction more effective weatherproofing, a more finished appearance and longer life.

SKID RAILS, on sides and rear of coach, provide added safety for passengers and material protection to body.

SKIRTING is securely braced and adequately protected by sturdy angle irons. Long body-life and protection in even unusually severe coach service, are assured.

WINDOWS are of brass sash with pinch locks operating on brass slides. They are free from rattle.

Add to this list of advantages such motor coach essentials as metal nonskid entrance step, removable safety mat in aisle and genuine leather seats of sturdy, enduring construction. Body maintenance costs are sure to be low.
New Exide Battery
Specially Built for Hard Motor Coach Service

No more rotting battery boxes. No more containers wet and soggy from last week's storm. New Exide composition case eliminates these annoying, cost-building evils. The case is impervious to the damaging effects of mud, water, acid and hard knocks.

Now you can have the famous dependability, power, economy of Exide Motor Coach Batteries in a composition case that will wear as long as these long-lived batteries . . . will stand up under the tough treatment a bus battery gets.

Write today for full information on Exide Motor Coach Batteries in the new composition cases. They are built to cut your maintenance costs.

Latest development of Exide engineers meets demand for improved battery service . . . . .

Exide
MOTOR COACH BATTERIES

THE ELECTRIC STORAGE BATTERY COMPANY, Philadelphia
Exide Batteries of Canada Limited, Toronto
METAL & THERMIT

PITTSBURGH    CHICAGO    BOSTON

120 BROADWAY
Have faith in the future of the transportation industry

Not words, but deeds must be used as the yard-stick with which to measure all progress made in the past, and as a basis for predicting the future.

In spite of the prophets of gloom, the motor bus has not ruined the electric railway business. Rather, it has become an important adjunct to the operations of the established transportation companies. If some track mileage has been abandoned, here and there, it represents that over-building which every industry experiences in its earlier years.

Look rather at the positive side of the picture! The statistics in this issue tell the story of an industry with a billion dollar revenue. New cars and buses added, hundreds of miles of track rebuilt, and extensions made. A budget for 1930 of about $300,000,000 for maintenance, and for betterments and extensions. These are the attributes of a going concern.

To this picture the Metal & Thermit Corporation adds this report for 1929—more Thermit Welds sold than ever before! For 1930, the programs already revealed to us by leading electric railway customers indicate substantially more work planned than in 1929. The release of money formerly tied up in speculative enterprises will make it easier for the railways to finance improvements and additions.

Metal & Thermit Corporation has much at stake in the success or failure of the electric railway industry. In expressing our own confidence in the future of your industry, we are reciprocating that confidence you have always shown in our product.
Big Business Adopts
Balanced Angle Compressors

Big business is setting a new pace. Facts—not opinions—are guiding its methods and selection of machines.

And big business has adopted air power by Balanced Angle Compressors.

Builders of half the world’s automobiles—
Makers of two-thirds of America’s electrical equipment—
Refiners of eighty percent of industry’s lubricants—

Great foundries, power plants, lumber mills, mines—
—now save money with Balanced Angle Air Compressors.

For these distinctive machines have proved their ability to supply air for less power, and lower maintenance.

The facts that persuaded big business to use Sullivan Compressors are available for you.

Send for Booklet 83-J.

S U L L I V A N
M A C H I N E R Y C O M P A N Y
809 Wrigley Building
Chicago, U. S. A.

Offices in all principal cities in the world
More Brill-Timken Trains

Because they practically eliminate starting resistance—because they need lubricating less often—because they require merely routine attention even after thousands upon thousands of miles, Timken Bearings have established themselves with both the builders and the operators of cars. Timkens are more than just anti-friction bearings. The total carrying ability of Timken tapered construction, Timken POSITIVELY ALIGNED ROLLS and Timken steel includes radial, thrust and combined loads.

Without compromise—without complication—Timken Bearings materially help in putting rail transportation on a more economical basis.

THE TIMKEN ROLLER BEARING CO.
CANTON, OHIO

TIMKEN
Tapered
ROLLER BEARINGS
THE CHOICE OF LEADING BUS FLEETS—because of its outstanding record

The U. S. Royal Heavy Service Tire asks no odds when it goes into bus service.

Its record on many of the country's most prominent fleets stands as full proof of its ability to deliver trouble-free mileage at low cost.

For those operators changing to balloons—the U. S. Royal Heavy Service Balloon is in equally high favor because it has qualified as having the same superior qualities associated with the high pressure Royal Heavy Service.

UNITED STATES RUBBER COMPANY
THE WORLD'S LARGEST PRODUCER OF RUBBER

U. S. ROYAL HEAVY SERVICE BALLOON

The great fleet of de luxe motor coaches operated by Union Pacific Stages, Incorporated, covering the northwest, are equipped with U. S. Royal Heavy Service Tires to meet the demands of a transportation service famous for its smooth operation.
Here is a section of the detail strip from a Class 80 Register. Because of the wide detail strip (4 1/4 inches) a complete record with proper column spacing is made possible.

8593
Consecutive Number on Detail Strip and Ticket

Only OHMER gives you this added protection

HERE'S a feature that you need on all your ticket-printing fare registers. It's a feature that was developed by transportation specialists to give you added protection through a complete check on every sale.

When the consecutive number appears on detail strip and ticket, you can positively identify each ticket with the corresponding sale on the detail strip. You can save time by auditing fares consecutively... a system impossible with any other register. You can make checking definite and simple.

And in addition, the detail strip carries the operator's number... another feature that makes the audit of sales even more positive and more accurate.

Other information appearing on the detail strip and ticket is the Date, the From and To stations, the Division traveled, and the Amount and Class of fare. No other fare register in the world gives so much information and so much protection.

Now... a more perfect “On and Off” Check!

Our transportation specialists have devised a new “On and Off” check. It is simple, accurate and sure. We want you to see how it works. Send for your free copy of the folder in which it is completely described.

OHMER
REG. U.S. PAT. OFF. AND OTHER COUNTRIES
FARE REGISTER COMPANY
Dayton, Ohio, U.S.A.
An Essential

quality materials

sound engineering

extensive facilities

Trolley Wheels and Harps

"Tiger" Bronze Axle and Armature Bearings

M.J Armature Babbitt
Combination for Perfect Service

QUALITY materials, sound engineering, and extensive facilities unite to produce these products of the National Bearing Metals Corporation. Such a combination has been at the service of the industry since the first street cars appeared. Such a well-organized background has made it possible to meet the requirements of the industry as conditions have changed and progress has been made.

Armature Babbitt Metal
Twenty-five different grades of babbitt have been successfully perfected in our line, designed for varying services and at varying prices. "Armature" for electric railway motor bearings is unexcelled for durability and economy.

Trolley Wheels
This company is the largest manufacturer of trolley wheels and harps. Many of our products have been perfected in co-operation with experts from various large electric railway systems.

"Tiger" Bronze Axle and Armature Bearings
Being one of the early achievements of this organization and probably the most widely known bronze on the market, "Tiger" Bronze has done much to establish the National Bearing Metals Corporation as one of the leaders in bearing manufacture.

The personnel of the More-Jones organization is composed of many men, of proven ability, whose connections with it date back to the very beginning of electric railway transportation in America.

These specialists, versed in your problems, will gladly work with you at your request.

NATIONAL BEARING METALS CORPORATION
More-Jones Division
ST. LOUIS, MO.

This WINTER-

The Sutton pipe connects with dome-shaped ventilating heads in the floor of the bus, drawing out the foul, cold air, and causing efficient circulation of warm, fresh air without drafts.

- The Vac-Vent Electric, the heart of the system. Exhaust gases from the motor in leaving the jet, create a powerful motion in the surrounding chamber. This is the operating force upon which the Vac-Vent system depends. A vacuum pressure of two pounds is often produced.

The vacuum set up in the Vac-Vent ejector draws off the vapors, gas fumes, carbon particles and exhaust heat, which ordinary mix with the crankcase oil, reduce the motor life, blow out the breather, and get into the body.
will your buses furnish passengers with stuffy—drafty—
gas poisoned air—
or will those buses be equipped with
“Vac-Vent”?  
(THE COMPLETE BUS VENTILATING SYSTEM)

No matter how luxuriously your buses are furnished or how comfortable the seats—your passengers will not be comfortable unless you take steps to remedy the ventilation evil.

Vac-Vent, the new ventilating system of radical, yet sound principle, is already adopted and enthusiastically praised by leading operating officials. Why? Because Vac-Vent easily accomplishes what no other ventilating system has even attempted to do—it thoroughly ventilates both the bus body and the motor crankcase. There are no moving parts—and no maintenance. The results depend upon a never-failing source of supply—the powerful exhaust from the bus motor. By surrounding the end of the exhaust pipe with our Vac-Vent Ejector, a vacuum is produced, which sucks out all of the vapors, fumes and carbon particles which blow by the pistons. The connecting pipe has two or more ventilating heads which project through the bus floor, drawing out the heavy, foul air at the floor line, and causing even distribution of fresh heated air.

Vac-Vent prolongs motor life, because of elimination of diluting and contaminating elements, and the reduction of motor temperature. It completely ventilates the bus. Get in touch with us now, in time for deliveries before bitter weather becomes the rule.
Roebling

Whether your needs are for the finest Magnet Wire for electrical equipment; aircraft or automotive cables; underground or overhead transmission cables required for hydro-electric developments, Roebling Quality Products can be depended upon for long and satisfactory service.

John A. Roebling’s Sons Company
Trenton New Jersey

Makers of Wire Rope, Wire and Electrical Wires and Cables
UTILITY means ECONOMY AND SERVICE

Below — Thermo-control and Heat Regulator Panel. Note the simplicity of assembly and rugged construction.

The Chromalox Strip shown below is the heart of the Utility Chromalox Cross Seat Heater. An unusually efficient heating unit listed as standard by Underwriters' Laboratories.

UTILITY Heating and Ventilating Systems, render adequate ventilation and proper car temperatures, providing comfortable transportation that increases revenue. Furthermore, many old heating systems are wasteful and uneconomical. Again you may be dividing your profits by unnecessarily high heating costs.

Let us tell you about Utility Compensating Systems of natural ventilation.

RAILWAY UTILITY COMPANY
2241 TO 2247 INDIANA AVE. CHICAGO, ILLINOIS
J. H. Denton—Eastern Manager
1328 Broadway, New York City
...Modern rolling mills, expert supervision, regular and frequent inspections are incorporated in every Gary Wrought Steel Wheel, giving that dependable service electric railway men expect in products bearing the name ILLINOIS. ...Our wheel engineers are at your service.

Illinois Steel Company
Subsidiary of United States Steel Corporation
Chicago, Illinois

ALL THAT GOOD WHEELS SHOULD BE
A complete wire and cable service

The new year finds Anaconda Wire and Cable Company in a better position than ever before to offer a complete wire and cable service to the electrical industry.

Nine wire mills, strategically located throughout the country and supplemented by convenient warehouse stocks, make possible a coast-to-coast service unequalled for promptness and dependability. Modern and efficient mill equipment strengthens production facilities and speeds deliveries. The coordinated supervision by a single organization from ore to finished product—from mine to consumer—guarantees the high conductivity and uniform quality of all Anaconda wire and cable products.

Fifteen sales offices dot the map between Boston and San Francisco, making Anaconda service immediately available everywhere. Our Engineering Department, with its background of metallurgical experience covering more than one hundred years, offers its facilities to electrical engineers to assist in the design and construction of cables to meet special and unusual requirements.

In a word, Anaconda offers a complete wire and cable service—wires and cables for every electrical requirement—and makes available to the industry the vast resources and technical facilities of the Anaconda organization. We welcome the opportunity of cooperating with you.
Globe designed tickets and transfers help you realize most on every riding dollar

A transfer designed to eliminate a large percentage of the ever-present abuses at transfer points; a ticket designed to save the conductor's time and eliminate change-making, a "hat check" to eliminate over-riding, a weekly and Sunday-pass to increase riding during off-peak hours and to give revenue in advance... these are a few of the concrete examples of Globe service in assisting operating companies to solve their fare problems.

Globe service has the verbal and written O.K. of most of the important operators. Globe experience is a tangible asset... resulting in increased revenue for you, and the elimination of fare difficulties. Write.

**Globe**
**TICKET COMPANY**
**PHILADELPHIA**

Factories:
Philadelphia  Los Angeles  Boston  New York  Jacksonville
Syracuse  Cincinnati  Cleveland  Pittsburgh  Springfield, Mass.

Digitized by Microsoft®
Time changes, but
Twin Coach 1st

1928 records of buses bought by electric railways

in large capacity buses buy in total buses bought show
Again in the year just ended, Twin Coach maintains its position; repeats its success of 1928.
This success is represented by the sale to electric railways of nearly 40% more 37-40 passenger coaches than were sold by all other coach manufacturers combined.

The railways requiring large capacity street car type vehicles realize that such units to succeed must be built as Twin Coaches are built—with body and chassis integral.
20th Century Spanish Leathers

Majestic Full Grain Leathers

Better Seats--Bigger Revenue!

They go hand in hand.

For better seats mean greater comfort. And your fare registers will tell the welcome story of increased revenue that follows your catering to the demands of your passengers.

That’s one reason why, for seat coverings, General Leathers have had such wide acceptance. Another reason lies in the fact that this durable leather is so easily cleaned with soap and water. It is fast in color. It never gets sticky in any weather. It stands the hardest kind of service.

Hides are furnished in all sizes and colors. On quantity orders, we cut directly from your patterns and this eliminates waste.

Write for samples. Specify General Leathers on your Cars, Buses and Taxi-Cabs or when you overhaul your seat coverings.

GENERAL LEATHER COMPANY
Makers of Famous Tried and Proven “00” Leathers
NEWARK, N. J.

Detroit Office
Stoddard Lovely & Co.
10-219 General Motors Bldg.

Colonial Traders, Inc.
20 Williams St.
Chatham, N.J.

London Office
R. & A. Kohnstamm, Ltd.
21 West Smithfield, London, E. C.

West Coast Office
A. J. & J. R. Cook, Inc.
237 Eighth St., San Francisco
Trackwork—*that is* wear-resisting and Weldable

Increasingly heavy traffic requires trackwork that is wear-resisting, weldable and thoroughly dependable. Bethlehem Silico-Manganese Trackwork, Design 999, meets all of these requirements. It can be installed at heavy traffic locations with confidence that it will stand up under the most severe service conditions.

Bethlehem Silico-Manganese Trackwork is remarkably wear-resisting and is readily weldable by any of the standard methods, such as electric arc, oxy-acetylene and Thermit Welding.

**BETHLEHEM STEEL COMPANY**

*General Offices: Bethlehem, Pa.*

*District Offices: New York, Boston, Philadelphia, Baltimore, Washington, Atlanta, Pittsburgh, Buffalo, Cleveland, Detroit, Cincinnati, Chicago, St. Louis, San Francisco, Los Angeles, Seattle, Portland, and Honolulu.*

Bethlehem Silico-Manganese Trackwork—Design 999
Wheels—that meet the demands of modern traffic

The exceptionally severe service that car wheels undergo today greatly reduces the life of ordinary wheels. Wheels that meet modern traffic conditions must be good wheels.

Bethlehem manufactures and offers to electric railways a wrought steel wheel that has the strength, endurance and wearing qualities to stand up and deliver exceptional mileage under severe modern traffic conditions. Five distinct forging and rolling operations are required to make a Bethlehem Wheel. The forging gives the metal toughness and density. The rolling establishes a uniform grain structure throughout the wheel virtually eliminating crystallization and reducing to a minimum the possibility of breakage.

When you use Bethlehem Wrought Steel Wheels you can rest assured that you will receive from each wheel many thousands of miles of trouble-free service.

BETHELHEM STEEL COMPANY
General Offices: Bethlehem, Pa.
District Offices: New York, Boston, Philadelphia, Baltimore, Washington, Atlanta, Pittsburgh, Buffalo, Cleveland, Detroit, Cincinnati, Chicago, St. Louis, San Francisco, Los Angeles, Seattle, Portland, and Honolulu.

BETHELHEM
Wrought Steel Wheels and Forged Axles

FORGED AXLES

Extreme care is exercised in the manufacture of Bethlehem Axles. Special heat treatment gives them ductility and a high elastic limit. They give excellent service under severe torsional stresses.
LONG PRODUCTS

Automotive CLUTCHES and RADIATORS

THE LONG MANUFACTURING CO.
DETROIT, MICHIGAN
Mile after Mile of smoother, quieter transportation

All over the country—from coast to coast—electric railway systems are adopting the Carey Elastite System of Track Insulation. Mile after mile of new rails will be Carey-insulated, in 1930.

Traction officials approve it because it means lower maintenance costs. The public approves it because it muffles noise—makes for smoother, more pleasant transportation.

Carey Elastite Track Insulation is climate-proof, rot-proof. Water seepage does not affect it—nor does the Summer sun or Winter frost. It eliminates joint ruts, pavement buckling between rails, cracking and spalling of adjoining concrete.

Is it any wonder that you see such a growing use of this product?

If you have any questions to ask about the Carey Elastite System of Track Insulation—write. Full details will be presented to you without obligation.

The Philip Carey Company
Lockland, Cincinnati, Ohio

Carey Elastite System of Track Insulation is preformed, under heavy pressure, of durable asphaltic compound, substantially reenforced with asphalt-saturated fibre.

Carey Elastite Electric Railway Products
Carey Elastite Expansion Joint
Carey Elastite Asphalt Plank
for bridge flooring
for water-proofing overhead bridges
Carey Elastite Trunking for signals
To street railway men this equipment is familiar, yet not devoid of interest. It still attracts attention by virtue of its contribution to safe, speedy, and economical transportation. Its potentiality for improvement in service and public goodwill is being recognized more extensively from year to year.

SAFETY CAR DEVICES CO.
OF ST. LOUIS, MO.
Postal and Telegraphic Address:
WILMERDING, PA.
CHICAGO       SAN FRANCISCO       NEW YORK
WASHINGTON     PITTSBURGH
50 YEARS have seen a revolution in the generation of direct current

The past fifty years have witnessed tremendous changes in the design of electrical machinery for the supply of direct current. Throughout these years, National Carbon Company, Inc., has been an outstanding leader in developing new and more efficient carbon brushes for the successful operation of these machines.

When the incandescent lamp was in its infancy, the Edison generator illustrated above was used as the source of electrical power. This generator was belt-driven from a steam engine. Its approximate capacity of 25 kilowatts was considered high.

Compare this with the methods of today. Most direct-current power in use today is initially generated as alternating current, often by units with a capacity of over 100,000 KVA. It is transmitted at high voltage to sub-stations where it is transformed to lower voltage and converted to direct current by means of huge rotary converters. The modern rotary converter illustrated herewith is a typical example.

The various designs of machinery necessary for the collection and redistribution of electrical energy in this highly efficient way would be impossible without carbon brushes. Scientific research in the up-to-the-minute Research Laboratories of National Carbon Company, Inc., always has kept (and still keeps) pace with the ever-changing demands placed on the many types of carbon brushes required.

Engineering science in our laboratories and carefully supervised workmanship in our factories are maintaining for National Pyramid Brushes the leadership established through the years.

NATIONAL CARBON COMPANY, INC.
If SKF Wasn't Quite So Big....

"The Highest Priced Bearing in the World"

Would Be Higher Priced

SKF Ball and Roller Bearings have never been sold on any other basis than performance. They can't be. No other bearing in the world costs so much—to buy or to make. But there are other bearings, many of them, that cost more—much more—to use.

SKF produces not one type but many different types of anti-friction bearings. The special ores it requires come from its own mines. The charcoal it uses in processing its special steels comes from its own forests. Its laboratories, plants, factory branches extend right 'round the world. Among its 23,000 employees 27 languages are spoken.

SKF supplies greater service to more customers in more places than any other anti-friction bearing manufacturer in the world. And SKF makes "the highest priced bearing in the world."

SKF INDUSTRIES, INCORPORATED
40 East 34th Street, New York, N.Y.
Actual Survey Shows That on a Typical Electric Railway Property, Car Wheels, Over an Extended Period, Represent the Highest Annual Item of Mechanical Maintenance Cost.

CARWHEEL BUDGETS FOR 1930
WILL BE LOWER FOR THE MANY REPRESENTATIVE ELECTRIC RAILWAY COMPANIES NOW USING

NACO SPUN STEEL CAR WHEELS

TO SERVE the industry effectively by supplying better car wheels—this was our purpose five years ago when engaging in the manufacture of wheels.

IN THE meantime, actual results covering severe service accurately computed on several properties have definitely established our product as a progressive and timely development.

When arranging your program for the coming year, write NACO SPUN STEEL WHEELS into your specifications for regular replacement use, and for any new car construction. This will lead to lower car wheel budgets over ensuing periods.

National Malleable & Steel Castings Co.
General Offices: Cleveland, Ohio
STEEL PLANTS: Sharon, Pa., Chicago, Melrose Park, Ill.
A good remedy for service troubles can usually be found in automatic signaling. "Union" automatic signals, interlocking installations, and power operated, remotely controlled switches are being used to eliminate unnecessary stops.

These installations give definite economies. They permit higher average speeds. The time saved per trip due to signaling can be definitely represented as return on investment. Installations of "Union" apparatus are dependable investments.

Our nearest district office will gladly give you more information on "Union" apparatus.

1881  Union Switch & Signal Co.  1930
NEW YORK    MONTREAL    CHICAGO    ST. LOUIS    SAN FRANCISCO
SWISSVALE, PA.
Bond Performance

One of the advantages of buying American Steel and Wire Company Rail Bonds is the assurance you will have of dependable performance. The reason is materials, design, and construction. Our experience has been of the kind that is worth money to you in Bond performance.

The AB-2 Bond is easily and quickly applied with a steel electrode. The open shape of this Bond terminal is especially desirable since the arc can be directed freely at the junction of the terminal and the rail.

Would you be interested in inspecting a sample?
POLES—STRAIGHT STRONG and STURDY

TYPICAL of this modern age is the Union Metal Fluted Steel Pole. Designed with the City Beautiful ideal in mind, it is gracefully tapered and fluted in the manner of architectural columns. Here is no ordinary pole, no public eyesore. Straight, strong and sturdy, Union Metal Poles stand in even rows along the curb-line, monuments to the foresight of progressive utility operators.

Because they are fabricated from heavy steel, they are strong enough to withstand heavy side strains. And because of their strength—and appearance—one set of poles may be used to support lighting units, trolley span wires, traffic signals, and distribution and transmission lines. The result is true economy for the users of the poles and a decided improvement in street appearance.

THE UNION METAL MANUFACTURING CO.
GENERAL OFFICES AND FACTORY: CANTON, OHIO
SALES OFFICES: New York, Chicago, Philadelphia, Cleveland, Boston, Los Angeles, San Francisco, Seattle, Dallas, Atlanta
DISTRIBUTORS
General Electric Supply Corp.
Graybar Electric Company, Inc.
Offices in all principle cities

UNION METAL
DISTRIBUTION AND TRANSMISSION POLES
The indisputable economy of Spray Painting... the smoother, more durable lacquer finishes... the tremendous reduction in the out of service time required for refinishing, and the increased capacity of your paint shop makes Spray Painting Facilities an essential part of your maintenance equipment. Many Street Railways are seriously considering the adoption of this modern means of cost reduction... You too, will install Spray Painting facilities in your paint shop.

When you are contemplating this equipment, remember that Mahon engineers are recognized the world over as a highly specialized staff of Spray Booth experts... remember also, that it cost no more for the services of these specialists whose widely diversified experience will prove of incalculable value to you in the economical solution of your Spray Booth problems, both in initial cost and in operating expense over a period of time. Arrange a consultation with Mahon engineers today.

THE R. C. MAHON COMPANY
DETROIT, MICHIGAN
Manufacturers of Spray Booths and Exhaust Stacks,
Industrial Drying Ovens and Blow Pipe Systems.

MAHON
SPRAY BOOTHs & EXHAUST STACKS
DESIGNED FOR FIRE SAFETY
Increased Mileage

Greater Economy

Maximum Safety

CARNegie WHEELS

Product of CARNEGIE STEEL COMPANY, Pittsburgh, Pa.—Subsidiary of United States Steel Corporation
the TIME TESTED Overhead Construction

From the very beginning of the electric railway industry, A. & J. M. Anderson have been known for the high quality of Line Material which they supply. And by constantly introducing new products which help railway operating men with their problems, this company has built up an extensive and varied line of overhead construction material. Hence from one source, you can purchase many of the items of Line Material which you require.

At the right is a partial list of ANDERSON TIME TESTED Line Material. From every item, you may be sure of long life and dependability. More than 40 years of specializing in Line Material are back of every product.

Large or small orders of standard material can be shipped promptly from stock. Whatever your requirements—write us today.

Bulletin No. 39 contains over one hundred pages; it illustrates and describes hundreds of different items. A copy of this comprehensive catalog will be sent on request.

Albert & J. M. Anderson Manufacturing Co.
289-305 A Street, Boston, Mass.
New York Chicago Philadelphia London
WHEN car wheels pass over this trackwork, they have a continuous flange bearing through the crossings. Approaches to the flangeway intersections are gradual. These two features of construction eliminate the usual pounding noise where the guard rail is of ordinary depth and the approaches are short.

This double track 3-part through wye is constructed of 7-inch guard rail Standard Section Lorain 140 No. 468 and corresponding flange bearing rail 150 No. 512. The tongue switches are of manganese steel. Mates, frogs and crossings are of iron-bound hard centre construction with chrome nickel steel center plates.

LORAIN can meet any street railway requirement from the most complicated layout to a switch tongue lock-box; tongue switches, mates, frogs, crossings, etc., either to girder rail or standard tee rail sections. Investigate our ability to serve you.

THE LORAIN STEEL COMPANY
JOHNSTOWN, PA.

SUBSIDIARY OF UNITED STATES STEEL CORPORATION

AMERICAN BRIDGE COMPANY
AMERICAN SHEET AND TIN PLATE COMPANY
AMERICAN STEEL AND WIRE COMPANY

Carnegie Steel Company
Cyclone Fence Company
Federal Shipbuilding and Dry Dock Company

Lorain Sales Offices—ATLANTA CHICAGO CLEVELAND DALLAS NEW YORK PHILADELPHIA PITTSBURGH

Lorain GIRDER RAILS GIRDER GUARD RAILS
PLAIN GIRDER RAILS RAIL JOINTS AND TRACK ACCESSORIES
EXPANSION JOINTS FOR ELECTRICALLY WELDED TRACK
SPECIAL TRACKWORK SWITCHES, FROGS AND CROSSINGS
in
Solid Manganese Steel, Manganese Insert Construction, Chrome Nickle Steel Inserts Construction and Built-up Construction of all heights and weights of rail.

American Sheet and Tin Plate Company
American Bridge Company
American Steel and Wire Company

Carnegie Steel Company
Cyclone Fence Company
Federal Shipbuilding and Dry Dock Company

Illinois Steel Company
Minnesota Steel Company
National Tube Company

The Lorain Steel Company
Tennessee Coal, Iron & R. R. Company
Universal Portland Cement Company

Remember there is only one way to put track in the street exactly like the plan.

Uniform Mechanical Methods and STEEL TWIN TIES
To Put The Track In The

View of new standard Steel Twin Tie and
—at left—the Precision Rail Clip.

D. S. R. Track Layer

Compression Tamper

Uniform Tension Bolt Tightener

INTERNATIONAL STEEL
Use Uniform Mechanical Methods and Steel Twin Ties

Uniform results in constructing paved track are what every operator wants. For uniform quality and results International machine methods combined with Steel Twin Ties have no counterpart in paved track construction. It is the only completely controlled, economical method of building paved track—regardless of whether the job is large or small.

The modernized standard Steel Twin Tie has 8 plate anchors twisted into the concrete. It is furnished with the precision type rail clip that is rolled, sawed, drilled and machined, and with heat treated high tensile bolts.

Install these Steel Twin Ties with the four machines that comprise the International Mechanical Method—Track Layer, Bolt Tightener, Compression Tamper and the marvellous Mortar-Flow Pulsator that gives a 300% better bond between rail, tie and concrete.

Then you know you have track in the street exactly like the plan.

Let us demonstrate International Mechanical Track laying methods, submit prices on ties, and terms on machine equipment. Write.

Vibrating the track structure at 5500 vibrations per minute—with the "Mortar-Flow" Pulsator—gives 300% better bond between steel, rail, and concrete.
Here's a labor saver for you!

The Differential Electric Locomotive Crane Car

Saves Time and Labor
Reduces Accidents

Economically Performs Many Operations:
- Handling rails
- Handling special track work
- Setting poles
- Handling bridge timbers
- Magnet loading
- All kinds of loading and unloading operations

One Man Operation:
The crane operator sits in a revolving turret. From his seat he can conveniently and safely control the movement of the car along the track as well as control the four distinct crane movements.

Safety:
The machine is speedy but safe. It conforms to Electric Railway clearances. Never blocks traffic on adjacent tracks.

The DIFFERENTIAL METHOD

cuts construction costs

- The Differential Electric Dump Car.
- The Differential Body—3-way Dump
- The Clark Concrete Breaker
- The Differential Electric Locomotive Crane Car

Adopt the Differential Method for Better Track and Lower Costs

The DIFFERENTIAL STEEL CAR CO., Findlay, Ohio, U. S. A.
Good Lubrication keeps these Buses young

Buses wear out in parts. Sometimes the parts become worn out through long service. All too often they wear out early because of incorrect lubrication or unsuitable lubricants.

Socony Aircraft Oil and Socony Gear Compound and Greases are keeping many buses young in New York and New England by providing their moving parts with correct lubrication.

The Charles H. Vollmer Motor Bus Lines, for instance, have found that Socony lubricants give their equipment longer life, and consequently have reduced their maintenance costs.

We believe we can show you that Socony lubricants will do the same thing for your buses.

Socony
Gasoline · Motor Oil · Aircraft Oil
Special Gasoline plus Ethyl

Standard Oil Company of New York
Is a saving of $180.00 per Bus—per year Interesting to you?

"Tests recently completed on a line completely equipped with Economy Gasoline Meters show that a saving of 10% to 17% IN GASOLINE can be obtained through the use of these meters.

"This would mean a saving in FUEL COST of $180.00 per bus per year, or $.006 per bus mile.

"THESE METERS would pay for themselves in 3 to 6 months’ time in gasoline savings."

ECONOMY GASOLINE METERS

WILL Give you individual fuel consumption records, by men, by vehicles and by routes.
WILL Tell you which drivers are operating their busses correctly.
WILL Cut your fuel costs by encouraging correct operation.
WILL Give you data on which to base educational campaigns for drivers.
WILL Indicate the condition of your equipment day by day, trip by trip.
WILL Assist your Mechanical Department to properly maintain your equipment.
WILL Cut your maintenance costs by indicating defective equipment.
WILL Enable you to determine proper carburetor adjustment.
WILL Assist you in estimating the merits of various auxiliary devices.
WILL Serve as a daily check upon the quality of your gasoline.
WILL Enable you to fit most efficient vehicle to proper service.
WILL Help you to determine most efficient schedules.
WILL Indicate amount of fuel withdrawn from tank for power.
WILL Eliminate waste of gasoline by overflowing tank when refilling.
WILL Give you an accurate measure of your fuel costs by men, by routes, by busses, by trips.

Let us send you the details of this new device and how it works.

Economy Electric Devices Company
37 W. VAN BUREN ST., CHICAGO

Sangamo Economy Watthour Meters
Peter Smith Heaters

Haskelite and Plymed
Peter Smith Reverse Flow Car Ventilating System

Lang Bus Bodies
Economy Gasoline Vehicle Meters
NATIONAL SHELBY
TROLLEY POLES
Minimum weight with maximum strength

To keep daily service at the highest peak of efficiency means the elimination of delays or traffic tie-ups frequently caused by trolley poles failing to hold up in service. Reliable poles, therefore, are a good investment. Their selection should be based on design and tests that prove their fitness for the character of service in which they will be used.

NATIONAL-SHELBY Poles are designed with sufficient strength to meet all service requirements and yet not be of excessive weight. A special form of reinforcement at the proper place gives the pole great strength while the grade of steel used and a special heat treatment after drawing gives a high elastic limit and assures long life and satisfactory service.

In addition, every NATIONAL-SHELBY Trolley Pole is individually tested before it leaves the mill—a form of test that approximates actual service conditions. This type of test is especially important in that it minimizes the possibility of any defective pole being installed—thereby helping to cut the cost of trolley pole service before it begins. A description of this test and complete information about these poles will be sent on request.
The New Wharton Switch
Designed For Minimum Maintenance

...no kick-up...no moving forward
no holding-down device

The Wharton Flexible Wall Switch has a heel tightening device based on the principle of a split collar. By means of a bolt the wall is flexed or drawn in until it hugs the tongue heel; thus all play caused by wear is taken up. The nut of this bolt is located in the drain box and is readily accessible.

The tongue pin is 9½" in diameter and is 6" deep. This construction eliminates a holding-down device, prevents kick-up and forward movement of the tongue.

WM. WHARTON JR. & CO. INC.
EASTON, PA.

NEW YORK  PHILADELPHIA  BOSTON
PITTSBURGH  SAN FRANCISCO  EL PASO  HOUSTON
CHICAGO  SCRANTON  MONTREAL
“Standard” Steel Wheels Are Safer

PRODUCTS
Rolled Steel Wheels
Armature Shafts
Axles and Springs

Modern High Speed Electric Transportation needs the superior safety and economy of “Standard” Wrought Steel Wheels and Forged Steel Axles.

STANDARD STEEL WORKS COMPANY
CHICAGO
NEW YORK
RICHMOND

PHILADELPHIA, PA.
WORKS: BURNHAM, PA.

ST. LOUIS
PORTLAND
SAN FRANCISCO
BRIDGEPORT BRASS COMPANY is pleased to announce to the many users of Bridgeport Phono-Alloys the appointment of General Cable Corporation as our sole and exclusive agent in the United States to draw wire from Phono-Alloys and to sell such wire and stranded cable.

This arrangement offers a three-fold advantage to all users of these famous Bridgeport Brass Company products:

1. Ready availability of Phono-Alloy products through well-equipped and strategically located plants, with large capacity for drawing wire and stranding cable.

2. Technical assistance, gladly given when needed, by a staff of competent cable engineers, unbiased in their recommendations.

3. The co-operation of a nation-wide sales organization thoroughly versed in the practical application of Phono-Alloys to the transmission of electrical energy.

The Bridgeport Brass Company will continue, as heretofore, the manufacture and sale of Phono products, thus making available the combined engineering counsel and manufacturing facilities of both companies for the benefit of users of Phono-Electric, Phono-Hi-Strength, and Phono-Hi-Conductivity wires and stranded cables.

The Bridgeport Brass Company feels that the appointment of the General Cable Company as outlined above will be welcomed throughout the entire electrical industry, further perfecting, as it does, the service obtainable by standardizing on Phono-Alloys.
Of particular significance is the appointment of General Cable Corporation by the Bridgeport Brass Company as its sole and exclusive agent in the United States to draw wire from Phono-Alloys and to sell such wire and stranded cable.

For, in the addition of bronze Phono-Alloys to its complete line of electric wire and cable products, General Cable Corporation takes a forward step in broadening its scope of service to the entire electrical industry. The appointment is truly indicative of our earnest desire to provide a complete, dependable source of supply for all types of electrical wires and cables—and thus to be able to weigh our customers' requirements with open minds, uninfluenced by manufacturing limitations. The soundness of this policy and the benefits derived from it by all wire and cable users will, we believe, be quickly realized by the whole industry.

Adequate manufacturing facilities and a large sales and engineering organization, ably represented in the principal cities of the United States, are now available to all users of Phono-Alloys.

Although Bridgeport Brass Company will continue the manufacture and sale of this material, wires and cables manufactured from Phono-Electric, Phono-Hi-Strength, and Phono-Hi-Conductivity alloys will henceforth be obtainable through all of the divisions of General Cable Corporation.
MOTOR COACH FUMES ARE COSTLY

THE pedestrians that your motor coaches pass at the street corners . . . the motorists that follow your buses on the highway . . . may be prospective passengers.

To subject these potential customers to the stifling fumes produced by gasoline with high sulphur content is not good business . . . and it can easily be avoided. Red Crown Gasoline, pure and practically free from sulphur, does not produce objectionable odors.

As a motor fuel Red Crown Gasoline ranks at the top. It possesses every characteristic that a superior gasoline must possess . . . quick starting . . . rapid acceleration . . . power . . . ability to give maximum mileage.

Motor coach operators who investigate motor fuel find that Red Crown, in addition to burning without the objectionable odors so noticeable in some gasolines, speeds up service, increases mileage and lowers operating costs.

A test will convince you, as it has others, that Red Crown is the gasoline for you to use.

STANDARD OIL COMPANY
(Indiana)

RED CROWN GASOLINE
How the Old Town Has Changed

HERE is Fifth Avenue at 34th Street in 1898. The horse-drawn stages originally installed in 1885 “to prevent an invasion of the Avenue by horse cars” long ago made way for “America’s first fleet of gasoline propelled coaches, imported from Europe.” These too are gone. Now Yellow Coaches serve Fifth Avenue . . . the most famous thoroughfare in American history and probably the most severe city-service route in this country.
From Washington Square to 72nd Street is the most congested three miles of bus route in America.

Easter on the Avenue at 50th Street in 1900. There was no annoying automobile competition in these gay days—but just look at the ‗ansoms.

The first buses to run on Fifth Avenue were imported from Europe.

The Most Famous—and Difficult City-Service Route in America

The history of bus operation in America began 45 years ago in New York—on Fifth Avenue—known in pioneer times as "The Middle Road."

Its forebear was the horse-drawn stage. The Fifth Avenue Transportation Company, Limited, was organized in 1885 to operate a horse-drawn stage line. The company grew. Ten years later its equipment consisted of 71 stages and 360 horses.

Then came a reorganization. History tells us that the new owners in 1899 began experimenting with "gasoline and electric propelled buses" but that "the first types utilizing a gasoline engine and an electric transmission" were found impractical.

Then came experiments conducted with a single gasoline bus—the DeDion Bouton imported from Europe. Fourteen others were ordered in 1907. Two months later the horse equipment was sold at auction. The fleet of buses grew steadily. Motor coach operation on Fifth Avenue had come to stay.

Then came the world war. Coaches could no longer

Fifth Avenue Coach buys 100 more
The latest double deck Yellow Coach of the type just ordered.

be imported and the company was forced to manufacture their own equipment to meet their specialized requirements. Then came Yellow Coach—one of America’s first bus manufacturers—with equipment specially designed and developed for large capacity passenger transportation. Fifth Avenue has been standardizing on Yellow ever since.

Today the Fifth Avenue Coach Company operates a maximum total of 440 buses—with 100 more Yellows now on order to replace equipment of older type.

There is no more severe or grueling test of equipment than double deck operation on Fifth Avenue. Here, along this world-famous artery, buses operate over a longer congested route than is found in any motor coach operation in America. Congestion! From Washington Square to 72nd Street a dense packed mass of vehicles and surging humanity stretches solidly ahead for three grueling miles. Yet under the scheduled headway a bus every 16\(\frac{1}{2}\) seconds must work its way through.

The drag and strain on machinery is tremendous. During practically all hours of the day the traffic is packed, jammed. When it moves it moves as a unit. Frequent traffic stops pile up the buses. Equipment crawls, stops, starts, stops and starts again. One mile—two—three—there is no relief in this congested area.

Fifth Avenue Coach Company operates 32.23 miles of route.

11,385,574 revenue bus miles were piled up during the year ending June 30, 1929.

66,236,312 revenue and transfer passengers were carried.

618,181,395 active seat miles were furnished.

Yellow Coaches
1,300 drivers and conductors are on the payroll and four main and service garages keep equipment in good condition.

Traffic conditions on Fifth Avenue hold no place for motor coaches that cannot stand the gaff. These big, double deck coaches must keep moving for a breakdown would jam traffic instantly.

The Company's years of experience along this ruthless proving ground, proves that Yellow Coaches successfully meet the abnormal conditions encountered.

Because of their performance, 100 "Type Z" Yellow chassis, for double deck bodies, have just been ordered by this pioneer operator and will soon go into service on the most famous, and difficult, city-service route in America—Fifth Avenue in New York.

Interesting Facts

The Fifth Avenue Coach Company is the pioneer bus operator of America.

The company obtained its charter in 1885 and operated horse stages on Fifth Avenue until 1907.

The first experiments with gasoline buses in America were conducted on Fifth Avenue by this company.

The first successful gasoline bus was imported from Europe in 1906.

The company has an operating fleet of 440 coaches—practically all double deck equipment—and has just placed an order for 100 additional Yellow Chassis.

Year Ending June, 1929

Passengers carried...66,236,312
Miles of route.............32.23
Revenue bus miles.........11,385,574
Drivers and conductors...1,300
Garages and shops..........4

GENERAL MOTORS TRUCK COMPANY, PONTIAC, MICH.

Subsidiary of Yellow Truck & Coach Mfg. Company
Add definite sales value--

ART RATTAN Seats

Street car manufacturers who install Art Rattan seats find that they add definite sales value to their products. The qualities that made Art Rattan seats outstanding in the bus field is repeated among car builders.

The greater comfort, smart tailoring, deep, inviting upholstery and sturdy frames result from years of experience in building Art Rattan Seats.

Operators insist on comfort and style. Art Rattan Seats meet their demands.

ART RATTAN WORKS, INC.
Builders of De Luxe Street Car Seats
CLEVELAND, OHIO

OAKLAND, CAL.
Through the McGRAW-HILL PUBLICATIONS you can tell your sales story to this broad sweep of industry and business:

Economy in distribution is a matter of intelligent weighing of markets and intensive specialization in those that are found to be most profitable. The McGraw-Hill publishing program offers not only a wide and effective advertising coverage of industry and business but facilities and experienced help in establishing efficient selling programs to which advertising, to be successful and economical, must be geared.
AMERICAN MACHINIST—A weekly publication reaching those executives of the metal-working industries who are responsible for management, production and plant operation. Circulation 17,512.**

PRODUCT ENGINEERING—A new monthly publication reaching the executives of the metal-working industries who are directly responsible for the planning of the product from the viewpoint of salability, best service in use and economy in manufacture. Over 6,000 copies of this publication are distributed monthly to the executives in charge of research, design, specification and field investigation.¹

THE BUSINESS WEEK—A new journal of business news and interpretation. Fast, complete coverage of the news. Published weekly on a newspaper schedule. Fifteen editors—all business specialists—provide 75,000 major executives with the news they need and tell them what it means.⁴

SYSTEM—A monthly journal devoted to modern business management. Covers the managerial executives in large and medium-sized businesses. Circulation 70,000.

FACTORY & INDUSTRIAL MANAGEMENT—A monthly publication serving the men responsible for production and plant management policies in all major industries. A general industrial executive journal. Circulation more than 33,000.**

INDUSTRIAL ENGINEERING—A monthly publication serving the plant engineering department throughout industry on the selection, installation and maintenance of mechanical and electrical equipment, and maintenance of plant structures. Circulation 15,000.**

ENGINEERING NEWS-RECORD—A weekly publication reaching the engineering executives and contractors of the civil engineering and construction industry. Editorially covers planning, designing, construction and maintenance of buildings, bridges, highways, railroads, waterworks, irrigation, drainage and sewerage systems, etc. Circulation 30,000.**

CONSTRUCTION METHODS—A monthly pictorial of field practice and equipment read by the field-minded construction men. Covers construction, maintenance and material handling methods for general construction, highways, buildings, industrial plants, public works and utilities. Circulation 32,000.**

POWER—A weekly publication reaching those in responsible charge of power generation and attendant services in all industries. Editorially covers the functions of executive control, installation, operation, maintenance and application of power wherever it is employed. Circulation 27,535.**

AVIATION—A weekly publication serving all those engaged or actively interested in the development of the aeronautical industries. 150,332 copies are subscribed to by the business men of the aeronautical industries. The oldest American aeronautical magazine.∗

ELECTRIC RAILWAY JOURNAL—A monthly publication reaching the managing and operating executives and engineers of city and inter-city transportation companies—electrified railways (surface, subway, elevated) and affiliated bus operations—in the U. S., Canada and throughout the World. Circulation nearly 6,000.**

CHEMICAL & METALLURGICAL ENGINEERING—A monthly publication serving the chemical engineering or process industries—a group of approximately 20 industries closely related because of common production processes. Circulation more than 13,000.**

FOOD INDUSTRIES—A monthly publication serving the manufacturing and processing of food products. Written for the production executives and technologists of the food manufacturing industries. Circulation 10,000.

COAL AGE—A monthly engineering journal reaching the executives and operating heads of the bituminous and anthracite mining industry. Devoted editorially to operating, technical and business problems. Circulation 9,383.**

ENGINEERING AND MINING JOURNAL—A national semi-monthly publication read by the executives and operating heads responsible for mining, milling, smelting and refining metals and non-metallic minerals in the United States and possessions. Editorially covers operating, technical and business problems of the industry. Circulation 7,000, concentrated in the United States and its possessions.

ENGINEERING AND MINING WORLD—An international monthly publication read by the executives and operating heads of 3,000 mining enterprises outside the United States and its possessions. Editorial covers operating, technical and business problems connected with mining, milling, smelting and refining of metals and non-metallic minerals. Circulation 6,300 (outside U. S. A. and possessions).

E. & M. J. METAL AND MINERAL MARKETS—A weekly publication read by metal and mineral dealers and brokers, and the major industrial metal consumers, also by the sales executives of mineral producing companies. Editorially covers metal and mineral market trends and current prices of metals and minerals. Circulation 1,500.

ELECTRICAL WORLD—A weekly publication reaching executives and engineers of central stations and electrical manufacturers, electrical engineers of industrial manufacturers, consulting engineers, etc. Circulation more than 18,500.**

ELECTRICAL MERCHANDISING—A monthly publication reaching appliance dealers, departments of central stations, sales executives of electrical appliance manufacturers, wholesalers and dealers of all classes handling electrical merchandise in volume. Circulation more than 17,000.**

RADIO RETAILING—A monthly publication serving retailers, wholesalers and manufacturers—radio, music, hardware, sport, department stores, etc. The only ABC-ABP paper in the radio or music trade field. Circulation more than 20,000.**

ELECTRICAL WEST—A monthly publication serving central station executives, appliance dealers, jobbers, contractors and contractor-dealers, in the 11 Western and Pacific Coast states. Circulation nearly 6,000.**

BUS TRANSPORTATION—A monthly publication read by the managing, operating and maintenance executives and engineers of common carrier bus operating companies throughout the United States. Circulation nearly 10,000.**

TEXTILE WORLD—A weekly publication serving all branches of textile manufacturing—cotton, wool, silk and rayon. Edited for the administrative and production executives. One of the earliest industrial publications (established 1868) and the world’s accepted textile authority. Circulation nearly 9,000.**

** Member of Audit Bureau of Circulations and Associated Business Papers
† Member of Audit Bureau of Circulations
¹ First issue appears in January, 1930

McGRAW-HILL PUBLISHING COMPANY, INC.
NEW YORK CHICAGO PHILADELPHIA WASHINGTON
DETROIT ST. LOUIS CLEVELAND BOSTON
SAN FRANCISCO GREENVILLE LONDON
SPEED
GETAWAY
LESS WEIGHT
NO NOISE

"Tool Steel" Gear Drive

Fig. 2—Axle Unit, Coupling and Hanger (top housing removed)

This Drive Has Made Good
Bulletin upon Request

The Tool Steel Gear & Pinion Co.
Elmwood Place, Cincinnati, Ohio
DUNDEE "A" friction tape is popular with electrical workers because it sticks quickly and therefore is easy to use. Foremen and superintendents like it because it does not dry out and therefore it stays in place.

Dundee "B" is a true friction tape. The adhesive compound is not merely spread on the cotton fabric but is calendered under heavy pressure into every part of the cloth. For that reason the fabric and the adhesive never separate into layers.

In spite of the care used in its manufacture, it is moderately priced. Specify it on your next order.
Convert your Danger Zones into Safety Zones

Make it a thorough job. You can’t afford to be half-hearted in your protection efforts. TOLEDO TORCHES are not just another means of protecting your construction work. They are the only means that will fully protect you from accident losses.

Toledo Torches are free from theft and breakage.
They are always ready for service without attention.
Our patented Economy Burner cuts the oil cost in half and insures perfect performance.

Look for our name on each

TOLEDO TORCH
The Toledo Pressed Steel Co.
Toledo, Ohio

News....

brief, late news flashes for the electric railway industry

To supplement the service of the regular monthly issues of Electric Railway Journal, a separate NEWS service appears on thirty-nine Saturdays during the year. This supplement keeps you in touch with court decisions . . . fare increases . . . new ordinances . . . association meetings . . . financial statements . . . equipment purchases.

Subscription Price: For all countries taking domestic subscription rate, $2. Sold in combination with the monthly edition of Electric Railway Journal for $4 a year domestic rate.
STRUCTURAL STEEL

Fabricated STEEL STRUCTURES for every purpose

PROGRESS PICTURE, POWER STATION

Fabricated Structural Steel by AMERICAN BRIDGE COMPANY

Subsidiary of United States Steel Corporation

Manufacturers of STEEL STRUCTURES of all classes, particularly BRIDGES AND BUILDINGS Roof Trusses, Columns, Girders, Towers and Poles, etc.

General Office: 71 BROADWAY, NEW YORK, N. Y.

Contracting Offices in Principal Cities
The Texas Company has solved the problem of car journal lubrication

A new oil seal has been devised which for the first time effectively prevents leakage of lubricant from the journal box and the access of abrasive dust and water.

It is an important part of a new Texaco System of Lubrication.

Notice the illustration above. It shows one of the oil seals after two years actual service—still in perfect condition.

Contrast this with the illustration of the felt-lined wooden dust guard. A few months service renders these dust guards entirely ineffective.

The Texas Company is prepared to supply the new Texaco Oil Seals and explain fully the money-saving principle of Texaco Lovis Oil and the Texaco System of Lubrication. Write The Texas Company, Dept. L.

TEXACO LUBRICANTS

THE TEXAS COMPANY,
17 Battery Place, New York City
Electric Motor Insulations

...for every need
for every motor type and size!

Glance at the insulations listed at the right. There is one for every motor need from slot buttons to phase leads. They are all performance-proved in thousands of motors of every manufacture. Their quality is unvarying, for throughout manufacture—from raw materials to finished products—continuous inspections to most rigid standards are maintained.

We offer you one source of supply for all your motor insulations and quality that is unexcelled.

MICA INSULATOR COMPANY
New York: 200 Varick Street Chicago: 542 South Dearborn Street
Cleveland Pittsburgh Cincinnati Birmingham Seattle San Francisco

Super-Micanite and Micanite
Commutator Segments Commutator, Rings, Tape.

Empire Oiled Insulations
Linotape, Cloth, Armatite, Paper, Tubing, Canvas Duck, Silk.

Mica Insulations
Varnishes, Compounds, Slot Paper, Cotton, Sleving, Friction Tape, Rubber Tape, Twines.

MICA INSULATION

PERFECT EMPIRE

REG. U. S. PAT. OFF.

MICA INSULATION

OILED CLOTH INSULATION
This is one of a series of advertisements directed originally to advertising men in an effort to make industrial advertising more profitable to buyer and seller. It is printed in these pages as an indication to readers that McGraw-Hill publishing standards mean advertising effectiveness as well as editorial virility.

**PATENTS EXPIRING**

what’ll we do? what’ll others do?

**THE FORMULA**

Pyramided effects of continuous industrial advertising sent sales and profits constantly upward after patents expired. A sustained advertising program of full and double pages, with pithy, factful copy, is keeping the XYZ Co. in top place. A clear-cut victory—not so much for McGraw-Hill publications but for Industrial Advertising strategically applied.

During this three-year period, when XYZ’s profits were barely enough to pay the patent owners, XYZ advertised regularly in McGraw-Hill Publications—building recognition for the future—intrenching themselves in a strategic position for the post-patent period.

Basic patents on a machine used extensively by a specific industry were owned by the ABC Corp. The XYZ Co., also made the machine, along with other products, paying the ABC people a royalty for every machine sold. The XYZ Co. chose to stay in business without making a practical profit on this particular product. Why?

Two years or so ago the patents expired. The expected happened. Dozens of manufacturers turned to making the machine. But instead of diminishing sales for the XYZ Co., there came increased sales, pyramiding profits and leadership in the field. This leadership is being maintained today by the same formula that was used steadily for three years before industry-at-large was free to make the machine.
Boyerize—and "skip-stop" the repair shops!

In continuous operation—that's where you will find cars equipped with Boyerized Parts. These parts have wear, tear and strain resisting qualities that are phenomenal. Boyerizing—a special process gives them this tremendous strength.

Boyerized Parts outlast parts made of untreated steel three to four times—reduce replacements 50 to 75%.

Put a "skip-stop" sign on your repair shops by specifying Boyerized Parts on new cars or for replacements. Use the list!

**BOYERIZED PARTS**

---

**LIST OF PRODUCTS**

- Brake Pins
- Brake Hangers
- Brake Levers
- Pedestal Gibs
- Brake Fulcrums
- Center Bearings
- Side Bearings
- Spring Post Bushings
- Brake Bushings
- Bronze Bearings
- Bolster and Transom
- Chafing Plates
- Spring Posts
- McArthur Turnbuckles
- Manganese Brake Heads
- Manganese Truck Parts

**BEMIS CAR TRUCK COMPANY**

**ELECTRIC RAILWAY SUPPLIES**

**SPRINGFIELD, MASS.**

Representatives:
- W. F. McKenzie, 62-66 First St., Portland, Ore.
- J. H. Denton, 1328 Broadway, New York City, N. Y.
- A. W. Arlin, 519 Delta Building, Los Angeles, Cal.

---

**Bates-Truss Poles for Trolley Suspension**

Modern transportation demands modern methods. The Bates-Truss Pole is the solution of trolley suspension problems. The general tendency of electric railways toward the increased use of Bates-Truss Poles is significant in these days of high costs and keen transportation competition.

Structural simplicity, combined with lasting strength and fine appearance, makes the Bates-Truss Pole ideal for all forms of overhead construction. Let us quote you on poles, structures or towers.

**BEST**

**EAST CHICAGO, IND.**
ROLLER-SMITH
Portable Direct Reading
RAIL BOND TESTERS
are
Standard the World Over

And—for good reasons. They are light, compact and portable. Only one man is required to make quick, accurate readings. Readings in units of feet of rail are taken directly from the 300° long scale.

The Type SBT is recommended for all ordinary work and the supersensitive Type BBT for conditions where there is little or no current in the rail. Bulletin G-200 should be in the hands of every man who is interested in bond testing. Send for it.

"Over thirty-five years' instrument experience is back of Roller-Smith"

ROLLER-SMITH COMPANY
Electrical Measuring and Protective Apparatus
Main Office: 2140 Woolworth Bldg., NEW YORK, N.Y., U.S.A.
Works: Bethlehem, Pennsylvania, U. S. A.
Offices in principal cities in U. S. A. and Canada
Representatives in Australia, Cuba, Japan and Philippine Islands

Meets Any Change in Fare or System

The ease with which Clevelanders fit into any fare collection system has made them standard on hundreds of properties.

Any system of collection can be built around them. They collect tokens and tickets as efficiently as coins.

Under your existing system, they insure efficient, modern fare collection. Their flexibility makes them fit into any change in fare collection that you may make tomorrow.

"4-Way" locks with other safeguards insure ample protection. Simple to operate and sturdily built they will easily outlast the car.

The Cleveland Fare Box Co.
4900 Lexington Ave. Cleveland, Ohio
Canadian Cleveland Fare Box Co., Limited, Preston, Ontario
"4-Way" Padlocks, Coin Auditing Machines, Change Carriers, Tokens
...a sign...

Track areas paved with vitrified brick are unmistakable signs of THRIFTY FARSIGHTED MANAGEMENT.

For engineering data on Brick Pavements, write National Paving Brick Manufacturers Ass'n, 1245 National Press Building, Washington, D.C.

VITRIFIED BRICK PAVEMENTS
FACE THE FUTURE . PAVE WITH BRICK.

It's Poor Publicity --

An accident on your property may be news but it's poor—and costly—publicity for your lines.

NACHOD Automatic Signal equipment is the best insurance against such occurrences. Positive in action, there is a type for every need.

N-A-C-H-O-D Spells Safety—On Your Crossings

On Streets—Over Your Entire System


Nachod and United States Signal Co., Inc.
Louisville, Ky.
THE fine record of service of Tucolith flooring is proven by its years of use in over 50,000 vehicles. Its future is indicated by the increasing number of new street cars in which Tucolith is the specified flooring.

TUCO PRODUCTS CORPORATION
30 CHURCH ST., NEW YORK
RAILWAY EXCH. BLDG., CHICAGO
Especially for Bonding around Splice Bars

Erico CAE Arc Weld Bonds are preformed. That's one reason why they are so widely used for special work and cross bonding. It's the reason, too, why the cable goes over splice bars without twisting or bending to get the bond to lie in position on the rail.

Type CAE Arc Weld Bonds are made with copper terminals. Due to the angle at which the terminal is sheared, every wire is exposed to the welding arc and must be included in the weld. The large area of weld is secured with but one half electrode per terminal, using C-1 flux coated copper electrodes which are short and convenient for the welder to handle.

A request for samples entails no obligation.

Write—

The Electric Railway Improvement Co.
2070 E. 61st Place, Cleveland, Ohio

---

PANTASOTE TRADE MARK
—the car curtain and upholstery material that pays back its cost by many added years of service. Since 1897 there has been no substitute for Pantasote.

AGASOTE TRADE MARK
—the only panel board made in one piece. It is homogeneous and waterproof. Will not separate, warp or blister.

Standard for electric railway cars and motor buses

Samples and full information gladly furnished.

The PANTASOTE COMPANY, Inc.
250 Park Avenue
NEW YORK

THERE'S A TRENTON TOWER for Railway Work, too!

From our forty-four years' experience we have built this Trenton Utility Tower to handle overhead construction on the railroads. It operates on ARA standard gauge track and has a wheelbase of 8 feet. Body platform 6 feet wide, 12 feet long and about 2 feet from top of rail to top of platform. Equipped with Brakes, Pin Couplings, and Rail Clamps so truck can be locked in position.

J. R. McCARDELL AND COMPANY
391-401 SO. WARREN ST., TRENTON, N. J.
One of the Latest Type Lightweight-One-Man Interurban Cars built by CUMMINGS CAR AND COACH CO.
111 West Monroe St., Chicago, Ill.

JOHNSON FARE COLLECTING SYSTEMS

Johnson Electric Fare Boxes and overhead registers make possible the instantaneous registering and counting of every fare. Revenues are increased 1½ to 5% and the efficiency of one-man operation is materially increased. Quicker boarding of passengers with resultant reduction in running time for the buses. Over 5,000 already in use.

When more than three coins are used as fare, the Type D Johnson Fare Box is the best manually operated registration system. Over 50,000 in use.

Johnson Change-Makers are designed to function with odd fare and metal tickets selling at fractional rates. It is possible to use each barrel separately or in groups to meet local conditions. Each barrel can be adjusted to eject from one to five coins or one to six tokens.

Drip Points for Added Efficiency

They prevent creeping moisture and quickly drain the petticoat in wet weather, keeping the inner area dry.

The Above Insulator—No. 72—Voltares—Test—Dry 84,000 Weld 51,400, Line 10,000.

Our engineers are always ready to help you on your glass insulator problem. Write for catalog.

Hemingray Glass Company
Muncie, Ind.
Est. 1848—Inc. 1870

Johnson Fare Box Co.
4619 Ravenswood Ave., Chicago, Ill.
Replacements in 1930
Silver Lake Trolley and Bell Cord lead again for special railway service. Durable and economical, produced from the best yarns obtainable, the quality of Silver Lake products has made them standard for the industry.
For replacements in 1930 order Silver Lake. Samples on request.
SILVER LAKE COMPANY
Newtonville, Mass.

Silver Lake Company

Chillingworth
One-Piece Gear Cases

Seamless, Rivetless, Light in Weight
Chillingworth One-Piece Gear Cases will wear longer because they are made of tough durable deep drawing steel, properly annealed and supported by strong Malleable Iron Brackets, or Forged Steel if you prefer.
Because of the seamless one-piece construction with overlapping joints, they prevent dirt entering or grease escaping—the best possible means of saving your gears and pinions.
Chillingworth One-Piece Gear Cases meet all operating requirements. Used extensively on rapid transit service. Most steam road electrifications use Chillingworth Cases.
Chillingworth Manufacturing Co.
Jersey City, N. J.

Chosen for Performance

Trolley wheels are never chosen for looks, never selected because one kind costs a little more or less than another. They’re chosen for performance. That’s why

Kalamazoo

Seamless, rivetless, light in weight, Chillingworth One-Piece Gear Cases will wear longer because they are made of tough durable deep drawing steel, properly annealed and supported by strong Malleable Iron Brackets, or Forged Steel if you prefer. Because of the seamless one-piece construction with overlapping joints, they prevent dirt entering or grease escaping—the best possible means of saving your gears and pinions. Chillingworth One-Piece Gear Cases meet all operating requirements. Used extensively on rapid transit service. Most steam road electrifications use Chillingworth Cases.
Chillingworth Manufacturing Co.
Jersey City, N. J.

Kalamazoo, Michigan
<table>
<thead>
<tr>
<th>Engineers and Consultants</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Ford, Bacon &amp; Davis</strong></td>
</tr>
<tr>
<td>Engineers</td>
</tr>
<tr>
<td>39 Broadway, New York</td>
</tr>
<tr>
<td>PHILADELPHIA CHICAGO SAN FRANCISCO NEW ORLEANS</td>
</tr>
<tr>
<td><strong>STEVENS &amp; WOOD</strong></td>
</tr>
<tr>
<td>Engineers and Constructors</td>
</tr>
<tr>
<td>60 John Street, New York</td>
</tr>
<tr>
<td>Transportation Examinations and Reports</td>
</tr>
<tr>
<td><strong>THE BEELER ORGANIZATION</strong></td>
</tr>
<tr>
<td>Engineers and Accountants</td>
</tr>
<tr>
<td>JOHN A. BEELER, DIRECTOR</td>
</tr>
<tr>
<td>Traffic — Traction</td>
</tr>
<tr>
<td>Bus-Equipment</td>
</tr>
<tr>
<td>Power-Management</td>
</tr>
<tr>
<td>Appraisals Operating and Financial Reports</td>
</tr>
<tr>
<td>Current Issue LATE NEWS and FACTS free on request</td>
</tr>
<tr>
<td>52 Vanderbilt Avenue, New York</td>
</tr>
<tr>
<td><strong>ALBERT S. RICHEY</strong></td>
</tr>
<tr>
<td>ELECTRIC RAILWAY ENGINEER</td>
</tr>
<tr>
<td>WORCESTER, MASSACHUSETTS</td>
</tr>
<tr>
<td>Examinations</td>
</tr>
<tr>
<td>Reports-Appraisals-Rates</td>
</tr>
<tr>
<td>Operation-Service</td>
</tr>
<tr>
<td><strong>STONE &amp; WEBSTER INCORPORATED</strong></td>
</tr>
<tr>
<td>New York Boston Chicago</td>
</tr>
<tr>
<td>Organization</td>
</tr>
<tr>
<td>Financing</td>
</tr>
<tr>
<td>Design</td>
</tr>
<tr>
<td>Construction</td>
</tr>
<tr>
<td>Management</td>
</tr>
<tr>
<td>Reports</td>
</tr>
<tr>
<td>Appraisals</td>
</tr>
<tr>
<td>PUBLIC UTILITY AND INDUSTRIAL PROPERTIES</td>
</tr>
<tr>
<td><strong>HEMPHILL &amp; WELLS</strong></td>
</tr>
<tr>
<td>CONSULTING ENGINEERS</td>
</tr>
<tr>
<td>Gardner F. Wells</td>
</tr>
<tr>
<td>Albert W. Hemphill</td>
</tr>
<tr>
<td>APPRAISALS</td>
</tr>
<tr>
<td>INVESTIGATIONS COVERING</td>
</tr>
<tr>
<td>Reorganization</td>
</tr>
<tr>
<td>Operation</td>
</tr>
<tr>
<td>Construction</td>
</tr>
<tr>
<td>50 East 42nd St., New York City</td>
</tr>
<tr>
<td><strong>SANDERSON &amp; PORTER</strong></td>
</tr>
<tr>
<td>ENGINES</td>
</tr>
<tr>
<td>PUBLIC UTILITIES AND INDUSTRIALS</td>
</tr>
<tr>
<td>DESIGN AND CONSTRUCTION EXAMINATIONS REPORTS VALUATIONS</td>
</tr>
<tr>
<td>NEW YORK CHICAGO SAN FRANCISCO</td>
</tr>
<tr>
<td><strong>E. H. FAILE &amp; CO.</strong></td>
</tr>
<tr>
<td>Designers of</td>
</tr>
<tr>
<td>Garages—Service</td>
</tr>
<tr>
<td>Buildings—Terminals</td>
</tr>
<tr>
<td>441 Lexington Ave. New York</td>
</tr>
<tr>
<td><strong>J. ROWLAND BIBBINS</strong></td>
</tr>
<tr>
<td>CONSULTING ENGINEER</td>
</tr>
<tr>
<td>TRANSPORTATION UTILITIES</td>
</tr>
<tr>
<td>Transit-Traffic Development Surveys</td>
</tr>
<tr>
<td>Street Plans, Controls, Speed Signals</td>
</tr>
<tr>
<td>Economic Operation, Schedule Analysis</td>
</tr>
<tr>
<td>Bus Co-ordination, Rerouting, Budgets, Valuation, Rate Cases and Ordinances</td>
</tr>
<tr>
<td>EXPERIENCE IN 26 CITIES</td>
</tr>
<tr>
<td>2301 Connecticut Avenue Washington, D. C.</td>
</tr>
<tr>
<td><strong>BYLLESBY ENGINEERING and MANAGEMENT CORPORATION</strong></td>
</tr>
<tr>
<td>231 S. La Salle Street, Chicago</td>
</tr>
<tr>
<td>New York Pittsburgh San Francisco</td>
</tr>
<tr>
<td><strong>WALTER JACKSON</strong></td>
</tr>
<tr>
<td>Consultant on Fares and Motor Buses</td>
</tr>
<tr>
<td>The Weekly and Sunday Pass Differential Fares—Ride Selling</td>
</tr>
<tr>
<td>Holbrook Hall 5-W-3 472 Gramatan Ave., Mt. Vernon, N. Y.</td>
</tr>
</tbody>
</table>
January, 1930

ELECTRIC RAILWAY JOURNAL

The P. Edward Wish Service
50 Church St., NEW YORK
Street Railway Inspection DETECTIVES
131 State St., BOSTON

H. U. WALLACE
All Work Under Personal Supervision
6 N. Michigan Ave. 420 Lexington Ave.
Chicago New York City
Phone LEXINGTON 8465

KELKER, DE LEUW & COMPANY
Consulting Engineers
Transit Development Operating Problems Traffic Surveys Valuations
111 W. WASHINGTON ST., CHICAGO

SAFETY
Are you interested in reducing your operating costs?
Start the year by making a check of your wheel and maintenance cost. Allow our experienced wheel engineers to make a survey of your operating conditions and recommend a design of the new chilled back of flange and chilled rim wheels best suited for your particular service.
We can show you a definite saving per 1000 car miles and a material reduction in shop costs and equipment charges.

No turning—No maintenance
Address any of the following

GRIFFIN WHEEL COMPANY PLANTS

CHICAGO BOSTON TACOMA
DETROIT ST. PAUL LOS ANGELES
CLEVELAND KANSAS CITY SALT LAKE CITY
CINCINNATI COUNCIL BLUFFS DENVER

MILEAGE GUARANTEED

The
2000 Type
Bus Heater

Increased heating efficiency, simplified assembly, absolute insulation from body, easy installation and low cost are the features of the new 2000 type Heater. Supplement B-4 mailed on request, contains a complete description.

The Nichols-Lintern Co.
7960 Lorain Ave., Cleveland, Ohio

R 11 Double Register

A Fare Registration System that Gains the Confidence of ALL

The durability, accuracy, speed and convenience of International Registers has given them the nation-wide reputation for efficient service that they have enjoyed for over thirty years. Electric operation gives the new types even greater speed, accuracy and convenience. Registers can be furnished for operation by hand.

The International Register Co.
15 South Throop St., Chicago
It's Dependable —

Open the Eyes of Your Operators with —

The AIR-PUSH WINDOW WIPER

Built to Wear the Lifetime of Your Equipment

National Railway Appliance Co.
Graybar Bldg.
420 Lexington Ave.
New York

WORKS LIKE A DOOR CHECK

Unprotected Spring Return Switches get severely battered by every passing wheel flange running against them. The RACOR Oil Cylinder Retarding Dash Pot gives protection.

Acting exactly like a door check, it allows the points to be forced aside easily by the first flange but retards their return movement. The result is that successive flanges do not strike but only rub the points and the life of the points is greatly prolonged.

This equipment is simple, has few parts, requires little attention and will operate in any climate. It is double acting. Operates automatically with switch in either position and freely for hand throw.

Behind Racor Service stand nine plants which specialize in the manufacture and distribution of railroad track turnout and crossing equipment, including Manganese work for heavy traffic.
**SEARCHLIGHT SECTION**

**EMPLOYMENT and BUSINESS OPPORTUNITIES—USED and DISPOSED NEW EQUIPMENT**

**UNDISPLAYED—RATE PER WORD:**
- Positions Wanted, 5 cents a word, minimum $1.00 an insertion, payable in advance.
- Positions Vacant and all other classifications, excepting Equipment, 10 cents a word.
- Proposals, 40 cents a line an insertion.

**INFORMATION:**
- Box Numbers in care of our New York, Chicago or San Francisco offices count 10 words additional to undisplayed ads.
- Discount of 10% if full payment is made in advance for four consecutive insertions of undisplayed ads (not including proposals).

**DISPLAYED—RATE PER INCH:**
- 1 inch $6.00
- 2 to 3 inches 4.50 an inch
- 4 to 7 inches 3.50 an inch
- Other spaces and contract rates on request.
- An advertising inch is measured vertically on one column. 3 columns—30 inches—
- to a page.

**POSITIONS VACANT**

**ACTIVE, ambitious young man wanted for position of street and interurban railway superintendent.** Man of technical training and experience in operating responsibility desired. Must furnish references and complete statement of experience. An excellent executive opportunity with rapidly growing street and interurban railway system in the Middle West. 

**NEW “SEARCHLIGHT” ADVERTISEMENTS**

- New “SEARCHLIGHT” Advertisements must be received by 3 P.M. on the 15th of the month to appear in the issue out the 1st of the month.
- Address copy to the Searchlight Department
  Electric Railway Journal
  Tenth Ave. at 30th St., New York City

**BUSINESS OPPORTUNITY**

**Capital Raising**

Stock and bond selling campaigns planned and executed for companies seeking development, mergers, reorganizations and now financing by experienced dependable financial organization. References exchanged and booklet by request. PS-105, Electric Railway Journal, Tenth Ave. at 30th St., New York, N. Y.

**STREET RAILWAYS**

We are in the market at all times to purchase and dismantle abandoned street railways. Highest prices paid.

**M. K. FRANK**

Park Row Bldg., New York

**IMMEDIATE SHIPMENT**

**FOUR BIRNEY CARS**

in good condition. Any reasonable offer accepted.

**THE PERRY, BUXTON, DOANE CO.**

**New and Relaying Rails**

**All Weights and Sections**

We specialize in buying and dismantling entire Railroads, Street Railways, and all other industrial properties which have ceased operation. We furnish expert appraisals of all such properties.

**May We Serve You?**

**THE PERRY, BUXTON, DOANE CO.**

Rail Department, Philadelphia, Pa.  General Department, Boston, Mass.

Pacific Sales Office—Failing Building, Portland, Oregon

---

**Agents and Representatives—**

can be secured through the **SEARCHLIGHT SECTION**

Responsible Agents and Representatives commit the Searchlight Section for new lines to handle.

---

**FOR SALE**

6—Light Weight Double

Truck Passenger Cars

two to four years old—

excellent condition—ready

for immediate shipment.

- Single Truck Sweepers.
- Double Truck Snow Plows.
- Railway Motors.
- Controllers.
- Compressors.

Reasonably priced.

Let us have your requirements.

**H. E. SALZBERG COMPANY, INC.**

225 Broadway — Estd. 1898 — New York City, N. Y.

---

When business judgment dictates the wisdom of abandoning part or all of your electric railway equipment—don't let it rust away in idleness waiting for the chance piece-meal buyer to gradually unburden you, at big losses.

Do the one practical thing. Sell it as a unit to SALZBERG—complete with power plant, track, feeder and trolley wire system and rolling stock.

You will get FAIR dealing and the highest prices that are based solely on present day market values. Save money, time and trouble. We will do our own dismantling.

No obligation for our proposition.
Competent to solve cleaning problems

ASK us about your car and motor repair cleaning problems that seem to defy solution. From our long experience in serving electric railway systems, we can suggest suitable Oakite materials and methods for overcoming the difficulty.

Our nearest Service Man will gladly study your cleaning requirements and recommend the most effective and economical Oakite material for saving time and effort in cleaning cars, large and small truck and brake parts, motor parts, etc. A postal to us will bring him to your shop.

Manufactured only by
OAKITE PRODUCTS INC., 288 Thames St., NEW YORK, N.Y.

Oakite Service Men, cleaning specialists, are located at

American Bridge Co. .................................................. 103
American Brown Boveri Co., Inc. .................................. 30
American Car Co. ...................................................... Third Cover
American Fork & Hoe Co., The ...................................... 33
American Steel & Wire Co. ........................................... 75
American Steel Foundries ............................................ 24-25
Anaconda Wire & Cable Co. ......................................... 76
Art Rattan Works, Inc. ............................................... 97

Bates Expanded Steel Truck Co. ..................................... 109
Beeler Organization .................................................... 116
Bemis Car Truck Co. .................................................... 109
Bender Body Co., The .................................................. 122
Bethlehem Steel Co. ..................................................... 62-63
Bibbins, J. Roland ....................................................... 116
Bridgeport Brass Co. ................................................... 90-91
Brill Co., The J. G. ...................................................... Third Cover
Buchanan & Layng Corp. ............................................... 116
Bylesby Eng. & Mng. Corp. .......................................... 116

Carco Co., Philip .......................................................... 65
Carneige Steel Co. ....................................................... 78
Chillingworth Mfg. Co. ............................................... 22-23
Cities Service Co. ....................................................... 116
Cleveland Fare Box Co. ............................................... 116
Collier, Inc., Barron G. ............................................... 28-29
Columbia Machine Works ............................................ 102
Consolidated Car Heating Co. ....................................... 35
Cummings Car & Coach Co. ......................................... 114

Dayton Mechanical Tie Co., The .................................... 34
De Vibeiss Co., The ..................................................... 32
Differential Steel Car .................................................. Insert 84
Dodge Brothers .......................................................... Insert 37-40

Economy Electric Devices Co. ....................................... 86
Electric Railway Improvement Co. ................................. 113
Electric Service Supplies Co. ....................................... 14-15
Electric Storage Battery Co. ........................................ 41

Faile & Co., E. H. ......................................................... 116
Firestone Tire & Rubber Co., The .................................. 26
Ford, Bacon & Davis .................................................... 116
"For Sale" Ads ............................................................. 119

General Electric Co. ................................................... Front Cover and 16-17-18
General Leather Co. .................................................... 61
General Motors Truck Co. ............................................. Insert 93-96
Goodyear Tire & Rubber Co. .......................................... 36
Globe Ticket Co. .......................................................... 56
Griffin Wheel Co. ......................................................... 117

Hale-Kilburn Co. .......................................................... 13
"Help Wanted" Ads ....................................................... 119
Heimawray Glass Co. .................................................... 114
Hemphill & Wells ......................................................... 116
Heywood-Wakefield Co. ............................................... 31

Illinois Steel Co. .......................................................... 54
International Motor Co. ............................................... 103
International Register Co., The ..................................... 117
International Steel Tie Co. .......................................... Insert 81-83

Jackson, Walter ............................................................ 116
Johnson Fare Box Co. ................................................... 114
Johns-Manville Corp. ................................................... 12

Kelker, DeLurw & Co. .................................................... 117
Kuhlman Car Co. .......................................................... Third Cover

Long Mfg. Co. .............................................................. 64
Lorain Steel Co. ........................................................... 80
### The 1930 Budget

#### for Tubular Pole Maintenance and Construction

This part of the 1930 appropriations for maintenance and construction may not be satisfactorily large.

Expand it by taking advantage of the salvage and construction hints given in our new bulletin—Accessories for Tubular Iron Poles.

#### Reinforcing and Extension Clamps

A-Clamps—for reinforcing corroded joints, or extending poles, with 1 in. reductions in outside diameter from lower to upper section. *Installation illustrated at right.*

B-Clamps—for reinforcing corroded swaged joints where reduction in outside diameter is less, averaging about 5/8 in. from lower to upper section. *Illustrated below.*

C-Clamps—for same diameter of pipe throughout. Larger sizes for overcoming ground-line corrosion, or for lower extensions, and smaller sizes for pole-top extensions.

### Williams Pole Mounts

Pole Mounts, as illustrated at left, frequently provide the only satisfactory, economical method of salvaging old tubular poles, or installing new poles under certain conditions such as anchoring poles on bridges, rock, concrete, etc. Also used with pre-cast concrete base to salvage pole corroded at groundline, or to give maximum clearance with given pole.

#### M. I. F. Crossarm Gains

Assemblies are available for all service conditions, weights of feeders, lengths of arms, bracing, etc. Lighter in weight, yet ample strong.

### Other M. I. F. Specialties

used by Electric Railway Companies and covered in other Bulletins are:

Williams Pole Mounts for wood poles, Crossarm Gains for wood poles. Cable Insulator (Span) Hangers—Spool Insulator or spilt spoon types, with conductors parallel to messenger or at right angles, for single conductor, or in multiple, etc.

*Send for new Bulletin mentioned, also literature on other items.*

---

### MALLEABLE IRON FITTINGS COMPANY

**Pole Hardware Department**

Factory and New England Sales Office: Branford, Connecticut

**Middle Atlantic States Sales Office:** 36 Church St., New York, N.Y.

*General Sales Agents elsewhere in U. S.*

**LINE MATERIAL COMPANY,** South Milwaukee, Wis.

*Canadian Mfg. Distributors: Lines & Cable Accessories, Ltd., Toronto*
NOT only 38 comfortable seats but also a big 23-inch aisle and generous standing well, providing accommodations for many additional passengers.

The four-piece jackknife entrance door at right front and the same type exit door at right rear are actuated by pneumatic air engines with controls at driver's seat.

Bus operators know from experience that this Bender large City Pay-Enter handles bigger loads and handles them with more speed and ease.

And, furthermore, like other Bender units, it has that inbuilt quality of durability combining stamina with a practical lightness of weight, assuring low maintenance and longer life.

You will profit by getting the complete facts from us.

THE BENDER BODY CO.
W. 62nd and Denison, Cleveland, O.
Wilmington Reorders Again!

In 1928 the Delaware Electric Power Company of Wilmington, Delaware, purchased ten Brill low-level city cars. During the summer of 1929, ten additional cars were delivered and now an order for twelve more of this same type car has been received.

Here is ample evidence of the value of modernization with Brill Cars equipped with Brill Trucks.

Let this same combination work for you in your city.

THE J. G. BRILL COMPANY, Philadelphia

Associate Plants

American Car Company, St. Louis, Missouri
The G. C. Kuhlman Car Company, Cleveland, Ohio
Pacific Coast Representative, Rialto Bldg., San Francisco
A NEW STAR TO HITCH TO

...for quieter, more comfortable riding, reduced operating costs, and bigger profits.

The TIMKEN - DETROIT AXLE CO.
DETROIT, MICHIGAN

TIMKEN Worm Drive TRUCKS
FOR ELECTRIC RAILWAY CARS
ELECTRIC RAILWAY JOURNAL

FEBRUARY, 1930

Thirty five Cents per Copy

Original equipment of Consolidated Heaters, still in excellent condition.

The largest order for electric car heaters ever placed and the first order for 3000 Volt Heaters

Light Weight Heaters

Electric Heaters and Resistor Heaters

CONSOLIDATED CAR-HEATING COMPANY INC.

NEW YORK   ALBANY   CHICAGO

1892
FIRST Electric Car Heater
Invented and built by
CONSOLIDATED

1902
NEW YORK Elevated Rys.
Electrified all Cars

1904
INTERBOROUGH Subway
Built All Cars Equipped
with CONSOLIDATED

1907
CHICAGO Surface Cars

1913-14
PHILADELPHIA
Rapid Transit Co. orders
39144 CONSOLIDATED Heaters
for 1618 Cars

1928
CLEVELAND Railways adopt
CONSOLIDATED Heaters

1929
D L & W Railway orders 12126 ★
3000 volt CONSOLIDATED Heaters
NEW YORK Municipal Subway orders
8400 CONSOLIDATED Heaters
CLEVELAND Railway orders
CONSOLIDATED Heaters
for 2nd 100 Cars

RECORDS
CAR HEATERS

PROTECTED COIL  ENCLOSED ELEMENT  DUPLEX RESISTORS
COMPARATIVE operating tests have proved the superior calibre of Westinghouse "Champion" trolley ears.

These tests show their higher conductivity, uniform thickness of lips, longer life, and greater tensile strength. The "Champion" consists of two parts—the body and the runner. The body is made of a special high strength alloy; the runner, from a flat, tough copper sheet, blanked, punched and shaped.

We suggest that you give the "Champion" a test. Write our nearest district office for some of these ears. You will be convinced of their outstanding qualities.

Let the "Champion" be your next trolley ear

Service, prompt and efficient, by a coast-to-coast chain of well-equipped shops

Westinghouse
Next Month
How one electric railway is solving the small city transportation problem
De luxe buses in interurban service—another phase of the subject discussed in this issue
New developments in track construction

Tenth Avenue at 36th Street
New York, N. Y.

CABLE ADDRESS:
"MACHINIST, N. Y."

JAMES H. MCGRAW, Chairman of the Board
MALCOLM MURR, President
JAMES H. MCGRAW, Jr., Vice-President
EDWARD J. MURR, Vice-President
MASON BOWERS, Vice-President
EDGAR KOSAK, Vice-President
H. C. PASHBEN, Secretary

Member A.B.C.
Member A.R.P.

Official correspondent in the United States for Union Internationale de Transports, de Chemins de fer et de Transports Publics Automobiles.

NEW YORK, District Office, 555 Madison Avenue
WASHINGTON, National Press Building
CHICAGO, 500 North Michigan Avenue
PHILADELPHIA, 1600 Arch Street
CLEVELAND, Guardian Building
BOSTON, 107 Storrow Building
CINCINNATI, 751 Vine Street
COLUMBUS, 50 High Street
COLUMBUS, 75 High Street
DALLAS, 1104 Commerce Street
DETROIT, 257 General Motors Building
MINNEAPOLIS, 105 Cass Avenue
ST. LOUIS, 401 Market Street
SAN FRANCISCO, 635 Mission Street
SACRAMENTO, 428 Chamber of Commerce Bldg.
NASHVILLE, 105 Second Avenue, N. W.
LONDON, 6 Beresford Street, London, E. C. 4

Entered at second-class matter, June 23, 1913, at the Post Office at New York, N. Y., under the Act of March 3, 1879. Printed in U. S. A.

Number of Copies Printed
This Issue, 6,200

Contents of This Issue
FEBRUARY, 1930

Editorials ............................................................. 65
Notable Achievements in Accident Prevention Win Brady Awards for Boston, Tampa and Tide Water Companics ..................... 68
Baltimore Rate Decision Sanctions Larger Earnings .................... 75
Engineering Executive Committee Receives Committee Reports ... 77
New Albany Car Includes Many Innovations ........................ 78

By R. S. BEERS
Correct Timing of Signals Essential in Traffic Regulation—Part One . 82
By THEODORE M. MATSON
A.E.R.A. Executive Committee Holds Cleveland Meeting ............. 84
Detroit Express Service Gains Popularity .......................... 85

By CLIFFORD A. FAUST
More Business and How to Get It .................................. 89
Opportunities for Profit in de Luxe Bus Operation .................... 91

By JOSEPH R. STAUFFER
Monthly and Other Financial Reports ................................ 97
Letters to the Editor .................................................. 98
Building Concrete Track with Minimum Interruption to Service .... 100
Double Milling Rail Heads to Prevent Cupping of Joints ............. 103

By HOWARD H. GEORGE
Distinctive Features in St. Louis Sample Car .......................... 105
Causes of Wheel Failure Studied at Havana .......................... 107

By OTTO GOTTSCHALK
Maintenance Notes:
Deep Crankcase Fans Prove Advantageous ............................ 103
One-Man Long Level—By R. B. Evans .............................. 104
Pavement Straight Edge—By P. H. Costello ........................ 104
Spray Equipment Effective for Weed Killing—By A. G. Pibble 104
Repair of Interchangeable Bearings—By Max Feigenbaum 106
Flexible Rail Joints Tried at Providence ............................ 107
Combination Tie Plates for Various Rails—By W. S. Yeats 108
Axles and Armature Bearing Jig—By Herbert Senior ............... 108
Testing Circuit Breakers in Place—By R. W. James ................ 108

New Products for the Railways’ Use ................................ 109
News of the Industry .................................................. 111
Increased Revenue

Results from higher schedule speeds

Higher schedule speeds may be obtained not only by the use of new and modern cars, but also by properly rehabilitating old equipment, making use of modern development. For instance:

Some ways to increase speed are:
1. Change the gear ratio.
2. Shunt the field.
3. Use fields with fewer turns.

And then, too, increased ratings may be obtained by the use of:
1. Internal and external fans.
2. Square wire armature coils.
3. Class "B" insulation.

Any Westinghouse transportation salesman will be glad to assist you himself or to send an engineer to help you make a study of your requirements in order to help you obtain higher schedule speeds.

Westinghouse Electric & Mfg. Company
East Pittsburgh, Pennsylvania
Sales Offices and Service Shops in All Principal Cities of the United States
Speedy car movement -- attracts new freight business

Baldwin-Westinghouse electric locomotives are necessary tools in giving the reliable and speedy car movement that attracts new freight business.

The Wisconsin Power and Light Company recently ordered a 50-ton, 600-volt, 400-hp., Baldwin-Westinghouse locomotive. Prompt shipment permitted its being placed in freight and switching service almost at once over the 15-mile run between Sheboygan and Plymouth connecting with trunk line railroads.

Seventy-five of these standard 50-ton Baldwin-Westinghouse electric locomotives are in successful service throughout the United States.

A recent survey of freight haulage business on typical electric railway properties indicates a 50 per cent increase in gross freight receipts between the years 1920 and 1928. The excellent performance of Baldwin-Westinghouse locomotives was a contributing factor to these favorable business records.

Address either company or call our nearest office for full particulars about standard Baldwin-Westinghouse electric locomotives.

Have you seriously considered the freight possibilities of your property?

The Baldwin Locomotive Works

Baldwin-Westinghouse

Westinghouse Electric & Manufacturing Co.
East Pittsburgh, Pa.
Is road to rule—or rail?

Improved Atlas Rail Grinder

Eureka Radial Rail Grinder

Imperial Track Grinder

Ajax Electric Arc Welder
Billions for better roads. How much for better rail?

Every dollar for better roads helps automobile compete with rail.

Every dollar for better track helps rail compete with automobile.

Nobody wants to ride rough road or rough rail.

Smooth your rail and keep it smooth with the equipment you see here.
Cut Your Pole Replacement Budget
$73.52 for Each Worn Out Pole

Renewing Steel Poles at Ground Line
With O-B Pole Sleeves Gives Old Poles
Double the Life of New Poles, at a
Total Cost of $12.98 Each

HOW many of your steel poles were replaced last
year? How many of them were corroded only at
the ground line? Multiply this last number by $73.52,
and the result is the actual saving you would have real-
ized had you renewed these poles with O-B Pole Sleeves.

This fact has been proved by the experience of electric
railway properties in practically every large city in America, where
O-B Pole Sleeves are saving thousands of dollars annually.

This is how it works out. A new 30-ft. pole (7-inch) costs about
$61.50. Freight, haulage, unloading and installation labor costs
are at least $25.00. So, every new 7-inch pole costs approxi-
mately $86.50 to install.

But, by renewing the old pole with an O-B Pole Sleeve, the cost
is only about one-seventh that of a new pole installed, and the add-
ed life is double that of a new pole. Here is the cost—

1 7-in. Pole Sleeve $10.50
Labor: 2 men @ $0.60 per hour . . 1.20
Foreman @ $0.80 per hour . . 0.80
Cement, sand, gravel and paint . . . 0.48
Total Renewing Cost $12.98

Your saving on each pole renewed is $73.52.

Unless you are now using O-B Pole Sleeves, you are “passing up”
one of the most outstanding money-saving opportunities in system
maintenance today. Furnished in five sizes, for 5-in. to 10-in. poles.

Ohio Brass Company, Mansfield, Ohio
Canadian Ohio Brass Co., Limited
Niagara Falls, Canada

Ohio Brass Co.
NEW YORK  PHILADELPHIA  BOSTON  CHICAGO  CLEVELAND  ST. LOUIS  ATLANTA  SAN FRANCISCO  LOS ANGELES  DALLAS
O-B Rail Bonds are Designed Particularly For You

The Ohio Brass Company manufactures many designs of rail bonds. These bonds have been designed to provide for every practical application need, and to employ all recognized methods of welding.

The advantage to the industry of such a diversified line is apparent. The first advantage is that the choice of an O-B rail bond is not confined to a certain type of bond, for there is an O-B bond of a design suited to each particular requirement. A second advantage is the completeness of the line, for regardless of the method of welding employed, O-B rail bonds are available in many types for any specific type of welding equipment.

There are preferences as to the methods of welding employed. However, bonds designed for any particular method, take into consideration the full advantages as well as the shortcomings of each method, so that the best results possible are assured under the particular circumstances.

O-B rail bond designs are not the result of theory, but have been developed by engineering study in the field. Refinements offered in O-B rail bonds have been incorporated because this field observation pointed out the need for such refinements. So, regardless of the method of welding employed, whether it be by oxy-acetylene gas welding, or electric arc welding, employing either steel, copper or carbon electrode, the best results will be obtained by the selection of an O-B rail bond, designed to provide the utmost in efficiency, economy and long life for the method employed.

Ohio Brass Company, Mansfield, Ohio
Canadian Ohio Brass Co., Limited
Naswa Falls Canada

Ohio Brass Co.
NEW YORK PITTSBURGH PHILADELPHIA BOSTON
CHICAGO CLEVELAND ST. LOUIS ATLANTA
SAN FRANCISCO LOS ANGELES DALLAS

PORCELAIN INSULATORS LINE MATERIALS RAIL BONDS CAR EQUIPMENT MINING MATERIALS VALVES
Reducing
car lighting to a
science

Safety Dome Lighting Fixtures provide numerous advantages over older methods of car illumination, requiring less current consumption, more perfect diffusion of light and the elimination of eye strain. And by using larger lamp units they have the advantages of longer lamp life, simplified wiring and less theft.

Aside from this, they provide much more attractive interiors by the inviting and artistic effect they produce.

Above is illustrated two views of the type T fixtures and also a typical installation. These units are used in the new twenty-in-series lighting system, which also utilizes the cutout type C lamp.

Many types of dome type lighting fixtures are illustrated in our No. 7 catalog and in special data sheets which will be sent to you upon request.

Write for Special Data Sheets

ELECTRIC SERVICE SUPPLIES CO.

MANUFACTURER OF RAILWAY, POWER
AND INDUSTRIAL ELECTRICAL MATERIAL

Home office and manufacturing plant located at 17th and Cambria Streets, Philadelphia, Pa.; District offices are located at 111 North Canal Street, Chicago, Ill., and 54 Church Street, New York City.

Branches—Bessemer Bldg., Pittsburgh; 11 Broadway, Boston; General Motors Bldg., Detroit; 216 N. Washington Ave., Berrien; Canadian Agents—Lyman Tube & Supply Company, Ltd., Montreal, Toronto, Vancouver.
NP adds to its list of
door control mechanism—

An Indestructible Track
for sliding doors

This door track is provided with a renewable wearing surface, that rotates as the doors operate. This results in a wearing surface, four times the area provided by any other type track.

And the wearing surface can be easily replaced.

Applicable to either new or old cars.

Ask for Bulletin No. 25-A.

NATIONAL PNEUMATIC COMPANY
Executive Office: Graybar Building, New York
General Works: Rahway, New Jersey
McCormick Building 1010 Colonial Building
CHICAGO PHILADELPHIA
Manufactured for Canada by
Railway & Power Engineering Corp. Ltd.
TORONTO
There's Only One Solution

To induce more people to use the trolleys instead of their own motor cars, the trolleys must go faster than they now do and they must be more comfortable. The best minds in the industry recognize that the competition of the private automobile is based on its superior speed and comfort. Schedules can be somewhat accelerated by better pick-up, better brakes, faster loading and unloading, but before trolleys can compete in speed with automobiles, the automobile traffic must be reduced. It can be reduced only by improving trolley service so effectively that people will ride the trolleys in preference to using their motor cars.

The initial step is to make the trolleys comfortable. The installation of comfortable seats, seats that equal or excel the comfort of automobile seats, is the first requisite. A number of trolley companies have installed Hale & Kilburn chairs with profitable results. They have increased their passenger traffic because of the improved comfort of their cars.

We shall be glad to supply facts and figures regarding this interesting subject.

HALE & KILBURN SEATS
"A BETTER SEAT FOR EVERY TYPE OF MODERN TRANSPORTATION"

HALE & KILBURN CO.
General Office and Works:
1800 Lehigh Avenue, Philadelphia

SALES OFFICES:
Hale & Kilburn Co., Graybar Bldg., New York
Hale & Kilburn Co., McCormick Bldg., Chicago
Frank F. Hodler, 903 Monadnock Bldg., San Francisco

H. A. Thornwell, Candler Bldg., Atlanta
W. F. Jefferies, Jr., Mutual Bldg., Richmond
W. D. Jenkins, Praterlan Bldg., Dallas, Texas
H. M. Butler, 146 N. Sixth St., Portland, Oregon

This Hale & Kilburn No. 392-A deep cushioned leather covered reversible seat is the one used by the Market Street Railway in San Francisco.

We are putting Comfort into Street Cars
Do you have your copy?

You have, no doubt, been following our series of advertisements dealing with the seven factors that influence stopping distance. . . . The interest manifested in this series by street railway men throughout the country has indicated an eagerness for better brake performance. . . . These advertisements have now been reprinted in booklet form for ready reference and connected study by those interested. If you have not already received a copy, write for one now. Ask for Publication 9073.

Remember, also, that our engineers are always available for assistance in solving your braking problems.

WESTINGHOUSE TRACTION BRAKE CO.

General Office and Works WILMERDING, PA.
ANOTHER TRIUMPH OF GENERAL ELECTRIC RESEARCH!

G-E Glyptal Lacquers are more than paint. They protect and seal—tanks, pipe lines, motors... machinery, structural steel... the list is endless, in every industry.

Long-run cost is less because they need no primer, no sizer... one glossy coat does the work of two.

Their tough, flexible film prevents rust, withstands heat, alkalies, weak acids, salt spray, mineral oils. And it lasts.

Applied with spray-gun, brush or dip-tank these lacquers dry dust-free in 30 minutes! Save time and labor.

G-E Glyptal Lacquers modernize industrial painting. Let them modernize yours—beginning NOW!

G-E Merchandise Distributors everywhere can tell you about G-E Glyptal Lacquers—or write Section M-812, Merchandise Department, General Electric Co., Bridgeport, Conn.

(Join us in the General Electric Hour, Saturday at 9 p.m. Eastern Standard Time, N.B.C. Network).
February, 1930

**SKILL +**

G-E Arc Welding Accessories

Good eye . . . steady hand . . . experience . . . welding technique—they're priceless. Don't handicap them. The right welding accessories help them turn out good work fastest.

General Electric offers accessories that aid welders. They are the result of practical experiments. They are adapted to inside or outside use.

Receive the most from your welders' efforts by furnishing them with quality accessories.

G-E Merchandise Distributors everywhere have G-E Arc Welding Accessories in stock—or write Section M-812, Merchandise Department, General Electric Company, Bridgeport, Conn.

**GOOD WORK, FAST!**

**GENERAL ELECTRIC**

**ARC WELDING ACCESSORIES**

**MERCHANDISE DEPARTMENT:**

**GENERAL ELECTRIC COMPANY:**

**BRIDGEPORT, CONN.**
MODERN EQUIPMENT WINS PUBLIC PATRONAGE

The Gary Railways Company improved local service with this type of modern light-weight car, G-E equipped.

For interurban operation, also, Gary Railways Company uses modern cars with G-E equipment.

GARY WELCOMES NEW CARS

BUSINESS men and city officials joined the throng that welcomed new street cars into service between Gary and Crown Point, Ind. Like scores of other cities, Gary is helping people to realize more and more that the railway industry is keeping up with the times—that modern equipment offers speedy, comfortable transportation.

The Gary Railways Company operates a total of 72 street cars, of which 14 are used in interurban service. All are equipped with G-E motors, G-E control, and G-E air brakes. General Electric Company, Schenectady, New York. Sales offices in principal cities.
15 Trolley Buses for Salt Lake City

G·E Equipped

THE trolley bus is fast becoming an important part of the transportation system in Salt Lake City. Such advantages as maneuverability, smooth, quick acceleration, speed on grades, low operating cost, and decreased paving charges have led to a recent decision of the Utah Light and Traction Company to provide fifteen additional units.

The new Salt Lake City trolley buses will be equipped with General Electric motors and foot-operated PCM control, with electric braking feature.

*PCM control, a recent General Electric contribution to the railway industry, provides automatically smoother and faster acceleration. For complete information, communicate with the nearest G·E sales office.

A motion-picture film showing trolley buses in operation is available. Address the G·E office nearest you.

GENERAL ELECTRIC

GENERAL ELECTRIC COMPANY, SCHENECTADY, N.Y. SALES OFFICES IN PRINCIPAL CITIES
3 Times Approved at Baltimore

In each of three successive years—1927 to 1929—the United Railways and Electric Company of Baltimore, Md., has purchased 250 G-E aluminum lightning arresters. This company operates 1131 passenger cars and 149 service cars.

The unqualified approval of the G-E aluminum arrester at Baltimore dates back to 1910, when 1000 units were purchased. These were in continuous service until 1926, when a much improved type was announced by General Electric. Since then, the improved design and better performance of the new arrester have resulted in the gradual replacement of the original units.

For complete information, address the G-E sales office nearest you or General Electric Company, Schenectady, N. Y.

Join us in the General Electric hour, broadcast every Saturday at 9 p.m., E.S.T. on a nation-wide N.B.C. network.
Supreme Court Strikes Off Shackles of Inadequate Rates

GOOD reason for expecting improvement in the financial condition of the electric railway industry is found in the recent decision of the United States Supreme Court in the rate case of the United Railways & Electric Company of Baltimore. The court definitely established two important principles of rate making and reaffirmed a third which it had previously laid down. It held that the electric railway company was entitled to a return of 7 1/2 per cent on its present fair value. It ruled that depreciation should be set up on the basis of "expenditures equal to the cost of the worn-out equipment at the time of replacement; and this, for all practical purposes, means present value." Moreover, the decision suggests, although it does not definitely state, that present reproduction cost must be considered the most important factor in determining valuation for rate-making purposes.

Encouraging, indeed, is the ruling that a return of 7 1/2 to 8 per cent is not excessive. Since the industry in general has had to pay interest at this rate or more when it has gone into the market for new money, it cannot fairly be denied permission to earn that rate of return. Few state regulatory bodies, however, have been willing to grant rates sufficient to accomplish this purpose. It is noteworthy that only two members of the Court, Justices Brandeis and Holmes, took exception to this part of the decision and that their objections were directed rather at the rate base than at the rate itself.

Concerning the proper basis upon which to calculate depreciation, wide differences of opinion have long existed. On the one hand it is said that the purpose of setting up depreciation is to permit the replacement of worn-out physical property. The natural corollary of this is that replacement cost should be the basis of calculation. On the other hand it is claimed that the object should be merely to restore to the treasury the money originally spent; from which it follows that original cost rather than replacement cost should be the basis of calculation. When the latter plan is adopted the extra cost of the new property required to replace that which has been worn out must be met by borrowing additional money and thereby increasing the capital investment.

Provided that the earnings are high enough to permit borrowing, it does not make a great deal of practical difference which method is followed. In one instance the company must earn a larger sum for depreciation, while in the other, the depreciation allowance is smaller, but there is also required a certain sum for interest on the additional investment. The relation between these amounts depends on the difference between the original and the replacement cost and the length of the useful life of the property. Since the general level of prices is upward rather than downward, the original cost method of calculating depreciation will result in a steadily increasing investment and a steadily increasing burden of interest charges.

To what extent the opinion of the court may be taken as an indorsement of the reproduction cost theory of valuation is not entirely clear. This point was not at issue and the decision merely asserts that "it is the settled rule of this court that the rate base is present value." Judging from the previous rulings of the court in the Indianapolis Water Company case and the St. Louis & O'Fallon Railroad case it may be inferred that reproduction cost is to be considered a major element in determining value. This view is strengthened by the vigorous dissent of Justices Brandeis and Holmes, who are recognized believers in the prudent investment theory of valuation. The language of the decision, however, leaves this phase of the matter open to argument.

Prompt improvement of the financial condition of the railway in Baltimore may be expected to result from the decision. Ultimately it is likely to have far-reaching effects in fare cases now pending in other cities. At this time when the need for modernization of the electric railway equipment has received wide recognition, the decision of the court is particularly timely and opens the door to a new and better era for the local transportation industry.

Improved Fire Record Brings Lower Insurance Rate

FOR many years the fire record of the electric railways was not one in which the industry could take much pride. More recently, however, a marked improvement has occurred. Several factors have contributed to this improvement. Present-day structures and equipment are not so inflammable as those of an earlier period. Greater care is devoted to storage of materials. A larger measure of attention is paid to periodic inspections. More efficient methods of fire detection have been developed, as well as automatic equipment for fire extinguishing. All this has resulted in a material decrease in the number of fires in electric railway carhouses and shops, and a decrease in the seriousness of the fires that have occurred.

This achievement has been the more noteworthy when compared with the steadily rising fire losses for the country as a whole. In recognition of this, new fire insurance rate schedules for electric railways have been granted in 42 states, and tentatively adopted in three others. For this accomplishment a large measure of credit goes to the committee on insurance of the American Electric Railway Association. It is now up to the
luxury to take advantage of the opportunities that have been offered to them. If they do, substantial savings will be effected. There is every reason to expect that improvement in the fire record will be continued, in which event it may be anticipated that still further reductions will be made in the rate schedule.

Luxury Becomes a Necessity

DE LUXE buses in urban service have proved their ability to earn profits. That they have done so independently and not at the sacrifice of revenue from city-type operations is a fact of major significance. The attractive equipment and the fast, direct service which is typical of the majority of these lines has appealed to a new kind of rider. This is clearly shown by a survey of numerous properties published elsewhere in this issue. Almost without exception, the de luxe lines now in operation, charging fares considerably above those for street car service, are routed so as to connect the downtown business, shopping and theater districts of the city with one or more exclusive residential sections. The business man has found this service convenient for his trips to and from the office and as comfortable as traveling in his own private automobile. During the mid-day hours the women enjoy an attractive vehicle for their shopping trips.

Some of these lines have opened new territory that would not support or permit street cars, but the majority of them are furnishing a selective additional service through communities already well served by city lines. The higher fares, 25 cents in the majority of instances, make it possible for the operating company to render faster and more luxurious service; yet at the same time offer economies to the motorist who has been in the habit of using his automobile for commuting. It has been estimated that a person cannot drive his car into town, park it and return home at a cost less than $1 per day. At half the cost he can use the buses and not have the worry of driving or parking. Traffic conditions, parking restrictions and the cost of short-time storage in a garage are all working for the benefit of the de luxe bus and are more than indirectly responsible for the expansion of this class of service.

Further evidence of the future of the de luxe bus is found in the statistics of recent bus purchases. There were more buses of this type bought by the electric railways last year than in any previous year. Approximately 400 more de luxe buses were purchased in 1929 than in 1928, while there was an increase of only 23 in city-type buses. Undoubtedly there is a definite luxury trend in bus operations, and the electric railways are strengthening their systems both from an operating and economic standpoint by expanding their service along this line.

Value of Elevated Railways Proved Anew

ALTHOUGH occasional clamor is heard in favor of the removal of elevated railways from city streets, evidence continues to accumulate that they still have a real place in providing transportation in large communities. An apt illustration of this is furnished by comparison of the service now being given by the elevated railway lines in New York City and the service which a new elevated motor highway now under construction along the Hudson River waterfront is expected to render. The cost of this undertaking probably will exceed $18,000,000, and its carrying capacity has been estimated at approximately 100,000 persons per day. A few blocks away an elevated railway is at present carrying more than 250,000 persons per day. A subway could do no more.

Yet the city, while spending vast sums for the construction of the new elevated highway, is proposing at the same time to tear down its elevated railways.

An argument often advanced is that the present elevated railway structures are unsightly. In this respect the elevated highway promises little improvement. Already a forest of ugly steel columns has sprung up in the center of West Street interfering to a considerable extent with surface traffic. Of course, there is much to be said in favor of the new project. By providing a by-pass route without grade crossings between lower Manhattan and the uptown residential districts it will undoubtedly afford some relief to the city's congested streets. But the real measure of usefulness of a transportation facility is the number of people accommodated. From this standpoint the elevated railways are far more valuable than the new highway.

In Manhattan, unfortunately, the elevated railways stand low in public esteem. Stations of corrugated iron designed and built in an era when jigsaw work was the ultimate in ornamentation cannot fail to shock the esthetic tastes of the present-day Gothamite. Nor can a rolling stock of the pre-Spanish war period hold forth much in the way of rider appeal. But stations can be made artistic, and modern cars, less noisy and more comfortable than those now in use on the "L" in Manhattan, are obtainable.

That the prejudice against elevated structures in New York is being carried to an extreme is evidenced by the fact that this very useful and relatively inexpensive form of transit is being to a large extent ignored in plans for the future. Into the far reaches of Brooklyn and Queens, amid scenes almost pastoral, subway routes are being planned at enormous expense to handle anticipated development that is at best many years away. Chicago, more wisely, provides in her new city plan for some 70 miles of elevated lines to serve the more remote suburbs. Before deciding that the day of the elevated railway has passed, New York would do well to study carefully the facts and figures of the situation.

Scientific Accident Analysis Brings Practical Results

SAFETY has as its ultimate goal the prevention of all accidents. In industry, however, it has been necessary to interpret it in relative terms because the ideal seems impossible of attainment. Since it is inevitable that some accidents should occur, their cost must be estimated year by year and allowed for in the budget as a more or less constant element of operating expense.

As a result of this treatment of the situation from the financial point of view, accident prevention work frequently degenerates into a part of the regular routine, and efforts to better conditions become perfunctory. Preaching accident prevention by emphasizing to the men the cost to the company is not effective, particularly if the operator believes he is doing the best he can. Trying to place the blame for the accident on someone other than the operator is not profitable, for it does not
reduce the pain of the victim or the grief of his friends, 
or does it save the expense involved. But that some-
times represents the scope of accident prevention work. 
In refreshing contrast to this is the attitude of the win-
ners of the latest Anthony N. Brady Memorial Safety 
Award, as evidenced by the brief’s submitted in the com-
petition and abstracted in this issue.

The program of research in accident prevention out-
lined by the Boston Elevated Railway, which won the 
Brady medal in the class of large properties, is particu-
larly noteworthy. Not satisfied with the ordinary meth-
ods, the management had a searching analysis made to 
determine, so far as possible, all the causes of accidents 
in order that they might be dealt with intelligently and 
eliminated wherever possible. A program was put before 
the organization in such a manner that all co-operated in 
working it out effectively. After only one year the 
results have been remarkable. They have proved the 
soundness of the methods used. The good operators 
have remained good and the poor ones have become 
much better. There has been a marked reduction in the 
number and in the severity of accidents.

While the methods which are so successful in Boston 
may appear elaborate for some of the smaller properties, 
there is nothing that cannot be used with suitable mod-
ification. In fact, the smaller size of a property should 
make the use of similar methods simpler and should 
produce results more quickly. The other winners of the 
Brady awards did use methods which, while not de
developed so scientifically as those used in Boston, followed 
along similar lines in many respects. Intensive and con-
tinuous efforts made it possible to improve the already 
good records they had achieved in past years.

Putting Noise on the Defensive

NOISE is receiving ever-increasing attention as an 
unfavorable factor in American life, particularly in 
metropolitan centers. Means of eliminating or reducing 
it are under consideration nearly everywhere. Unneces-
sary blowing of factory whistles has been banned. Even 
the ringing of church bells is looked upon with disfavor 
in some cities. The noisy motor truck, a consistent off-
fender, has occasioned so much caustic comment that in 
many places it has become the subject of police regula-
tion. Drilling and blasting for building foundations are 
today subjects of criticism. Riveting, that symbol of 
progress, is under suspicion, for now electricity wields 
building frames in silence. Contractors have become 
apologetic about the noise they feel compelled to make.

With all this campaign against unnecessary noise it is 
inevitable that unfavorable attention should be directed to 
noisy street cars. Many people probably believe that 
the noise of street car operation cannot be eliminated. 
Few indeed realize the progress that is being made along 
this line. The committee on noise reduction of the 
A.F.E.R.A. has shown conclusively that most of the noise 
usually associated with car operation is unnecessary. 
New cars are being built that are far less noisy than those of the older types. Even the old cars can be 
made far less noisy than some of them now are. A 
monkey wrench and a screwdriver will work wonders in 
tightening up the loose bolts and screws. Loose or 
broken parts that rattle and squeak can be attached se-
curely or replaced. Noisy air compressors, the curse of 
many cars, can be repaired or new ones installed that 
do not make a racket every time the car stops.

As to the track, of itself it is one of the quietest things 
on earth. But when a car passes it begins to act up and 
emit many and various noises. Here again the wrench 
and the welder can make a lot of difference. By tight-
ening loose joints, truing up worn surfaces and securing 
correct alignment even poor track can be so improved 
that cars can run on it without emitting sounds of pain 
that arouse the neighborhood.

Since noise is an indication of inefficiency, it follows 
that the noisy car is being subjected to strains that are 
heading it for the repair shop sooner than necessary. 
Money spent on noise reduction will return directly in 
lower maintenance costs. Equally important, however, 
is the effect on the public. This cannot be measured in 
dollars and cents but it is hardly an exaggeration to 
say that it may mean the difference between success and 
failure.

Use of One-Man Car Upheld

FINDINGS of the special master in the suit in equity 
of the Shreveport Railways vs. City of Shreveport 
to enjoin enforcement of an ordinance requiring two men 
on every street car are not only of importance to the 
company in question, but also carry a message affecting 
the entire industry. In no uncertain language it is 
pointed out that a municipality’s right under its police 
powers to interfere in matters of this kind exists only 
when necessary to the safety and convenience of the 
public. The court states that from the evidence the 
modern one-man car with safety devices has been shown 
to be safer than its predecessor, the two-man car. 
Furthermore, the evidence shows that speed has been 
increased and that companies have been able to operate 
more service, that wages have been increased, and that 
operators have become more efficient and better satisfied 
when the change from two-man to one-man cars has 
been made. Moreover, the court found that since 1917 
no public service commission has refused to permit the 
operation of one-man cars, and since 1924 no commis-
sion has limited the right to use one-man cars subject 
to any particular conditions. Under these circumstances 
the refusal of the city to permit the use of one-man cars 
of the latest type was held to be arbitrary, and 
equivalent to a taking of the railway’s property without due 
process of law.

Aside from the specific matter of safety of one-man 
operation, the court made several significant statements. 
The evidence showed that a choice had to be made 
between reducing railway operating expenses through the 
instrumentality of the one-man car, and the ultimate 
bankruptcy of the company and the loss of electric rail-
way service to the city of Shreveport. The court was 
unwilling that the city should lose its railway. It 
appraised the situation correctly when it said that street 
cars, for the present at least, appear to be an essential 
means of transportation for a large portion of the popu-
lation, particularly those not able to own automobiles, 
and the loss of such service without an equally cheap 
substitute would be a serious handicap to a growing 
community.

While the fight against the one-man car has largely 
died out, this decision makes the position of the courts 
more definite than it ever has been. In addition, it chal-
 lenges the right of the municipal authorities to exert 
their police power in matters which do not affect the 
safety and convenience of the public.
NOTABLE ACHIEVEMENTS IN

Accident Prevention

Win Brady Awards for Boston, Tampa and Tide Water Companies

WINNERS of the Brady safety medals have recently been announced by the American Electric Railway Association. There are three divisions in the contest, according to the amount of service rendered. In Class A, including electric railway organizations operating more than 5,000,000 vehicle miles, the award, consisting of a gold medal, was made to the Boston Elevated Railway, with honorable mention to the Louisville Railway. The Class B award, a silver medal, for those companies operating more than 1,000,000 but not over 5,000,000 vehicle miles, went to the Tampa Electric Company, with honorable mention to the El Paso Electric Company. In Class C, for smaller properties, the bronze medal was awarded to the Tide Water Power Company of Wilmington, N.C.

The awards are a memorial to the late Anthony N. Brady, and are presented each year for the best records of safety in operation and health promotion made by electric railways. The selection of the winners was made by a joint committee of the American Museum of Safety and the American Electric Railway Association, consisting of Lewis Gatrty, president the Bank for Savings, chairman; Col. A. B. Barber, manager transportation and communication department U. S. Chamber of Commerce; James H. McGraw, chairman of the board McGraw-Hill Publishing Company, Inc., and Charles Gordon, managing director American Electric Railway Association.

Accident Analysis Successful in Boston

BY FAR the most impressive accomplishment of the Boston Elevated Railway in its safety work has been its study of the human factor in accidents. Since it was recognized that accidents may be caused by some human failings, primarily of a psychological nature, the railway engaged the Personnel Research Federation of New York to survey the situation. As a result it was found that half of the accidents happen to less than a third of the operators. In one sample of 200 men of ample experience and maturity, one-half the accidents happened to only one-fifth of the motormen. This difference in proneness to accidents holds even when the question of blame is eliminated. A further study indicated that men who pay the most attention to operating efficiently, as evidenced by the percentage of coasting obtained, are also the men who have the least accidents. It was found that the 100 men with the lowest coasting records had 364 accidents and 73 delinquencies, while the 100 men with the highest coasting record had 313 accidents and 46 delinquencies. A further study of delinquencies of bus operators developed that, apart from fare irregularities, among the low-accident men there was an average of 9.7 delinquencies which were made by 65 per cent of the men; whereas among the high-accident men, there were 16.8 average delinquencies made by 89 per cent of the men.

A study of the men over 50 years of age showed that 21 men with abnormal blood pressure had a total of 136 accidents, or 6.5 per man; those with normal blood pressure, numbering 38, had 110 total accidents, or an average of 3 per man. The length of service was found to have a very distinct relation to the number of accidents, the older men having far less accidents than the younger ones; second, the largest number of accidents and the largest proportion of men having a large number of accidents are in the group with less than one year of experience.

Summing up, it was found that there are four classes of men who may be regarded as more than ordinarily prone to accidents: (1) those who do not operate economically, as shown by low coasting record; (2) those whose record of delinquencies is long; (3) older men with abnormal blood pressure, and (4) younger men with very limited experience.

Following this survey the records of car operators and motormen were studied individually. They were divided into two classes: (1) high-accident men, i.e., those with five or more collisions during 1927; (2) low-accident men, i.e., those with fewer than five collisions during 1927. It was found that out of 2,300 operators, approximately 20 per cent, or 472, were high-
accident men, and the remaining 1,828 were low. The 1,828 low men were regarded for the time being as satisfactory operators, and were left under the usual influences inducing safety.

The high-accident men were then studied and handled individually. Two things were noted about these men: (1) the man who tends to have many slight accidents, which are themselves relatively unimportant, is also the man who tends eventually to have serious accidents; (2) the man who has many accidents in one year is also the man who is likely to have accidents every year. Accident proneness may, therefore, be regarded as something in the nature of a disease, which has to be diagnosed and treated. The first step in treating a man is finding out why he has accidents.

Instructors were then brought into conference, relative to the 472 operators who were on the high-accident list. They rode on the cars with these operators, making observations as to their habits. Then the habits of the operator, his record, personality, and physical condition were all considered together in an attempt to arrive at conclusions regarding the cause of his accidents, and in relation to the possibility of the effectiveness of individual action, the main thought being that the man should be cured of his accident tendencies if possible.

The method chiefly depended on to produce a reduction in accidents was instruction on the job by the especially trained instructors. While instruction was mainly relied on, two other methods were used: (1) where the accident record of a man indicated that he did not realize his responsibility, he was interviewed by the safety supervisor and division superintendent; (2) where the cause of accident was ill health, the men were physically examined and told what was the matter with them, and advised to go to their own physicians for treatment.

Since the habits in question were generally of long standing and a change would require some time, it was necessary to arrange follow-up work. Each inspector was required to see each of his operators on the job, the frequency depending on the seriousness of the case. When it became apparent that although a man might do his job well during the hours the instructor was with him, he might not do it at all well during the other 47 hours of the week, the entire street supervisory force was enlisted. Their hours and duties were rearranged so that they could include a great measure of personal supervision of high-accident operators.

A selected group of instructors and supervisors was consolidated into a group of safety inspectors, working directly under the safety supervisor. Districts were allotted to these inspectors, according to the routes and districts where the accident hazards were greatest. Sample studies of accidents and times of accidents were made. It was then made the duty of the inspectors to acquaint the high-accident men with all the information they had regarding the accident hazards of the district.

Other activities of the transportation department con-
ternal accidents have included conferences with the division superintendent regarding the method of handling men, co-operation of the dispatchers and carhouse starters, particularly with respect to warning operators when weather conditions were unfavorable, or when men were placed on new routes, and keeping a careful check of punctuality. These men have also been encouraged to inspect cars and see that the equipment is on hand and the car in perfect running order.

Results that have been obtained have proved the soundness of these methods. During the year 1928 the collision accidents involving surface cars were reduced from 7,197 to 5,923. This reduction came about by concentration of efforts of high-accident men. Figures show that the 472 high-accident men in 1927 averaged 7.1 accidents per man, or a total of 3,327 accidents. During 1928, 312 of these men averaged 2.1 accidents per man, or a total of 663; 160 averaged 7.1 accidents per man, or 1,136 total accidents. The accidents for this group were therefore 1,799 altogether. Contrasted with this the 1,828 low-accident men in 1927 averaged 2.1 accidents per man, a total of 3,870 accidents. During 1928, 1,693 of these men averaged two accidents per man, or 3,386 accidents; while the remaining 135 averaged 5.8 accidents per man, or 738 accidents, making a total of 4,124 accidents for this group. Thus it will be seen that while there was a 46 per cent reduction in the accidents of the men in the first group, a number of the men of the second group had a larger number of accidents in 1928 than 1927. The discovery, after the first year's investigation, that a few of the men placed in the low-accident group could not be classed as constantly low-accident men was an unforeseen but valuable result of the investigation. With the additional knowledge obtained, the system of training has been rounded out to include provisions for special treatment of this new group.

Accident location studies have been made on a different basis from that usually followed. For instance, on a particular route a check-up showed that the inbound collisions were all with the front left corner of the car, while outbound collisions were with the right front corner. The reasons for this were investigated, and the instructors and men were told how they should operate in view of the condition. This cut the accidents on the line to one-third of the former number. In another instance, instructors were overheard telling the men how much extra care was necessary at a certain corner, where studies showed that there had been no accidents for more than a year.

Investigation showed that the times of the accidents as well as the locations should be taken into account. In one place it was found that inspectors had been on duty sixteen hours a day during the previous winter to look after traffic conditions, but during the evening rush the inspector was required to go to a cross-over 1,000 ft. away. Study revealed that 80 per cent of the accidents at this point occurred during the evening rush hour. Placing a man there from four to six in the afternoon resulted in cleaning up the bad spot, and the sixteen hours of unnecessary supervision was eliminated. In another place, the prevailing type of accident in the summer required twenty-hour supervision, while a study of winter conditions showed that 75 per cent of the accidents occurred during only five hours of the day. The superintendent found that he could arrange for five hours supervision, and did so, reducing accidents on the route from nineteen to nine a month.

At the beginning of 1928, the inspection school and the employment office of the railway were consolidated as the division of employment and training. Inspectors teach the new employees as well as the older ones. Preparing for an interview with a man, the superintendent decides that it would be better to have this man's instruction followed up on the card. The regular instructor arrives with him and gives him instruction when necessary. Eighty high-accident men have been taken out on special cars in street operation by the division inspectors. These men have been re-instructed for from one to three days, and special attention has been given to any faults in operation or habits which increase accident hazards.

The work of 1928 showed that when every possible expedient had been tried to cure men of their accident proneness, some were not successfully handled. In order to discover the reasons for their accident proneness a psychology laboratory was set up and these men put

![Graph](image-url)

Accident proneness is confined to relatively few men. This record from Boston shows that 1,828 low-accident men had 3,870 collisions, or an average of 2.1 per man, while 472 high-accident men had 3,327 collisions, or 7 per man. The small chart shows distinctly that caution comes with experience, most of the high-accident men being young in the service.
through tests to secure further information about their mental make-up. After observations it was found that several psychological factors are more or less constant as contributing causes of accidents: (1) the degree of adaptability of the operator to various types of equipment; (2) his quickness of reaction to sound and light; (3) powers of concentration over a period; (4) judgment of speed and distance.

From these tests it was determined that operators should be divided into three classes: (1) first-rate operators, 73.6 per cent of all, who never have more than a few accidents; (2) those who for one reason or another do not ordinarily operate in a safe manner, unless special methods of instruction are adopted, but who always would be classed as high, comprising 20.5 per cent of the total; (3) those who are likely to be either in the high-accident or low-accident class in any year, forming 6.6 per cent of the men. In this third class fall those who are qualified in all classes of service and who change from one type to another, and those whose health, family circumstances, etc., either improve or become worse in any year.

The function of the safety organization, then, has been three-fold: (1) to reduce the number of high-accident men; (2) to follow up the men whose manner of operation has improved and crystallize their improved habits; (3) to prevent unnecessary shifts of those men who, due to change of operation, will have a tendency to come into the high-accident class.

Safety an Integral Part of Management

Two fundamental principles determined the policy of the Boston Elevated Railway in its safety work during 1928, according to the company’s presentation. First, safety is an integral part of management and not simply something to be taken care of by a special department charged with the administration of safety features only. Second, all specific safety efforts must be preceded by and based upon thorough research and investigation into past accidents and their causes.

In order to interest the public in accident prevention, there has been close co-operation with the Massachusetts Safety Council, officials of the railway being on the executive board of that organization. During 1928 the general manager of the railway was president of the council.

Particular attention has been taken to interest the children in safety. A special motorcycle officer detailed to make observations at the opening and closing of schools found that the children from certain streets did not have due respect for their own safety, so that he visited the schools in question, talked with the teachers, and in some cases talked directly with the children of the class. Another result was the formation of a junior safety council in the schools; the co-operation of local service clubs was secured; the Kiwanis Club donated white safety belts to the boys for use while on duty as safety patrols.

In connection with its physical plant, the company has done much to make the track safe for operation. In addition a derailment committee visits the scene of the trouble whenever a derailment or a split switch occurs. The evidence obtained is weighed and a decision is reached as to the probable cause. As a result, in comparison with 243 derailments in 1927, costing in claims $15,130, there were only 208 derailments in 1928, costing in claims $11,548.

In order to prevent collisions with cars turning, clearance lines have been painted on the pavement. On one of the recently opened highways, known as the Northern Artery, the hazards to passengers have been eliminated by moving the safety zones from the highway and placing center loading areas between the tracks. These center loading areas allow passengers to keep away from the vehicular traffic, which is not halted while passengers are boarding and alighting.

Particular attention has been paid to the equipment to keep it at all times in safe operating condition. The older buses which were purchased by the company in 1922 and in several years thereafter have been replaced by modern buses of steel construction which have much greater strength to withstand shocks in collisions. The street cars have also been maintained better, and there is an improved reliability of the cars from the accident standpoint. In cars, both for surface and rapid transit lines, safety features have been installed. Much new testing equipment has been installed in the shops to insure that the cars are in safe operating condition. Changes have been made in the rapid transit stations to enhance the safety of passengers. Safeguards have been placed at approaches to drawbridges to prevent cars from running off the track at such points.

Due to the extensive use of automobiles in winter, as well as during the open months, changes in the snow removal program have been made so that a width of at least 14 ft. in the roadway adjoining the tracks is cleared, as well as the area over the tracks themselves. Using these measures, the street surface is free from snow in practically the entire width, for the whole winter. The railway also keeps open 140 miles of highway, over which its buses operate.

Tampa Betters Safety Record

SAFETY work in Tampa, which brought the Tampa Electric Company the Brady Award for 1927, had even better results in 1928. In the latter year there was a total of 820 car and bus accidents, as compared with 1,175 occurring in 1927, 2,843 in 1926 and 3,070 in 1925. This represents an improvement in 1928 over 1927 of 30 per cent, over 1926 of 71 per cent, and over 1925 of 73 per cent. From the comparative record of acci-
The reduction in collisions with vehicles is particularly notable. In 1925 there were 2,597 such collisions, in 1926 there were 2,458 collisions, in 1927 1,021 collisions, and in 1928 only 691. These figures indicate an improvement for 1928 over 1925 of 280 per cent in miles operated per collision with a motor vehicle. The automobile registration in the two years was approximately the same. The latter year also shows a substantial reduction in other classes of accidents as compared with the three previous years.

The total expense of settlement of suits, judgments and claims was $9,940 in 1928, as compared with $35,135 in 1927, and approximately the same amount in each of the two preceding years. The total accident costs have been reduced from $56,290 in 1925, $62,182 in 1926 and $57,237 in 1927, to $25,236 in 1928. This is a reduction of approximately 60 per cent. The cost of accidents per vehicle-mile for the four years was 1.45 cents in 1926, 1.31 cents in 1926, 1.49 cents in 1927 and 0.65 cents in 1928. With an accident reserve accumulation of $60,000 at the end of 1928, it has been possible to reduce the accrual basis from 5 per cent to 3 per cent of the revenue from transportation. This record of reduction in accident costs has been obtained with a reduction in the cost of safety work from $5,448 in 1927 to $4,799 in 1928.

Safety work has been carried on by the Tampa Electric Company for many years. In a summary of the presentation for the Brady Award last year made in Electric Railway Journal for Jan. 26, 1925, page 161, were listed the several plans used up to the end of 1927. The program has been continued during the past year.

During 1928 blinker stop signs were installed at street intersections of the most important through thorough-fares. Clearance lines at curves are now painted on the street surface in yellow instead of white, which was the same color as that used by the city in marking street intersections, parking places, etc. It is believed that this change prevents confusion with other lines painted on the pavements.

In connection with the annual South Florida Fair, the company, in its exhibit in 1928, showed the front end of a street car. Inside it motion pictures and lantern slides were displayed on a screen. Two short films were run, along with slogans. It is estimated that between 18,000 and 20,000 people saw the exhibit during the ten-day period of the exposition.

Beginning with 1928, a new contest among the trainmen was begun. This plan has as its reward a monthly prize of $5 to each man of the car or bus line which operates the greatest number of miles per accident. The extra men are also divided into groups, and the members of the winning group are likewise given a prize of $5 each. This contest has proved very successful, and tends to keep interest aroused where it has perhaps lagged a little during the four-month bonus contests which were described in the article last year. Under the rules of the contest, all accidents are counted, whether chargeable or non-chargeable. In the case of unreported accidents, a regular man is disqualified from participating in any earnings of the line for that monthly period in which the unreported accident occurred.

When a line makes a poor showing in the line contest for two months in succession, class meetings are held for the men from that line, in which every phase of the operation is discussed, together with the possible accident hazards, in order to ascertain if possible the reason for the line's poor showing. These classes have been found very beneficial and have always resulted in improvement for the lines that have been making a poor showing.

In the work of the shops, one of the most noteworthy accomplishments for safety during 1928 was the adoption of the system of keeping all cars and buses on the same run daily. It is believed that when a man is entirely familiar with his car by the daily use of it, he naturally will handle it with a greater degree of safety. This system has also helped in reducing car defects, and improving the reliability of the service.

Tide Water Power Company Extends Safety Measures

Despite continually increasing congestion on streets and highways the Tide Water Power Company of Wilmington, N.C., maintained the excellent record during 1928 that it had established in winning the Brady Award in its class in the two preceding years. This company always has laid great stress on resuscitation of persons suffering from electric shock or suffocation in drowning. It was a pioneer in adopting the Schaeffer prone pressure method and has extended its service to neighboring industries and the general public. The company owns and operates a large bathing pavilion at Wrightsville Beach and maintains lifeguards for the protection of the public. It also has shown during the bathing season a one-reel picture, "Artificial Respiration," every eighth evening. Reports have come back from many southern states illustrating the peculiar effectiveness of this method of visual instruction.

The company also co-operates with the safety departments of the railroads and industries located in the city as well as with the local Y.M.C.A. In the company's employee school for vocational training and safe practices, the employees of other companies are welcome to receive instruction without charge.

Particular attention is directed toward all locations where accidents are likely to occur. Where the view of the track is obstructed special precautions are taken. Where a hedge is permitted to obscure the view at a crossing a continuous agitation for its trimming or removal will begin, and will be continued until the risk is eliminated or abated. Signs are placed at important points along the lines of the company giving full directions as to speed and control of the cars. It is believed that this has enabled employees to make better than average time with little if any extra hazard.

The company bettered its record of accidents from 46 in 1927 to 45 in 1928. There have been no fatalities on the properties for four years. Expressed in proportion to gross revenue the cost of accidents was 1.366 per cent for the year 1928. The claim department operations
and miscellaneous expense were 0.537 per cent of the 1928 gross earnings.

In 1928 the bonus system for rewarding trainmen and bus drivers for safe operation met with great success. Of the 34 regular operators 15, or 44 per cent, held perfect safety records. Of the average number of 48 total operators, 43 received some reward for safe operation. The plan provides for the payment of $1 to each operator for each no-accident month. In the event that he has an accident he loses all of the accumulated bonus for the year to date, but can start over the next month. There is an additional bonus of $1 for each no-accident quarter, and $5 extra for a perfect year, making a possible total actual bonus of $21. The cost of this system was $522 in 1928, or less than 1 per cent of the payroll.

**Louisville Men Have New Attitude on Safety**

**WHILE** safety work on the Louisville Railway during 1928 followed along the same lines as in the past two years, there has been a change in the attitude of the men since the safety program was inaugurated in 1921. At present they are making efforts to operate safely because they have a conviction that safe operation for its own sake is distinctly worth while.

Among mechanical improvements which contribute to safety, the most important during 1928 was the elimination of a grade crossing over which three of the heaviest street car lines operate. Safety of operation has been increased by a change in the color with which the street cars are painted, the present scheme comprising a lemon yellow for the car body with a broad stripe of apple green running around the body and a cross of apple green on the front and rear dashes. Four safety zones have been installed at the principal loading points on Jefferson Street. Air gongs have been substituted on cars operating on important lines for single-tap foot-operated gongs. Treadle doors at the rear of cars on one of the one-man car lines have been installed. Improved destination signs have made it easier for passengers to distinguish routes and have minimized the hazard due to their standing in the street to see if the car approaching is the desired one. Improved springs and locking devices have been installed in electrically operated switches to prevent splitting of switches and subsequent derailment.

Despite an increase in the number of car-miles run from 12,140,867 in 1927 to 12,365,167 car-miles in 1928, the cost of repairs due to accidents was reduced from $7,262, to $6,045.

Comparison of 1928 statistics with those for 1927 shows that the latter year in nearly all respects was the safer. The total charges to the injuries and damages account were reduced from $201,112 to $162,186. The average number of miles operated per chargeable accident went up from 13,326 in 1927 to 17,440 in 1928. In this connection it must be remembered that 1928 was the eighth year of intensive safety effort on the property and comparatively little improvement was looked for.

Indicative of the change of attitude of the employees toward safety is the fact that, of 24 safety rallies held at different carhouses during the year, 22 were arranged by the platform men themselves. Posters and charts in the carhouses are found of the utmost value in keeping the enthusiasm for safety of its employees constantly stimulated. One of these shows the average miles operated per accident from 1910 to date. Another is a blueprint which shows the complete safety record of all of the employees. Still another chart is a blueprint showing the standing of each carhouse in the company's monthly accident contest.

During the year a postgraduate course for trainmen was inaugurated. This supplements the training of new employees and makes the old employee who takes it a more efficient street railway man. There also has been increased attendance by employees of the company at the Louisville Safety Council's industrial school.

The good will of the company has been enhanced by speeding up the street car service. This was accomplished late in 1927 and early in 1928. In 1927 the company operated 12,140,867 car-miles in 1,433,271 car-hours; in 1928 it operated 12,365,167 car-miles in 1,416,690 car-hours. This was accomplished with the increase in car-miles per accident and decrease in total cost mentioned elsewhere. Besides this general improvement in speed, an express service was inaugurated on one of the company's main lines during the year. For four miles in the center of the main route the street cars make no stops at streets other than transfer points, local service being given by buses.

**El Paso System Increases Zero Accident Days**

**DURING** the year 1928 the El Paso Electric Company bettered its record for any previous year, having a total of 435 accidents as compared with 445 in 1927, and 452 in 1926. This compares with 1,767 in 1921, the earliest year for which statistics were presented. Accidents were at the rate of 1.42 per 10,000
car-miles, and 2.35 per 100,000 passengers carried. The figures for 1928 represent an improvement of approximately 8 per cent in the factor of safety over the medal winning year, 1926. Reviewing results for the past eight years, the company's presentation states that accidents per 100,000 passengers carried and per 10,000 car-miles operated have been reduced more than 75 per cent.

During 1928 earnings were increased to the extent of $12,752, and expense was reduced by $18,614, through accurately fitting service to conditions. The company operated 233,452 car-miles less and hauled 76,516 passengers more in 1928 than during the previous year. Faster schedules offset lengthened headways and readjustments were followed by a further reduction of the number of street car and bus accidents.

For years it has been the practice of this company to set an accident bogey. By the beginning of 1928 so much progress had been made towards the goal of accidentless transportation that no bogey was set and the men were simply urged to do their best to "beat last year's accident record." This they did, lowering the record for 1927 by ten accidents.

That the efforts towards the reduction of accidents have been appreciated in the city of El Paso is evidenced by the many expressions of good will included in the report. The results did not follow a spurt or any series of spasmodic efforts during which spectacular improvements were shown. On the contrary, progress along safety lines was shown by regularly bettering the established accident record year after year, notwithstanding that these records have already been recognized as among the best.

Warning signs, the exercise of tact and courtesy, and extra precautions taken to prevent accidents have played an important part in the program. Careful inspections have been made, special instructors have taught student operators and a joint committee on investigating accidents has been active. Operators are continually on the alert and report all unsafe conditions. Various safety devices have been adopted, quite a few of which were developed by the men in the ranks.

Outstanding benefits have been secured through the company's honor roll and gold star merit system. A day off with pay once each month is the privilege of operators on the honor roll, and this has led to greatly increased efficiency and improved safety. The safety banquet which are held periodically have increased the interest of the men in accident prevention work, and the numerous safety contests conducted have resulted in materially lowering the number and seriousness of accidents.

One of the outstanding features of the safety contest was the establishment of a record for zero days, or days on which no accidents occurred. The company had a total of 117 such days in 1928. This means that the street cars and buses were operated about a third of the total number of days in the year without an accident of any kind. The goal which the company has set is to operate seven consecutive days without an accident. There were eight days in June, 1928, in which only one accident occurred, and in the last eleven days of December eight were operated without an accident. All the employees are now determined to make the seven consecutive days without an accident a reality. The result has been to stimulate a renewed interest in safety among all employees, which has materially lessened the number and seriousness of accidents in which the street cars and buses are involved.

## Lower Insurance Rates In Effect

NEW fire insurance rate schedules for electric railways are now in effect in 42 states, according to the announcement made at a meeting of the committee on insurance of the A.E.R.A., held at Baltimore Jan. 10. In three other states the new schedule has been tentatively adopted and test applications are being made. In three additional states the schedule has not been filed because of litigation; and in one state there are no traction lines rated.

Changes in this new schedule as compared with that previously in effect are as follows:

- The base rate "A" for incombustible buildings has been reduced 50 per cent.
- The base rate "B" on other structures has been reduced 16½ per cent.
- More favorable treatment has been accorded buildings of superior construction (rated under base rate "A") and deficiency charges for such buildings have been lowered in numerous instances.
- Occupancy charges for motor buses (items 31 t,u) have been lowered 25 per cent and 20 per cent respectively, with all occupancy charges reduced 50 per cent when in incombustible buildings.
- Watchman deficiency charge has been reduced 50 per cent when base rate "A" is used.
- External protection charges are reduced one-half when base rate "A" is used.

Deductions have been introduced for semi-steel cars. A 33½ per cent reduction has been allowed in the base rate for rolling stock (1) on tracks and (2) in yards. Charges covering defective wiring and heaters for cars on tracks have been reduced 50 per cent under stated conditions.
**Baltimore Rate Decision**

Sanctions Larger Earnings

United States Supreme Court approves 7 1/2 to 8 per cent return on present fair value. Similar basis held to be proper for setting up depreciation

PRINCIPLES which may have a far-reaching effect upon the electric railways and the entire utility industry in this country were laid down in the recent decision of the United States Supreme Court in the rate case of the United Railways & Electric Company of Baltimore. Not only did the court sustain the primary contention of the company that a return of 7.44 per cent was no more than fair and reasonable but it went further and declared that a return of 7 1/2 to 8 per cent is not unreasonable or excessive. Concerning depreciation, the second point at issue, the court stated specifically: "This naturally calls for expenditures equal to the cost of the worn-out equipment at the time of replacement; and this for all practical purposes means present value." The position previously taken by the court that reproduction cost must be considered in determining valuation, was reaffirmed, but the wording of the decision was more specific and definite on this subject.

More than two years have elapsed since the first step was taken in the long series which led ultimately to the victory of the company in the nation's highest court. In August, 1927, the company applied to the Maryland Public Service Commission for an increase in fare from 7 1/2 cents to 10 cents.

The old 5-cent fare remained in effect in Baltimore until 1918, when this rate was increased to 6 cents. In the following year it was raised to 7 cents with two tokens for 13 cents. On Jan. 1, 1920, the token rate was withdrawn, and the fare became 7 cents straight. This rate continued until 1924, when the company was authorized to increase it to 8 cents with two tokens for 15 cents. Even this failed to yield a fair return on the investment and the company therefore requested permission to charge a 10-cent flat fare.

In response to this application the commission in February, 1928, ruled that the company could charge a cash fare of 9 cents, with three tokens for 25 cents. At that time the commission fixed the depreciation charge at $883,544, basing it on original cost. The company took the case to the Circuit Court, which in May held the rates granted by the commission were confiscatory and that depreciation should be based on present value. The commission then filed an appeal and the case went to the Court of Appeals of Maryland.

The Court of Appeals reversed the Circuit Court and upheld the contention of the commission that a fare calculated to yield a return of approximately 6.26 per cent is adequate. In the matter of depreciation, however, the Court of Appeals upheld the lower court and overruled the contention of the commission that depreciation should be figured on the basis of original cost. In all sides then appealed to the United States Supreme Court, the company in order to secure a rate of return higher than 6.26 per cent and the commission in order to win its point that depreciation should be calculated on original cost.

The decision of the United States Supreme Court, announced on Jan. 6, 1930, sustained the decision of the Maryland Court of Appeals that depreciation should be calculated on present value, but reversed the latter's ruling that 6.26 per cent constitutes an adequate return. In discussing this subject the Supreme Court stated:

"The commission fixed a rate of fare permitting the company to earn a return of 6.26 per cent on this valuation; and . . . the case resolves itself into the simple question whether that return is so inadequate as to result in a deprivation of property in violation of the due process of law clause of the Fourteenth Amendment. In answering that question, the fundamental principle to be observed is that the property of a public utility, although devoted to the public service and impressed with a public interest, is still private property; and neither the corpus of that property nor the use thereof constitutionally can be taken for a compulsory price which falls below the measure of just compensation. One is confiscation no less than the other."

"What is a fair return within this principle cannot be settled by invoking decisions of this Court made years ago based upon conditions radically different from those which prevail today. The problem is one to be tested primarily by present-day conditions. Annual returns upon capital and enterprise, like wages of employees, cost of maintenance and related expenses, have materially
increased the country over. This is common knowledge. A rate of return upon capital invested in street railway lines and other public utilities which might have been proper a few years ago no longer furnishes a safe criterion either for the present or the future. Nor can a rule be laid down which will apply uniformly to all sorts of utilities.

What may be a fair return for one may be inadequate for another, depending upon circumstances, locality and risk. The general rule recently has been stated in Bluefield Co. vs. Pub. Serv. Comm., 262 U. S. 679, 692-695:

"What annual rate will constitute just compensation depends upon many circumstances and must be determined by the exercise of a fair and enlightened judgment, having regard to all relevant facts. A public utility is entitled to such rates as will permit it to earn a return on the value of the property which it employs for the convenience of the public equal to that generally being made at the same time and in the same general part of the country on investments in other business undertakings which are attended by corresponding risks and uncertainties; but it has no constitu- tional right that such rates as are realized or anticipated in highly profitable enterprises or speculative ventures. The return should be reasonably sufficient to assure confidence in the financial soundness of the utility and should be adequate, under efficient and economical management, to maintain and support its credit and enable it to raise the money necessary for the proper discharge of its public duties. A rate of return may be reasonable at one time and become too high or too low by changes affecting opportunities for investment, the money market and business conditions generally.

"Investors take into account the result of past operations, especially in recent years, when determining the terms on which they will invest in such an undertaking. Low, uncertain or irregular income makes for low prices for the securities of the utility and higher rates of interest to be demanded by investors. The fact that the company may not insist as a matter of constitutional right that past losses be made up by rates to be applied in the present and future tends to weaken credit, and the fact that the utility is protected against being compelled to serve for confiscatory rates tends to support it. In this case the record shows that the rate of return has been low through a long period up to the time of the inquiry by the commission here involved."

"What will constitute a fair return in a given case is not capable of exact mathematical demonstration. It is a matter more or less of approximation about which conclusions may differ. The court in the discharge of its constitutional duty on the issue of confiscation must determine the amount to the best of its ability in the exercise of a fair, enlightened and independent judgment as to both law and facts."

"There is much evidence in the record to the effect that in order to induce the investment of capital in the enterprise or to enable the company to compete successfully in the market for money to finance its operations, a net return upon the valuation fixed by the commission should not be far from 8 per cent. Since 1920 the company has borrowed from time to time approximately $18,000,000, upon which it has been obliged to pay an average rate of interest ranging well over 7 per cent and this has been the experience of street railway lines quite generally. Upon the valuation fixed, with an allowance for depreciation calculated with reference to that valuation, and upon the then prescribed rates, the company for the years 1920 to 1926, both inclusive, obtained a return of little more than 5 per cent per annum. It is manifest that just compensation for a utility, requiring for efficient public service skilful and prudent management as well as use of the plant, and of which the rates are subject to public regulation, is more than current interest on more investment. Sound business management requires that after paying all expenses of operation, setting aside the necessary sums for depreciation, payment of interest and reasonable dividends, there should still remain something to be passed to the surplus account; and a rate of return which does not admit of that being done is not sufficient to assure confidence in the financial soundness of the utility to maintain its credit and enable it to raise money necessary for the proper discharge of its public duties. In this view of the matter, a return of 6.26 per cent is clearly inadequate. In the light of recent decisions of this Court and other federal decisions, it is not certain that rates securing a return of 7/4 per cent or even 8 per cent on the value of the property would not be necessary to avoid confiscation. But this we need not decide, since the company itself sought from the commission a rate which it appears would produce a return of about 7.44 per cent, at the same time insisting that such return fell short of being adequate. Upon the present record, we are of opinion that to enforce rates producing less than this would be confiscatory and in violation of the due process clause of the Fourteenth Amendment."

From these views Mr. Justice Brandeis and Mr. Justice Holmes dissented. Their dissent, however, appears to have been based upon a difference of opinion concerning valuation and proper allowance for depreciation rather than upon the belief that a return of 6.26 per cent is adequate. In fact, Justice Brandeis' statement refers to a return of 7.78 per cent upon the figure which he considers to be the fair value of the property.

Concerning the method which should be used in setting up depreciation the language of the decision is explicit. The Court states:

"The allowance for annual depreciation made by the commission was based upon cost. The Court of Appeals held that this was erroneous and that it should have been based upon present value. The court's view of the matter was plainly right. One of the items of expense to be ascertained and deducted is the amount necessary to restore property worn out or impaired, so as continuously to maintain it as nearly as practicable at the same level of efficiency for the public service. The amount set aside periodically for this purpose is the so-called depreciation allowance. Manifestly, this allowance cannot be limited by the original cost, because, if values have advanced, the allowance is not sufficient to maintain the level of efficiency. The utility is entitled to see that from earnings the value of the property invested is kept unimpaired, so that at the end of any given term of years the original investment remains as it was at the beginning."

This naturally calls for expenditures equal to the cost of the worn-out equipment at the time of replacement, and this, for all practical purposes, means present value. It is the settled rule of this Court that the rate base is present value, and it would be wholly illogical to adopt a
different rule for depreciation. As the Supreme Court of Michigan, in Utilities Commission vs. Telephone Co., 228 Mich. 658, 666, has aptly said: 'If the rate base is present fair value, then the depreciation base as to depreciable property is the same thing. There is no principle to sustain a holding that a utility may earn on the present fair value of its property devoted to public service, but that it must accept and the public must pay depreciation on book cost or investment cost regardless of present fair value. We repeat, the purpose of permitting a depreciation charge is to compensate the utility for property consumed in service, and the duty of the commission, guided by experience in rate making, is to spread this charge fairly over the years of the life of the property.'"

From this opinion Justices Brandeis and Holmes again dissent and also Mr. Justice Stone in a separate opinion. Their objections appear to be based on general disagreement with the reproduction cost theory of valuation, and present value as the basis for depreciation allowance.

In the matter of valuation the language of the decision is open to some difference in interpretation. The statement is made that "it is the settled rule of this court that the rate base is present value." In the opinion of lawyers representing the United Railways & Electric Company, this is a reaffirmation of the stand taken by the Court in the St. Louis & O'Fallon Railroad case when it upset the valuation of the Interstate Commerce Commission because sufficient consideration had not been given to the matter of reproduction cost. It appears also to refer back to the Indianapolis Water Company case wherein the Supreme Court held "if the tendency or trend of prices is not definitely upward or downward and it does not appear probable that there will be a substantial change of prices, then the present value of lands plus the present cost of constructing the plant, less depreciation, if any, is a fair measure of the value of the physical elements of the property.'

The exact procedure for putting into effect the decision of the United States Supreme Court remains in doubt at this time. It appears probable that the United States Court will transmit its rulings to the Maryland Court of Appeals and thence to the Circuit Court, resulting in the issuance of a permanent injunction to restrain the Public Service Commission from interference with the collection of a 10-cent flat fare by the United Railways & Electric Company of Baltimore.

Engineering Executive Committee Receives Committee Reports

Several subjects of importance were taken up at the regular meeting of the executive committee of the American Electric Railway Engineering Association held in New York on Jan. 9, 1930.

Reports were received from the standing committee in charge of the several divisions of association work, and it appeared evident from them that every effort is being made to speed the reports this year to have them ready in time for the annual convention to be held in June.

On account of the withdrawal of the New York State Railways from the American Electric Railway Association, F. McVittie tendered his resignation from the Engineering executive committee. His resignation was accepted with regret. To fill the vacancy thus created Walter Bryan, superintendent of power, St. Louis Public Service Company, was nominated and unanimously elected. It was provided, however, that the remaining members of the executive committee be advanced in positions, since Mr. McVittie was a ranking member at the time of his resignation.

Resolutions were presented and adopted on the death of G. W. Palmer, Jr., who was the only honorary member ever elected by the executive committee of the Engineering Association.

A number of matters pertaining to the American Standards Association were taken up. Having completed this assignment the committee on special track work was discharged. C. W. Squier was appointed as the association's representative on the committee on machine pins. On the subject of hacksaw blades the proposed standardization prepared by E. P. Goucher was adopted for submission to the American Standards Association. On account of the proposed change in the method of testing steel and malleable iron pipe unions of standard weight, this subject also was referred back to Mr. Goucher. New designs of axles which were proposed were withheld from the Manual pending a discussion with the American Railway Association.

Considerable discussion developed relative to the program of the annual convention to be held in San Francisco next June. According to the plan adopted by the American Association, sessions of the Engineering Association will be held Monday and Wednesday afternoons and Thursday morning. As to the division of time among various subjects, the matter was left to the committee on convention program, of which F. H. Miller is chairman.

Discussion developed as to whether the subjects of motor buses and wood preservation should be reorganized as separate divisions of the Engineering Association, instead of special assignments under the rolling stock and way and structures divisions, respectively. This was referred to a committee consisting of A. T. Clark, chairman; P. V. C. See, and E. M. T. Ryder.

Revisions of the constitution and by-laws and the rules and regulations for committees were adopted at the last convention and referred to a committee on editing consisting of R. C. Cram and C. R. Harte. A report of the committee on editing was presented by Mr. Cram. The proposals were principally changes in wording to clarify the meaning and to insure uniformity. They were tentatively approved by the executive committee for printing in proof form and submission to the membership for approval.

DIFFERENCES of many kinds from conventional designs are found in the new car which has been operating for some little time on the lines of the United Traction Company, Albany, N. Y. The outstanding features are the extensive use of aluminum and its alloys in the body construction, and the driving motors and type of control.

Particular care has been taken to make the car interior attractive. The miscellaneous parts of the electrical equipment, such as the control devices and switches, have been grouped and placed in a cabinet in each vestibule, with a convenient table top which not only conceals the equipment but provides a place for the operator to lay his transfers, punch and other paraphernalia.

Tests made have shown that the service performance of the car is also somewhat unusual. The free running speed is 32 m.p.h., which is attained with a rate of acceleration on the control points of 3.5 m.p.h.p.s. Stops with the service brake are at the rate of 2.5 m.p.h.p.s., but when emergency braking is used, combining both air and magnetic devices, the rate obtained may be as high as 6 m.p.h.p.s.

In order to obtain minimum weight, aluminum and its alloys have been used extensively in the car body and framing, many parts being made entirely of such materials. In the following discussion, where aluminum is referred to it is understood that the term includes not only pure aluminum, but the various alloys of the metal which have been brought out by the Aluminum Company of America and which have been designated by it as suitable for the part in question.

The side sills are formed of 3 x 5 x 5/16-in. aluminum angles, extending with one continuous piece from front body corner posts to center exits and from center exits to rear vestibule corner posts on both sides of the car. The cross sills are formed of 4-in. aluminum channels. These are fastened to the underside of the side sill angle. The body end sills are formed of two 4-in. aluminum channels spaced on 10 1/8-in. centers, fastened to the body side sills with top and bottom center gusset plates riveted to the end sills and platform center sills.

The center exits are reinforced with additional longitudinal sills and plates, forming a step well. A 4-in. aluminum channel is placed at the junction between the floor plate and the top step well. This runs the full length of the center exit and is connected by angle clips to the body cross sill and riveted to the floor plate. The center exits each have a floor cover plate of No. 9 gage aluminum, flanged on the inside, and extending from within 4 1/2 in. of the center line of the car to the side sills and between the main body cross sills on the two sides of the center exit. The step hangers, risers and tread plates are formed of No. 7 gage aluminum flanged at the ends.

### General Dimensions of the Albany Car

<table>
<thead>
<tr>
<th>Description</th>
<th>Ft.</th>
<th>In.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Length overall</td>
<td>42</td>
<td>3</td>
</tr>
<tr>
<td>Length over dashes</td>
<td>41</td>
<td>11</td>
</tr>
<tr>
<td>Length over body</td>
<td>32</td>
<td>11</td>
</tr>
<tr>
<td>Length of platform</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Bumper projection</td>
<td>2</td>
<td>9</td>
</tr>
<tr>
<td>Truck centers</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Wheelbase of truck</td>
<td>5</td>
<td>4</td>
</tr>
<tr>
<td>Wheel diameter</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Post centers</td>
<td>4</td>
<td>0</td>
</tr>
<tr>
<td>Vestibule door openings between posts</td>
<td>4</td>
<td>0</td>
</tr>
<tr>
<td>Side exit door openings, between posts</td>
<td>4</td>
<td>0</td>
</tr>
<tr>
<td>Width over all</td>
<td>11</td>
<td>5</td>
</tr>
<tr>
<td>Width over side sills</td>
<td>10</td>
<td>11</td>
</tr>
<tr>
<td>Width over vestibule corner posts</td>
<td>7</td>
<td>0</td>
</tr>
<tr>
<td>Width of aisle</td>
<td>8</td>
<td>2</td>
</tr>
<tr>
<td>Width of seats</td>
<td>11</td>
<td>1</td>
</tr>
<tr>
<td>Height, rail to top of trolley boards</td>
<td>9</td>
<td>11</td>
</tr>
<tr>
<td>Height, rail to under side of all</td>
<td>27</td>
<td>6</td>
</tr>
<tr>
<td>Height, rail to bottom of apron</td>
<td>23</td>
<td>7</td>
</tr>
<tr>
<td>Height, door to handrail</td>
<td>6</td>
<td>9</td>
</tr>
<tr>
<td>Height, rail to first step, end door</td>
<td>17</td>
<td>3</td>
</tr>
<tr>
<td>Height, first step to platform, end door</td>
<td>15</td>
<td>3</td>
</tr>
<tr>
<td>Height, first step to second step, center exit</td>
<td>15</td>
<td>3</td>
</tr>
<tr>
<td>Height, second step to car floor, center exit</td>
<td>15</td>
<td>3</td>
</tr>
</tbody>
</table>

Aluminum is used extensively in the framing of the Albany car. Rolled, extruded and cast sections of various alloys are employed.

By

R. S. BEERS
Transportation Engineering Department
General Electric Company

Electric Railway Journal—Vol. 74, No. 2
78

Digitalized by Microsoft ©
Innovations

The open side of the platform is supported by a built-up knee, formed of No. 7 gage aluminum plate pressed to shape. The top and bottom edges of these knees are reinforced by a $2\times2\times\frac{1}{2}$-in. steel angle riveted to them. The knees are further braced with a No. 7 gage aluminum hanger plate, flanged on the inside edge for connecting to the knee and then around the outside of the side sill angle.

The center sills at the front and rear ends of the car extend through the body end sill to the buffer sills, and are formed of 4-in. aluminum channels, connected with angle clips. The body end sills are further braced with two $\frac{1}{2}$-in. pressed 5-in. aluminum channels laid flatways and extending from the end sill to the body bolsters being bolted to them. The closed side of the platform is formed by a continuation of the side sill angles. The platform ends at each end of the car are reinforced with No. 9 gage aluminum nosing plates for the full width of the car and some 20 in. deep.

Body Framing Is of Aluminum

The body framing also is of aluminum construction. The material includes cast, rolled and extruded sections, heat treated. The side posts are of extruded "U" shaped sections extending from side sill to side plate, bolted and clipped to the side sills. The truss braces between each pair of side posts are of built-up construction, consisting of an aluminum belt rail or sash-rest casting, a body side plate casting and a No. 14 gage, heat-treated aluminum flanged plate riveted to the side sill angle. These individual truss frames form the side body construction and extend from body pier posts to center exit pier posts on both sides of the car. On the closed side of the vestibule cast aluminum belt rails are used, bolted to the corner vestibule posts and body pier posts. These castings have lugs which permit steel diagonal bracing to be used. The side body girder plates and letterboards are of 18 gage aluminum plates held in place by aluminum moldings bolted to the side posts.

The body side posts are fastened to the roof carlinns by cast aluminum shoes bolted to them, forming a continuous member from sill to sill. The side posts are finished on the inside of the car by extruded aluminum pilasters.

The main controller is placed beneath the car floor, the master control being actuated by the left foot. The right foot governs the reverser and the air brake. Only auxiliary devices have to be controlled by hand.

Foot-operated control and extensive use of aluminum in the framing are features of this new car for the United Traction Company of Albany, N. Y.
The body corner piers and exit door piers are finished of pressed sheet aluminum pilasters.

The roof is of the arch type with vestibule hoods at each end. A channel shape extruded aluminum carlin is located at each side window and door post, and the ends of these carlins are fastened to the side plate bracing and window posts by cast aluminum brackets. The body roof is sheathed with \( \frac{3}{8} \)-in. Haskelite. Hooke to the full width of the roof, and in five window-length sections. The hoods are sheathed with \( \frac{3}{8} \)-in. Agasote cast in two pieces. The outside of the roof is covered with canvas.

The center vestibule posts extend from the buffer sill to belt rail and are of extruded heat-treated aluminum, being tied to the corner posts by diagonals of 2x3-in. flat steel bar braces. The inside finish of the vestibule below the windows is formed by the aluminum equipment cabinet, while the side vestibule finish is of No. 18 gage aluminum plate. A sign box of cast aluminum is built into the vestibule hood.

The heading line is No. 18 gage aluminum sheet curved to the contour of the roof, jointed on the carlinls and covered with aluminum moldings. The advertising card racks are made of No. 18 gage aluminum, forming an expense to the heading line sheets. The edges are covered with aluminum moldings grooved to take standard car cards the full length of the car body.

The doors are made of cherry. Post cappings, pier cover plates and moldings are of aluminum. The wains-coting below the windows consists of aluminum plate.

The window stooling is an extension of the cast aluminum truss brace finished with cherry capping. Besides the main framing, aluminum is used in a number of details on the car. Spacer rings for the head lamps and housing rings for the marker lights are made of aluminum, as is the sander reservoir.

The seats are of the walk-over type, with a welt divided back. The chair for the motorman is of the bucket type and is adjustable vertically and longitudinally. The seats are upholstered in brown Spanish leather.

The car body is mounted on Cincinnati passenger type bar trucks, with spring pedestal cantilever type journal boxes and combination rubber cushions and semi-elliptical spring bolster suspension. The trucks are designed to operate on curves with a minimum radius of 30 ft. The wheelbase is 5 ft. 4 in., and the wheel diameter is 26 in.

---

**General Specifications of Equipment of the Albany Car**

<table>
<thead>
<tr>
<th>Type of unit</th>
<th>One man, motor, passenger, city double-end, double truck</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of seats</td>
<td>44</td>
</tr>
<tr>
<td>Builder of car body</td>
<td>Cincinnati Car Corp., Cincinnati, Ohio</td>
</tr>
<tr>
<td>Weight</td>
<td>32,000 lb.</td>
</tr>
<tr>
<td>Body</td>
<td>Aluminum</td>
</tr>
<tr>
<td>Roof</td>
<td>Aluminum</td>
</tr>
<tr>
<td>Air brakes</td>
<td>General Electric, foot-operated</td>
</tr>
<tr>
<td>Axles</td>
<td>Special</td>
</tr>
<tr>
<td>Car signal system</td>
<td>Consolidated buzzer and single stroke bell</td>
</tr>
<tr>
<td>Compressors</td>
<td>General Electric CP-72B</td>
</tr>
<tr>
<td>Condensers</td>
<td>Flexible duct</td>
</tr>
<tr>
<td>Couplers</td>
<td>General Electric PXM</td>
</tr>
<tr>
<td>Destination signs</td>
<td>Kirtland, end and side</td>
</tr>
<tr>
<td>Door mechanism</td>
<td>Consolidated Car Heating Co., with treadle at center door</td>
</tr>
<tr>
<td>Fare boxes</td>
<td>Johnson, electrically operated</td>
</tr>
<tr>
<td>Finish</td>
<td>Hipol type, Rispolin floor covering, Fiscoll,</td>
</tr>
<tr>
<td>Heat-insulating material</td>
<td>The ( \frac{3}{8} )-in. Creswell pneumatic Hand straps.</td>
</tr>
<tr>
<td>Headlights</td>
<td>Leather, white sanitary grip, Heat-insulating material. Cork Heaters. 2½ in., 500 watts, thermostat control</td>
</tr>
<tr>
<td>Headlights</td>
<td>Golden Glow, Nickel-plated, satin finish</td>
</tr>
<tr>
<td>Interior trim</td>
<td>Nickel-plated seatings.</td>
</tr>
<tr>
<td>Journal boxes</td>
<td>Nickel roller</td>
</tr>
<tr>
<td>Lamp fixtures</td>
<td>Standard, 20 in series</td>
</tr>
</tbody>
</table>

---

**Electric Railway Journal—Vol.74, No.2**
Power for driving the car is obtained from four GE-265 motors, one on each axle. These motors are rated at 35 hp. each and make it possible to maintain a high schedule speed. The motors are of the standard, self-ventilated type, geared for a free running speed of 32 m.p.h. at 550 volts. The gear ratio is 68:15.

Arrangements have been made for foot operation of the G.E. Type PCM control. In practice it has been found that this control has all the flexibility of the hand-operated Type K. The operator can choose practically any speed he desires by stopping on the resistance notches. This may be done by the movement of his foot on the control pedal. Since the brake is controlled with the other foot both hands are free for making change, punching transfers and similar purposes, thus reducing the duration of the stops.

The control was developed to meet the requirements of street railways for faster acceleration without discomfort to the passengers. In general, this improvement has been obtained by increasing the number of resistance steps permitting small increments of accelerating current with a comparatively short time interval on each step and for the total operation. In normal service accelerations as high as 3.5 m.p.h.p.s. are secured. There are nine steps in series and nine in parallel on the main controller. The action is automatic, the master controller having three points, known as switching, series, and parallel. When the operator presses his foot down to the full parallel position the control notches up under the direction of an accelerating relay.

The line breaker, contactors and all of the main control equipment are in a box underneath the car, while the foot-operated master controller is recessed into the toe board. The main contacts are locked in the off position when the reverse lever is removed, just as in the usual hand controller. Normally the acceleration of the car is controlled by the pedal, and, in addition, there is a pilot valve operated by the heel plate which cuts off power in an emergency and applies both air and magnetic brakes.

The air brakes are of the straight air type with an emergency feature. The usual hand valve is replaced by a foot-operated control valve of the automatic lap type. The novel feature of this valve is that when the pedal is put in any braking position and held there, a definite pressure will be built up and maintained in the brake cylinder without moving the pedal back to a lap position. In other words, the amount of pressure built up depends on the distance the pedal is depressed. There is also a lock so that the pedal may be placed in the full service position and held there, as when the operator is changing ends.

Supplementary braking is obtained by the magnetic track brakes. These consist of four electromagnets mounted between the wheels of each truck. Normally they clear the rail head but they can be lowered on the head and magnetized at the will of the operator. The magnets are energized directly from the trolley and are controlled through the intermediary of pneumatic valves. The retardation obtained by these brakes is thus independent of the motors and control. It does not in any way reduce the effectiveness of the air brakes.

In an emergency both the air and magnetic brakes function together, such a combination allowing for very fast braking without the sacrifice of flexibility or ease of operation. Although the full braking effort is not needed at every stop the operator takes greater advantage of his high accelerating rate when he knows that he can follow more closely behind traffic and get a high rate of retardation if needed.

A bell ringer, a sander and the magnetic track brake are each operated by individual hand valves. The supply of air to these valves is automatically cut off when the pedal is locked so that a passenger on the rear platform cannot tamper with them. Compressed air for operating the control and the auxiliaries is furnished by a CP-27, 15-cu. ft. compressor, suspended beneath the car.

Two circuits, each consisting of twenty lamps in series, furnish illumination for the car interior and for the headlight, destination signs and markers. The lighting fixtures are of the dome type with provision for short-circuiting a defective lamp. A novel feature is that when the motor reverser is turned in changing ends the headlight and other indication lamps are reversed without further attention from the operator.

Straight pneumatic control is used for the door at the motorman's platform, while the center door is handled with automatic treadle control. A four-position rotary valve enables the motorman to select the door-opening combination that he desires. A signal lamp in front of the motorman indicates whether the center door is closed. The door engines are of the direct stroke differential type mounted above the door. Each engine operates a two-leaf door.

The signal buzzer is operated by a pull switch and a cord running down each side of the car. In addition there is a single stroke bell with a push button near the center door so that the passenger can signal the motorman.

There is a conventional stop light on each end of the car, and in addition red lamps are placed over each door connected in the same circuit with the stop light. By this means automobile drivers as well as persons inside of the car, are warned that a stop is about to be made.

The development of this new type of car was initiated by the United Traction Company of Albany, N. Y., which furnished unusual assistance and co-operation to the manufacturers in suggestions and practical demonstrations in operation. The car and trucks were built by the Cincinnati Car Corporation and the electrical equipment was furnished by the General Electric Company.
CORRECT TIMING OF

Essential in

Traffic Regulation

PART ONE

The utility of any traffic signal system depends upon the accuracy with which the system is adjusted or timed to fit the traffic requirements. An examination of the characteristics of traffic flow shows that there are certain demands which should be satisfied in so far as the fluidity and safety of traffic movement is concerned. These may be set forth as follows:

Signals should be timed (1) so as to prevent or reduce to a minimum the accumulation of traffic in any block or series of blocks; (2) in accordance with the relative volume of traffic flow per lane at each intersection; (3) so as to permit in so far as possible the flow of traffic at the speed which is normal for the area traversed; (4) so as to vary with the traffic speed and with the volume throughout the traffic day; (5) so as to prevent, or reduce to a minimum, the simultaneous flow of conflicting streams of traffic, for both vehicular and vehicular with pedestrian movements.

All of these requirements, with the exception of the third, are or may be present at even the simplest type of signal installation—the isolated, independently controlled intersection. Therefore, the problems which arise on an individual intersection must be solved before the problems of a traffic control system can be taken up.

Establishing the Ratio of Times

With respect to any one stream of traffic which flows into a signalized intersection the function of the controlling signal is to allow or to prohibit the flow of that traffic stream. The relative amounts of time which the signal gives to the controlled stream of traffic to go and to stop form a ratio of time division. Several factors influence the selection of a ratio of time division. The amount of traffic flow in each direction is certainly basic in establishing this ratio. The width of roadway or the number of lanes in which traffic flows is likewise important. The character of the traffic, the nature of the movement and the channelization of flow are factors to be considered.

In this discussion, a simple right-angle intersection is taken for sake of simplicity. Assume all things are equal except the width of the intersecting roadways.

Ignoring clearance periods the proper ratio of movement time for flow of traffic on one street at the intersection with another varies inversely as the roadway widths of the intersecting streets expressed in pairs of traffic lanes. A simple method of application of this principle is to reduce all traffic streams to vehicles per lane on each roadway and then treat all roadways alike.

Let us next assume all things equal except the volume of traffic flow. In this instance the ratio of time divisions varies directly as the traffic flow.

Where complex intersections are dealt with, roadway widths of unequal numbers of lanes can be treated as described above. That is, the traffic flow on all roadways is reduced to vehicles per lane and hence all roadways are reduced to equal terms and treated equally. The division of the cycle then varies directly as the flow per lane. Each artery is then given its part of the available time and is described by its flow per lane divided by the sum of all the other arteries' flow per lane. The available time is ordinarily described as the time of each cycle less the clearance periods. These are discussed later.

The art of traffic engineering has not as yet developed to a point where it is possible to determine accurately the effect on the ratio of time division of such things as the character of traffic flow and the nature of the traffic movement.

The clearance or caution period which is usually indicated either by an amber or by a red light is one of the most important items in the make-up of the complete cycle. As the name of the clearance period implies, its primary purpose is to clear the intersection of vehicles and pedestrians that have been moving in one direction at an intersection in time so as to prevent conflict. This may mean that the intersection is entirely clear before cross-flow is released, or in any case that the cross-streams are released only after a sufficient length of time after the clearing stream has been stopped so as to prevent conflict. While the clearance period is largely a safety measure, it is designed to produce both smooth and safe operation.

In analyzing these requirements of the clearance period, it is seen that the length of the clearance time is expressed by speeds, distances and stopping times. The length of time required to stop a vehicle is significant in establishing the clearance period. If a stream of traffic which is flowing through an intersection is to be stopped, a sufficient warning time must be given because of the "inertia" effect. That is to say, a moving vehicle cannot be stopped instantly. As a minimum time, then, the clearance period should be long enough so as to permit stopping the vehicles which have been moving. At 20 m.p.h., a speed now accepted for traffic movement in nearly every urban center, a vehicle with adequate
Factors influencing the time ratio and length of cycle at a single intersection are discussed in this article. Timing for signal systems covering a number of intersections will be discussed in a future article.

\[ T = \frac{0.682}{V} (W + D) \]

At complicated intersections there exists frequently a length of free path from the place the cross-flow vehicles are stopped to the point where these vehicles would conflict with the clearing stream; therefore a deduction can be made from the above clearance time.

If \( d \) = length of free path in feet to clearing stream
\( v \) = average speed of accelerating cross-flow in miles per hour
and \( t \) = amount of time to be deducted
\[ t = \frac{0.682}{v} \frac{d}{V} \]
and the clearance time becomes
\[ T = \frac{0.682}{V} (W + D) - \frac{0.682}{v} d \]

The above equations apply to vehicles only. Usually, however, the pedestrians are requested to obey signals and in these cases a sufficient length of time must be set aside for clearing the pedestrian streams out of danger from released cross-flow vehicles. It is readily seen that, due to the slow movement of pedestrians, the clearance period demanded by them will usually be larger than required by vehicles.

Consider the movement of pedestrians at an intersection across the street in the direction, with respect to the center, which is counter-clockwise. The most severe condition results when this group of pedestrians will have left the curb at an instant prior to the beginning of the clearing period and will be directly in front of the cross-flow vehicles waiting release at the end of the caution period. If no safety zones or isles are provided in the roadway and no parking lanes exist, the distance which these pedestrians must clear during the caution period is the width of the roadway, and, the average walking speed being about 5 ft. per second, the time required would be about one-fifth of this distance expressed in feet. Of course, if safety isles or other places exist in the roadway over which there is no vehicular movement the distance to be cleared is accordingly reduced.

The cycle length to be determined must include the various components which have been discussed heretofore. The total length of the cycle must be adequate to care properly for each of these components. In choosing a length of cycle for an isolated or independent signal installation there is no factor on which to base the cycle length, as is the case in a signal system where the length of cycle must be based on the correlated flow of traffic. The standards set forth in the recommendation of the American Engineering Council, however, set the limits of cycle lengths between 40 seconds and 80 seconds as good practice.

It may be proved mathematically that in any cycle the total delay equals the number of vehicles stopped times half the sum of the delays to the first vehicle and the last vehicle.

The total hourly delay experienced by one lane of
traffic is, of course, equal to the cyclic delay multiplied by the number of cycles per hour. What this amounts to under various conditions is shown in the following table in which the time spacing of departures is assumed to be three seconds:

<table>
<thead>
<tr>
<th>Delay in Vehicle Seconds Per Hour Per Lane</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
<tr>
<td>----------------</td>
</tr>
<tr>
<td>40</td>
</tr>
<tr>
<td>60</td>
</tr>
<tr>
<td>80</td>
</tr>
<tr>
<td>100</td>
</tr>
<tr>
<td>200</td>
</tr>
<tr>
<td>300</td>
</tr>
<tr>
<td>400</td>
</tr>
<tr>
<td>500</td>
</tr>
<tr>
<td>600</td>
</tr>
<tr>
<td>700</td>
</tr>
<tr>
<td>800</td>
</tr>
<tr>
<td>900</td>
</tr>
<tr>
<td>1000</td>
</tr>
</tbody>
</table>

The time savings of shorter cycles on this basis are evident from the chart on page 83. Of course, the increments in total delay for any cycle length become proportionately heavy for high densities. It will be noted that, making these assumptions, when the rate of flow reaches 1,200 per hour the total delay experienced by any stoppage to the traffic streams is infinite.

![Chart](image.png)

Time efficiency with respect to cycle length and clearance

In connection with the choice of cycle lengths it is of interest to note the effect of clearance periods on the useful time that a signal can deliver for various cycle lengths.

Let $E =$ Efficiency or per cent time given to passing

additional traffic

$C =$ Cycle length

$P =$ Clearance period

If $P$ is the same for both directions

$E = \frac{C - 2P}{C}$

That is, the per cent efficiency of available traffic flow time is equivalent to the total time minus the losses, divided by the total time. This is shown graphically on the chart on this page.

Now, if a part of the traffic wave is temporarily stopped, the first part of the green period, when vehicles pass at capacity spacing, is more valuable than the latter part.

Since the caution period comes at the end of the green period, the subtraction of a few seconds from the green period, which are given over to the caution period, does not materially affect the efficiency of the operation. This is true where traffic is temporarily stopped before the green light shows. However, for continuous movement of the traffic waves, all parts of the green period are equivalent in terms of vehicles.

A.E.R.A. Executive Committee Holds Cleveland Meeting

COINCIDENT with the Annual Meeting of the Central Electric Railway Association, a meeting of the executive committee of the American Electric Railway Association was held at Cleveland on Jan. 24. J. H. Hanna, first vice-president, presided in the absence of President Shoup. Plans for the 49th annual convention of the American Electric Railway Association, to be held at San Francisco, June 23-26, were outlined by Charles Gordon, managing director, and W. V. Hill, manager California Electric Railway Association. Labert St. Clair told of the preparation of publicity material for the convention.

Brief comments on the status of the interstate bus bill and Interstate Commerce Commission railroad consolidation plan were made by Dr. Thomas Conway, speaking for the committee on national relations. Reports were received also from the policy, membership, finance and manufacturers advisory committees. W. E. Wood, chairman publications committee, outlined a plan by which it is proposed to increase the circulation of the association's magazine Aera and place it in the hands of a larger number of men in a supervisory capacity in the industry. After considerable discussion of various phases of this project it received the unanimous indorsement of the executive committee.

Preceding the meeting the members of the executive committee were the guests of Col. Joseph Alexander, president Cleveland Railroad, at a luncheon at the Union Club. It was decided to hold the next meeting on March 21 at association headquarters, New York.

Anti-Freeze Liquid Changed

FREQUENT trouble has been experienced during the present winter due to freeze-ups in the air brake equipment on cars equipped with anti-freezers. This trouble first made its appearance the latter part of last winter and became more acute this year. The cause of the trouble has been traced to the alcohol used. From the chief chemist of the Prohibition Department, it has been learned that U. S. Formula No. 5, which is generally used in automobile radiators, was modified about two years ago, one of the modifications consisting of adding a small percentage of alcohol, which has a high boiling point. This makes Formula No. 5 a good anti-freeze solution for automobile radiators but has just the opposite effect in preventing freeze-ups in the air brake system of electric railway cars. For that reason it is recommended that U. S. Formula No. 1 should be used to prevent freeze-ups in air brake systems. In so doing it is necessary to clean the anti-freezers thoroughly, so as to insure that all the alcohol is removed.

Second Contest Period Starts

BEGINNING Feb. 1, the second period of the Electric Railway Journal Maintenance Contest will extend until April 30. Rules were published in the issue of November, 1929. Contributions will be welcomed from anyone in the industry. Watch for announcement next month of the prize winners for the first period.
Train on the Jefferson Avenue line approaching a station. The safety zones are covered with awnings and are well protected

Detroit Express Service

Gains Popularity

By

CLIFFORD A. FAUST
Assistant Editor Electric Railway Journal

WHEN the Department of Street Railways, Detroit, inaugurated express street car service on Jefferson Avenue in September of 1927, using small buses for local service, the plan was looked on rather as an experiment. There were numerous skeptics who predicted a short life for the plan. But in spite of such prognostications, the express service became popular immediately after its introduction and became more so as the months passed.

The best evidence of the success of the Jefferson line was the adoption of a similar plan on Grand River Avenue on Aug. 19, 1928. Like the original installation, this line met with public favor at the very outset and attracted an increasing number of patrons as the people became acquainted with the system. In some measure the immediate acceptance of the Grand River express service was due to the education of the public by the Jefferson line, but by and large, it was occasioned by the higher speed and shorter running time.

Figures from the beginning of the service to the end of 1929 show clearly that the Jefferson Avenue line has enjoyed a very large increase in patronage and that the Grand River line also has built up its riding, in spite of the inauguration of a paralleling high-speed, de luxe bus route. Passenger revenue, as well, has shown corresponding increases on both lines. Measured by these two barometers, patronage and revenue, express service is a successful innovation in Detroit.

Moreover, there is an intangible factor which is reflected in these figures and which is extremely important from the standpoint of the Department of Street Railways. It is the good will obtained by offering an improved service. Aside from the evidence of good will appearing in the operating results, the management has received hundreds of letters, praising the new system and commending the railway for making the change. It is significant that many motorists have stated that they are
leaving their automobiles at home and riding the high-speed trolley lines to get to their places of employment more quickly and more pleasantly. Letters received from regular patrons have also praised the express service from the standpoint of saving time and making a more comfortable ride. Many expressed real pride in riding the lines because they can get to work in less time than neighbors driving automobiles.

**Other Benefits of System**

In addition to the important results of more passengers and revenue, and an increased amount of good will, the express service has brought about several others.

Among these are lower operating expenses, a higher degree of safety, an increase in the street capacity, a speeding of all forms of traffic, and an improvement of public relations, largely by pleasing the motorists and truck drivers.

Operating expenses have been lowered principally through the saving of cars, operators and power. On the Jefferson Avenue line five cars are saved on the base schedule and twelve on the peak. On the Grand River line three cars are saved on the base and ten on the peak. On the individual cars and trains in express service there also is a large saving in energy over full local service because of the elimination of many stops. As shown in the accompanying chart two single cars on the Jefferson line average 2.15 and 2.07 kw.-hr. per car-mile in the express zone, but consumed 4.31 kw.-hr. in the downtown loop and 3.30 kw.-hr. in the local zone. Tests with two trains of a motor car and trailer each showed the energy consumption in kilowatt-hours per car-mile to be 2.65 and 2.43 in the express zone, as compared with 6.03 in the downtown loop and 4.08 in the local zone. These savings are very important, since the line is one of the heaviest traveled in the city.

It has been proved in Detroit that higher speeds of both street cars and buses are attended by fewer accidents. In an accompanying illustration are shown curves for average street car speed and number of accidents over a period of more than one year. As will be seen, the accidents decrease as the speed increases, and vice versa. Greater safety on the express lines may be attributed largely to the fewer loading areas in the street and the

On Jefferson Avenue express stops originally numbered six each way and averaged one every 0.83 mile. A few added more recently have decreased the spacing slightly. On Grand River Avenue there were originally eleven inbound and twelve outbound stops.

Since the discontinuance of local bus service a few more stops have been added.

Among these are lower operating expenses, a higher degree of safety, an increase in the street capacity, a speeding of all forms of traffic, and an improvement of public relations, largely by pleasing the motorists and truck drivers.

Operating expenses have been lowered principally through the saving of cars, operators and power. On the Jefferson Avenue line five cars are saved on the base schedule and twelve on the peak. On the Grand River line three cars are saved on the base and ten on the peak. On the individual cars and trains in express service there also is a large saving in energy over full local service because of the elimination of many stops. As shown in the accompanying chart two single cars on the Jefferson line average 2.15 and 2.07 kw.-hr. per car-mile in the express zone, but consumed 4.31 kw.-hr. in the downtown loop and 3.30 kw.-hr. in the local zone. Tests with two trains of a motor car and trailer each showed the energy consumption in kilowatt-hours per car-mile to be 2.65 and 2.43 in the express zone, as compared with 6.03 in the downtown loop and 4.08 in the local zone. These savings are very important, since the line is one of the heaviest traveled in the city.

It has been proved in Detroit that higher speeds of both street cars and buses are attended by fewer accidents. In an accompanying illustration are shown curves for average street car speed and number of accidents over a period of more than one year. As will be seen, the accidents decrease as the speed increases, and vice versa. Greater safety on the express lines may be attributed largely to the fewer loading areas in the street and the

On Jefferson Avenue express stops originally numbered six each way and averaged one every 0.83 mile. A few added more recently have decreased the spacing slightly. On Grand River Avenue there were originally eleven inbound and twelve outbound stops.

Since the discontinuance of local bus service a few more stops have been added.

Among these are lower operating expenses, a higher degree of safety, an increase in the street capacity, a speeding of all forms of traffic, and an improvement of public relations, largely by pleasing the motorists and truck drivers.

Operating expenses have been lowered principally through the saving of cars, operators and power. On the Jefferson Avenue line five cars are saved on the base schedule and twelve on the peak. On the Grand River line three cars are saved on the base and ten on the peak. On the individual cars and trains in express service there also is a large saving in energy over full local service because of the elimination of many stops. As shown in the accompanying chart two single cars on the Jefferson line average 2.15 and 2.07 kw.-hr. per car-mile in the express zone, but consumed 4.31 kw.-hr. in the downtown loop and 3.30 kw.-hr. in the local zone. Tests with two trains of a motor car and trailer each showed the energy consumption in kilowatt-hours per car-mile to be 2.65 and 2.43 in the express zone, as compared with 6.03 in the downtown loop and 4.08 in the local zone. These savings are very important, since the line is one of the heaviest traveled in the city.

It has been proved in Detroit that higher speeds of both street cars and buses are attended by fewer accidents. In an accompanying illustration are shown curves for average street car speed and number of accidents over a period of more than one year. As will be seen, the accidents decrease as the speed increases, and vice versa. Greater safety on the express lines may be attributed largely to the fewer loading areas in the street and the
removal a few more stops were added to the street car line. From the very outset of the Jefferson Avenue line there were fewer transfers from local buses to express street cars and cars to buses than the company had expected. Patrons residing within a reasonable distance of the central business district preferred to remain on the local buses rather than make one or two changes. It also was discovered that people would walk a longer distance to an express street car stop rather than bother with taking a transfer bus. The service is maintained by the local buses on Jefferson Avenue now for those who do wish to make the changes and for those who prefer to ride the entire distance by bus.

**Passengers Have Increased Steadily**

In Table I are given the revenue, passengers and average speed of the Jefferson line for the months of October, 1927, to December, 1929, inclusive. Study of this table shows that with the exception of one month — November, 1929 — both revenue and passengers have increased over the corresponding month of the previous year.

On the Grand River line both revenue and passengers for the street cars have increased, the month of November, 1929, being the only one to show a decrease over the corresponding month in the previous year. Revenue was built up from $102,313 in September, 1928, to $114,969 in December, 1929. Revenue passengers for the corresponding month totaled 1,672,508 and 1,879,760. Coach operation on Grand River Avenue for the period of a little more than five months showed an increase for the first three months and a sharp falling off for the last two. These figures are given in Table II.

Division of revenue and passengers for a typical day early in 1929 on the Jefferson express line is made in Table III. For both railway and coach operation the greatest amount of revenue was collected in cash fares, tickets accounting for a greater portion of the remaining revenue. The ratio of the total railway revenue to coach revenue was approximately 4 to 1. However, the mileage of the street cars was less than 2/3 times that of the coaches. Receipts per vehicle-mile for the cars were $0.404 and $0.256 for the coaches; passengers per

---

**Table I—Revenue, Passengers and Speed of Jefferson Line, October, 1927, to December, 1929**

<table>
<thead>
<tr>
<th></th>
<th>Rail</th>
<th>Coach</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Revenue in Dollars</td>
<td>Revenue in Dollars</td>
</tr>
<tr>
<td>October</td>
<td>63,460</td>
<td>1,033,170</td>
</tr>
<tr>
<td>November</td>
<td>61,850</td>
<td>1,024,236</td>
</tr>
<tr>
<td>December</td>
<td>66,065</td>
<td>1,083,147</td>
</tr>
<tr>
<td>January</td>
<td>75,426</td>
<td>1,226,942</td>
</tr>
<tr>
<td>February</td>
<td>71,635</td>
<td>1,153,922</td>
</tr>
<tr>
<td>March</td>
<td>82,057</td>
<td>1,393,962</td>
</tr>
<tr>
<td>April</td>
<td>73,521</td>
<td>1,251,195</td>
</tr>
<tr>
<td>May</td>
<td>79,491</td>
<td>1,298,317</td>
</tr>
<tr>
<td>June</td>
<td>76,802</td>
<td>1,276,205</td>
</tr>
<tr>
<td>July</td>
<td>70,733</td>
<td>1,241,440</td>
</tr>
<tr>
<td>August</td>
<td>76,218</td>
<td>1,260,785</td>
</tr>
<tr>
<td>September</td>
<td>74,415</td>
<td>1,213,055</td>
</tr>
<tr>
<td>October</td>
<td>78,491</td>
<td>1,281,090</td>
</tr>
<tr>
<td>November</td>
<td>79,715</td>
<td>1,304,275</td>
</tr>
<tr>
<td>December</td>
<td>79,116</td>
<td>1,298,558</td>
</tr>
</tbody>
</table>

Accidents decrease as the speed of street cars increases in Detroit, and vice versa, according to the above curves.

---

**Table II—Revenue, Passengers and Speed of Grand River Line, September, 1928, to December, 1929**

<table>
<thead>
<tr>
<th></th>
<th>Rail</th>
<th>Coach</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Revenue in Dollars</td>
<td>Revenue in Dollars</td>
</tr>
<tr>
<td>September</td>
<td>102,313</td>
<td>1,672,508</td>
</tr>
<tr>
<td>October</td>
<td>113,491</td>
<td>1,854,708</td>
</tr>
<tr>
<td>November</td>
<td>116,283</td>
<td>1,905,170</td>
</tr>
<tr>
<td>December</td>
<td>112,580</td>
<td>1,844,354</td>
</tr>
<tr>
<td>January</td>
<td>117,193</td>
<td>1,912,535</td>
</tr>
</tbody>
</table>

**Table III—Analysis of Jefferson Express Line on a Typical Day, March 1, 1929**

<table>
<thead>
<tr>
<th></th>
<th>Revenue</th>
<th>Cash</th>
<th>$1,588</th>
<th>$477</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tickets</td>
<td>1,392</td>
<td>520</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Transfers</td>
<td>155</td>
<td>50</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>83,135</td>
<td>5847</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Mileage:**

- **Mileage of street cars:** 7,763
- **Revenue passengers per vehicle-mile:** 80,404
- **Revenue passengers per vehicle-mile:** 83,256
- **Average speed:** 9.40
- **Passengers:** 6,000
- **Other transfers:** 28,034

**Jefferson line transfers:** 1,098

**Railway:**

- **Cash:** 81,588
- **Tickets:** 26,461
- **Transfers:** 28,034
- **Total:** 37,061

**Coach:**

- **Cash:** 1,392
- **Tickets:** 26,461
- **Transfers:** 28,034
- **Total:** 37,061

**Average energy consumed in kilowatt-hours per car-mile by two single cars and two motors of a car and trailer car on Jefferson line. Note the much lower consumption in the express zone.**

**Electric Railway Journal—February, 1930**
Table IV—Detailed Analysis of Grand River Express Operation—Daily Averages of Data for the Weeks from August 20-24 to November 26-30, 1928

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Total revenue</td>
<td>$8,909</td>
<td>$9,399</td>
<td>$10,636</td>
<td>$10,803</td>
<td>$10,984</td>
<td>$11,200</td>
<td>$11,202</td>
<td>$11,202</td>
<td>$11,202</td>
<td>$11,202</td>
<td>$11,202</td>
<td>$11,202</td>
<td>$11,202</td>
<td>$11,202</td>
<td>$11,202</td>
</tr>
<tr>
<td>Total operating expenses</td>
<td>$2,994</td>
<td>$3,064</td>
<td>$3,178</td>
<td>$3,097</td>
<td>$3,003</td>
<td>$3,003</td>
<td>$3,003</td>
<td>$3,003</td>
<td>$3,003</td>
<td>$3,003</td>
<td>$3,003</td>
<td>$3,003</td>
<td>$3,003</td>
<td>$3,003</td>
<td>$3,003</td>
</tr>
<tr>
<td>Net revenue</td>
<td>$8,909</td>
<td>$9,335</td>
<td>$10,458</td>
<td>$10,790</td>
<td>$10,980</td>
<td>$11,200</td>
<td>$11,202</td>
<td>$11,202</td>
<td>$11,202</td>
<td>$11,202</td>
<td>$11,202</td>
<td>$11,202</td>
<td>$11,202</td>
<td>$11,202</td>
<td>$11,202</td>
</tr>
<tr>
<td>Revenue per car-mile, dollars</td>
<td>$1,075</td>
<td>$1,140</td>
<td>$1,158</td>
<td>$1,158</td>
<td>$1,133</td>
<td>$1,140</td>
<td>$1,158</td>
<td>$1,158</td>
<td>$1,158</td>
<td>$1,158</td>
<td>$1,158</td>
<td>$1,158</td>
<td>$1,158</td>
<td>$1,158</td>
<td>$1,158</td>
</tr>
<tr>
<td>Transfer passengers</td>
<td>23,470</td>
<td>23,619</td>
<td>24,962</td>
<td>24,404</td>
<td>24,252</td>
<td>24,961</td>
<td>24,618</td>
<td>24,638</td>
<td>24,445</td>
<td>24,319</td>
<td>25,165</td>
<td>26,855</td>
<td>26,548</td>
<td>25,756</td>
<td>26,043</td>
</tr>
<tr>
<td>Total passengers</td>
<td>78,935</td>
<td>80,931</td>
<td>88,217</td>
<td>86,657</td>
<td>86,948</td>
<td>88,407</td>
<td>88,076</td>
<td>88,588</td>
<td>86,249</td>
<td>90,739</td>
<td>93,690</td>
<td>94,095</td>
<td>93,687</td>
<td>92,358</td>
<td>95,498</td>
</tr>
<tr>
<td>Speed in miles per hour</td>
<td>11.22</td>
<td>11.43</td>
<td>11.69</td>
<td>11.79</td>
<td>11.83</td>
<td>11.90</td>
<td>11.82</td>
<td>11.41</td>
<td>11.25</td>
<td>11.23</td>
<td>10.78</td>
<td>11.22</td>
<td>11.65</td>
<td>11.63</td>
<td>11.62</td>
</tr>
<tr>
<td>Combined Car and Coach</td>
<td>$8,405</td>
<td>$8,445</td>
<td>$8,687</td>
<td>$8,796</td>
<td>$8,709</td>
<td>$8,745</td>
<td>$8,766</td>
<td>$8,780</td>
<td>$8,445</td>
<td>$8,772</td>
<td>$8,372</td>
<td>$8,334</td>
<td>$8,297</td>
<td>$8,387</td>
<td>$8,477</td>
</tr>
<tr>
<td>Net revenue—car and coach</td>
<td>$8,405</td>
<td>$8,445</td>
<td>$8,687</td>
<td>$8,796</td>
<td>$8,709</td>
<td>$8,745</td>
<td>$8,766</td>
<td>$8,780</td>
<td>$8,445</td>
<td>$8,772</td>
<td>$8,372</td>
<td>$8,334</td>
<td>$8,297</td>
<td>$8,387</td>
<td>$8,477</td>
</tr>
<tr>
<td>Net revenue—coaches</td>
<td>$8,405</td>
<td>$8,445</td>
<td>$8,687</td>
<td>$8,796</td>
<td>$8,709</td>
<td>$8,745</td>
<td>$8,766</td>
<td>$8,780</td>
<td>$8,445</td>
<td>$8,772</td>
<td>$8,372</td>
<td>$8,334</td>
<td>$8,297</td>
<td>$8,387</td>
<td>$8,477</td>
</tr>
</tbody>
</table>

*Deficit.

Vehicle-mile were 9,489 for the cars and 5,444 for the coaches. Of the 73,661 total railway passengers, 26,461 paid 6-cent fares, 25,056 tendered tickets, 1,098 transferred from Jefferson Avenue coaches and 21,046 transferred from other lines. Of the 17,962 coach passengers, 7,788 paid 6-cent fares, 94 paid 10-cent fares, 5,762 used tickets, 1,476 transferred from the express cars and 2,842 transferred from other lines.

A detailed analysis of the Grand River express operation for the weeks from Aug. 20-24 to Nov. 26-30, 1928, is given in Table IV.

On the Jefferson Avenue the speed before express operation was started was 12.45 m.p.h.; the speed in the express zone is now 18.4 m.p.h. The running time, which formerly was 20.5 minutes through the express zone of 4.1 miles, has been reduced to 13.5 minutes. On the Grand River line the average speed was increased from 12.15 m.p.h. to 17.36 m.p.h. The running time has been reduced on the section which originally was express, from 32 minutes to 25 minutes.

Table V—Running Time and Average Speed of the Jefferson Line, as Operated on a Typical Day in 1928

<table>
<thead>
<tr>
<th>Westbound</th>
<th>Eastbound</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time Zone</td>
<td>Zone 1</td>
</tr>
<tr>
<td>5:00 a.m.-8:30 a.m.</td>
<td>10:54</td>
</tr>
<tr>
<td>Speed</td>
<td>12.00</td>
</tr>
<tr>
<td>8:00 a.m.-12:00 p.m.</td>
<td>9:34</td>
</tr>
<tr>
<td>11:00 a.m.-6:00 p.m.</td>
<td>11:35</td>
</tr>
<tr>
<td>Speed</td>
<td>11.79</td>
</tr>
<tr>
<td>5:00 p.m.-11:00 p.m.</td>
<td>10:29</td>
</tr>
<tr>
<td>Speed</td>
<td>10.82</td>
</tr>
</tbody>
</table>

On Jefferson Avenue the local transfer buses run inside the safety zones at express stops. Between these stations they stop at the curb.

Electric Railway Journal—Vol. 74, No. 2
More Business
and How to Get It

Ways of securing additional traffic were theme of annual meeting of Central Electric Railway Association held at Cleveland Jan. 23-24. Other topics of interest were technique of freight handling and employee training.

Recognition of the importance of freight business as a source of revenue for the interurbs was a notable feature of the annual meeting of the Central Electric Railway Association, held at Cleveland, Ohio, Jan. 23 and 24. One entire session was devoted to a discussion of means of developing this type of business. Development of passenger business was touched upon by speakers at other sessions.

"Were it not for the freight traffic now carried by the interurbs, and the promising outlook for the continued development of freight business, the future of the interurban industry would indeed be problematical," said William L. Butler, executive vice-president Cincinnati & Lake Erie Railroad. "Success in holding and developing freight business depends upon our ability to give overnight delivery to an ever-widening territory, and upon the enterprise and ingenuity in supplementing our rail service to provide the same or greater convenience, reliability and cheapness of service for prospective shippers as is afforded by our principal competitor, the motor truck, or by the steam railroads."

The speaker also made a point of the necessity of developing an entirely new technique of freight service by the electric railways if they are to hold a position in the transportation industry midway between the steam railway and the motor truck. "Not only must we move freight more quickly, but we must modernize our facilities and operations to move it more economically," said Mr. Butler.

"Much depends upon the development of a closer contact between the company and the shipper," declared H. A. Nicholl, general manager Union Traction Company of Indiana. He expressed the opinion that a great deal can be accomplished in this direction by cutting down the loss and damage of shipments and by effecting quicker settlements where losses are sustained. "Companies are to some extent going into the pick-up and delivery business," stated Mr. Nicholl, and he urged a further extension of this activity, calling his hearer's attention to the clear-cut recommendation of their own committee on the subject made at a previous meeting.

"Don't let your interurban suffer," advised C. L. Van Aucken, editor Electric Traction, in a paper on "Interurban Development." "Either kill it or cure it." Citing numerous examples of what had been done in the C.E.R.A. territory the speaker affirmed his faith in the belief that in the majority of cases, if energetic methods are employed, a cure can be effected.

That too many railways have plowed along the same old furrow until it has become a rut was the opinion expressed by Hudson Biery, Cincinnati Street Railway, whose paper on "City Transportation Development" was read by Paul Wilson. "Many of us are trying to render adequate service rather than attractive service," he stated. In discussing the matter of advertising the speaker advised that it should start with a limited program and expand gradually, but, once started, the program should never be allowed to die out entirely.

The program was concluded by a showing of stereopticon slides illustrating methods of handling freight in the C.E.R.A. territory. The showing of the pictures was accompanied by a discussion of the subject by J. K. Coberly, traffic manager of the Columbus, Marion & Delaware Railway.

Fundamental factors affecting the present situation and the future of the electric railway industry were discussed at the opening session. Following a brief address of welcome made by John D. Marshall, Mayor of Cleveland, L. M. Brown, president of the association, presented an encouraging picture of what the future will hold for the industry if it takes advantage of its opportunities.

An abstract of his remarks appears elsewhere in this issue.

Charles Gordon, managing director of the American Electric Railway Association, pointed out the necessity of approaching our work with the aim of solving the community transportation problem rather than merely trying to operate electric cars. Since the earliest day when electricity was first used as a source of power, it has never yet been relegated to a secondary position in any field and it is not likely, according to Mr. Gordon, that electricity will suffer defeat in the field of local transportation.

Movement of people, not movement of vehicles, is the ultimate objective, he said. One four-track rapid transit line will carry as many people as 25 express highways. One double-track street car line will carry four times as many people as an express highway. More than 200 years ago, the streets of London were congested because too many people used private transportation vehicles. That was the origin of the first public transportation service. To return now to the use of private vehicles would be a step backward. Intelligent development of public transportation facilities is the only possible solution of the problem.

How public transportation service is being given in Grand Rapids was the subject of a paper by L. J. De
Lamarter, general manager Grand Rapids Railroad, which in the absence of Mr. De Lamarter was read by J. W. Knecht. It was brought out in this paper that modern cars in Grand Rapids have not only decreased operating cost but also attracted new riding.

Selling methods were discussed by E. S. Jordan, Jordan Motor Car Company, who spoke at the morning session on the second day of the meeting. "The great American novel, when it is written, will be written around the story of transportation and communication," he said. "It is a dramatic, romantic business in which we are engaged." The speaker pointed out that civilization is based upon the lowest cost per ton-mile of transportation, and cited numerous examples in the history of transportation to prove his theory.

In a comprehensive and instructive paper on "The Conference Method and Its Use in the Training of Employees," E. G. Cox, director of service improvement, Chicago, North Shore & Milwaukee Railroad, told of the development of the conference training methods with particular reference to the manner in which it was applied on the property which he represented. Dividing his paper into four general parts he discussed, in turn, what the conference method is, why it is used, how it operates, and what it accomplishes.

"Contrary to the accepted thoughts of a few years ago," said the speaker, "the important period of training the employees does not end with the close of the probation period. The vestibule instruction of a new man, although highly important, is not now regarded as the beginning and the end of the training period. Rather the training process goes on and on as long as the service of the employee, and the longer it goes on the more difficult it is likely to become."

The meeting was closed with the report of a number of committees, followed by the election of officers. Officers for the coming year will be:

President, L. G. Tighe, assistant general manager Northern Ohio Power & Light Company, Akron, Ohio.
First Vice-President, F. H. Wilson, president and general manager Cleveland Southwestern Railway & Light Company, Cleveland, Ohio.
Second Vice-President, R. R. Smith, receiver Chicago, South Bend & Northern Indiana Railroad, South Bend, Ind.
Secretary-Treasurer, L. E. Earlywine, Central Electric Railway Association, 308 Traction Terminal Building, Indianapolis, Ind.

Henry Bucher, general manager Indiana Service Corporation, Fort Wayne, Ind., was elected to the executive committee to replace C. T. Dehore, president Indianapolis & Southeastern Railroad, Indianapolis, Ind.

The Dodo Became Extinct Because It Ceased Developing

**By L. M. Brown**

**Vice-President Interstate Public Service Company**

**President Central Electric Railway Association**

SOME people would have us believe that electric railway men are in the same class as the dodo. The dodo bird is extinct and today there are those who voice the opinion that we are rapidly approaching extinction and it is only a matter of time until we will be hunting jobs in other lines of business. While it is unquestionably true that the number of electric railways is gradually diminishing, this does not necessarily mean the general breakdown of such transportation as a means of handling urban and interurban traffic. Rather do we see in the gradually diminishing mileage of electric railway lines a possible solution to the difficulties that admittedly beset our path.

Perhaps there is some justification in likening those lines that fail to the once proud and plumed dodo bird. The dodo became extinct because it quit growing and developing with the changing times. Rather than follow the example of the other birds that tried hard to meet new climatic and food conditions, it allowed its feathers to droop and it suffled. The results were just those which might have been foreseen. But the fact that the dodo bird died out had little or no connection with development of other birds which found themselves facing the same conditions. The latter are still doing business and raising large and prosperous families.

The trends in our industry today are twofold. First, there is consolidation into logical, contiguous and larger systems, and second there is a gradual elimination of those lines foredoomed to failure. long ago when they were constructed from "nowhere to nowhere" with no stopover privileges. These latter lines had the seed of their failure in their inception, for they were built quite largely to be termed "booming" period, when the idea held sway that any kind of a line would pay if it could only be built.

The process of elimination of these lines is a healthy and normal situation. We do not despair of a tree when we prune its weaker branches, but on the contrary are more optimistic as to its ultimate success. It is thus that we see the gradual elimination of various lines an omen for good rather than otherwise and we take increased courage for the future.

To be successful we dare not stand still. Many of the major units in our territory are definitely committed to a policy of consolidation, admittedly in an effort to place various lines that are now financially unsuccessful upon a successful basis. With unified management and operation backed by adequate finances the public will benefit by improved service.

It is evident that the freight business must contribute an increased proportion of interurban line revenue. For these lines to prosper they must increase this business, and particularly the carload business. To do this successfully will require improved terminal facilities, industrial sidings, elimination of short radius curves, building around some cities and towns, and other improvements in roadway and equipment for faster and more economical operation.

To meet the growing demand for fast, comfortable and convenient passenger service on both city and interurban lines, large sums of money have been and are now being spent to rehabilitate a number of properties in this territory. Modern, light-weight, easily running, noiseless cars for one-man operation, with comfortable seats and attractive appointments, and the speeding up of the service improves the morale of the public and employees and tends to increase the riding habit. In some of the larger cities serious consideration is being given to underground rapid transit or other forms of rapid transit lines on private right-of-way; to the operation of de luxe motor coach service in appropriate territory at possibly higher rates; and to the taking over of truck service. Some of these plans are as yet in the experimental stage and it is too early to know just what the final results may mean, but the efforts now being put forth certainly make the outlook for the industry much more encouraging.

Let us not be discouraged by a seeming apathy and lack of appreciation on the part of the public. Service and conveniences are frequently unappreciated until they are lost, or drastic events bring them to the attention of those who use them. The public may, occasionally, find something new in which it will become interested for a time, but experience will, in time, force that same public back to the patronage of a business based upon sound economical principles.

Our task is to adapt the type of transportation we represent to a civilization that is constantly increasing in wealth and in complexity. The opportunity is before us. The public needs and should have modern, efficient electrical transportation. It is within our province to supply that need, and if we do so our efforts will be appropriately rewarded.

"It's an electric age!"

\*Abstract of an address made at the annual meeting of the Central Electric Railway Association, Cleveland, Ohio, Jan. 23-24.
Opportunities for Profits in
De Luxe Bus Operation

THAT the de luxe bus attracts new riders, produces additional income without a sacrifice on the part of city-type operations and is a type of vehicle capable of gaining favor on routes through many highly restricted residential districts of a city, has been definitely proved by the experience of a number of leading electric railways.

Co-ordination of street car and trolley-fare bus services has progressed steadily during the past decade, with the result that many companies have definitely strengthened their operating and economic structures. However, there is an additional definite field for the de luxe bus and the faster, more exclusive features it affords. This field is not limited exclusively to the development of new sections, but often is to be found along or parallel to existing city routes. Although one of the major values of the de luxe bus is the part it has played in securing franchises through districts where formerly any suggestion of public conveyance met with wholesale opposition, it has been equally well applied to established arteries of mass transportation.

Operating practices in Pittsburgh and Detroit contrast these applications very clearly. In Pittsburgh, six 25-cent fare de luxe coach routes originate in the heart of the downtown business district, extend along improved motor boulevards and serve, on their outbound extremities, the most exclusive residential sections of the city or suburbs. In Detroit, four 10-cent minimum-fare parlor coach lines have been established and successfully operated on four main thoroughfares, served throughout their length by street cars or city-type buses at lower fares. In both cities patronage has been built up from those persons who rarely used the regular service, but were attracted by the new, distinctive vehicles and the advantages of the service they rendered.

"De luxe," the word itself and its application to bus equipment and the type of service rendered, is unquestionably a relative term and any general definition must be the result of past and present practices. Those companies that are utilizing the de luxe bus have almost unanimously had one objective in establishing such service, namely, a form of transportation to bridge the gap between the street car and the higher priced means of travel. 

Survey of urban de luxe bus operations by more than a dozen railways shows that exclusive, higher fare service attracts new riders, principally from the automobile and not gained at the expense of the street car and city-type bus.

By
J. R. STAUFFER
Assistant Editor Electric Railway Journal

Electric Railway Journal—February, 1930
## Comparative Study of Fourteen DeLuxe Bus Routes

| Company                        | Line | One Way Mileage | Equipment Used | Territory Served                                                                 | Other Forms of Transportation | Fare — Streetcar or City-type Bus | Fare — Tokens 9 tickets | Tokens 25c 9 tickets | Headways, Minutes | Minutes to Peak | Speed, M.p.h. | Speed of City-type Service |
|--------------------------------|------|-----------------|----------------|----------------------------------------------------------------------------------|------------------------------|----------------------------------|-------------------------|----------------------|------------------|-----------------|--------------|-----------------|----------------------|
| Pittsburgh Railways            | Wilkinsburg 7.57 | Twin Coaches 35 passenger | Business district of Pittsburgh and residential sections | Street car and trains | 25c, 2 tickets | $2.00 | Tokens 25c 9 tickets | 4 | 10 | 13.80 | 10.09 | Yes |
| Highland Park                  | 7.47 | Yellow Coaches 19 passenger | Pittsburgh and East Liberty business and residential districts | Street car | 25c, 2 tickets | $1.00 | Tokens 25c 9 tickets | 7 | 15 | 14.00 | 10.28 | Yes |
| East Liberty                   | 5.12 | Yellow Coaches 25 passenger | Pittsburgh and East Liberty business and residential districts | Street car and trains | 25c, 2 tickets | $2.00 | Tokens 25c 9 tickets | 4 | 7 | 15.90 | 10.2 | Yes |
| Squirrel Hill                  | 5.72 | Yellow Coaches 21 passenger | Downtown Pittsburgh and exclusive residential sections | Street car | 25c, 2 tickets | $2.00 | Tokens 25c 9 tickets | 5 | 10 | 15.60 | 11.15 | Yes |
| Mt. Lebanon                    | 6.92 | Yellow Coaches 21 passenger | Downtown Pittsburgh and residential districts | Street car | 25c, 2 tickets | $2.00 | Tokens 25c 9 tickets | 5 | 12 | 15.00 | 11.85 | Yes |
| Bellevue                       | 6.55 | Yellow Coaches 19 passenger | Downtown Pittsburgh and residential districts | Street car and trains | 25c, 2 tickets | $2.00 | Tokens 25c 9 tickets | 8 | 15 | 17.10 | 11.22 | Yes |
| Dept. of Street Railways       | Grand River 12.18 | Cadillac 16 passenger | Business and residential districts | Express street car | 10c, minimum (zones) | | 6c, 1 | 13 | 14.10 | No |
| Jefferson                      | 6.80 | 13 Dashes 15 passenger | Business, industrial and residential districts | Express, street car and city-type bus | 10c, minimum (zones) | | 6c, 4 | 9 | 14.82 | Exp. street car, bus 12.60 | No |
| Mack                           | 9.07 | 13 Dashes 15 passenger | Business and residential districts | Express, street car and city-type bus | 10c, minimum (zones) | | 6c, 4 | 10 | 15.46 | 11.18 | No |
| Woodward                       | 8.05 | 31 Dashes 15 passenger | Business and residential districts | Street car | 10c, minimum (zones) | | 6c, 1 | 2 | 14.36 | 10.39 | No |
| Capital Traction Co. Washington, D. C. | 8.00 | 16 Yellow Coaches 29 passenger | Government administration, business and residential districts | Street car | 4 tokens | 40c | 3 to 7 | 20 | 13.00 | 9.00 | No |
| Cleveland Railway              | Airport Express 12.85 | 4 cylinder Whites | Downtown Cleveland through residential district to airport | Street car and city-type bus | 15c, 25c (zones) | 50 | 60 | 17.00 | 15.00 | Yes |
| Heights Express                | 7.92 | 9 Yellow Coaches 29 passenger | Downtown Cleveland to exclusive Cleveland Heights | Street car and city-type bus | 25c, Street car, Bus 10c. | 5 | 30 | 17.00 | 15.00 | No |
| United Railways & Electric Co. | Roland Park 6.25 | Whites 25 passenger | Business District of Baltimore and residential sections of Roland Park, Guilford and Homeland | Street car and city-type bus | 25c, 4 tokens | 35c | 10 | 20 | 15.20 | 10.40 | No |

travel such as is afforded by the private automobile or taxicab. It was evident that it would be folly to establish lines of a superior type of service at equal or little higher fares than those being charged on the street car, because any patronage would be gained at the expense of the city type service. A new rider had to be found and the logical place was that group of people who had previously left the street car for the automobile. It has generally been found that de luxe bus routes equipped with the most modern type of vehicles do appeal to a class willing to pay a higher fare for a service which is fast, comfortable and convenient.

Bus operations in Pittsburgh are unique in contrast with the general practices carried on by the other electric railways throughout the country. There is not one trolley-fare bus in regular use on a system of 592 miles of track. This is due, first, to the general topography of the territory served by the Pittsburgh Railways and, second, to the fact that this whole territory is adequately served by the street car. Consequently when the subject of bus operation presented itself the question of the type of service to be installed had to be considered from three angles: Should buses be substituted for street cars on a number of lines? Should co-ordinated service at trolley fare be established in direct competition with the street car? Should an additional higher fare service be placed on selected routes throughout the city? The latter course seemed the only logical one for the Pittsburgh property, and as a result the Pittsburgh Motor Coach Company now operates six de luxe coach lines at a 25-cent fare. In addition there are four zone routes at 25-cent minimum fare with additional 5-cent zones between Pittsburgh and Charleroi, Pittsburgh and Castle Shannon, Pittsburgh and Oakmont, and a line known as Frankstown Road. There is still a third type of service, namely, two routes at 10-cent minimum fare with 5-cent additional zones. These routes extend between Charleroi and California and Charleroi and Donora, Pa.

A careful analysis of the cost of travel in Pittsburgh was made. It was found that one could travel on the street car for approximately 3 cents per mile, could drive his privately owned automobile for about 10 cents per mile, or could use the de luxe bus in interurban and interstate service will appear in a later issue.
the taxicab at approximately 20 cents per mile. It became evident that any means of transportation costing the rider about 3 cents a mile should be profitable, principally because the riders would not come from those who patronize the street car, and for 3 cents a mile a service of quality could be rendered to appeal to the rider who had left the street car previously for the automobile. A charge of 25 cents was made and has proved satisfactory for the lines established. Most of the riding on the Pittsburgh lines is one way, although on the new Wilkinsburg route there is now some two-way business. Nearly all passengers are carried for a greater part of the run. There is no short-haul traffic.

The Pittsburgh Railways began its operation with the larger type of bus, having seating capacities of from 29 to 35 passengers. Experience, however, on routes such as it operates with almost entirely one-way traffic has shown that the smaller type of bus is more satisfactory for this kind of work, and the company’s new purchases are of the 21-passenger seating capacity.

**Detroit Operation Unique in Extensive Use of Smaller Buses**

Unlike Pittsburgh, Detroit found its field for de luxe bus operation on four main thoroughfares served throughout their length with street cars and city type buses. Also operating on these routes were hundreds of jitneys carrying on an enormous business in competition with the railway’s services. The small type bus was selected to replace jitneys principally because they created an impression of a more individual service than the larger equipment and because shorter headways could be run with fewer empty seats.

The four routes operated on Grand River, Jefferson, Mack and Woodward Avenues now use 161 buses of 15- and 16-passenger capacity of the Dodge and Cadillac manufacture. On the Grand River Line 44 16-passenger eight-cylinder Cadillacs are used to provide selective local service in co-ordination with an express street car route on this avenue. The fare on this line ranges from 10 cents to 30 cents, in 5-cent increments. The fare on the street car is 6 cents. The headways range from 1½ minutes in the peak hours with a base table of three minutes in the non-rush hours.

Likewise on Jefferson Avenue the de luxe bus operation has competition by express street car, local city-type bus and competitive bus service. The fares on this line range from 10 cents to 20 cents in 5-cent increments, while the street car and local bus charge 6 cents and the competitive bus 10 cents. This line serves the downtown section of Detroit as well as industrial and residential sections on Jefferson Avenue.

Woodward Avenue, one of the most heavily traveled thoroughfares in Detroit, is served by the Woodward Parlor Coach Line and a street car line. On this line eighty-one 15-passenger Dodges are used and run on one- and two-minute headways throughout the day. Short headways are also maintained by the street cars and yet at times there is apparently not enough service to accommodate the traffic on this avenue. From a revenue standpoint the de luxe bus operation on Woodward Avenue is the most successful. The Mack Avenue Coach Line operates parallel to the Jefferson coach route part of the way, then it turns north into residential districts. This
line operates thirteen 15-passenger Dodges at a fare of 10 cents to 25 cents in 5-cent increments. Headways of four minutes in the rush hours and ten minutes in the non-rush hours are scheduled.

The Capital Traction Company Washington D. C., operates three lines with de luxe bus equipment. The original one, the Chevy Chase coach line, was started in September, 1925, and operates from the downtown business section of Washington past the Union Station and Capitol to the outlying district of Chevy Chase. The second line is a sightseeing line purely and operates from the Treasury Building in the center of the city, past the Lincoln Memorial and through Potomac Park. Its operation is not comparable with the others except that the rate of fare and type of equipment used are the same. This line operates only during the summer months and caters principally to tourists. The third line, known as the Cleveland Park Parlor Car Line, was started in November, 1927, but as it did not prove profitable was abandoned on Sept. 30, 1929, with the exception of one trip in each direction in the morning and afternoon rush hours.

The Chevy Chase Coach Line has been a most successful operation since its beginning. It started operating with four buses on a headway of twenty minutes all day. Traffic has increased continually so that now sixteen coaches are used to run headways of three, four and five minutes in the morning and five, seven and ten minutes in the evening rush hours. An interesting chart showing the gross revenue and revenue per mile of this line, since its beginning, accompanies this survey. This increase in patronage has not been built up at the expense of the street car or city-type bus, but has come from new riders who prefer to leave their automobiles at home and use the high type of service that this line affords. The Chevy Chase Line parallels the street car line along its whole length outside of the city proper, and furnishes service which can be obtained on street cars throughout its length.

A distinctive feature of this line is the unusual seating arrangement of the bus. Twenty-nine-passenger Yellow Coach chassis are used, but individual seats are so placed that only 21 passengers are carried. From an economic standpoint this practice has been questioned, but those in charge of the Chevy Chase Coach Line feel sure that to a great extent this individual seating of their passengers without crowding has been the cause of its success. Another feature is the smoking compartment in the rear, partitioned off from the front of the bus by glass panels.

Cleveland Railway Operates Two Lines

Two express de luxe bus routes are operated by the Cleveland Railways in the territory which it serves. The first is known as the Airport Express; the second, the Heights Express. The latter line was only put in operation on Dec. 7, 1929, and is in every sense a full de luxe service between downtown Cleveland and the very highly restricted residential section of Cleveland Heights. The fare on this line is 25 cents. No transfers are given or accepted. Its installation just before the Christmas rush period had distinct advantages, in that a number of people used the line in preference to taking their automobiles into the Christmas traffic jams, became familiar with the type of service and are continuing to use it.

The line carried 380 customers the first day. This increased regularly until it now has over 800 fares a day. At the beginning a fifteen-minute service was provided during the rush hours. It was found necessary to give a ten-minute service during the rush hours on

Unusual seating arrangement and smoking compartment feature the Chevy Chase buses

![Chart showing gross revenue and revenue per mile of the Chevy Chase Line](chart)

Gross revenue has been increasing steadily on the Chevy Chase Line. Revenue per mile has remained constant

The Chevy Chase Coach Line in Washington, D. C. serves all phases of the Capital's activities

Electric Railway Journal—Vol. 74, No. 2

94
account of the heavy patronage. During the other hours of the day the service operates on a half-hour schedule. From Dec. 7 to Dec. 31, inclusive, the coaches operated 12,850 miles, carried 15,039 passengers and took in $3,859, earning approximately 30 cents a mile. The cost of operating is figured at about 27 cents a mile.

The situation with regard to the Airport Express line is particularly interesting. The route is 12.50 miles in length and runs from the Cleveland Airport to East 22nd Street and Euclid Avenue, operating as an express route through the greater part of the territory. The Berea Bus Line Company operates from Berea, Ohio, to the Public Square over the same route. This interurban line has been in operation for the past six or eight years and has during all that time been doing an interurban business as well as picking up passengers from all points along its route in the city to the Public Square. While this is contrary to the provision of the Collister-Kreuger act of Ohio, it has been permitted by the Cleveland City Council because the Cleveland Railway was not giving adequate service on the same streets.

By resolution of the Cleveland City Council, the Cleveland Railway started operation of the Airport express route on Aug. 23, 1929. During the air races of the National Aeronautical Association this route paid very well, as many as 100 coaches per day being used. However, after the races business immediately dropped off because of the duplicated service provided by the Berea Bus Line and the Cleveland Railway.

The Cleveland Railway route is too long for the rate of fare charged at the present time, namely 15 cents for the first 10 miles, 20 cents for the next zone of 1 mile, and 25 cents within the second zone of 1½ miles. This route is being continued at the request of the City Council, although the Cleveland Railway has requested permission to abandon it. If the Berea Bus Line were required to rely on the income derived from its interurban operation it would undoubtedly lose money, but the combination makes it a paying proposition. In other words, interurban service alone is a losing proposition, express service on a line of this length is a losing proposition, but the combination of the two results in a profitable operation.

In September, 1929, the United Railways & Electric Company, Baltimore, Md., began operation of its first de luxe bus line known as the Roland Park Coach Line.

The route connects the downtown section of Baltimore, with three of the large residential sections—Roland Park, Guilford and Homeland. The fare charged is 25 cents between any two points. It is an additional express service through territory well covered by city-type bus and street car service. Operating locally through the three residential sections, it then runs express into the
center of the city. Up to the present time the line has operated only on weekdays, there being insufficient traffic on Sundays and holidays to justify running the buses.

Before establishing this line a very complete survey of the situation was made in conjunction with the Roland Park Company and various civic committees. Letters were mailed to residences throughout the district asking their opinions on the proposed line. The replies were encouraging and the service was started with a complete schedule calculated to produce a patronage that would build up to the capacity of the coaches instead of with a skeleton service that would grow only as increased patronage demanded. The railway company believed that this would familiarize the users of the bus with its full advantages at once, and would achieve the results of having more people change their riding habits. A very unusual feature in the layout of this route consists of a double loop in the downtown section of Baltimore. The loop used in the rush hour is shorter between these two points, as there are street car lines serving the same territory. The type of service is different from the city type of bus service in that Yellow Coach de luxe buses are used on this line, while White, Mack and Reo city-type buses are used on the feeder lines. The fare is 25 cents on the de luxe buses and 7½ to 25 cents on the feeder lines. The speed of this line is approximately 15 m.p.h. as compared to 11 m.p.h. on the street cars.

The Cincinnati Street Railway, Cincinnati, Ohio, on Nov. 21 began operation of a new bus route between the business district of Cincinnati and a new, recently built up high-class subdivision 6 miles from downtown. Four new Mack buses with special 25-passenger bodies are being used. The fare charged is 25 cents. The coaches operate on a 30-minute headway from 7:30 in the morning until 8 p.m., when they go on an hourly headway until midnight.

The lines and type of service so far mentioned have been strictly selective higher fare lines operated for the purpose of appealing to a new type of rider in a community served by city-type operations of both street cars and buses. Quite distinctive from this type of service is another use for the de luxe bus on certain selected city lines. A number of companies are providing the local public on many of their lines with de luxe motor coaches, not as supplementary service at higher rates of fare. The United Electric Railway, Providence, R. I., operates 69 Twin Coaches and 40 of the latest model six-cylinder Whites on lines operating at regular rates of fare, most of which supplant street cars. Quite a few of these lines are routed and operated as express service, benefiting the residents of outlying districts near Providence. With this equipment they also operate several special routes, two of which are only operated in the summer months to provide supplementary service between Providence and Crescent Park, and Pawtucket and Crescent Park. Crescent Park is a summer shore resort. Excellent results have been secured, particularly on the latter where the earnings have been very high. Two other special routes between Pawtucket and Pawtuxet, and between Olneyville and Pawtuxet are operated on Wednesday and Saturday nights to serve a very fine public balloon in Pawtuxet. Twin Coaches are used on these lines, which take a more direct route than the trolley car and operates express all the way.
**Monthly and Other Financial Reports**

**Electric Railway Journal—February, 1930**
Two-Color or Three-Color Signals

New York, N. Y., Jan. 1, 1930.

To the Editor:

In a recent report issued by the National Committee for Municipal Traffic Ordnances and Regulations, certain proposed standards for the regulation of vehicular traffic were recommended. The more important of these deal with the proposal to employ three-color light signals at locations where a two-color signal might suffice. Since definite positions contrary to these recommendations have been taken by traffic officials of at least two major cities, New York and Los Angeles, the decision seems at least open to question.

It is important to note that this recommendation is predicated upon a tabulation of replies to questionnaires sent by the national committee to some 200 municipalities where traffic control signals are now in operation. The purchases and installation of the traffic control systems in these 200 municipalities as a rule have not been by the official department directing traffic, usually the police department, but in general by the Aldermanic Council or Town Trustees. Ordinarily neither of these two bodies includes traffic control engineers, nor is it versed in the art of traffic control signaling. The bidders proposing to supply traffic control apparatus, with the exception of one or two manufacturers who had undertaken to furnish traffic control signal units as a side line, were persons politically affiliated and in a favorable position to secure a contract. After receiving the award these persons generally established a temporary factory wherein were assembled the signal housings or such other apparatus as could not be purchased in the open market. Obviously these manufacturers preferred to sell three-color light signals upon which the profit was comparatively large.

From the foregoing it may be inferred that, in adopting a tabulation of the replies received in the questionnaires, the national committee has based its recommendation on apparatus supplied by certain manufacturers not making a specialty of producing traffic control signal apparatus, as distinguished from a recommendation based on protracted tests made by competent traffic control engineers to determine the superiority of one or the other signal system.

Politics a Factor in Signal Equipment

Unfortunately, owing to the political onus usually associated with awarding such contracts most of the established and largest manufacturers of signaling systems, who have had long experience in that field, have held aloof from street traffic control. One major city has had the local public service corporation finance, install and maintain the traffic control system at a service charge of $55 per signal unit per year, thereby relieving the city of all major responsibility. Obviously the position of the national committee precludes making such a recommendation.

With reference to the indications for governing existing traffic, the conditions under which vehicular traffic operates may be classified as follows:

1. Congested traffic lanes: for example, the hub arteries of a major city where traffic ordinarily is so dense that comparatively slow movement occurs.
2. Major traffic lanes: these include the more important arteries extending from the congested areas to the outlying districts and adjacent towns, on which vehicles may travel in groups at comparatively high speed.
3. Maladroit intersections: those other than simple right-angled intersections, blind streets, etc.

Four General Types of Control

For the above three conditions of traffic the following systems of signaling may be adopted:

1. Synchronous, where all vehicles traveling in parallel directions proceed for a fixed interval of time, alternately with all remaining stationary for a similar, or differing, period of time.
2. Progressive, where successive blocks show the same signal indication in conformance to the speed-distance factor determined by the rate at which traffic may pass through. Such ideal conditions of block length are rarely found. In this system the driver of a vehicle will always find a green signal at the approach to an intersection providing he has traveled at the prescribed speed. Obviously no yellow signal is required.
3. Speed-distance or co-ordinated, based on the speed-distance factor of each block traversed, long or short. In such a system the driver will always find a green signal as he approaches the intersection, provided he travels at the prescribed speed. This system permits group movement of vehicles. Obviously such a system is ideal and does not require the yellow light.
4. Special control, more generally applied to maladroit intersections, and dealing with conditions too complex to discuss here. With the exception of manual control they can usually be covered by systems 1 or 3.

Let me refer now to the application of systems 1 to 4 to the conditions (a), (b) and (c), previously named.

Condition (a): Congested traffic lanes comprising the hub area of the major cities. The traffic is ordinarily so dense that high-speed group movement of vehicles cannot be obtained. Obviously the more simple two-color (green and red) synchronized system will suffice, being not only more economical and simple to install but more simple to operate and less costly to maintain. Owing to the comparatively low speed the moving vehicles can be stopped within a few feet and no yellow signal is required.

Condition (b): Major traffic lanes extending from congested districts to outlying districts and adjoining towns. As these lanes not only permit a higher speed, but also group movement to obtain maximum capacity, obviously the co-ordinated system should be installed. If the vehicle driver proceeds at the proper speed he will always find a green signal at the approaching intersection. It is therefore obvious that no yellow signal indication is required.

From the foregoing it will be apparent that a maximum flow of traffic may be effected by the use of two-color signal indications only, and that the ideal systems for obtaining maximum traffic do not require a third indication. Furthermore, investigations where the yellow signal is employed indicated that the motorist will speed
Railway Crossing Signals Should Be Distinctive

Nachod & United States Signal Co., Inc.
Louisville, Ky., Jan. 8, 1930.

To the Editor:

As manufacturers of highway crossing signals for electric railways, we have noted a certain trend which we think merits discussion. One cannot fail to mark how implicitly the traffic signal indications are obeyed by automobilists; and, on the contrary, unfortunately, anyone can recall how many times at a highway crossing signals indicating the approach of a train have been wantonly disregarded by motorists. What more natural than that the railways, solicitous to have their crossing signals obeyed, should set up at their crossings with highways indications that look like or imitate traffic signals, showing green normally to the street, and red when there is a train approaching? We ourselves have sold a number of such highway crossing signals, when so specified by the purchaser, and we note that certain steam roads are installing such indications at their highway crossings.

We think this is essentially wrong, since a traffic signal is a "stop and stay" signal, the indications being periodically reversed; while the highway crossing signal, for which a distinctive indication has been specified by the Signal Division of the A.R.A., is a cautionary signal in the nature of a "stop and proceed" signal. The automobilist who confronts a crossing signal in operation should stop and wait a reasonable time; and then, if no train appears, should drive close enough to the crossing to see for himself, before he crosses. It is manifestly impossible to control a highway crossing signal so that it will always mean that a train will pass the crossing in so many seconds; for the train may be stopping within the warning zone, or it may be shifting over the tracks but not approaching the crossing. This means that the automobilist will be indefinitely held up, or he must violate a signal which he has been taught to consider as a "stop and stay" signal.

Moreover the railroad, by exhibiting a normal green at the crossing, which is the most unrestricted clear indication possible, invites the autoist to cross on the strength of that indication alone without stopping and without looking. If a normal indication is wanted, yellow, which is cautionary, at least imposes care in crossing. The writer is of the opinion that the traffic signal indications of alternating red and green, with or without the intermediate yellow, should be reserved for traffic signals, and flashing lights or wigwag signals reserved for railroad crossings.

O. A. Ross, President and Chief Engineer.

Extensive Paving Work Done by San Francisco Municipal Railway

City and County of San Francisco
Department of Public Works, Municipal Railway

To the Editor:

Your survey of paving practices of the railways of the United States, as contained in an article appearing in the Electric Railway Journal on page 1108 of the December, 1929, issue, has been read by me with considerable interest. Your readers might infer from this article, however, that the Municipal Railway of San Francisco is relieved of all paving charges which the private companies are subject to. For your information, the following statement of the paving charges of the Municipal Railway for the last three years is detailed:

[Fiscal Year | 1926-1927 | Maintenance | $18,209.69 | New construction | $1,907.00 | Replacements | $25,578.81 |
| 1927-1928 | Maintenance | $19,555.45 | New construction | $1,535.99 | Replacements | $6,797.99 |
| 1928-1929 | Maintenance | $16,667.11 | New construction | $102,461.48 | Replacements | $9,500.61 |
| Total | 46,364.44 |
| Total July 1, 1926 to June 30, 1929 | 128,689.74 |
| Fiscal Year | 1929 | Maintenance | $100,746.20 |

From the above statement it will be seen that over $200,000 was expended by the Municipal Railway in the last three years for paving, of which nearly one-half was for maintenance and replacements. Considering that the Municipal Railway has approximately 80 miles of single track of railroad to maintain, it will be readily seen that sufficient expenditure has been made to keep the paving in first-class order.

The general impression given to the public by the reading of articles in various railway and other publications is that the Municipal Railway of San Francisco has considerable work performed for it by the city of San Francisco for which no charges are made. This is an entirely erroneous conclusion, as the Municipal Railway pays the city of San Francisco for all work performed for it.

F. Boeke, Superintendent.
International steel Twin. Ties spaced 6 ft. center to center were laid on a 3-in. layer of broken stone.

Seven-inch grooved girder rail was used with rolled-steel joint plates seam welded.

Track was brought to correct line and grade by machine tamping.
Building Concrete Track with Minimum Interruption of Service

After track in Boston had been brought to line and grade with dry broken stone ballast, voids were filled with cement grout, using a vibrating machine to assure complete penetration.

USE of a novel method of construction recently enabled the Boston Elevated Railway to renew its tracks on Huntington Avenue with a minimum interruption of service. Instead of using mixed concrete as is the usual practice, which requires that the track be supported to line and grade by blocking, bracing, etc., this track was brought to line and grade with dry broken stone ballast and the voids filled with cement grout, a vibrating machine being used to assure proper penetration.

In the design of this track structure the total depth is 12 in. At the bottom is a 3-in. layer of broken stone. Good quality, clean, 2-in. trap rock was used for this purpose. International steel Twin Ties spaced 6 ft. center to center were laid on the broken stone. The rail used was 7-in. grooved girder, with rolled steel joint plates, carbon arc seam welded. Another layer of broken stone was then placed, making the total depth 9 in. to the subgrade. Next, the ballast was thoroughly tamped and the track brought to correct line and grade.

After this had been done grout was poured into the voids. For this purpose a mixture of one part cement, two parts fine bank sand, and water was used. The bank sand was considered to be preferable to sea sand on account of the presence of a large amount of shell in the latter. Sufficient water was used to make the grout flow easily and penetrate to the bottom of the broken stone.

Penetration was aided by the use of a vibrator. The duration of vibration considered necessary to give complete penetration was four minutes. Tests made by the Massachusetts Institute of Technology of the concrete produced by this method showed that it was strong and of good quality. A 3-in. layer of sheet asphalt was laid on the concrete to constitute the paving surface.

This method of construction is similar in certain respects to that of the Hassam pavement which was at one time widely used in the vicinity of Boston and elsewhere. It is believed by H. M. Steward, superintendent of maintenance, to possess an important advantage in that it permits the use of the track by cars at a much earlier period than is possible where mixed concrete is used. In fact it is believed that cars can safely
The weight of the Boston Elevated wrecking truck is about 12,800 lb. and it was estimated that it lifted one-half the weight of the gas company's truck, or 2,500 lb., so that the total weight on the unsupported track was 15,300 lb.

The tracks were damaged very little as a result of the water break and the removal of the gas company's truck. The in-bound track, being unsupported for a distance of 30 ft., sagged of its own weight slightly. The out-bound track, however, remained to proper surface.

The pavement in the space between the two tracks was broken through in order to facilitate the placing of shoring to support the tracks and to allow the city departments to make the necessary repairs. Has this not been necessary, the concrete and asphalt pavement would have remained intact for the entire track area—that is, the tracks, the dummy and the brows.

When the repairs to the underground structures were made, car service was resumed on both tracks, these tracks being supported by shoring. No further repairs to the tracks were necessary except to replace the pavement. The excavation caused by the water has been filled in, but the shoring supporting the tracks was allowed to remain in place, as the final settlement of the fill will not take place for a considerable period. This occurrence furnished an interesting demonstration of the solidity of a structure of this design.
Double-Milling Rail Heads to Prevent Cupping at Joints

By Howard H. George
Superintendent of Way Cleveland Railway

PROBABLY no part of the track structure has given more trouble than the joint, and it has been the subject of a large amount of study and investigation. The goal toward which railway engineers have been striving has been a joint which would have a life equal to the rail without cupping, but the number which produce such results has been rather small as compared with the total number installed. Assuming that splice bars are of a suitable design, that an adequate seam weld has been provided and that the mechanical assembly of the joint has been properly made, there is only one factor left, which is generally responsible for past failures. That is the flowing of the rail steel into the small gap between the rail ends which soon causes the head of the remaining rail to cup.

For a number of years it was the general practice to specify rail ends to be milled square. In practice, however, it was found that it was impossible to mill these rails exactly square and that sometimes the rail bases of the abutting rail ends made contact before the heads. This, of course, made it impossible to close the gap. To overcome this difficulty the specifications were revised to provide for undercutting all rail ends from head to base, thus insuring initial head to head contact when the joint was first assembled. This has been the practice for several years and is the method now generally followed. Since the rails are undercut for their entire depth, however, as the head wears down there develops an opening between the ends of the rails. As the gap widens, metal from the head of the sending rail flows down into the opening, allowing the car wheel to strike a blow on the receiving rail, the result being the relatively early appearance of rail cupping.

Electric railway engineers have long sought to eliminate, or at least minimize this trouble, resort frequently being had to the use of shims. During the present year, the writer arranged with one of the rail manufacturers to experiment with the double-milling of rail ends as developed in the way committee of the American Electric Railway Engineering Association about four years ago and later patented by E. M. T. Ryder, way engineer of the Third Avenue Railway. The method followed is shown on the accompanying sketch. The rails were first undercut in accordance with existing standard practice and then the heads were milled square. Each rail was carefully checked at the milling machine by the machine operator and also by the inspector.

Accompanying photographs show clearly the difference in the results obtained, as between the standard undercutting and the square milling of the heads. These joints were made up in the usual way by drifting the rail ends together with 1/4-in. diameter drift pins, reaming the holes and bolting up with 1/4-in. diameter heat-treated bolts. The joints were then seam-welded, using the hand feed method of welding with extra low carbon welding rods. The splice bars have a carbon content between 0.2 and 0.3. They were then machined through, as shown, to expose the conditions in the center of the joint. The practically perfect contact of rail ends throughout the entire depth of the head as well as the perfect contact along the fishing surfaces are felt to constitute ample justification for the additional expenditure of 75 cents per ton involved in the extra milling operation.

Deep Crankcase Pans Prove Advantageous

INCREASING by 2 in. the depth of bus crankcase pans has proved advantageous for the International Railway of Buffalo, N. Y. The oil capacity is increased approximately 77 per cent. This increase in possible oil storage has served to eliminate the mid-day follow-up of buses for the purpose of adding oil to motor crankcases. Buses are getting approximately 28 miles to a quart of oil. Old crankcases held 9 qt. of oil, while the new and deeper crankcase pan holds 16 qt. of oil.
One-Man Long Level*

By R. B. Evans
Assistant Superintendent of Construction
Cleveland Railway

In checking the level of the subgrade and the stone track foundation it is often necessary to use a level board longer than ordinary. To facilitate this work, the Cleveland Railway has designed a long level board which can be handled by one man. This board is 10 ft. long, 1 1/2 in. wide and 4 in. high in the center, tapering to 2 1/4 in. on either end. A strip of sheet metal is fastened to the bottom side to preserve its wearing surface. At the free end of the board is placed a level glass where it is easily seen by the operator. At the same end there is also a graduated metal gaging rod, which can be set to any distance desired, being held in position with a setscrew.

Pavement Straight Edge*

By P. H. Costello
Paving Inspector Cleveland Railway

Greatly improved pavement surface and increased production per man have resulted from the use of a "pavement straight edge" made in the Cleveland Railway shops. This new device has also made it unnecessary for a workman to follow the pavers to raise or lower inaccurately placed stones. Past experience on the Cleveland Railway indicated that, when laying granite block pavement in the track area, the paver did not always lay the block to a uniform surface. Use of the new "pavement straight edge" has corrected this.

Spray Equipment Effective for Weed Killing*

By A. G. Pirkle
Georgia Power Company, Atlanta, Ga.

For removing weeds from between tracks the Georgia Power Company has designed a spray equipment for distributing a weed-killing chemical. This apparatus is erected on a flat car and connected by pipes to a tank carrying the solution. The spray equipment is moved over the roadbed by a sand car, which is equipped with an air compressor. Compressed air is brought by means of a hose to the tank containing the solution, which is then forced out through nozzles at the desired pressure. The chemical used is non-poisonous and is shipped in a concentrated form which must be diluted by taking 4 gal. of water and 1 gal. of the concentrate. After the solution is made it is agitated about ten minutes by applying...
a pressure of 30 lb. of air through a perforated pipe running the full length of the tank, the top of which is left open. At a working pressure of 30 lb. per sq.in., each of seven small nozzles sprays 8½ gal. per minute and each of two large nozzles sprays 24 gal. Thus the total capacity is 107½ gal. per minute. This requires an air compressor which has a capacity of at least 60 cu.ft. of air per minute.

Manufacturer’s specifications call for 472 gal. of diluted solution per mile. To discharge that amount, a speed of about 40 m.p.h. is required. While operating, the car is run as near to that speed as can be estimated by the motorman. The spray nozzles are controlled by individual valves, which makes it possible to apply the chemical only where vegetation exists. When all nozzles are open, the width of the spray is about 15 ft. This method is more economical than the old method of hand weeding. In three days all weeds were killed in a track area of more than 20 miles of single track, thus making it possible to have a clean roadbed during the entire growing season. Concentrated chemical totaling 1,473 gal. was used, which at 38 cents per gallon cost $567.92. Labor cost for the three days was $922.94, five men being employed where four could have done the job. The total cost was $660.86 for 20.08 miles of single track, or $32.91 per mile.

Distinctive Features in Sample Car
Built by St. Louis Public Service Company

IN THE past two or three years a number of experimental and sample cars have been constructed by the electric railways and manufacturers. All of these have embodied new ideas in their design and have contributed to the development of the modern car to suit present-day needs. The latest car to make its appearance is a sample car recently completed for the St. Louis Public Service Company, St. Louis, Mo. Like the others, the St. Louis car has in addition to certain features tried in other cars a number of new ones. Among its interesting features are automatic pedal control, resembling in the arrangement of the pedals that of an automobile, a switch to hold the controller in full series position, a pedal for preventing emergency braking when the hand is released from the dead-man control, a control panel for the buttons and levers operating the gong, sand, doors, emergency braking and heaters, a standiong arrangement in the front which makes fare collection for the one-man operator easier, extensive use of aluminum throughout the car, equal mounting of equipment underneath the car, a reverser control mounted in a pedestal at the rear, a motor-operated fare box and an attractive appearance, both exterior and interior. As the car includes those elements of design which the company feels are desirable for standard service on its system, the company plans to use it as a sample when ordering new equipment as needed. Westinghouse electro-pneumatic control, actuated with line current, is installed in the car. It is the VA variable automatic type, switch-operated. The master control, operated by a pedal, is mounted in a cabinet recessed in the floor. The air brakes, of General Electric design, are operated manually, with a self-lapping valve. The arrangement of the two pedals differs from previous installations in that the pedal for acceleration is on the right and the pedal for braking on the left. This change was made to make the operation of the car more nearly like that of an automobile, and hence more natural for most motormen. Both pedals are depressed with the right foot, so that in both braking and accelerating the action for the right foot is the same as in starting and stopping an automobile. In starting, the brake pedal is released and the accelerator pedal on the right depressed; in stopping the procedure is simply reversed. Of course with no gears to shift and no clutch pedal to operate the left foot remains idle.

A pleasing appearance was obtained by a low roof, a 5-in. skirt below the side sill and streamline painting.

Electric Railway Journal—February, 1930
Unit switches for the control are mounted in a cabinet at the rear of the motorman, another departure from usual practice. This cabinet extends out from the side of the car making a partition between the motorman's compartment and the remainder of the car. Action of the various control switches is obtained through an air-operated sequence drum. Another innovation is a series control switch which stops the advance of the control when full series position is reached. This is particularly useful for switching and operating at slow speeds through congested downtown districts.

Immediately in front of the operator's seat and over the two pedals is a control panel on which are mounted a brake-locking switch, controls for both the front entrance and center exit doors, a dead-man control button, a handhold, and buttons for operating a gong, releasing sand and controlling a heater circuit.

**NEW TYPE OF DEADMAN CONTROL**

If the motorman wishes to leave his position at the front of the car he may do so by locking the brakes with a device on the control panel. The dead-man control button is located at a convenient position for the left hand. In a corresponding position on the right is a handhold of the same size and shape for the operator's right hand. If the operator wishes to remove his hand from the dead-man control button he may prevent an emergency braking by depressing a pedal near the floor. The heater circuit is controlled by two buttons so that the heater current can be utilized for throwing track switches. These buttons have absolute control regardless of the thermostat standing.

In addition to the regular reverser at the front of the car there is a second, located in the center of the semi-circular rear end. A Westinghouse drum control switch and a General Electric brake valve are mounted in the enclosed pedestal. To operate the reverser, the cover is simply released and slid up a stanchion to a resting position. An automatic gong in the base of the pedestal is a further help for the operator in backing up his car.

Entrance is gained to the car through double outward-folding doors at the front. By locating stanchions in the front vestibule as shown in an accompanying illustration, it is possible for a large number to board the car, yet all must pass by the fare box in single file. This allows quick loading and positive collection from every passenger. Two half-seats on the left side at the front allow free passage for the passengers after leaving the fare box. The circulating load principle is employed, the passengers leaving by treadle-operated sliding doors in the center. Fare collection is made with a Johnson fare box, operated with an air motor. It is lighted by a lamp in a specially constructed reflector box with louver construction, which allows good lighting of the fare box but prevents the light from glowing at the operator or boarding passengers.

Aluminum was used for practically the entire body. Body bolsters, stanchions, conduits for wiring, posts, letterboard and carlings (one at each post) are all of this metal. Aluminum was used also for all of the ceiling except the circular ends which are of Agasote. Almost all air brake and door control piping is of copper with brass fittings. Air compressors and reservoirs were located under the rear of the car to give a more even distribution of weight between the front and rear trucks. The car has a total weight of 36,180 lb., divided 19,380 lb. for the body, 10,800 lb. for the trucks and 6,000 lb. for the motors.

Careful attention was given to obtaining a pleasing appearance, both exterior and interior. With a narrow letterboard, low roof, streamline painting and a skirt, obtained by extending the side plate 5 in. below the side sill, a racy appearance was obtained. A wide single-piece window, equipped with two vertical-acting window wipers, a dash-lighting headlight and a sun visor, gives a distinctive air to the front. The car exterior is finished in orange and cream, trimmed in red. Its roof is gray and the window guards and lettering are black. With 26 cross-seats, three single seats and provision for seven passengers in a circular seat at the rear, the car has a total seating capacity of 62.

**Repair of Interchangeable Bearings**

*BY MAX FEIGENSPAN*

_Mechanic Hamburg Elevated Railway_  
_Hamburg, Germany_

_Finish bench for reaming and finishing relined bearings in the Hamburg Elevated Railway shops_

**FINISHING** bearings which have just received a new lining is greatly simplified by the use of a specially constructed portable bench in the shops of the Hamburg Elevated Railway. The bench is provided with four vises, each of which holds the bearing in a different position. This facilitates the finishing of its surface on all sides. After reaming has been completed the bearing can be placed in the center vise in a nearly horizontal position and further finished by hand if this is desirable. Bearings are held in place by adjustable claws.

*Submitted in Electric Railway Journal Prize Contest.*
Causes of Wheel Failure Studied at Havana

BY OTTO GOTTSCHALK
Engineer Car Equipment Department
Havana Electric Railway

RECENTLY it came to our attention in Havana that
none of our cast-iron chilled car wheels were being
removed because of wear on the tread, but rather because
of low flanges due to chipping. This called forth an
investigation which brought us to the conclusion that
the chipping was due to a combination of two condi-
tions: first, flange-bearing switches, mates and frogs; second, method of molding and chilling the wheel.

The Havana Electric Railway operates 600 single-
truck cars, all equipped with cast-iron chilled wheels
of 30-in. diameter, 2¼-in. tread and ¾-in. flange. In the
city the track consists of grooved running rails with
numerous sharp curves, switches and crossovers. The
crossovers, switches and mates are of the flange-bearing
type. Outside the city the track system consists of tee
rails, non-flange-bearing switches, frogs and crossovers.
Storage tracks in yards are of the same construction.

Our records showed that over a period of six years
the average life of wheels was 36,000 miles. This low
figure was due to the precautions taken to prevent derail-
ments in operating cars on the tee rail. Wheels with
low and chipped flanges were removed for fear of derail-
ment on the tee rail while they could have been oper-
ated safely over the grooved rail in the city of Havana.

Various explanations were offered for this chipping.
It was suggested that wheels were not properly installed
on the axles. Sharp curves, improper alignment of
track, rough spots due to rail welding, etc., were also
suggested as possible sources of trouble. Probably all
of these contributed to some extent. However, we
found one of the chief difficulties to be that the bend
of metal left on the top of the flange of non-chilled back
flanges broke or chipped little by little when passing
through crossovers or frogs and more so when passing
through switches and mates. The chipping was found to
be a detail process up to a certain point; then larger
pieces of metal broke off, resulting in a condition
that might cause a derailment in operation over tee rail.

To test our theory we placed a number of wheels in
service with non-chilled back flanges that had this bead
of metal ground off, taking care during the grinding to
prevent undue heating which would soften the chill. The
average mileage obtained from these wheels was 42,000
miles.

Manufacturers have now developed the chilled-back
flange wheel, claiming for it that the change in grain of
the metal increases the average mileage per wheel. We
believe this to be true, although the change in the grain
is not the principal cause. It is rather that the extension
of the chill blocks when molding causes the slight bead
of metal formerly left on the top of the flange to be left
on the outside, so that the contour of the flange at the
point of contact with the flange-bearing switches, mates
and crossovers is left in a perfect condition, almost as if
it had been turned in a lathe.

Despite this improvement we have continued to expe-
rience a certain amount of trouble from chipped flanges,
and we have come to the conclusion that it is not fair to
expect even a perfect flange of a cast-iron chilled wheel,
with its brittle metal, to support a car and its passenger
load when passing through and over flange-bearing
switches, mates and crossovers, though the period of
such strain is only of momentary duration. The tread
of the wheel was designed to carry the load. Men were
not intended to walk on their toes. How long could
men do this stunt without a breakdown?

If cast-iron wheels give a greater return on the invest-
ment than steel wheels, then we must eliminate the
flange-bearing switches, mates and crossovers.

Flexible Rail Joint Tried at Providence

EXPERIMENTS are being made by the United Elec-
tric Railways of Providence, R. I., to determine
whether or not advantages can be obtained by the use
of a welded rail joint differing in principle from those
commonly used. The design of this joint, known as the
Moisselle joint, provides a round bar which is welded
to the rail heads and which has a U-shaped bend op-
posite the rail ends, making the joint flexible rather than
rigid. About a year and a half ago, 175 of these joints
were installed on various rail sections including 9-in.
girder, 8-in. high T, and 66-lb., 70-lb. and 75-lb. T rail.
An inspection a year later showed a few partial failures
which were attributed to the use of weld bars which
were too small and to defective welding. The record of
these joints was considered by H. W. Sanborn, chief
engineer, to be good enough, however, to warrant a trial
of 50 additional rail joints of the same type. Larger
bars were used in the later installation. The features of
the joint which particularly appealed to the manage-
ment were its ease of installation, the absence of necess-
ity for any mechanical fit in the fishing section and the flex-
ibility due to the bend in the bar which is thought to
eliminate the blow on the receiving rail and also to pro-
vide for expansion and contraction.

Single-truck cars and sharp curves are typical of electric railway operation in Havana

Flexible Rail Joint Tried at Providence

EXPERIMENTS are being made by the United Elec-
tric Railways of Providence, R. I., to determine
whether or not advantages can be obtained by the use
of a welded rail joint differing in principle from those
commonly used. The design of this joint, known as the
Moisselle joint, provides a round bar which is welded
to the rail heads and which has a U-shaped bend op-
posite the rail ends, making the joint flexible rather than
rigid. About a year and a half ago, 175 of these joints
were installed on various rail sections including 9-in.
girder, 8-in. high T, and 66-lb., 70-lb. and 75-lb. T rail.
An inspection a year later showed a few partial failures
which were attributed to the use of weld bars which
were too small and to defective welding. The record of
these joints was considered by H. W. Sanborn, chief
engineer, to be good enough, however, to warrant a trial
of 50 additional rail joints of the same type. Larger
bars were used in the later installation. The features of
the joint which particularly appealed to the manage-
ment were its ease of installation, the absence of necess-
ity for any mechanical fit in the fishing section and the flex-
ibility due to the bend in the bar which is thought to
eliminate the blow on the receiving rail and also to pro-
vide for expansion and contraction.

Flexible Rail Joint Tried at Providence

EXPERIMENTS are being made by the United Elec-
tric Railways of Providence, R. I., to determine
whether or not advantages can be obtained by the use
of a welded rail joint differing in principle from those
commonly used. The design of this joint, known as the
Moisselle joint, provides a round bar which is welded
to the rail heads and which has a U-shaped bend op-
posite the rail ends, making the joint flexible rather than
rigid. About a year and a half ago, 175 of these joints
were installed on various rail sections including 9-in.
girder, 8-in. high T, and 66-lb., 70-lb. and 75-lb. T rail.
An inspection a year later showed a few partial failures
which were attributed to the use of weld bars which
were too small and to defective welding. The record of
these joints was considered by H. W. Sanborn, chief
engineer, to be good enough, however, to warrant a trial
of 50 additional rail joints of the same type. Larger
bars were used in the later installation. The features of
the joint which particularly appealed to the manage-
ment were its ease of installation, the absence of necess-
ity for any mechanical fit in the fishing section and the flex-
ibility due to the bend in the bar which is thought to
eliminate the blow on the receiving rail and also to pro-
vide for expansion and contraction.
Combination Tie Plate for Various Rails*

BY W. S. YEATS
Georgia Power Company, Atlanta, Ga.

To obtain the full life of a creosoted tie it is necessary to protect it from mechanical injury. If rails start to cut in, decay will follow and ties must be removed sooner than if they had been protected.

To prevent this type of wear the Georgia Power Company uses tie plates in various sizes to fit the different rail widths which are found on the property. The tie plate used by the company has simplified the problems of the track foreman because it fits the bases of rail of 4½ in. to 6 in. width by ½ in. intervals. Either two or three spikes per plate may be used, and the form of the hole is such that the spikes are backed up by the plate. This tie plate has been used by the Georgia Power Company since 1923, during which time it has been entirely satisfactory.

Axle and Armature Bearing Jig*

BY HERBERT SENIOR
Foreman Louisville Railway

For turning axle and armature bearings a special jig is used in the shops of the Louisville Railway. This consists of a bearing centering plate and a bearing clamp collar. When starting the operation it is necessary to face the bearing at the split surface, after which the bearing clamp collar is put on to hold the bearing halves together. When this is finished, the bearing is chucked and the tailstock is screwed against the center plate to force the four center pins in the bearing, as shown in the accompanying drawing.

When these operations have been performed the bearing clamp collar is released and is moved back over the tailstock. The bearing is then ready for turning with only one setting of the tool.

All reclaimed bearings are welded on the two halves, after which they are spread over a mandrel ¼ in. larger than standard size and then finished in the jig described. After the bearings have been turned on the outside to the required dimension, the outside of the collar and the inside of the bearing are finished to the required size.

Testing Circuit Breakers in Place*

BY R. W. JAMES
Electrical Department Ottawa Electric Railway
Ottawa, Canada

It has been found advantageous on the cars of the Ottawa Electric Railway to set the line switches and circuit breakers at definite points and then to seal them so that they cannot be tampered with, either by car operators or carhouse employees, without the knowledge of the line switch repairman.

To test and calibrate the line switches in place on the car, a testing set has been developed by the electrical department. This is installed in one of the pits in the

*Submitted in Electric Railway Journal Prize Contest.
New Products for the Railways’ Use

Improved Headlight Resistance

Greater efficiency of the individual units and easier maintenance are advantages claimed for a new headlight resistance recently placed on the market by the Ohio Brass Company. The units are of the exposed wire type instead of having covered wire, thus affording maximum opportunity for heat radiation. Ventilation is aided by two baffles mounted on top of the resistance, forming a duct for air circulation.

In order to make up for possible variations in line voltage, a sliding shunt is attached to two adjacent tubes by which the desired amount of current is delivered to the lamp. There are no exposed operating parts in the new resistance, and the cover may be readily removed without danger of losing the holding ratchets, which are securely fastened to the base. In place of the “pig tails” that were formerly used as connections, the new units are joined with brass strips which have completely overcome sagging and the resultant danger of grounded contacts.

Novel Lubricating System for Roller Bearings

Simplicity of construction marks the new Fafnir-Melcher roller bearing for railway journals. A sleeve comprising the inner race, a roller assembly, and an outer housing in which the roller path is integral, are the three main parts. The sleeve, being shrunk on or on the axle, furnishes a hard and wear-resisting surface for the operation of the rollers. Alignment and flexibility are provided for in the design of the box. The rollers need take only radial load as all lateral thrust is absorbed by bronze thrust bearings, which, due to efficient lubrication, have a life equal to any other part of the bearing. The housing or box itself is composed of three parts: the front cover, containing the oil seal grooves and dust guard; the center member, in which is embodied the roller path equalizer seat and the pedestal flanges, and the oil reservoir.

A special alloy is used for this center member, and the roller path is heat-treated and ground to a minimum tolerance, thus assuring accurate fits, concentricity, and a wearing surface equal to or better than that of the separate outer race type. An advantage of this construction is the greater wall thickness permitted, which naturally increases the strength of the box, but still remains within A.E.R.A. standard pedestal dimensions.

The assembly consists of two sets
of flexible rollers each contained in a spacer bar cage. The separator bars between each of the rollers permit better lubrication, as well as positive alignment of the individual rollers at all times. A feature of the bearing is the circulating and filtering lubricating system, which provides a constant circulation or flow of from 15 to 30 drops of filtered oil per minute through the bearing. The important element is a wick which draws oil from the reservoir to the axle, whence by centrifugal action it is carried to the roller path, through the rollers and back to the well again.

Demountable Wheel for Rail Cars

WITH the new Fairmont demountable wheel for rail cars, it is possible, instead of discarding the whole wheel when a tire wears out, simply to remove eight \( \frac{1}{8} \)-in. nuts and press on a steel wheel blank or tire, which is bolted to the hub and remains permanently in position on the axle. The bolt circle is \( \frac{8}{3} \) in. instead of the usual 5 in. Stout parkerized lock washers secure the nuts. As the Fairmont hub is not pulled from the axle, no time is lost in refitting spoiled insulation. There is no re-gaging and re-aligning of wheels every time a tire wears out.

The bolted hub makes it possible for the car operator to keep his car safe by tightening the nut with an ordinary wrench, if any bolt loosens. With riveted hubs, no tightening is possible, and there is always a temptation for the car operator to continue to use the car until such time as it is more convenient to change the dangerous wheel which has loose hub rivets.

Since but two sizes of rims (16-in. and 20-in.) need be carried, and these fit every hub on the line regardless of axle size or taper, a maximum stock of 50 tires is ample, where hundreds of complete wheels were formerly stocked. After all cars are once equipped with bolted hubs, a hub stock of one or two of each size is ample, for the light hubs are subject to practically no wear. Fairmont tires are furnished in both \( \frac{1}{8} \)-in. and \( \frac{3}{16} \)-in. plate, and nest handily in vertical stacks. A large wheel stock can thus be kept in one small room, and the few reserve hubs can be kept in small bins.

The application of Fairmont hubs, which are furnished in any size and taper of bore, reduces the wheel stock for all cars to two tire sizes (or four items if both \( \frac{1}{4} \)-in. and \( \frac{3}{16} \)-in. tires are used).

Light-Weight Spray-Painting Outfit

CONVENIENT portable apparatus for light-duty spray painting has recently been put on the market by the De Vilbiss Company. The light weight and compact size of this outfit make it extremely handy. The specially designed air compressor, and 4-hp universal electric motor which drives it, weigh only \( \frac{5}{2} \) lb. The spray gun weighs only \( \frac{1}{4} \) lb. and is said not to tire the arm even with long-continued use.

This apparatus has special features which are said to give it large capacity and unusual efficiency. The high air pressure produced by the powerful little motor and the design of the pressure-feed spray gun produce a complete, fine atomization of the material and assure the same good results achieved by high capacity outfits. Easy adjustments of the air cap of the gun enable the operator to atomize perfectly any of the various paints, lacquers or material that may be in use.

Two air caps give a choice of round spray or a full fan spray several inches wide. The pint size glass container has standard Mason jar thread. Ordinary Mason jars can be used for extra containers. The gun body and compressor housing are of high-grade aluminum alloy. Nozzle caps, fluid tip, valves and other parts are of brass, nickel-plated and nicely finished. It is designed to plug into any 110-volt electric socket. The complete unit consists of the Type GT spray gun, rotary compressor with switch, 15 ft. of air hose, and connections, 10-ft. extension cord and plug, and brass wire for cleaning.

Heavy-Duty Circular Saw for Track Work

TO FACILITATE the cutting of heavy timber the De Walt Products Corporation of Lancaster, Pennsylvania, has developed a heavy-duty electrically driven circular saw. One man can operate this machine, feeding the saw with a hand ratchet gear feed or by chain feed on the arm of the machine. This arm may be raised or lowered to depths of cut. Saw blades up to 36 in. are provided to handle 12-in.x20-in. material. The saw blade operates at 1,750 r.p.m. and is direct-driven by motor operated on either alternating or direct current in 220 to 550 volts.

This machine comes in two sizes, Models L and T, the capacity of the L type being 12x12 in. material, while the capacity of the T type is 12x20 in. The larger type is mounted on a metal table equipped with all-steel conveyor rollers for easy handling. The elevating device is operated by a wheel in front of the table which gives rapid elevation and ease in operation.

Light-weight spray-painting outfit manufactured by the De Vilbiss Company
Philadelphia Wrought Up Over Transit Tangle

The Suit in Equity Brought by the City Results in Lively Sessions and Sensational Comment—A New Deal Is Likely

EARLY in January hearings were begun before presiding Judge Harry S. McDevitt in Common Pleas Court in Philadelphia in the equity suit brought by City Commission and public Adley against the Mitten corporations, not only demanding a complete audit but asking for the end of Mitten Management's control of the transit system. After a few sessions the court observed that things were "going from bad to worse" and the result was that the equity suit hearings were transformed into a series of round-table conferences which, as indicated in Electric Railway Journal News for Jan. 25, may mark the birth of a new transit policy for the city. Behind closed doors in Judge McDevitt's court room Mayor Mackey, Deputy Comptroller S. Davis Wilson and representatives of the City Council and the Mitten interests decided that four transit experts, one each for the four persons or groups represented, would be designated to formulate recommendations as to the future of the transportation system.

NEW RELATIONSHIP MAY RESULT

The way was thus opened for a re-adjusted relationship of the city and the rapid transit company that may involve the municipal condemnation of the entire transit system, the ousting of the Mitten interests as managers and the appointment of a new managerial organization. Certainly the developments are attracting wide attention, so much so that they have been made the topic of a special article in the New York Times by Lawrence Davies. This observer even goes so far as to say that despite denials from one or two of the concerns mentioned in the speculation, suggestions in political and financial quarters that the move for a "re-deal" has the backing of interested bankers and public utility corporations eager to gain a foothold in the Philadelphia transportation field have won credence in the last few days. The early days of the equity suit were spent in the bickering of opposing counsel in revealing intricate phases of the financial arrangements that the Mitten interests have made to take over the control of the transit system. At a hearing held last week Judge McDevitt charged that Thomas E. Mitten and his son and successor, Dr. A. A. Mitten, were sole owners of the stock of Mitten Management, Inc., which collected an annual fee of $1,100,000 for P.R.T. operation; in adducing from the city's representatives on the P.R.T. board, Joseph S. McCulloch and Ernest T. Trigg, that they knew little of the company's operations, especially Wilson paid no attention to actions; and in warnings from the judge that the case must be tried in court and not in the newspapers.

This last act followed the release to the newspapers of the city's answer in the suit before Deputy Comptroller Wilson, its chief of counsel, had turned the papers over to the court. After Mitten lawyers had described the answer as "vitrificatory, defamatory, malicious and scandalous" Judge McDevitt received Mr. Wilson's apology and ordered him to file an amended paper with the "vitrificatory" comment deleted.

Ellis Ames Ballard and associated counsel for the Mitten interests have taken the position that although the late Thomas E. Mitten dominated the transit company's affairs, his domination had brought the P.R.T. operation to "as high a plane of excellence as that attained by any surface street railway in any metropolitan area in the United States, and that the relations existing between the men and management had been brought to a degree of harmony unsurpassed in any other community." They have contended that the regulatory power and jurisdiction over the P.R.T. methods and classification of its accounts rests exclusively with the Public Service Commission. The hearings have had their amusing incidents as well as the revelations that produced headlines for the Philadelphia papers. Deputy Comptroller Wilson, although not a full-fledged member of the bar, was authorized to prosecute the suit, but was assisted by Assistant City Solicitor John J. Elcock, Mr. Elcock one day protested to Judge McDevitt that Mr. McDevitt left the witness stand and then returned. All he had to do was sit and twiddle his thumbs. The judge bade him find a comfortable seat and cease speaking about "the public understands the situation."

Former Senator George Wharton Pepper, former Judge James Gay Gordon and other prominent lawyers associated with the Mitten side, have been by turns enraged, exasperated and caustically tolerant of Mr. Wilson's prosecution tactics. That Mr. Wilson's methods have been unorthodox even the critical Philadelphia Record has been forced to admit. Of him that paper felt required

(Late News Continued on Page 112)

Electric Railway Journal—February, 1930

111
New Orleans, La.—For the first time since the beginning of the beautification work on Canal Street, which necessitated the closure of the New Orleans Public Service, Inc. lines, six lines using tracks in this street resumed operations there on Jan. 19. The new rerouting is expected to facilitate the movement of traffic in Canal Street, lessen congestion, and speed up the railway service.

New York, N. Y.—The Regional Plan Committee made public on Jan. 25 the detailed studies of its engineering staff on the subject of the Brooklyn and Queens approaches to the projected 39th Street-East River vehicular tunnel. They have an important bearing on the recently announced proposal of the New York Metropolitan Transportation Authority for a new 34th Street vehicular tunnel for a highway connection between Long Island and Weehawken, N. J. Several months were required by the engineers for their studies.

Kennebec, Me.—Directors of the Augusta & Kennebec Railway deferred payment of the dividend on Dec. 1, 1929, on the company's 6 per cent cumulative preferred stock.

Dayton, Ohio—The Cincinnati & Lake Erie Railroad has formed an honor club for employees of its predecessor companies who have served continuous service of 25 years or more. At the organization banquet on Jan. 22, 39 employees, eligible for membership, and 22 members of the men's club were honored by Dr. Thomas Conway, Jr., president of the railroad.

Philadelphia, Pa.—Backers of the project of a competitive taxicab service have appealed to the Superior Court against the ruling of the Public Service Commission assuming to grant a franchise in this field to Philadelphia Rapid Transit & Mitten Management. The position of the commission in its ruling was that “the time has come when regulated monopoly is the best means of taxicab operation.”

Washington, D. C.—The Parker bill, for regulation of buses operating in interstate commerce, was considered in executive session on Jan. 24 by the interstate commerce committee of the House. The committee voted in favor of the provision requiring certificates of public necessity and convenience before any buses are permitted to operate in interstate commerce. It is said that the bill will be reported favorably to the House very soon.

New York, N. Y.—At a meeting of the Board of Estimate on Jan. 24 at which the matter of granting a franchise for a bus line in Brownsville, Brooklyn, to the Eastern Parkway, Broadway & East New York Transit Relief Association came up, Mayor Walker announced that consideration of the franchise would be deferred until April 25, asserting the city was not in the mood for granting a franchise to this or any other company until the Legislature had disposed of his bill, now pending, which would provide united bus transportation.

Geneva, N. Y.—The Public Service Commission has approved the assignment by the Geneva Railway Bus Lines, Inc., to the Colonial Motor Coach Corporation, of the health of granted by the franchise to the company on Jan. 29, 1929. The certificate covers the automatic bus line running from Geneva to Seneca Falls. The commission also granted an amended approval to the certificate calling for operation over other streets than those named in the original consent by the city.

Seattle, Wash.—Salesmanship on the part of trainmen and others that will resell street car and city bus service to those who have gradually withdrawing their patronage from the Municipal Railway during the last few years has been demanded by George B. Averly, superintendent of public utilities.

Boston, Mass.—The Boston Elevated Railway is advertising in display space in the daily press with the title of “The Best American Railway Company” in the Brady Award contest, in which, in its class, the company was declared to have done most “to conserve the safety, comfort and convenience of the public and its employees,” in 1928.

Detroit, Mich.—The Detroit & Port Huron Shore Line Railway, the Rapid Railway and the Port Huron City Electric Railway have been sold at public auction to Roger I. Martinus and Augustus C. Ledyard, representing the bondholders protective association, on their bid of $300,000. There were no other bids. The sale is subject to confirmation of the Charles C. Simons of the federal court.

Atlanta, Ga.—A new issue of Georgia Power & Light Company's preferred stock was placed on the market Jan. 1. This stock is offered for sale at $100 per share plus accrued dividends, both for cash and on a part payment plan. It is cumulative and is redeemable at $110 per share plus accrued dividend. Employees are being paid a special commission of $1 per share for selling this stock.

Bloomington, III.—The Illinois Power & Light Corporation has formally accepted the new twenty-year franchise with terms practically the same as those of the preceding contract, except that wider latitude is given to the company in the establishment of bus lines to supplement railway lines.

Syracuse, N. Y.—The committee representing the New York State Railways 50-year first consolidated mortgage bonds series "A" and "B" has announced an extension of time for the deposit of the bonds to Feb. 18, 1930. Receivers for the New York State Railways were appointed on Dec. 30, 1929, by the United States District Court for the Northern District of New York and they are now operating the properties.

New Orleans, La.—Records up to Jan. 2 show the bombing of 64 trolley cars of the New Orleans Public Service, Inc., since the strike of union crews last July.

Evansville, Ind.—The Evansville & Ohio Valley Railway, operating a railroad and bus service from Evansville to Rockport and Brownsville, Ind., and bus lines to Mount Vernon, Ind., Tell City and Cannelton, Ind., and Henderson and Owensboro, Ky., is advertising its most intensive ad campaign in the Evansville and Owensboro newspapers. According to Ray Millican, general manager, the newspaper has started well with the company's passengers and freight, which showing a nice increase over the corresponding period last year.

St. Louis, Mo.—Murray J. Douglas, former president and secretary, respectively, of the St. Louis local of the Amalgamated Association, at the annual meeting of the Sick Benefit Association of the union are suing the Union Labor Insurance Agency and the Southern Surety Company to reinstate a contract for a sick and accident insurance for members of the union cancelled last October by the Southern Surety as improperly drawn. All claims prior to the cancellation of the contract were paid in full. The court is expected to compel the Southern Surety to pay all the claims that have come up since the cancellation.

Hartford, Conn.—The Connecticut Company discontinued its High Street bus franchise Jan. 26. The authority of the Public Utilities Commission, which accepted the declaration of the company that the route was unprofitable, frequent transportation over alternative routes, the commission believes, compensates for less frequent transportation afforded by the High Street service.

Washington, D. C.—The Washington Railway & Electric Company and the Capital Traction Company on Jan. 21 voiced their objections to Congress to the proposal for their merger sent to the Capitol by the Public Utilities Commission.

Alameda, Cal.—Arrangements have been practically completed between the city and the Key System Transit Company, whereby the Key System will operate street railway support the new electric trolleys to be installed on Park Street in Alameda between Clement Street and San Jose Avenue. Present plans call for the removal of all Key System trolley poles on this portion of Park Street. Trolley wires will be fastened directly to the electric trolleys.

Philadelphia, Pa.—The Council's transportation committee has selected Roosevelt Boulevard as the route for the construction of a $30,000,000 high-speed feeder line to the Broad Street Subway. The new subway will extend from Broad and Hunting Park Avenue along the boulevard to Pennypack Circle. The committee has also recommended that the Council employ Sol M. Schwab, former city consultant, to engage a transit expert to advise the legislative body in negotiations with P. R. T. for a new operating arrangement on the North Broad Street Subway. In addition the committee has approved an enabling ordinance appropriating $7,000,000 for the extension of the Market Street Subway's elevated tracks to the Schuykill River and authorizing the director of transit to advertise for proposals and enter into necessary contracts.
More Than $5,000
a Day from Third Avenue Buses

Receipts of the Third Avenue Railway, New York, from bus operation, between $5,000 and $6,000 a day. These bus receipts are not included in the receipts of the railway system, only net gross, and operation appears in the income statement. During the past year there were extraordinary expenses due to the installation of new line, equipment. The buses are being depreciated on the basis of a five-year life which takes care of the equipment notes issued for a larger part of the buses. Under these conditions, the bus operation showed a deficit of $287,775 for the year. It is believed that in a very short time the bus operation of the system will show profitable present operation with great possibilities for the future. President Fisher of the company.

"The threat of the destruction of trolley lines by bus competition has disappeared. The bus lines now in operation have been laid out in the main to feed and supplement existing trolley lines. It has been a long, tedious process of education both of ourselves and the communities in which we operate in arriving at fair and reasonable conditions of operation. We have had many municipal authorities to deal with in Westchester County, and it has taken time to reach a fair basis for carrying on a business that of necessity has to look somewhat to the future for its rewards."

Adding to Income with Package Service

The Lehigh Valley Transit Company, Allentown, Pa., has instituted a package service upon its Liberty Bell limited cars, which cover the 60 miles between Allentown and Philadelphia. Frequent requests have been made by firms with small parcels requiring quick delivery to Philadelphia and way points, to have the cars perform this service. It has not been a question of money; the requirement was fast delivery. Space was available in the motorman's cabin to transport a considerable number of packages without any inconvenience. The railway, therefore, announced that baggage tickets costing 50 cents could be secured. The packages or parcels are delivered by the sender at any of the baggage rooms along the route. Here they are loaded upon the cars, and dropped off at the various stops requested. Packages must be under 50 lb. in weight and must not exceed 4 cu.ft. in capacity.

More Maneuvering in Chicago

The Chicago City Council's local transportation committee on Jan. 27 unanimously voted an expenditure of $80,000 from the traction fund for the preparation of actual plans and specifications for a State Street subway. The specifications have been written into an ordinance for the construction of the subway by special assessment, with property owners subsidizing the construction cost.

At this same meeting John Maynard Harlan, attorney for an Eastern group seeking a franchise, charged that the committee of bankers appointed by Samuel Insull does not really exist, that A. W. Harris has never accepted his appointment, and that the committee would have difficulty in showing that it has ever met.

The Aldermen discussed and shelved for three weeks Alderman Guernsey's request that March 15 or April 1 be set as a date on which franchise contenders should submit transit ordinances. This was done because the sub-committee is working on an ordinance draft with the surface and elevated lines. Alderman Guernsey's plan for a subway in solid rock 125 ft. below street level was turned over to the engineers for study. On Jan. 21 the Chicago City Council's transportation sub-committee submitted a dozen changes which it has made in the new co-ordination ordinance to Attorney Walter L. Fisher, legal representative of Federal Judge James H. Wilkerson. The changes are all technical and tend to strengthen the city's position. If they pass Attorney Fisher, the changes will then be submitted to the local transportation companies and to the citizens' committee.

No Propaganda in Boston

Broadcasts

Radio broadcasts started by the Boston Elevated Railway, Boston, Mass., to stimulate patronage and increase good will toward the road have caused Representative Sullivan, of Dorchester, to protest to Governor Allen, asserting the broadcasts were being utilized to urge continuance of public control.

Chairman Harriman of the trustees of the company has replied that the purpose of the broadcasts was simple and direct, namely, to attract more riders to the system. He said in part:

"In recent years the trustees have appropriated moderate sums for advertising to stimulate riding. The radio broadcast is in line with this effort. We believe that the objects sought are all within the scope of legitimate advertising, that the returns will be commensurate with the small expenditure and that the effort indicates a management alert to the requirements of present business methods."

"It is not the intention of the trustees now or later to attempt in any way to influence the public mind with respect to the future organization of the Boston Elevated Railway. We intend simply to tell the facts with regard to the service as they are today and explain how the road has been operated under public control."

Mr. Harriman attached a list of electric railways using the radio for advertising purposes and an article from Aera explaining its use in this connection.

Ancillary Receivers for New York State Railways

Judge Adler in the United States District Court in Buffalo, N. Y., has appointed William T. Plumb and Benjamin E. Tilton as auxiliary receivers for the properties of the New York State Railways following an equity receivership action against the company brought by the General Finance Corporation, Utica. Judge Adler instructed them to continue the lines in operation and submit a detailed report of the condition of the company. The receivership order enjoins all creditor interests from instituting court actions against the receivers on past due claims.

Storm Hits Portland, Me.

Electric railway service at Portland, Me., was hampered severely during the week ended Dec. 21 by the double sleet storm which cut off all incoming power service and threw the lighting, power and railway load upon the Cape steam

Obstacles to Electric Railway Service in Portland

Electric Railway Journal—February, 1930

113
Philadelphia Wrought Up

**OVER TRANSIT TANGLE**

(Continued from Page 111)

In the interim A. A. Mitten, chairman of the board of the Philadelphia Rapid Transit Company, in an open letter to Edwin R. Cox, president of the City Council, has made a few suggestions as a basis for consideration and discussion of the lease by the city of the Broad Street subway.

To such data a new lease should be signed Philadelphia Rapid Transit will be underwritten from the city the loss which stands today at $800,000 and is being reduced at the rate of about $40,000 per month.

2. Philadelphia Rapid Transit will sign an agreement for the annual terms, new lease to run from year to year.

The lease shall contain the following terms:

(a) Philadelphia Rapid Transit to pay to the city monthly the net addition to its net earnings arising from Broad Street subway operation for the preceding month as reported by the board of ten which board should be continued for this purpose.

(b) In computing subway operating expenses the board shall include to cover general and management expenses 2 per cent of subway gross revenues; this percentage was included nothing on this account.

(c) In case for any reasons, such as opening subway extensions, increase of operation, the company shall be entitled to any repayment of the city, but such repayment shall be saved to the company and in lieu of increased revenues from subsequent months and thereafter P.R.T. payments to the city shall be resumed.

(d) Each lease to run from year to year terminable by either party at the end of the first or any later year on three months prior written notice.

Mr. Mitten stated in the letter that loss in addition to rental to P.R.T. for the full fifteen months period of operation of the subway amounted to $826,603, although for the month of November, as for several other recent months, the subway has proved a slight financial benefit to the city management and the Mitten Bank Securities Corporation and three or four other companies, where it is almost as impossible to unscramble them as it was to unscramble the railroads after the war. They have become so intertwined and interwoven now that one cannot pull any one out of demarcation in any of the evidence that has already been produced.

As Dr. Davies sees it, to many observers any agreement for possible condemnation of the whole transit system seems far distant. Skepsis is the reigning state of mind. And in the meantime, changes for speedy tunneling under the Schuykill River in order to lay the West Philadelphia elevated tracks in preparation for the Pennsylvania Railroad improvements and for the extension of the city-owned Broad Street subway into the northeast section. In short, transit has become the urgent outstanding problem of the Mackey administration.

COMPANY MAKES SUBWAY OPERATING PROPOSITION

Electric Railway Journal—February, 1920

114
Underground Headquarters London’s Highest Commercial Structure

The fine new headquarters of the London Underground Railways combine construction above St. James’s Park Station and crowned with a flood-lighted tower that is one of London’s newest and most outstanding landmarks, is now in full use. The exterior of the building takes the form of a huge white Latin cross. It has been made familiar to London public through the controversy which the Epstein sculptures aroused. The interior has no such suggestion of towering solidity. The impression is rather one of simplicity, lightness, and polished cleanliness.

The whole building gives a sense of utility and of a certain austerity without discomfort. It has its own water supply pumped from an artesian well 500 ft. below the ground level to tanks alongside the balconies of the tenth and top floor. Its electricity is drawn from Lot’s Road power station of the Underground Company, and transformed to the required voltage in the basement. Here, too, are an automatic telephone exchange and a kitchen for the supply of afternoon tea to the 1,000 occupants of the offices. The business part of the building extends underground only to the tenth floor, but above that rises the tower with a 60-ft. flagpole above it. This is both a landmark by day and by night. It affords a fine view to those who are privileged to ascend it.

Not being a virgin site, certain inherited difficulties presented themselves in the construction of the building. St. James’s subway station and the contiguous railway ran across a portion of the site only a few feet below street level. The foundation of the building in this region had to be straddled over the subway and the framework stanchions based on cross girders some 34 ft. in length, bridging it. The girders themselves rested on group piles at each side of the railroad.

The building is the highest commercial structure in London.

476 Miles to Be Electrified in Switzerland

The complete list of railway lines in Switzerland to be electrified within the next seven years is as follows:

<table>
<thead>
<tr>
<th>Line</th>
<th>Length in Kilometers</th>
<th>When to Be Electrified</th>
</tr>
</thead>
</table>
| Neuchâtel-Chaux-de-Fonds-Cottens  
  Neuchâtel  
  Delemont-Bozel  
  Delemont-Dolcey  
  Wallisellen-Ceter-Rapperswil-Urnerboden-Kriengarten  
  Zürich-Affoltern-Zürich  
  Biel-Beaumont-Chaux-de-Fonds  
  Berne-Lausanne  
  Berne-Biel  
  Grenchen-Solothurn  
  Altdorf-Authors  
  St. Gallen-Luzern  
  St. Gallen-Luzern  | 38  
  38  
  40  
  46  
  36  
  44  
  84  
  49  
  23  
  31  | 1930-31  
  1930-31  
  1931-32  
  1931-32  
  1932-33  
  1932-34  
  1933-34  
  1934-35  
  1935-36  
  1935-36  |

Paris Subway Fusion Takes Effect

Amalgamation of the Metropolitan and the Nord-Sud railways of Paris gives Paris a unified subway system of more than 200 miles, with approximately 70 miles of double track. There has always been a close working agreement between the two lines, with interchange of trains. From the administrative and operating standpoints, however, useful economies may be expected. It has been reasonably claimed for Paris that, in proportion to its population, the city has a more closely-woven network of sub-surface railroads than any other city in the world, there being, roughly speaking, 1 mile of double-track underground railroad to every 4,285 of inhabitants. Yet in many respects comparison between the underground transport system of Paris and similar systems in other large cities cannot be justified, because at present, in the case of the French capital, all of the lines terminate at the city boundary. In the not distant future, however, this condition will be altered, for several lines which extend into the nearer suburbs are scheduled for early construction, and one is even now being built. There is also a larger project, which has been sanctioned by the Prefecture of the Seine, which will carry the lines still further afield, and thus bring Paris into line with large metropolitan centers elsewhere.

Rome, Italy—Rome is at last to have a metropolitan subway system, the decision having been made at a recent meeting of the Superior Council of Public Works. The system will, when completed, consist of three lines, called A, B, and C. Line A’s total length will be between 6 and 7 miles. It will cost $16,500,000. Line B will be 34 miles long. It will cost about $8,600,000. Line C will be nearly 5 miles long. It will cost $1,500,000. The project is particularly opportune at the present moment, when it has been already decided to abolish the surface Railways from the center of the city. With the abolition of the street cars, a so-called zone of silence is to be created in the center of the city.

Manchester, England—Since bus traffic is eating into the tramway revenue the tramways committee has resolved to curtail the normal tram car building program and to reduce expenditure on tramway tracks. R. Stuart Pilcher, tramway manager, says that the number of tramway passengers during the year ended March 31, 1929, had decreased by more than 5,000,000 compared with the previous year, while the number of bus passengers had increased by about the same amount. Both undertakings are run by the municipality. Mr. Pilcher recommends the Mayor to postpone the order for tramway rolling stock, both as to seating and lighting. In a bill which the Manchester Corporation is proposing, it seeks authority to run buses beyond the city, to carry freight, to enter into working agreements with other local authorities and with companies in respect of buses, and to substitute trolley vehicles or buses for existing tramways. Some such proposals are covered by the Government’s road traffic bill.

Sydney, Australia—Construction of Eastern Suburbs Electric Railway in New South Wales has been postponed owing to shortage of funds for new works.
$112,000,000 in Subway
Contracts in Year in New York

The New York City Board of Transportation awarded more than $112,000,000 in contracts for construction and rehabilitation of subway tracks and stations needed for its operations accounted for $109,126,644 of this amount. The rest was allocated to work done under Article 21-A and I.R.T. systems under their contracts with the city.

About $140,000,000 worth of contracts will be let during 1930. It is expected that within a short period, with the letting of the contract for the new bridge over the Gowanus Canal, an entire trunk line of the city's new subway system, except for a short link connection to the re-capturable B.-M.T. Culver line, will be under construction from Broadway and 215th Street in Manhattan to the ocean front in Coney Island. The Manhattan division is now nearing completion, the spring of 1931 having been set as the date for opening travel on the line from the Harlem River to Chambers Street.

According to the board, the $5,000,000 shops, storage and repair yards at 207th Street and the Harlem River waterfront will be finished before next spring.

Columbia Abandonment Case
Before Supreme Court

The United States Supreme Court has consolidated upon the suit between the state of South Carolina and the Columbia Railway Gas & Electric Company, which originated over the suspension of the franchise in Columbia. The Supreme Court of South Carolina held that the franchise linked inseparably the operation of the electric street railway, light and power businesses—all public services—and that the railway service could not be separately abandoned. The company appealed to the Supreme Court from the decision of the state court. In their brief to the court requesting that the appeal be dismissed, the state and the city authorities contend that a franchise never held by a unit charter requires railway operation at a loss. They contend, however, that the company has not made an honest effort to make the service pay.

More Time Asked to Perfect Omaha Rerouting

Growing dissatisfaction with the rerouting of the Omaha & Council Bluffs Street Railway System as a result of a traffic survey conducted by Ross W. Harris, resulted in a well-attended City Council meeting on Jan. 29, open to the public. Pressure was brought to have the Council at a forthcoming meeting instruct the company to restore the route as it was on Dec. 18.

President Shannahan requested that 90 days be allowed the company in which to make such changes as it found necessary for the success of the new system, and also that the company's request for restricted parking on the main downtown streets during rush hours be granted. For the traffic study it was denied, but the City Council passed an ordinance ordering only parallel parking on the main downtown thoroughfares during rush hours. This

Rearranging Parked Area
on Broadway

W. G. Fullen, chairman of the New York Transit Commission, has proposed a plan for remodeling the park plots in Broadway, between Columbus Circle and 120th Street, to provide for inside entrance and exit on Broadway surface cars and elimination of the hazard to passengers in being struck by vehicular traffic in that thoroughfare. Police stanchions, forming safety zones for use of surface car passengers, have been found to afford inadequate protection. The Tri-State Commission would cut down the park space in the centre of the roadway, with sidewalks and 35 ft. wide islands on either side. Rearrangement of the doors on the surface cars, which officials of the Third Avenue Railway have agreed to make, will provide entrance and exit facilities on the "off" side. This new arrangement would permit several cars to stop in one block to take on and discharge passengers.

Company Rejects Proposed
Jacksonville Franchise

Formal rejection by the Jacksonville Traction Company, Jacksonville, Fla., of the Miller draft of the proposed new franchise has been announced by J. P. Ingle, manager of the company. Mr. Ingle said in part:

The operations of this company for the year ended Sept. 30, 1929, resulted in a deficit of $450,000 on its interest charges on its debt. No dividends have been paid on the preferred stock since 1916 and none on the common stock since 1914. With the first mortgage bonds of the company maturing March 1, 1931, and its present franchise expiring Jan. 15, 1932, and with the present earnings, it will be impossible to provide new money to pay these bonds at maturity or to pay for improvements. During this critical situation, the company has sought honestly and earnestly for a new franchise fair to it and to the public.

The franchise recently prepared by the city attorney is even more burdensome than the present one. Under the newly proposed terms the company could not survive. We desire earnestly to co-operate with you in a fair solution of the situation and will be willing to negotiate with you on such a basis. We are convinced, however, that no solution can be found in any terms even approaching those in the proposed franchise and we therefore feel that an attempt to arrive at a workable franchise from such a base would be of no avail.

“We hope sincerely that you will recognize the justice of our position and order a new draft prepared which will make possible the object we both wish to accomplish, which is to give adequate service to the public on a fair basis.”

Attractive Transportation
Guide to Binghamton

The first issue of the “Triple Cities Transportation Guide,” published by the Triple Cities Traction Company, Binghamton, N. Y., has been mailed to more than 40,000 to 50,000 persons and concerns in the community, through the cooperation of the Binghamton Light, Heat & Power Company. In an introductory statement, attention is invited to the fact that the company serves a community of 130,000 population, has 50 miles of trolley tracks, operates buses over routes aggregating 30 miles, and has a universal transfer system which allows patrons to complete their journeys by bus or trolley without additional charge. The guide lists all trolley and bus lines, with schedules of departures and arrivals at each of the streetcar and trolley stations in the city. The last page of the folder carries a half-tone reproduction of a photograph of the first electric car of Binghamton, taken in July, 1886.

Status of Service-at-Cost
at Rochester

With the New York State Railways thrown into a receivership, status of the service-at-cost contracts with the railways and the city of Rochester is doubtful. The contract would expire on Aug. 1, but under its provisions, in the event of a receivership, it becomes void unless the City Council passes special legislation to retain it. If the contract is declared void, a 5-cent fare automatically goes into effect under a strict interpretation of the terms of the document. Realizing that such a course would be ruinous to the company it is believed that the Council will authorize retention of the present contract until Aug. 1. It is expected that negotiations will be continued to aid toward drafting a new contract. A deadlock on municipal legislation in 1930 with four regular and four insurgent Republicans, and the Mayor too ill to take part.

No Hope for Seattle to Do Better on Purchase

Councilman Blaine, head of the finance committee of the City Council of Seattle, Wash., who is on a visit to eastern cities, says that, in his opinion, Seattle has virtually abandoned its efforts to refinancing its municipal railway purchase debt with new bonds longer in life than the 20-year moratorium which declares the two-year moratorium arranged by Mayor Edwards with A. W. Leonord, president of the Puget Sound Power & Light Company, offers the city the only way out of the critical financial situation affecting the railway. During his absence, Mr. Blaine's colleagues have passed an ordinance providing for acceptance of the two years extension of time on the 1930 and 1931 installments offered by Mr. Leonard. They are now considering the introduction of an alternative bill which would provide for actual retirement of the 1930 installment of $833,000 with new twenty-year bonds.

Electric Railway Journal—Vol.4, No.2

116
Renewal of Toledo Ordinance as an Issue

City officials of Toledo, Ohio, are studying the Milner ordinance, under which the Rail Traction Company operates, in an effort to prevent any increase in the fare due to the provisions of the ordinance. After the expiration of the first ten years of its operation, the ordinance must be extended or an amortization fund be set up to retire the bonds and preferred stock of the Community Tram Company. Street Railway Commissioner E. L. Graumlich estimated that a fare increase of 15 cents over present rates would be necessary to set up the amortization fund. In the event that the Milner ordinance is extended, this amortization fund will not be necessary immediately. Martin S. Dodd, city law director, said the question of the necessity of submitting this ordinance to the people for renewal is debatable.

Suggestions from Railway President on St. Louis Problems

Stanley Clarke, president of the St. Louis Public Service Company, at a meeting of the Transportation Survey Commission, in St. Louis, discussed some of the recommendations made in the reports of R. F. Kelker, Jr., consulting engineer of the commission, relative to improving St. Louis transit. At the suggestion of Mayor Miller, Mr. Clarke will submit a written report in which he will give his own suggestions for improving transit conditions in the city.

Mr. Clarke expressed the belief that Mr. Kelker was considering the question in terms of vehicles rather than people. Wider streets and super-highways would serve to bring more vehicles into the congested districts, while the big problem was how to get more people into the business section. This could best be done by making it possible for street cars to move more freely. He said that street cars do not require wide streets if other vehicles are kept out of the way.

Mr. Kelker concluded that subways do not offer a solution but must be of much benefit to street car riders, but Mr. Clarke held them of "immeasurable benefit." In discussing traffic conditions in the business district Mr. Clarke pointed out that 40 per cent of cars on the Olive Street lines frequently are rerouted at Twelfth Boulevard due to congestion east of that thoroughfare.

South Shore Plans New Freight Terminal for South Bend

Another step has been taken by the Chicago, South Shore & South Bend Railroad in its plan to eliminate freight traffic over the city streets in the recent acquisition of an 114-acre tract in South Bend for construction of a new freight terminal. The acquisition and development of this property, according to plans of the line, will enable the company to provide a more convenient and more convenient service, will eliminate the movement of freight over South Bend streets and will provide highly desirable sites for industries.

The company will develop the site as a freight terminal and industrial site with inbound and outbound freight tracks and houses. All present buildings are to be reconditioned and made suitable for the use of industrial tenants. The property is to be provided with adequate and ample yard space, and two large warehouses are to be reconditioned for use as inbound and outbound freight houses.

When the new terminal is completed, the South Shore Line will abandon its present freight terminal on LaSalle Street, and will disconnect the present method of handling less-than-carload freight in tractor-trailers over South Bond Street from the old freight house at Orange and Olive Streets to the LaSalle terminal.

Growth in freight business also has necessitated the abandonment of the South Shore Line's freight yard at Burnham, Ill. At the present time the yard has a capacity of 110 cars on two tracks. When the added trackage is installed, the yard capacity will be 550 cars. The project includes installation of two new main line tracks on the yard. The use of the present main line tracks for freight service and the addition of a fifth freight track. The yard is used for the classification of freights, consolidation and delivery. Work on this project is now 60 per cent completed.

Abandonments in Indiana

Arthur W. Brady, receiver for the Union Traction Company of Indiana, has announced that service on the Muncie-Union City division will be discontinued on Feb. 8, and on the Anderson-Middletown division, Feb. 28. Authority for abandonment of the two lines was granted on Jan. 23 by Judge R. E. Morrow in the Madison County Circuit Court. The Public Service Commission approved the abandonment several months ago. The Muncie line is 32.6 miles long and the Anderson-Middletown division, 9.6 miles. Mr. Brady explained:

"The Muncie-Union City interurban line has been a factor of importance in the social and business life of the communities it serves for a century, and it is with regret and reluctance that the decision to terminate has been reached. That determination has been forced by conditions beyond the control of the company. In addition to the losses caused all railway lines by the constantly increasing use of automobiles, this division has suffered acutely from the abandonment of the old Union City-Dayton line, with which for many years it interchanged passenger and volume of traffic.

The large deficits due to these causes it has proved impossible to overcome through fare revisions, improved service or other means."

Mr. Brady expressed appreciation for the efforts recently made by business men of the communities to help canvas their towns for enough freight traffic to put the line on a profitable basis and thus forestall abandonment of the service.

One-Man Car Case Won by Shreveport Railways

As noted in Electric Railway Journal for Jan. 18, it has been indicated in a report of the District Court of the United States for the Western District of Louisiana, dated Jan. 6, in the suit in equity of the Shreveport & Gulf Shore Company of City of Shreveport to enjoin the enforcement of an ordinance requiring two men on each street car, that the court held that it is not a violation of the right of a one-man car: "the type of car which will give the greatest safety and efficiency."

The case is important not only in its bearing on the right of the use of one-man cars: "the type of car which will give the greatest safety and efficiency." The case is important not only in its bearing on the right of the use of one-man cars: "the type of car which will give the greatest safety and efficiency."

The case is important not only in its bearing on the right of the use of one-man cars: "the type of car which will give the greatest safety and efficiency." The case is important not only in its bearing on the right of the use of one-man cars: "the type of car which will give the greatest safety and efficiency."

The case is important not only in its bearing on the right of the use of one-man cars: "the type of car which will give the greatest safety and efficiency."

No public service commission in any state now refuses to permit the use of one-man cars. Conditions are altogether different from what they were in 1917, when the Supreme Court rendered a decision in the Sullivan case favoring two-man operation. Then the one-man car was in its experimental stage; now the safety car has been operating without a flaw for several years on some of the most modern routes in the country.

The City of Shreveport is the only city under whose police power to interfere in matters of this kind exists only when the facts come within the safety considerations of the public. The philosophy of our institutions warrants reasonable restrictions but there must be some real justification for the exercise of the power.

Street cars appear to be an essential means of transportation, especially in the large portion of the population of cities and the loss of service therefrom handicaps the city to a growing city. On the whole, I believe that it will only be advantageous to the public if one-man cars of the latest type, at least until they can be properly tested. The right of a growing city to eliminate the former methods to transport others, is arbitrary and amounts to a taking of the rail way's property without due process of law, and that it would not be necessary to discharge any employees in making the change.

That, from the evidentiary facts, the one-man car, a modern safety car equipped with all the automatic safety devices, has shown by a clear preponderance of the evidence to be safer than its predecessor, the two-man car.

That the speed and schedules of street car systems have been increased under one-man operation, that companies are able to operate more cars, that wages have been increased, the company has become more efficient and better satisfied. That since 1917 no public service commission has refused to permit the operation of one-man cars, and since 1924, no company has been held to violate its recommendation of one-man cars subject to any particular conditions.

The court reserved to the defendants the right to apply for a modification of the decree should the conditions warrant.

Southern Equipment Men

Analyze Maintenance Practices

NO TYPE of equipment escaped analysis at the meeting of the Electric Railway Association of Equipment Men, Southern Properties, held at Birmingham, Ala., on Jan. 27, 28 and 29. All were covered in the papers presented, either from the standpoint of their maintenance or their application. Papers on a variety of subjects covered armature room tests, car lubrication and inspection. Other papers covered a variety of subjects, including the new Pittsburgh car.

Practically all of the second day was devoted to the discussion of the association's questionnaire. A total of 53 live questions were entered and each pro-
voked many valuable ideas.

Every detail of Pittsburgh's new aluminum car was given by D. H. Bell, engineer of equipment Pittsburgh Rail-
ways, in the first paper presented. In introducing his subject Mr. Bell said:

"There undoubtedly exists in the electric railway industry today the advantage to supersede the present street car. The need is para-
mount on account of the increasing competition of the private automobile and the motor truck. Whether this new
vehicle will operate on the rails or rubber tires is at present impossible to de-
termine because of the many factors involved. There are, however, certain fundamen-
tal characteristics which any new vehicle should embody if it is hoped

"The urban transportation industry is confronted with a form of competition
which came into being gradually and insidiously but which today is

tremendously effective. I refer to the private automobile. With this intro-
duction the paper on maintenance transportation, prepared by C. S. Sale,

president of the American Car & Foundry Motors Company, and pre-

sentation of the National Car Company, expressed his views on the present

street car's considerable potentialities as the basis of an entirely new

system of transportation.

"The old came into being gradually, insidiously but which today is
tremendously effective. I refer to the private automobile. With this intro-
duction the paper on maintenance transportation, prepared by C. S. Sale,
president of the American Car & Foundry Motors Company, and pre-
sentation of the National Car Company, expressed his views on the present
street car's considerable potentialities as the basis of an entirely new
system of transportation.

"The old came into being gradually, insidiously but which today is
tremendously effective. I refer to the private automobile. With this intro-
duction the paper on maintenance transportation, prepared by C. S. Sale,
president of the American Car & Foundry Motors Company, and pre-
sentation of the National Car Company, expressed his views on the present
street car's considerable potentialities as the basis of an entirely new
system of transportation.

Conspicuous Indexes for January, 1930

Compiled for Publication in ELETRICO RAILWAY JOURNAL by ALBERT S. RICHIE


<table>
<thead>
<tr>
<th>Year</th>
<th>Latest High</th>
<th>Latest Low</th>
</tr>
</thead>
<tbody>
<tr>
<td>1929</td>
<td>130 205 5</td>
<td>120 190 5</td>
</tr>
<tr>
<td>1930</td>
<td>140 210 5</td>
<td>130 195 5</td>
</tr>
</tbody>
</table>

Street Railway Fares*

<table>
<thead>
<tr>
<th>Year</th>
<th>Latest High</th>
<th>Latest Low</th>
</tr>
</thead>
<tbody>
<tr>
<td>1929</td>
<td>130 205 5</td>
<td>120 190 5</td>
</tr>
<tr>
<td>1930</td>
<td>140 210 5</td>
<td>130 195 5</td>
</tr>
</tbody>
</table>

Electric Railway Materials*

<table>
<thead>
<tr>
<th>Year</th>
<th>Latest High</th>
<th>Latest Low</th>
</tr>
</thead>
<tbody>
<tr>
<td>1929</td>
<td>130 205 5</td>
<td>120 190 5</td>
</tr>
<tr>
<td>1930</td>
<td>140 210 5</td>
<td>130 195 5</td>
</tr>
</tbody>
</table>

Electric Railway Wages*

<table>
<thead>
<tr>
<th>Year</th>
<th>Latest High</th>
<th>Latest Low</th>
</tr>
</thead>
<tbody>
<tr>
<td>1929</td>
<td>130 205 5</td>
<td>120 190 5</td>
</tr>
<tr>
<td>1930</td>
<td>140 210 5</td>
<td>130 195 5</td>
</tr>
</tbody>
</table>

Electric Ry. Construction Cost

<table>
<thead>
<tr>
<th>Year</th>
<th>Latest High</th>
<th>Latest Low</th>
</tr>
</thead>
<tbody>
<tr>
<td>1929</td>
<td>130 205 5</td>
<td>120 190 5</td>
</tr>
<tr>
<td>1930</td>
<td>140 210 5</td>
<td>130 195 5</td>
</tr>
</tbody>
</table>

General Construction Cost

<table>
<thead>
<tr>
<th>Year</th>
<th>Latest High</th>
<th>Latest Low</th>
</tr>
</thead>
<tbody>
<tr>
<td>1929</td>
<td>130 205 5</td>
<td>120 190 5</td>
</tr>
<tr>
<td>1930</td>
<td>140 210 5</td>
<td>130 195 5</td>
</tr>
</tbody>
</table>

Wholesale Commodities

<table>
<thead>
<tr>
<th>Year</th>
<th>Latest High</th>
<th>Latest Low</th>
</tr>
</thead>
<tbody>
<tr>
<td>1929</td>
<td>130 205 5</td>
<td>120 190 5</td>
</tr>
<tr>
<td>1930</td>
<td>140 210 5</td>
<td>130 195 5</td>
</tr>
</tbody>
</table>

Retail Food

<table>
<thead>
<tr>
<th>Year</th>
<th>Latest High</th>
<th>Latest Low</th>
</tr>
</thead>
<tbody>
<tr>
<td>1929</td>
<td>130 205 5</td>
<td>120 190 5</td>
</tr>
<tr>
<td>1930</td>
<td>140 210 5</td>
<td>130 195 5</td>
</tr>
</tbody>
</table>

Industrial Industry

<table>
<thead>
<tr>
<th>Year</th>
<th>Latest High</th>
<th>Latest Low</th>
</tr>
</thead>
<tbody>
<tr>
<td>1929</td>
<td>130 205 5</td>
<td>120 190 5</td>
</tr>
<tr>
<td>1930</td>
<td>140 210 5</td>
<td>130 195 5</td>
</tr>
</tbody>
</table>

Bank Clearing

<table>
<thead>
<tr>
<th>Year</th>
<th>Latest High</th>
<th>Latest Low</th>
</tr>
</thead>
<tbody>
<tr>
<td>1929</td>
<td>130 205 5</td>
<td>120 190 5</td>
</tr>
<tr>
<td>1930</td>
<td>140 210 5</td>
<td>130 195 5</td>
</tr>
</tbody>
</table>

Business Failures

<table>
<thead>
<tr>
<th>Year</th>
<th>Latest High</th>
<th>Latest Low</th>
</tr>
</thead>
<tbody>
<tr>
<td>1929</td>
<td>130 205 5</td>
<td>120 190 5</td>
</tr>
<tr>
<td>1930</td>
<td>140 210 5</td>
<td>130 195 5</td>
</tr>
</tbody>
</table>

*The three index numbers marked with an asterisk are computed by Mr. Richie, as follows: Fares index is average street railway fare in all United States cities with a population of 50,000 or over, exclusive of New York City, and weighted according to population. Street Railway Materials Index is relative average price of materials (including fuel) used in street

railway operation and maintenance, weighted accord-
ing to average use of such materials. Wages index is relative average maximum hourly wage of motormen, conductors and timekeepers employed on interurban and interurban railways operated in the United States, weighted according to the number of each man employed on these roads.
L. G. Tighe, Assistant General Manager at Akron, Heads C. E. R. A.

Lawrence G. Tighe was elected president of the Central Electric Railway Association at a meeting held in Cleveland on Jan. 24. He is a director and assistant general manager of the North-Eastern Ohio Power & Light Company, Akron, Ohio, with which he has been connected since 1916. He went from the Consumers Power Company in Michigan to Akron as general superintendent of production and distribution of the light and power division of the company. At that time the system in Akron was in a run-down condition. The equipment was not in good shape and the service was decidedly unsatisfactory. Mr. Tighe made a careful survey of the situation, and worked out methods whereby the system was gradually brought up to its present state of efficiency. In recognition of that work, he was made assistant general manager of the company in January, 1925.

Mr. Tighe was elected to the board of directors of the company at Akron in 1929 to take the place of Charles Currie, who died a short time before. Since his elevation to the position of assistant general manager, he has taken over the major part of the details connected with the operation of both the light and power division and the transportation division of the company.

The new president of the Central Electric Railway Association was born in Saratoga Springs, N. Y., on Oct. 10, 1886. He attended school in Schenectady but during the summer months he lived on his grandfather's farm near Saratoga. There he harbored the notion that he would like to become a real farmer. A few years in school aroused his interest in electricity with a consequent subjugation of the impulse to farm it. When he finished school, he secured employment in the works of the General Electric Company at Schenectady. He stuck to the business and studied nights. In a few years the company sent him to its branch in Detroit where he remained several years and was then promoted to a position in the Jackson, Mich., plant. He remained with the General Electric Company until 1913 when he became connected with the Consumers Power Company in Jackson, controlled by Hodenpyl, Hardy & Company.

Mr. Tighe is not a builder if not persistent. He has never put the farm idea completely out of his mind. So far, however, the nearest he has come to his original desire to become a farmer is to become the owner of some three acres of land just outside the city limits of Akron. There he has his home. He is very much interested in making this country place attractive and is a grower of flowers and shrubs. His chief recreational diversions are golf and he is a member of the Elks, Fairlawn Golf, City and Kiwanis clubs. He is fond of music and has a reasonably good voice. He is known as a "bear of work" and is happiest when he is engrossed in analysing a knotty problem.

F. H. Dohany on Detroit Commission

Additional changes are announced in the personnel of the Detroit Street Railway Commission, charged with the responsibility of operating Detroit's municipal street railway and bus lines. John J. Gorman has resigned from the commission and Frank H. Dohany has been appointed by Mayor Bowles to succeed him. Two months ago G. Ogden Ellis resigned as president of the commission. Commissioner John J. Barlum succeeded him in that post. It is expected that Commissioner Barlum on the board of commissioners, is in line to succeed Mr. Ellis, will be made vice-president of that body.

Mr. Gorman was appointed during the administration of John W. Smith. In a formal letter to the Mayor, Mr. Gorman said that he wished to give up his commissionship last fall, but at the time Mr. Barlum, now president of the body, urged him to remain until the new Mayor took office. When he accepted the appointment 21 years ago Mr. Gorman had just retired from active business and, having no immediate plans, welcomed the opportunity of rendering a public service. However, in the past year his mortgage banking business has grown to such proportions that it now requires all his time and attention. It will be recalled that last fall he presented a definite plan for the creation of a cross-town elevated highway over the right-of-way of the railroads.

In addition to conducting an active law practice, Mr. Dohany, the new member of the commission, is a director of the American State Bank, a director and vice-president of the American Fort Street Company and president of the Southington Woods Company. He was born in Detroit, Mich., 55 years ago. He acquired his education at the state normal school at Ypsilanti and the Detroit College of Law. He was admitted to the bar in 1892.

G. W. Jones in Important Post in Brooklyn

George W. Jones, who has been vice-president of the Brooklyn & Queens Transit Corporation since July 1, 1929, and who, prior to that time, was vice-president and treasurer of the Brooklyn City Railroad, was appointed vice-president also of the Brooklyn-Manhattan Transit Corporation, the New York Rapid Transit Corporation and the Williamsburgh Power Plant Corporation, on Jan. 1, 1930. As indicated briefly in the Electric Railway Journal previously, Mr. Jones will have charge of all contracts for materials and supplies for the four companies and will have direct charge of the purchasing departments.

Mr. Jones is a veteran of the Spanish-American War and after the war was connected with the Department of the Interior of the Insular Government of Porto Rico for nine years. This department had charge of all public utilities, public lands, public buildings, public roads and the telegraph system.

G. W. Jones

During his last two years on the island, Mr. Jones was assistant commissioner of the interior for Porto Rico.

After returning to the United States, Mr. Jones was a member of the staff of the J. G. White Company for several years. Subsequently he joined the engineering firm of Sanderson & Porter. When the Brooklyn City Railroad resumed independent operation on Oct. 19, 1919, Mr. Jones was elected treasurer and five years later was also made vice-president. On July 1, 1929, he became vice-president of the Brooklyn & Queens Transit Corporation at the consolidation of the various B.-M.T. surface operating companies and the Brooklyn City Railroad into the Brooklyn & Queens Transit Corporation.

Added Responsibility for H. W. Godfrey With P. R. T.

H. W. Godfrey, superintendent of instruction of the Surface Lines of the Philadelphia Rapid Transit Company, Philadelphia, Pa., has been appointed acting superintendent of instruction of the surface lines, buses and cars, reporting to R. F. Tyson, vice-president. F. G. Suria has been appointed assistant superintendent of instruction. The following chief instructors will be continued: J. W. Hall, chief instructor for the surface lines, F. Humphreys, chief instructor for the buses, S. Edwards, chief instructor for the cars.

119
Miss Caroline Hein Secretary in Cincinnati

Miss Caroline Hein has been elected secretary of the Cincinnati Street Railway, Cincinnati, Ohio, to succeed Joseph Nicholson, who died on Nov. 19, 1929. Miss Hein started her railway career in December, 1917, as secretary to Walter A. Draper when he was vice-president of the Cincinnati Traction Company. A few years later she was made assistant secretary of that company and of the Ohio Traction Company.

When the Cincinnati Street Railway took over the operation of the street cars in Cincinnati in November, 1923, Miss Hein was retained as assistant secretary in charge of secretary's office. She served in that position up to her present promotion. She also acted as librarian for the railway and has established one of the best industrial libraries in Cincinnati.

+ F. P. Royce Retires from Stone & Webster

Frederick P. Royce is retiring as a vice-president of Stone & Webster, Inc., Boston. For the past two years Mr. Royce has devoted his time and attention to executive matters, financial problems and special studies for Stone & Webster, Inc. During 1919, in connection with Stone & Webster activities in the railway situation in New York, he acted as general manager for the receiver of the Brooklyn Rapid Transit Company, since succeeded by the Brooklyn-Manhattan Transit Corporation, and assisted in examining the situation on the Interborough Rapid Transit Company and advising about it. On Jan. 1, 1920, he became a partner in Stone & Webster in general charge of the securities division and for a year or more continued in advisory work in connection with the railway situation in New York. When Stone & Webster was incorporated, July 1, 1920, Mr. Royce became vice-president and continued in charge of the securities division until the firm of Stone & Webster & Hodggett was incorporated in January, 1927.

Mr. Royce became associated with Stone & Webster in 1909, acting first as division manager in the Management Association, and later as a director in some of the New England companies, and shortly afterwards as vice-president of the management division, continuing with the New England companies, also the Minneapolis company, the two Houghton companies, and Faduca. He was also actively engaged in the development of new business.

Howard L. Rogers and Frederick S. Pratt also are retiring as vice-presidents of Stone & Webster Inc.

+ C. M. Shelter Heads Stark Electric

Curtis M. Shelter, Canton, Ohio, general counsel for the Suburban Light & Power Company and the Utilities Service Company, Inc., has been elected president of the Stark Electric Railroad. Mr. Shelter succeeds W. E. Davis, who has retired from the presidency of the company. Other officers of the company are Eugene S. Sweeky, vice-president; C. E. Sperow, vice-president and general manager; O. K. Ayers, treasurer and assistant general manager and W. H. Grimes, secretary and auditor. At the same time the appointment of Mr. Ayers as district manager for the Alliance division of the Suburban Light & Power Company was made public. He succeeded A. Thomas, chief engineer, who will devote his entire time to engineering work.

The Stark Electric Railroad, a branch of the Utilities Service Corporation, operates between Canton and Salem, a distance of 35 miles. Headquarters are in Alliance.

+ J. C. Newman Way Engineer at Richmond

J. C. Newman was transferred from Norfolk to Richmond on Jan. 1, as engineer of maintenance of way for the Virginia Electric & Power Company. Mr. Newman has been in charge of track maintenance on the Norfolk properties for several years.

J. C. Newman

Before coming to Virginia, he was engaged for three years by the Public Service Commission of New York, being in charge of track alignment and grades on the construction of rapid transit lines in New York City.

He is a native Kentuckian and was graduated from the University of Kentucky. After finishing school, he was with an oil company in Illinois for a short while and later was engaged on special work design for the Lorain Steel Company at Johnstown, Pa.

+ W. A. Robertson Appointed to Fort Worth

W. A. Robertson, general superintendent of the Jacksonville Traction Company, Jacksonville, Fla., has been appointed general superintendent of the Northern Texas Traction Company at Fort Worth, Tex. Mr. Robertson went to Jacksonville 5 years ago from Beaumont, Tex., where he was superintendent of railways for the Eastern Texas Electric Company. Prior to his work in Beaumont he was superintendent of transportation for the Galveston-Houston Electric Company, operating an interurban connection between Galveston and Houston. Eight years before becoming connected with the interurban, he was employed by the Houston Electric Company, in various capacities. He has been connected with companies operated by Stone & Webster, Inc., for nearly twenty years.

Messrs. Burch and McWethy Consulting Engineers

Edward P. Burch, for many years a consulting engineer of Minnesota, and Harold E. McWethy, for the past three years engineering valuations of the Twin City Rapid Transit Company of Minneapolis, have been retained as consultants and analysts with offices in the Foshay Tower in Minneapolis.

Mr. Burch has been engaged for more than 30 years as consultant for many railways, railroads, and power companies, on operation, valuation and consolidation questions. He has made reports, in many cases, at Minneapolis, Seattle and Everett, Detroit, and Cleveland. He is a director of the Minneapolis, Northfield & Southern Railway, and the receiver of the Minneapolis, Anoka & Cuyuna Range Railway. His book, "Electric Traction for Railway Trains," has been used as a text and reference work in many universities.

Mr. McWethy has had a broad experience in public utility valuation and statistical research. Following his graduation from the University of Wisconsin Engineering College in 1909, he spent twenty years as an apprentice with the Westinghouse Electric & Manufacturing Company. The next nine years he served as valuation engineer and case investigator for the Illinois and Wisconsin Company, a subsidiary of Wisconsin. Then followed two years of public utility valuation work in Nashville, Philadelphia, and in the state of Mississippi, and four years as a street railway engineer of the Minnesota Railroad and Warehouse Commission before he became valuation engineer for the Twin City properties.

+ Henry Bucher in Charge of Midland Properties

Announcement has been made by Robert M. Feustel, executive head of the Midland Union, that he will take charge of the operation of the railway properties in Indiana controlled by that company under the company's new president, Henry Bucher, Fort Wayne, as general railroad executive. The company operates power, light, railway and gas utilities in northern Indiana, particularly in the eastern section of the state.

Mr. Bucher has been railway manager of the Indiana Service Corporation for the last six years. He also had been manager of the Fort Wayne division of the Indiana Service Corporation. Mr. Bucher's office will be in Indianapolis. The position of division manager will be filled by H. E. Vordermark, who has been treasurer of the Indiana Service Corporation for many years and who for the last few years also has been vice-president.

If the petition of the Insull-controlled Central Indiana Power Company, a merger with the Terre Haute, Indiana & Eastern Traction Company and the Terre Haute Traction & Light Company, is approved by the Indiana Public Service Commission, the direction of all the railways would be under the divisional management of Mr. Bucher.

The Midland Company, an Insull holding company operating extensive properties in Indiana, also has made holdings in other states. Earlier the company controlled a number of companies, including the Union Traction Company of Indiana, now in receivership.
E. K. Miles in Charge in Syracuse

Earl K. Miles has mounted the business ladder from motorman to general manager of the New York State Railways, to which post he was named on Dec. 23, at the same time that B. E. Tilton, vice-president and general manager of the system, was elected president of the company. Mr. Miles attended school at Adams and later at Albany Business College. His first real job was as a motorman in Syracuse. In 1916 he left the railway to become a mail clerk. On Jan. 1, 1919, he returned to the railway. The board made him general manager in June, 1922, when he was appointed division superintendent of the Tallman division. Three years later he was made assistant to the general superintendent and shortly thereafter was made superintendent of transportation.

Jim Malone Assistant to A. D. McWhorter in Memphis

Jim Malone—no one in Memphis would think of calling him anything else—has been appointed assistant to A. D. McWhorter in directing transportation of the Memphis Street Railways, Memphis, Tenn. This step is a distinct promotion for Jim, and comes in acknowledgment of his capable work during the period that he has been associated with the office of Mr. McWhorter.

Mr. McWhorter says that Jim knows every angle of street railway transportation by experience. He also emphasizes Jim’s dependability at doing every job, large or small, committed to him. As general superintendent Mr. McWhorter has charge of two other departments besides transportation. Jim’s duties, however, are as assistant to the transportation department.

Jim became connected with the company on Feb. 13, 1921, as traffic checker in the schedule department and has worked in that capacity since that time. After completing a course in the Memphis Law School at night, he passed his bar examinations in June, 1929. This fall when instructors for the law were being chosen to conduct educational classes, Jim was elected to one of them and in this work he has demonstrated his faithfulness and ability.

B. F. Braheney Elected Vice-President

Bernard F. Braheney, elected vice-president in charge of accounting of the Byllesby Engineers’ Management Corporation, Chicago, Ill., has been with the Byllesby organization since 1910. He started as a clerk in the auditing department of the Northern States Power Company at St. Paul office and in that capacity continued since that time. After completing a course in the Memphis Law School at night, he passed his bar examinations in June, 1929. This fall when instructors for the law were being chosen to conduct educational classes, Jim was elected to one of them and in this work he has demonstrated his faithfulness and ability.

Traveling auditor of the company. In 1915 he was appointed assistant general auditor of the Northern States Power Company, a position he held until 1920 when he was made assistant general auditor of the Byllesby Engineering & Management Corporation with headquarters in Chicago. Since 1923 he has been general auditor of the company.

F. K. Baker in Important State Post in West

Fred K. Baker, Everett, Wash., is the newly appointed head of the Department of Public Works for the state of Washington. This body regulates bus transportation as well as motor freight in that state, grants all certificates, passes on transfers and extensions, and makes rulings which have an important bearing on the industry. Mr. Baker has served since last August as supervisor of transportation, but late in December gave up that post, and upon the resignation of Judge Baker, who was then director, Mr. Baker was appointed to that post.

Charles F. Scott Awarded the Edison Medal

The Edison Medal of the American Institute of Electrical Engineers has been awarded to Prof. Charles F. Scott, New Haven, Conn., for his contributions to the science and art of polyphase transmission of electrical energy.

The Edison Medal was founded by associates and friends of Thomas A. Edison to award annually for meritorious achievement in electrical science, electrical engineering, or the electrical arts, by a committee consisting of 24 members of the American Institute of Electrical Engineers.

Charles F. Scott is professor of electrical engineering at Yale University. He was born at Athens, Ohio, on Sept. 19, 1864. He was educated at Ohio University, the Ohio State University, Columbus, from which he graduated in 1885, and Johns Hopkins University, where he engaged in graduate study for more than a year.

H. O. Crews in New Post

Hobart O. Crews, for seven years director of public relations for the Chicago Surface Lines, was recently appointed public administrator for Cook County by Governor Emmerson. He was sworn in on Jan. 24 and at once assumed charge of the office. Before his association with the Chicago Surface Lines, Mr. Crews was managing editor of a paper in Springfield, Ill. He was at one time superintendent of departmental reports under Governor Lowden of Illinois.

W. W. Weddle Terre Haute Roadmaster

W. W. Weddle, formerly assistant roadmaster of the Terre Haute, Indianapolis & Eastern Traction Company, Indianapolis, Ind., was promoted on Jan. 7 to the position of roadmaster. He succeeded John L. Cough, who resigned. Mr. Weddle started work with the Terre Haute, Indianapolis & Eastern Traction Company as a section laborer in 1907. He was made foreman in 1912, supervisor in 1921 and assistant roadmaster in 1924.

L. H. Seagrave Chairman of United States Electric Power

Louis H. Seagrave, chairman of the board of the United States Electric Power Corporation, has been elected chairman of the board of the Standard Power & Light Corporation, which will control the Standard Gas & Electric Company. Victor B. Norris, president of United States Electric Power, has been elected president of Standard Power & Light. John L. Norton continues as president of Standard Gas & Electric. No changes will be made in the officers of the latter company, whose stockholders also have approved the reorganization plan announced at the end of last year.

J. I. Foster in New Memphis Post

J. I. Foster, for several years superintendent of transportation with the Memphis Street Railway Company, has been appointed to direct the work of the welfare department, just established to provide a means by which the company may manifest its interest in the welfare of all employees.

Mr. Foster knows more employees probably than any other official of the company. He has been much of his time in the past visiting the homes where sickness or distress have come. The company management considers the work so important that it has made it a business for it so apt, that his transfer to it is to be regarded in the light of a promotion.

Mr. Foster began his railway career in Chattanooga in 1883. In 1900 when the Memphis company desired to secure an active, dependable man to assist the general superintendent, Mr. Foster was recommended, and he came to Memphis at that time as the assistant to Frank Smith.

R. B. Stearns Massachusetts Northeastern Receiver

Federal Judge Brewer has appointed Robert B. Stearns of Boston receiver for the New York Street Railway, Haerhill, Mass., operating more than 100 miles of electric railway. He was bonded for $35,000. Mr. Stearns was formerly vice-president, general manager and treasurer of the Eastern Massachusetts Street Railway, from which he withdrew as an officer in January, 1929, after more than ten years of service with the company.

E. A. Mitchell, formerly in charge of taxicab inspection in the Public Utilities Department, has been appointed senior street railway inspector, and assistant to George B. Avery, superintendent of public utilities, Seattle, Wash.

W. L. O’Brien has been appointed superintendent of transportation and traffic, succeeding E. A. Mitchell, as inspector of the street railway lines.

J. I. Foster has been appointed superintendent of transportation and traffic, succeeding W. L. O’Brien, promoted.
OBITUARY

Julius Theobald

Julius Theobald, general manager of the Springfield Railway, Springfield, Ohio, died on Jan. 30, following an illness of three months. Mr. Theobald was born in Columbus 54 years ago. He attended high school there and later went to Ohio Wesleyan, from which he was graduated. He entered the utility field after finishing his college work, and his ability as a leader and executive was soon recognized. For a series of promotions he accepted a position as superintendent of the Atlantic City Electric Light Company. Six years ago he went to Springfield to become general manager of the Springfield Railway.

James A. Duffy

James A. Duffy, superintendent of equipment for the Monongahela-West Penn Public Service Company, Fairmont, W. Va., for ten years, died on Jan. 1. Mr. Duffy was born at West Newton, Pa., 57 years ago. In his early years he moved with his parents to Pittsburgh and there he was located for many years. He was employed with the Duquesne Traction Company and the Allegheny Light Company in Pittsburgh, later with the Pittsburgh Railways. From Pittsburgh Mr. Duffy went to Havana, Cuba, with the Green- wood Engineering Company, and was for some time engaged there in construction work as chief engineer, and was also with the Havana Electric Railway in Cuba. On his return to Pitts- burg from Cuba, Mr. Duffy became master mechanic with the Pittsburgh Railways. He was a master mechanic of the Penn-Ohio System for seven years.

John O'Laughlin

John O'Laughlin, roadmaster for the Terre Haute, Indianapolis & Eastern Traction Company, Indianapolis, Ind., died on Jan. 2. Mr. O'Laughlin was 75 years old. He started his railroading career with the Western Maryland and was a water boy. He helped to build the present lines of the Erie Railroad in New York State and was employed by the Pennsylvania Railroad. Following this he served on the Ann Arbor Railroad for some time, but in 1912 joined the Terre Haute, Indianapolis & Eastern Traction Company. He was a member of the Roadmasters and Maintenance of Way Association of America since 1887.

Charles A. Lux

A founder of the Rochester, Syracuse & Eastern Railroad, Syracuse, N. Y., died in that city on Jan. 22. He was 70 years old. With William P. Gannon, Mr. Lux organized the electric railway, which began operation in 1905. He also helped build other interurban lines in central New York. Later he entered the water power field. His holdings on the Salmon River were sold to the Niagara, Lock- port & Ontario Power Corporation.

John B. Leighton

John B. Leighton, who served as claims adjuster for the San Francisco Municipal Railway System, San Fran- cisco, Cal., from 1913 to 1926, died in that city Jan. 20 at the age of 73. Mr. Leighton was a pioneer street railway man of San Francisco. He served for many years on the Commission of the Presidio & Ferries Railroad, which in 1913 was absorbed by the Municipal System.

A. T. Spencer

Albert T. Spencer, general superintendent of construction and maintenance, Montreal Tramways, died at his home on Jan. 26. He had been ill about two months.

Probably the best-known way engi- 

[...]

nager in Canada, Mr. Spencer had made a reputation for himself that was inter-

tional. He had held his position in 

Montreal since December, 1926, having come to it from the post of assistant to the general manager of the Toronto Transportation Commission. In May, 1921, he had accepted the important position of engineer of way of the Toronto Transportation Commission in anticipation of the extensive program of track rehabilitation which began when the commission took over the street railway lines from the city on Jan. 1, 1921. Under his direction about 

200 miles of track was rebuilt according to the most modern standards, and con-
siderable new track was laid. The work was done in a surprisingly short time, largely because Mr. Spencer made use of the latest types of construction ma-

chinery and resorted to many novel methods.

Following the completion of the rehabilitation program, Mr. Spencer was made assistant to the general manager of the Toronto Transportation Commission in May, 1924, continuing in that position until his return to Montreal at the end of 1926.

Mr. Spencer's engineering career began in 1900 with the Dominion Coal Company at Glace Bay, N. S., where he was engaged in general construction, mining and railway work. He was field engineer with the Canadian Pacific Rail- 

way from 1903 to 1905, and until 1906 as chief of party. In 1906 he entered the employ of the Montreal Street Rail-

way as engineer of survey, location and construction of certain projected suburban electric lines. Following the com-

pletion of this assignment he began regular work on the staff of the company and its successor, the Montreal Tramways, serving as assistant engineer in charge of maintenance of way. He left Montreal in January, 1921, to go with the Hydro-Electric Power Commission of Ontario as assistant engineer in the railway department. There he remained until his connection with the Toronto 

Transportation Commission later in the same year.

For many years Mr. Spencer was active in the American Electric Railway Engineering Association. At the time of his death he was a member of the standing committee on questions and of the committee on nomina-
tions. He did much research on the use of special steels in trackwork and on methods of hardening rail. He was an associate member of the Engineering Institute of Canada, a member of the Association of Professional Engineers of Quebec, a member of the Association of Professional Engineers of Ontario and a member of the American Society for Municipal Improvements.

Maurice A. Welsh

Maurice A. Welsh, superintendent and traffic manager of the Waterloo, Cedar Falls & Northern Railway, Waterloo, Iowa, died at the Chicago Memorial Hospital, Chicago, Ill., on Jan. 18.

Mr. Welsh's railway service combined hand work and outstanding ability in a very unusual degree. To his originality he coupled force and energy, being quick to translate ideas into action. His ability to make and retain the friendship of all who knew him was evidence of his sincerity, good faith and unfailing geniality. He was unsparingly loyal to his railroad and to his superiors. He was fair to the public and never too busy to give intelligent and sympathetic consideration to every complaint. Above all, he tempered justice to his associates with real friendship, so that he held the respect of all who worked under him.

Mr. Welsh was born at Iron River, Mich., on March 4, 1887. He entered the service of the Illinois Central Rail-

way in 1903 as special agent, in which capacity he was employed until early in 1910, when he resigned to enter the employ of Walter D. Payne & Company of Waterloo. In 1911 he accepted the position of special agent with the Waterloo, Cedar Falls & Northern Railway. On March 1, 1914, he was appointed superintendent with jurisdiction over the operating and claims departments, and on Dec. 20, 1922, his jurisdiction was extended to the traffic department with the title of superintendent and traffic manager.

H. C. Higgins

Henry C. Higgins, who helped to build many electric railways in Iowa, Wisconsin and Illinois in his six decades of active railway work, died on Jan. 22, in Centralia, Ill., where he had resided for the past 23 years. Mr. Higgins began his career as a con-

tractor on the Baltimore & Ohio Rail-

road's western lines at the age of 21 years, but afterward confined himself to the utility field. His last important assignment was the management of the Sterling, Dixon & Eastern Electric Railway and manager of the Lee County Lighting Company at Dixon, Ill. He was associated with several of these companies from the time of their inception until July, 1907, when he re-
tired from active business.

A. T. Spencer

OBITUARY
Heavy Stocks of Materials Necessary to Insure Uninterrupted Service

In order to maintain continuous and uninterrupted service on its street railway and motor bus lines which serve the greater part of Connecticut, the Connecticut Company is obliged to carry in stock in its carhouses and other storage facilities, more than 10,000 different parts and items of equipment, a number of different kinds of each. To keep this stock on hand at all times requires a continuous investment of more than $1,000,000, but the amount is necessary if the effects of wear and tear on equipment are to be offset by rapid repairs and replacements.

Chief among the items of stock carried are rails, ties, poles and trolley wire, about 100,000 ties being required each year for renewal to insure safety and riding comfort.

In the course of a year the company has to replace some 7,500 panes of car window glass, while the preservation of the varying quality of the rolling equipment requires the use of about 10,000 gal. of paint and varnish. About 17,000 lb. of heavy grease and 20,000 gal. of oil are needed for lubrication. The number of electric lights burnt out and replaced on the company's equipment during a year would suffice for the renewals of 4,500 families, while the trolley pole rope would have furnished each family with a clothes line and each could have been furnished with a new broom from the stock of the latter required in cleaning the cars.

To Hasten Work on New Subway

The Board of Transportation of the city of New York will hold a public hearing on Feb. 10 on the proposed new Second Avenue trunk-line subway route linking new rapid transit lines in the easterly part of the Bronx with another new rapid transit network in Brooklyn and Queens. The hearing will be one of a series to be held between Feb. 6 and March 19 in the board's offices at 250 Hudson Street on the 100 miles of proposed new subway routes included in the $800,000,000 project announced on Sept. 16 as the second stage of the city's subway construction program.

The Board of Transportation plans to submit definite routes to the Board of Estimate for approval this summer and expects to award about $25,000,000 in construction contracts by fall so that work may be started during 1930. The routes as outlined in the tentative program announced on Sept. 16 call for 294 miles of track and the laying of about 2,000,000 ft. of trolley wire, and the construction cost, exclusive of financing charges, equipment, power and other items, is estimated at $438,000,000.

British Get Part of Buenos Aires Subway Car Order

Ira W. McConnell, first vice-president of Dwight P. Robinson & Company, Inc., New York, says that not all the equipment of the Buenos Aires subway will be of British manufacture. Mr. McConnell said:

"We placed an order with a British firm for 56 cars. The reason for placing the order abroad lay in the fact that we were able to obtain the cars for 15 per cent less from British manufacturers. The entire order amounts to approximately $1,000,000. The special equipment, or most of it, is being purchased from firms in the United States. United States trade is maintaining its own in Argentina and home manufacturers who can prove the merit of their product are showing gains. Where there is a decided difference in price, of course, the purchasers buy abroad."

Use of Aluminum Alloys Reduces Weight of New Cars of British Columbia Electric Railway

Additional details of the fifteen trolley cars recently delivered to the British Columbia Electric Railway by the Canadian Car & Foundry Company for service in Vancouver are now available. The cars, which are of the one-man-two-man, single-end, double-truck type, embody certain features of structure and design which are rather unusual. Underframes consist of pressed-steel shapes and rolled-steel sections, with built-up body bolster, consisting of open hearth steel plates and cast-steel filters. Sideframes consist of rolled-steel 3-in. by 2-in. angle side sills, tee bar posts, rolled-steel belt rails, rolled-steel angle side plates, grade 17 Duralumin side girders, with the same grade of material for letter boards. Floors consist of two thicknesses—lower floor 3/8 in. thick and top floor of 1-lb. maple, with mats laid at standing spaces. Between the floors is laid a hot waterproof composition to deaden sound. Floors are screwed and nailed to stringers which are bolted to steel members in underframe. Floors are of plain arch design, reinforced by rolled-steel carlines and steel frame bulkheads at each body end. Roof boards are tongue and groove, covered with cotton duck, laid in white lead. Trucks are of the latest design of the Canadian Car & Foundry Company, built for standard gage, with wheelbase of 6 ft. 4 in. They are equipped with a graduated spring system, said to make for easy riding qualities, and are built with particular attention to the elimination of noise. Complete weight of wood and trucks is given as 39,000 lb., and the builder estimates a saving of 1,200 lb. through the use of Duralumin. Additional details of the equipment of these cars were supplied in the Annual Statistical Number of Electric Railway Journal, issued January, 1930, page 63.

Smaller Capacities Feature Recent Bus Orders

Conspicuous among bus deliveries made during the past few weeks have been the number of units of from 18- to 23-passenger capacity, numbers of which are being ordered for de luxe and semi-de luxe service on city and intercity routes. The United Traction Company, of Albany, N. Y., has added three White Model 65 buses to its already extensive fleet, while the Denver Tramway Com-

Use of Aluminum Alloys Reduces Weight of New Cars of British Columbia Electric Railway

Additional details of the fifteen trolley cars recently delivered to the British Columbia Electric Railway by the Canadian Car & Foundry Company for service in Vancouver are now available. The cars, which are of the one-man-two-man, single-end, double-truck type, embody certain features of structure and design which are rather unusual. Underframes consist of pressed-steel shapes and rolled-steel sections, with built-up body bolster, consisting of open hearth steel plates and cast-steel filters. Sideframes consist of rolled-steel 3-in. by 2-in. angle side sills, tee bar posts, rolled-steel belt rails, rolled-steel angle side plates, grade 17 Duralumin side girders, with the same grade of material for letter boards. Floors consist of two thicknesses—lower floor 3/8 in. thick and top floor of 1-lb. maple, with mats laid at standing spaces. Between the floors is laid a hot waterproof composition to deaden sound. Floors are screwed and nailed to stringers which are bolted to steel members in underframe. Floors are of plain arch design, reinforced by rolled-steel carlines and steel frame bulkheads at each body end. Roof boards are tongue and groove, covered with cotton duck, laid in white lead. Trucks are of the latest design of the Canadian Car & Foundry Company, built for standard gage, with wheelbase of 6 ft. 4 in. They are equipped with a graduated spring system, said to make for easy riding qualities, and are built with particular attention to the elimination of noise. Complete weight of wood and trucks is given as 39,000 lb., and the builder estimates a saving of 1,200 lb. through the use of Duralumin. Additional details of the equipment of these cars were supplied in the Annual Statistical Number of Electric Railway Journal, issued January, 1930, page 63.

Smaller Capacities Feature Recent Bus Orders

Conspicuous among bus deliveries made during the past few weeks have been the number of units of from 18- to 23-passenger capacity, numbers of which are being ordered for de luxe and semi-de luxe service on city and intercity routes. The United Traction Company, of Albany, N. Y., has added three White Model 65 buses to its already extensive fleet, while the Denver Tramway Com-
pany and the Pittsburgh Motor Coach Company has delivered one and two respectively, of this type. Among buses of larger type to be noted in recent deliveries are five White Model 54 buses and a five-thirty model FF 90 F Street Railway, for co-ordinated service in connection with its rerouted street railway service, two buses of the same type for the Reading Transportation Company, and one for the Cumberland & Westernport Transit Company, of Frostburg, Md. This same company has also placed a delivery of a Type Z 39-passenger Yellow coach. Los Angeles Railway has received three White Model 54 buses and a Model 54A from the same manufacturer. Two White buses of large capacity have recently been placed in service by a subsidiary of the Grays Harbor Railway & Light Company between the cities of Hoquiam and Aberdeen, Wash.

Recent deliveries by the Mack-International Motor Truck Corporation include one Mack Model BB four-cylinder 177-in. chassis to the Peoples Motor Coach Company of Chicago. The firm has also delivered a Model BC six-cylinder 33-passenger city type buses to the Hamburg Railway, Hamburg, N. Y.; and five Model BC six and five passenger buses to the Durham Public Service Company, of Durham, N. C.

American Car & Foundries Motor Company has delivered two A.C.F. 25-passenger street car type coaches to the Stockton Electric Railway, Stockton, Cal.; and four all-steel 40-passenger gas-electric metropolitan type coaches to the Boston Elevated Railway. General Motors Truck Company reports delivery of one Type V city-service bus to the Erie Railway, Erie, Pa., three Type Y passenger buses to the Louisville Railway; two Type W city-service buses to the Oklahoma Railway, Oklahoma City, five Type W observation coaches to the Milwaukee Electric Railway & Light Company; and nine Type Z buses to Public Service Co-ordinated Transport.

**Linde Oxygen Plant for Portland, Ore.**

The Linde Air Products Company announces the opening of an oxygen plant at 60 Knott Street, Portland, Ore. This plant, which started operations on Nov. 19, 1929, is located on a private siding on the Oregon Washington Railroad. A. D. Davis is superintendent of the plant and D. L. Fox, whose headquarters are at 114 Sansom Street, San Francisco, Cal., is district superintendent. R. G. Daggett, with headquarters at the same address, is division superintendent.

**Brooklyn Surface Lines to Be Rerouted**

Plans to reroute surface lines in downtown Brooklyn at a cost of approximately $100,000 were announced recently by William S. Menden, president of the Brooklyn-Manhattan Transit Corporation, at a luncheon of the Downtown Brooklyn Tobacco Club, which transportation leaders and representative business men met to discuss the downtown district's transportation and traffic needs. Mr. Menden said that work on the installation of new curves and switches that would be needed in connection with the B.M.T. proposed to make the expenditure of $100,000 to try out a scheme which might simplify the operation of surface equipment field is the linking by eliminating crossings and left-hand turns.

**Merger in Electric and Hand Lift Truck Field**

A recent development of definite interest and importance to the materials handling equipment industry is the merger of Astor & Associates; Inc., of New York, by which the Astor & Associates, Inc.; the American Manufacturing Company; and the American Machine Company, of New York, have been merged with the Lovell Manufacturing Company, of Buffalo, N. Y., to form the new company, to be known as the Automatic Transportation Company, for the manufacture of lift trucks, lift-truck platforms, portable elevators and structural steel storage racks.

The new firm is the successor of the Astor & Associates, Inc.; the American Manufacturing Company; and the American Machine Company, of New York, and is a manufacturer of industrial trucks, and tractors, while Walker Vehicle Company is one of the oldest motor truck manufacturers in the United States, having been in business since 1903. It manufactures a full line of electric trucks for street use.

**Taft-Peirce Manufacturing Company, Woonsocket, R. I., has appointed Hal W. Reynolds direct factory representative in the Cleveland territory. Mr. Reynolds is experienced in the small tool and gage field. His headquarters will be at 1724 St. Claire Avenue, Cleveland, Ohio, where he will hold a representative stock of Taft-Peirce products which include gages, tool room spacers, magnetic chucks and reamers. The territory embraced by the Cleveland office includes the northern half of Ohio.**

**FitzJohn Manufacturing Company, Muskegon, Mich., maker of motor coach bodies, in completing its business for 1929 enjoyed an increase in sales of approximately 17 per cent over 1928 and one of the largest years in volume of business in the history of the company. The company also reported a further increase in 1930, the company having shipped an 18,000-sq.ft. addition to its plant, bringing the total area for operating purposes to 74,000 sq. ft. In addition to business enjoyed during past years, in 1929 contact was made with the White and the Studebaker organizations and standard bodies, suitable for mounting on their various chassis, are now being manufactured.**

**Hyatt Roller Bearing Company, Newarl, N. J., announces the appointment of H. K. Porter as general sales manager. He succeeds H. O. K. Meister, promoted to assistant general manager of the Hyatt Company. During the past fourteen years Mr. Porter has held various positions on the Hyatt sales staff. He was assistant general sales manager prior to his new assignment.**

**Eccles & Davies Machinery Company, Los Angeles, Cal., has been appointed sole California distributor for the sale of the Useda Machinery Company's exceptionally tough high-speed steel tools. Stocks will be carried at Los Angeles for prompt service to patrons.**

**Wagner Electric Corporation, St. Louis, Mo., announces the appointment of Major Edman as branch manager at the Minneapolis territory. Before the war he was power engineer of the Chicago, Illinois Light Company of Peoria, Ill., and immediately after leaving the army he again assumed that post. He joined the Wagner Electric Corporation in 1927 as a salesman in the St. Louis territory, from which he was transferred to the Minneapolis office as branch manager.**
1. Light Weight (72 lb.)

2. Never Clog with Chain.


5. Maximum Power (3000 lb. braking pressure).

National Brake Company, Inc.
890 Ellicott Square
Buffalo, N. Y.

The Elleon Co., 50 Church St., New York

Canadian Representative:
Lyman Tube & Supply Co., Ltd., Montreal, Can.

PEACOCK STAFFLESS BRAKES
A New
Seneca Street

Seneca street is finished. Completion of repaving now provides a new structure for practically every inch of the way from Main street to the city line. Three years ago IRC took the first step in actual rehabilitation of Seneca street by reconstructing its tracks and paving from the Buffalo river to city line. Last year additional work was done in the stretch from Smith street to the Larkin viaduct, and this year IRC has completed its work by reconstructing the stretch from Peabody to Bailey and the stretch from Main to Michigan.

IRC of Buffalo, N. Y., tells its patrons...

"The rails instead of being joined at the end mechanically by means of a plate and bolts are Thermit-welded, providing practically a continuous rail structure from one end of the line to the other.

This construction makes car riding remarkably smooth, comfortable and speedy."

NOTE: The italics are ours.
WHY does the street railway management in Buffalo go out of its way to put this story before the car-riders? To advertise Thermit? Not a chance! It's to advertise smooth, comfortable and speedy transportation. That's all! The management in Buffalo has found Thermit Welding a means to an end—an end of rail joint troubles.

Rails become smooth, continuous ribbons of steel when Thermit welded. Joints are virtually eliminated. There are no gaps for wheels to jump. There are no rough spots to cause noise or vibration. Paving once laid need not be disturbed during the entire life of the rail itself.

Thermit Welds being pure homogeneous steel have the same electrical conductivity as the rail. Consequently no rail bonds are used when Thermit Welds are installed.

Springtime is trackwork time!
Not only in Buffalo, but in many other cities in the U.S. and Canada, reconstruction and repair programs involving Thermit Welding—are now being prepared. Include Thermit Welding in your “estimates.” Information and cost data on request.
New Birney car made by St. Louis Car Co. Axles are Timken-equipped.

Timken-equipped Journals Mean Increased Revenue

The final gesture in mechanical refinement is made with Timken Bearings. It is a fact, demonstrated in every division of the revenue transportation field, that sharp reductions in operating costs are brought about by the highly anti-friction performance of Timken Bearings under all loadings including thrust. Power consumption for starting, and charges for lubrication, maintenance, and depreciation are decreased because Timken Bearings supply load-carrying advantages in car journals never before attained in an anti-friction bearing. Every need for enduring economy in bearings is supplied by Timken tapered construction, Timken POSITIVELY ALIGNED ROLLS and Timken-made steel—wherever wheels and shafts turn.

THE TIMKEN ROLLER BEARING COMPANY
CANTON, OHIO

TIMKEN Tapered Roller BEARINGS
Careful counts have proven that many more buyers of merchandise travel by electric railway car than by all other means combined. To the merchant, therefore, the electric railway car is a most important vehicle. It is even a more important vehicle if it carries the merchant's message to the people. Through Collier Service Car Cards, the merchant urges the buyers to the stores and indirectly to use the vehicle which carries most of them.
IN the heart of a busy city, where safety must be maintained at its maximum, there is nothing so important in the selection of electric line poles as the certainty of their strength and endurance. Another important factor, of course, is their appearance.

Both of these requirements are embodied in the tubular steel pole and reach their maximum effectiveness in NATIONAL Poles, because of their great strength and reliability under severe conditions of service and their clean cut, neat appearance which adds to rather than detracts from the built-up surroundings.

Wherever the factors of safety and appearance dominate, it will pay you to specify NATIONAL Poles. Made by the largest manufacturer of Tubular Products in the world, with facilities for meeting a wide range of specifications in pole construction. Ask for Bulletin No. 14—Tubular Steel Poles.

For additional protection against atmospheric corrosion use NATIONAL Copper-Steel Line Poles. Steel containing a small percentage of copper makes it more resistant to corrosion caused by alternate wet and dry conditions. The fact that tubular poles are constantly exposed to such conditions, makes the use of copper-steel particularly desirable for this purpose. Ask for Bulletin No. 11—Copper-Steel Pipe.

NATIONAL TUBE COMPANY, Pittsburgh, Pa.
Subsidiary of United States Steel Corporation
OVER 10,000 MILES PER DAY ON GOODYEARS

On the roads of Texas, Oklahoma and Arkansas, the 100 coaches of Dixie Motor Coach Corporation travel 10,780 miles per day —on Goodyear Tires.

There's a test of tire performance! Endurance, traction, long mileage soon prove themselves in such operations.

More motor coach fleets are equipped with Goodyear Tires than with any other kind. That's mighty strong evidence that it will pay you to get in touch with a Goodyear Truck Tire Service Station Dealer—and find out what his tires can do for you.

On your new coaches specify Goodyears

GOODYEAR
THE GREATEST NAME IN RUBBER
Temperatures of twenty degrees below zero—snow-covered, wind-driven roads—yet schedules must be maintained.

The Wisconsin Northern Transportation Company does it—maintaining a year round service between Duluth, Minnesota and Eau Claire, Wisconsin, 130,000 bus miles a year.

Scientific lubrication with Cities Service petroleum products, plus the use of powerful, clean burning Cities Service gasoline, makes economic operation possible even under these adverse conditions.

This same scientific Cities Service lubrication is available to bus properties throughout the country.
schedules in zero weather

WISCONSIN NORTHERN TRANSPORTATION

REVISED TIME SCHEDULE

<table>
<thead>
<tr>
<th>Stations</th>
<th>Local</th>
<th>Total</th>
<th>A. M.</th>
<th>P. M.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eau Claire</td>
<td>11</td>
<td>11</td>
<td>10:20</td>
<td>3:20</td>
</tr>
<tr>
<td>Chippewa Falls</td>
<td>9</td>
<td>18</td>
<td>9:50</td>
<td>2:50</td>
</tr>
<tr>
<td>Bloomer</td>
<td>8</td>
<td>26</td>
<td>9:20</td>
<td>2:20</td>
</tr>
<tr>
<td>New Auburn</td>
<td>7</td>
<td>35</td>
<td>9:00</td>
<td>2:00</td>
</tr>
<tr>
<td>Chetek</td>
<td>6</td>
<td>45</td>
<td>8:40</td>
<td>1:40</td>
</tr>
<tr>
<td>Cameron</td>
<td>5</td>
<td>60</td>
<td>8:20</td>
<td>1:20</td>
</tr>
<tr>
<td>Rice Lake</td>
<td>4</td>
<td>74</td>
<td>8:00</td>
<td>1:00</td>
</tr>
<tr>
<td>Long Lake</td>
<td>3</td>
<td>92</td>
<td>7:40</td>
<td>1:40</td>
</tr>
<tr>
<td>Spooner</td>
<td>2</td>
<td>104</td>
<td>7:20</td>
<td>1:20</td>
</tr>
<tr>
<td>Trego</td>
<td>1</td>
<td>122</td>
<td>7:00</td>
<td>1:00</td>
</tr>
<tr>
<td>Lampson</td>
<td>0</td>
<td>123</td>
<td>6:40</td>
<td>1:00</td>
</tr>
<tr>
<td>Minong</td>
<td>-1</td>
<td>30</td>
<td>6:20</td>
<td>1:00</td>
</tr>
<tr>
<td>Gordon</td>
<td>-2</td>
<td>36</td>
<td>6:00</td>
<td>0:50</td>
</tr>
<tr>
<td>Solon Springs</td>
<td>-3</td>
<td>45</td>
<td>5:40</td>
<td>0:40</td>
</tr>
<tr>
<td>Bennett</td>
<td>-4</td>
<td>60</td>
<td>5:20</td>
<td>0:30</td>
</tr>
<tr>
<td>Hawthorne</td>
<td>-5</td>
<td>75</td>
<td>5:00</td>
<td>0:20</td>
</tr>
<tr>
<td>Middle River</td>
<td>-6</td>
<td>90</td>
<td>4:40</td>
<td>0:10</td>
</tr>
<tr>
<td>Rock Mound</td>
<td>-7</td>
<td>105</td>
<td>4:20</td>
<td>0:00</td>
</tr>
<tr>
<td>Morrison's Corner</td>
<td>-8</td>
<td>120</td>
<td>4:00</td>
<td>0:00</td>
</tr>
<tr>
<td>Parkland</td>
<td>-9</td>
<td>135</td>
<td>3:40</td>
<td>0:00</td>
</tr>
<tr>
<td>Itasca</td>
<td>-10</td>
<td>150</td>
<td>3:20</td>
<td>0:00</td>
</tr>
<tr>
<td>Allouez</td>
<td>-11</td>
<td>165</td>
<td>3:00</td>
<td>0:00</td>
</tr>
<tr>
<td>Superior</td>
<td>-12</td>
<td>180</td>
<td>2:40</td>
<td>0:00</td>
</tr>
<tr>
<td>Duluth</td>
<td>-13</td>
<td>200</td>
<td>2:20</td>
<td>0:00</td>
</tr>
</tbody>
</table>

WISCONSIN NORTHERN TRANSPORTATION CO.
from ATLANTA...

a study of traction advance

THE photograph shows an interesting example of the Georgia Power Company's extensive track reconstruction work in 1929. Mitchell Street, Atlanta—2,250 feet of track.

The type of construction built by Mr. C. A. Smith, Superintendent of Roadways: Concrete beams under rails; Dayton ties bent so as to require minimum amount of concrete, spaced 3 ft. center to center of ties (see photo); 80-lb. A.S.C.E. rail... and, of course, a stress-absorbing cushion between the rails and the concrete paving—the Carey Elastite System of Track Insulation, standard A, B and D sections.

A guaranty of quicker, better, smoother service and lower maintenance cost. Of course, you will want full information on this modern traction improvement. Write.

AN interesting view of the construction work of the Georgia Power Company Street Railway, on Mitchell Street, Atlanta. Note particularly the application of Carey Elastite System of Track Insulation.

Carey Elastite
SYSTEM OF TRACK INSULATION

The Philip Carey Company • Lockland, Cincinnati, Ohio
CHANGE-OVERS WITH

GOODYEAR TYPE "K" RIMS

easy, rapid way to greater profits

CUT down change-overs with Goodyear Type "K" rims offer you a quick increase in profits for your trucks.

Nothing complicated—you simply cut down your old solid-equipped wheels and weld on single or dual Type "K" felloes. You get better service from your trucks; your drivers like the new power. Your repair bills are smaller, and your lay-ups shorter.

Mr. E. W. Wiedebusch, President, Builders Supplies & Fuel Co., Wheeling, W. Va., takes time enthusiastically to write: "Most pleased with this installation and results obtained. We have been able to get into places that were before im-

"The Man who changes the tires likes Goodyear Type 'K' Rims"

possible. Our repair bills have been smaller, and with our drivers and every one connected with our trucking department so much better satisfied, we have secured considerable new business."

Type "K" Rims are trim, clean, cool running. You can take any tire off in three minutes or less. They are safe because they stay on the tire until your repair boss says the word—then off with least loss of time.

Leading truck and bus manufacturers and users everywhere emphatically endorse Type "K" Rims. Write today to Goodyear, Akron, Ohio, or Los Angeles, California, for complete information.
New!

... an important development in varnished cambric tape

SEAMLESS bias varnished cloth at the price of sewn bias! That's what a specially developed base cloth has made possible.

Price no longer need compel you to waste time and insulation in cutting out sewn seams. This new seamless bias comes in long, continuous lengths, without sewn joints. It has greater dielectric and mechanical strength than the sewn bias.

Whether it be for wrapping cable joints, for winding coils, or for any similar insulating need, you will find this new seamless bias tape ideal. It's made in either black or yellow finish, in tape form or in rolls approximately 36” wide.

Send for a sample.

MICA INSULATOR COMPANY
Cleveland  Pittsburgh  Cincinnati  Birmingham  Seattle  San Francisco
ANNOUNCING—new large capacity coaches —so powerful and flexible that they set the pace in present day traffic; with powerful engines that keep high speed schedules regardless of hills. Designed and built by A.C.F.
Q. C. C. offers a series of large capacity passenger coaches that are new—a new to Q. C. C. and new to the industry. They are not simply revamped and modernized editions of models that have already existed. With no compromises, Q. C. C. has brought its long experience and tremendous resources to the task of building coaches that exactly fit the needs of modern bus transportation and schedules... In appearance, the bodies of these new coaches are practically the...
same. But one chassis is designed to meet normal requirements with a 120 h. p. Hall-Scott engine, and the other is powered with a 175 h. p. Hall-Scott for unusual operating conditions where great power or sustained high speed are required. In this way the operator may obtain the same rider-appeal and exceptional operating qualities of the truly modern coach, with the horsepower his requirements call for.
Consider these revolutionary features and specifications:

Parlor Car seating capacity: Up to 37 passengers; auxiliary seats for more. 261" wheelbase where necessary . . . Headroom: 76 inches. Inside width between liner panels: 883/4 inches. Removable lift type sash on metal guides—all windows opening all the way; each pair of seats is provided with an individual window . . . Inside metal baggage racks lined with carpet (ceiling above protected) extend full length of coach . . . Inside finish: metal panelling, including ceiling, to harmonize with color scheme selected.

The location of the transmission provides unusually roomy entrance space. Transmission, drive-line and rear axles are designed specially for coaches of this series. Chassis engineered to allow adequate "roll" without stress on springs, shackles or chassis.

Three speed transmission, possible only by flexibility of new fully balanced engine. Full floating axle with bevel gear and pinion drive; Hotchkiss drive; largest and strongest axle used in any bus.

Both the 120 h. p. and 175 h. p. Hall-Scott engines are so advanced in their performances that both actual road performance and laboratory test curves show them to be from one to two years ahead of the industry. They retain all the fundamentals that have established Hall-Scott engines in the transportation field, but their refinements admit them into an entirely new class.

Features such as fully counterbalanced seven bearing crankshafts, with vibration dampener, dual carburetion, dual ignition, entirely new carburetion and manifolding, all contribute to this new superlative performance.

AMERICAN CAR AND FOUNDRY MOTORS COMPANY
30 CHURCH STREET • • NEW YORK CITY
A manufacturing company, marketing its product nationally, was faced with serious competition. Its salesmen could visit customers only at intervals of several months. They could give little time to developing new prospects. Regional mills and other competitors were making deep inroads into its business.

A Key Town Plan of telephoning was presented to this company and adopted. Its use enables the salesmen to cover their territory at least twice as often, at proportionately lower cost. The Key Town Plan is used by many business firms to meet modern conditions. Under this method, the representative goes to the key cities in person. From these he conducts his business in the surrounding area by telephone, buying and selling goods, building good-will, answering questions, adjusting complaints, quoting prices or specifications.

In this way he can cover territory far more quickly. Many business men alternate personal visits with telephone calls, visiting certain cities on one trip and telephoning nearby ones, and reversing the procedure the next.

There is now in effect a further reduction in various long distance rates, saving telephone users of the United States more than $5,000,000 a year. This is the fourth reduction within little more than three years. It is part of the fundamental policy of the Bell System, which is to provide the best possible telephone service at the least cost to the public. Out of town calls are Quick . . . Easy . . . More economical than ever.
Look to DeVilbiss for
The Exhausting Equipment
Your Particular Operation
Demands

COMPLETE SPRAY OUTFITS
FOR EVERY PURPOSE.....

Spray guns of various types and sizes.
Pressure feed paint tanks and containers.
Spray booths, exhaust fans, and approved lighting fixtures.
Air compressing equipment.
Air transformers and accessories.
Air and fluid hose and connections.
Complete outfits from the smallest hand-operated units to the largest industrial installations.

HERE is the one place where all the varied industries and operations engaged in spray-painting and spray-finishing find exhausting equipment designed, built, sold and installed with true specialization.

DeVilbiss has provided exhausting equipment for every different spray-painting and spray-finishing task carried on in the world today. DeVilbiss creates exhausting equipment and spray booths for many operations whose needs cannot be adequately served by existing equipment. Whatever may be your need from the finishing of railway cars and buses to the spray-decorating of art objects, DeVilbiss brings a vast experience and a complete understanding to your exhausting problem, and DeVilbiss economically provides exactly suitable exhausting equipment.

It costs you nothing and may save you much to see us first.

THE DEVILBISS COMPANY  272 PHILLIPS AVENUE  TOLEDO, OHIO

Sales and Service Branches

NEW YORK  PHILADELPHIA  CLEVELAND  DETROIT  INDIANAPOLIS
ST. LOUIS  SAN FRANCISCO  LOS ANGELES  WINDSOR, ONT.

Direct factory representatives in all other territories
A Comfortable, Sanitary and Modern Seat!

HERE is a seat which maintenance engineers will appreciate. Its close-woven cane webbing back and cushion are easy to keep clean. The genuine leather facing on the cushion reinforces the seat at the greatest point of wear. In addition, the individual backs and deep, spring cushions are shaped to allow proper posture and leg freedom. Mechanism rails are set in and the frame of the chair is made of selected Northern hard-grained ash, further strengthened by malleable iron braces. Write to the nearest Heywood-Wakefield sales office for complete details of the 327-M Special and other popular bus and electric railway seats in our line.

HEYWOOD - WAKEFIELD COMPANY

BOSTON, MASSACHUSETTS

516 West 34th St., New York City
J. R. Hayward, Liberty Trust Bldg., Roanoke, Va.

439 Railway Exchange Bldg., Chicago, Ill.
A. W. Arlin, Delta Bldg., Los Angeles, Calif.
The G. F. Cotter Supply Co., Houston, Texas

The Railway and Power Engineering Corporation
133 Eastern Ave., Toronto; Montreal; Winnipeg, Canada
Socony Lubrication
Is Bus Life Insurance

When you buy Socony lubricants, you are buying life insurance for your equipment. By providing correct lubrication, Socony products actually increase the life of the unit parts of your buses and contribute to better operating efficiency. In addition, Socony lubricants make possible longer working periods without lay-ups for repairs.

Socony lubricants have satisfied the exacting requirements of many bus operators in New York and New England—among them the operators of the Luna Cars mentioned above. Let our representative tell you what these oils will do for you.

SOCONY
MOTOR OIL   AIRCRAFT OIL
(Winter Grade)
GASOLINE   SPECIAL GASOLINE plus ETHYL
STANDARD OIL COMPANY OF NEW YORK
Electric Railways to Spend 371 Millions This Year

Based on an Investment of More Than 5 Billions...a Gross Revenue of Over a Billion...and the Highest Net Income They've Ever Made

THE electric railway companies are budgeted to spend $371,220,000 during 1930...more than a million dollars a day.

For new equipment and maintenance alone, they expect to spend $251,530,000, an increase of more than 15 millions over 1929...more than 25 millions over 1928.

It is significant that not only the totals, but the appropriations for each account are increasing. This can only indicate that the maintenance standards of the railways are being steadily raised.

Increasing net profits, expanding bus operations, favorable track adjustments, larger purchases of rolling stock...all reflect the great improvement in the financial situation. Nearly 1,500 new cars were purchased, and a larger number of old cars scrapped than ever before, in 1929.

Electric Railway Journal's "Maintenance Contest" will be continued in 1930 for the fourth successive year, in cooperation with the American Electric Railway Engineering Association. These contests have aroused widespread interest in maintenance practices. Each year has produced an increasingly large number of competitors, nearly 200 having submitted suggestions for improved maintenance in 1929.

THIS YEAR, THEREFORE, the editorial pages, will have special significance...the advertising pages extraordinary value...in

THE ANNUAL MAINTENANCE NUMBER

of Electric Railway Journal

APRIL ISSUE

Advertising Forms Close March 19.
NEED a complicated layout?

...OR a switch tongue lock-box?

... WRITE TO

LORAIN

Lorain GIRDER RAILS GIRDER GUARD RAILS PLAIN GIRDER RAILS RAIL JOINTS AND TRACK ACCESSORIES EXPANSION JOINTS FOR ELECTRICALLY WELDED TRACK SPECIAL TRACKWORK SWITCHES, FROGS AND CROSSINGS Solid Manganese Steel, Manganese Insert Construction, Chrome Nickel Steel Insert Construction and Built-up Construction of all heights and weights of rail.

It should be particularly gratifying to know that, from the most minor piece of track equipment to the most complicated type of construction, you can look to one manufacturer for prompt, efficient, satisfactory service.

LORAIN'S experience and leadership in trackwork development date all the way from horse-car days to its present modern, complete line of standard and special equipment. The service you can expect from LORAIN is more than the mere supplying of materials; it includes an appreciation of, and a helpful solution to, your every trackwork problem.

THE LORAIN STEEL COMPANY
JOINTOWN, PA.

SUBSIDIARY OF UNITED STATES STEEL CORPORATION

AMERICAN BRIDGE COMPANY
AMERICAN SHEET AND PLATE COMPANY
AMERICAN STEEL AND WIRE COMPANY
PACIFIC COAST DISTRIBUTOR—UNITED STATES STEEL PRODUCTS COMPANY

PRINCIPAL SUBSIDIARY MANUFACTURING COMPANIES:
CARRIGAN STEEL COMPANY
CYCLONE FENCE COMPANY
FEDERAL SHIPBUILDING AND DRY DOCK COMPANY

ILLINOIS STEEL COMPANY
MINNESOTA STEEL COMPANY
NATIONAL TUBE COMPANY

TENNESSEE COAL, IRON & R. R. COMPANY
UNIVERSAL PORTLAND CEMENT COMPANY

THE LORAIN STEEL COMPANY

Lorain Sales Offices—ATLANTA
CHICAGO
CLEVELAND
DALLAS
NEW YORK
PHILADELPHIA
PITTSBURGH

The Lorain Steel Company, Johnstown, PA.
Bond Performance

One of the advantages of buying American Steel and Wire Company Rail Bonds is the assurance you will have of dependable performance. The reason is materials, design, and construction. Our experience has been of the kind that is worth money to you in Bond performance.

The AB-2 Bond is easily and quickly applied with a steel electrode. The open shape of this Bond terminal is especially desirable since the arc can be directed freely at the junction of the terminal and the rail.

Would you be interested in inspecting a sample?
Remodeling a CITY'S STREETS with UNION METAL POLES

A typical "street of the past". Note the obsolete cluster-type lighting standards and the trolley poles extending down the center of the street.

The same street resurfaced and modernized with an installation of Union Metal all-purpose poles.

NARROW thoroughfares, cluttered with a variety of posts and poles, fail to measure up to the standards of the modern City Beautiful. When Union Metal Fluted Steel Poles are installed, streets take on a new, fresh, neat appearance. Unlike ordinary poles, they add to, rather than detract from the beauty of the street. They are, in themselves, pleasing to the eye.

These poles are strong enough to carry ALL necessary electrical equipment . . . trolley span wires, feeder lines, lighting units, distribution lines, traffic signals and street signs. Consequently the number of poles along the street may be reduced as much as 75%. The curb-line forest vanishes.

Embodied in Union Metal Poles are construction principles which make them strong, light and long lived. They can be installed at a low cost. Upkeep expense is nominal. And during the many, many years they are in service, Union Metal Poles are consistent builders of good will for their owners.

THE UNION METAL MANUFACTURING CO.
GENERAL OFFICES AND FACTORY: CANTON, OHIO
SALES OFFICES: New York, Chicago, Philadelphia, Cleveland, Boston, Los Angeles, San Francisco, Seattle, Dallas, Atlanta
DISTRIBUTORS
Offices in all principal cities

UNION METAL DISTRIBUTION AND TRANSMISSION POLES
THE NEW

Mack

6-CYLINDER BUS MODELS B C

AT LAST . . . AN "INTERMEDIATE SIX" — ON ROUTES WHERE FOUR AND LIGHT-SIX CYLINDER BUSES ARE OVERWORKED AND BIG SIXES UNDERWORKED AT HIGH OPERATING COSTS... THIS BUS CREATES PROFITS.
This latest addition to the line of Mack Buses is the much needed "intermediate six" for city or interstate service.

It will handle profitably and comfortably up to 33 seated passengers (and an equal number of standees) without overtaxing its power.

Its outside and inside appearance and finish, with all steel base, wide service doors, roomy aisles and luxurious seats, need no selling to men who know Mack standards.
The outstanding features of this Mack BC Bus are the power and flexibility of the exceedingly compact 100 h.p. six-cylinder engine:

—the large drop-forged, case-hardened crankshaft with 7 main bearings 3" in diameter

—the silent, super-strong Mack Hypoid Bevel Gear final drive for high-speed service

—with full floating shafts in a one piece, drop forged chrome nickel steel banjo type axle.

In short, in capacity, in power, in speed and in construction to "stand the gaff," Mack Model BC is exactly the bus long desired to fill a definite need in the field today.
Model BC 100 h. p. six-cylinder Engine. Exclusive cold circulation type thermostatic cooling system which prevents overheating and overcooling.

A few of the Mack BC Bus users:

Albany Transit Co. . .
Allentown & Reading Transit Co. . .
Atlantic Stages, Inc. .
Cincinnati Street Railway Co. .
C. J. Brimail .
Durham Public Service Co.
Georgia-Florida Motor Lines .
Albany, N. Y.
Reading, Pa.
Cincinnati, Ohio.
Baltimore, Md.
Durham, N. C.
Atlanta, Ga.

Hamburg Railway Co.
Howard Bus Line, Inc.
Montreal Tramways.
Queen City Coach Co.
St. Joseph Railway.
Light, Heat & Power Company.
Tel-City Railway Co.
Charles Vollmer .
Nathan Zeskind .

Buffalo, N. Y.
Columbus, Ga.
Montreal, Canada
Charlotte, N. C.
St. Joseph, Mo.
Davenport, Iowa
Amsterdam, N. Y.
Baltimore, Md.

MACK TRUCKS, INC.
25 Broadway, New York, N. Y.

The quiet, sturdy Mack Hypoid Gear final drive assures long-life in city and interstate service.
you wouldn’t know the old boy now!

When electricity was young, the ½-horse-power Perrett motor pictured above was considered the latest in small motor design. It was one of the first ones built with a laminated field core. It was equipped with a row of pencil carbon brushes. Today this same motor has become obsolete. In its place we have the commutating type A.C. motor which bears but slight resemblance to its forebear. As brush manufacturers, National Carbon Company, Inc., has kept pace with this progress made by modern engineering.

The fractional horse-power motor of today, which plays such an important part, both in industry and in the home, would not have been possible without the laminated field which was a feature of the early Perrett motor. Of equal importance in this development has been the advance in brush manufacture. The exacting demands placed upon these little motors require a brush of superior commutating characteristics and long life, free from abrasive action and quiet in operation. These needs have been met by our engineers in the Research Laboratories of National Carbon Company, Inc.

National Pyramid Brushes are manufactured under careful supervision and scientific control. They are maintaining the reputation for satisfactory performance established and held through the years of rapid development in the electrical industry.

NATIONAL CARBON COMPANY, INC.
Here’s What You Get — and more

Hundreds of Hyattized cars in operation on street railways and interurban lines throughout the country are proving the practicability of Hyatt Roller Bearings for journal box service.

With friction free Hyatts replacing plain brass journals, jerky starting and stopping is eliminated and substituted with smooth, quiet, joltless riding . . . the kind of riding comfort passengers enjoy.

But Hyatt advantages don’t stop there . . . operating economies, too, are provided. Hyattized journal boxes are reducing maintenance, saving power, and helping to keep the cars out of the repair shops.

Repeat orders from property after property is the best indication that Hyatts are making good. That Hyatt journal boxes conform to A.E.R.A. standards is another point in favor of their wide-spread use.

HYATT ROLLER BEARING COMPANY
NEWARK DETROIT CHICAGO PITTSBURGH OAKLAND

HYATT ROLLER BEARINGS
PRODUCT OF GENERAL MOTORS
One of the Buses of the Higgins Transit Co. which operates between Grand Rapids, Hastings, Kalamazoo, and Battle Creek, Michigan.

“Two are about to enter our 5th Year on Goodrich 100%,”

SAYS E. C. HIGGINS, President, HIGGINS TRANSIT COMPANY

Mr. E. C. Higgins, President of the Higgins Transit Co., Hastings, Michigan, expresses a typical attitude toward Goodrich.

“Our entire fleet is equipped with Goodrich Tires.

“We are about to enter our fifth year on Goodrich; our fifth year, by the way, of very complete satisfaction, both in our dealings with Goodrich and in the consistent mileage which we have received from our tires.

“We believe you will be happy to know our true feelings. We are certainly strong for Goodrich Bus Tires, and you may rest assured that as we add to our fleet, Goodrich will be the tire equipment.”

Goodrich Distributors enable you to keep a check on “pay loads” and overloads by means of the Loadometer which indicates the weight on each wheel.

Seven Superior Specifications
Built Into Every Heavy Duty Silvertown

1. Heavily insulated stretch-matched cords.
2. Additional adhesion—from greater insulation between outside plies.
3. Heavy twin beads for better rim seating.
4. Extra gum fillers between plies for longer tire life.
5. Heat-resisting, interlocking cord breakers.
6. Tread designed correctly for heavy duty service.
7. The whole tire toughened by the famous Goodrich “water cure.”


Goodrich HEAVY DUTY Silvertowns

SPECIFY GOODRICH ON YOUR NEW BUSES
You can't bury VIBROLITION!

The result of trying to bury VIBROLITION!

DO YOUR STREETS SHOW IT?

Concrete correctly used—is the ideal foundation for track and paving substructure. But it must be protected from VIBROLITION.

As long as the marks of "VIBROLITION" remain submerged, they will be ignored, but once they break through to the surface—as they will do—it's everybody's business. These surface signs are only a small indication of the greater physical disorder... underneath.

Despite the untold damage done by this scourge of so-called permanent structure, however, "VIBROLITION" has accomplished two great things for the electric railway industry. First it has exploded the fallacy that a vibrating steel rail can be permanently installed and secured in concrete without a means of protecting that concrete... and secondly, it has brought to the forefront the only tie, substitute or otherwise, that positively and permanently prevents it.

"The Better Tie"
prevent it with DAYTON TIES

The track shown above is a continuation of the track shown in picture No. 1, opposite page. But in this section Dayton Ties were used. Note the unbroken pavement and absence of any sign of "VIBROLITION."

THERE is no cure for "VIBROLITION" once this trouble makes known its presence, without complete rehabilitation of the track structure. But fortunately it can be prevented by installing in the first place the only tie that will permanently prevent it. And this prevention of "VIBROLITION" is but one of many advantages which Dayton Ties provide... smoother trackage... noise elimination... increased comfort for passengers... decreased wear on rolling stock and most of all, a positive reduction of maintenance costs. No other tie, substitute or otherwise, can do this for you. And yet, Dayton Ties can be installed at lower costs than the cheapest track you ever built.

Can you afford to ignore such facts without first getting a quotation for your 1930 work? Write today.

Send for your copy of this book!

Every maintenance engineer interested in lower maintenance costs will want a copy. Write today for yours.

Without an Alibi"

TRACK AND PAVING STRUCTURE TIE CO.,-DAYTON, OHIO
"ILLINOIS" on a wrought steel wheel is more than a mark of identification. It means a wrought steel wheel produced by the best and most modern equipment. Expert supervision, careful workmanship and frequent inspection from wheel block to finished wheel all tend to produce multiplied mileage at low cost.

Our Wheel Engineers are at your service.

Illinois Steel Company
Subsidiary of United States Steel Corporation

General Offices:
208 South LaSalle Street...Chicago
What is TULC?

The answer is—
Unusual results and
Less maintenance Costs.

In the operation of
Street Railway
Appliances.

Lubricant which produces
Unexcelled results.
Bearing life increased—
Replacement costs lessened.
It reduces hot boxes, etc.
Cuts lubricating troubles—
Always uniform—
No acid—no filler—no dripping
Test it—see for yourself.

The UNIVERSAL LUBRICATING CO.
CLEVELAND - - - OHIO
Many well-known street-railway companies are cashing in on a new transfer system, designed by Globe to meet modern traffic demands. No two will operate exactly alike, and right here is one reason why Globe's half-century of experience is of value. Having on file many problems similar to the one in question (yours, let's say), we can help you initiate a series of transfers to eliminate a majority of the revenue leaks now suffered by the present system.

Are we sincere? Investigate, Buffalo, Toledo, Akron, Baltimore, and the rest. Then let us help you.
Announcing a New Yellow Coach

Type "U"

Powered with the Big Six Buick Engine

The persistent demand for a coach that would be the same as the Yellow Type "W" but powered with a six-cylinder engine is now met in this new Type "U" Yellow Coach—the latest addition to the Yellow line.

Type "W" introduced wholly new standards in small capacity coach construction. In the new Type "U" these standards are duplicated and maintained. Only in the most costly large capacity coaches will the same features be usually found. The Type "W" made them available at a new level of economy.

Now they are found in this latest addition to the Yellow family—at a price that represents still a greater saving in initial cost.

In Type "U" is found the same powerful, smooth four-wheel service brakes with their perfect automatic equalization of brake pressure on all four wheels... the same exceptionally strong and rigid frame with its seven sturdy cross members; three of them tubular... the same outboard...
mounting of the front springs; secret of the exceptional riding qualities, roadability and easy steering of the Type "W" . . . the same oversize, underslung worm drive rear axle . . . the same accessibility and betterments that simplified maintenance and reduced operating costs in the Type "W" . . . all are here.

In addition to the Type "W" with its 8-cylinder engine, the Type "U" now makes available a six—the big new Six developed by Buick . . . famous for its power, low maintenance cost and fuel economy. Its exceptional stamina and dependability have been demonstrated in many millions of miles of actual service.

To balance with this power plant a different clutch, transmission and transmission brake has been developed, thoroughly tested and adopted. With these exceptions, virtually the same chassis specifications that apply to the Type "W" fit the Type "U". Many of the chassis parts are interchangeable. And in appearance, dimensions, workmanship and appointments the bodies are identical.

GENERAL MOTORS TRUCK COMPANY
Pontiac, Michigan
Subsidiary of Yellow Truck & Coach Mfg. Co.

MODELS AVAILABLE
21 passenger city service
16 passenger parlor coach

Type "U"
Yellow Coach
Powered with The Big Six Buick Engine
Announcing
A new Series

Type W
with the new and more powerful
8 cylinder Cadillac Engine

In the entire history of bus operation in America no model of coach has ever enjoyed the popularity of the Type "W." More Type "W"s were purchased last year than any other type or model of motor coach produced in America. Everywhere, Type "W" has been extraordinarily satisfactory to the hundreds of different companies who have put this model in operation. It has successfully demonstrated its capacity in every class of service . . . built revenue and cut operating costs for many companies in both city and intercity service . . . been adopted with unusual success for developing new routes, for rendering de luxe service at a high rate of fare, for special charter service. It is recognized everywhere as a thoroughly tried and seasoned transportation vehicle.

Now comes the new series Type "W," retaining all of the proven features of design that have been so enthusiastically endorsed by operators plus new betterments and refinements that definitely add to performance, to ease of maintenance and to still lower operating costs.

Chassis improvements include the new and more powerful eight-cylinder V-type Cadillac engine,
modified to meet the requirements of motor coach operation ... increased displacement ... increased bore ... smoother operation. A bigger generator ... 600 watt capacity. Better carburetion ... automatic heat control ... air cleaner. Improved ignition distributor ... with heavier condensers and provision for lubricating bearings. Dual ignition coils ... provision against road failure ... with a ten second change-over switch. An improved starting motor ... with Bendix drive. An improved clutch of the twin disc dry plate type ... smooth ... long lived. On the highway or in city service the performance of the new Type "W" is smooth, quiet, and powerful beyond any comparison in the small coach field. Its flexibility and rapid acceleration are truly remarkable — truly comparable to passenger car performance. And it has the fastest, smoothest trouble-free brakes ever designed for coach use.

GENERAL MOTORS TRUCK COMPANY
Pontiac, Michigan
Subsidiary of Yellow Truck & Coach Mfg. Co.

MODELS
21 passenger parlor observation
21 passenger city service
21 passenger de luxe city service
17 passenger parlor coach

Type "W"
Yellow Coach
with the new and more powerful Cadillac Engine
3 types of Johns-Manville FLOORING to meet every need of the modern Bus and Railway Car

CONSIDER the flooring of your buses and cars. Why not specify it as you do other equipment? Flooring not only affects the cost of the bus or car, but what is equally important—the cost of maintenance and the appearance. Johns-Manville offers a choice of flooring from the lowest-cost, lifetime floor to the most De Luxe flooring obtainable. For every type of bus or railway car there is a J-M Flooring that will meet every requirement and insure lasting service.

J-M Masticoke
Low Cost — Long Life

J-M Masticoke provides a floor that is pleasing in appearance, is long-lasting and low in cost. This modern flooring will meet the severest service requirements. It will last the life of the bus or car without maintenance. Its surface is slip-safe. It will not retain dust, dirt or germs. It is easily cleaned by flushing with water. Its color is a pleasing dark gray. When you want a low-cost floor that will give trouble-free service, specify J-M Masticoke Flooring.

J-M Magnesite
For Decorative Effects

Where, in addition to durability and free maintenance, you want an attractive flooring which can be secured in flat colors to harmonize with the bus or car interior, specify J-M Magnesite. In attractiveness and durability, this floor will give the best-dollar for dollar-flooring value in a colored floor that can be bought for your buses.

J-M Tile Flooring
The De Luxe Flooring

For the highest type of equipment, here is a flooring that provides the utmost in appearance without sacrifice of durability. Light in weight, this flooring allows color combinations and assorted designs which will greatly enhance the decorative effect of the most luxurious coach or interurban car. J-M Tile Flooring is resilient—quiet and comfortable to walk on. It provides the superlative in flooring. Its cost is not high.

The long life and satisfactory service of J-M Masticoke Flooring has been well demonstrated by its extensive use on railroad coaches and Pullman Cars. Where color is necessary, J-M Magnesite and J-M Tile Flooring answer every requirement of railway car and bus service and maintenance at a comparatively low cost. Mail the coupon for information on these J-M Floorings.

JOHNS-MANVILLE
Address
At nearest office listed below
New York Chicago Cleveland San Francisco Montreal
(Offices in all large cities)

Please send complete information on J-M Bus and Railway Car Floorings.

Name
Address

ELECTRIC RAILWAY JOURNAL
How Much Should a Wheel Weigh?

Enough metal must be put in a car wheel to give adequate strength and wear resistance. How much of it is necessary to fulfill these conditions depends upon the kind of metal used. By reason of its special heat-treated composition the Davis "One-Wear" Steel Wheel can secure a given result with a minimum weight. It's the special metal that makes the difference.

American Steel Foundries
New York  Chicago  St. Louis
For heavy-traffic locations use silico-manganese trackwork

The new Bethlehem Silico-Manganese Weldable Trackwork has high resistance to impact and abrasive wear. The extremely fine-grain and dense structure of silico-manganese steel becomes more firmly set under constant impact. These qualities combined with weldability make Bethlehem Silico-Manganese the logical trackwork to install at all heavy-traffic locations.

Bethlehem Silico-Manganese Trackwork is readily weldable by any of the standard methods, such as electric-arc, oxy-acetylene or Thermit welding.

The wear-resisting properties of Silico-Manganese steel are well established. For years it has been the standard for high-grade tools such as punches, chisels, shear blades, etc., as well as for finest quality automobile springs, and for parts subject to shock and extremely hard grinding wear with little or no lubrication.

Bethlehem Silico-Manganese Weldable Trackwork can be installed at all heavy-duty locations with confidence that it will stand up under the most severe conditions of service.

BETHLEHEM STEEL COMPANY
General Offices: Bethlehem, Pa.
District Offices: New York, Boston, Philadelphia, Baltimore, Washington, Atlanta, Pittsburgh, Buffalo, Cleveland, Cincinnati, Detroit, Chicago, St. Louis.
Pacific Coast Distributor: Pacific Coast Steel Corporation, San Francisco, Los Angeles, Portland, Seattle, Honolulu.
Export Distributor: Bethlehem Steel Export Corporation, 25 Broadway, New York City

BETHLEHEM
Silico-Manganese Trackwork—Design 999
The inevitable by-product

More fares
induced by quieter, smoother, faster, more comfortable transportation

Lower costs
less weight; faster schedules that mean more passengers per car-hour; lowered maintenance of equipment and tracks

inevitably produce
BIGGER PROFITS

TIMKEN
worm drive
TRUCKS
for electric railway cars

AXLE CO., DETROIT, MICH.
LONG CLUTCHES ARE USED ON THE COMPLETE LINE OF AUTOCAR TRUCKS

LONG PRODUCTS
AUTOMOTIVE CLUTCHES AND RADIATORS

LONG MANUFACTURING CO.
DETROIT MICHIGAN
Carnegie Steel Cross Ties provide the foundation for a smooth, repair-free track—a track that saves wear and tear on rolling equipment and greatly enhances its comfort. Electric railway operators, facing the competition of automotive vehicles, realize the importance of providing safe, comfortable transportation. Passenger appeal begins with the track.

Carnegie Ties are easily installed. The bolt and clip by which the rail is secured are simple and efficient. The unit cost (cost per foot of track per year) is considerably less than for wood ties.

Plan to include Carnegie Steel Cross Ties in your 1930 track construction program. It will prove to be an investment that pays dividends—particularly in passenger satisfaction.

Carnegie Steel Company
Subsidiary of United States Steel Corporation
PITTSBURGH, PA.
For the fifth straight year, the New England Transportation Company is using U. S. Tires. 1930 finds all of its more than 280 vehicles on the new U. S. Royals.

OFFICIALLY OK'D by Leading Bus Fleets

The new year brings still greater success . . . more widespread endorsement of the new U. S. Royal Heavy Service . . . both Balloon and High Pressure.

Millions of tire miles a month are demonstrating its trouble-free, on-schedule performance and the added gripping power of its wide, deep tread and buttressed shoulders.

It is a matter of record that every prominent bus line which used these tires in 1929, has officially ok'd them as standard equipment for 1930.

UNITED STATES RUBBER COMPANY

World's Largest Producer of Rubber
Safety is but one feature of modern air brake control

The Westinghouse Automotive Air Brake is coming more and more to be known not alone as a safety device . . . but as one of the most important units of economic necessity in modern coach operation.

Westinghouse Automotive Air Brakes have enabled thousands of coach operators to increase schedule speeds. The results are obvious—better service, more passenger loads and greater profits. The fact that Westinghouse control assures perfect equalization of braking force at all times is also a feature of no small importance. Skidding is minimized . . . brake adjustments are less frequent and lining life is lengthened materially.

The Westinghouse braking system also furnishes an air supply for the operation of various pneumatic devices such as warning signals and door control mechanisms.

The far reaching advantages of Westinghouse Automotive Air Brakes are more fully outlined in several recent publications which may be had by addressing the WESTINGHOUSE AIR BRAKE COMPANY, Automotive Brake Division, Pittsburgh, Penna.

A tuned combination of the Pneuphonic Horn, a unique warning signal designed especially for the modern motor coach by Westinghouse engineers. This unusually effective signal operates from the same air source as the Westinghouse Automotive Air Brake.
INTERLOCK of brakes with doors, by means of a common operating valve, simplifies manipulation, and the selective door control feature, which permits treadle control of rear exit, insures prompt and flexible passenger interchange under varying traffic conditions.

SAFETY CAR DEVICES CO.
OF ST. LOUIS, MO.
Postal and Telegraphic Address:
WILMERDING, PA.
CHICAGO  SAN FRANCISCO  NEW YORK
WASHINGTON  PITTSBURGH
Walter Bates Steel

EXPANDED SQUARETRUS

SQUARETRUS Construction—
for Strength, Appearance, Economy, Efficiency

More lbs. of strength for lbs. of weight than any other design.

“SQUARETRUS” Poles are made from four main pieces. Each corner leg angle is intact with one set of expanded lacing. Erection of structures is obviously a simple matter, easily kept at a minimum expense.

Very few bolts; examine the cut carefully for detail of construction. Tabulated data gladly furnished.

WALTER BATES STEEL CORPORATION

GARY INDIANA

See our advertisement in the January 4th issue of Electrical World, Pages 250-251.

Let us hear from you—you will promptly hear from us.
THE GREATEST SINGLE
and Data

THE INTERNATIONAL STEEL TIE COMPANY
16702 WATERLOO ROAD, CLEVELAND, OHIO
SOURCE OF FACTS... on Paved Track Construction

Now Ready To Mail...
Third Edition of the Paved Track Notebook
"UNIFORM PAVED TRACK"

In three short years, the Paved Track Notebook has become recognized as the greatest single source of facts and data on modern paved track construction utilizing steel ties.

"Uniform Paved Track" is the title of this new, enlarged Third Edition.

In it previous data is brought up to date. The addition of a wealth of new material makes this handbook 25% larger, more interesting, more useful.

The Mortar-Flow Principle, the improved method of concreting paved track with the revolutionary "Mortar-Flow Pulsator" is fully explained. Exact details of how best to install compressed concrete paving, and of how to use the new vibrated grout method of construction for early service are given.

Research Results on concrete and steel bond are presented for the first time anywhere.

Modernized Twin Ties with the new "Precision" Rail Clip—which is sawed and drilled, not punched and sheared—and heat treated bolts are completely described.

Two New Types of track construction are shown. Paved track design is discussed from the Executive's viewpoint.

Unit Pressures on the subgrade with concrete foundation and stone ballast are compared.

A New Section has been added on the important subject of waterproofing the track structure and subgrade drainage.

INITIAL COST COMPARISONS are given for typical installations. A table of units of track work per man hour on over 60 miles of track, permits application of this data to your local conditions.

A Reference Section with notes on concrete, and a convenient table of cubic contents of typical track trenches completes this remarkably informative "Uniform Paved Track" Notebook.

Every Railway man who has to do with paved track will want a copy of "Uniform Paved Track."

Offered in three bindings: De Luxe, Leather covered, permanently bound, for executives; a leather covered, loose leaf ring book for engineers; for general use, a loose leaf leather folder with clips.

Your copy awaits your request. Mail the coupon—now!

THE INTERNATIONAL STEEL TIE CO., 16702 Waterloo Road, Cleveland, Ohio

Please send my copy of "Uniform Paved Track" to:

Name .................................................. Title ..................................
Address ..........................................................
City .......................................................... State ................................
Business men, industrialists and engineers—600,000 of them—regularly read the McGraw-Hill Publications. More than 3,000,000 use McGraw-Hill books and magazines in their business.

The Business Week
System
Harvard Business Review
Aviation
Factory and Industrial Management
Power
Industrial Engineering
American Machinist
Product Engineering
Bus Transportation
Electric Railway Journal
Food Industries

Chemical & Metallurgical Engineering

OVERSEAS PUBLICATIONS
Electricidad en America*
Ingeniería Internacional*
American Machinist (European Edition)

The American Automobile*
El Automóvil Americano*
Engineering and Mining World

*Published by an associate company,
Business Publishers International Corporation
WITH bare hands, the plowman fought for his food. Hunger harried him... bent his back, bowed his head.

Then the machine... freedom... time to cultivate his fellows as well as his fields... to live, to think, to be.

Industry gave every man a hundred hands... farms produced more with less men. Millions of workers flowed from farm to factory. Swiftly industry expanded, became complex.

As the pace grew faster there was a vital, growing need for the interchange of experience. Men of industry had to keep constantly informed of Industry's activities and progress... of the current news and developments in their own specialized fields. Out of these needs came the industrial press—the McGraw-Hill Publications.

Today 600,000 men of industry, the very men who lead, guide and operate the modern business world, read the McGraw-Hill Publications because they realize that they must read... or fall behind! They are paid in advance subscribers. Each has placed a cash value on the information that the McGraw-Hill Publications bring him.
THE automobile or truck may gas pedestrians with impunity—but you cannot permit your motor coaches to do so. You can’t afford to antagonize these potential patrons by subjecting them to stifling fumes.

If your motor coaches are releasing objectionable fumes, try Red Crown Gasoline and Polarine Motor Oil. The sulphur and impurities that are present in many fuels and lubricants and which are a major cause of obnoxious combustion odors, have been reduced to a minimum in Red Crown and Polarine.

Red Crown Gasoline and Polarine Motor Oil form an ideal combination...a gasoline that gives power, mileage and complete combustion...a motor oil that is pure and rich, supplying thorough, efficient lubrication to the motor. Working together they give that perfectly balanced performance which insures efficient service and low cost operation.

Have our engineers make a test of Red Crown and Polarine in your motor coaches and let the result speak for itself.

STANDARD OIL COMPANY
(INDIANA)
910 S. MICHIGAN AVE., CHICAGO, ILL.
...CAN YOU AFFORD TO SUPPORT OLD AGE?

If not...
for lower costs with Dodge Coaches

THERE COMES A TIME WHEN BURDENSOME MAINTENANCE COSTS MAKE REPLACEMENT AN ECONOMY

Operators, large and small, are discovering this simple truth: it is more economical to replace old equipment than to continue using it with resultant high maintenance costs.

Dodge Coaches are built for modern service requirements — the Street Car Coach is of the 21-passenger type, the Parlor Coach seats 16 passengers. Their dependability is acknowledged by experienced operators. Their economy in operation and maintenance is conclusively proved. Their comfort and fine appearance attract and hold the preference of riders.

Your maintenance costs may now be excessive. Lower them by replacement with modern, economical Dodge Coaches.
. . AND YOUR MAINTENANCE COSTS WILL CONTINUE LOW BECAUSE A DODGE BROTHERS DEALER—ONE OF YOUR REPUTABLE LOCAL BUSINESS MEN—CARRIES AN AMPLE STOCK OF REASONABLY PRICED REPLACEMENT PARTS . . .
Around the World
4000 TIMES
on FISK TIRES

The Fisk method of Engineering Analysis on motor coach operations, different from all others, is so fundamentally sound—and Fisk Tires are so markedly superior—that the trend to Fisk has become a procession. Some of the country’s largest bus operations will travel 100,000,000 miles on Fisk Tires during 1930.

Operators of great coach fleets—railroads, street railways and other big bus systems—don’t buy tires out of habit or friendship. With public favor and company profits at stake, their purchasing agents measure values with the most exacting yardsticks. They search the whole tire field... invite solicitation by competing tire builders... examine tires, figures, records. Then they choose—and the trend to Fisk has become a procession! Why? Fisk Transportation Engineers study every tire equipment problem and supply the right tires for each coach, each route, each transportation job. Fisk’s nearby service stations co-operate 52 weeks a year.

Fisk actually lowers tire costs per mile. Because Fisk shows an overwhelming record for tires that give uninterrupted service.

THE FISK TIRE COMPANY, Inc.
Commercial Tire Department
CHICOPEE FALLS MASS.

mileage

FISK
WAR+++ ON THE RED

THE ONLY RED WORTHY OF THE FEAR of modern business is the baleful red that glows from figures written in scarlet ink, silently flashing the news of wastes that eat up profits, of excessive costs and inadequate returns. They are the figures of defeat. The world of business rightly hates these red figures. It wages against them a war without quarter, bitter and implacable.

In that war the business paper serves as artillery. Its guns are presses. Its projectiles are facts in their most potent form +++ for truth and printer’s ink are a combination more devastating than TNT and steel.

In every field of industry or trade where there is a live business press a barrage of fact is being fired against wasteful practices. Production costs crumble daily under its drumfire of information on machines, materials, technique and management. Distribution costs are coming in for their share of pounding. The business paper as the attacking arm of business progress is out to do away with the things that eat up profits. The Reds must go.

Honestly, independently, the modern business press carries on its battle for better business practice. Its facts are accurate, tested, correlated and organized. They are unbiased. There is no special pleading, no “blurb,” no catering to vanities. It has won the respect of its readers by its self-respect. By its dependability it has won their dependence. It commands a paid circulation on its own merits. It enjoys a sound advertising revenue because its character constitutes it a sound advertising medium.

THE ASSOCIATED BUSINESS PAPERS, INC.
FIFTY-TWO VANDERBILT AVENUE - NEW YORK CITY

This publication is a member of the Associated Business Papers, Inc. a cooperative, non-profit organization of leading publications in the industrial, professional and merchandising fields, mutually pledged to uphold the highest editorial, journalistic and advertising standards.
What is it that you desire in wheels?

Safety—
Elimination of broken flanges and flats—
Increased mileage—
Low maintenance costs—

“Standard” Wrought Steel Wheels will meet these requirements.

STANDARD STEEL WORKS COMPANY
PHILADELPHIA, PA.
STRUCTURAL STEEL

FABRICATED STEEL STRUCTURES
for every purpose

Fabricated Structural Steel by AMERICAN BRIDGE COMPANY
Subsidiary of United States Steel Corporation

Manufacturers of STEEL STRUCTURES
of all classes, particularly
BRIDGES and BUILDINGS, Roof Trusses, Columns, Girders, Towers and Poles, etc.

General Office: 71 BROADWAY, NEW YORK, N. Y.
Contracting Offices in Principal Cities

"WELD PLATES"
For EFFICIENT, ECONOMICAL JOINTS

Do you believe in statistics? Rely on performance records? If so, the performance records of the many "Weld Plates" now in use will convince you that they lead the bar-weld joints in efficiency and economy.

"Weld Plates" represent the most modern welding practice. They are the strongest and most up-to-date plates rolled especially for electric welded joints. Note the shape—the grooves for retaining plenty of weld metal along the upper edges—the wide contact areas at top and bottom—the suitability for the use of short bolts.

A trial will convince you of their efficiency and economy.

THE RAIL JOINT COMPANY
165 Broadway, New York
ACCESSORIES...

That Better Track Construction

DIFFERENTIAL Dump Cars, Differential 3-way Truck Bodies, Clark Concrete Breakers, Differential Electric Locomotive Crane Cars — are accessories to better track laying methods, better track, lower costs.

Take, for example, the Differential Electric Locomotive Crane Car. One man from a revolving turret controls the car movement and four distinct crane movements. It is fast and safe. It conforms to Electric Railway clearances. Does not block traffic on adjacent tracks.

For handling rails and bridge timbers; for doing special track work, pole setting, magnet loading, or for any loading or unloading operation the Differential Locomotive Crane Car is unsurpassed.

Let us explain the advantages of Differential equipment. Write.

The Differential Steel Car Co.
Findlay, Ohio, U. S. A.

Differential Electric Locomotive Crane Car
Capacity: Five tons at radii up to 26 feet, two tons at radii from 26 feet to 44 feet.
Commonwealth Trucks

*cut operating costs*

Cast Steel Frame, including cross and end transoms, a single unit.

Pedestals cast integral with frame, protected from wear by renewable hardened spring steel liners.

(PATENTED)

The Commonwealth Street Railway Truck illustrated above has given years of satisfactory service with maintenance costs practically eliminated. The unsurpassed performance records of this and other Commonwealth Trucks are responsible for their use by many leading railways.

General Steel Castings Corporation

*Commonwealth Division*

GRANITE CITY, ILLINOIS

Small Parts . . .

With large responsibilities

Small parts though individually inexpensive, can become, if frequently replaced, a major item of expense. Replacement involves not only cost of parts but also that of labor and of "time out" for rolling stock.

The responsibility for keeping these costs down is often overlooked when purchasing small parts. Boyerized parts are specially made to shoulder this responsibility.

Their slight additional cost over ordinary parts justifies itself through longer service. By charging a little more, the manufacturer is able to use the best materials, give more attention to design, and to use the famous "Boyerizing" heat treating and hardening process which ensures three or four times longer life.

It pays to specify them, and to insist on getting them.

BEMIS CAR TRUCK COMPANY

*ELECTRIC RAILWAY SUPPLIES*

SPRINGFIELD, MASS.

Representatives:

F. F. Bodler, 903 Monadnock Bldg., San Francisco, Cal.

W. P. McKenney, 50-52 First Street, Portland, Ore.

J. H. Denton, 1328 Broadway, New York City, N. Y.

A. W. Arlin, 519 Delta Building, Los Angeles, Cal.

BOYERIZED PARTS
This is one of a series of advertisements directed originally to advertising men in an effort to make industrial advertising more profitable to buyer and seller. It is printed in these pages as an indication to readers that McGraw-Hill publishing standards mean advertising effectiveness as well as editorial virility.

**PATENTS EXPIRING**

what'll we do?
what'll others do?

**The Formula**

During this three-year period, when XYZ's profits were barely enough to pay the patent owners, XYZ advertised regularly in McGraw-Hill Publications—building recognition for the future—intrenching themselves in a strategic position for the post-patent period.

Pyramided effects of continuous industrial advertising sent sales and profits constantly upward after patents expired. A sustained advertising program of full and double pages, with pithy, factual copy, is keeping the XYZ Co. in top place. A clear-cut victory—not so much for McGraw-Hill publications but for Industrial Advertising strategically applied.

**BASIC** patents on a machine used extensively by a specific industry were owned by the ABC Corp. The XYZ Co. also made the machine, along with other products, paying the ABC people a royalty for every machine sold. The XYZ Co. chose to stay in business without making a practical profit on this particular product. *Why?*

Two years or so ago the patents expired. The expected happened. Dozens of manufacturers turned to making the machine. But instead of diminishing sales for the XYZ Co., there came increased sales, pyramiding profits and leadership in the field. This leadership is being maintained today by the same formula that was used steadily for three years before 'industry-at-large' was free to make the machine.

**McGRAW-HILL PUBLICATIONS**

New York  Chicago  Cleveland  Detroit  Philadelphia  St. Louis
Greenville  San Francisco  Boston  London
TEXACO OFFERS A NEW LUBRICATION

Electric railway car journal lubrication has been revolutionized. Power losses have been substantially reduced. Bearings, journals and waste can now be effectively protected from abrasive dust and water and effectively lubricated.

The new Texaco Oil Seal and Texaco Lovis Oil are accomplishing what was formerly regarded as impossible. Texaco Oil Seals are being installed on many of the country's leading roads.

This new Texaco Lubrication has aroused the interest of the entire electric railway industry. It is something with which every railway executive should be familiar.

Tests will gladly be arranged by Texaco engineers at the request of any operating executive. Write The Texas Company.

THE TEXAS COMPANY
Dept. L, 17 Battery Place, New York City
Offices in Principal Cities
TRANSPORTATION revolves around 3 things—starting, continuing, stopping-weight. One of the problems is dead weight. It slows up schedules, requires extra power to move, takes its toll of profits.

Today, thanks to light, strong Alcoa Aluminum alloys, dead-weight's menace is diminished. Car-bodies, structural members, trucks, are being made of equal strength— with less than half the weight. Dead-load is transformed to pay-load. Result—better service with substantial power-savings, faster schedules, reduced maintenance-of-way expense.

ALCOA ALUMINUM
Cleveland Street Railways

Carry Loads That Pay Instead of Prey

Cleveland, the first to use Alcoa Aluminum strong alloys, to banish old-fashioned heavy metals; the first to step out from under the menace of dead-weight—reduced the weight of a car by 12,900 pounds. Cleveland found that Westinghouse 50 H. P. could be replaced by 35 H. P. motors, that the weight of the motors consequently was reduced 660 pounds. Schedules were speeded up; lubrication costs reduced; power costs cut in direct proportion to the weight saved.

Cleveland quickly discovered that the same car covered more territory, attracted more riders, stayed out of the shop longer, and did all this at a much lower operating cost because it carried a load that paid—instead of preyed on power and profits.

Our engineers will be glad to consult with you upon the practical application of Alcoa Aluminum strong alloys in transportation.

ALUMINUM COMPANY of AMERICA, 2463 Oliver Building, PITTSBURGH, PA.
Offices in 19 Principal American Cities
"TOOL STEEL" SINGLE REDUCTION UNIT

A REVENUE BUILDER — A COST REDUCER

S MALL, light and compact—utilizing fully the advantages of the light, high speed motor—this single reduction unit has proven more than an efficient drive.

It is a sales influence—a powerful factor in increasing patronage. It holds present riders—gains new ones—by assuring faster running time—quick pick-up and noiseless operation.

3,000 lbs. per car reduced weight compared with conventional motor drive.

A single spur gear, a pinion and a flexible coupling of proven design makes up the unit. It is simplicity itself.

Fifteen months of trouble-free service has proved its dependability. Carefully conducted tests have shown no measurable wear on gear, pinion or bearing surfaces. The long life qualities of this remarkable drive reduces maintenance cost to a minimum.

Meeting the need for faster car movement and shorter schedules this drive unit merits your investigation.

We shall be glad to send you the complete story.

THE TOOL STEEL GEAR & PINION CO.
Cincinnati, Ohio
WHEN COMPETITION BECOMES SERIOUS

When competition seriously threatens the position of an established transportation business the reason can be found, usually, in the time saving which competitors offer. And there is no better way for an electric railway to create savings than to signal its right-of-way with "Union" Automatic Signals.

"Union" Automatic Signals, interlocking installations, and remotely-controlled, power-operated switches, produce definite savings. The higher average speed and the consequent saving in time per trip which results can be represented as return on investment. When competition becomes serious, the answer is "Union" Signals.

Look to your seats for rider comfort
For better seats mean more riders. This fact is recognized by the many operators who specify General Leathers.
Clean, neat, easily washed, durable—and always attractive.
Specify General Leathers on your next order for Electric Cars, Buses and Taxi-Cabs—Send for samples:

Majestic Pull Grain Leather
100th Century Spanish Leathers
Gentleman Leather
Salon Hand Stuffed Leathers

General Leather Co., Newark, N. J.

PANTASOTE TRADE MARK
—the car curtain and upholstery material that pays back its cost by many added years of service. Since 1897 there has been no substitute for Pantasote.

AGASOTE TRADE MARK
—the only panel board made in one piece. It is homogeneous and waterproof. Will not separate, warp or blister.
The Proper Quality and Design FOR YOUR NEEDS

National products are the result of intensive specialization. Practical and economical in service, they fully meet the requirements of modern electric railway operation. Their advantages can be quickly proven by a trial. Prices and full details submitted upon request.

Sullivan adds the 66-ft. Vibrationless Compressor

Vibrationless Portable Compressors have given a new meaning to dependable air power service.

So popular have these Vibrationless Compressors become, that Sullivan Engineers have now added the 66-foot size to the Sullivan line.

You will find this new compressor a real profit maker on small jobs of rock drilling, spray painting, concrete or asphalt cutting, clay digging, tamping, riveting, cleaning—wherever a small amount of work is to be done with air, or where tools will be run intermittently.

Details of the new Vibrationless Compressor

The 66-foot "WK-312" has two cylinders $4\frac{1}{4} \times 4$ inches—is run by an 18 H.P. engine, and is good for 100 lbs. pressure.

It may be mounted on steel wheels (wt. 2500 lbs.) spring mounting with rubber tires; skids or two-wheel trailer.

Standard Sullivan Equipment includes: American Bosch high tension magneto and impulse starter, Zenith carburetor, Pierce Governor, Sullivan slow-down governor, pilot valve unloader, Imperial engine primer, and AC Filters.

Vibrationless Compressor Catalog, No. 83-F

SULLIVAN AIR POWER EQUIPMENT

SULLIVAN MACHINERY CO.
809 Wrigley Building, Chicago, Ill.
As Efficient as
It is Simple

The Cleveland Fare Box meets every modern fare collection need—without depending on a complicated, involved system for its efficiency.

It is fitted for any rate of fare or system—handles zone fares as readily as unit fares.

Once installed a Cleveland Fare Box never becomes "obsolete"—it meets any change—accommodates fractional fares, flat fares, either paper or metal tickets.

The Cleveland Fare Box Co.
4960 Lexington Ave., Cleveland, Ohio

Canadian Cleveland Fare Box Co., Limited, Preston, Ontario

"4-Way" Padlocks, Coin-Auditing Machines, Change Carriers, Tokens

For Overhead Trolley Work of Any Description

TRENTON TOWERS

Trenton Towers are universally known as the safest, fastest and most practical method of bringing overhead construction within working range. They are economical to operate and provide safe, easy working conditions for line men. Indispensable for rapid repairing of pole type equipment, braces, trolley wires, traffic signal lights, gas or electric chassis. Will be glad to send a catalog. Write

J. R. McCardell & Company
391-401 South Warren St., Trenton, N. J.

STUCKI SIDE BEARINGS

SPECIAL CARBON STEEL
HEAT TREATED

LARGE WEAR SURFACES
FREE ROLLER
ONLY TWO PARTS

A. STUCKI CO.
OLIVER BLDG., PITTSBURGH, PA.
**Better Brakes Need Better Brake Shoes**

**IMPROVEMENT** of trolley-car schedules in urban service involves faster starts and quicker stops and has made the redesign of braking systems imperative. The new brakes now being advocated work faster and more powerfully than any systems hitherto used.

These improved brake mechanisms vastly increase the strains upon brake shoes due to higher speeds, quicker application and heavier pressures. They should be equipped with Diamond-S brake shoes, the features of which keep them in operation long after ordinary brake shoes have worn out.

The American Brake Shoe and Foundry Company
230 Park Ave., New York
332 So. Mich. Ave., Chicago

---

**A new Wharton Contribution to the industry**

The Wharton Flexible Wall Switch has a heel tightening device based on the principle of a split collar. By means of a bolt the wall is flexed or drawn in until it hugs the tongue heel; thus all play caused by wear is taken up. The nut of this bolt is located in the drain box and is readily accessible.

The tongue pin is 9 1/2-in. in diameter and 6-in. deep. This construction eliminates a holding-down device, prevents kick-up and forward movement of the tongue.

We can help you on trackwork lay-outs whether complicated or simple. Write.

Wm. WHARTON Jr. & COMPANY, Inc.
EASTON, PA.
News....
brief, late news flashes for the electric railway industry

To supplement the service of the regular monthly issues of Electric Railway Journal, a separate NEWS service appears on thirty-nine Saturdays during the year. This supplement keeps you in touch with court decisions ... fare increases ... new ordinances ... association meetings ... financial statements ... equipment purchases.

Subscription Price: For all countries taking domestic subscription rate, $2 per year.

How to fit yourself for leadership in business

Examine these Five Helpful Books Free!
Craig and Charters—Personal Leadership in Industry.
McClure—How to Think in Business.
Schell—Technique of Executive Control.
French and Uhler—English in Business.
Hoffman—Public Speaking for Business Men.

Library of Personal Efficiency in Business

These five practical volumes give you the methods used by successful executives in getting results for themselves in business. They represent actual business conditions—they cover situations exactly the same as you face in your daily work—and they show you clearly and definitely just how these situations can be handled for your own best interests.

They discuss everything the executive must do in taking care of the personal element in his job. They take up business thinking, speaking and writing. They discuss business relations with subordinates, associates and superiors. They cover the executive's handling of his personal self. All of it explained in the light of "getting results." All of it in absolute answer to the question "What makes a good executive?"

5 volumes, 1158 pages $10.75
Easy monthly payments
Send the Coupon Today.

McGraw-Hill
FREE EXAMINATION COUPON

You may send me on approval for 10 days' free examination, the LIBRARY OF PERSONAL EFFICIENCY IN BUSINESS. I agree to return the books, postpaid, in 10 days or to remit $2.75 in 10 days and $2.00 per month for four months.

Name ...........................................
Address ...........................................
City ........................................... State
Position ...........................................

Subscriber to Electrical World? ...........................................
Member A.I.E.E.? ...........................................

(Books sent on approval to retail purchasers in U. S. and Canada only.)
**Chance and Memory VS. Automatic Control**

There's no good argument for operating on chance and memory. Even the argument of lower cost doesn't hold true. Time and again collisions and crashes have demonstrated how costly "Chance and Memory" really is.

Its cost is continuous—you never know when, depending on the human element alone, it will take toll in lives, property and equipment.

With Nachod Automatic Block Signals the first cost gives you the protection. They operate independently of the train crew—chance and memory are out of the picture. At all times these signals insure safe, fast operation—are adapted for single or double track.

Type CD, shown above, for single track, shows when the block is clear or, if occupied, which way the car is moving. On a clear block it tells the motorman when he has set the Stop signal at the other end, shows the car following into the block that it is already occupied, and gives each motorman an indication that he is protected in entering. The system is Permissive, allowing several cars to follow into the same block under full protection.

**Nachod Spells Safety**

Today is the day of fast schedules. The industry has found in Nachod & U. S. Block Signals, the equipment that provides maximum safety under all conditions of operation.

**Nachod & United States Signal Co., Inc.**

Louisville, Ky.

We also manufacture: Turn-right Signals, Signals for Single and Double Track, Signal End Signals, Annunciator Signals, Highway Crossing Signals, Headway Recorders.

---

**Now Built To Work Both Ways**

The Racor Oil Cylinder Retarding Dash Pot has long been used to prevent spring-return switch points from being banged to pieces. When the first wheel flange forces the points aside the Dash Pot offers no resistance, but it does retard their return so that following flanges do not strike them hard.

Now this useful specialty is made double-acting. In other words, it may be attached to either side of the switch without special assembling and it permits the switch to be run through from either side, checking the return of the points regardless of their position. Also, the switch may be hand-operated in either direction without interference from the dash pot.

Used in combination with Ramapo Automatic Return Switch Stands it provides ideal control for siding switches.

Behind Racor Service stand nine plants specializing in the manufacture and distribution of railroad track turnout and crossing equipment, including Manganese Work for heavy traffic.

**Ramapo Ajax Corporation**

Racor Pacific Frog and Switch Company, Los Angeles, Seattle
Canadian Ramapo Iron Works, Lachine, Montreal, Ontario

General Office: 3 West 38th Street, N.Y.

Los Angeles, 6023 W. 6th Street, Los Angeles, Calif.

Chicago: 2321 S. Dearborn St., Chicago, Ill.

New York: 3 West 38th Street, N.Y.

N. Y.

Nine Racor Works

Hillock, N. Y.; Niagara Falls, N. Y.; Chicago, Ill.; East St. Louis, Ill.; Superior, Wis.; Portland, Ore.; Los Angeles, Calif.; Edmonton, Alta.; Niagara Falls, Ont.
ALL types of City and Interurban cars of latest design and Modern construction are built by—

CUMMINGS CAR AND COACH CO.
111 W. Monroe St.
Chicago, Ill.

A Fare Registration System that Gains the Confidence of ALL

The durability, accuracy, speed and convenience of International Registers has given them the nation-wide reputation for efficient service that they have enjoyed for over thirty years.

Electric operation gives the new types even greater speed, accuracy and convenience. Registers can be furnished for operation by hand.

The International Register Co.
15 South Throop St., Chicago

Drip Points for Added Efficiency

They prevent creeping moisture and quickly drain the petticoat in wet weather, keeping the inner area dry.

The Above Insulator—No. 73—Voltages—Test—Dry 84,000 Wet 31,400, Line 10,000.

Our engineers are always ready to help you on your glass insulator problem. Write for catalog.

Hemingray Glass Company
Muncie, Ind.
Est. 1848—Inc. 1870
Dundee “A” Clings

The electrical worker wants a tape that sticks, because it speeds up his job. A tape that is hard to wrap in cold weather makes his work harder.

Dundee “A” fills his requirements nicely because it clings in any weather. It is moderate in price, too, and yet is a true friction tape with the adhesive thoroughly calendered into the fabric under heavy pressure.

THE OKONITE COMPANY
Founded 1878
THE OKONITE-CALLENDER CABLE COMPANY, INC
Factories: Passaic, N. J. Paterson, N. J.

SALES OFFICES:
NEW YORK CHICAGO PITTSBURGH ST. LOUIS BOSTON
ATLANTA BIRMINGHAM SAN FRANCISCO
LOS ANGELES SEATTLE DALLAS

Novelty Electric Co., F. D. Lawrence Electric Co.,
Philadelphia, Pa. Cincinnati, O.

Canadian Representatives: Engineering Materials, Limited, Montreal
Cuban Representatives: Victor G. Mendosa Co., Havana

Roebling Quality Products
Starter and Lighting Cable; Car Wire; Motor Lead Cable; Ignition Cables; Traffic Control Cable; Battery Wire.

Electrode Holder Cable
Electric Welding Cable
Arc Welding Wire
Gas Welding Wire

John A. Roebling’s Sons Co.
Trenton, N. J.
The P. Edward Wish Service
50 Church St., NEW YORK
Street Railway Inspection DETECTIVES
131 State St., BOSTON

March Issue Closes FEBRUARY 19th
Early receipt of copy and plates will enable us to serve you best—to furnish proofs in ample time so changes or corrections may be made if desired.

Electric Railway Journal.

H. U. WALLACE

All Work Under Personal Supervision
6 N. Michigan Ave. 420 Lexington Ave.
Chicago New York City
Phone LEXINGTON 8485

The 2000 Type

Bus Heater

Increased heating efficiency, simplified assembly, absolute insulation from body, easy installation and low cost are the features of the new 2000 type Heater. Supplement B-4 mailed on request, contains a complete description.

The Nichols-Lintern Co.
7960 Lorain Ave., Cleveland, Ohio

SAFETY

GRIFFIN WHEEL COMPANY
Griffin Chilled Tread Wheels with Chilled Rims and Chilled Back of Flanges for all City and Interurban Railway Service

DEPENDABLE—ECONOMICAL—SAFE

CHICAGO DETROIT CLEVELAND CINCINNATI NEW YORK

MILEAGE GUARANTEED

Griffin Chillingworth One-Piece Gear Cases

Seamless, Rivetless, Light in Weight

Chillingworth One-Piece Gear Cases will wear longer because they are made of tough durable deep drawing steel, properly annealed and supported by strong Malleable Iron Brackets, or Forged Steel if you prefer. They meet all operating requirements. Used extensively on rapid transit service.

Most steam road electrifications use Chillingworth Cases.

Chillingworth Manufacturing Co.
Jersey City, N. J.

CANADA
ENGLAND
Tool Steel Gearing & Equip Co.

REPRESENTATIVES
NEw YORK
J. W. Geeks
FRANCE
A. P. Champion
CHOSEN for PERFORMANCE

Trolley wheels are never chosen for looks, never selected because one kind costs a little more or less than another. They’re chosen for performance. That’s why

KALAMAZOO

Trolley wheels and harps are the standard of comparison today. That’s why many properties use them exclusively. There’s a difference in trolley wheels. May we tell you about it?

THE STAR BRASS WORKS
KALAMAZOO, MICHIGAN

JOHNSON FARE COLLECTING SYSTEMS

Johnson Electric Fare Boxes and overhead registers make possible the instantaneous registering and counting of every fare. Revenues are increased 1 ½ to 5 % and the efficiency of one-man operation is materially increased. Quicker boarding of passengers with resultant reduction in running time for the buses. Over 5,000 already in use. When more than three coins are used as fare, the Type D Johnson Fare Box is the best manually operated registration system. Over 50,000 in use. Johnson Change-Makers are designed to function with odd fare and metal tickets selling at fractional rates. It is possible to use each barrel separately or in groups to meet local conditions. Each barrel can be adjusted to eject from one to five coins or one to six tokens.

Johnson Fare Box Co.
4619 Ravenswood Ave., Chicago, Ill.

THE FLOORING THAT HAS MET WITH GENERAL APPROVAL IN THE ELECTRIC RAILWAY FIELD

TUCO PRODUCTS CORP.
30 CHURCH ST., NEW YORK
Railway Exchange Bldg., CHICAGO
The Perry, Buxton, Doane Co.

New and Relaying Rails
All Weights and Sections

We specialize in buying and dismantling entire Railroads, Street Railways, and all other industrial properties which have ceased operation. We furnish expert appraisals of all such properties.

May We Serve You?

The Perry, Buxton, Doane Co.

Rail Department, Philadelphia, Pa. General Department, Boston, Mass.

Pacific Sales Office—Falling Building, Portland, Oregon

Railways Purchased in Entirety

When business judgment dictates the wisdom of abandoning part or all of your electric railway equipment—don't let it run away in idleness waiting for the chance piece-meal buyer to gradually unburden you, at big losses.

Do the one practical thing. Sell it as a unit to SALZBERG—complete with power plant, track, feeder and trolley wire system and rolling stock.

You will get FAIR dealing and the highest prices that are based solely on present day market values. Save money, time and trouble. We will do our own dismantling.

No obligation for our proposition.

H. E. Salzberg Company, Inc.

225 Broadway — Est. 1898 — New York City, N. Y.
Paint-stripping costs cut 50% 

Cost of materials and labor for stripping paint from cars in the shop of a certain Southern traction company were considered too high. Then Oakite materials and methods were given a trial.

Immediately a change was noted. One particular car, on which there were thirty coats of paint, was stripped to the original wood and metal at a cost of less than $10 ... a saving of 50%. This tremendous amount of paint was removed without any hand scrubbing or scraping ... a final rinse left surfaces ready for repainting.

Similar economies are being effected in hundreds of car shops throughout the country wherever Oakite materials and methods are in use for cleaning and related operations. Write for particulars. Or ask our nearest Service Man to call. No obligation in either case.

Oakite Service Men, cleaning specialists, are located in the leading industrial centers of the U. S. and Canada

Manufactured only by OAKITE PRODUCTS, INC., 28B Thames Street, NEW YORK, N. Y.

---

**ALPHABETICAL INDEX**

This index is published as a convenience to the reader. Every care is taken to make it accurate, but Electric Railway Journal assumes no responsibility for errors or omissions.

- Aluminum Co. of America: Insert 91-92
- American Brake Shoe & Foundry Co.: 97
- American Bridge Co.: 86
- American Car Co.: Third Cover
- American Car & Foundry Motors Corp.: Insert 31-34
- American Steel & Wire Co.: 41
- American Steel Foundries: 60
- American Telephone & Telegraph Co.: 35
- Associated Business Papers, Inc.: 84
- Bates Steel Corp., Walter: 73
- Beeler Organization: 102
- Fenns Car Truck Co.: 88
- Bender Body Co., The: 108
- Bethlehem Steel Co.: 61
- Bibbins, J. Roland: 102
- Brill Co., The J. G.: Third Cover
- Buchanan & Layng Corp.: 102
- Byllesby Eng. & Manag. Corp.: 102
- Carey Co., Philip: 28
- Carnegie Steel Co.: 65
- Chillingworth Mfg. Co.: 103
- Cities Service Co.: 26-27
- Cleveland Fare Box Co.: 96
- Collier, Inc., Barron G.: 23
- Consolidated Car-Heating Co.: Front Cover
- Cummings Car & Coach Co.: 100
- Dayton Mechanical Tie Co., The: 50-51
- De Leuw & Co., Charles: 102
- De Vilbiss Co., The: 36
- Differential Steel Car: 87
- Dodge Brothers: Insert 79-82
- Electric Railway Journal Filler: 39
- Electric Service Supplies Co.: 10
- Faile & Co., E. H.: 102
- Fisk Tire Co., Inc., The: 83
- Ford, Bacon & Davis: 102
- "For Sale" Ads: 105
- General Electric Co.: 14-15-16-17-18
- General Leather Co.: 94
- General Motors Truck Co.: Insert 55-58
- General Steel Castings Corp.: 88
- Goodrich Rubber Co., B. F.: 49
- Goodyear Tire & Rubber Co.: 25-29
- Globe Ticket Co.: 54
- Griffin Wheel Co.: 103
- Hale-Kilburn Co.: 12
- Haskellite Mfg. Co.: Back Cover
- "Help Wanted" Ads: 105
- Hemingray Glass Co.: 100
- Hemphill & Wells: 102
- Heywood-Wakefield Co.: 37
- Hyatt Roller Bearing Co.: 48
- Illinois Steel Co.: 52
- International Motor Co.: Insert 43-46
- International Register Co., The: 100
- International Steel Tie Co.: 74-75
- Jackson, Walter: 102
- Johnson Fare Box Co.: 104
- Johns-Manville Corp.: 59
Why They Pave With BRICK

DURABILITY under the most severe service conditions makes vitrified brick the first choice for paving track areas...when the brick structure needs repair a brick pavement is quickly opened...and also it is quickly closed with 100% re-use of the original brick...the low maintenance saves money...the freedom of a brick pavement from traffic interruption builds public good-will.

For engineering data write National Paving Brick Manufacturers Association, 1245 National Press Building, Washington, D.C.
Here's a unit with such rider appeal that your passengers will prefer it to driving their own cars.

Some of the ways operators are already planning to use this club coach are for extra fare de luxe operation, theatre specials, conventions, sight-seeing de luxe and special excursions.

A DRAWING ROOM ON WHEELS. Every reasonable facility for comfort of the rider. Luxurious divans and lounges deeply upholstered in beautiful and durable cloth or leather. Magazine stand and writing desk. Cabinet for radio set and ample inside overhead cushioned-edge racks for luggage. Individual candlestick side lights in addition to regular aisle dome lights. Non-shattering glass throughout. Exhaust fan insuring a constant supply of pure air. And many other features that attract riders.

This coach has been recognized as filling a need for special passenger handling that heretofore has not been available to bus operators. Seats 35 passengers.

THE BENDER BODY COMPANY, W. 62nd and Denison, Cleveland, Ohio
Cleveland Again Selects Brill Cars and Trucks

The one hundred single-end, double-truck city cars ordered by the Cleveland Railway Company from The G. C. Kuhlman Car Company are now being delivered. Like the first order of fifty, these new cars are equipped with Brill Trucks, a significant indication of the dependability of the Brill product.

The cars boast of individual leather upholstered Brill Seats, improved lighting and all possible safety devices—truly modern, profit-producing equipment.

Details furnished for the asking.

THE J. G. BRILL COMPANY, Philadelphia
Associated Plants
American Car Company, St. Louis, Missouri
The G. C. Kuhlman Car Company, Cleveland, Ohio
Pacific Coast Representative, Rialto Bldg., San Francisco

BRILL MODERN ELECTRIC CARS
Cuts body maintenance to a minimum . . . .

blood-albumin glued plywood reduces dead weight in buses . . . .

Since every pound of excess dead weight costs money instead of earning it, the use of HASKELITE plywood products in buses is highly important to the operator.

This paneling material is actually stronger than steel of the same weight and is seven times stronger than wood across the grain. At the same time it makes possible attractive finishes that impress the bus rider.

PLYMETL, the metal-faced plywood, adds great impact resistance to light weight and strength, and cuts body maintenance on roofs and exterior side panels. Write for further information on the uses of these plywoods in buses.

Haskelite Manufacturing Corporation
120 South La Salle Street
Chicago, Illinois
Ye gods, 'tis a dizzy pace for we old managers.
FURTHERING their program of car replacement and expansion, the West Penn System has placed twelve new modern light-weight interurban cars in service on its Allegheny Valley lines.

These cars will replace all the present rolling stock operating in the Allegheny Valley between Aspinwall, New Kensington and Natrona, Pa.

The use of four Westinghouse high-speed 35-hp. motors and W-N drive, along with a reduction in wheel size and floor level, all tend to decrease the stop time, and permit a substantial increase in schedule speed.

Service, prompt and efficient, by a coast-to-coast chain of well-equipped shops.
Contents of This Issue

MARCH, 1930

Editorials ................................................................. 125

Traffic Officers as Transportation Men .......................... 128
By CLARENCE P. TAYLOR

New Track Construction Methods Prove Speedy and Economical .... 130
By R. H. DAILEY

Baltimore Substation Wins Architectural Distinction ............. 131
By L. E. SUMMERS

Operating Delays Reduced by Practical Instruction Methods .......... 132
By J. R. STAUFFER

Rome Readjusts Car and Bus Routes ............................. 136
By E. MARIO ASCARELLI

Electric Coaches Installed on New Orleans Shuttle Line .......... 141
By W. S. RAINVILLE, JR.

Road Builders Recommend Relief of Paving Obligations .......... 143

De Luxe Bus Finds Wide Application in Interurban Service .......... 144
By I. O. MALL

Complete Car Replacement on Allegheny Valley Route .......... 150

Accident Causes Analyzed at Cleveland .......................... 152

“Dark Period” Before Sunrise Creates Accident Hazard .......... 152

Letter to the Editor .................................................. 153

Track Without Ties Built at New Orleans .......................... 154
By I. O. MALL

Monthly and Other Financial Reports ............................. 158

Prizes Awarded for First Period of New Maintenance Contest .... 159

Maintenance Notes:

Double Air Chuck Inflates Dual Tires Evenly — By Richard Grant .................. 160

Electric Governor for Buses — By E. J. Jonas .................. 160

Emergency Dolly for Broken Axle — By E. J. Jonas ......... 160

Safety Holder for Dipping Armatures — By W. A. TRAVIS .... 161

Disconnecting Locked Tongues of Electric Track Switches —
By G. I. GRANT .................................................. 161

Electrically Heated Inspection Lamp — By Christ REINER .... 161

Improved Connecting Rod for Tongue Switches — By E. B. SPENCER .......... 162

Welding and Cutting Equipment Combined — By W. H. HAYES .......... 162

Hood Rims and Carlini Re-shaped by Machine — By
James DAVIDSON .............................................. 163

Reclaimed Crank Case Oil for Curves and Switches — By
Louis T. BOTTI ............................................... 163

Field Testing and Taping ............................................ 163

Advantages of Single-Motor Drive for Gas-Electric Buses — By
C. A. ATWELL ................................................ 164

Hand Lever for Testing Pneumatic Bell Ringers .................. 164

Proper Fit of Brushes Reduces Chatter — By W. F. WARNER ........ 164

News of the Industry .................................................. 165
THE life of a set of armature coils is determined by such factors as, Condition of Core, Workmanship and Type of Service... but the most important factor of all is the Coils themselves.

One of the largest interurban operating companies has built up a record during the past few years of rewinding only seven per cent of its armatures a year. It is worthy of note that this traction company uses Westinghouse coils for its Westinghouse motors.

Service, prompt and efficient, by a coast-to-coast chain of well-equipped shops
Niagara Junction

Changes to BP helical gears

Several years ago, it became necessary to replace the original spur gears on some of the electric switching locomotives of the Niagara Junction Railway, because they were causing excessive noise and vibration which resulted in heavy maintenance costs. With a view to preventing a recurrence of these conditions, the railway company installed Westinghouse-Nuttall BP helical gears.

That all expectations were fulfilled is convincingly evident from the fact that since then the other locomotives on this property also have been equipped with BP helical gears.

Assurance of longer gear life, too, is indicated by the results to date, in spite of the fact that some of the BP spur gears ran from 12 to 24 hours daily, 6 days a week, for sixteen years.

Also, it is this superior performance that has established the preference for BP helical gears on passenger equipment.

Service, prompt and efficient, by a coast-to-coast chain of well-equipped shops
Popular pastime:

Gum-shoeing for nerve-rackers
Let the editor say it again. We quote from last month's Journal:

One thought missing is reference to track-grinding. That's the thought that makes all the difference in the world. Grind and weld, weld and grind— that's the answer to the cry for peace and applause.

"Noise is receiving ever-increasing attention as an unfavorable factor in American life, particularly in metropolitan centers. Means of eliminating or reducing it are under consideration nearly everywhere."

"With all this campaign against unnecessary noise it is inevitable that unfavorable attention should be directed to noisy street cars."

"The committee on noise reduction of the A.E.R.E.A. has shown conclusively that most of the noise usually associated with car operation is unnecessary."

"As to the track, of itself it is one of the quietest things on earth. But when a car passes it begins to act up and emit many and various noises. Here again the wrench and the welder can make a lot of difference. By tightening loose joints, truing up worn surfaces and securing correct alignment even poor track can be so improved that cars can run on it without emitting sounds of pain that arouse the neighborhood."

"Money spent on noise reduction will return directly in lower maintenance costs. Equally important, however, is the effect on the public. This cannot be measured in dollars and cents but it is hardly an exaggeration to say that it may mean the difference between success and failure.

Railway Trackwork Co.

3132-48 East Thompson Street, Philadelphia

AGENTS
Chester F. Gallor, 50 Church St., New York
Chas. N. Wood Co., Boston
R. P. McDermott, 208 S. LaSalle St., Chicago
P. F. Bodler, San Francisco, Cal.
Equipment & Engineering Co., London
ABOUT eighteen months ago O-B introduced a new section insulator—an insulator in which the entire underrun was renewable. This design was highly important, for it presented features of convenience, economy and service life which far exceeded those of any previous design. These features include:

1. Quick and easy replacement of any worn part, or the entire underrun as required.
2. Complete replacement of entire underrun without disturbing or removing either trolley or span wires. No block and tackle required.
3. Remarkable savings, in some cases as high as 50%, in replacement labor cost and in material cost.
4. No delay in schedules—no interruptions to service.

In communities throughout the country, alert overhead superintendents have tested, then standardized on the O-B Renewable Underrun Section Insulator. Their experience can be duplicated on any property. Inquire of your O-B representative.

Ohio Brass Company, Mansfield, Ohio
Canadian Ohio Brass Co., Limited
Niagara Falls, Canada
The NEW O-B Interurban Type Dash-Illuminating Headlight

To meet a demand brought about by the O-B Dash-Illuminating Headlight for city service, O-B now offers a new and distinctly different headlight—a dash-illuminating headlight for interurban service—a headlight designed to completely overcome the major disadvantages of older designs. This new O-B Interurban Type Dash-Illuminating Headlight provides:

1. Ample track illumination and pick-up for the highest speed service.
2. Adequate illumination through cities and towns without glare, or without dimming through resistance.
3. Full illumination of the dash through prismatic lens in the sides and bottom of headlight.
4. 100% safe illumination at all times.

For information and demonstration inquire of your O-B representative or address

Ohio Brass Company, Mansfield, Ohio
Canadian Ohio Brass Co., Limited
Niagara Falls, Canada

Ohio Brass Co.
The problem confronting street railways involves a circular argument: if schedules were faster, people would ride; if people would ride, their motor cars would be off the streets; if private motor cars were off the streets, schedules would be faster; if schedules were faster, people would ride, etc., etc.

A start must be made somewhere if conditions are to be improved.

It has been demonstrated over and over again on many properties that clean, comfortable cars with comfortable seats attract heavily increased passenger traffic. Riders in your cars mean automobiles off the streets. Get the riders into your cars by making them comfortable and advertising the fact. It won't be long before you can accelerate schedules.

The logical place to start is with comfortable seats. HALE & KILBURN seats are the acme of comfort.

HALE & KILBURN SEATS

"A Better Seat for Every Type of Modern Transportation Service"

HALE & KILBURN CO.
General Office and Works: 1800 Lehigh Avenue, Philadelphia

SALES OFFICES:
Hale & Kilburn Co., Graybar Bldg., New York
Hale & Kilburn Co., McCormick Bldg., Chicago
E. A. Thornwell, Candler Bldg., Atlanta

Frank P. Bodler, 903 Monadnock Bldg., San Francisco
W. L. Jeffries, Jr., Mutual Bldg., Richmond
W. D. Jenkins, Praetorian Bldg., Dallas, Texas
H. M. Euler, 140 N. Sixth St., Portland, Ore.
The Customer Has Been Right for 1030 years

Why not try

TWINS

You Want Riders and you know the Riders Say "Twins Ride Best"
More Twin Coaches have been sold to Electric Railways than of all other makes of 37-40 Passenger Types Combined.
The Practice of Building Separate Motor Coach Bodies and then attaching them to a chassis is The Hard Way
"Electric Coaches are no dream
They are real live Transportation"

W.S. Rainville, Jr.—Equipment Engineer—at Birmingham meeting
Southern Equipment Association.
January 27, 1930
The Basis of Correct Door Control

National Pneumatic Door Engines, controlled mechanically, pneumatically or electrically, are the logical solution for your door control problems.

For one man cars, the N. P. Automatic Treadle Exit Door Provides

THE EASIEST WAY OUT

NATIONAL PNEUMATIC COMPANY

CHICAGO

Graybar Bldg., New York

PHILADELPHIA

Manufactured for Canada by Railway & Power Engineer Corp., Ltd.
IMPROVE TRACK CONSTRUCTION

To build modern track requires modern equipment—and no equipment is more modern than Differential.

Outstanding is the Differential Electric Locomotive Crane Car. It is fast and safe, conforms to Electric Railway clearances, does not block traffic on adjacent tracks. One man from a revolving turret controls the crane for any loading or unloading operation, for handling bridge timbers and rails or any special track work.

Combine this crane with Differential Dump Cars, Differential 3-Way Truck Bodies and Clark Concrete Breakers and you are assured that track will be laid faster, better, more economically. We will be glad to explain the advantages of Differential equipment. Write

THE DIFFERENTIAL STEEL CAR CO.

FINDLAY, OHIO, U.S.A.
SERVING the SERVICE

WE appreciate the responsibility imposed by years of service in the traction field. Thorough research in solving many problems has given us full understanding of the diversified needs of the field and endowed us with the facilities and knowledge to meet them.

... When you desire to install any new equipment, or to modernize old equipment, our representatives are at your SERVICE

Complete Air Brake Equipment for every class of service

WESTINGHOUSE TRACTION BRAKE CO.
AIDS TO FASTER AND

The Faraday Passenger Signal System provides pushes within easy reach of every passenger for signalling the operator to stop. It is a practical, inexpensive and reliable method of building good will among your patrons.

This complete line of pushes, bells, buzzers and resistances will meet the needs of the simplest and most complicated systems. Every device is highly engineered and made to provide long, reliable, unfailing operation.

This equipment is completely listed in our Car Equipment Catalog No. 7 and Bus Equipment Catalog No. 9.

Home office and manufacturing plant located at 17th and Cambria Streets, Philadelphia, Pa.; District offices are located at 111 North Canal Street, Chicago, Ill. and 50 Church Street, New York City.
BETTER SERVICE

HUNTER-KEYSTONE illuminated destination signs "tell the public where you're going." They advertise your service and your different routes. They make easy the re-routing of cars and give a business-like appearance to your cars.

When remodeling or building new cars Hunter-Keystone signs should be given first consideration in order to assure successful operation of those cars.

Hunter signs are listed in catalog No. 7 for railway cars and in catalog No. 9 for buses.

SPECIAL CIRCUS
MAIN ASCOT AVE.
TEMPLE ST.
THROUGH CAR MINERSVILLE NEW PHILADELPHIA

Front of Curtain

SPECIAL CIRCUS
MAIN ASCOT AVE.
TEMPLE ST.
THROUGH CAR MINERSVILLE NEW PHILADELPHIA

Rear of Curtain

The curtains used in Keystone-Hunter signs under usual service conditions will last for many years. Should they become dirty and soiled with misuse it will pay to renew them. They are continually selling your service—keep them right.

Branches—Bessemer Bldg., Pittsburgh: 36
Broad Street, Boston, General Motors Bldg.,
Detroit; 315 W. Washington Ave., Terre Haute;
Canadian Agents—Lyman Tube & Supply Com-
pany, Ltd., Montreal, Toronto, Vancouver.

CE Supplies Co.
Eliminates a Lot of Guesswork from Motor Repairs

You can’t tell, by a glance, whether insulating varnish will *lengthen* the life of your motor coils—as it should. But you *can* tell by its maker.

General Electric makes insulating varnishes . . . uses them exclusively in its own products . . . stakes its reputation on them. You can use them confidently . . . always. They cut maintenance costs.

Skilled varnish makers and highest grade ingredients *make them right*—a great research laboratory keeps them *right*.

You can get G-E Insulating Varnishes from General Electric Merchandise Distributors everywhere. For full information, write Section M-813, Merchandise Department, General Electric Co., Bridgeport, Conn.
TYPE L G-E WELDING ELECTRODE
Puts STRENGTH into steel joints

Shattering loads...braking strain...impact — they have least effect on truck frame welds made with G-E Type L Electrode. Its tensile strength is high...its penetration deep.

Type L is a wire specially processed for strength...It also possesses all the good qualities of fluxed rods. In addition, it flows uniformly, spatters little and yields a smooth bead.

Wherever a steel welding job is to be done by hand, choose one of the G-E Electrodes with confidence.

You can get welding electrodes for every kind of welding from G-E Merchandise Distributors — or write Section M-813, Merchandise Department, General Electric Company, Bridgeport, Connecticut.

G-E ELECTRODES FOR EVERY WELDING JOB
Type A — For Cast Iron only.
Type B — For Automatic Welding.
Type F — For General Welding of Steel.
Type L — For General Welding of Steel—High Tensile Strength.
Type H — For Automatic Welding.
Type M — For General Welding of Steel—Sound and Ductile welds.

ACCESSORIES, TOO:
General Electric has developed accessories that are right:
Helmets and Hand Shields
Electrode Holders
Weld Gauges
Welding Cables
Scratch Brushes, etc.
GE line material

Form C2
Ear

Form L4
Section Insulator

Form T
Frog

Form Q2
Splicing Sleeve
holds in the hardest service

Keg-type Strain Insulators

Form HT Suspension

These G-E line-material devices and many others are described in the new catalog, GEA-611. A copy is available without charge. Simply address your nearest G-E line-material dealer, your nearest G-E sales office, or General Electric Company, Schenectady, New York.

General Electric is constantly developing and testing new line-material devices to simplify your overhead construction problems. All standard parts are available for immediate delivery from G-E warehouses and from G-E line-material dealers throughout the United States.
As a Bus Operator

—You know that for a bus in daily service

The Purchase Price Is Less Than the Annual Operating Cost

To consider purchase price alone, without regard to earning power or possible economies of operation, is to be “penny wise and pound foolish”.

A gas-electric bus, in spite of its higher cost, has a potential earning power and low operating cost that often overcome the price differential in less than a year.

When an operator equips his buses with electric drive, he increases their life 50 to 100 per cent.
Public Transportation Gaining Steadily in Large Cities

MORE than 6,500,000,000 electric railway and bus passengers were carried last year by the public transportation systems in a group of ten of the largest cities in the United States, according to preliminary reports of operating companies. This figure sets a new high record for traffic in these cities. While 1929 was not a record breaking year in every city in the group, the slight recessions in some places were more than offset by substantial gains in others. The total is an increase of nearly 33 per cent over the total for the same cities ten years ago, when approximately 5,000,000,000 passengers were carried. Considering only the passengers carried on the electric rail lines the increase was a little over 25 per cent.

Cities included in this group are New York, Chicago, Detroit, Cleveland, Baltimore, Boston, Pittsburgh, St. Louis, Milwaukee and San Francisco. Taken together their transportation systems handle a substantial part of the total city transit traffic of the country. During the past decade the population of these cities, together with a few adjoining communities served by the same transportation systems, has increased about 16 per cent. Thus the growth in riding has been more than twice as rapid as the growth in population. Expressed in another way, the number of rides per inhabitant per annum has increased from an average of 330 ten years ago to about 375 at the present time. A similar trend toward increased use of public transportation facilities is evident also in other cities, but complete figures are not available at this time.

Extension of rapid transit service in New York, Chicago and Boston has played an important part in the growth of the traffic in this group of cities. It is significant, however, that substantial traffic increases have been recorded also in those cities of the group which have no rapid transit facilities.

The relative importance of bus service has been increasing steadily. Ten years ago buses carried less than 1 per cent of the total number of passengers while the electric rail lines carried over 99 per cent. Today the buses are carrying nearly 6 per cent and the rail lines 94 per cent of the total. By far the largest part of this increase in bus traffic has resulted from the development of new services, as there has been comparatively little replacement of rail service in these cities. Express and de luxe bus service, as well as local service reaching new territory, has brought additional business to the transportation systems while the electric rail lines have continued to render highly efficient service on heavily traveled routes.

That the total number of riders in public transportation vehicles has increased during the past decade in this group of growing cities is not surprising. That the average number of rides per inhabitant per annum should have shown a substantial increase, however, is worthy of note. And that this should have occurred simultaneously with the phenomenal development in the use of the private automobile is, indeed, remarkable. Better than could any words these few figures show the essential character of public transportation service.

Defining the Place of the Taxicab

Seldom has it been possible to obtain any exact measurement of the extent to which the cruising taxi contributes to traffic congestion. For that reason the experience of the city of Pittsburgh, where a taxicab strike has been in progress for some weeks past, is particularly interesting. Notable improvement in traffic conditions has been evident since the taxicabs have been off the streets. Congestion has practically disappeared although there has been no decrease in the total number of persons entering the downtown area. This is easy to understand as counts made previous to the strike showed that more than 75 per cent of the taxicabs moving through the downtown streets were empty.

Relief of congestion has been of great benefit to both the users of private automobiles and the users of street cars and buses. The speed of all vehicles has been substantially increased and the maintenance of schedules has been greatly facilitated. The additional revenue accruing to the railway has not been a matter of any importance since the average number of persons who formerly used taxicabs did not amount to much more than 1 per cent of the railway and bus riding. But the improvement in service made possible by the elimination of the cruising cabs has been remarkable.

From this it would be easy to contend that taxicabs should be permanently banned from congested districts, but such is not the conclusion of transportation men who have been studying the situation. Rather it is thought that the strike has proved the need for regulation which will permit the taxicab to play its proper part in transportation without adding unnecessarily to congestion.

Of late there has developed a widespread tendency on the part of taxi operators to depart from the field of individual service which they are particularly well adapted to render and to encroach upon the field of mass transportation. Taxicabs cruising along lanes of heavy travel with the hope of picking up chance passengers are doing little more than duplicating existing service of street cars and buses. Not only does this add unnecessarily to the total volume of traffic on the street but it constitutes an uneconomic use of the roadway, because the number of passengers carried is
disproportionately small compared with the number of vehicles. Probably the taxicab operators have drifted into this practice almost unconsciously. The legitimate demand for taxicabs fluctuates widely. Sufficient equipment is provided to meet the maximum demand. Fares have been cut down to a minimum in most cities. Hence it has become necessary to drum up business in slack hours and the cruising cab with all its attendant evils has come into being.

To correct this situation it is necessary only to restore the taxicab to its legitimate field by eliminating cruising, establishing stands off the main streets and placing call boxes at convenient locations. Taxi service can thus be made entirely satisfactory for those who desire individual transportation, without clogging the streets with empty vehicles going nowhere.

Agencies interested in traffic regulation throughout the country have been studying the situation in Pittsburgh. Developments there are proving the soundness of many theories previously held and it is not too much to hope that the result of this experience will be a clearer understanding of the place of the taxicab and a larger degree of regulation to control its operations to the best advantage of the public at large.

Public Protection or Private Profit?

Recent developments in connection with legislation concerning the practice of engineering in the state of New York deserve the close attention of electric railway men. On the one hand the architects' law has been changed to make it a misdemeanor for any person other than a registered architect to "design plans and specifications for structures or alterations exceeding $10,000 in cost." On the other hand, a proposal has been made to amend the engineer license law in a way which might make it necessary for track foremen and substation operators to hold engineers' licenses. The potential danger in these regulations is too serious to be ignored.

When these laws were first enacted some years ago, the avowed purpose was to make sure that the designers and builders of important structures should be competent to perform their work. Competent efforts have been made, however, to convert the laws intended for the protection of the public into instruments for improving the financial condition of architects and engineers by restricting the performance of certain jobs to a limited number of officially authorized persons. Many engineers, however, being wholly out of sympathy with these efforts, have refrained from applying for licenses. Thus it has become a common practice of corporations doing engineering work to have one license holder sign all such plans and designs as require the signature of a licensed engineer. To a considerable extent this practice has defeated the original purpose of the law.

It is now proposed to correct the situation by defining an engineer as one "who engages in, or who holds himself out as able to engage in—the designing, the preparing and filing plans and specifications for, the supervising and inspecting of—structures, machines, processes and (or) other engineering work or appliances involved in public or private projects, the safety and control of which are essential to the public welfare." Just how far-reaching this amendment would be in actual practice is difficult to foretell. Nevertheless it is evident that it might easily be interpreted to include a large number of persons whose work is in no sense real engineering. Sufficient opposition to the new definition has developed, however, so that its adoption at this time appears improbable. Efforts to amend the law so as to place engineers on an equal footing with architects as regards structural design appear more likely to succeed.

Whatever the feeling of individual engineers may be concerning these license laws, their existence is a condition and not a theory. They are in effect in some 26 states, in several of which trends have been evident similar to those in New York. Undoubtedly there is need for correcting certain conditions now existing. But care must be exercised to see that the cure is not worse than the disease. It would be easy to go too fast and too far with changes in the present law. Rather than remain aloof because of their disapproval of these developments, all engineers should participate and help steer them so that the rights of engineers shall be adequately protected without extending the scope of the law to cover too broad a field.

Co-ordinated Transit Makes Progress

When a community passes from the small city stage to that of metropolitan center a demand comes for transit of a different kind from that which was satisfactory before. People do not all want to reach one central point, and a radial system breaks down. This is particularly true because of increasing street traffic congestion. Even higher schedule speeds, while essential, will not alone compensate for wrong methods or indirect routes. Accordingly, some form of co-ordination in which all the available means of transit are used to best advantage is necessary to the continued growth of the community.

The latest city to follow this course is Rome, Italy. Beginning with the first of this year a radical change was made. Outlying routes of street cars were consolidated and now feed into a belt line surrounding the central part of the old city. On account of crooked, narrow streets, all cars have been excluded from this area and buses are used to furnish such distributing service as may be necessary. Crosstown passengers transfer to the belt line and do not enter the congested district at all. This system replaces the one that was in use for many years. A multiplicity of street car routes, most of them with infrequent headways, reached many destinations, and nearly all of them ran through the most congested portions of the city. Buses supplemented the service, principally in the outskirts.

To complete the new system a subway has been planned. When completed—it will take several years to build—it will give direct routing to central points, with schedule speeds that cannot be approached by surface transportation. It is to be presumed that a further rerouting of surface lines will be possible when the subway is built.

In some respects the new system in Rome resembles that built up in the Boston area in this country. Rapid transit plays a large part in the success of the Boston system. Surface routes, for the most part, are local in character and terminate at the nearest rapid transit stations, where transfer is made to one of several trunk lines passing through the center of the city underground. Such surface cars as do enter the heart of the city do so in subways and terminate at locations convenient to the most important points.

London also has a system which is not unlike these two. In one respect it more closely resembles the new
Rome system—surface cars are excluded from the central area and buses furnish all the service. Here again there is the problem of crooked, narrow streets. There is a comprehensive network of subways such that the passenger from the outlying districts does not need to use the surface routes at all. The buses should be of chief advantage to the short rider who does not leave the central area. However, most of the routes radiate out for several miles. As a consequence there are many buses on the streets and the congestion has become so great that movement is very difficult. The function of the buses for local riding is all but defeated. In this respect the Rome plan is superior, although it involves a transfer for anyone who travels between the suburbs and the center of the city.

Such a plan as the one just started in Rome is bound to be watched with interest. It is too early to pass judgment on it until more definite results can be had than are available after a trial of a few weeks. In fact, it is not possible to determine the full value of the plan until it is rounded out with the completion of the subway system, and operation of that cannot begin for several years at the very least.

A Study in Financial Fortitude

AnoTher electric railway has been reorganized on a basis that gives every reason to believe it will meet successfully the new economic conditions. The road is the Chicago, South Bend & Northern Indiana Railway and its affiliate, the Southern Michigan Railway. The history of what has been done with it financially is reminiscent of the suggestions contained in the report of the American Electric Railway Association's committee on finance made some few years ago. Whether or not those responsible for the reorganization had in mind the recommendation of the committee on finance of the association is not disclosed, but the process of procedure followed the committee's recommendation and the successor company has emerged with a financial structure which does resemble the typical one suggested.

Significant, indeed, is the fact that the reorganization was not voluntary. Only occasionally can security holders be made to see the value of voluntary action under the theoretically sound doctrine of the greatest good to the greatest number. This was not one of those rare occasions. So the stage was set for the auctioneer and his hammer.

But that is said and done. To recapitulate the financial set-up here is not necessary. It is important, however, to note that the Indiana Railway first mortgage of $426,000 emerges as an extended obligation to be amortized out of current earnings within six years. When that has been done the funded debt will be $1,533,085. Meanwhile treasury bonds will be issued to finance additions and extensions and the equipment trust method will be called into use to finance the purchase of ten new city cars and ten new interurban coaches. Again obligatory amortization out of earnings will tend to keep the structure of bonds within the reasonable earning capacity of the property. Accrued interest on other bond issues has been cared for by additional evidences of indebtedness.

All in all, the new structure has been so arranged as to make it possible to continue operation on a basis that will attract capital and credit and permit the properties to be properly rehabilitated. The successor organization is regimented financially for a gait fit for the economic company in which it finds itself, not for the step of the wooden soldier. The facts are a study in financial fortitude.

Municipal Operation Not Immune from Economic Law

CASH fares on the Detroit municipal railway will go from 6 cents to 8 cents on March 15 and cash bus fares from 10 cents to 8 cents. The ticket rate on cars has been nine for 50 cents, but will become four for 30 cents or ten for 75 cents for use on either cars or buses. These changes follow the determined stand of Mayor Bowles to the effect that the railway shall meet, in fact as well as spirit, the mandate of the charter that it charge a rate of fare adequate to pay its debt obligations and at the same time provide current maintenance money sufficient to keep the system healthy.

Apparently the Mayor had little cause for dissatisfaction with the system as it was being run. But he was not satisfied that the fares were sufficient to provide out of earnings for the orderly development of the system to meet the expanding requirements of the city. So he asked John H. Morgan, auditor to the system, to report to him. The principal source of trouble, Mr. Morgan said, was that the rate of fare had never been sufficiently high to produce revenue to pay all necessary obligations as provided by the city charter.

If the Mayor was not prepared to recommend one way or another about fares when he took office, Mr. Morgan's statement removed the last iota of doubt from his mind. The street railway commission then backed him up. It voted two to one for the increase. Frank Couzens, son of Senator Couzens, under whom municipal ownership was brought about when the latter was Mayor of Detroit, was the recalcitrant. He is understood to have taken the position that the alleged neglect in the past to provide funds sufficient for depreciation was no reason why fares should be advanced now. But they are to be advanced. They are to be advanced because the municipal railway is no more immune from the play of the economic forces around it than are the private companies operating under comparable circumstances. This, the most recent operating statistics prove.

For twelve months ended Jan. 31, 1930, the net profit on the municipal lines was $106,576 after charges, taxes and sinking fund requirements, compared with a net profit of $399,873 in the preceding twelve months. That is not much to brag about under the circumstances. As for the future, if there is no decrease in traffic and several other if's prove to be correctly diagnosed, gross revenue should increase by $3,000,000 for the current year over that for the one recently closed. Other phases of the matter are reviewed elsewhere in this issue.

Meanwhile, $8,760,322 will be needed by June 31, 1931, for new equipment, extensions and repairs. The 1930-1931 budget sets up a bond issue of $7,000,000 to take care of the major part of this cost. If General Manager Smith has his way, 100 new cars and 75 buses will be purchased at once at a cost of $2,225,000. He also feels that a similar number should be purchased during the 1930-1931 fiscal year. Detroit really needs them. Of that there is no doubt. To buy them the railway will have to pay real money, and the Mayor intends that the city shall get that money from the people who use the service.
Traffic Officers as Transportation Men

Promoting safe, orderly and expeditious use of the streets is the primary function of police traffic officers. They should approach the problem from the standpoint of transportation rather than that of law enforcement.

ENFORCEMENT duties of traffic officers should be incidental to their primary functions of promoting safe, orderly and expeditious use of the streets and highways. A traffic officer should be more of a transportation man than an enforcement officer. The failure of some officers to grasp this point of view cannot be properly charged against them as individuals. The fault lies deeper. The rapid growth in the size and complexity of travel created baffling problems of automobile fatalities and traffic congestion. No precedents were available for meeting the difficulty, nor did time permit customs to evolve or best practices to develop. As a result it was only natural to try legislation as the first "cure." Certain acts and omissions were made crimes and the whole problem thereafter turned over to the police to struggle with as best they could.

Previously policemen dealt chiefly with vicious criminals, or at least with definitely anti-social persons, and seldom had to bother with forgetful and careless citizens. The situation now is that, according to law, both traffic law violators and burglars are criminals. Hence, is it any wonder that men who have spent a large portion of their lives handling hardened criminals should have difficulty in adapting themselves to the handling of a totally different class of law-breakers?

The traffic problem might have been given to railroad men to solve. Indeed, such an assignment would have been quite logical. Perhaps, if this had been done, the railroads with their superior experience in the transportation field and their special facilities might have been more successful than the police. Police departments had no men who were trained and able to do the necessary research and engineering work. They had no staff of men experienced in the training of the public mind. They had no funds with which to promote the needful enterprises. All that the police had was a large fund of knowledge and experience in the handling of criminals. Considering the handicaps, it is a wonder that any progress has been made.

Not only has the problem of the regulation of traffic...
been a source of much trouble to the police, but in size it now bids fair to eclipse that of crime. Many chiefs of police find that more than half of their own time is spent working on traffic problems and that if the public were to have its own way all of the policemen would be on traffic duty most of the time.

The police were among the first to recognize the special nature of street traffic control. As a result, all of the foremost police departments have traffic bureaus or divisions to which all traffic functions are attached. This specialization has been furthered by the advent of the local traffic engineer, who takes charge of the engineering features of street traffic and the local safety council, which disseminates safety education. When these two agencies are active it is possible for a traffic division to concentrate on enforcement.

Enforcement, however, has come to have a broader meaning than the apprehension and prosecution of law violators. In traffic, it no longer stands for wholesale arrests, but for the performance of those duties which will best promote safe, orderly and expeditious use of the existing street surfaces. Such a conception of a traffic officer's purpose may be less definite than one which prescribes the arrest and prosecution of all offenders, but it is certainly more apt to produce the results which legislators sought when they passed traffic laws.

**Quarrelsome Disciplinarians Disappearing**

Traffic officers still vary considerably in their notions of how they should conduct themselves and what they should expect from the public. A change for the better is observable as the blundering officious type is being displaced by men who are both efficient and pleasant. The latter are experts in the management of people and vehicles and not quarrelsome disciplinarians.

When viewing the traffic officer as a transportation man one finds some striking similarities between the duties which he performs and those of railroad men. A railroad switchman, in an interlocking tower where two lines cross at grade, signals approaching trains so as to prevent conflicts and collisions. A traffic officer directing traffic at an intersection does the same thing for vehicles. A train dispatcher decrees that certain trains shall wait for others and gives the most important trains the preference. Also, he sees that there is ample time in the schedule for the necessary movements to be made in safety; so, too, with a traffic officer when he sets the timing of traffic signals. To the main flow of traffic he gives the most time and the advantage of progressive movement in trains if possible. He also allows a short interval after stopping the traffic on one street to permit the last few vehicles to clear before a signal to proceed is given the traffic waiting to cross.

A railroad general superintendent has many executive functions that are not analogous to the duties of a traffic officer, but his principal objective of keeping things moving is the same. While such a superintendent is directing his attention to congested lines and idle rolling stock, traffic officers are looking after congested streets and automobiles that are parked overtime.

When a parade or caravan is to pass through a city the traffic officer often plays an important part in assembling and running it. In the work of making up the procession does he not do something very similar to what a yardmaster and switching crew do when they make up a train? As soon as the procession is under way he is generally charged with seeing that the correct routes are taken, that the schedule is kept, and that all necessary precautions are taken for the safe and uninterrupted movement of the column. In this rôle his responsibilities are obviously like those of a conductor.

In both fields a certain amount of police work is required. But as the work of the railroad police is small compared with that of the whole organization, so, too, should the arrests and prosecutions by traffic officers constitute a small part of their total efforts.

Both the railroad safety engineer and the traffic officer are employed to prevent accidents without unduly interfering with transportation. The work of each involves the investigation of traffic hazards and the taking of appropriate action toward the elimination of dangerous conditions. In fact, a traffic officer should be guided by the same principles and practices as are followed by safety engineers.

These few examples of similarity between some of the work done by railroad men and that performed by traffic officers may help to make it clear why it is desirable that a traffic officer should be more of a transportation man than an enforcement officer. In the capacity of a transportation man a traffic officer would serve the public by keeping things moving and by working diligently and intelligently to prevent accidents. On this basis the value of an officer would not be measured by how large a number of arrests he made or how large the gross receipts from fines were but by how few people he arrested, coupled with how smoothly and efficiently he kept traffic moving, how few accidents occurred and how few complaints were made about traffic conditions or the officer.

**Training Efficient Traffic Officers a Problem of Personnel Management**

To train a group of traffic officers to work efficiently is a difficult problem, and one in which the details vary with each individual department. However, assuming that a particular traffic division is well organized, political interference small, and new men selected carefully for their fitness, the problem resolves itself chiefly into one of management of personnel. The practice of sending men out to handle traffic without a single instruction, other than where they are to go, is proving too costly to continue. Uniformed officers make numerous mistakes and sometimes irreparable blunders. The time required for their superior officers and the courts to straighten out case after case of avoidable error is sufficient ground for some educational effort. And when to this is added the wasted time of the officer himself as well as that of clerks, attorneys, witnesses, juries and defendants, the need is apparent. Moreover, a difference in the accident and congestion situation may properly be a debit against an incompetent officer.

One of the basic principles of good management is that the worker should be instructed thoroughly in what he is to do. For this purpose, Baltimore, Boston, Detroit, Los Angeles, New York and many other cities have training schools for traffic officers. Several states, some counties, and a few universities, too, have joined in the movement by offering special opportunities to ambitious officers. The rapid growth of associations of traffic officers is indicative of a general desire on the part of traffic men themselves to learn from the experiences of each other. It is also true that each year sees a greater number of traffic officers visiting in different parts of the country in order to see first-hand how things are done in other cities. It is important that electric railway men know of these movements in order that they may
encourage them in their own localities, for these are some of the best means for training traffic officers.

A well-rounded course of instruction should include a working knowledge of police practice, criminal investigation, law and psychology. Special effort should be made to teach the practical details connected with the characteristics of traffic flow, the handling of traffic at intersections, enforcement of parking regulations and other important traffic rules, handling of violators, handling of crowds and processions, the proper procedure at fires and major disasters, the testing of brakes and headlights, the prevention of accidents, the investigation of traffic hazards, the investigation of accidents, the proper procedure and conduct in court and the way to get along congenially with fellow officers, other departments, the press and the general public.

No modern business enterprise would attempt to direct its employees without some form of supervision; yet there are still many traffic divisions in which there is little, if any, check for determining the extent to which orders are obeyed and policies carried out. Every squad of traffic officers needs a field supervisor to show them how their work should be done, to see that it is done according to instructions, and to see that there is sufficient work planned ahead to keep them busy. In the office, it is vitally necessary to keep track of each officer’s assignments, to see that they are attended to. But officers cannot do their best work unless they are in a favorable frame of mind. The cultivation of good morale is perhaps the most difficult task that any chief faces. Success can come only when a chief is able to demonstrate leadership and unflinching fairness. In addition, there should be allotted to each man sufficient work to keep his mind constantly occupied. Ambitious men want to get ahead, and unless consideration is given to them they may leave the department or spread dissatisfaction. Increase of pay, special details on difficult cases or problems, promotions and recommendations to executive positions in other traffic departments are means of keeping this class of men happy in their work. Politics, always a disturbing element, should not be permitted to interfere in the appointments or the work of a traffic division. Every reasonable means should be taken to make the work interesting to the men.

Modern business methods of managing personnel must be adopted to make traffic officers efficient transportation specialists. Such methods will be selected not just because they are used in the best-managed businesses, but because they are right and will yield great benefits to the traffic officer, his department and the public.

---

New Track Construction Methods Prove Speedy and Economical

By R. H. Dalgleish
Chief Engineer Capital Traction Company, Washington, D. C.

BY THE adoption of a new track design in which bent steel ties are imbedded in monolithic pre-mixed concrete, delivered by truck and thoroughly tamped and vibrated by special power-driven apparatus, the Capital Traction Company, Washington, D. C., has found it possible to lay track faster and more economically than in the past. In May, 1929, the company rebuilt 3,104 ft. of surface track by the new method. This track has now been in operation about eight months, during which time the temperature has ranged from zero to 100 deg. F. A few lateral cracks have developed, but there is no indication of any separation between the rails and concrete. The results obtained are considered so satisfactory that it has been decided to standardize on this method of construction until some better one is developed.

The design consisted of 103-lb., A.E.R.E.A. 7-in. grooved girder rail installed on a new type International twin steel tie, thermit welded joints, and monolithic concrete pavement from below the ties to grade. The original track had been constructed on a 9-in. crushed stone bed, which was not materially disturbed in the reconstruction work. The new type steel tie, which is bent upward in the center, reduces the amount of excavation necessary as compared with that of the straight tie by about 5 cu.yd. per 100 ft. of track, with of course a corresponding decrease in the amount of concrete. At the same time it provides for an ample depth of concrete in the center of the track to take care of vehicular traffic.

Ties and rails were installed in the usual way, but as the concrete was placed the entire track structure was vibrated by means of a machine with two pneumatic hammers, mounted on a piece of channel iron in such a position that each hammer operated over a block of steel placed approximately over the lip of the rail. A thorough machine tamping of the concrete was followed immediately by the vibration treatment. The result was extremely interesting. Air bubbles could be seen along the rails for a distance of 5 ft. ahead of the machine, clearly proving that what had been previously considered well-tamped concrete, in reality contained many voids. The vibrating machine was moved along the rails about a foot at a time. In addition to a very dense concrete with a perfect bond around rails and ties, the treatment also brought the mortar to the surface so that a good finish was obtained easily.

It might be thought that the cost of excavation neces-
Use of bent steel ties imbedded in monolithic concrete has proved economical and satisfactory

necessary to install the bent ties would more than offset the saving in concrete, but this did not prove to be the case. After the renewal of the old track, practically all that was necessary was the trenching under the rails, and by means of a template made of 2-in. lumber the trenches were easily kept to the proper size and grade.

The concrete for this job was furnished by a contractor in mixer trucks, the materials subject to inspection by the railway at his plant and on the job. The use of truck-mixed concrete also serves to keep the street clear of mixers, aggregate piles, water lines, etc., resulting in lower overhead costs and fewer accidents. Mixing of the concrete was done on the job under the supervision of the concrete foreman, who carefully regulated the amount of water used. It is interesting to note that the actual amount of concrete necessary to complete the job was found to be about 7 per cent more than the estimated amount, as based upon past experience in the use of straight ties. This excess probably was due to the settlement and compacting of the concrete by the vibration treatment.

Vibration treatment compacted the concrete to an extent that required the use of 7 per cent more material than had been estimated

The total cost of this new type of construction was $8,976 per foot of single track. Labor (6.258 hours) cost $2.712, hauling cost $0.219, and material cost $6.045 per foot of single track. These figures include the cost of installing and removing temporary crossovers, hire for switchmen and signalmen, etc.

Baltimore Substation Wins Architectural Distinction

Newest electric railway substation of the United Railways of Baltimore, with two 2,000-kw. converters. It is semi-automatic and was completely in service for the first time in December, 1929. It is early American in style and is the design of Addison F. Worthington, a Baltimore architect. The building was one of three that received honorable mention in the Baltimore Evening Sun's annual competition for the most artistically designed business or industrial building erected during the year. It is located in Hamilton, a suburb in the northeastern section of Baltimore.
Set up of equipment used on one type of rapid transit car

Interior of new instruction school in trainmen's room of 69th Street Terminal

Brake demonstration racks have been placed at one end of room

Walls are covered with charts and diagrams. Cut sections of individual pieces of equipment are mounted near by
Operating Delays Reduced

By Practical Instruction Methods

By

L. E. Summers

Assistant Operating Manager Elevated Division

Philadelphia Rapid Transit Company

DELAY of a few seconds to a rapid transit train leaving one end of the line may easily develop into a ten- or fifteen-minute "drag" before the completion of the trip, and a delay of a few minutes duration as the result of a slight mechanical failure is almost a calamity. It is of the utmost importance, therefore, that each train, when leaving the yards, be as mechanically fit as possible. The track, signal and electrical equipment must be in almost perfect condition, and the employees must be intelligent, alert and resourceful. As a means of developing these characteristics in its subway-elevated men, PRT recently completed the installation of a new instruction department, located in the trainmen's room at the 69th Street terminal of the Market-Frankford subway-elevated line.

The instruction policy of the management, in so far as its subway-elevated employees are concerned, is based upon the premise that practically any mechanical or electrical defect in rolling stock which may develop in service can be temporarily corrected by trainmen if they are thoroughly familiar with details of equipment...
In the instruction room are sections of three full-sized subway-elevated cars, placed end to end and stripped of ceiling, seats and floor. One side of each car has been removed for purposes of clear vision. In all other respects they are similar to those in regular service. Rolling stock on the Market-Frankford line consists of two types of cars: the older Market Street cars, equipped with GE Type M Control and Westinghouse electric-pneumatic AMRE brake equipment, and the more modern Frankford cars equipped with Westinghouse Type ABF control and Westinghouse electric-pneumatic AMUE brake equipment. Thus two types of instruction equipment are required.

A completely equipped motorman’s cab has been set up. Doors, door controls, and every air pipe, coil, valve, wire, etc., in and under the body of the cars are exposed to view. Air pipes and reservoirs are painted in different color schemes for purposes of easy identification and explanation. Two brake demonstration racks stand side by side at the end of the room. A complete set of movable couplers is provided to show the trainmen how to couple and uncouple cars. Walls are covered with charts, diagrams and blackboards.

An especially interesting feature is a device whereby the instructor, through manipulation of a switchboard located in the far corner of the room, can produce in the equipment of the cars the external symptoms of practically any failure likely to occur in actual operation. The student, standing in the cab, is assigned the task of determining and temporarily correcting the difficulty. Every defect which might occur in actual operation is manufactured for him, and he is rigidly instructed in the procedure necessary to locate it promptly and overcome it temporarily.

When a new employee enters the elevated division as a student conductor, he is first placed in actual operating service for at least three days under the guidance of an experienced conductor who teaches him how to manipulate the doors and instructs him in the various duties he is expected to perform. He is then assigned to the instruction room where the details of equipment are thoroughly explained to him until he is familiar with all phases of his duties. Finally, he is required to take an examination, part oral and part by demonstration, which he must pass with an average of at least 85 per cent.

While working as a conductor the new employee continues to study in the school for advancement to a motorman’s position. After having served as a conductor for six months, he enrolls for the motorman’s in-
struction course. This course consists of one week's actual study of train operation under a motorman instructor. The student is next given instruction on cars in the yard, followed by an examination which he must pass with an average of 85 per cent. The minimum time in which a student may complete this course is eleven days. Instruction is given individually or in groups as occasion and convenience dictate, and by demonstration or lectures.

A chart on which are shown types of signals in use, with their various positions and indications, is used in the examination and instruction of trainmen. No explanations are given on the chart, and the student is required to read correctly each indication as he would see it in actual operation.

Thus, in the instruction room, a trainman not only learns how to operate a car, as does the average motorist receiving instructions for an operator's license examination, but, he learns his lessons to the extent and in the sense in which an auto mechanic learns his. Trainmen can see what occurs when the controller handle is moved to the extreme right, when the brakes are applied and released, or what takes place when either of the two fails to function properly. The degree of thoroughness to which this instruction procedure extends may be illustrated by the fact that the examination for motormen contains a list of 83 questions and that for conductors 35 questions. Not only must new men survive this rigid examination, but all employees must go through the instruction school once a year for brushing up purposes, submitting to the same examination as the beginners, and passing it with the same average. Should either a new or an old man fail to pass the quiz, he is required to attend the instruction school until he has satisfactorily shown his ability to master the questions.

Should a motorman or conductor be the cause of an unnecessarily long delay or, as a result of continual checks by members of the instruction department, be found deficient in any point of operation, he is sent to the school for additional instruction. Not until he has clearly demonstrated his ability to prevent a recurrence is he allowed to return to his train. These checks cover the manner in which a motorman stops and starts his train, with particular attention to smoothness and rapidity; the degree of accuracy he maintains in his running time schedules; his response to unexpected signal tests; the conductor's carefulness and time in opening and closing doors and the behavior of both members of the crew in an emergency.

Records of trainmen's voluntary attendance at the school give the best indication of the interest displayed. The instruction room, open seven days and two evenings each week, has supplanted the outside trainmen's room as the gathering place for motormen and conductors during their spare moments. Idle chatter and newspaper reading have given way to pipe line and valve discussions, as men bend over the car "chassis" and pump question after question at the instructors. One motorman, for instance, made 23 visits to the instruction room in the course of a month, spending 61 hours and 35 minutes among the reservoirs and brake demonstration racks. An average of twenty trainmen visit the room daily and the average time consumed by each man is 55 minutes. This is considered a remarkable record since trainmen on the Market-Frankford subway-elevated line number only slightly more than 170. Superintendent of Instruction Harry Keely and Instructor Frank James, who are largely responsible for the organizing and development of the department, are frequently hard pressed for replies to a barrage of questions.

The employees of the rolling stock maintenance division are also scheduled for regular periods in the instruction room, the demonstrating equipment lending itself in an ideal manner to study by these men responsible for inspection and maintenance of rolling stock. Their course of instruction naturally varies in some degree from that of trainmen. Classes for electrical and air brake maintenance employees are conducted each year from September to June. Air brake employees, in the first part of their course, are instructed in the theory of the equipment in the instruction room, each man being required through use of charts and actual equipment to follow the course of the air through all the pipes, reservoirs, valves, etc., explaining the functions of each, and "shooting trouble." These men are then taken into the shop and required to demonstrate their ability in determining and correcting defects in the various valves in the complete brake equipment. Employees working on electrical car equipment are divided into a primary and an advanced group. Their classes are held one night a week in the school, for instruction in the theory of all electrical equipment and for training in locating and repairing trouble.

The remarkable interest on the part of all subway-elevated men has been directly reflected in the delay sheets. Long delays on the line have been considerably reduced as a result of these instruction methods. Experience has proved already that the voluntary visits which the men pay to their school make the routine examinations practically nothing more than a matter of form.
Rome Readjusts Car and Bus

Street cars replaced by buses in business district. Unified transfer system between car and bus. New belt line affords direct communication among districts outside of business area. Special work necessitated by new system installed in four hours. Sightseeing with buses encouraged by municipal transportation system give a series of through routes from the outer portions of the city to the principal railroad stations, going underneath a portion of the central district.

For a number of years the transportation lines in the city have been controlled by the municipality through an organization known as the "Azienda delle Tranvie e Automobili del Governatorato di Roma" (A.T.A.G.), but no previous plan has been worked out for a co-ordination of the various means of transportation. The original companies which preceded the municipal consolidation were privately owned and had been consolidated into one system, following the conversion from horse to electric traction many years ago. In 1911 the municipality organized and constructed a small railroad way system, principally in the outlying districts. Due to the war this system was only slightly expanded, but in 1920 when most of the franchises of the private companies expired, the lines were taken over by the city. The inefficiency of the old transportation system then became apparent and in 1923 plans were begun to rehabilitate and consolidate the lines. These plans have been modified several times and have culminated in the system which has just begun operation.

The main purpose of the consolidation of the street car systems was to facilitate transportation among the various sections of the city and to eliminate transferring from one system to another. While the service was adequate for the city as it existed before the war, growth in the last ten years has been so rapid that it has been

---

**Electric Railway Journal** — Vol. 74, No. 3
necessary to expand the transportation facilities greatly to keep pace with it. An accompanying table shows the increase in rolling stock and track of the surface lines between Jan. 1, 1920, and Dec. 31, 1929. Rome is one of the few large cities in Europe in which a considerable amount of construction has been undertaken since the war. The total amount spent was approximately 2,000,000,000 lire ($10,600,000). With the construction of 37 miles of track the surface lines have been extended proportionately more rapidly than the population has increased. This expansion program

When surface cars were taken out of business districts, better service was rendered on radial and belt lines

1—Plaza Ponte Milvio 20—Santa Saba
2—Acqua Acetosa 21—San Paolo
3—Villa Velicelli 22—Monte Verde
4—Piazza Verbano 23—Monte Sacro
5—Piazza San G. 24—San Pietro
6—Monte Sacro 25—Vatican City
7—Acqua Bulicante 26—Piazza Indipendenza
8—Piazza San G. 27—Piazza Pla
9—Q. Italia 28—Piazza Flaminio
10—Portonaccio 29—Piazza Colonna
11—Campolo Vernano 30—Piazza Cavour
12—Acqua Bulicante 31—Piazza Pia
13—Santa Croce 32—Piazza Colonna
14—G. Apple 33—Piazza Indipendenza
15—Porta Latina 34—Piazza Fiume
16—Porta Latina 35—Piazza Garibaldi
17—Monte Verde 36—Piazzale Trionfale
18—Piazza Colonna 37—Plaza Hansizza

New street cars of the MRF type have eighteen seats facing forward and twenty seats arranged longitudinally

**Electric Railway Journal**—March, 1930

137
Train service consists of one motor car and trailer, both of the one-truck type. Cars in these trains have all seats facing forward, placed by buses as an experiment, however, and the results indicated that this plan would bring some relief from congestion. Accordingly, between 1927 and 1929, plans were made for a replacement of all street cars by buses in the central business district of Rome. The entire transportation system has been laid out with the idea that ultimately passengers will be carried from outlying districts to the business centers by means of a subway in addition to other means of public transportation.

**Simplification of Routing Basis of New Plan**

In making the traffic survey for the new routes, it was found that the principal difficulties of the old street car service could be summarized under three heads:

1. There were too many long lines with infrequent headways, irregular service, and indirect routes.
2. Many lines went through the congested district.
3. All cars covered the entire line and were heavily loaded in the center and almost empty at the ends.

Accordingly, in order to provide uniform means of traffic circulation in the central zone after it definitely had been decided to remove street cars from the congested areas, it was desirable to change the system of street car service. Among methods of doing this, it was decided to simplify the basis of street car routing. The principal factors considered in making this change were:

- The simplification of the number of lines.
- The reduction of routes and stops.
- The elimination of dead-end and outside routes.
- The elimination of duplicating routes.
- The elimination of routes through congested districts.
- The utilization of bus routes in the outlying districts.
- The introduction of new routes, connecting routes, and shorter routes.

**Table I—Growth of Rome Street Car System 1920-1929**

<table>
<thead>
<tr>
<th></th>
<th>Jan. 1</th>
<th>Dec. 31</th>
</tr>
</thead>
<tbody>
<tr>
<td>Miles of track</td>
<td>1920</td>
<td>1929</td>
</tr>
<tr>
<td>Number of track switches</td>
<td>93</td>
<td>170</td>
</tr>
<tr>
<td>Substation capacity, a.e. kw</td>
<td>4,400</td>
<td>10,100</td>
</tr>
<tr>
<td>Substation output, kw-hr per annum</td>
<td>20,000,000</td>
<td>60,000,000</td>
</tr>
<tr>
<td>Carhouse capacity, cars</td>
<td>550</td>
<td>1,000</td>
</tr>
<tr>
<td>Cars available</td>
<td>500</td>
<td>900</td>
</tr>
</tbody>
</table>

Electric buses are of the battery type and accommodate 18 seated passengers and 22 standees.

**Table II—Comparison of Old and New Services in Rome**

<table>
<thead>
<tr>
<th>Before Recourting</th>
<th>After Recourting</th>
</tr>
</thead>
<tbody>
<tr>
<td>Miles of street with track</td>
<td>72.5</td>
</tr>
<tr>
<td>Miles of double track</td>
<td>136.2</td>
</tr>
<tr>
<td>Miles of street car route</td>
<td>217</td>
</tr>
<tr>
<td>Miles of bus route</td>
<td>67</td>
</tr>
<tr>
<td>Total miles of line</td>
<td>284</td>
</tr>
<tr>
<td>Number of street car routes</td>
<td>51</td>
</tr>
<tr>
<td>Number of bus routes</td>
<td>36</td>
</tr>
<tr>
<td>Number of car trains</td>
<td>406</td>
</tr>
<tr>
<td>Number of buses</td>
<td>91</td>
</tr>
<tr>
<td>Seats and standing room offered per hour per mile of route</td>
<td>125,000</td>
</tr>
<tr>
<td>Car-miles run per annum</td>
<td>24,200,000</td>
</tr>
<tr>
<td>Bus-miles run per annum</td>
<td>2,080,000</td>
</tr>
<tr>
<td>Total vehicle-miles per annum</td>
<td>26,480,000</td>
</tr>
<tr>
<td>Schedule speed of street cars, m.p.h</td>
<td>6.63</td>
</tr>
<tr>
<td>Schedule speed of buses, m.p.h</td>
<td>5.57</td>
</tr>
<tr>
<td>Energy used per annum by street cars, kw-hr</td>
<td>55,000,000</td>
</tr>
<tr>
<td>Gasoline used per annum by buses, gallons</td>
<td>841,500</td>
</tr>
</tbody>
</table>

**Table III—Classification of Routes**

<table>
<thead>
<tr>
<th>Before Recourting</th>
<th>After Recourting</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total number of tramway routes</td>
<td>33</td>
</tr>
<tr>
<td>Inner belt routes (two directions)</td>
<td>3</td>
</tr>
<tr>
<td>Radial lines</td>
<td>26</td>
</tr>
<tr>
<td>Outlying crostown lines</td>
<td>3</td>
</tr>
<tr>
<td>Suburban lines</td>
<td>2</td>
</tr>
<tr>
<td>Total number of bus routes</td>
<td>23</td>
</tr>
<tr>
<td>Through routes in center</td>
<td>7</td>
</tr>
<tr>
<td>Lines entering center</td>
<td>3</td>
</tr>
<tr>
<td>Suburban lines</td>
<td>11</td>
</tr>
<tr>
<td>Radial line</td>
<td>1</td>
</tr>
<tr>
<td>Average length of route, street cars</td>
<td>4.3</td>
</tr>
<tr>
<td>Average length of route, buses</td>
<td>1.0</td>
</tr>
</tbody>
</table>
business area a study was made to determine where the
limits of the district could be established. Due to
the topography of the city, which is hilly, and the various
old monuments and buildings which can not be removed
as being the last samples of a bygone civilization, traffic
is slowed down considerably, and it was found impossible
to give the exact limits of the district. Accordingly, a
zone was laid out which includes practically all of the old
Papal City excepting the Borgi and the Trastevere areas
and also a part of the newer city. A double-track belt
line encircles this district.

From the belt line the street railway routes radiate
outward, having their outer terminals in the suburban
districts. These lines enter the belt line at nine points
where passengers can transfer directly to the latter or
to the buses which run into the business district.

From these intersections the series of bus lines pass
through the central points of Rome including the Piazza
Colonna and Piazza Venezia.

In order to facilitate direct communication among
outer portions of the city, it was planned to have a second

Table IV—Types of Street Cars of the Rome System

<table>
<thead>
<tr>
<th>Type</th>
<th>MRS</th>
<th>CT-135</th>
<th>Trailer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Class</td>
<td>Double truck</td>
<td>Single truck</td>
<td>Single truck</td>
</tr>
<tr>
<td>Number of windows</td>
<td>7</td>
<td>8</td>
<td>8</td>
</tr>
<tr>
<td>Two motors per car; horsepower of each</td>
<td>56</td>
<td>58</td>
<td></td>
</tr>
<tr>
<td>Brakes</td>
<td>Air</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Overall length</td>
<td>44 ft. 4 in.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Seating capacity</td>
<td>24</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Standing room</td>
<td>47</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table V—Buses of the Rome System

<table>
<thead>
<tr>
<th>Type</th>
<th>34-S.P.A.</th>
<th>34-S.P.A.</th>
<th>Lancia</th>
<th>Lancia</th>
<th>Electric</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number</td>
<td></td>
<td>160</td>
<td></td>
<td></td>
<td>40</td>
</tr>
<tr>
<td>Length</td>
<td>4 ft. 8 in.</td>
<td>7 ft. 10 in.</td>
<td>13,960</td>
<td>13,960</td>
<td>101,940</td>
</tr>
<tr>
<td>Width</td>
<td>7 ft. 10 in.</td>
<td>7 ft. 10 in.</td>
<td>14,000</td>
<td>14,000</td>
<td>14,000</td>
</tr>
<tr>
<td>Seating capacity</td>
<td>45</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Standing room</td>
<td>45</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Weight, gross</td>
<td>13,860</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Horsepower</td>
<td>45</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

A Lancia bus of the Omicron long type affords seats to 26
passengers and room for 24 standees, and has a rear exit

or outer belt line, but since there appeared to be no need
for carrying this line completely around Rome, only
parts of the proposed route have been put in operation
in the northwest, northeast and southeast sections. In
addition to the surface lines which go out to the sub-
urban districts, several bus lines serving these territories
have been retained. They will be replaced by electric
service, however, as soon as the traffic increases to such
an extent that the change is desirable from the viewpoint
of efficient transportation.

The fare system has been changed because the number
of direct through lines was reduced and also to encour-
gage passengers not going to the center of the city to take
routes which do not enter the congested area. It was
also desired to increase the riding habit of the public on
the street cars because the latter have lower operating
costs than buses.

Under the new arrangement the city can be considered
as divided into three zones. First, the central zone in
which service is given by buses only; second, the outer
zone, which is served by street cars exclusively, and
third, the suburban district which is served by street cars

While new trackwork was installed service was continued uninterrupted over old track

Electric Railway Journal—March, 1936

139
and independent bus lines. There are some exceptions to this arrangement, where bus lines are being run beyond the inner belt line and reach points in the intermediate zone. This was done because no track construction was possible in the districts thus served, which needed transportation facilities badly.

Transfer between street cars and buses is available to those passengers traveling from the center of the city to the outer districts and back. Separation of the routes improves service for both cars and buses, and reduces traffic delays in the center of the city. Another advantage is the flexibility of the routes, which can now be changed easily without disrupting the entire system.

The layout of the service is shown in an accompanying diagram. The belt line connects the nine principal transfer points indicated by letters. The bus lines are indicated by the initials of the two terminals they connect. The cars of each route carry the same number as the one given for the outer terminal.

In the new fare system, it was considered desirable to discourage the transit through the central business area of passengers who did not have to stop there. Although the fare system was wholly revised it was considered necessary to retain the existing minimum fare. New tickets were issued permitting transferring for a continuous trip from one point in the city to another, but the ride was limited to one direction only. The number of transfers permitted depends entirely on the routes of the lines involved. Two transfers are necessary when the entire trip is made by a street car and one transfer when the trip is made by buses or by a combination of bus and car. The time limit of the tickets has been set at one hour as it was considered that this was time enough to reach any transfer point during one continuous trip. In order to keep within this time limitation, three types of transfers have been provided. The first is priced at 50 centesimi (2.6 cents). This is the old rate and the ticket is good on street cars only. The second type of ticket is priced at 60 centesimi (3.2 cents) and is good on buses or a combination of bus and car. The third ticket, costing 1 lira (5.26 cents), is good for travel from one side of the city to the other. The car ticket shows the various routes and transfer points. The ring in the center represents the belt line surrounding the central business district. The bus ticket is similar except that it covers a specific route between two of the transfer points. These two tickets, with an extra fare for entering the business area, will keep practically all the passengers in the outer district who do not have to transact business in the restricted zone. The 1-lira ticket is good on all cars or buses for the date and hour punched, and has been in use for several years. Corresponding to each of the three types of tickets there is a season ticket, which eliminates paying a fare each time bus or car is boarded.

A comparison of the old and new services is given in an accompanying table. It will be noted that there has been a material reduction in the number of miles of street in which car tracks are used. While the old rails have not been torn up so far they have now been used since the beginning of the year. There has been a reduction of 25.4 miles of double track. Due to the elimination of duplication of routing, the total miles of car routes and bus lines has been reduced from 284 to 154, a saving of 130 miles of route. The principal saving is in the reduction of the number of car lines from 51 to 33, although the bus routes have been decreased from 26 to 23 only at the same time. The number of car trains has been greatly reduced, while the number of buses in service now is more than double. The total number of vehicle-miles per annum, however, has been decreased slightly, while it will be noted that the scheduled speed both for cars and buses has been increased a little over 10 per cent. The number of car and bus routes and the number of lines serving the various territories are given in an accompanying table. A list of the various types of rolling stock operated by the transportation system is given in tables 4 and 5, which list the cars and buses separately. In addition a few cars and trailers of an old type are being retired.

About two months of construction work was necessary and a new electric substation was installed. This new substation transforms 8,000 volts a.c. to 600 volts d.c. through mercury vapor converters with a rating of 350 kw. built by the Societa Officine Subalpine of Turin. Cables for the distribution system have been installed to an aggregate length of 6.2 miles. It also is expected that a new substation with a rating of 2,000 kw. will soon have to be installed in the Piazza San Pietro.

The most important track construction was the installation of special work at the newly created transfer points, while some sections of nearby lines were connected in order to complete the inner belt line. Apart from these changes comparatively little new track work had to be laid. The change-over of the old system to the new was effected in four hours on New Year's Day, from 1 to 5 a.m. The new installation comprised 12.2 miles of track, 106 switches and 362 frogs.

In order to familiarize the public with the new routing, signs were placed at all transfer points and at various locations along the line, where sections of maps and tables were also available.

*Editor's Note—Since the new system was put in operation Jan. 1 of this year, there has not been sufficient time to determine whether the results are satisfactory. Conflicting reports have been received at this office. Definite information is awaited with interest.*
Electric Coaches Installed on New Orleans Shuttle Line

By W. S. Rainville, Jr.
Equipment Engineer New Orleans Public Service, Inc.
New Orleans, La.

Equipped with two 50-hp. motors each, the New Orleans electric coaches are capable of attaining a maximum speed of approximately 25 m.p.h. and maintaining a schedule speed of more than 10 m.p.h.

This view shows the Twin Coach on Carrollton Avenue.

Confronted recently with the necessity for rebuilding track on a short, unprofitable street car line, the New Orleans Public Service, Inc., decided to substitute trackless trolleys. The management felt that the substitution would not only put the line on a paying basis, but would also afford an opportunity of becoming familiar with this type of vehicle and studying its possibilities for use on other railway lines with light patronage.

Two electric coaches were purchased, one from the Twin Coach Corporation and the other from the American Car & Foundry Motors Company. On Dec. 2, 1929, the two 28-passenger, single-truck cars were withdrawn and the new vehicles placed in service. The route, which is 1.214 miles in length, parallels the Carrollton Avenue street car line in the western part of the city for two blocks, extends northwest on Oak Street to a district called Southport, goes two blocks northeast on Eagle Street and then back to Carrollton Avenue by way of Willow Street. With the exception of two short blocks the entire route is over paved streets. On Willow Street, where the street car tracks were eliminated, new paving was laid in 1929.

The cash fare of 7 cents charged on the electric coach line is the same as on the company's car lines. Transfers are accepted from other car lines and are issued free. A headway of eight minutes is maintained on the route by one coach, the other coach serving as a standby.
The total daily mileage of the operation is approximately 175 miles, the coaches being alternated in morning and afternoon service. Although this operation is a small one, it is sufficient to familiarize the distribution, transportation and rolling stock and shop departments with electric coach operation.

Overhead construction for the route is of the simplest type, the same materials being used as in the street railway overhead system on tangent and curve construction. Both positive and negative trolley wires are of No. 00 copper, spaced 24 in. apart. Positive feeder taps are essentially the same as those used for the previous street car operation. The negative trolley wire is grounded to existing rails on near-by streets at several points. There are no spring frogs, special insulated crossings, wyes or loops in the installation.

**Electric Coaches Are of Latest Design**

The electric coach supplied by the American Car & Foundry Motors Company is constructed entirely of steel along the lines of the A.C.F. “Metropolitan” bus. It weighs 19,000 lb. and is mounted on 38x9-in. tires, with duals on the rear. An entrance door is located behind the front wheels, and a treadle-operated exit door is at the rear. National Pneumatic electro-pneumatic door control, with full brake interlock safety features, is provided. The coach has a nominal seating capacity of 40 passengers, but this was cut to 38 by removing two seats from over the forward wheel housing at the right.

This vehicle is powered with two General Electric 298, 50-hp., automotive type railway motors. They are supported rigidly from the body framing and are connected to a Timken inverted worm-drive axle by two single section 3½-in. tubular drive shafts provided with two all-metal joints per shaft. A gear reduction of 11 to 1 is used. The motors are controlled by the General Electric type PCM foot-operated automatic control, without dynamic braking. The main motor controller is located in a compartment beneath the rear cross-seat. This unit can be reached for inspection by removing the rear seat or an exterior panel in the rear of the coach. The controller includes three contactors for making the series and parallel connections of the motors, two line breakers for the positive and negative trolley leads, an overload relay, an accelerating relay and two motor cut-out switches. The resistor portion of the controller is operated by a camshaft driven by an air engine. Nine series and nine parallel steps are provided, so that the current changes on each step are small.

Operation of the main controller is by a master controller mounted in the floor of the coach at the operator’s station. The pedal on this controller has four operating positions—off, switching or holding, full series running and full parallel running. Movement of the pedal is about 3 in. and only a very slight pressure is required.

The motor reverser, which is mounted horizontally at the driver’s left, is of the hand-operated drum type, with three positions—forward, off and reverse. This device is so arranged that the control circuit is complete only when the handle is in one of its operating positions. Motor resistors are of the edgewise-wound ribbon type. Current collection equipment includes 4-in. Kalamazoo wheels, the Ohio Brass Company’s swivel harp, 18-ft. 6-in. poles, the O.B. Form 5 trolley base and O.B. trolley retrievers.

Brakes on the A.C.F. electric coach are of the four-wheel air-operated type. The CP-25, 10-cu.ft. air compressor, MJ compressor governor and VB-2 foot-operated brake valve are of General Electric manufacture. The air brakes are supplemented by a mechanical hand brake, consisting of a 16-in. disk brake mounted on each propeller shaft. This is controlled by a lever to the right of the operator.

The electric coach manufactured by the Twin Coach Corporation is constructed of Plymell steel, weighing 16,500 lb. completely equipped. It is mounted on single 40x104-in. medium pressure tires in the front and 38x7-in. high pressure duals on the rear. The entrance door on this coach is located ahead of the front wheels. The circulating load feature is provided by a treadle-operated exit door in the rear. This coach has a seating capacity of 42 passengers and is equipped with bellows type seats, upholstered in rattan.

Two Westinghouse No. 1426, 50-hp. automotive type
railway motors are used. These are connected to the special Timken-Twin Coach underslung dual worm axle by two 2-in. diameter shafts with Cleveland Universal joints at each end. The motors are controlled by Westinghouse type VA foot-operated automatic control, without dynamic braking. All main control apparatus is located under the rear seat, accessible from both the interior and exterior of the coach.

The motor control equipment is operated by a master controller mounted beneath the floor and connected to a pedal at the operator’s position. The motion of the controller drum operates the main circuit switches directly and also changes the setting of the limit relay. In this manner the rate of acceleration is governed by the distance to which the accelerator pedal is depressed.

To the left of the operator is mounted the motor reverser, of the hand-operated type and with four positions—off, forward, reverse and emergency braking.

Brakes for the Twin Coach are of the four-wheel air-operated type, using ABS Brakebloks and gun iron drums. The DH-10 air compressor, R-414 compressor governor and B-4 brake valve were furnished by the Westinghouse Traction Brake Company. The air brakes are supplemented by an emergency brake consisting of two drum-type driveshaft brakes actuated by a hand lever.

Both vehicles are housed in the Carrolton Station and are inspected and maintained by the regular carhouse crew. Because of the simplicity of the electric coach no skilled mechanics are required. It is the intention of the company, however, to place pitmen in the bus garage for short periods so that they may become familiar with the rear axle, steering mechanism and other distinctly automotive parts. Inspection and greasing have been placed on a 2,000-mile basis. One of the street car inspection pits has been adapted to the use of the electric coach by installing guard rails along its sides. A negative wire is suspended in the carhouse, parallel to the street car positive wire, for bringing coaches over the pit. A portable outfit for inflating the tires was constructed a DH-16 railway air compressor and two air reservoirs being used. With the exception of a Manley Hi-lift jack, no special equipment has been purchased for the maintenance of the new vehicles.

---

Road Builders Recommend Relief of Paving Obligations

VARIOUS recommendations directly affecting electric railways were embodied in the report of the sub-committee on street railway tracks and paving of the American Road Builders Association presented at Atlantic City, Jan. 13-18. The conclusions in the report were based on a survey covering some 4,000 miles of track. Particularly significant is the recommendation that the cost of paving in the track area should not be borne by the railway alone.

Girder rails varying in height from 6 in. to 9 in. are used in 80 per cent of the cities, according to the report. The 7-in. girder rail is the most popular. Girder rails have many advantages over the T-rails from the paving engineers’ standpoint. The low joints which were so common in old track construction, with their resulting breaking of the pavement, seem to be overcome through the general use of a combination bolted and welded joint.

The use of wood ties predominates, according to the committee. A few cities use both wood and steel ties, and some use only steel ties. The majority of the users of wood ties use broken stone or slag ballast from 6 in. to 8 in. thick, while the users of the steel tie use 8 to 12 in. of concrete, or from 6 to 8 in. of broken slag or stone for ballast under the ties. Concrete is quite generally placed between and over the ties to support the paving surface or for the surface itself. Brick, stone blocks and concrete are used in about equal amounts for the paving within the track area. Some asphalt paving is used, especially along the outside of the rails.

The roadway pavement wearing surface is carried to the outside rail in about 60 per cent of the surveyed cities.

The survey disclosed the fact that in 70 per cent of the cities, the city engineer determines the type of track construction, and in 75 per cent of the cities he supervises the track and paving construction, although 80 per cent of the railway companies pay for the paving in the track area. In only two instances does the city maintain, at its own expense, the pavement in the track area, and in only two other instances does it do the maintenance at the expense of the railway company.

After pointing out the heavy expense involved in construction of a suitable pavement, the committee suggests that the public, as represented by the taxpayer or the users of motor vehicles, should contribute toward the paving of that portion of the roadway within the track area. Under this arrangement, it is intended that a more substantial type of track construction might be provided, which would be of advantage to both the users of the railway cars and bus and automobile riders.

In the construction of street railway tracks in city streets, the committee believes the most permanent type possible to be obtained should be adopted. The sub-base for track construction should be thoroughly drained and unyielding. Special effort should be made to produce such a result, and, if necessary, a sub-base of concrete should be provided, in order to secure a firm base. In cities where an 8-in. concrete slab has been used as a sub-base, the results have demonstrated its superiority over other types. Experience seems to indicate that, from the standpoint of paving surface, the best results can be obtained by the use of grooved rails, although some cities seem to be getting fairly good results with T-rails. With grooved rails it is much easier to secure and maintain a satisfactory paving surface, since the pavement can be finished flush with the steel. With such construction the cross movement of traffic is greatly facilitated.

It is felt that the use of brick and stone block paving in the car tracks gives more satisfactory results than other types. The block type, with asphalt filler, is easily removed when repairs to the rails are necessary, and absorbs more readily the vibration set up by car traffic.

Whatever the design of the track construction and its paving, it seems logical to make a complete separation between the roadway pavement and the track structure. Each should be capable of supporting the maximum traffic loads independent of the other.
De Luxe Bus

Finds Wide Application

WITHIN the past five years, no phase of surface transportation has expanded more rapidly than has that of intercity bus operation. At the beginning of 1930, a total of approximately 29,500 buses, most of which are of the de luxe type, were regularly rendering such service over 300,000 miles of route. Nearly 33,000 miles of intercity lines, both intrastate and interstate, were added in 1929. The electric railways of the country have been among leaders in this development. They have extended their fields of operation with new intercity lines, in many instances through territories already served by interurban cars, have absorbed competing independent bus companies and co-ordinated the selective services, and have stabilized intercity operation in a number of instances by the abandonment of long unprofitable interurban car lines and the substitution of more direct, fast and comfortable bus routes.

Important factors contributing to the progress in intercity bus transportation are the luxurious features of the buses themselves, the growth of convenient terminals, the extension of improved highways, the co-ordination of interline services and the extensive merchandising of nation-wide travel by bus. The great majority of buses now being used on long distance routes are comparable in comfort and convenience to the private automobile, with adequate facilities for handling small baggage. They travel on the newest and most direct highways between two cities, beginning and ending the trip at comfortable, centrally located terminals where connections with other lines are made with minimum delay.

Co-ordination of interline services and the joint use of terminals by two or more companies, serving different territories, are the two factors which are doing most to stabilize intercity bus operation. Facilities on a network of routes covering the whole country are gradually assuming the form of one large unified system. Not only is this true of the routes themselves, but it is true from operating, economic and maintenance standpoints. Interline agreements and service arrangements between the Pennsylvania-Ohio System and the number of through bus lines operating in the state of Ohio form a notable example of this co-ordination. Practically every bus line from the West or Middle West, traveling to the Eastern states, passes through the state of Ohio and into the town of Youngstown. In Youngstown a central terminal is maintained and operated by the Pennsylvania-Ohio System to which all these through lines report for the interchange of passengers. Mechanics and service equipment are located at this terminal for the use of any line.
Unification of intercity systems and construction of improved highways have been major factors in the steady expansion of long-distance bus operations. Increasing popularity of this type of service promises continued growth.

Efforts to secure as many direct interline connections and as many interline joint tariffs as possible with other lines in this district have resulted in suitable arrangements with practically every operation which would be of value to the system in the state. A rather unusual agreement for the sanding of hills during icy weather has been made. The through lines purchase the sand or ashes, the Pennsylvania-Ohio System transports it to important points along the routes and the highway department of the state does the actual spreading.

A comparative study of intercity de luxe bus operations as carried on by three companies will be found in an accompanying table, showing details of fare structures, territories served and equipment used.

Public Service Co-ordinated Transport, operating throughout the entire state of New Jersey, is the largest bus operating organization in the United States. In a consideration of intercity bus operation a great majority of the local lines could properly be put under that classification, as their services join more than 300 municipalities in the state. Two accompanying maps show interstate and intercity bus routes in north and south New Jersey. The operations extend into New York from northern New Jersey and into Philadelphia from southern New Jersey.

Interstate service is operated to New York City from Nyack, New York, Elizabeth, Montclair, the Oranges, Maplewood, Paterson and Passaic, all in New Jersey. From Philadelphia, Pa., lines operate to New Jersey to Vineland, Millville, Bridgeport, Penningrode and Billingsport. A number of de luxe intercity bus operations are carried on wholly within the state operating from the cities of Newark, Paterson, Camden and New Brunswick.

The Cincinnati Street Railway has operated for the past two years a de luxe motor coach line during the morning and evening rush hours between Government Square and Avondale, a one-way distance of 4.6 miles. One bus was used in this service, making two trips inbound in the morning and three trips outbound in the evening. In the morning no one patronized the line outbound and in the evening only one or two used it inbound. At first the public was slow to use this service, but patronage grew until there was sufficient demand for this high-class service all day, so four new buses were purchased. These coaches, designed for 29 passengers, were equipped to seat only 25, giving 36 in. between seats. This made it possible for a person sitting next to the window to leave without disturbing the person on the aisle. Provision for two card tables was made at the rear, where the last two seats over the wheel casing face backwards.

The route was extended a mile further to Avondale Heights, a new and highly restricted subdivision, and an all-day schedule was put into effect on Nov. 25, 1929. The new schedule called for a half-hour headway between 7:30 a.m. and 8:30 p.m. and hourly service from 8:30 p.m. to midnight. The fare on this line was established at 25 cents, with five tickets for a dollar, no transfers and no standing passengers.

During the latter part of December, patronage grew during the rush hour until certain trips had to be double-headed. This continued after the holidays, so on Jan. 13, 1929, a new schedule, giving fifteen-minute service during the evening and morning rush hours between Government Square and old Avondale, and 30-minute service to the Heights, was placed in effect. Service outbound after 6:30 p.m. and inbound after 7 p.m. was discontinued, as experience had shown it was not patronized. The line competes with an independent bus operation at a 10-cent fare and a street car line over about 60 per cent of the route, and with a 10-cent bus line belonging to the Cincinnati Railway over about 85 per cent of the route. Despite all this the receipts are gradually increasing and it is estimated that the line will be on a paying basis within a period of twelve months.

The Twin City Rapid Transit Company, Minneapolis, Minn., furnishes without competition all the local bus transportation in Minneapolis, St. Paul and suburban territory. De luxe bus service is operated on eight lines of which the total route mileage is approximately

in Interurban Service

By J. R. Stauffer
Assistant Editor
Electric Railway Journal
97 miles. Three of these lines, with a total of 52 miles, operate into suburban districts. All serve territories having street car lines, thus giving the district preferential service but over different routes.

The fare on two of the three intercity de luxe bus lines, operating between the loops of Minneapolis and St. Paul, a distance of about 10 miles, is 25 cents for the entire distance, or any portion thereof. On the third intercity line tokens are sold at the rate of two for 25 cents, one token being accepted as fare within the limits of either Minneapolis or St. Paul, the intercity ride requiring two tokens. A passenger making the Minneapolis-St. Paul trip by street car is required to pay a fare in each city, the present fare being 10 cents cash, or a token sold at the rate of six for 45 cents.

The speed on the intercity buses between the loops

---

### Comparative Study of Twenty-Six Intercity De Luxe Bus Routes

<table>
<thead>
<tr>
<th>Company</th>
<th>Line</th>
<th>Mileage One Way</th>
<th>Equipment Used</th>
<th>Cities or Towns on Route</th>
<th>Other Transportation on Route</th>
<th>Through Fare</th>
<th>Fare on Competing Lines</th>
<th>Headways</th>
<th>Speed M.p.h.</th>
<th>Speed of Competing Lines M.p.h.</th>
<th>Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>The Connecticut Co, New Haven, Conn.</td>
<td>New Haven to Bridgeport</td>
<td>18</td>
<td>Type Y Yellow Coach</td>
<td>West Haven, Milford, Stratford</td>
<td>Intercity car circuits route</td>
<td>60c.</td>
<td>5 tokens @8c each 50c.</td>
<td>1 hour</td>
<td>17.60</td>
<td>13.22</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td>Bridgetown to East Derby</td>
<td>14.5</td>
<td>Type Z Yellow Coach</td>
<td>Stratford, Shelton, Derby</td>
<td>Bus service replaced interurban car</td>
<td>4 tokens @8c each 40c.</td>
<td>1 hour</td>
<td>19.49</td>
<td>Yes</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Meriden to Middletown</td>
<td>9</td>
<td>Type Z Yellow Coach</td>
<td></td>
<td></td>
<td></td>
<td>1 hour</td>
<td>22.22</td>
<td>Yes</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Meriden to Wallingford</td>
<td>7</td>
<td>Mack</td>
<td>Yaleville</td>
<td>Bus service replaced interurban car</td>
<td>3 tokens @8c each 30c.</td>
<td>30 min.</td>
<td>14.74</td>
<td>Yes</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Meriden to New Britain via Berlin</td>
<td>11</td>
<td>Whites</td>
<td>Berlin</td>
<td>Intercity car via Plainfield &amp; Southhampton</td>
<td>4 tokens @8c each 40c.</td>
<td>40 min.</td>
<td>16.76</td>
<td>Yes</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Hartford to New Britain</td>
<td>11.5</td>
<td>Yellow Coach</td>
<td>West Hartford</td>
<td>Intercity car</td>
<td>3 tokens @8c each 30c.</td>
<td>1 hour</td>
<td>13.92</td>
<td>Yes</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Norwich to Putnam</td>
<td>35</td>
<td>Yellow Coach</td>
<td></td>
<td>Bus service replaced interurban car</td>
<td>11 tokens @8c each 10c</td>
<td>1 hour</td>
<td>19.67</td>
<td>Yes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pennsylvania-Ohio Public Service Corp., Pennsylvania-Ohio Coach Lines, Youngstown, O.</td>
<td>Youngstown to Cleveland</td>
<td>70</td>
<td>6 cyl. White, 35 passenger</td>
<td>Girard, O. Niles, O. Warren, O. Chagrin Falls, O.</td>
<td></td>
<td>Erie R.R. Penna. R.R.</td>
<td>$2.00</td>
<td>Erie $2.39 Penna. $2.39</td>
<td>2 hours</td>
<td>24.0</td>
<td>42.0</td>
</tr>
<tr>
<td></td>
<td>Youngstown to Akron</td>
<td>50</td>
<td>Fagor, 33 passenger</td>
<td>No incorporated communities</td>
<td></td>
<td></td>
<td>Erie R.R. B. &amp; O. R.R.</td>
<td>$1.60</td>
<td>Erie $1.92 B. &amp; O. $1.92</td>
<td>2 hours</td>
<td>26.0</td>
</tr>
<tr>
<td></td>
<td>New Castle, Pa. to Youngstown</td>
<td>90</td>
<td>6 cyl. White, 35 passenger</td>
<td>Youngstown, O. Girard, O. Niles, O. Warren, O. Chagrin Falls, O.</td>
<td>Intercity car Youngstown to New Castle</td>
<td>$2.50</td>
<td>Youngstown New Castle 45c. Bus 75c.</td>
<td>4 hours</td>
<td>24.0</td>
<td>40.0</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td>Youngstown to Greenville, Pa.</td>
<td>30</td>
<td>Fagor, 26 passenger</td>
<td>Hubbard, O. Sharren, Pa.</td>
<td></td>
<td>Erie R.R.</td>
<td>$1.00</td>
<td>$1.10</td>
<td>3 hours</td>
<td>24.0</td>
<td>30.0</td>
</tr>
<tr>
<td></td>
<td>Youngstown to Warren</td>
<td>15</td>
<td>4 cyl. White, 26 passenger</td>
<td>Girard, O. Niles, O. Warren, O. Chagrin Falls, O.</td>
<td>Intercity car</td>
<td>50c.</td>
<td>Cash 40c. Tickets 30c. R.R. 50c.</td>
<td>1 hour</td>
<td>20.0</td>
<td>30.0</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td>Sharon to New Castle, Pa.</td>
<td>24</td>
<td>Fagor, 26 passenger</td>
<td>Farrell, Pa. Middlesex, Pa. New Wilmington</td>
<td></td>
<td>Penna R.R.</td>
<td>$1.00</td>
<td>.72</td>
<td>2 hours</td>
<td>24.0</td>
<td>36.0</td>
</tr>
<tr>
<td></td>
<td>Youngstown to Sharon</td>
<td>15</td>
<td>Fagor, 26 passenger</td>
<td>Hubbard, O.</td>
<td>Intercity car</td>
<td>50c.</td>
<td>40c. .31</td>
<td>1 hour</td>
<td>25.0</td>
<td>35.0</td>
<td>No</td>
</tr>
<tr>
<td>Northern Ohio Power &amp; Light Co., Cleveland-Akron Canton Bus Co., Akron, Ohio</td>
<td>4 Routes from Akron to Cleveland via (a) State Road (b) Hudson Road (c) Brecksville Road (d) Broadview Road</td>
<td>38.9</td>
<td>Twin Coaches Whites</td>
<td>Northfield, Hudson, Brecksville, W. Richfield</td>
<td>Intercity cars and railroad</td>
<td>$1.40</td>
<td>Intercity car $1.60 Railroad $1.34</td>
<td>30 min. to 1 hour alternating between 4 routes</td>
<td>Yes</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Akron to Canton</td>
<td>24.40</td>
<td>Twin Coaches</td>
<td>Unicentown Greentown N. Canton</td>
<td>None</td>
<td>70c.</td>
<td>No comp.</td>
<td>30 min. to 1 hour</td>
<td>Yes</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Canton to Wooster</td>
<td>33.90</td>
<td>Whites</td>
<td>Massillon Dalton East Union</td>
<td>None</td>
<td>$1.00</td>
<td>No comp.</td>
<td>Every 2 hours</td>
<td>Yes</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Canton to Dennison</td>
<td>40.10</td>
<td>Yellow Coaches</td>
<td>N. Industry Dover New Philadelphia</td>
<td>None</td>
<td>$1.50</td>
<td>No comp.</td>
<td>Every 2 hours</td>
<td>Yes</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Massillon to Dennison</td>
<td>37.9</td>
<td>Yellow Coaches</td>
<td>Justin Dover New Philadelphia</td>
<td>None</td>
<td>$1.35</td>
<td>No comp.</td>
<td>Every 2 hours</td>
<td>Yes</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Akron to Wadsworth</td>
<td>17.1</td>
<td>Whites</td>
<td>Copley Loyal Oak</td>
<td>Intercity car</td>
<td>35c.</td>
<td>35c.</td>
<td>5 trips daily</td>
<td>Yes</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Akron to Edinburg</td>
<td>26.5</td>
<td>Various types</td>
<td>New Kent Ravenna</td>
<td>Intercity car</td>
<td>75c.</td>
<td>Comp. only to Ravenna</td>
<td>2 trips daily</td>
<td>Yes</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Dover to New Philadelphia</td>
<td>3.0</td>
<td>Various types</td>
<td>New Philadelphia</td>
<td>None</td>
<td>15c.</td>
<td>No comp.</td>
<td>Every 13 min.</td>
<td>Yes</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Harberton to Wadsworth</td>
<td>7.36</td>
<td>Various types</td>
<td>Norton Center</td>
<td>Intercity car</td>
<td>15c.</td>
<td>14c.</td>
<td>City schedule</td>
<td>Yes</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
of Minneapolis and St. Paul ranges from 13 to 14 m.p.h. On the three suburban de luxe lines the speed ranges from 14 to 18 m.p.h. These speeds compare with 9 m.p.h. on city and feeder service, and 10 m.p.h. on street cars.

The British Columbia Rapid Transit Company, Vancouver, B. C., a subsidiary of the British Columbia Electric Railway, operates two services, de luxe motor coach and express. The lines are confined to districts in which the railway operates and terminate at the same depots, thus co-ordinating and getting the maximum use from railway and coach equipment at peak hours.

Between Vancouver and New Westminster, the railway operates over three routes, the de luxe motor coaches paralleling one of these. A one-way fare of 25 cents is charged on the coaches, and a round-trip fare of 35 cents on the rail cars. There is about five minutes difference in the running time. The interurban cars operate a twenty-minute service, and the motor coach schedule calls for a fifteen-minute headway throughout most of the day. A second de luxe bus operation parallels an interurban railway line into the Fraser Valley for a distance of about 72 miles. The motor coach fares on this route are based on the rate of 4 cents per mile, whereas the railway fares are based on 3 cents per mile, excepting at points where there is competition, when the competitive rate is met.

Eleven Fageols, two Whites, and one Federal sedan type bus, all fully equipped for de luxe service, are used on these lines. The motor coach service has proved satisfactory, and, from a financial standpoint, though the coaches take away some revenue from the railway, as a whole the earnings have increased. This is due to the fact that the motor coaches have eliminated strong competition by jitneys which gave a door-to-door service.

Intercity bus service carried on by the Connecticut Company in the state of Connecticut consists of seven lines. In the case of three of these lines, namely, Bridgeport-New Haven, Hartford-New Britain and Meriden-New Britain, the terminals are also connected by interurban car lines. The lines between Meriden and Wallingford, Norwich and Putnam, Meriden and Middletown, and Bridgeport and East Derby replaced trolley operations. In most instances where interurban cars and buses are operated, the cars cover a different or more circuitous route than the buses.

Between Bridgeport and New Haven a comparison of the two services is as follows: On the interurban cars the fare is 50 cents cash or five tokens at 814 cents apiece; the running time is one hour and 45 minutes and a headway of 30 minutes is maintained. On the bus, the through fare is 60 cents cash and no local business is done in the city where street cars are paralleled, excepting between Stratford and Bridgeport, where the minimum fare is 20 cents as compared with 814 cents
the interurban car operates on a 30-minute headway during the non-rush hour and on a 20-minute headway during the rush hour, the fare being two tokens at 8½ cents each or 20 cents cash, while on the bus, the fare is 25 cents using tokens or 30 cents cash. The running time is 55 minutes and the headway is hourly.

The Pennsylvania-Ohio Public Service Corporation and its subsidiary, the Pennsylvania-Ohio Coach Lines, began de luxe intercity bus service on Aug. 1, 1922, between Youngstown and Warren, Ohio. This original installation of bus service was made to eliminate a hack competition which was drawing patrons from the interurban car service between the two cities. On Nov. 1, 1922, a second line was inaugurated between Youngstown and Sharon, Pa. The hack competition continued to grow and additional bus lines were put in throughout the territory but by the latter part of 1923 the competition was eliminated and it was only necessary for the company to purchase two out of ten lines.

At the present time the Pennsylvania-Ohio Coach Lines operates over seven routes and operates bus terminals in Cleveland, Youngstown and Warren, Ohio. Two lines, namely, between Youngstown and Warren, and Youngstown and Sharon, Pa., are in direct competition with interurban car service. For the other lines competition consists of railroad service. On the New Castle, Pa., to Cleveland, Ohio, route, which operates by way of Youngstown, interurban car service is run between Youngstown and New Castle.

Co-ordination between the lines operated by the Pennsylvania-Ohio System and all connecting long distance lines operating throughout the state has been one of the chief factors in the success of the operation carried on by this company. After extensive preliminary work they have been successful in adjusting the schedules of their lines and connecting lines so that proper connections can be made at various points throughout the state. Likewise they have co-ordinated the sale of tickets or commutation mileage for use on other lines as well as their own. Commutation mileage books having a travel value of $10 and which are sold for $7.50 are handled by the Great Lakes Stages, Southwestern Bus Company and the Penn-Ohio Coach Lines, and are honored on practically all lines in the community. The mileage is redeemed by the company at the reduced value. Through-ticket sales for long hauls have been comparatively easy, but it has taken a great amount of effort to secure the many interline connections and joint tariffs with short routes which are now in existence. The results are indicated by the fact that one interline connection alone, involving a stub end of 15 miles, owned by an independent operator, gives and accepts from the Penn-Ohio lines as many as 1,400 passengers per month, all of whom are interline passengers. Another service rendered by this company is its direct connection between points on its line and the boats of the Detroit & Cleveland Navigation Company. Certain buses are run right to the docks of the company and through tickets will be sold for through travel by bus and boat in the near future.

Extensive merchandising of the various services by intercity buses is carried on by the company. Schedules are mailed by a group of bus operators to about 3,000 residents of the state. In addition to this approximately 1,200 schedules are mailed by the company to a group of people who previously received them and answered a letter asking about the effect of mailing such timetables and information. These 1,200 people requested...
that the schedules continue to arrive at their homes. Every hotel in the state and most of the department stores receive schedules in bulk which are placed at convenient points for the use of their patrons.

De luxe bus operation carried on by the Pacific Electric Railway, Los Angeles, Cal., consists of one line, known as the Beverly Boulevard Motor Coach Line, running between Los Angeles and Castellammare, a distance of approximately 23.8 miles. Castellammare is located on the coast, north of Santa Monica. This line serves a territory in which there is no other motor coach or street car service with the exception of a portion of the route within Los Angeles that is served by local lines of the Los Angeles Railway and Los Angeles Motor Coach Company. The line is restricted, however, in handling local traffic within the territory served by these other companies.

Twenty-nine passenger Yellow coaches equipped with individual, comfortably upholstered seats, are used on this route. Standees are not carried. Fares on the Beverly Boulevard Motor Coach Lines are on a slightly higher basis than on the other bus lines. The average one-way fare is 2.7 cents per mile, compared with the regular one-way fare basis of 2 cents per mile within a radius of 12 miles from Los Angeles, and 2¼ cents per mile outside of that zone.

The greater portion of the losses in the operation of this de luxe route is subsidized by a group of real estate operators owning extensive properties along the line. The line was established at their instance, approximately two years ago.

Through its subsidiary, the Shore Line Motor Coach Company, the Chicago, South Shore & South Bend Railroad operates a de luxe bus service between Chicago, Ill., and Benton Harbor, Mich., which is separated into two divisions, Chicago, Ill., to Michigan City, Ind., and Michigan City, Ind., to Benton Harbor, Mich. This route is 105 miles in length. The service operates through a territory just east of the Indiana-Illinois state line, which is also served with local street car operations. The equipment used on the de luxe service is of the parlor car type, whereas in the local operations the ordinary street car type of coach is used. The average speed on the de luxe route is 23½ miles per hour, whereas on the local routes the average is only 10 miles per hour.

The Eastern Massachusetts Street Railway, Boston, Mass., operates one de luxe bus line, between Taunton, Mass., and Providence, R. I., the operation in Providence being joint with the United Electric Railways Company of that city. These cities are also connected by an interurban car line. The fare on the interurban line is 60 cents one way or $1 for a round trip, while on the bus line the fare is 50 cents one way and 75 cents a round trip. The reduced rate on the buses is due to very severe jitney competition. The bus line does local business over its route, but the fare and territory served tend to make it an express operation.

The Northern Ohio Power & Light Company on twelve intercity de luxe bus routes operates 50 buses over a total of 383 miles. Between Akron and Cleveland there are four routes using four different roads. Service is also supplied between Cleveland and Akron by interurban cars operated by this company. Two other de luxe bus lines, namely, between Akron and Wadsworth, and Akron and Edinburg, have interurban car competition. On the remainder of the routes there is neither car nor bus competition. An accompanying map shows the territory served by the Northern Ohio Power & Light Company and the table gives the details of these lines.

The Pacific Northwest Traction Company and the North Coast Transportation Company operate in a main trunk line from Portland, Ore., through Washington, to Vancouver, B. C. The latter company also operates several small branch lines. Although a very high type of equipment is used and a de luxe service rendered, this line is classed as express, rather than de luxe. No standees are permitted on any of the lines unless in a case of emergency. The schedule speed, including stopovers, is approximately 28 m.p.h. No regular stopping places are scheduled, but the buses stop on signal from intending passengers. The coaches do not average more than one stop every 3 or 4 miles.

Parlor bus route from Los Angeles helps build up shore resort at Castellammare
A night parade of the new cars over the Allegheny route climaxed an efficient publicity program.

Complete Car Replacement on Allegheny Valley Route

Twelve new cars have been placed in regular service following a three-day ceremony, including parade, public inspection and free riding.

MODERNIZATION in practically every phase of operation was completed on the Allegheny Valley division of the West Penn Railways with the installation of twelve new cars on Feb. 14. An intensive and effective publicity campaign directed by the company and ably supported by the newspapers of the district laid the foundation for a three-day ceremony which included a parade of the new cars, public inspection of the cars in each town on the line and two hours of free riding.

This division, operated as the Allegheny Valley Street Railway, serves an industrial district lying on the west of the Allegheny River between Aspinwall and Natrona, Pa., with an extension across the river to New Kensington, Pa. The route is approximately
20 miles long and is operated as two lines, one from Aspinwall to New Kensington and the other between New Kensington and Natrona. The fact that there are twelve towns on the route and twelve cars were needed to replace the old equipment led the company in their plan for the installation celebrations.

In order to bring forcefully before the residents of each town the completeness of the modernization program, each new car was named for one of the towns, with the name printed on the car above the number. One car was called "Miss New Kensington," one "Miss Aspinwall," etc. Representatives of the company went before the borough councils of the towns and laid before them the general plan for the installation ceremonies and asked their co-operation for its success. Each council was asked to select a young lady from the town to act as sponsor for the christening of the car bearing that town's name, the christening to take place during the parade to be held on the evening of Feb. 14. The selection of these sponsors in itself was one of the most effective bits of advertising that could have been done. In some cases the burgesses appointed the sponsor; in one town a contest was held and the sponsor chosen from among a number of contestants. Special street railway editions of two newspapers were printed and distributed throughout the whole section announcing the names of the sponsors and giving the details for the three-day celebration attending the inauguration of the new service.

As a result of this preliminary advertising the parade of the new cars was a pronounced success. At 7:30 on Friday evening, each car was spotted at a location within the town for which it was named in charge of a host, an official of the company, who received the guests that had been invited to make the first trip. The parade began in Natrona where two cars were spotted, the first carrying the West Penn Band. The second car, "Miss Natrona," was christened in the presence of approximately 500 residents of the town and the procession moved south along the route. As the leading car came to the location where another car was waiting, christening ceremonies were held and the new car fell in line and moved on with the rest. This procedure was carried out the whole way down the line until all cars were together in the Aspinwall loop.

During the ride, the guests, consisting of the town Councilmen and their families together with prominent citizens in each town, were entertained by the host who answered any questions about the new service. He gave them each a little booklet entitled "These Cars Are Yours," which explained some of the details of the new cars and told of the desire on the part of the West Penn Railways to give a modern service throughout their territory. Cigars and cigarettes were supplied to the gentlemen, while the ladies received candy and other favors. That the publicity had been effective was thoroughly demonstrated over the whole line of march. In every town the streets were lined with people and at the points where the cars were located, crowds gathered to watch the christenings. When the parade reached the southern end of the line, the formation was broken and each car proceeded back over the line alone, discharging passengers at points convenient to them. Because the regular service on the line was somewhat disrupted due to the parade, the intending passengers waiting along the line were picked up on the new cars and without charge were taken to their destination. On the next day, the cars were placed
at central locations in each town where they were open for inspection by the public. A representative of the company was in charge of each car during this time to answer any questions about the equipment or the new service. He also explained the safety devices and their adaptability to one-man operation, an innovation with the new cars. In every case the townspeople turned out in full force to inspect the new cars. On the following day, Sunday, between 2 and 4 p.m. the public was invited to ride free. Anyone boarding the cars between those two hours could make a trip at the company’s expense and become familiar with the features of comfort and speed of the new cars.

The new cars were built by the Cincinnati Car Corporation, and were assembled at the West Penn shops in Connellsville, Pa. They are much lighter, faster and more comfortable than the old equipment. The length over all is 47 ft. 3 in.; width, 8 ft. 6\frac{1}{2} in.; height, 10 ft. 3 in.; truck wheelbase, 5 ft. 4 in.; and the weight is approximately 31,000 lb. The truck is known as the Cincinnati Car Corporation’s Type 101, the fundamental features of design being cantilever elliptic springs and wing type journal boxes. These have two coil springs per box, the box being movable vertically on rectangular slides which are held between the continuous tiebar underneath the boxes and the truck side frame by means of a through-bolt passing through the side frame, the rectangular slide and the bottom tiebar. Support of the motor by means of brackets attached to the truck side frame and a tube running across the truck from bracket to bracket is one of the features. Other specifications follow:

- **Air brakes.** Westinghouse
- **Car signal system.** Faraday
- **Current transformers.** National Lock Works Company
- **Curtain material.** Fantazoo No. 65 M
- **Door mechanism.** National Refrigerator Company
- **Doors.** Folding
- **Floor covering.** 5 in. baize and inlaid linoleum
- **Glass.** Plate
- **Hand brakes.** Straight staff
- **Foot insulating mat.** 1-in. compressed cork
- **Headlights.** Single coil panel type, Consolidated Car Heating Company
- **Headlight.** Ohio Brass. S.S. stationary type
- **Headlight plate.** 14 in. Aggregate
- **Journal bearing.** West Plate 3x7-in.
- **Journal boxes.** 10x7-in. pedestal type
- **Motor.** Westinghouse 4,000-hp. 142-in.
- **Registers.** Ohmer
- **Rear.** Open
- **Roof material.** No. 8 canvas
- **Seats.** Reclining type, cross cushion, 37½ in.
- **Seating material.** Brown Spanish leather
- **Seating material.** Stationary
- **Trolley.** Retriever, Standard No. 4
- **Trucks.** Westinghouse
- **Truck.** Cincinnati Type 101
- **Ventilator.** Westinghouse
- **Wheels.** Rolled steel 22-in. diameter.

### Accident Causes Analyzed at Cleveland

**INSTRUCTIVE information concerning the cause of accidents on the Cleveland Railway has been developed by an investigation made by the company in collaboration with the Metropolitan Life Insurance Company. The data are based on an intensive study extending over a period of months and embracing the records of 167 motormen at the Woodhill station.** To determine which operators were particularly prone to accident, the 1928 record of each motorman at the station was carefully studied. Accidents from all causes were included in determining an individual record so that all contributing factors might be given consideration.

It developed that there was a definite relationship between accident frequency and the length of service of the motormen, the veteran men in general having fewer accidents than the new men. It was shown that the motormen with unsatisfactory accident records were also inclined to use an excessive amount of power when operating their cars. No relationship was found to exist between accident frequency and delinquencies in reporting for work, tardiness, absence, etc.

Physical difficulties, such as defective vision, organic diseases, high blood pressure, etc., were found to be primarily responsible for about 12 per cent of the accidents. In 22 per cent of the cases an improper attitude of mind, or a personality unsuited to the work, was found to be a primary factor. The remaining 66 per cent were attributable to shortcomings such as failure to recognize potential hazards, inattention to work, etc.

### “Dark Period” Before Sunrise Creates Accident Hazard

**EXISTENCE of an accident hazard not generally recognized is indicated by investigations made recently by the Capital Traction Company, Washington, D.C., under the direction of H. V. Schreiber, safety engineer. These investigations were directed toward ascertaining conditions which exist during the “dark period” after the street lights have been extinguished and before sunrise. Because the company has a considerable number of vehicles in operation on the streets during the early morning hours, this study is of particular interest to the railway, but it was extended to include also the general collision hazard.**

In Washington, as in most cities, the street lights are operated on the 4,000-hour schedule. This is roughly equivalent to lighting the lamps one half-hour after sunset and extinguishing them one half-hour before sunrise. An interesting exception to the usual practice in this regard is found in St. Louis where astronomical clock control is used to turn on the lights automatically at sunset and turn them off at sunrise.

Data furnished by the Weather Bureau in Washington show that a large proportion of days are cloudy, foggy, or rainy at sunrise. During the three years from Oct. 25, 1926, to Oct. 24, 1929, there were on the average 5.1 days per month when the weather was rainy, 12.9 days when the weather was cloudy, and 12.7 days when the visibility was poor for one reason or another. Monthly averages are given in the following table:

<table>
<thead>
<tr>
<th>Month</th>
<th>Rainy Days</th>
<th>Cloudy Days</th>
<th>Visibility Days</th>
</tr>
</thead>
<tbody>
<tr>
<td>January</td>
<td>9.0</td>
<td>15.4</td>
<td>2.0</td>
</tr>
<tr>
<td>February</td>
<td>8.0</td>
<td>10.0</td>
<td>6.3</td>
</tr>
<tr>
<td>March</td>
<td>7.0</td>
<td>12.7</td>
<td>11.0</td>
</tr>
<tr>
<td>April</td>
<td>3.7</td>
<td>12.6</td>
<td>8.1</td>
</tr>
<tr>
<td>May</td>
<td>4.7</td>
<td>16.3</td>
<td>11.4</td>
</tr>
<tr>
<td>June</td>
<td>3.0</td>
<td>14.3</td>
<td>5.9</td>
</tr>
<tr>
<td>July</td>
<td>2.9</td>
<td>16.3</td>
<td>6.6</td>
</tr>
<tr>
<td>August</td>
<td>3.7</td>
<td>21.3</td>
<td>9.8</td>
</tr>
<tr>
<td>September</td>
<td>3.7</td>
<td>15.0</td>
<td>12.2</td>
</tr>
<tr>
<td>October</td>
<td>6.3</td>
<td>10.4</td>
<td>16.3</td>
</tr>
<tr>
<td>November</td>
<td>6.8</td>
<td>16.0</td>
<td>16.8</td>
</tr>
<tr>
<td>December</td>
<td>6.3</td>
<td>13.7</td>
<td>18.6</td>
</tr>
</tbody>
</table>

These figures were further classified by the Weather Bureau to show the approximate distance at which objects could be distinguished on foggy mornings.
As to the actual occurrence of accidents during this period of the day, complete data are not available. The company's records, however, show some twenty collisions which occurred during the dark period in a year's time. Also the company had one negro track greaser killed by an automobile while he was at work. Records of the Traffic Bureau covering a period from January, 1926, to September, 1929, show 167 accidents during these hours.

---

**LETTER TO THE EDITOR**

**Statistics on Pittsburgh Railways Securities Amplified**

**INFORMATION** on the Pittsburgh bonds published in the Annual Statistical Number was based on compilations by well-known financial authorities, supplemented by statements sent directly to the editors. The omissions of disposition of the Pittsburgh securities in Table III was made because correct information was not obtainable up to the time of going to press. The statement of defaults of interest is similar to that published in the Annual Statistical Number of the Journal for Jan. 12, 1929, and the same bonds are included in the earlier list. Where the maturity date is given in the table of bonds in default it is assumed that both principal and interest remain unpaid. In the present instance the interest is being met, although bonds are in default of principal.

The Journal is glad to have this information and to publish it as an addition and correction to that given in the article referred to.—Editors.

Pittsburgh Railways Company

PITTSBURGH, PA., JAN. 31, 1930.

To the Editor:

Our attention has been called to an article on page 44 of Electric Railway Journal for January, in which we find a number of incomplete statements with respect to matured bonds on the properties operated by the Pittsburgh Railways Company:

**Table III—Disposition of Electric Railway Maturities in 1929**

The $200,000 of Pittsburgh Railway equipment trust, due Feb. 1, 1929, were retired.

The Central Traction Company firsts, due July 1, 1929, in the amount of $325,500 have not been extended. The principal is in default, but interest is being paid each six months at the rate of 5 per cent per annum.

The Wilkinsburg & East Pittsburgh Street Railway firsts, due Sept. 1, 1929, in the amount of $1,989,000 were refunded by an issue of Monongahela Street Railway first refunding mortgage 5 per cent bonds, due Dec. 1, 1958.

**Table VIII—Outstanding Electric Railway Bonds in Default of Interest**

Included in this table are the following issues of matured bonds of the Pittsburgh Railway system which are in default with respect to the payment of principal, but upon which interest has been and is being paid in full, semi-annually:

There is also included in this table $993,000 principal amount of Monongahela Street Railway 5's which mature June 1, 1898, and were refunded by a similar amount of first refunding mortgage 5 per cent bonds of that company, due Dec. 1, 1958; also, $1,898,000 principal amount of Wilkinsburg & East Pittsburgh Street Railway 5's, due Sept. 1, 1929, which were refunded by the issue of a similar amount of Monongahela Street Railway first refunding mortgage 5 per cent bonds, due Dec. 1, 1958.

The $1,500,000 principal amount of Pittsburgh & Birmingham Traction 5's due Nov. 1, 1929, were extended, at the same rate of interest, to Nov. 1, 1930.

As the interest on all outstanding matured and unmatured bonds of the Pittsburgh Railway System has been and is being paid, when due, we would thank you to publish in the next issue of the Electric Railway Journal, a statement correcting the erroneous statements published in the January issue with respect to the bond issues indicated above.

C. S. Mitchell

Controller.
ENGINEERS of the New Orleans Public Service are of the opinion that the design of paved track is susceptible of rational analysis and that a paved track to be economically satisfactory must combine the materials of construction in the most scientific manner. With this thought in mind the matter was approached as an original problem in engineering design and a design was developed differing radically from ordinary practice. The track structure consists primarily of a reinforced concrete foundation to which the rails are anchored in parallel surface and alignment by means of resilient rail anchorages.

Due to the commercial considerations involved in the manufacture of steel rails, the existing A.E.R.E.A. standard 7-in. girder rail was chosen for use and the track structure developed around this rail. Analysis determined the requirements of the rail anchorage, and since a unit was not available on the market, a new design was developed. The resilient rail anchorage utilized in this construction was subjected to detail development tests and its dimensions and properties proportioned to meet service conditions.

The foundation is shaped so as to form a continuous girder beneath each rail. The reinforcement consists of 1/8-in. straight and deformed bars placed both longitudinally and transversely at points where they will efficiently resist the stresses set up in the foundation. Just beneath and parallel to each rail are two continuous longitudinal angles embedded in the concrete to which are fastened the rail anchorage units. These angles are held in parallel alignment by deformed straps welded to the angles at the points of contact. These same deformed straps support and carry the entire system of bar reinforcement.

The resilient rail anchorage consists of two oval-shaped thin steel plates cramped on the outer edges over a round steel ring and welded at the periphery to form a closed container. This weld fuses the edges of the plates together and the whole is fused to the steel ring, forming a very stable marginal periphery within the diaphragm. An oval-shaped bearing plate is welded to both the top and bottom diaphragm plates. These bearing plates are substantially smaller than the diaphragm plates and concentric therewith. The rail is held in place by rail clips, the anchorage bolts passing through the diaphragm and bearing against the embedded angles in the foundation. The inside of the diaphragm contains an asphalt-asbestos mixture forced into place under pressure and while hot.

The load from the rail is transmitted through the upper bearing plate to the top of the diaphragm. As the diaphragm plate flexes inward a compression is built up in the confined asphalt-asbestos cushion and this pressure is reacted to by the bottom bearing plate of the diaphragm which in turn transmits the load to the foundation. When the load is relieved the residual compression in the cushion acting in conjunction with the resilient diaphragm plates returns the upper bearing plate to its normal position. The asphalt-asbestos cushion serves a dual purpose in that it affords stability to the diaphragm and aids in dissipating the vibration absorbed from the rail.

The resilient rail anchorages are spaced on 4-ft. centers and staggered with respect to parallel rails, this latter feature minimizing the foundation stresses. The steel bar reinforcement in the foundation is so distribu-
Design adopted after prolonged experimentation has little resemblance to usual types. Reinforced concrete foundation acts as unit to hold rails in position. First cost is $75,000 per mile. Maintenance cost is estimated at less than $100 per mile per year.

Without TIES
Built at New Orleans

The reinforced concrete foundation is used as a unit to hold the rails in parallel surface and alignment and in this capacity displaces the conventional crosstie used in track construction. Rails are maintained independent of the pavement by being coated with approximately 1/4 in. of plastic asphaltic mixture. This material maintains its normal plastic condition under the maximum and minimum temperatures that are met. This coating functions as a vibration insulator and prevents water from entering between the pavement and the rail. An Elastite strip 1/2 in. in thickness is placed under the base of the rail and held in place by special wire clamps. Thus the foundation and pavement concrete is not allowed to come into bonding contact with the rail and sufficient leeway is provided for the resilient action of the rails.

Basic advantages of this type of track construction are believed to be:

1. Proper recognition of the dynamic action produced in the rail by the progressive movement of a rolling wheel load.

A moving wheel load is essentially a moving impact load. The entire wheel load is concentrated on a narrow line area on the surface of the rail. If the rail cannot give slightly and ease the shock of the suddenly applied load the intense local stress developed in the surface structure of the rail approaches and sometimes exceeds the bearing strength of the steel. As a consequence the rail wears away rapidly, due not so much to abrasion as to the peening action of rolling.

If, however, the rail can give or deflect slightly with a resilient reaction, the impact stress is distributed over the cross-sectional area of the rail body with a lessened intensity of local stress. Commercial steel rails are of a beam section which gives them stiffness and a resilient capacity when acting as a beam. Due to the stiffness of the rail the deflection wave tendency extends a considerable distance on either side of the wheel loads. In order to permit elastic reaction in the rail, sufficient resiliency is provided in the rail anchor.
The rail is coated with about 1/4 in. of plastic asphalt material applied with a paddle as shown.

ages to allow the deflection wave to spread out and proceed uniformly.

The effect of resilient rail action within controlled limits on rail life is of course problematical. Experience in New Orleans with approximately 100 miles of ballasted track without pavement, which is flexible rather than resilient, indicates that rail failure will result from fatigue rather than from abrasive and rolling wear. It seems logical to conclude that rail life under a given tonnage movement will be very materially increased over that obtained in the past with rigid rail construction.

2. Rail anchorage has durable resilient properties and allows resilient movement without mechanical wear.

The resiliency of the rail anchorage is dependent upon the flexing action of the diaphragm plates. The diaphragm is designed so that a load of 10,000 lb. causes it to deflect 0.025 in. Thus the banding stresses set up in the plates are very small and the plates should have a long fatigue life. The asphalt-asbestos cushion is inert and confined so that it cannot be dissipated. Properly protected from corrosion and electrolysis the life expectancy of the anchorage is certainly commensurate with the rest of the structure.

Firm anchorage to the foundation in conjunction with resiliency in the rail support is provided by extending the anchorage bolts through the reinforcing angles in the foundation. Repeated impact tests over a long period of time show that vibrations set up in the rail are absorbed by the diaphragm and this destructive action is eliminated before it reaches the pavement.

It has been thoroughly demonstrated in industrial practice that surfaces in variable pressure contact with bolts are most effectively held tight when a resilient element is incorporated at the plane of surface contact. This element of design is provided in the diaphragm. It is important to note also that movement in the rail anchorage occurs without attendant mechanical wear, a factor which assures uniform action throughout its life. Attention is also called to the action of the diaphragm which permits a lateral or tipping action of the rail. This allows the rail and wheel to make full contact under variable conditions of wear and improves the adhesion characteristics between the wheel and the rail.

3. Rail action is maintained independent of and not constrained by the surrounding pavement with a watertight seal between the rail and the pavement.

With a uniformly controlled rail movement it becomes possible to separate the rail and the pavement with an assurance of maintaining water-tight construction. The sealing material between the rail and the pavement breaks the line of vibration and materially reduces the operating noises. The asphalt is impervious to water and is protected from atmospheric reactions which might cause it to deteriorate.

4. Design provides for unlike strength and elastic properties of rails and concrete foundation in resisting the effect of expansion and contraction due to temperature change.

Under the influence of temperature change the rail acts independently of the foundation. Expansion builds up a compressive stress in the rail. The rail fastenings hold the rail to alignment and prevent buckling, and the compressive stress is absorbed in the rail. Contraction builds up a tension in the rail which requires no assistance from the fastenings in holding the rail to alignment. Expansion and contraction of the reinforced concrete foundation occur independently of the rails in accordance with the elastic properties of the unit. Steel and concrete have the same coefficient of expansion, but due to their unlike strength and elastic properties they cannot act together under the influence of temperature change. Steel rails have sufficient strength to resist the range of temperatures encountered in service. Concrete does not have sufficient strength to resist the range of temperatures encountered, the failure being due to contraction with attendant cracking. Sufficient steel bar reinforcement to prevent and control visible cracking has been utilized in this design to provide for flexural load stresses acting in conjunction with temperature stresses.

5. The foundation and base pavement are made integral and the reinforced unit precludes the use of a conventional crosstie member.

Integral construction of the foundation and pavement concrete into a monolithic mass provides maximum strength with a minimum of material. The introduction of steel bar reinforcement controls and stabilizes the concrete which is in accordance with the fundamental requirements of a
properly designed concrete structure. Sufficient time has not elapsed in the industrial world to prove the life expectancy of reinforced concrete but it can logically be expected to have a life far greater than concrete without reinforcement.

As long as the concrete maintains its homogeneous stability the rails will be held in parallel surface and alignment. The conventional crosstie, when embedded in concrete, functions only as an anchorage for holding the rails. In this design the steel which would commonly be utilized as a direct member between the rails has been incorporated as bar reinforcement in the concrete foundation and the crosstie eliminated.

Tie rods are used at sufficient intervals between the rails to hold them in a parallel position and to facilitate proper alignment during construction. They are covered with asphaltic material to prevent their bonding to the concrete, which in turn prevents their interfering with the resilient action of the rail.

6. Marginal stability of the pavement alongside the rails permits the use of an asphalt surface pavement.

The granite paving block laid parallel to the rail and embedded in the green concrete provides lateral stability for the edges of the asphalt pavement. An asphalt pavement protected in this manner can develop its full life without destruction. The surface pavement is renewable without disturbance to the rest of the structure. The cushioning of the traffic wheel load inherently gained with asphalt pavement adds materially to the life expectancy of the concrete foundation.

7. Design provides for renewal of rail with minimum disturbance of surface pavement and no disturbance at all to the foundation.

The rail may be removed by breaking out the granite block and sufficient concrete between the block and the rail to allow access to the clip fastenings. On the assumption that the resilient rail will fail ultimately, its replacement can be made without disturbing the foundation.

8. First cost of this type of construction is high; but this is offset by the reduced cost of maintenance and the longer life.

It is obvious that this design is not a cheap construction. Comparison with rigidly constructed track utilizing steel crossties shows that the differential cost factor between the two is based upon rail anchorage cost. Manufacture of the resilient rail anchorage on a production basis has potential possibilities of balancing the cost of steel in the two units of construction. The track constructed on the project as outlined in this article cost $75,000 per mile.

Analysis of the maintenance requirements of this design indicates that there should be practically no maintenance at all. In fact, an underlying motive in the development of the design was to construct a track that would require no major maintenance. If the structure holds up as it should and as has been proved by concentrated tests, track maintenance will be confined to welding and grinding at the joints and to repairs of the asphalt pavement occasioned by vehicular traffic.

New design of track being tried in New Orleans differs from customary practice in that no ties are used

Application of double anchorage unit under silico-manganese frog. Clips are adjusted to fit the base of the casting and then welded to base plate and to frog casting

While it is desirable from the investment point of view to keep the first cost as low as possible, this should not be done at the expense of subsequent maintenance and depreciation. Longer life with reduced maintenance justifies a higher first cost. Our analysis indicates an average maintenance cost not exceeding $100 per mile per year throughout its full life, and a depreciation rate of not greater than 3 per cent to cover renewals and replacements.

This design of track has been used in the reconstruction of Canal Street at New Orleans in which four parallel tracks occupy the center of the street in a raised neutral strip 56 ft. wide. This strip is paralleled by 35-ft. roadways on either side. The construction involves approximately 4 miles of tangent track interlaced with 32 special work layouts. Three-fourths of the special work layouts and over one-half of the tangent tracks were constructed under car operation.

Single Life vs. Renewable Track

Opinions of prominent way engineers on this interesting subject will be presented in the April issue.
Monthly and Other Financial Reports
Gains in Gross and Net Income Seen in January

on Numerous Properties Over Last Year

9,582,008
9,736,269

Jan., 1930
Jan., 1929

l2mo. end.
l2mo. end.

Income

Net
Income

$

$

Gross

Operating Operating
Revenue Expenaes
t
$
Market Street Ballway, San Francisco, Cal.
674,048o
781,528
January, 1930
688,090a
789,713
January, 1929

Taxes
t

107,480
101,623
1,552,956
1,413,405

8,029,052o
8,323,864o

Capital Traction Co. Washington, D. C.
259,420
377,088
December, 1929
375,666
260,989
December: 1928

iaekgonTille Traction Co., JacksonzUle, Fla.
8,075
101,349
76,474
December, 1929
5,775
84,260
104,290
December, 1928
108,890
928,589
1,141,139
12mo.end.Dec., 1929
971,149
106,774
1,199,516
12mo. end. Dec., 1928

99,168
89,835

67,240
57,339

13,601
60,

W

United Railways & Electric Co., Baltimore, Md.
December,
December.
12mo. end.
12mo. end.

1929
1928

Dec, 1929
Dec., 1928

972,529
1,470,831
968,459
1,431,039
16,717,099 11,335,024
16,273,806 10,873,921

152,554
129,156
1,635,733
1,578,782

362,263
350,009
3,921,934
3,971,926

January, 1930
January, 1929

1,087,684
1,060,890

80,723
65,879
534.856
558,393

December, 1929
December, 1928

12mo.end.Dec,
12mo.end.Dec,

1929
1928

100,801
145,689

978,710
926,655

286,824
225,043

Boston, Revere Beach & Lynn K.R., Boston, Mass.
253,617
3,692
285,865
3 mo. end. Dec., 1929
281,658
265,439
9,146
3mo. end. Dec, 1928
33,769
12mo. end. Dec, 1929 1,271,014 1,002,418
43,896
12mo. end. Dec, 1928 1,222,093 1,068,548

29,446
6,936
237,681
112,591

5,S7l
90,520
61,894

282,360
286,830

80,691

December, 1929
December, 1928

3,105,111
3,153,656

2,030,450
2,085,649

7,281

Eastern Massachusetts Street Railway, Boston, Mass.
758,812
796,402

January, 1930
January, 1929

37,755
35,716

448,284
491,090

Springfield Street Railway, Springfield, Mags.
3 mo. end. Dec, 1929
3 mo. end. Dec, 1 928
12 mo. end. Dec, 1929
12 mo. end. Dec, 1928

135,922
173,971

82,456

499,387
567,019

64,226
101,187
209,046
282,102

158,996
3mo. end. Dec, 1929
188,205
3mo. end. Dec, 1928
639,015
12 mo. end. Dec, 1929
620,314
12mo. end. Dec, 1928

49,244
65,924
184,050
150,036

Department of Street Railways, Detroit, Mich.
January, 1930
January, 1929
12 mo. end. Jan.,

12mo. end.

Jan.,

1,810,502
2,165,113
2,400,419
1,961,002
1930 26,209,568 20,907,042
1929 24,969,027 19,576,192

65,090
62,545
753,494
778,592

Duluth-Superlor Traction Co., Duluth, Minn.
140,770
12mo. end. Dec, 1929 1,780,428 1,476,499
153,562
12mo. end. Dec, 1928 1,873,330 1,535,170

297,796
149,123
398,509
270,456
4,654,066 2,981,856
4,861,680 2,978,992

181,739
218,394

12,756
49,222

41,675
501,786

103,918
116,348
1,624,612

28,072
41,741
698,223

29,262
22,495
264,072
305,320

193,670
145,491/
S7,2M
97,i2ef
1,884,156 1,384,966/
1,310,648
868,179/

Kansas City Public Service Co., Kansas City, Mo.
December, 1929
January, 1930

12mo. end. Dec, 1929
Illinois

Terminal

771,361
761,935
8,951,616

Co., St. Louis,

December, 1929
December, 1928
12 mo. end. Dec, 1929
12 mo. end. Dec, 1928

586,313
573,945
7,163,425
6,717,136

624,081
603,911
6,825,216

43,361

Mo.
363,381
588,692
5,015,064
5,101,080

Lincoln Traction Co., Lincoln, Neb.
475,318
415,788a
12mo. end. Dec, 1929
480,033
389.714a
12 mo. end. Dec, 1928

60,614
91,889

12,419
31,066

Gloversvllle R.R., Gloversville, N. T.
45,823
95,637
65,196
»,.?»4e
37,855
67,772
89,769
6,U6e
760,871
70,775
317,053
12mo. end. Dec, 1929 1,025,933
75,963
312,545
749,352
12mo. end. Dec, 1928 1,036,155

4,610
64,077
70,giO

Fonda, Johnstown

&

December, 1929
December, 1928

13,795

Brooklyn-Manhattan Transit Corporation, New York, N. Y.
5,134,097 3,383,385
January, 1930d
3,977,564 2,595,745
.January, 1929
7 mo. end. Jan., 1930i 35,544,051 23,805,477

Brooklyn

&

Queens Transit Corporation, New York, N. Y.

January, 1930
January, 1929
7
7

715,528
353,454 1,492,346
288,281
1,149,078
439,808
2,253,662 10,001,305 4,566,659
1,941,116 8,412,423 3,545,950

mo. end. Jan.,
mo. end. Jan.,

1,971,577
1,550,153
1,962,740
1,687,814
1930 13,907,132 10,969,673
1929 14,071,065 11,729,520

Firth Avenue Coach Co., New York, N. Y.
September, 1929
556,691
450,950o
559,065
474,352a
September, 1928
3mo. end Sept., 1929 1,674,774 1,414,154a
1,735,911
l,466,949o
3 mo. end. Sept., 1928

117,113
104,381

800,103
748,730

325,940
191,390
191,155
63,791
2,287,688 1,403,534
842,757
1,743,678

132,539
105,103
332,555
326,723

131,926
102,838
330,718
319,254

Y.

552,21 lo

545,945a

3,110,384 2,410,946
3,128,417 2,407,285
41,326,194 27,734,679
40,532,572 28,434,357

New York, Westchester & Boston Ry., New York, N.
12mo.end.Dec,
12mo.end.Dec,

1929
1928

216,830
204,911
2,530,488
2,390,398

142,343
153,697
1,570,218
1,622,858

Y.

26,437
19,947
275,817
239,672

Stiten blind Rtpld Transit C3., New York, N. Y.
December, 1929
196,274
90,670
18,448
December, 1928
242,433
164,611
17,166
12mo.end. Dec, 1929 2,637,897 1,892,347
210,265
12mo.end.Dec, 1928 3,127,661 2,103,175
225,874

Third Avenue Railway,

Boston Elevated Ballway, Boston, Mass.

Taxes

t

Long Island Railroad, New York, N. Y.

December, 1929
December, 1928

16,393

97,533
115,154

i

Hudson & Manhattan B.R., New York, N.

51,347
41,944
846,916
673,789

,

23,894
30,038

Operating Operating
Revenue Expenses

January, 1930
January, 1929

New York, N. Y.
982,045
6,894,688
7,005,433

90,508
86,647
624,850
642,216

Schenectady Railway, Schenectady, N. Y.
3mo.end.Dec, 1929
417,999
376,179
1928
429,636
357,955
3 mo. end. Dec,

22,307
23,330

7
7

mo. end. Jan.,
mo. end. Jan.,

1930
1929

1,254,726
1,259,493
8,926,444
9,050,681

1,006,301


Prizes Awarded for
First Period of New Maintenance Contest

Atlanta and Cleveland Railway men are winners in way and structures, rolling stock and shops, and bus departments. No award made in the electrical and line department.

During the first quarter of the Electric Railway Journal Maintenance Contest started in November, 1929, a total of 23 maintenance items were submitted. Many properties not having participated in previous contests contributed valuable ideas. All items submitted were carefully considered by the committee of judges consisting of C. A. Smith, superintendent of roadway Georgia Power Company, chairman; G. C. Hecker, general secretary American Electric Railway Association; Dwight L. Smith, electrical engineer Chicago Rapid Transit Company; T. H. Nicholl, research department Cleveland Railway; and John A. Miller, Jr., managing editor of the Journal.

In the department of rolling stock and shops, the prize was awarded to the article "Hood Rims and Carlin's Reshaped by Machine," submitted by James Davidson, assistant foreman in the mechanical department of the Cleveland Railway. This machine is unusual in its design and greatly facilitates the forming of hood rims and carlin's as described elsewhere in this issue. The prize in the department of way and structures was won by W. H. Hayes, supervisor of welders and grinders of the Georgia Power Company, for his article "Welding and Cutting Equipment Combined." The item tells in detail how an oxyacetylene cutting apparatus and a complete welding outfit were installed on one truck. This arrangement has proved to be of great benefit to the maintenance of way repair men, who are now enabled to do the cutting and welding of rails more quickly.

In the department of buses and garages, the article "Double Air Chuck Inflates Dual Tires Properly" was awarded the prize. This article was submitted by Richard Grant, formerly foreman of the Berea Garage of the Cleveland Railway. A unique method of inflating dual tires devised by the Cleveland Railways is described in this item, which appears elsewhere in this issue. In the electrical and line department only one item was received and for this reason the judges decided to make no award but to consider this article in the second period of the contest.

James Davidson

James Davidson was born in 1886, and started to work for the company during September, 1907, as a carpenter in the department of equipment and building. With the exception of one year, when the Cleveland Railway was operated by the Municipal Traction Company, Mr. Davidson has been in the employ of the same company since 1907. He advanced to the position of assistant foreman of the erecting department in 1913, which position he is holding at the present time. Mr. Davidson has always been much interested in the simplification of methods in the shops of his department, and many improvements have resulted from ideas which have been originated by him during his connection with the Cleveland Railways.

Richard Grant

In the department of buses and garages the prize winning item was submitted by Richard Grant, foreman of the Berea Garage, Cleveland Railway, and was entitled "Double Air Chuck Inflates Dual Tires Evenly." Mr. Grant died on Feb. 11, 1930, as the result of injuries received in an automobile accident. He was 39 years old and had been in the employ of the Cleveland Railway since August, 1926. He was greatly liked by his fellow workers and his death will be felt very keenly by all those who were in close contact with him in the daily performance of their duties.

W. H. Hayes

W. H. Hayes was employed by the Georgia Power Company as a welder, and after two years was promoted to the position of supervisor of welders and grinders, which he is holding at the present date.
Double Air Chuck Inflates Dual Tires Evenly*  
BY RICHARD GRANT  
Foreman Berea Garage Cleveland Railway  

DEVELOPMENT of a double air chuck has greatly facilitated inflation of rear wheel dual tires to the proper pressure on buses of the Cleveland Railway. The single fitting was found unsatisfactory, since it was difficult if not impossible to inflate the inside and outside tires properly with several sizes in use. Correct inflation is of importance if maximum mileage and minimum road failures are to be attained.

The double air chuck illustrated enables the operator to reach without difficulty the valve stems, regardless of type or angle. Its use has brought about a far better condition of the tires on rear wheels, and has reduced the time for inflation materially, resulting in a saving of labor.

Electric Governor for Buses  

HOOKED in the control circuit of the generator which supplies energy to the motors driving the bus, an automatic electric governor built by the General Electric Company according to specifications of the International Bus Company, Buffalo, N. Y., prevents high generator voltage. Excessive speed of the bus is thus avoided, as is also flashover on the motor commutator. The device consists of a solenoid-actuated lever which operates a butterfly valve on the carburetor. All gas-electric buses operated by the International Bus Company have been equipped with this new device.

Emergency Dolly for Broken Axles*  
BY E. J. JONAS  
Superintendent of Equipment Cincinnati Street Railway  

TRAFFIC delays due to broken axles are reduced to a minimum by means of a dolly designed in the shops of the Cincinnati Street Railway. The device can be harnessed to a broken truck by the repair crew to bring the car in to the shops. The device used has a weight of 445 lb. The center portion of the dolly axle is of 3-in. steel tubing shrunk on to 2-in. solid ends. The wheels are free to revolve on the axle, and each has an annular groove in a bronze bushing which is filled with lubricant by means of a pressure gun. Two sets of truck frame supporting blocks accommodate the two types of trucks used by the company.

On a paved street two men can install the emergency dolly with ease in a short time. To accomplish this the truck is jacked up and wheels rolled into place. This being done, the end members are then coupled and the car is ready to move. A 2-mile run at normal operating speed over curves and special work has been made with this device without trouble of any kind.

*Submitted in Electric Railway Journal Prize Contest.
Safety Holder for Dipping Armatures*

By W. A. Traw
Armature Room Foreman Dallas Railway & Terminal Company

With a new safety yoke of 1\times2\text{-in.} iron bar designed and used in the shops of the Dallas Railway & Terminal Company an armature prepared for dipping and baking is supported from the bottom and is locked in such a position that it is almost impossible for it to slip out of the holder before being dipped. Formerly on one or two occasions the old-style clamp put on the commutator end of the armature shaft slipped off with an almost disastrous result when an armature fell to the floor, barely missing a workman.

It should be noted that one size yoke will take practically every size and type of railway armature from 25 to 65 hp.

Disconnecting Locked Tongues of Electric Track Switches*

By G. I. Grant
Chief Inspector School of Instruction
Toronto Transportation Commission

Locked tongues due to ice-coated plungers in electrically operated switches make it necessary for operators to disconnect the tongue from the plunger by the removal of a link in the mechanism. Several car derailments have occurred on the lines of the Toronto

When the link to be removed to release a frozen electric track switch was painted a distinctive color derailments were reduced in Toronto

Transportation Commission when the wrong link has been removed and the tongue thereby cut free from its locking spring. In addition to diagrams posted in carhouses and lectures given to new men in the school of instruction, a further aid to operators has been provided by painting the proper links with a distinctive color.

Electrically Heated Inspection Lamps*

By Christ Reinker
General Foreman Mechanical Department
Cleveland Railway

A trouble light that is particularly adapted for use in cold weather has been designed at the Havard shops of the Cleveland Railway for the use of the line department. It consists of a handle, 8 in. long and 2 in. in diameter, with a conical reflector 5 in. long. The wooden handle, drilled with a number of 1\text{-in.} holes, contains a 2,500-ohm resistance, properly insulated, which acts as a heater. The resistance is in series with a 110-volt, 23-watt Mazda lamp located within the reflector. This light is especially advantageous when work must be done to the overhead in tunnels, under bridges, or at night when the weather is cold, as it keeps the hands of the workman warm and permits him to do his best work.

Inspection light used by Cleveland Railway has electrically heated handle
Improved Connecting Rod for Tongue Switches*

By E. B. Spenzer
Way Department Cleveland Railway

Decreased wear on the working parts of lock boxes of track switches has resulted in Cleveland from the use of a coil spring placed on the connecting rod between the tongue and the yoke. This spring is adjusted just under tension and takes up any slack motion due to the wear that occurs, thus reducing the likelihood of having a split switch. The frequency of inspection is materially decreased, which gives the switch crew more time for other work. Construction of this connecting rod is simple and easy. Ordinarily the connecting rods are threaded the entire length to provide for the nuts, which hold and adjust the pipe separators. With the new design this is not necessary, for the entire adjustment is taken care of at the nut B at the end of the rod, as shown on the accompanying sketch.

Welding and Cutting Equipment Combined*

By W. H. Hayes
Assistant Road Master Georgia Power Company
Atlanta, Ga.

Complete welding and cutting equipment in a single unit, consisting of a Una Type D-4 electric welder and an oxy-acetylene cutting outfit, installed on a 1-ton White truck, has been found very useful by the Georgia Power Company. Two such trucks have been equipped. Considerable time has been saved by having these units together, as the men do not have to wait for the equipment to be moved, especially when jobs located at various places have to be taken care of. In particular, each man can do his own burning instead of having to wait for someone to come and do it for him.

When special work has worn down and become noisy it is built up by welding and ground to a smooth surface. This repair lasts about two years under heavy traffic and longer when traffic is lighter. A hard center broken beyond repair is taken out, and a piece of steel cut and laid in the casting and welded into place. Then it is built up to the same dimensions as the old hard center by welding and ground down to a smooth surface. This lasts as long as the other work in the same location, which saves the expense of taking out the whole frog and replacing it with a new one or installing a new center. If the hall of the rail is broken away from a joint a plate is put on the outside of the rail and welded to the base while it is ground to a smooth surface after cooling.
Hood Rims and Carlins Reshaped by Machine

By James Davidson
Assistant Foreman Mechanical Department
Cleveland Railway

FORMING hood rims and carlins in the shops of the Cleveland Railway has been expedited by the development of a machine for forming these parts. This replaces the old method of shaping by hand with clamps.

The machine consists essentially of a table with the form for a hood rim or carlin placed on it and a flexible steel band attached to a pneumatic cylinder. A cylindrical steam chest is conveniently located to steam the wood. The strip to be bent is placed in position; then the air is admitted to the cylinder, and by means of levers the steel bands shove the board to the required position of the hood or carlin. After the piece is shaped it is placed on a form and slats are nailed in position.

Reclaimed Crank Case Oil for Curves and Switches

By Louis T. Botto
Superintendent Maintenance of Way
San Antonio Public Service Company

AFTER considerable experimentation the maintenance of way department of the San Antonio Public Service Company has adopted the practice of using oil drained from automobile crank cases for oiling the curves and switches over its system. This oil has a very high lubricating value and is much more satisfactory than the crude oil formerly used. Its use has resulted in a saving of $30 per month.

Corrections

In the article “Spray Equipment Effective for Weed Killing” appearing on pages 104-105 of the February issue of this paper, it was stated that a speed of 40 m.p.h. is required to discharge 472 gal. per mile of track. The figure 40 m.p.h. is a typographical error and should read 14 m.p.h.

On page 108 of the same issue, in the article “Combination Tie Plate for Various Rails,” the phrase “tie plates in various sizes” should read “a combination tie plate” to fit the different rail widths.

Field Testing and Taping

TESTING field coils is considered of sufficient importance in the Cold Spring shop of the International Railway, Buffalo, N. Y., to have an especially designed testing outfit for this purpose. All coils are checked at some time between their final taping and their dipping. A first test is usually made when the coils come out of the motor; the second test after the coil is repaired and the third test after the coil has been dipped. A Peerless Equipment taping machine saves the labor of three men at 50 cents per hour, with a resultant saving of something like $4,050 a year on the basis of a 54-hour week. The $300, which represents the cost of the taping machine, is paid for a dozen times over, as a consequence.
Advantages of Single-Motor Drive for Gas-Electric Buses

By C. A. Atwell
Design Engineer
Westinghouse Electric & Manufacturing Company

Gas-electric buses of recent design use either one, two or four driving motors. There are certain fundamentals in the design of a single motor of large capacity, however, which give it advantages over two or more motors of equivalent total capacity. These advantages are: less weight; less cost; more rugged construction; higher efficiency; less inspection and maintenance required and the use of simpler control and wiring allowed.

The decreased weight of one motor as compared to two or more motors of equivalent capacity is due to the requirement of less total active copper and iron to produce the same result, and also to the fact that the weight of the mechanical parts of the single motor is less than the total for the smaller motors. The net result is that the single motor weight is 15 to 20 per cent less than the weight of two motors which do the same service, and this percentage will be increased in a comparison of the single motor with four motors capable of performing the same service.

The manufacturing cost of the single motor is less, not only because of less total material used, but also because of the reduced number of manufacturing operations. It is easy to see that it will not take as much labor to wind one armature as it does to wind two smaller ones of approximately half the size.

Better mechanical construction can be obtained in the single motor because of the relatively larger parts throughout. This applies especially to the electrical windings. A single motor, for example, uses a single-turn armature coil while the usual motor for a dual drive equipment uses a two-turn armature coil. It is generally true that electrical apparatus of larger rating has higher efficiency. Comparison of existing single-drive and dual-drive bus motors shows the single motor to have between 2 and 4 per cent higher efficiency over the operating range. The point of maximum efficiency for the single motor is around 92 per cent, and for the dual-drive motor, 89 per cent.

Inspection and maintenance for a small motor require practically the same work as for a larger one; thus the amount of this item will be practically proportional to the number of motors. The bus wiring is simplified by the use of a single-drive motor as it is necessary to carry only one set of power cables from the controller to the motor.

In general, it appears that the disadvantages of the single motor drive are; lack of the “motor series” connection; 1 to 1\(\frac{1}{4}\) in. increase in bus floor height or decrease in ground clearance; inability to obtain independent traction on each driven wheel.

Opposed to these disadvantages are the six inherent advantages of the single motor already mentioned and, in addition, the weight and cost savings effected in the bus construction by the fewer number of motor supports, driving gears, propeller shafts and universal joints or couplings. Evaluation of these advantages and disadvantages for a gas-electric bus of given size and weight to operate in a certain service should give a rather definite indication as to whether the single-motor drive should or should not be used.

Hand Lever for Testing Pneumatic Bell Ringers

Testing pneumatic bell ringers is done by means of a simple and convenient device in the shop of the Richmond Railways, Staten Island, N. Y. This outfit was designed and constructed by Equipment Inspector Nicksie. A 1-in. x 6-in. plank is bolted to the end of the work bench. A standard foot valve and pin are mounted on a \(\frac{3}{4}\)-in. x 5-in. x 9-in. plank which is supported by two 1\(\frac{1}{2}\)-in. x 1-in. hangers fastened to the work bench plank. One side of this foot valve is connected to the air supply and the other side is supplied with a long nipple threaded on both ends.

The ringer to be tested is screwed on the end of this pipe. A tapered wooden handle, 13 in. long, \(\frac{3}{4}\) in. thick, 3 in. wide on one end and 1 in. wide on the other, is hinged and fastened to the bench plank directly over the center of the valve plunger. Pressing down on this handle compresses the valve plunger, admitting air to the ringer under test.

Proper Fit of Brushes Reduces Chatter

By W. E. Warner
Brentford, England

Apart from mechanical vibration of the motor, brushes chatter from two causes, an uneven commutator surface or a bad fit of the brushes in their holders. If the micas stand above the segments the brushes are sure to vibrate, and sometimes with recessed micas vibration occurs also. This is caused by the sharp edges of the segments and can be prevented by filing a very slight bevel on the edges so as to present a rounded edge to the brush. It is desirable to sand the commutator after the micas have been recessed. If the brushes are badly fitted in their holders they will vibrate, although a certain amount of clearance is necessary to permit the free movement of the brush, which, however, should not be excessive. A well-fitted brush should slide freely up and down, although motion backward or forward is undesirable. When brushes do not fit properly and others cannot be procured, a practical remedy is to dust the edges of the brush and the inside of the holder with powdered flake graphite. This graphite will take up the clearance between the brush and the holder and take up the play, and not prevent free movement of the brushes.
Akron, Ohio—Approximately $400,000 will be spent in Akron during 1930 by the Northern Ohio Power & Light Company looking toward a betterment of the railway lines and the improvement of car service. 

New York, N. Y.—The Interborough Rapid Transit Company is to install a turnstile at the Grand Central Terminal station with a new type of gears, designed to eliminate noise. If successful the device will be placed on all turnstiles. 

Louisville, Ky.—In police court, on Feb. 18, Robert Falls, seventeen years of age, was fined $10 for hooking a ride on the back of a car of the Louisville Railway. Neil W. Funk prosecuted the case as head of the claim department of the railway. He cited numerous instances of boys and other persons who hang to street cars, and asked that an example be set in this case. 

Albany, N. Y.—The New York State Automobile Association went on record on Feb. 25 opposing any increase in the motor fuel tax this year. 

Indianapolis, Ind.—The Public Service Commission has approved a petition of the Peoples Motor Coach Company and the Pennsylvania Railroad to establish a new bus line between the Union Station in Indianapolis and the Hawthorne freight yards. The English Avenue route will be abolished as soon as the new line direct to the downtown district is started. The Peoples Motor Coach Company is owned by the Indianapolis Street Railway. 

San Francisco, Cal.—The Key System Transit Company announced that deposits as of Feb. 14 indicate payments under subscription for new preferred stock of $3,505,825 against required amount of $3,500,000. 

St. Louis, Mo.—The aldermanic committee on streets and sewers has approved a proposed ordinance for the widening of Broadway between Morris Avenue and Switzer Avenue. The Broadway tracks of the St. Louis Public Service Company are to remain on the west side of the street. Alderman Kuhs informed the committee that neighborhood opposition to the tracks on the west side had been withdrawn. The railway said it would substitute buses for the street of Taylor Avenue should it be required to undertake the costly work of placing the car tracks in the center of the widened street. 


(L ate News Continued on Page 90)
Boston, Mass.—Postponement for two weeks has been ordered on hearing of the bill which would authorize the Eastern Massachusetts Elevated Railway to acquire the securities of the Boston & Revere Electric Street Railway, Win- nissimmet Railroad, Boston & Chelsea Railroad and East Middlesex Street Railway.

+ Denver, Col.—The Denver Tramway Company has placed two more bus routes in service this week, the line abandoned to carry not from the Union Station far out into the Park-Hill district. The bus lines connect in the outside residential district with other rail- way lines which start from the Union Station. This eliminates duplicate trans- portation throughout the business sec- tion of the city.

+ Springfield, Ill.—Realizing the possi- ble need of future electrification, the Chicago & Illinois Midland proposes to purchase the Chicago, Springfield & St. Louis line from Springfield to Lock Haven, Ill., on condition that it can acquire the other Boston Elevated Railway on stretches and 100-ft. around towns. With this same idea in mind, the Midland has acquired a 200-ft. right-of-way from Springfield to Peoria.

+ Los Angeles, Cal.—A petition has been filed with the Los Angeles Council to require the Los Angeles Railway to ex- tend its West Adams Street Line to the Silver City. The same petition asks that the lines of the company be extended to Moynier Lane.

+ Ithaca, N. Y. — The Public Service Commission has authorized the Ithaca Railway, Inc., to exercise a franchise from the city for the operation of its trolley line in that city. On Dec. 5 last the commission denied a like application because it had not applied and received approval from the commis- sion for the reorganization of the Ithaca trolley line. The reorganization was approved on Jan. 10 last.

+ Richmond, Va.—An investigation into a revision of rates in the interest of in- creasing travel on the line will be under- taken by the Richmond-Ashland Elec- tric Railway. President Zimmer reports that traffic has improved in recent months and that it now appeared that the company would be able to meet the interest on its bonds in July. Because of the extraordinary expense connected with repairs and a loss of traffic, this work was under way, the company defaulted its interest payment on Jan. 1. To bring about a closer relationship between the company and people living in the territory served by the line, J. A. Schermerhorn and J. R. C. Brown have been added to the board.

+ Boston, Mass.—Differences of opinion between the city and the Boston Ele- vated Railway over the question of financing the plan under Governor Square appeared so pronounced as to cause a stake with the legislative committee on metropolitan affairs at the recent hear- ing, but Henry I. Harriman, chairman of the Elevated board of trustees, sug- gested that the committee appoint a sub-committee to meet with the trustees and the Mayor with a view to bringing about a basis for agreement, so that legislation could be passed at the present session. The burden of Mr. Harriman's argument has been that the Elevated road could not meet the entire cost of rentals, which is $135,000 a year on the $3,000,000 relief project.

+ New York, N. Y.—The Pennsylvania Railroad's proposal to establish bus transfer service at Newark and New York Has been assigned by the Inter- state Commerce Commission for hearing on March 26. The commission previ- ously had suspended operation of the tariff filed by the Pennsylvania to meet the competition of the Baltimore & Ohio. The commission has not formally an- nounced whether the investigation inci- dent to the Pennsylvania's tariff will also include the Baltimore & Ohio's practice, inaugurated several years ago, without authorization from the commis- sion, but it is probable that the legal status of the latter's policy will be brought into the issue at the hearing.

+ Kansas City, Mo.—The limited-stop plan of street car operation will be ap- plied to several more lines by the Kansas City Public Service Company. Streets which lines involved in the change now operate have been made safety stops for intersecting vehicular traffic. An actual check on lines to which the skip-stop plan has been applied shows a saving in time of from 18 to 25 per cent. Under the plan, stops usually are made at every other block on north and south streets, and every third block on east and west streets. The plan aims at passenger stops from 1,100 to 1,200 ft. apart.

+ Youngstown, Ohio.—The Youngstown Municipal Railway has asked permission of the state Public Utilities Commission to buy the Youngstown- Sharon interurban line, 13.6 miles in length, for $757,333, to be paid for with a 7 per cent promissory note. The West End Company has asked authority to buy the Youngstown-Sharon inter- urban line, 13.6 miles in length, for $2,133, 978, to be paid for by a 6 per cent promissory note.

+ Fishkill, N. Y.—The Fishkill Electric Railway has applied to the Public Ser- vice Commission for permission to sub- mit bids for street cars in Fishkill. The municipal authorities have consented to the substitution. It is proposed to operate buses along the Beacon-Fishkill road through Fishkill township and village to the eastern terminus of the present trolley line.

+ Louisville, Ky.—A plan to sell two power plants and all substations of the Louisville Railway to the H. M. Bylesby Management & Engineering Company has been approved by the Kentucky Public Service Commission for $3,000,000 and an underwriting of $3,000,000 in refunding bonds by a local syndicate, which would be used as a means for the refinancing of $6,000,000 in first mortgage bonds due on July 1, 1936. The proposal for the sale of the power plants is not a new one, but the prospects for the consum- mation of the deal would appear to be good, particularly since it is understood that the banks for purchasing the newly suggested come closer to meeting the ideas of the railroad management than any that have heretofore been suggested.

+ Cascadia, Wash.—The Oregon Electric Railway's project to build a line from Albany to Cascadia, Wash., 40 miles, has been modified to cover the entire line of the Southern Pacific's line between Al- bany and Lebanon. The rest of the project, which includes three branch lines, will be carried out as originally planned in the application submitted to the Interstate Commerce Commission by the Linn County Logging & Lumber Railway. The applica- tion has been amended accordingly and the Southern Pacific has withdrawn its opposition to construction of the line, which will tap extensive timber lands on the west slope of the Cascade mountains.

+ St. Louis, Mo.—Bids are being taken on the concrete substructure for the Illi- nois Terminal Bridge over the Mississippi River, to be known as the River City. The bridge will also be known as the River City. The bridge will also be known as the St. Louis & Chicago Union Railroad's 300-ft. high bridge will be built over the Mississippi River at St. Louis to connect the Mc- Kinley Bridge with the proposed sub- way under Twelfth Street between Cass Avenue and the present passenger terminal at Twelfth Street and Lucas Avenue. President Fischer, of Illinois Terminal, says the steel for the superstructure is being fabricated and excavating for the 3,000-ft. subway portion will be started as soon as the elevated line has been installed and the city has completed condemnation of the property needed to widen High Street to a 100-ft. boulevard. Two tracks will be installed in the subway, but it is designed to care for six tracks eventually.

+ Ottawa, Ont.—Red Line, Ltd., has appealed to the Second Divisional Court at Toronto against a judgment of Mag- ifrate Hopewell of Ottawa who fined it $10 and costs for unlawfully competing with the Ottawa Electric Railway within the city limits and for soliciting passengers. Appellant operates a sightseeing bus from the Chateau Laurier under agree- ment with the hotel, charging $1 per head. The Ottawa Electric Railway operates a sightseeing bus line along the same route.

+ New York, N. Y.—Stockholders of the Commonwealth & Southern Corpora- tion, Allied Power & Light Cor- poration and Penn-Ohio Edison Com- pany approved on Feb. 10 a plan of merger and consolidation of the Com- monwealth & Southern Corporation, Allied Power & Light Company, Commonwealth Power Corporation, Penn-Ohio Edison Company and South- eastern Power & Light Company, and specifically approved a plan of merger and consolidation of the three companies incorporated in Delaware, namely: the Commonwealth & Southern Corporation, Allied Power & Light Corporation and Penn-Ohio Edison Com- pany, thus completing the first and most important step in the simplification of the corporate structure of the Common- wealth & Southern System. Stockhold- ers of the Maine corporations, namely, Commonwealth & Southern Corporation, Southeastern Power & Light Company, over 96 per cent of the common stock of which is already owned by the Com- monwealth & Southern Corporation, will meet later.
Progress Reported on Washington Merger Legislation

After having decided to separate the section pertaining to court appeals from the resolution permitting the Washington railroad merger, the Senate committee has announced that action on the merger proposal will be deferred until disposition has been made of the court sections. Under the present arrangement the section formerly attached to the merger agreement, which limits the right of utility companies to appeal to the courts in rate cases, will stand as an amendment to the utility act. It is contended by the utility commission that under the present law the companies can submit matters of fact as well as matters of law to the courts.

Meanwhile, practically every section of the bill has been agreed upon by the committee. There is some dispute, however, over the rates of fare for school children. Although the amendment relating to court appeals on rate cases will be reported out first, both of the bills will be placed together on the Senate calendar.

Under the terms of the merger bill, the lines of the Westinghouse Railway & Electric Company will be consolidated as the Capital Transit Company. The bus properties of the Westinghouse Rapid Transit Company will also be acquired by the new organization. It is also provided that the rates of fare in effect on Aug. 1, 1929, shall remain unchanged for a period of two years after the consummation of the merger. The companies have filed their present "Burden of paying the expenses of traffic policemen at street railway crossings and intersections. In addition, instead of being compelled to pay the entire cost of maintaining the paving between the rails and for 2 ft. outside of the outer rail, the company will only have to pay one-fourth of this expense.

New Franchise Proposed for Rochester

The New York State Railways, Rochester Lines, now in receivership, and the city of Rochester have reached an agreement whereby the service-at-cost contract, controlling railway operations, may be continued to Aug. 1. Meanwhile a new contract will be drafted to supplement the present one, voided automatically with the receivership. The railway acceded to demands of the Council that a 1-cent fare be established for school children and that tickets be sold on electric cars and buses at a rate of six for 30 cents or twelve for $1. The straight fare is 10 cents.

Changes in New York Utility Regulation Recommended

Two reports have emanated from the commission, revision of New York state utility laws. Of these, reports, that prepared by Colonel Donovan, counsel to the commission, proposes a revision of the New York statutes which would recognize the established law of the land regarding mergers. The report of the Public Service Commission has been submitted to the legal powers and facilities it needs to effect real regulation, based upon adequate research of its own and including supervision of utility accounting and finance. These provisions he would supplement by a declaration of legislative policy favoring voluntary agreements between the commission and the service companies for rate regulation through accounting control, in the interest of reducing the great volume of protracted and unsatisfactory litigation over rates.

Professor Bonbright and Frank P. Woolsey, of Government appointees, declare for enactment of the "prudent investment" theory of valuation. They embrace the idea of duplication of electric and electric plants and distributing systems by municipalities, if only as a means of compelling the companies to "help rather than hinder regulation in order to retain the private ownership method," and favor creating a so-called people's counsel. Continuation of the existing situation, say the commissioners, "will presently lead to present government ownership in some form as the only solution, but they hasten to add that "we do not feel that public opinion is yet ready for that alternative."

Detroit Fares to Be Increased

(Continued from Page 165) will also be much reduced by reason of the added revenue. The last installment on the D.U.R. purchase debt is due Dec. 1, 1931, and the clearing up of this obligation will release more than $2,000,000 annually to the department.

In Feb. 19 Mr. Smith announced that the purchase of 150 new street cars, 125 motor coaches, installation of express railway service on Fort Street and Michigan and Hamilton Avenues, and rebuilding of tracks on several lines, will be among the first improvements undertaken by the Department of Street Railways, under the new plan. In the meantime, the street installation of trackless trolleys will be effected at an early date on Plymouth road. The new trackless trolley line is to be about a mile long, and will be of the Peter Witt type, and the majority of the new coaches will be of the single-deck street car type.

Auditor Morgan says that despite the increase in fares the department, if it insists upon purchasing 125 new cars and 125 motor coaches, may find itself in debt again. He said:

"I can not say whether we will actually be in debt until the budget has been made up and careful estimates prepared. In the D. S. R. budget there is an item of $5,300,000 for 100 street cars and 75 motor coaches. The department has wanted this additional equipment for some time but I opposed it because the money was lacking. If the funds are not in sight in the future I think we will have to oppose the purchase of this equipment."

According to Mr. Morgan the fare increase is necessary to take care of past accumulatory deficit and to set up a depreciation reserve with which to meet future replacements of worn-out equipment.

The D. S. R. is including $7,000,000 in bonds in its new budget. This, Mr. Morgan said, is to take care of "past neglected maintenance" and to take up $3,000,000 in short time obligation, which is now held at 6 1/2 per cent interest basis. The new bonds will reduce this charge to 4 per cent.

Arrange Your A.E.R.A.

San Francisco Itinerary Now!

American Electric Railway Association headquarters has just mailed to all members a handsome illustrated brochure covering the three special trains for the San Francisco convention—a red, a white, and a blue. The first two trains provide for travel through some of the most picturesque points in the country. The blue special is a fast train for those whose time is limited. The red special, however, will determine their return routing when tickets are purchased for the going trip in order to take advantage of the special round-trip summer tourist rates. Return tickets are good until Oct. 31. Intending passengers are asked to consult their local railroad ticket agents. A special railroad travel expert will also be glad to discuss plans for the entire trip, make up a definite itinerary and procure accommodations. No charge for this service.

June is a month of particularly heavy travel, and in order to secure the newest and most up-to-date equipment the committee should know well in advance the number of persons for whom accommodations are to be arranged on each train. This information must be included with each booking and the convention committee will notify the A.E.R.A. delegates as to how to arrange for the trip. A.E.R.A. delegates are October minded so do not wait. The A.E.R.A. convention committee is concerned. The convention this year takes place in June, three months earlier than usual.

The hotel committee has issued a circular giving hotel rates and instructions about securing accommodations in San Francisco. Delegates should communicate with Chair-

Get Set for San Francisco

PRESIDENT SHOUP extends a most cordial invitation to come to California next June. The West Coast committees under W. V. Hill, manager of the California Electric Railway Association convention is concerned. The convention this year takes place in June, three months earlier than usual. The hotel committee has issued a circular giving hotel rates and instructions about securing accommodations in San Francisco. Delegates should communicate with Chair-
South Bend System Reorganized

New Company Formed to Take Over Chicago, South Bend & Northern Indiana Railway and the Southern Michigan Railway

With the approval of the receivers courts on July 11, one of the final steps was taken in lifting the receivership of the Chicago, South Bend & Northern Indiana Railway and the Southern Michigan Railway. By a new company known as the Northern Indiana Railway, Inc., will take over the assets of both the former companies. It is believed that under the new capital plan it will be possible to rehabilitate the properties, add new rolling stock, and extend the lines to take care of the expanding requirements for transportation of the communities the company serves.

Faced with continued losses in riding due to competition from the private automobile, the Chicago, South Bend & Northern Indiana Railway was forced into receivership in July, 1927. In December of the same year its affiliated property, the Southern Michigan Railway, also went into receivership. In both cases R. R. Smith, vice-president and general manager of the companies, was named receiver by the federal courts. Amendments made previously to effect voluntary reorganization were found to be impractical. It was believed, however, that a plan of reorganization could be formulated by which the companies could make a financial upswing, making it possible to continue operations on a basis where capital and credit could be attracted and the properties re-habilitated.

Old Financial Set Up Unworkable

Under the financial set-up prior to the receivership there were three underlying mortgages in addition to the Chicago, South Bend & Northern Indiana Railway mortgage. Of these three, prior to the mortgage, the Indiana Railway first mortgage, with principal maturing on Jan. 1, 1930, has paid interest regularly. The property was sold more than once and the mortgage was extended for six years during which a sinking fund will retire the bonds. The old funded debt was as follows:

- Indiana Railway first mortgage 5's, $426,000
- Northern Indiana Railway first consol. mortgage 5's, $538,000
- LaPorte & Michigan Traction Company first mortgage 5's, $312,000
- Chicago, South Bend & Northern Indiana Railway first mortgage 5's, $3,089,000
- Funded debt on the property of the Chicago, South Bend & Northern Indiana Railway totaled $4,415,000. In addition there were $2,500,000 in 5 per cent cumulative preferred stock and $5,500,000 in $1,000 bond stock.
- Funded debt of the old Southern Michigan Railway was as follows:
  - South Bend & Southern Michigan Railway first mortgage 5's, $536,000
  - Southern Michigan Railway first consolidated 5's, $395,000

This made a total of $9,515,000 in bonds. By the terms of the funded plan, the Chicago, South Bend & Northern Indiana Railway was $598,350 in arrears on interest. This accrued interest is being made up in addition to the reasonable rate of interest. In the case of the 25 cent express bus line now serving a small area of the Heights, Speed and comfort outweigh in importance the amount asked at the fare box. If the company can deliver passengers downtown—where most of them want to come—quickly and comfortably at a reasonable rate of fare it will find its chief difficulty surmounted. The county should think in terms of metropolitan living—Cleveland Plain Dealer.

Planning Wisely for Cleveland's Future

One virtue of the Cleveland Railway's plan to embrace the whole country in a single transportation system is that it will encourage Cuyahogans outside the parent city to think in terms of metropolitan development. The transportation future of this community is bound to the policies of the Cleveland Railway to a degree sometimes unconsidered. Reports submitted to the railway indicate that good service is considered by passengers more important than low fare. It is illustrated in the case of the 25-cent express bus line now serving a small area of the Heights. Speed and comfort outweigh in importance the amount asked at the fare box. If the company can deliver passengers downtown—where most of them want to come—quickly and comfortably at a reasonable rate of fare it will find its chief difficulty surmounted. The county should think in terms of metropolitan living—Cleveland Plain Dealer.

Electric Railway Journal—Vol.71, No.3

168
Providing Rapid Transit a City Responsibility

Negotiations are under way to fund the $3,690,284 floating debt of the Cincinnati Street Railway. So Walter A. Draper, president, told stockholders in his annual report made on Jan. 29. Mr. Draper's report showed a total capital value as of Dec. 31, to be $34,996,240. The value of property fixed by city ordinance on Nov. 1, 1925, was $27,000,000. Additions and betterments since that year total $6,887,659.

Choosing the topic, "Looking Ahead," Mr. Draper said in part:

"In many cities the problem of local mass transportation has reached a status requiring pointed consideration and readjustment. Opinions may differ as to the transportation of the future.

"There is no doubt that private facilities have carried an increasing number of people each year. But some public transportation always must be ready to serve, and it is necessary for the modern operator to endeavor to provide facilities that will most readily meet requirements and at a reasonable cost.

"If transportation companies cannot provide the capital necessary for constructing subways and other forms of rapid transit, the municipality will be required to aid in providing facilities. In New York, Philadelphia, Boston, and other cities various forms of municipal assistance have been extended, ranging from actual municipal ownership to the payment of subsidies of some nature.

"The form of contract existing between the Cincinnati Street Railway and the city lends itself readily to the working out of the problem as may be found necessary and best.

"The present transportation system with the addition of cars from time to time is adequate to care for many more passengers than now are carried. Nevertheless, new forms of rapid transit service are being urged. The substitution of such facilities would not be undertaken by this company without costs too great for the users of the service to bear. The extent to which the city could participate in providing rapid transit would depend entirely upon the plan that was to be followed.

"It is hoped the fare which has continued more than four years will provide funds sufficient to meet all requirements. Should the fare control fund, however, be materially reduced, there are several ways of helping to meet the situation. One would be to have the city relieve the company of all charges that still are imposed as burdens on the car riders. Another would be to have the city, with its ability to raise money at a low rate of interest, provide certain facilities to be used by the transportation system. A charge for transfers is becoming more general throughout the country."

Ideas for Selling the Service

Inspiration for electric railway advertising men was furnished at a recent sales meeting of the Procter & Gamble Company, Cincinnati, world famed makers of Ivory soap. The advertising department desired to impress the sales force pictorially with the strength of street car advertising as used by the Procter & Gamble Company to advertise its products and reinforce the efforts of the sales department.

Four large posters, two of which are reproduced herewith, were prepared by Barron G. Collier, Inc., and were loaned to the Procter & Gamble Company for this meeting. The original posters were brilliantly produced in color, making them extremely effective. They were 40 in. high and 24 in. wide. The novel comparisons employed suggest interesting copy for selling local transportation.

Additions to Roxy Theatre in Atlanta

Overcoats were much in vogue at the recent Birmingham, Ala., meeting of the Association of Equipment Men, Southern Properties, as evidenced by this view showing the delegates wading through 3 in. of snow on the grounds of the Continental Gin Company. Following a visit to the Birmingham Electric shops, the group went to the cotton gin plant for an inspection trip and luncheon as guests of Tom Elliott, president of the company and for several years previous an executive of the Cincinnati Car Company.

Rerouting Plan in Omaha Changed

As a result of dissatisfaction with the rerouting of the Omaha & Council Bluffs Street Railway, Omaha, Neb., which went into effect in December, a new plan has been determined by company officials to go into effect on March 2 for 60 to 90 days.

The new plan attempts to satisfy complaints made ever since the Harris rerouting plan was put into effect. Demands of Thirteenth Street property owners, who ask resumption of tram service on this street, have not been met, but President Shannahah has promised to endeavor to work out a satisfactory solution. Mr. Shannahah said: "The company is willing to give the city anything in the way of transportation it wants, providing it pays the bills. Rerouting has not proved the saving in expense anticipated. Any increased service now will only add to the company's deficit. If the commissioners will join with the company in applying to the state railway commission for better service, and if the city is willing to pay for it, we shall gladly join."

Electric Railway Journal—March, 1930
Unification Bill for New York City Introduced

A bill amending the public service commission law of New York State setting up a board of transit control in the city of New York was introduced in the New York State Senate and the Assembly on Feb. 25 by the minority leaders, Bernard Downing and Irwin Steinberg. The measure: represents the views of the city of New York on how unification of transit facilities can be brought about. Among other things it guarantees a 3-cent fare which would be maintained, in case of a deficit in operation, by the taxpayers of the city of New York. The bill is supported by a statement of the minority leaders. A similar bill introduced in 1928 and again in 1929 failed to be reported in either house. It is thought likely the measure which has now appeared will be reported this year.

Window Wipers for Providence Cars

Recently the United Electric Railways, Providence, R. I., appropriated sufficient money to equip all of its street cars with window wipers. For some time the company has realized that operation without window wipers during stormy weather was unsatisfactory, hazardous and not consistent with safety promotion work among the employees.

Conspectus of Indexes for February, 1930

Compiled for Publication in ELECTRIC RAILWAY JOURNAL by ALBERT S. RICHLEY

<table>
<thead>
<tr>
<th>Street Railway Fares*</th>
<th>Latest</th>
<th>Month Ago</th>
<th>Year Ago</th>
<th>Last Five Years</th>
</tr>
</thead>
<tbody>
<tr>
<td>Street Railway Fares*</td>
<td>Feb., 1930</td>
<td>Jan., 1930</td>
<td>Feb., 1929</td>
<td>Feb., 1928</td>
</tr>
<tr>
<td>913</td>
<td>.84</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Electric Railway Materials*</th>
<th>Latest</th>
<th>Month Ago</th>
<th>Year Ago</th>
<th>Last Five Years</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electric Railway Materials*</td>
<td>Feb., 1930</td>
<td>Jan., 1930</td>
<td>Feb., 1929</td>
<td>Feb., 1928</td>
</tr>
<tr>
<td>142.9</td>
<td>144.4</td>
<td>145.0</td>
<td>159.2</td>
<td>139.5</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Electric Railway Wages*</th>
<th>Latest</th>
<th>Month Ago</th>
<th>Year Ago</th>
<th>Last Five Years</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electric Railway Wages*</td>
<td>Feb., 1930</td>
<td>Jan., 1930</td>
<td>Feb., 1929</td>
<td>Feb., 1928</td>
</tr>
<tr>
<td>231.7</td>
<td>231.3</td>
<td>229.9</td>
<td>231.7</td>
<td>221.0</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Electric Ry. Construction Cost</th>
<th>Latest</th>
<th>Month Ago</th>
<th>Year Ago</th>
<th>Last Five Years</th>
</tr>
</thead>
<tbody>
<tr>
<td>203.9</td>
<td>204.5</td>
<td>205.2</td>
<td>205.7</td>
<td>199.0</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>General Construction Cost</th>
<th>Latest</th>
<th>Month Ago</th>
<th>Year Ago</th>
<th>Last Five Years</th>
</tr>
</thead>
<tbody>
<tr>
<td>206.5</td>
<td>209.0</td>
<td>210.4</td>
<td>211.5</td>
<td>202.0</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Wholesale Commodities</th>
<th>Latest</th>
<th>Month Ago</th>
<th>Year Ago</th>
<th>Last Five Years</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wholesale Commodities</td>
<td>Feb., 1930</td>
<td>Jan., 1930</td>
<td>Feb., 1929</td>
<td>Feb., 1928</td>
</tr>
<tr>
<td>93.4</td>
<td>94.2</td>
<td>97.2</td>
<td>104.5</td>
<td>93.4</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Wholesale Commodities</th>
<th>Latest</th>
<th>Month Ago</th>
<th>Year Ago</th>
<th>Last Five Years</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wholesale Commodities</td>
<td>Feb., 1930</td>
<td>Jan., 1930</td>
<td>Feb., 1929</td>
<td>Feb., 1928</td>
</tr>
<tr>
<td>11.51</td>
<td>11.6</td>
<td>12.98</td>
<td>14.41</td>
<td>11.51</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Food</th>
<th>Latest</th>
<th>Month Ago</th>
<th>Year Ago</th>
<th>Last Five Years</th>
</tr>
</thead>
<tbody>
<tr>
<td>Food</td>
<td>Feb., 1930</td>
<td>Jan., 1930</td>
<td>Feb., 1929</td>
<td>Feb., 1928</td>
</tr>
<tr>
<td>155.4</td>
<td>158.0</td>
<td>154.6</td>
<td>167.1</td>
<td>150.8</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Cost of Living</th>
<th>Latest</th>
<th>Month Ago</th>
<th>Year Ago</th>
<th>Last Five Years</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cost of Living</td>
<td>Feb., 1930</td>
<td>Jan., 1930</td>
<td>Feb., 1929</td>
<td>Feb., 1928</td>
</tr>
<tr>
<td>160.4</td>
<td>162.0</td>
<td>160.9</td>
<td>171.8</td>
<td>159.3</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Industrial Activity</th>
<th>Latest</th>
<th>Month Ago</th>
<th>Year Ago</th>
<th>Last Five Years</th>
</tr>
</thead>
<tbody>
<tr>
<td>Industrial Activity</td>
<td>Feb., 1930</td>
<td>Jan., 1930</td>
<td>Feb., 1929</td>
<td>Feb., 1928</td>
</tr>
<tr>
<td>121.8</td>
<td>116.4</td>
<td>132.5</td>
<td>140.4</td>
<td>94.3</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Bank Clearings</th>
<th>Latest</th>
<th>Month Ago</th>
<th>Year Ago</th>
<th>Last Five Years</th>
</tr>
</thead>
<tbody>
<tr>
<td>95.2</td>
<td>89.6</td>
<td>108.7</td>
<td>111.8</td>
<td>94.0</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Business Failures</th>
<th>Latest</th>
<th>Month Ago</th>
<th>Year Ago</th>
<th>Last Five Years</th>
</tr>
</thead>
<tbody>
<tr>
<td>78.55</td>
<td>67.38</td>
<td>56.19</td>
<td>102.09</td>
<td>23.13</td>
</tr>
</tbody>
</table>

*The three index numbers marked with an asterisk are computed by Mr. Richley, as follows: Fares index is average street railway fare in all United States cities with population of 50,000 or over, with the New York City and weighted according to population. Street Railway Materials index is relative average price of materials (including fuel) used in street railway operation and maintenance, weighted according to average use of such materials. Wage index is relative average maximum hourly wage of motormen, conductors and motormen and to a lesser extent of other employees on interurban railways operated in the United States, weighted according to the number of men employed on these roads.

Experiments were made with several window cleaners, and a wiper has been selected which will keep the glass clean during rain and snow storms and will remove sleet. The window wiper is manually operated by a hand lever near the top of the window. The operator pulls the lever and the wiper sweeps the width of the window in one motion, cleaning it all in one movement. Up to Feb. 15, 28 cars had been fully equipped, and wipers are designed to be used on more than 100 cars—within a few weeks. It is hoped that every car on the system will be equipped by March 1.

Simpler Car Parts Proposed

O. C. Wright, superintendent of equipment of the St. Louis Public Service Company, St. Louis, Mo., in an address before the February meeting of the Birney Club, called attention to the weight of accessories on the ordinary car. A pointed question asked by the speaker was if anyone ever heard of a street car, even if it was 30 years old, which during its entire life ever had anything taken off of it. He also questioned if apparatus designed to be used on a street car were worked out in conjunction with the car body or other parts to which it is to be attached.

A little known fact brought out by the speaker is that for the purpose of taking power from the trolley through the motors to the ground and through the auxiliary apparatus on a modern car 50 ft. long, approximately 2,500 ft. of copper wire of various sizes is used. Some 400 ft. of pipe, or eight times the length of the car, is used to provide air brake and power door operation. Most of this consists of expensive copper tubing.

For one kind or another to the equipment, Mr. Wright believes, run the cost of the modern car up to figures almost prohibitive, increase the weight, and make the operation of the car during wet weather and cleaning it all in one movement more difficult. He believes the time is opportune to wipe the slate clean and design a car intended from the start at a weight at which all component parts will be worked out, each in its proper relation to the other. He believes that if this plan is followed, it should be possible to carry on, with the initiative supplied by the operator and concurred in and supported by the car builders and manufacturers of car equipment.

Protest Against Competitive Service Sustained

Setting aside a decision handed down by the Ohio Public Utilities Commission last June, the Ohio Supreme Court has ordered the Salisbury Transportation Company to remove from its schedule, sustaining a protest filed by the Stark Electric Railroad against the increased service.

Two companies operate between Alliance and Canton, Ohio. The Stark Electric operates interurban cars while the Salisbury company operates buses along a route part of which parallels the Stark Electric tracks and part of which is several miles from the railway.

Last summer the state commission authorized the bus company to operate two buses on an hourly schedule. The Stark Electric said the increased service was not necessary. With the protest ignored the Stark Electric appealed to the Supreme Court.

A Source of Facts on Track

"Uniform Paved Track" is the title of the new, enlarged third edition of the "Paved Track Notebook," issued by the International Steel Tie Company, Cleveland, Ohio. In previous data are brought up to date. The addition of new material makes this handbook 25 per cent larger, more interesting, more useful.

The mortar-flow principle, the improved method of constructing paved track with the revolutionary "Mortar-Flow Pulsator" is fully explained. Details of how best to install compressed concrete paving, and of how to use the new vibrated grout method of construction for early service are given.

Research results on concrete and steel boards are presented for the first time. Modernized twin ties with the new "Precision" rail clip and heat-treated bolts are completely described.

Additions of new types of track construction are shown. Paved track design is discussed from the executive's viewpoint.

Unit pressures on the subgrade with concrete foundation and stone ballast are compared. A new section has been added on waterproofing the track structure and submarine foundations.

Initial cost comparisons are given for typical installations. A table of units of track work per man-hour on more than 60 miles of track permits application of these data to local conditions.

A reference section with notes on concrete, and a convenient table of cubic contents of typical track trenches completes the "Uniform Paved Track Notebook."
Decision Reserved in Buffalo Fare Case

Federal Judge Hazel in United States District Court at Buffalo, N. Y., has reserved decision on the application of the International Railway for appointment of a three-judge court to fix a valuation figure which fare may be based.

The railway seeks a 10-cent fare in Buffalo and increased fares in Niagara Falls and Jamestown. Judge Hazel indicated that he would give the cities in which increased fares are asked sufficient time in which to prepare for the suit "the usual issue," it was indicated that the court would like to have the railway take its case back to the commission.

Another Fare Proposed in Columbus, Ohio

A 7-cent cash fare with five tickets for 35 cents has now been proposed by the Columbus Union Light & Power & Light Company, Columbus, Ohio, but the City Council has voted to postpone action on the proposal of the company has been operating without a franchise since 1926, but has kept the fare at 6 cents cash since that time.

$1,250,000,000 for New York's New Rapid Transit Lines

The 1929 annual report of the New York Transit Commission emphasizes progress in grade crossing elimination during the year, mentioning particularly the fact that plans have been agreed upon for doing away with "Death Avenue" in New York City as part of the West Side improvement.

It also mentions prominently settlement of a large number of disputed accounting items as a result of which the Interborough Rapid Transit Company paid New York City $6,291,118 on account of accrued deficit up to June 30, and $2,309,096 thereafter, and also put $3,950,931 into the depreciation fund for the year, to June 30, and $500,000 for the succeeding six months.

Of the new subways, the report says that although parts of the Eighth Avenue system are to be in operation in 1931, the commission's estimates of traffic are so large that already East Side trunk line are being planned, the city's investment in existing subways is $380,000,000; the Eighth Avenue system is to cost $650,000,000 and the other new lines are to cost $600,000,000 more.

The report traces the progress of the Interborough 5-cent fare litigation during the year. The commission says that this issue "involved a tremendous amount of work, attracted national attention and engaged the leading lights of the country," and remarks that it "was most fortunate" in having as its chief counsel Samuel Untermyer, who, with his son, Irwin, "successfully upheld the contents of the commission and the city on the contract" and 7-cent fares without charge.

Engineers Inspect Cleveland Terminal

Inspection of the electrification being installed for the operation of the steam railroads entering Cleveland as operated by the Cleveland Union Terminals Company was the feature of the meeting of the committee on heavy electric traction of the American Electric Railway Engineering Association held on Feb. 19.

Following a short business meeting, luncheon was served in the rooms of the Cleveland Association of Commerce. It was then taken over the terminal building, the electrified tracks and the locomotive repair shops. The meeting and trip were arranged by W. B. Cooper, manager of the Cleveland Improvement Company and L. W. Birch of the Ohio Brass Company. It was made possible through the courtesy of Messrs. Everett and Pinkerton of the Terminal Company.


Brady Medals Awarded at Meeting in New York City

In the presence of members of the Metropolitan Section, A. E. A., and visitors from other cities the Anthony N. Brady Memorial Awards for safety of operation during the year 1928 were presented at the Engineers' Auditorium, New York City, on Feb. 7. Edward Dana, general manager, Boston Elevated Railway, accepted the gold medal for cities of the first class. He brought with him to share the honors five operators, one chosen from each division of the property because of outstanding accomplishment in safe operation over a period of years. The Tampa Electric Company, winner for the second time of the silver medal for cities in the second class, was represented by Superintendent Sheridan and two operators. The bronze medal for cities in the third class was again awarded to the Tide Water Power Company, Wilmington, N. C. Honorary mention was also given to the Louisville Railway and to the El Paso Electric Company.

Charles Gordon, managing director, A. E. A., addressed the meeting. He said that accidents to passengers on electric railways have been decreasing. He also stated that the number of passenger carried out of every 280,000,000 carried last year was fatally injured. This record was made possible by an unending and aggressive campaign of accident prevention in which the electric railways are constantly engaged.

An inspiring address by Harry Cordell, master mechanic, Chicago, North Shore & Milwaukee Railroad, was a feature of the meeting.

First Serious North Shore Accident in Ten Years

Eleven persons were killed and many were injured when a Chicago-bound passenger train of the North Shore & Milwaukee Railroad struck an automobile at a grade crossing just north of Kenosha late on the night of Feb. 23 and was derailed.

The automobile was hurled directly into the path of a northbound freight train, as the five cars of the passenger train left the track.

The first car of the passenger train buried its nose in the soft mud of the ditch. The car behind piled into it. The rear cars also went over into the ditch, and their passengers were more fortunate than those in the two forward cars.

It was the first time in ten years that a passenger on the North Shore Line had met death in an accident.

The facts appear to be that the occupants of the automobile which was struck ignored the warning signal at the crossing, paid no attention to another private car which had been brought to a stop near the crossing and then in the effort to cross the grade crossing, crossed directly in the path of the on-rushing southbound passenger train.

In accordance with its regular policy, the Interstate Commerce Commission will investigate the accident. To that end A. H. Leonhart, from Green Bay, and H. M. Burtch, from Chicago, inspectors of the commission, have been ordered to Kenosha. It is not believed that the report from these inspectors will be submitted to the commission much before the end of March.

400 Newark Cabs Pass to the Public Service

Public Service Co-ordinated Transportation of Newark, N. J., has acquired control of Yellow Cab, Inc., through purchase of the majority of the capital stock. Yellow Cab, Inc., is the largest taxicab company in northern Jersey, one of the largest in Newark and vicinity. It also controls the Yellow Cab of Union County and the Brown & White Taxicab Company of Paterson, N. J. It operates in Newark. Public Service will take over active operation as soon as details can be arranged. No announcement was made as to the consideration paid for the stock.

---

TWENTY YEARS' GROWTH IN TOTAL OF REVENUE PASSENGERS

<table>
<thead>
<tr>
<th>1909</th>
<th>1919</th>
<th>1929</th>
</tr>
</thead>
<tbody>
<tr>
<td>Subway</td>
<td>228,450,146</td>
<td>461,074,059</td>
</tr>
<tr>
<td>Elevated</td>
<td>2,028,106,208</td>
<td>348,188,600</td>
</tr>
<tr>
<td>New York Rapid Transit Corporation and</td>
<td>283,000,000</td>
<td>283,000,000</td>
</tr>
<tr>
<td>Rapid Transit Corporation</td>
<td>143,816,821</td>
<td>301,021,402</td>
</tr>
<tr>
<td>Total</td>
<td>655,467,165</td>
<td>1,141,587,060</td>
</tr>
<tr>
<td>Surface car passengers</td>
<td>728,728,127</td>
<td>873,556,452</td>
</tr>
<tr>
<td>Bus passengers</td>
<td>30,434,950</td>
<td>30,434,950</td>
</tr>
<tr>
<td>Grand total</td>
<td>1,293,924,594</td>
<td>2,035,877,505</td>
</tr>
</tbody>
</table>

Rapid Transit Traffic in World's Leading Cities

<table>
<thead>
<tr>
<th>Passengers Carried</th>
<th>1929</th>
</tr>
</thead>
<tbody>
<tr>
<td>New York</td>
<td>1,916,000,000</td>
</tr>
<tr>
<td>London</td>
<td>465,115,000</td>
</tr>
<tr>
<td>Paris</td>
<td>818,344,000</td>
</tr>
<tr>
<td>Berlin</td>
<td>260,259,000</td>
</tr>
</tbody>
</table>

Miles of Double Track | Passenger Carried by Subways | Total Traffic Carried by Subways |
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>New York</td>
<td>211</td>
<td>6,900,000</td>
</tr>
<tr>
<td>London</td>
<td>150</td>
<td>2,000,000</td>
</tr>
<tr>
<td>Paris</td>
<td>48</td>
<td>7,500,000</td>
</tr>
<tr>
<td>Berlin</td>
<td>23</td>
<td>4,000,000</td>
</tr>
</tbody>
</table>
Progress Reported in Springfield, Ohio

Settlement of the transit problem at Springfield, Ohio, apparently awaits a decision of the courts as to whether paving assessments and unpaid franchise fees constitute a lien on the company's assets, prior to the rights of the bondholders. A four-hour meeting held on Feb. 21, between the city officials and executives of the Cincinnati & Lake Erie Railroad, with Thomas Conway, Jr., president, acting as spokesman, served to clear up a number of confusing points.

The railway company proposes to purchase the Springfield Railway from the receiver, and then to set up a system whereby some of the present narrow gauge tracks will be continued and others abandoned in favor of the standard gauge service over the interurban tracks, augmented where necessary by Valley but only as necessary. The company would be relieved of future paving assessments if the city loses its present suit against the plant.

The main problems at present are those of a twenty-year franchise, a service-acceptance plan, and the appraisal of the railway under the service-acceptance plan. The company offered to reimburse the city for his service charge if an expert appraisal engineer estimated the property at a lower valuation than that contained in the company's proposal.

BOOK REVIEWS

Mastering a Metropolis


City and regional planners, architects, and those interested in the growth of the modern city will find this book fascinating reading. City dwellers and newcomers to the city will also find the book worth reading. Those who believe in the New York region, will be relieved as well as interested by the projects now under consideration, which are so clearly and entertainingly set forth in this volume.

"Planning the Future of the New York Region" is the authorized popularization of the ten detailed and technical volumes published by the Committee on the Regional Plan of New York and Its Environs. The author describes in popular language the outstanding features of the comprehensive plan worked out by this committee over seven years' study and research at a cost of $1,000,000. Many maps and illustrations help the reader visualize the extraordinary development which is outlined here.

Review of New York Association's Work


The meetings of state and sectional associations, being smaller than those of national associations, afford an intimacy of contact among the members not offered by the larger organizations. They are, therefore, often productive of very valuable material. The sessions reported in this volume are of that nature.

Railroad Electrification Economics


Professor Healy's treatise on steam railroad electrification was written following a six-month survey of the electrifications of Europe, which was made subsequent to several years of experience with one of the leading electrified steam railroads of America. The author has stressed the economics of electrification, devoting an entire chapter to this subject, and considering each element from this standpoint.

Power and its supply are given a prominent place in the book, taking somewhat more than half of the space. The power contract is analyzed in considerable detail, since the author devotes much of his attention to the purchase of energy from some outside source. Substations, switching and sectionalizing are taken up in two chapters, the various methods used in different countries and in Europe being discussed in detail. Overhead supporting structures, the contact system, co-ordination of electric fields and equipment, and distribution are covered in five chapters. Motive power, including current collection, traction motors, and transmission of power from the motors to the driving wheels and mechanical elements of locomotives, is analyzed for many types of equipment.

The book is valuable for the engineer of the economist who is considering electrification as a means of improving railroad operation. It gives information which is essential in making a comparison between existing methods and steam and the methods that have been developed in successful electrifications. The author does not contend that electrification is useful everywhere. He says that it now is possible to study the possibilities of electrification, which are decidedly topics for discussion, and the indication of the dangers which are ever present in any analysis.

Electric System Handbook


Here is a handbook different from those usually presented. It tells the story of the electric system as a whole in form which can be understood by the non-technical reader. It is more in the nature of a textbook than a handbook, as its term ordinarily is understood. Students of engineering, operators, inspectors, maintenance and test department employees, and railroadmen should find it helpful.

Railway substations, including the use of mercury arc rectifiers and automatic control systems, are discussed in a separate section of 67 pages.

Annual Safety Congress Transactions

National Safety Council, Publicity Division, Chicago, Ill. 225 pages, 60 cents.

Complete transactions of the public safety, education and women's sessions of the Eighteenth Annual Safety Congres, held in Chicago, Sept. 30-Oct. 4, 1929, are now available. The volume contains authoritative papers and discussions on public utilities, safety, uniform traffic laws and ordinances, accident reports and statistics, law enforcement, traffic engineering and control, public illumination, and personal causes of accidents, school safety work, junior safety councils, vocational schools, and safety work of women's organizations.

Elektrische Bahnen

By D. O. Hübling. Published by Siemens & Halske, A.G., Berlin, Germany.

This book discusses in detail the development of the electric railway and electric railroad since the first appearance of an electric train at the Industrial Exhibition in 1879 in Berlin. The extent of electrification in Europe is reviewed in the first chapter and it was found that at the end of 1927 the mileage of electric railroads amounted to 5,587 miles, while countries outside of Europe had electric railroads amounting to 3,157 miles.

The various types of electric motor cars and locomotives employed are described, while the advantages of alternating current and direct current are compared also. Although the book discusses especially the railroad, considerable attention is given to the planning of electric conduct and signal construction and installation.

Safeguarding Installment Sale Contracts


Selling of goods on the installment plan has become one of the standard commercial practices all over the United States. The author indicates in detail the legal differences between various plans in use for installment selling, and the dangers that beset the seller if the contract is not properly drawn and executed. Since practice varies in the several states, each one is taken up in detail, and local practices and laws are explained where the law is not clear.

While sales of rolling stock under equipment trusts are not covered in detail, the special point noted that special laws covering such sales exist in all states and territories except the District of Columbia, Texas, and Virginia. Some of the laws in other states do not differ greatly from the general laws.

Any railroad or other utility buying or selling merchandise on the installment plan will find in this book a wealth of information, with specific references to decisions on the various points involved.

Steam Railroad Statistics for 1928


This is the annual report of the Interstate Commerce Commission on the operation of the steam railways for 1928, but it includes selected data on other common carriers subject to the Interstate Commerce Act, among them statistics of 223 electric railroads reporting to the commission. For 1928 the electric railroads reported gross revenues of $167,173,838 on an investment of $1,264,533,842 for road and equipment.
PERSONAL MENTION

Henry Bucher of Interstate
Assumes New Duties
Takes Up Post in Indianapolis in Which He Will Co-ordinate Interurban and City Lines of Vast Insull Undertakings

HENRY BUCHER, recently appointed general railroad executive of the electric railway properties in Indiana controlled by Midland United Company, has taken over his new duties at Indianapolis.

Operation of the electric interurban and street railways of the Indiana Service Corporation, Interstate Public Service Company and Northern Indiana Power Company will be co-ordinated under Mr. Bucher. This will involve no change in ownership or identities, but efforts will be made to obtain the advantages of one general supervision.

Mr. Bucher has been manager of railways of the Indiana Service Corporation at Fort Wayne for the past six years, having succeeded Sam W. Greenland in 1924. More recently, he also has held the position of manager of the Fort Wayne division of the Indiana Service Corporation, Northern Indiana Public Service Company and Northern Indiana Power Company, in charge of gas, electric and railway properties.

Prior to his going with the Indiana Service Corporation in 1924, Mr. Bucher was associated as a consulting engineer for ten years with Robert M. Feustel, now president of the Indiana Service Corporation and executive vice-president of the Midland United Company. While engaged in this work he made appraisals and valuations for many electric railways throughout the country. From 1910 to 1914 Mr. Bucher held a position with the joint engineering department of the Wisconsin Railroad Commission and the Wisconsin Tax Commission. He was graduated from the University of Wisconsin with an engineering degree in 1909.

William H. Snyder, chief clerk of the Indiana Service Corporation railway department since 1913, accompanied Mr. Bucher to Indianapolis, where he will co-ordinate the operations of the co-ordinated railway department.

Mr. Bucher's position as division manager at Fort Wayne has been taken by Harry Vordermark, vice-president and treasurer of the Indiana Service Corporation. Assisting Mr. Vordermark as local managers are James S. Clark, light and power department; J. F. McKay, Fort Wayne city railways, and M. P. Royal, gas department.

+ A. J. Berta Treasurer of North American Power Company

A. J. Berta, formerly assistant treasurer of the North American Light & Power Company, Chicago, and its subsidiaries, has been elected treasurer of these companies, succeeding P. L. Smith. As assistant treasurer, he was in close touch with every operating group. Mr. Berta's career in the public utility field began with the Middle West Utilities Company, in 1918. The foundation of his banking experience was obtained with the Harris Trust Savings Bank and the National City Company. The latter company lost his services when he was employed by Mr. Smith. On Feb. 16, Mr. Berta celebrated his tenth anniversary with this company and its predecessors.

+ J. J. McNally in Advertising Field

James J. McNally, formerly with the advertising department of the Washington Railway & Electric Company and the Potomac Electric Power Company, Washington, D. C., has announced the organization of Associate Advertisers to conduct an advertising service specializing in utility accounts. The new service will also act as advertising counsel for public utilities and allied industries. Before going with the Washington Railway & Electric Company, Mr. McNally was connected with Samson Service.

+ "Tom" Minary Resigns as Chairman at Louisville

Thomas J. Minary, chairman of the board of directors of the Louisville Railway, Louisville, Ky., for the past ten years, and prior to that president of the company, recently tendered his resignation to the directors. It was accepted and the post of board chairman was abolished. Mr. Minary remains on the board of directors.

The former chairman will have been connected with the company and its predecessors 38 years in May. Mr. Minary is now 79 years old. He became secretary-treasurer of the Central Passenger Railroad Company in 1872. He was only 21 years old at the time.

Consolidation in 1889 of this concern with the Citizens' Passenger Company and the City Railway resulted in the establishment of the present Louisville Railway. Mr. Minary became general manager after the consolidation. Then for a period of 23 years he served as president of the company before his election to the chairmanship of the board.

+ Col. C. H. Harvey Made Chairman at Knoxville

Col. C. H. Harvey tendered his resignation on Feb. 8 as president of the Knoxville Power & Light Company, Knoxville, Tenn., a position he has held for more than 25 years, to gratify his desire for "greater leisure than is possible under present responsibilities." His resignation was accepted by the directors, who then elevated him to the chairmanship of the board—a post which will enable him to keep in close touch with the affairs of the company. The board took no action toward filling the presidency. The duties formerly performed by Colonel Harvey will be taken over by Fred. V. Underwood, the vice-president and general manager.

Colonel Harvey went to Knoxville in 1885, immediately following his graduation from the University of Michigan, and became secretary to the general manager of the East Tennessee, Virginia & Georgia Railroad, the predecessor of the Southern. While employed there, he worked at night on the books of the Knoxville Electric Light & Power Company. In 1902 he was appointed general manager of both companies and two years later was elected president and general manager.

Colonel Harvey organized the two utilities into the Knoxville Railway & Light Company, which later became the present Knoxville Power & Light Company. In 1925 Colonel Harvey gave up his duties as general manager, and since then has been engaged in business and other administrative activities as president of the company.

Mr. Underwood went to Knoxville about five years ago to assume the duties of general manager. He has been connected with electric power interests practically all of his life and in Birmingham he held a position similar to that which he holds in Knoxville.
F. H. Brooks Now President of Lincoln Traction Company

F. H. Brooks of Lincoln, Neb., who was recently made president and general manager of the Iowa-Nebraska Light & Power Company and the Lincoln Traction Company, with headquarters at Lincoln, has been with the Continental Gas & Electric Corporation, a subsidiary of the United Light & Power Company, since its inception in 1913, first as general manager and then as vice-president and general manager of its properties in Nebraska, Iowa and Missouri, now known as the Iowa-Nebraska Light & Power Company.

Mr. Brooks' public utility career and operating experiences have been broad and varied. He started in the street railway field in Erie, Pa., in 1896. Later his activities took him into the copper regions of Michigan, where he did electrical engineering work for the Edison company of Sault Ste. Marie and the Peninsula Electric Light & Power Company. In this field these matters to the Governor. I appreciate the Governor's generous statement regarding my resignation."

The present commission is composed of three Democrats and two Republicans. The new chairman will be named by the Governor, but will have to be confirmed by the Senate. Mr. Prendergast's resignation became effective on Feb. 28.

Changes in El Paso Personnel

F. J. Gannon, since January, 1929, manager of the El Paso Electric Company, the Missel Valencia Traction Company, and the El Paso Electric Company, has been made president of the three companies and a member of their boards of directors. Mr. Gannon has been president of the El Paso & Juarez Traction Company, and a member of its board since his advent in El Paso. In his new position he will continue actively to manage all four companies.

R. O. Himel, formerly assistant treasurer of the El Paso Electric Company, the Missel Valencia Traction Company, and the El Paso Electric Company, has been made treasurer of the companies. For some time he has been a director of the El Paso & Juarez Traction Company.

J. B. Leddie, formerly superintendent of the Missel Valencia Electric Company, Las Cruces, N. M., a subsidiary of the El Paso Electric Company, has been made vice-president of the Missel Valencia company.

L. S. Thorne, general superintendent of railways, El Paso Electric Company, is also a director of the El Paso & Juarez Traction Company.

Central Association

Vice-Presidents

R. R. Smith, of the Chicago, South Bend & Northern Indiana Railway, was elected first vice-president of the Central Electric Railway Association, and F. H. Wilson, of the Cleveland-Southwestern Railway & Light Company, was elected second vice-president at the recent winter meeting of the organization held in Cleveland. The names of the two vice-presidents were interchanged in the article in the Electric Railway Journal for February, 1930, page 90.

M. E. Welsh in Charge of Central's Electric Division

Michael E. Welsh, superintendent of the Syracuse division of the New York Central Railroad, has been made superintendent of the electrical division with headquarters in New York City. Charles E. Olp, superintendent of the Rochester division, will succeed Mr. Welsh at Syracuse.

Mr. Welsh, who was associated with the New York Central ever since he was twenty years old. He entered the service as a brakeman on the Syracuse division in 1891. For the past twenty years he has been promoted to be freight conductor and in 1901 was made passenger conductor. In 1907 he became assistant trainmaster and was elevated to the position of Rochester division in the following year.

Three years later he was sent to Buffalo as trainmaster, and later was made assistant superintendent there. Mr. Welsh was superintendent of the Ontario division with offices in Oswego in 1923, and superintendent of the same year.

He went to Syracuse as superintendent of the Syracuse division in 1927.

Two New Vice-Presidents for St. Louis Car

Nelson L. Rhenquist and Howard R. Gas were elected vice-presidents of the St. Louis Car Company, St. Louis, Mo., at the annual meeting on Jan. 28. George L. Kippenberger was elected first vice-president and assistant general manager. Edwin B. Meissner was re-elected president and general manager.

Mr. Rhenquist joined the St. Louis Car organization in 1911 when President Meissner came from the Milwaukee Electric Railway & Light Company to accept the executive direction of the company. With the St. Louis Car Company Mr. Rhenquist worked up through several positions until in 1916 he was made purchasing agent. When the company entered the airplane construction field a year ago he was asked to give executive attention to that division, but continued to supervise the purchases for the company. As vice-president he will continue as executive for the aviation and purchasing departments.

Mr. Gas has served as a sales engineer since he joined the company on May 1, 1921. As vice-president his duties will be connected with the sales department. For seven years prior to joining the company, he was with the Missouri Public Service Commission. He had charge of the field operations for the commission in connection with the United Railways, the Union Electric Light & Power Company, the Kansas City Railways and, the Electric Light Company of Kansas City valuations as well as other similar undertakings. He also inspected all steam and interurban railroad properties for the state commission annually.

Prior to entering the service of the Missouri commission, Mr. Gas was a field engineer for the North Kansas City Development Company in charge of levee, sewer, street paving and building operations. He has also been associated with the Kansas City Southern Railroad, the Missouri, Kansas & Texas, the Chicago, Rock Island & Pacific, the St. Louis-San Francisco Railway and the New York Central Lines as a locating and construction engineer.

As a field engineer for Paret & Beard, consulting engineers, Kansas City, Mo., he made hydro-electric surveys on the Wichita River in Arkansas, and also basic surveys and estimates for the Wichita Terminals and a valuation of stock yard properties in Wichita. He had charge of the subways and viaduct construction, third
division, Kansas City Terminal Railways, and also was in charge of pre-cast slab concrete construction and of all subways and viaducts during the building of the Union Station and terminal project in Kansas City, Mo.

A. N. Baldwin, long connected with the Central California Traction Company, Stockton, Cal., as secretary and treasurer, has been elected a director of the Yellow & Checker Cab Company, San Francisco, Cal.

W. P. Jackson in Safety Work for California Commission

W. P. Jackson has been appointed service inspector in the safety division of the California Railroad Commission in charge of inspection of mechanical and electrical equipment on electric railway systems and stages under the jurisdiction of the commission. He will work under the direction of H. L. Engelhardt, safety engineer of the commission.

Mr. Jackson has been connected with the Sacramento Northern Railway, first division, for a number of years in line of mechanical equipment. Prior to that he was superintendent of equipment for the Key System Transit Company, Oakland, Cal. Many years' experience of electric railways throughout the country further qualify him for the work he is undertaking.

Through the establishment of a separate division of safety the commission is making a concerted effort to insure uniform safety conditions of operation and equipment for all electric railway lines and stage lines throughout California. Field inspections, it is hoped, will eliminate unsafe practices and faulty equipment among the common carriers. The division has been in existence only a little more than seven months.

Personnel Changes Follow Expansion in New Jersey

Public Service Co-ordinated Transport, Newark, N. J., has made the following changes in operating personnel: Charles D. Cone has been appointed assistant general sales manager of the Essex division of the company, and Mr. Cone was superintendent of transportation in the Hudson division.

In the Essex division, Spencer G. Harvey, Aaron H. Hill, J. B. McCallum and George M. Clement have been appointed district superintendents, each to have charge of one of the four districts into which the division has now been divided.

The new report to James M. Symington, manager, who will continue in general charge of the division. Mr. McCallum has charge of the northern district, which includes Big Trunk House, Spring Avenue garage, Miller Street carhouse, Rutherford carhouse, Harrison carhouse and Belfield Pike garage; Mr. Clement, Bloomfield district, including Montclair carhouse, Great Notch garage, Lake Street garage and Sixteenth Avenue carhouse; Mr. Harvey, Orange district, including Central Avenue carhouse, Roseville carhouse, City Line garage, Orange and Passaic Valley carhouse and Grove Street garage; and Mr. Hill, southern district, including Hilton carhouse, South Orange carhouse and Sherman Avenue garage.

Two new superintendents of jurisdiction over carhouses and garages in their districts. Jurisdiction over service in the town of Elizabeth embraces the garage, and Mr. M. Summey is assigned to division superintendents whose lines serve it.

George A. Rothery has been appointed assistant safety manager. George A. Rothery was manager of the company's southern division. David H. Roszel also remains as assistant manager, Hudson division.

Herbert E. Harper has been appointed manager of the southern division, and George W. Booze and Claude H. Norton have been appointed assistant managers in that division.

Messrs. Drafman, Springer and Strickler Advanced

Announcement has been made by the Ohio Brass Company, Mansfield, Ohio, of the election of G. L. Drafman as secretary and of W. A. Springer as treasurer, and of the appointment of J. M. Strickler as general sales manager.

Mr. Drafman began his business career with the Roycrofters, under the leadership of the late Elbert Hubbard at East Aurora, N. Y. Here he devoted himself to a study of the advertising business until the death of Mr. Hubbard, at which time he took a position in the office of the East Aurora Electric Light Company. In 1916 Mr. Drafman entered the employ of the Ohio Brass Company as assistant advertising manager. He served in this capacity until 1923 when he became assistant to E. F. Wickwire, then secretary of the company. In 1927 he was made general sales manager, a position he held until his election to the secretaryship which carries with it the duties of director of sales.

Mr. Springer Another Long-Service Employee

Practically the whole of Mr. Springer's business life has been devoted to the Ohio Brass Company. He became a member of the Ohio Brass organization in 1912 after completing a four-year course at the Mansfield High School. His apprenticeship was served under B. F. McLean in the record department. He was next transferred to the management of the traffic department, in which the opportunity was presented to learn much of the business in connection with his work of supervising O-B shipments to all parts of the world. For the past five years he has been assistant to the treasurer, handling, among other things, the forwarding and collecting of export shipments, and at the same time learning under the tutelage of C. V. Marks to master the intricacies of the company's finances. In this capacity he served until his recent election to the post of treasurer of the Ohio Brass Company.

At the completion of his high school career in 1906, Mr. Strickler joined the Ohio Brass Company as office boy. Six months later saw him moving up the ladder. The order, traffic, hi-tension, car equipment, bond and third rail, line material, pintype and general sales departments have all been stepping stones in his varied career. In 1927 he was made assistant general sales manager and now he has been made general sales manager of the organization.

Messrs. Mathias and Covert New Assistant Auditors for Westinghouse

H. N. Mathias and V. F. Covert have been elected assistant general auditors of the Westinghouse Electric & Manufacturing Company.

In rising from the ranks of the accounting department the two men took paths widely separated at first. Mr. Mathias has a service record with Westinghouse which began in 1899. Mr. Covert came to Westinghouse in 1911 from the old E. M. F. Motor Company, Detroit.

Mr. Mathias was born in Madison, Pa. After a business course in Pittsburgh he joined the Westinghouse Company. In 1908 he was made chief cost clerk. In 1917 he was made assistant to the general auditor. In 1928 he was appointed supervisor of cost and budgets. In his new post Mr. Mathias will have charge of installing standard cost and works accounting and will direct all works auditors.

Mr. Covert's first position with the Westinghouse Company was as payroll clerk. In 1917 he became assistant auditor of the Krantz Manufacturing Company, Brooklyn, a subsidiary. The same year he was sent to the Westinghouse South Philadelphia Works in charge of general accounts. In 1924 he was made works auditor in South Philadelphia. He returned to East Pittsburgh in 1926 and in 1928 he was appointed supervisor of district accounting.

Electric Railway Journal—March, 1930
L. C. Bullington Appointed General Sales Supervisor

L. C. Bullington, formerly manager of the Detroit office of the Westinghouse Electric & Manufacturing Company, has been appointed general sales supervisor of that company with his office at the East Pittsburgh Works.

Mr. Bullington joined Westinghouse, Chicago & Kansas City Company in 1889. In 1903, when the organizations entered into a merger, he was transferred to the sales department of the Westinghouse Manufacturing Company, headquartered in Atlanta. Later Mr. Bullington was transferred to the Buffalo office in a similar capacity. In 1918 he went to East Pittsburgh and was assistant to the manager of the power department. From that position he was promoted in June, 1922, to assistant manager of the power sales department. In 1925 he was made manager of the Cincinnati office and in 1928 he went to the Detroit office.

Curtis F. Jones Named to Louisville Board

Curtis F. Jones, employee of the Kentucky Carriers, Inc., bus subsidiary of the Louisville & Nashville Road, Louisville, Ky., has been nominated for employee-director of the railway. An employee-director has been chosen for seven years. Mr. Jones is 32 years old. He has been employed by the company for ten years. He is a veteran of the World War and was a member of the 91st Division. His brother, Wilbern T. Jones, motorman of the Broadway line, recently was awarded the Anthony J. Connell medal and $75 as the employee rendering the most outstanding service in 1929.

J. P. Potter to Head Pacific Railway Club

J. P. Potter, vice-president of the Ferro System Transit Company, Oakland, Cal., has been named by the nominating committee of the Pacific Railway Club for the office of president during the coming year. He is at present the club's vice-president.

Frank E. Russell, now mechanical engineer of the Southern Pacific Company, has been nominated for first vice-president, and L. L. Galbraith, a conductor for the Atchison, Topeka & Santa Fe Railway, for second vice-president. C. D. Wilkins, commercial agent of the Western Pacific Railroad Company, is the committee's nominee for treasurer. The club's election occurs March 13.

W. H. Onken, Jr., Retires from the "Electrical World"

William H. Onken, Jr., for years prominent in the electrical industry as an editor of Electrical World, a McGraw-Hill publication, has resigned and retired from his long association with this paper. Since 1900 he has been active as a writer and reporter for the electrical field. Mr. Onken began his journalistic work as a reporter on the staff of the New York Evening Journal. During this work he took a course in electrical engineering at the Brooklyn Polytechnic Institute. He came to the American Electrician in 1901 as an expanded and writer of the delinicate faculty for news gathering. Later the American Electrician, a monthly, was consolidated with Electrical World, a weekly, and Mr. Onken has continued with the paper since that time as associate editor, as managing editor, as editor and more recently as senior editor.

Charles J. Ellis Now with Brill

Charles J. Ellis, until recently chief engineer of the Cincinnati Car Company, Cincinnati, Ohio, has been appointed sales engineer in the electric car and truck division of the J. G. Brill Company. Mr. Ellis has a wide experience, dating back to 1911 when he started with the Cincinnati Car Company as a draftsman. He subsequently served in various officer capacities, successively becoming chief draftsman, sales engineer and chief engineer.

Harry Maze has resigned as superintendent of motor coach operations of the Union Traction Company, Anderson, Ind., to accept a position with an insurance company in Indianapolis. No successor has been named. The Union Traction Company operates more than 300 miles of bus route in Indiana.

Hugh M. Tate, a lawyer of Knoxville, has been nominated by President Hoover for a seat on the Interstate Commerce Commission, to succeed Richard V. Taylor of Alabama, whose term expired Dec. 31. Mr. Tate was born in Morristown, Tenn., Sept. 15, 1892; received academic and law degrees from the University of Tennessee and began to practice law in 1903. He was judge of the Eleventh Division, Tennessee from 1918 to 1920. He is a republican.

Robert M. Feustel, president of the Indiana Service Corporation, Fort Wayne, Ind., has been elected president of the Central Indiana Power Company, Indianapolis, Ind. He has been vice-president of the power company for more than a year. Samuel Insull, Jr., Chicago, who has been president, simultaneously was elected vice-chairman.

Edward B. Schoultes, formerly with the Barron G. Collier service, has been named advertising manager of the J. H. Sharp in charge of advertising work for the Washington Railway & Electric Company, Washington, D. C. Before accepting this position with the Washington company, Mr. Schoultes was connected with the H K Advertising Service in Washington.

C. H. Quick, chief clerk of the voluntary relief department of the Interborough Rapid Transit Company, New York, for the past two years, has been appointed superintendent of that department to succeed the late Anson T. Berry. As chief clerk, Mr. Quick was Mr. Berry's first assistant. In 1897 he took up his service with the company since Jan. 15, 1907. Mr. Quick is well known throughout the system.

George E. Tebbetts, engineer of structures of the Chicago Rapid Transit Company, Chicago, Ill., has been elected president of A.E.R.S. Section No. 6 for the ensuing year at the recent meeting. He succeeds Mr. M. E. Stockman, former president of the public utility department, who served as president during the year just closed.

Fred K. Baker, of Everett, Wash., has been appointed director of the Department of Public Works of Washington, by Governor Harry D. (and J. C. Denison. Mr. Baker served for some months as supervisor of transportation. The department regulates all bus operations within the state and passes on all applications for new lines or extensions.

A. R. Gonder, former secretary-manager of the Motor Coach Association of Washington, has resigned as head of the Department of Efficiency of the state, to become state secretary of the Savings and Loan Association.

Augustine A. Bragassa, a clerk in the offices of the Lynchburg Traction & Light Company, Lynchburg, Va., since last July, has been promoted to the ways and structures department of Roanoke Railway & Electric Company. Both the Lynchburg Traction & Light Company and the Roanoke Railway & Electric Company are subsidiaries of the Central Public Service Corporation.

Edgar Hyman, assistant transportation engineer of the Public Utilities Department at Cincinnati, Ohio, has reigned to become traffic manager of Ohio Bus Lines.

Charles J. Heacock, Warsaw, Ind., has been named treasurer of the Wyoming Interurban Railroad. Mr. Heacock has been office manager of a large machinery manufacturing company of Warsaw for several years.

H. Takada, general passenger agent, M. Tsokada, superintendent Sendai division, and H. Yamazaki, secretary to the vice-minister of the Japanese government-owned railroads, recently spent three days in inspecting the properties and operations of the Pacific Electric Railway in Los Angeles. The three railway officials are making an extended tour of this country and Europe in an inspection and study of steam and electric railway properties.

Thomas Adams has resigned as the general director of the committee on the regional plan of New York and its environs, but will remain as an adviser to the committee which will undertake to make the Eugenics plan carried out.

Herbert B. Filer, president of New Orleans Public Service Inc., New Orleans, La., has been re-elected chairman of the industrial bureau of the Association of Commerce of New Orleans.

H. Mosley, general manager of Burnley Corporation (England) transport department for about 30 years, is retiring.

A. George W. Brown, who has been research engineer of the Fifth Avenue Coach Company for the past eight years, has been appointed engineering engineer for the Borden's Farm Products Company.

Electric Railway Journal - Vol.74, No.3 - 176
C. T. Hutchinson

Charles T. Hutchinson, president of the McGraw-Hill Company of California, died on Feb. 12, at the age of 54. Mr. Hutchinson's active association with McGraw-Hill began in April, 1922, when he came to the company from the Dewey Publishing Company of San Francisco, publishers of the Mining and Scientific Press. Prior to this time he had played an active and prominent part in engineering circles on the west coast. In November, 1922, he was elected vice-president and general manager and a director of the McGraw-Hill Company of California. He also occupied the position of executive editor of the Journal of Electricity, now known as Electrical West. On Nov. 22, 1926, he was elected president of the McGraw Hill Company of California. During the last four years Mr. Hutchinson also occupied the important position of chairman of the California Engineering Bureau. His work with the Journal of Electricity was greatly appreciated by the engineers and the public, as his knowledge of the technical aspects of the engineering field was acknowledged. He was known for his courteous, companionable, and capable approach to his work, and his presence in the industry was greatly missed.

F. C. Pratt

Francis Cole Pratt, a vice-president of the General Electric Company, died on Jan. 26 in New York at the age of 63. Mr. Pratt was graduated from the Sheffield Scientific School of Yale University in 1888, and from the General Electric Company for about twenty years. In December, 1924, having served previously as vice-president in charge of engineering, he was appointed vice-president in charge of manufacturing, to fill the vacancy caused by the resignation of General L. E. Emerson. With this appointment he also assumed the chairmanship of the manufacturing committee of the General Electric.

T. A. McCusker

Terrance A. McCusker of the sales department of the J. G. Brill Company, died suddenly in the Jefferson Hospital, Philadelphia, on Jan. 30. Mr. McCusker, more familiarly known as "Terry" to his many associates in the electric railway industry, was born on May 3, 1866, at Philadelphia. He graduated from Girard College, Philadelphia, in 1881 and joined the Brill sales department as a stenographer on Apr 3 of that year. During his long connection with the Brill organization, he served in various capacities and positions of responsibility. He possessed a remarkable memory, being steeped in the knowledge of the industry's history during his long identification with it, and quickly recalling the minutest details pertaining to the development of car design and equipment.

James A. Brock

James A. Brock, "Anderson's first citizen," is dead. Mr. Brock was 82 years old, a native of Anderson and one of the pioneer business men of Anderson, Ind. For more than 50 years he was president of the Bank of Anderson. Mr. Brock was instrumental in founding the city's water and light company and the electric railway system.

OBITUARY

The progress in rehabilitating and improving the system was a source of great satisfaction to him, and he was not slow in expressing this satisfaction, and giving credit to those who were responsible for doing the work. When he was able to do so, Mr. Taft visited the general offices and different parts of the property, showing his interest at all times.

C. P. Taft

Charles P. Taft, who died at his home on Pike Street, Cincinnati, Ohio, on Dec. 31 occupied an important place in the life of Cincinnati. His long connection with the local transportation system was fittingly recognized by the directors of the Cincinnati Street Railway in a memorial which recites the fact that while Mr. Taft's finances were important in the company, they were not very great compared with that in many other enterprises with which he was identified, he had been associated in one way or another with the local transportation companies for more than a quarter of a century. He was active in the work of organizing these companies, and not only retained his place as director, but kept his interest in their affairs up to the last.

Thomas Gerchert

Thomas Gerchert, long connected with the Interborough Rapid Transit Company, is dead. He was 86 years old. In October, 1867, a few years after he had been honorably discharged from the Federal forces in the Civil War, Mr. Gerchert entered railroad work with the West Side & Yonkers Patented Railroad, serving as road checker, bookkeeper and paymaster and later became a conductor on the original elevated in New York. In 1878 Mr. Gerchert was appointed assistant secretary and treasurer and held this post after the Manhattan Railway acquired control. He served as claim agent of the company until he was promoted to be general claim agent of the Interborough Rapid Transit Company in 1905. He served in this post until 1921, when he retired.

Walter Lee Frazier

Walter Lee Frazier, superintendent of carhouses of the Cincinnati Street Railway, Cincinnati, Ohio, died at his home in Walnut Hills on Jan. 8. Mr. Frazier joined the company on Nov. 9, 1904, as a foreman, became an assistant general manager in 1918 and was general manager of the department responsible for the carhouses in 1920. Later he was given full charge of the company's carhouses. The remains were taken to his birthplace in Marysville for burial.

A. H. Henry

A. H. Henry, formerly track superintendent of the Monroe Street Railway, Monroe, La., now the Monroe Municipal Railway, is dead.

Thomas Worthington

Thomas Worthington, 78 years old, for 35 years an active Wyandotte County Democrat and former chief claim agent for the Metropolitan Street Railway, predecessor of the Kansas City Public Service Company, died on Jan. 24.

Alfred C. Lee

Alfred C. Lee, for 26 years in charge of the line work of the Indianapolis & Cincinnati Traction Company and its successor, the Indianapolis & Southwestern Railroad, died in Shivelyville, Ind., recently, at the age of 66. Mr. Lee formerly represented Shelby County in the Indiana Legislature.

E. L. Sleeper

E. L. Sleeper, for fifteen years personal representative of G. J. Kuhrt, president and general manager of the Los Angeles Railway, is dead. Mr. Sleeper was a native of Marion, Ohio. A civil engineer by profession, he had been employed on a number of large engineering projects in the East and Southwestern States, including the Panama Canal work. From 1910 to 1913 he was city engineer of Pomona, Calif. In 1913 he became chief engineer of the Southern California Rapid Transit Co.'s outer harbor at San Pedro, a position he held until he joined the forces of the Los Angeles Railway.

Electric Railway Journal—March, 1930
Public Service of New Jersey Places Largest Bus Order

In order to take care of replacements, extensions and new business throughout its territory, Public Service Co-ordinated Transport, Newark, N.J., recently placed what amounts to the largest order for buses ever given by a single company. In the order, which will call for 338 buses, are 211 of the gas-electric type, to be used in city service, and 170 of the gas-mechanical type for the long distance intercity routes. The city-type buses will provide seats for 40 passengers, while the intercity buses will seat 30 passengers.

Of the total order 338 chasis are to be supplied by General Motors Truck Company, Public Service building the bodies for this type in their own shops. The Mack Company is to supply ten buses of the city and two part city type buses, and the White Company supplies eleven buses. American Car & Foundry Motors Company's order is for twenty complete Model 40 33-passenger de luxe type buses for service on the Morris County division. These buses are equipped with Hall-Scott 120-h.p. motors, are of 240-in. wheelbase, and are provided with a recently developed fresh air system of heating and ventilation. Seats are of the individual bucket type, upholstered in leather.

- Features in the new buses will include the elimination of wheelchair seats, improved ventilation facilities, exterior and interior lamps, sound insulator, equipment, shock absorbers and balloon tires. Engine horsepower is, on the average, heavier than the present standards on the property.

Twin Coach deliveries during the month include one parlor car to the Milwaukee Electric Railway & Light Company, two 21-passenger urban type coaches to the El Paso Electric Company, and three 21-

passenger urban type coaches to the Houston Electric Company.

American Car & Foundries. Motor Company reports the delivery of one 33-passenger urban type coach to the Poughkeepsie & Wappingers Falls Railway, and one 40-passenger gas-electric coach to the Brooklyn & Queens Transit Corporation.

Denver Tramway Company has received two White Model 65 buses. The White Company has also made delivery of four model 65 six-cylinder buses to the Community Transit Company of Toledo, Ohio, and one bus similar to model 29 of the Houston Electric Company.

Mack-International Motor Truck Corporation reports delivery of one Model BC 29-passenger city type bus to Denver Tramway Company, one 33-passenger city type bus to Winnipeg Electric Company, and four 29-passenger city type buses to Community Tration Company, of Toledo.

Multiple Coin Turnstile Developed

A new multiple coin device turnstile will be installed at each of the terminal stations, allowing passengers to pay for their fare or tokens through the same slot, then separate and record separately, has been brought out by the H. W. Alexander Company, automakers, of New York. It is now being exhibited at the Ohmer Fare Register Company display rooms, New York.

The turnstiles appear of safe, sturdy construction and provides rapid, easy operation. It was designed for traction systems, subways, elevators, steam roads, parks, concessions and theaters. It has no electrical connections, hence meets the market demand for inexpensive apparatus to buy and to operate almost everywhere.

The turnstiles will soon be placed in trial operation on one of the New York street cars.

ELECTRIC RAILWAY MATERIAL PRICES—March 1, 1930

<table>
<thead>
<tr>
<th>Item</th>
<th>New York</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>Copper, electrolytic, delivered, cents per lb.</td>
<td>18.00</td>
<td></td>
</tr>
<tr>
<td>Lead, ingot, delivered, cents per lb.</td>
<td>35.00</td>
<td></td>
</tr>
<tr>
<td>Nickel, cents per lb.</td>
<td>55.00</td>
<td></td>
</tr>
<tr>
<td>Tin, delivered, cents per lb.</td>
<td>39.38</td>
<td></td>
</tr>
<tr>
<td>Aluminum, delivered, cents per lb.</td>
<td>14.30</td>
<td></td>
</tr>
<tr>
<td>Glass, delivered, cents per lb.</td>
<td>2.65</td>
<td></td>
</tr>
<tr>
<td>Zinc, Electrode, delivered, cents per lb.</td>
<td>18.00</td>
<td></td>
</tr>
<tr>
<td>Steel, delivered, cents per lb.</td>
<td>1.80</td>
<td></td>
</tr>
<tr>
<td>Paints, Putty and Glass—New York</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Linseed oil (5 bbls., lots)</td>
<td>14.45</td>
<td></td>
</tr>
<tr>
<td>White spirit oil (100 lb., leaf)</td>
<td>5.25</td>
<td></td>
</tr>
<tr>
<td>Turpentine (bbl., bulk) per gal.</td>
<td>0.61</td>
<td></td>
</tr>
<tr>
<td>Putty, 100 lb. bucket, cents per lb.</td>
<td>5.75</td>
<td></td>
</tr>
<tr>
<td>Wire—New York</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Copper wire, cents per lb.</td>
<td>19.67</td>
<td></td>
</tr>
<tr>
<td>Paving Materials</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Paving stone, granite, 5 in., f.o.b. New York</td>
<td>$150.00</td>
<td></td>
</tr>
<tr>
<td>Wood, bleached pine, 3 in. treated, N. Y. per cord, f.o.b.</td>
<td>$150.00</td>
<td></td>
</tr>
<tr>
<td>Paving brick, 34 in., f.o.b. New York, per 1,000</td>
<td>$150.00</td>
<td></td>
</tr>
<tr>
<td>Crushed stone, 2 in. to 3 in., N. Y. per ton, f.o.b. Chicago, Ill.</td>
<td>$150.00</td>
<td></td>
</tr>
<tr>
<td>Cement, Chicago, in carlots, without sand, f.o.b. New York</td>
<td>$150.00</td>
<td></td>
</tr>
<tr>
<td>Sand, &amp;dirt, delivered New York</td>
<td>$150.00</td>
<td></td>
</tr>
<tr>
<td>Old Metals—New York and Chicago</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Copper, cents per lb.</td>
<td>18.00</td>
<td></td>
</tr>
<tr>
<td>Lead, delivered</td>
<td>2.00</td>
<td></td>
</tr>
<tr>
<td>Sheet iron, galvanized (24 gauge), cents per lb.</td>
<td>3.55</td>
<td></td>
</tr>
<tr>
<td>Galvanized wire, ordinary, cents per lb.</td>
<td>2.90</td>
<td></td>
</tr>
<tr>
<td>Waste—New York</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Waste, wood, delivered, cents per lb.</td>
<td>1.40</td>
<td></td>
</tr>
<tr>
<td>Waste, coal, delivered, cents per lb.</td>
<td>1.40</td>
<td></td>
</tr>
<tr>
<td>Colored</td>
<td>8.00</td>
<td></td>
</tr>
</tbody>
</table>

Westinghouse Closes Year with Large Orders

Westinghouse Electric & Manufacturing Company entered the current year with unfilled orders approximating $65,000,000, the largest total since 1921, and more than 40 per cent greater than at the beginning of 1929. On April 1, 1928, or almost two years, when the company's accounting was on the fiscal year basis terminating March 31, the backlog of orders amounted to $47,742,204.

Orders booked by Westinghouse since Jan. 1, last, have also shown an upward trend compared with the like period of 1929.

Westinghouse completed its best year of operations in 1929 with net income estimated in excess of $26,500,000, after all charges, or about $10 a share on 2,665,315 shares of combined preferred and common stocks outstanding. This would compare with $20,814,940 after charges, or $8.78 a share on 2,370,063 shares of combined stocks issued in 1928.

Fageol Companies Close Successful Year

In the first consolidated statement published by the Fageol Motors Company and the Fageol Motors Sales Company, Oakland, Cal., embracing the operations of the two companies, a net profit, before deduction of federal income tax, of $153,658 is reported for the year ending Dec. 31, 1929. Since this is the first statement issued in consolidated form, comparative figures for previous years are not available. Total sales during the year amounted to $3,971,888.

Ten Double-Deck Buses and 50 New Cars for Baltimore

The United Railways & Electric Company, Baltimore, Md., has ordered twelve additional double-deck buses for service on the Charles Street line. Delivery is expected within the next two months. The company also is negotiating for 50 or more new cars. These it hopes to have ready for use in the fall.

Large Order for Car Heaters

Electric heaters for the 300 subway cars for the New York Board of Transportation have been ordered from the Consolidated Car-Heating Company. The heaters are of the panel type, lightweight, double coil. There are to be 28 heaters per car.

Society Lubricants for B-M.T.

Contracts were closed on Feb. 1 by the Standard Oil Company, New York, to provide all the lubricating products required for the subway, elevated, surface railways, buses, power stations and shops of the Brielle-Manhattan Transit Corporation in Greater New York.
The Motorman's last line of defence . . .

Peacock
Reg. U. S. Pat. Office
Staffless Brakes

Are direct, emphatic, sure in action. Fast on the take up, lots of power, never clog with chain, no matter how slack the rigging may be. They stop cars when they are called into action.

National Brake Co., Inc.
890 Ellicott Square
Buffalo, N. Y.

General Sales Office:
The Elcon Co., 50 Church St., New York

Canadian Representative:
Lyman Tube & Supply Co., Ltd.,
Montreal, Can.
... "ILLINOIS" on a wrought steel wheel is more than a mark of identification. ... It means a wrought steel wheel produced by the best and most modern equipment. ... Expert supervision, careful workmanship and frequent inspection from wheel block to finished wheel all tend to produce multiplied mileage at low cost.

Our Wheel Engineers are at your service.

Illinois Steel Company
Subsidiary of United States Steel Corporation
General Offices:
200 South La Salle Street  ..  Chicago
A Comfortable, Sanitary and Modern Seat!

HERE is a seat which maintenance engineers will appreciate. Its close-woven cane webbing back and cushion are easy to keep clean. The genuine leather facing on the cushion reinforces the seat at the greatest point of wear. In addition, the individual backs and deep, spring cushions are shaped to allow proper posture and leg freedom. Mechanism rails are set in and the frame of the chair is made of selected Northern hard-grained ash, further strengthened by malleable iron braces. Write to the nearest Heywood-Wakefield sales office for complete details of the 327-M Special and other popular bus and electric railway seats in our line.

HEYWOOD - WAKEFIELD COMPANY

BOSTON, MASSACHUSETTS

If you have not received a copy of our new Bus Seat Catalogue, write for it.
BETTER PERFORMANCE for Truck or Tractor

Industrial tires that cut costs

ONLY the most painstaking analysis,—careful study of actual conditions under which industrial tires are operated,—made it possible for Firestone to design and produce exactly the RIGHT tires for trucks and tractors. Smooth, easy rolling for small current consumption. The toughest rubber known for long, even wear. Positive traction. And underneath a base capable of long, continued abuse or overload to which most trucks are so frequently subjected. It will pay you to equip your trucks or tractors with Firestone Solid Industrial Tires. Write or call the nearest Firestone Branch today for full information.
A Million Dollars ... a Day!

More Than 113,000 Cars and Buses Continuously Operating Over 70,000 Miles of Track and Bus routes

That’s what wears out units and uses up materials and supplies so fast that electric railways must spend more than a million dollars a day this year for maintenance, betterments and extensions.

Fourteen millions more than last year ... 28 millions more than the year before.

That’s what necessitates repair shops resembling modern factories ... in size and equipment.

That’s why maintenance executives find Electric Railway Journal so interesting and helpful, particularly the Annual Maintenance and Construction Number published each year in April.

And that’s why advertisers find that April issue such a splendid medium for reaching this big ... and growing ... market.

THE

ANNUAL MAINTENANCE NUMBER

of Electric Railway Journal

APRIL ISSUE

Advertising Forms Close March 19th
Aimed at the source

THE TIMKEN - DETROIT
of bigger revenue

There's one sensible, sure-fire way to attract and hold more riders—give them quiet, smooth, fast, dependable transportation; the kind of riding made possible by Timken Worm Drive.

LESS NOISE
LESS WEIGHT
FASTER SCHEDULES
LOWER POWER CONSUMPTION
LOWER COSTS OF MAINTAINING TRACK AND EQUIPMENT

these are the benefits that come hand-in-hand with

TIMKEN WORM DRIVE
TRUCKS

for electric railway cars

AXLE CO., DETROIT, MICH.
SEVEN MORE MACKS FOR THE PENINSULA TRANSIT CORPORATION

Virginia's largest bus operator studies them all, and again repeats on Macks
For five years, from 1919 to 1925, Peninsula plugged along with mediocre equipment.

But in 1925, the initial purchase of 4 Model AB Macks marked the turning point in the company’s career. Improved equipment resulted in more satisfied passengers. Revenue figures began to climb. Soon, old routes were extended and new routes established. In each case, additional Macks were purchased.

In 1929, Peninsula secured the franchise for through-schedule service from Norfolk to Richmond—a 92 mile run. For this, its newest and longest route, the company wanted nothing but the most modern equipment available. For weeks, various makes of buses were rigidly tested and studied from every angle.

And in the end, Mack was again the choice. Seven Mack Model BK six cylinder buses for long distance service were purchased, bringing the company’s total to 24. Past judgment had been confirmed by this latest analysis.

Some of the comfort features of these completely Mack-built buses . . . . .

- Full view windows — non-shatterable glass.
- Pneumatic shock absorbers.
- Mack rubber shock insulation.
- Reclining chairs — head rests and leather air cushions.
- Electric fans — hot water heating.
- Thermos ice water containers.
- Pullman card tables.

MACK TRUCKS, INC.
25 Broadway, New York, N.Y.
An “on time” record

THE 64 motorcoaches of the County Transportation Co., Inc., in Westchester County, New York, were operated 2,388,869 miles in 1929, with an “on time” percentage for the year of 99.90 per cent. This remarkable record on 237,347 trips through the crowded thoroughfares of New York City's most congested suburban territory reflects the remarkable efficiency of this Company's operation in which scientific Cities Service lubrication plus the use of powerful, clean burning Cities Service gasoline plays an important part.

This same scientific Cities Service lubrication is available to bus properties throughout the country.

CITIES SERVICE COMPANY
60 Wall Street
New York City

KOOLMOTOR PRODUCTS
over 2,388,869 bus miles

Company:
County Transportation Co., Inc.

Number of Vehicles: 64
Yearly Bus Mileage: 2,388,869
Number of Trips: 237,347

Cities Service Products Use:
Cities Service Gasoline
Koolmotor Bus Oil XX
Koolmotor Transmission Oil (Heavy)
Koolmotor Universal Grease (Heavy)
Cities Service Grease Guns
Makers of
Simplex Multiple Unit Clasp Brakes

AMERICAN
NEW YORK
Flats and shellouts cost money. They are a burden on revenue.

Such a situation is an unnecessary one. It is easily solved:

Davis "one-wear" steel wheels stay in service and out of the shop. The secret is in the material used in their manufacture. It is a special heat-treated composition steel . . . slow wearing and never needs re-turning.

Davis "one-wear" steel wheels have three outstanding qualities worth your investigation. They are: wear resistance, strength, lightness.

Eliminate the wheel re-turning items from your maintenance.
Why Consider the Cost of Lubricants?

Electric railway lubrication practices are changing. A new system of car lubrication has been developed and has effected striking economies.

Operating engineers now realize more than ever before that the cost of lubricants per gallon or per pound is such a negligible factor that it is entirely unimportant as compared to the possible savings in power, waste consumption, labor for repacking bearings, elimination of hot boxes and reduced bearing and journal maintenance cost. It is a new view point.

The Texas Company, always a leader in providing better lubricants and lubrication practices, has been foremost in bringing this about. The Texaco System of Lubrication, of which Texaco Lovis Oil and the Texaco Oil Seals are important elements, has demonstrated conclusively that power consumption and maintenance cost per car-mile can be substantially reduced. Write The Texas Company for the facts. A Texaco Engineer will gladly give you full details—or arrange for any desired test on your own lines.

Texaco

The Texas Company, 17 Battery Place, New York City

Offices in Principal Cities

Lubricants
Between five railroad stations and steamship wharves, the New Orleans Transfer, Inc., move passengers and baggage. They are the contract agents for all railroad and steamship companies, and they have a 57 year reputation to maintain.

On the whole fleet of this company, Goodyears have been the only tires used for several years. They supply the sure-footed traction which safety of passengers demands, they have the dependability needed to run a fleet rigidly on schedule. More tons are hauled on Goodyear Tires than on any other kind, and scores of experiences like this serve to emphasize the reason. Let a Goodyear Truck Tire Service Station Dealer recommend the right type and size of Goodyears to meet your needs with greatest economy.

MORE PEOPLE RIDE ON GOODYEAR TIRES THAN ON ANY OTHER KIND
more
YELLOWS
for
Public Service
Coordinated
Transport

... the 12th order for Yellow Coach from one of America's largest bus operators.

... the largest single order ever placed for coaches with an American manufacturer.
...this order brings the total number of Yellows owned and operated by the Public Service Coordinated Transport to **1762** —the largest standardized fleet of coaches in America.

...and not one Yellow Coach has ever been retired from active service.

The big new Yellow 150 Horsepower 616 engine will be used in each of the 338 coaches ordered and 160 of the coaches will be equipped with 40-passenger bodies. This order was placed on the strength of known performance of Yellow Coaches operated by the Public Service Transport. It is its eleventh repeat order since 1924, when the first Yellow went into the service of this operator.

---

**YELLOW COACHES**
STARTLING...yes, and true. Facts and figures gathered from seventeen years of actual installation under all conditions of traffic have proved conclusively that tracks using Dayton Ties require no major maintenance at all. Think what it would mean to your property if you could deduct the greater part of your maintenance of track and roadway account from your operating expenses. It would perhaps mean the difference between red and black, in many cases. Certainly it would mean a far greater return on your investment than is possible where expense of maintenance is out of all proportion to operating expenses. And remember this...Dayton Ties can be installed more cheaply than the cheapest track you ever built. Progressive engineers who are ready to accept only proven facts are invited to write for full information regarding DAYTON TIES.

★ VIBROLITION
A coined word denoting demolition of rail substructure through rail vibration. Dayton Ties prevent VIBROLITION.

"The Better Tie

THE DAYTON INTEGRAL SYSTEM OF THE DAYTON MECHANICAL
Dayton Ties recognize the fundamental law that you cannot hold a vibrating steel rail in a concrete structure without inviting its destruction under the vibration of traffic unless you protect the concrete from this force. And because Dayton Ties incorporate this exclusive vibration absorption element . . . in seventeen years they have yet to show the slightest failure under every conceivable condition of traffic.

Send for your copy of this book

What is this disease of modern track structures? Every maintenance engineer knows its destructive effect. This interesting book brings out the facts and points the cure. Your copy is waiting.

Without An Alibi”

TRACK AND PAVING STRUCTURE
TIE CO., - DAYTON, OHIO
BOOKS
PADS
STRIPS

INCREASED Revenue possibilities of tickets in books, pads and strips are:

1. Attractive price to the public, yet limited riding privileges;

2. Faster collection and less change making;

3. Guarantee a definite number of rides which the auto will not get;

4. Secure money in advance;

5. Spent more readily than money;

6. Salable advertising space on covers and backs.

We recommend the 25/32 ticket size. It saves stock and 125 lbs. shipping weight per million, makes a small book that fits the pocket or handbag safely, does not fill up small fare boxes on long runs, and costs less per thousand in large lots.

Which style shall we send?

Globe
TICKET COMPANY
112 North Twelfth Street
PHILADELPHIA
Now Available—
this 38 passenger City Service Coach

with the new Yellow 150 hp. engine. Capacity to handle maximum peak loads, meet difficult grade or traffic conditions, maintain fast schedules

with practically no increase in fuel consumption over engines of smaller displacement

with many new chassis improvements

with the safest, surest trouble free brakes ever developed for bus use, air operated

and

with entirely new type bodies of all-metal construction

with a service life equal to that of the chassis

with comfortable seats for 38 passengers or without rear exit door 40 passengers

with quick loading and unloading thru front and rear air operated doors

plus all the time proven, dependable qualities that have made Yellow Z models so popular in city service everywhere

New Type Bodies of All-Metal Construction (see next two pages)

Wheelbase 250 inches
616 Yellow overhead valve 6 cyl. 150 hp. engine
Rigid Z type frame with tubular cross members
Air operated clutch
4-speed transmission amidship
Full floating worm drive rear axle
4-wheel service brakes, air controlled with gun iron drums and easily removable brake liners
Balloon tires 40 x 9.75
Optional, Yellow Knight sleeve valve 100 hp. 6 cyl. engine

YELLOW

38 Passenger TYPE Z
A side post weighs 7 lbs. 8 oz. It is of forged aluminum, interchangeable with other posts in the body.

A cross section of the body shell showing how the roof, side posts, side sections and floor are joined.

Assembling the body shell. Side sections, ends and roof are assembled over a fixture.

Assembling a side section in a special erection jig. The side panels are of plywood.

Assembling the roof side posts in a special erection jig. The posts will join the section at the belt.
New Type All-Metal Bodies

More substantial, remarkably light, longer service life, simpler and more economical to maintain.

Standard on the Z29 and Z38

The new all-metal coach bodies developed by General Motors Truck are now in regular standardized production. They represent a truly outstanding development both in the art of modern coach body engineering and in efficiency of manufacturing method.

For these coach bodies are of (1) rigid all-metal construction (chiefly duralumin and other aluminum alloys) (2) remarkably light in weight, yet (3) amazingly strong, with (4) a service life equal to that of the chassis. And like the chassis, these bodies are (5) precision built of standardized parts and sections which not only fit as accurately as the chassis parts, but (6) are just as easy to stock and renew. Yet with all these advantages it (7) costs no more than you would expect to pay for any well-built body.

Advanced engineering plus modern day principles of mass production are responsible for this important achievement.

The body shell consists of six major all-metal sections; a top, two sides, a rear, a front and a floor frame. Each section in turn is made up of smaller standardized body units. Each of these units is formed and assembled over precision jigs and fixtures from die-cut, drop forged or machine-shaped metal parts. Absolute precision of fit such as is found in the building of chassis parts prevails from the first manufacturing step to the last. As the small body parts come from the big machines, cut-shaped or forged to a micrometer fit they are assembled over precision jigs and fixtures to make a body unit. These standard body units are next assembled over a master erection jig which draws each body unit under pressure into accurate position and alignment and the whole is then rigidly belted together to make a complete top, side or end. The body sections, top, sides and ends, are then assembled over a body fixture and rigidly bolted together with specially designed bolts with thin flat heads and quick detachable snap on mouldings to form the completed body shell. No rivets, no wood, no hand cutting, no fitting. An all-metal mass production job with avoidable labor operations eliminated and with manufacturing costs reduced to a minimum.

Because duralumin or other aluminum alloys are used wherever practical, the body is amazingly light. A lighter body means that heavier revenue loads can be substituted without increasing tire or gasoline costs. Being of all-metal construction it is exceedingly strong and enduring. It is fire resisting and safer. It contains no wood and will last longer. Its rigid metal construction successfully resists weaving, rattles and squeaks. It has much thinner wall sections and consequently provides more body and revenue area for a given over-all body width. The slender side posts of forged duralumin are much stronger than wood and have less bulk, providing greater window area and vision for passengers standing or seated.

Maintenance is greatly simplified. For the first time, standard body parts and sections are available that fit as accurately and easily as chassis parts. The number of different body parts has been greatly reduced; many are interchangeable and inventory requirements have accordingly been greatly reduced. In case of accident, damaged body parts, units or sections can be quickly and cheaply removed and replaced with unskilled labor. Because flat head bolts instead of rivets are used throughout, the work of replacing damaged parts has been facilitated and greatly simplified. There is no need for costly, time consuming hand fitting, shaping or riveting.

To make possible the many economic advantages of this new type all-metal body has necessitated an exceedingly large investment in special manufacturing equipment and tools—further evidence that General Motors Truck has confidence in the future of highway transport and will leave nothing undone to promote its progress and to keep pace with the specialized requirements of the industry.
A New Z29!

Type Z, nationally famous for its years of dependable and economical performance on many of America's largest city operations is now available with many new and noteworthy improvements.

The wheelbase has been lengthened to 225 inches to make more room for the larger but lighter bodies of all-metal construction recently developed by Yellow and described on the preceding pages.

This new body in addition to its many other unequalled advantages makes possible an unusually liberal seat spacing (31 inches) to provide a maximum of comfort for 29 seated passengers, or as an alternative arrangement this body is available with a rear treadle door and seats for 29 passengers or without treadle door and seats for 31 passengers.

Other improvements are greatly improved riding qualities, 4-wheel service air brakes, balloon tires and many other chassis refinements. The total weight has been reduced resulting in more effective power and greater economy.

In addition to the worthwhile improvements that have been built into this popular city service model its dependable performance characteristics, low maintenance cost and high earning power has been rigidly maintained.

GENERAL MOTORS TRUCK COMPANY, Pontiac, Michigan
Subsidiary of Yellow Truck and Coach Manufacturing Company

Body: All-metal construction
Wheelbase, 225 inches.
Engine, 110 horsepower 6 cyl. Yellow Knight
Frame. Rigid Z type with tubular cross members
Clutch. Manually operated
Transmission. 4-speed amidship
Axle. Full floating worm drive
Service brakes, 4-wheel air controlled with gun iron drums and easily removable brake liners
Dual fuel feed system
Tires. Balloon 40 x 9.00
Optional, 616 Yellow overhead valve 150 horsepower engine
"Brrrrr! . . . thank goodness, there's a warm-looking bus"

*Brightly lighted motor coach promises warm, comfortable ride . . . attracts patrons*

A comfortable ride means more than good springs. On these cold nights it means passengers can relax in a warm, cheery, brightly lighted interior . . . and read their papers with ease and comfort.

Modern coaches require modern lighting. Running lights must be powerful and well-focused . . . to stab the darkness and reveal curve and danger spot. Interior lamps must be bright and well-placed . . . to give fares reading comfort, to make their ride seem shorter. And the coaches that offer these get the business.

To insure proper lighting an adequate power plant is vital . . . a generator of the right capacity, backed by a dependable storage battery. You will find that scores of successful motor coach operators have chosen Exide Motor Coach Batteries as standard equipment for their fleets.

Exide Batteries are specially designed for their jobs. They are built by the world's largest manufacturers of storage batteries for every purpose and planned by skilled engineers. You can be confident that every Exide Battery will do its duty steadily, dependably and economically. Write for information on specially designed battery for motor coach service.

**Exide MOTOR COACH BATTERY**

**THE ELECTRIC STORAGE BATTERY COMPANY, Philadelphia**

*The world's largest manufacturers of storage batteries for every purpose*

*Exide Batteries of Canada, Limited, Toronto*
The Cleveland Railway Company Increases Its Timkenized Car Equipment 129% In One Year

Profitable operation of electric railway systems is largely a matter of keeping public patronage up and operating costs down.

Timken Bearing-Equipped cars are helping to do both by wiping out wear and waste and increasing passenger convenience and comfort.

The Cleveland Railway Company is one of the progressive street car organizations that are profiting by Timken benefits.

This company placed its first order for 78 Kuhlman-Brill Timken-equipped cars in 1928. In the latter part of 1929, 100 additional cars were ordered, bringing the total up to 178 cars, and representing an increase of 129% in one year.

Easier, jerkless starting and smoother running distinguish cars with Timken-equipped journals. The drastic reduction of frictional load substantially lowers the power demand and saves lubricant. Wear is held in leash. Maintenance costs sink to new low levels.

And with these advantages there is the nullification of radial-thrust loads, cancellation of out-of-service charges due to plain bearing maintenance and the extension of truck life ... through the exclusive combination of Timken tapered construction, Timken POSITIVELY ALIGNED ROLLS and Timken-made steel.

THE TIMKEN ROLLER BEARING COMPANY CANTON, OHIO

TIMKEN Tapered Roller BEARINGS
A new book of Modern practice

- Yours
for the asking

HELPFUL, practical facts and methods dealing with every phase of commutator insulation and assembly—the consensus of opinion of leading authorities—all given in detail in this new book. You will find it extremely useful—thousands of repairmen have. A copy is yours for the asking.

MICA INSULATOR COMPANY

Cleveland Pittsburgh Cincinnati Birmingham Seattle San Francisco
DURING the past 40 years, the name LORAIN has been identified with many important developments in track equipment. The Dixon Tongue Switch—developed by LORAIN—is a solid casting of manganese steel. In addition to the Tadpole Heel feature, the Tongue is held in place by means of the Heel Plate which is provided with a raised floor to carry the car wheels on their flanges over the tongue heel. This eliminates the usual pounding of wheel tread on heel of tongue in the trailing position.

The Heel Plate is made of heat-treated cast chrome nickel steel, which facilitates the building up of floor by electro-deposit welding. The hold-down bolts and nuts are sealed with asphaltum to exclude moisture. Write our nearest District Sales Office for quotation.
For more than forty years street car riders have made good use of the service rendered by the Collier car cards in the fulfillment of their daily wants. This is confirmed by the fact that successful merchants and manufacturers are consistent users of street car advertising as an assured means of increasing business.

Since the car cards are really useful to the daily riders, they become, in effect, a part of the electric railway service. And so, in proportion, they assume a value to the electric railway company above and beyond the fact that they are a reliable source of income.

BARRON G. COLLIER INC., CANDLER BLDG., N. Y. C.

"CAR CARD ADVERTISING ALMOST EVERYWHERE"
To keep daily service at the highest peak of efficiency means the elimination of delays or traffic tie-ups frequently caused by trolley poles failing to hold up in service. Reliable poles, therefore, are a good investment. Their selection should be based on design and tests that prove their fitness for the character of service in which they will be used.

NATIONAL-SHELBY Poles are designed with sufficient strength to meet all service requirements and yet not be of excessive weight. A special form of reinforcement at the proper place gives the pole great strength while the grade of steel used and a special heat treatment after drawing gives a high elastic limit and assures long life and satisfactory service.

In addition, every NATIONAL-SHELBY Trolley Pole is individually tested before it leaves the mill—a form of test that approximates actual service conditions. This type of test is especially important in that it minimizes the possibility of any defective pole being installed—thereby helping to cut the cost of trolley pole service before it begins. A description of this test and complete information about these poles will be sent on request.
For all Requirements of ALL Spray Painting Operations

The most efficient and economical spray-painting and spray-finishing equipment is that which embodies in the specialized outfit or installation for a particular industry, the most advanced knowledge gained in the service of all industries.

DeVilbiss spray outfits for finishing and finish maintenance of motor and electric transport units are made and installed especially for the place in which they are used and the methods employed by the user. And they also include efficiencies which can come only from a vast experience under widely varied conditions in the many industries where painting and finishing are parts of production or maintenance processes.

Look to DeVilbiss for Modernized
Spray guns of various types and sizes.
Pressure feed paint tanks and containers.
Spray booths, exhaust fans, and approved lighting fixtures.
Air compressing equipment.

Air transformers and accessories.
Air and fluid hose and connections.
Complete outfits from the smallest hand-operated units to the largest industrial installations.

Your painting, finishing or ventilating problems may be peculiar to your own methods, materials and arrangements, but you will find that DeVilbiss has the equipment and the experience that assure the maximum advantages to you.

DeVilbiss engineers are working far in advance of the usual requirements of manufacturing and maintenance finish operations. Those who come to DeVilbiss obtain immediately the knowledge and the equipment which otherwise they would reach only through long and often costly experiment. It costs you nothing to learn what we can do for you.
Prospectors of 1930 find nuggets under the hood

Nearly a century ago, a rainbow flashed across the American skies, arching down into the newly discovered pot of gold in Sunny California. Later the rainbow moved behind Chilkoot Pass and lured hardy, eager men to the Yukon country.

Again it was the Transvaal... South America... Australia.

Today, the prospector of old has become a symbol of a bygone era. But 1930 has his counterpart... and needs his tireless spirit. The prospector of 1930 is uncovering hidden sources of profit in the operation of his busses... is achieving ways to increase net earnings even when gross operating income remains stationary.

For such men, the engineers of the Shell Petroleum Corporation have a message, a promise of help through the introduction of Shell Applied Lubrication. These engineers are at your command. If you feel the need for skilled counsel to help you eliminate losses due to less-than-100% lubrication, please feel free to call on the Shell specialists. There is no cost or obligation in a frank talk with them. And they will gladly come in response to a phone call or a letter directed to the nearest Shell office.

Shell Petroleum Corporation, Shell Building, St. Louis.
150,000 miles over mountainous roads without overhauling . . .
Take a look at the record that A. C. F. buses have run up in Yosemite Park!

Mr. Edwin T. Huffman, manager of the Yosemite Transportation System, writes that two of the A. C. F. buses in his company's service have given 150,000 miles service each without overhauling. More than this, he says that now, after their first overhauling, they seem as good as they ever were, both in appearance and the service they give.

The run of the Yosemite Transportation System through the mountainous Yosemite region covers roads that give a bus a good beating if it isn't built for them. It takes real stuff in a bus to stand up under the continual grind.

But that's the way A. C. F. builds every bus for you. All A. C. F. buses are built out of the finest materials we can lay our hands on . . . but there is a lot more than that to say for them. They are built by men who know buses . . .
who know the things you absolutely must have in a bus to meet your operating requirements. As a result, A. C. C: buses are built both for you and your patrons. They are built to answer the problems of your business . . . to give you dependable steady service, low running cost, long life, and absolute safety to your riders. They are built to give your riders the things that they demand from you . . . speed, comfort and luxury.

There's a business combination that simply can't be licked!

Here is a single example for you . . . the new Model 85 small capacity coach—a real bus, without a single adapted unit in the whole job brought over from truck or passenger car practice.

Every unit of the Model 85 coach is designed expressly for bus service. It has a smooth, powerful bus engine that will give you a high gear acceleration, from 10 to 25 miles per hour in only 15 seconds, which means high torque at low engine speeds, with power for acceleration right where you want it! The clutch . . . the transmission and drive line . . . the brakes . . . the
heater, which complies with all state requirements. Every one has been designed expressly for bus service. And every part and every unit has been designed and built so that it is oversize and stronger than it needs to be for the work it is called upon to do.

You can have Model 85 in either of two body types: a 21 passenger parlor coach, with plenty of seat room and comfort for 21 full grown people, or a 21 or 23 passenger street car.

We will gladly send you more complete details on this model. Won’t you write for them today?

**URBAN COACH**

**PARLOR COACH**

AMERICAN CAR AND FOUNDRY MOTORS COMPANY
30 CHURCH STREET — NEW YORK CITY
Fluted Steel Poles
Point the Way to Economy

Since the first installation of heavy duty Union Metal Poles, utilities have been quick to realize the economies which this type of equipment affords. Here are some of the reasons why Union Metal Poles will save money for you when used for almost any type of overhead service.

Long life. The pressed steel construction of Union Metal Poles assures much longer life than that of ordinary poles.

Fewer poles are required. Their strength permits heavy loading and the carrying of many different types of services.

Their ornamental appearance is such that property owners make no objections when the poles are installed on residential streets.

Replacements or repairs are economical and speedy.

Union Metal construction insures you of 100% salvage of the poles in case of removal. These are all money saving factors. If you would like to know the complete Union Metal Story, write one of the offices listed below.

The Union Metal Manufacturing Co.
General Offices and Factory: Canton, Ohio
Sales Offices: New York, Chicago, Philadelphia, Cleveland, Boston, Los Angeles, San Francisco, Seattle, Dallas, Atlanta
Distributors
Graybar Electric Company, Inc.
General Electric Supply Corp.
Offices in all principal cities

Union Metal Distribution and Transmission Poles
Are you receiving
The Electric Railway Journal NEWS?

—the Newspaper of the Electric Railway Field

When Electric Railway Journal was changed from a weekly to a monthly magazine, electric railway men everywhere asked us to continue to supply the current news of the field.

For that reason, a supplementary service was started, known as the Electric Railway Journal NEWS. It appears as a separate newspaper on thirty-nine Saturdays during the year. On the other thirteen Saturdays, the magazine itself appears with current news.

The Electric Railway Journal NEWS keeps its readers posted on court decisions . . . recent bus developments . . . current legislation enacted concerning electric railroads . . . changes in fare rates . . . news of purchasing activities . . . financial and corporate notes . . . editorial interpretation of vital news . . . personal items on men in the field. This newspaper constitutes the most complete guide to new developments in the field.

Subscription price is low—only $2 for the complete year's service of thirty-nine issues. Foreign rate, $4 annually. Sold in combination with the monthly edition of Electric Railway Journal for $5 a year, domestic rate. Send no money now—simply fill in and mail the coupon today!
Bond Performance

One of the advantages of buying American Steel and Wire Company Rail Bonds is the assurance you will have of dependable performance. The reason is materials, design, and construction. Our experience has been of the kind that is worth money to you in Bond performance.

The AB-2 Bond is easily and quickly applied with a steel electrode. The open shape of this Bond terminal is especially desirable since the arc can be directed freely at the junction of the terminal and the rail.

Would you be interested in inspecting a sample?
"OBsolete!" says the engineer who glances at the old-time Pfannkuche Alternator shown above. Obsolete, maybe, but nevertheless a monument to the early days of electric power that mark the beginning of a new civilization.

When this old A.C. Generator was new, National Carbon Company, Inc., already was a vital factor in the development of electrical equipment. Its efforts in consistently improving the quality of carbon brushes made possible persistent headway in motor designs.

The Pfannkuche Alternator was belt-driven and the frequency very inaccurate. But it served its purpose. With the increasing use of electrical power came the standardization of frequency and the development of large central power stations. Then super-power systems came into being. These required, at times, the bringing together of 25 and 60 cycle systems. The link between them is today's frequency-converter. Three frequency-converter sets are shown as they appear in a modern substation.

The coming years will see increased progress. And as greater turbines whirl in response to increasing demand, National Pyramid Brushes will continue to play the important part they have played up to now.

NATIONAL CARBON COMPANY, INC.
Safety...above all

Electric railway executives are realizing the many advantages of the Bethlehem Wrought Steel Wheel...its adaptability to today's severe traffic conditions...its ability to eliminate costly delays, due to slid-flats, shelled treads and broken flanges...the many thousands of miles of trouble-free service that it gives...and, above all, its safety!

The Bethlehem Wrought Steel Wheel has the strength, endurance and wear-resistance to stand up and deliver exceptional mileage under these severe traffic conditions. Five distinct forging and rolling operations are required to make a Bethlehem Wheel. The forging gives the metal toughness, and density; the rolling establishes a uniform grain structure throughout the wheel, virtually eliminating crystallization and reducing to a minimum the possibility of breakage.

In addition Bethlehem Wrought Steel Wheels have a liberal margin of safety. No wheels made by ordinary methods approach the high standard set by this type of wheel. That is why so many electric railways are turning to Bethlehem Wrought Steel Wheels. Your inquiry will receive prompt attention. Write today.

BETHLEHEM STEEL COMPANY
General Offices: Bethlehem, Pa.
District Offices: New York, Boston, Philadelphia, Baltimore, Washington, Atlanta, Pittsburgh, Buffalo, Cleveland, Detroit, Cincinnati, Chicago, St. Louis.
Pacific Coast Distributor: Pacific Coast Steel Corporation, San Francisco, Los Angeles, Portland, Seattle, Honolulu.
Export Distributor: Bethlehem Steel Export Corporation, 26 Broadway, New York City.

FORGED AXLES: Extreme care is exercised in the manufacture of Bethlehem Axles. Special heat treatment gives them ductility and a high elastic limit. And they give excellent service under severe torsional stresses.

BETHLEHEM
Wrought Steel Wheels
"Our 26 Coaches will exceed a Million Miles in 1930 on Goodrich exclusively"

Mr. F. M. Temple, Assistant Manager of the Interurban Transit Lines, Incorporated, (operating the "Short Way" Lines) and well known in Bus circles, makes the following comments regarding Goodrich Tires:

"Our twenty-six coaches which operate out of Toledo are equipped 100% with Goodrich Tires.

"During the year of 1929 our fleet covered in excess of 1,000,000 miles and we expect to exceed 1,200,000 miles in 1930 for our entire operation.

"We are pleased to state that during the last four years in which we have used Goodrich Tires exclusively, we have had every reason to be satisfied not only with the tires, but with the fine spirit of service and cooperation rendered by your local Branch and the factory."


7 Superior Specifications
BUILT INTO EVERY HEAVY DUTY SILVERTOWN

1. Heavily insulated stretch-matched cords.
2. Additional adhesion — from greater insulation between outside plies.
3. Heavy twin beads for better rim seating.
4. Extra gum fillers between plies for longer tire life.
5. Heat-resisting, interlocking cord breakers.
6. Tread designed correctly for heavy duty service.
7. The whole tire toughened by the famous Goodrich "water cure."

Goodrich HEAVY DUTY Silvertowns

SPECIFY GOODRICH ON YOUR NEW BUSES
A NEW HEAVY DUTY DESIGN

FOR BUSES TRUCKS AND TRACTORS

LONG MANUFACTURING COMPANY
DETROIT, MICHIGAN
SALES BILLED
Camden Electrical Division Only

We are making progress—

AMERICAN BROWN BOVYERI
LET US SHOW YOU
how costs modernizing with DODGE BROTHERS
are lowered by Dodge Coaches

High costs give way to lower costs when old equipment is replaced with modern Dodge Coaches

Operators, large and small, are fast coming to the sound realization that many a motor coach is too old to run economically. High operating cost, high maintenance cost and the discouraging of patronage with obsolete equipment—all are making stealthy inroads on investment returns.

Operators, large and small, are likewise finding in modern Dodge Brothers Motor Coaches the very qualities they need. These attractive coaches enable them to provide safe, comfortable, dependable service at a lower cost of operation and maintenance.
Low maintenance costs assured

CHASSIS: clean, sturdy and simple in design—easily accessible. Note absence of complicated brake linkages, rods and cables.

RADIATOR: honeycomb type; shutter controlled from driver’s seat. Water-temperature indicator on instrument board and thermostat in engine provide additional temperature control for economical operation.

TRANSMISSION: heavy-duty type with four speeds forward. Built to withstand the constant gruelling service demanded by bus operators today.

STEERING: easy, quick and certain, is insured by the sturdy nut and lever steering gear. Simplicity and rugged design make maintenance negligible.

REAR SPRINGS: 3-stage, progressive type, provide surpassing riding comfort. Flexibility, without sacrifice of strength, is assured with varying loads by the progressive action of each of the three spring sections.

BRAKES: safe, 4-wheel hydraulic with American Brakeblok linings and gun iron drums. Large, certain-in-action, long-wearing, require but the minimum of periodic attention.

ENGINE: Dodge Brothers 6-cylinder, furnishes a smooth flow of power. Designed and built with special thought to the needs of users who seek simplicity, economy and long life.

CRANKSHAFT: of the 7-bearing type weighs 69 pounds; total projected bearing area 28.36 sq. in.

Weigh well the importance of these and other chassis refinements such as oil filter, air cleaner, gas filter and crankcase ventilator. They help to lower maintenance costs.
GOOD WILL IS IMPORTANT—DON'T RUIN IT WITH FUMES

Good will is important to any business . . . it is a priceless asset to the transportation company. If your motor coaches are releasing objectionable fumes . . . if they are gassing pedestrians and potential patrons . . . they are seriously endangering good will and your business.

The sulphur and impurities that are present in many fuels and lubricants, are a major cause of obnoxious combustion odors. Red Crown Gasoline and Polarine Motor Oil, highly refined, pure and practically free from sulphur, do not produce these stifling combustion odors.

As a motor fuel Red Crown ranks at the top, giving power, mileage, economy. Polarine is pure and rich, supplying thorough, efficient lubrication to the motor. Working together they give that perfectly balanced performance which insures dependable service and low cost operation.

A test will convince you that Red Crown and Polarine form an ideal combination for your motor coaches.

STANDARD OIL COMPANY
(INDIANA)

910 S. MICHIGAN AVE.       CHICAGO, ILL.

Chicago       Detroit       Grand Rapids       Joliet       Mason City       Saginaw

Davenport      Duluth       Green Bay       Kankakee City       Stockton

Decatur        Evansville    Huron          La Crosse        Pecor

Des Moines      Fargo        Indianapolis      Marshfield       Peoria

RED CROWN GASOLINE

Polarine MOTOR OIL

STANDARD OIL COMPANY
(INDIANA)

910 S. MICHIGAN AVE.       CHICAGO, ILL.

Chicago       Detroit       Grand Rapids       Joliet       Mason City       Saginaw

Davenport      Duluth       Green Bay       Kankakee City       Stockton

Decatur        Evansville    Huron          La Crosse        Pecor

Des Moines      Fargo        Indianapolis      Marshfield       Peoria

RED CROWN GASOLINE

Polarine MOTOR OIL
Through the years,

METAL & THERMIT

PITTSBURGH  CHICAGO  BOSTON  120 BROADWAY
Back in 1905 this Company was formed to produce and sell Thermit in the United States. And because this process of welding was sound, and because its product has always been good, this Company has grown and prospered. Long time service is the real test of any product or process. Thermit Welds are permanent. They last as long as the rail itself. Cars are still operating over Thermit Welds which we made eighteen years ago. It was called "Thermit" then and it bears the same honorable name today. Although basically the same material, Thermit has been greatly improved by better control of the raw ingredients and the processes of manufacture, thus insuring the best possible product with absolute uniformity. Furthermore the methods of Thermit welding have been perfected and simplified. The Metal & Thermit Corporation has achieved its present size and prestige only by a continuous policy of research, study and improvement in its welding method. When you buy from the Metal & Thermit Corporation you are buying more than merely bags of material. You are buying engineering service. You secure the benefit of experience gained on many other properties. You have a guarantee of a satisfactorily completed job. We are not satisfied until you are.
Does advertising schedule have anything to do with sales?

Yes, according to the experience of Manufacturer Smith whose sales staff from top to bottom is advertising minded. Smith's schedule has been consistently maintained over a period of years in every issue of two McGraw-Hill publications.

Yes, according to the experience of manufacturer Brown whose sales executives are not so advertising minded. Brown's schedule in the same publications was consistent up to a certain point and then sharply curtailed. He believed that product quality would take care of most of his future sales.

Printers' Ink says succinctly: "The way to make money by using advertising is to use it—not to fiddle with it." Do not these two experiences from the industrial field endorse this as something stronger than theory?
LOOK at the terminal on the Type E A S Erico Brazed Bond! It took 30,000 pounds to shear it from the rail—and observe the area of copper left on the rail. Ask yourself if even the most severe service is apt to knock an Erico Bond loose.

Erico Bonds stay on the job, provide lasting, low resistance bonding. They can be applied in 60 seconds per terminal, with results shown in the unretouched photo above. Application is practically automatic. A few simple rules in operating the welding furnace and the bonder will secure uniformly good results.

The heat of application is not injurious to the rail structure and is so low that the entire process of application may be watched by the bonder with the naked eye.

E A S Brazed Bonds can be applied to standard or heavy beaded splice bars. Let us aid you in selecting the bond to fit your rail joint. Address

The Electric Railway Improvement Co.
2070 E. 61st Place
Cleveland, Ohio

ERICO
RAIL BONDS AND BONDING OUTFITS
Equipment for Today's Traffic

In today's heavy traffic—increased wheel mileage with lower maintenance cost, can be obtained in "Standard" Wheels.

Durability, increased wearing qualities and safety are forged and rolled into "Standard" Wrought Steel Wheels.

STANDARD STEEL WORKS COMPANY

PHILADELPHIA, PA.

Products
Steel Axles
Steel Springs
Armature Shafts
Rolled Steel Wheels

WORKS: BURNHAM, PA.

SALES OFFICES:
New York  Chicago  St. Louis
Richmond  Portland
San Francisco
years of Satisfaction + Economy with Socony Regular Gasoline

The fourteen buses of the Interstate Street Railway Company run between Attleboro, Mass., and Providence, R. I., and are also chartered for special jobs. They have been fueled exclusively with Socony Regular Gasoline for four years.

Operation has been so economical and satisfactory that this company has never switched to any other brand of fuel.

Socony products offer the logical solution to all gasoline and motor oil problems. Not only do they increase performance, but also their use lowers operation costs.

Join the ranks of fleet owners who use Socony Gasoline. Once you have tried it, you will find no reason to change.

SOCONY
Gasoline  Special Gasoline  plus Ethyl
Motor Oil  Aircraft Oil

STANDARD OIL COMPANY OF NEW YORK
Don’t Neglect Your Seats!

If they are right your service and revenues will increase, wrong and the passenger will leave your bus with a feeling of relief. You want satisfied customers not passengers who regret every riding minute.

Don’t neglect your seats.

General Leathers for seat coverings can help you make satisfied customers. They are soft and comfortable, clean easily with soap and water, and will not get sticky in any weather. Attractive to the eye, fast in color, it’s a pleasure to ride on General Leathers.

Hides are furnished in all sizes and colors.

On quantity orders, we cut directly from your patterns to eliminate all waste.

Experience on bus work has proved that General Leathers do a 100% seat covering job.

Our Specialties which we recommend for this purpose:

Majestic Full Grain Leathers
20th Century Spanish Leathers
Genesco Leathers
Salon Hand Buffed Leathers

Write for samples. Specify General Leathers on your next orders for Electric Cars, Buses and Taxi Cabs or when you overhaul your seat coverings.

GENERAL LEATHER COMPANY
Makers of Famous Tried and Proven “00” Leathers
NEWARK, N. J.
Here is an unusual "small capacity" coach—Every single part and unit has been designed expressly for bus service! A TRUE BUS!
This new model 85 passenger coach is not a rebuilt passenger car nor a rebuilt truck! There is not a single unit in the whole job that has been brought over from passenger car or truck building practice.

A.C.C. has spent years in the study of the problems of coach transportation, and realizes very thoroughly that a bus must be designed... every part of it... FOR BUS SERVICE!

Model 85 is a bus in every sense.

It has a BUS engine — a flexible, dependable, economically operated 6-cylinder power plant designed especially to meet the requirements of motor coach transportation. It is an engine that will give you a high gear acceleration from 10 to 25 miles per hour in only 15 seconds. This means high torque at low engine speeds — power for acceleration right where you want it!

Every other part follows this right out . . . there's a BUS clutch, a BUS transmission and drive line, BUS brakes, and an efficient heater complying with all state requirements, as standard equipment.
Every part has been designed so that it is oversize, and stronger than it needs to be for the work it has to do. You can check every one of them, and you'll find that in every case, the parts of this Model 85 bus are heavier, larger and stronger than standard practice for a bus of this capacity and weight. Model 85 is built for steady, hard service and with ordinary regular maintenance there is not the slightest possibility of failure of any of its units because of too-small or too-weak parts!

You can choose either of two types, depending upon your requirements in the service you are offering:

A 21 passenger parlor coach, with plenty of seat room and comfort for 21 fullgrown people.

A 21 or 23 passenger street car.

You can count upon maximum value from this new Q. C. F. model, for Q. C. F.
has taken care in every step of its designing and building to be sure that you get it!

We will be glad indeed to send you more complete specifications and details of this model. Why don't you write today?
Three long established electrical materials
every railway can use to advantage

TRANSITE . . . ASBESTOS EBONY . . . ELECTROBESTOS

These three Johns-Manville products are all proving their
greater efficiency and added economy in an increasing number
of applications on the electric railway car. For many years these
durable materials, formed in combination with asbestos, have met
the needs of the Electrical Industry for insulating panels and parts,
for arc barriers or wherever high dielectric strength and fire-
proofness are required.

J-M Asbestos Ebony is particularly well suited for electric in-
sulating boards, spacer bars, panel boards and in many other
instances where there is need for a board form of dielectric insula-
tion. This rugged material, supplied in sheets or in moulded forms,
is moisture-proof and will not warp or crack.

Wherever there is need for a highly efficient fireproof board,
Electrobestos and Transite offer ideal materials for insert pieces on
arc chute boxes, finger flash shields, circuit breaker boxes or any
place where there is an exposed arc to capture. They are light in
weight and easily handled and can be cut almost as readily as wood
to fit any desired shape. Electrobestos is usually supplied in moulded
form for convenience.

J-M Engineers will be glad to suggest the use of these low cost
materials where they can do a job competent to meet the require-
ments of higher voltages and the demands for quicker service. Fill
out the coupon for further information.

A typical J-M Arc Chute Box of Asbestos Ebony and Electrobestos

Johns-Manville
SERVICE TO TRANSPORTATION

J-M Friction Tape
...another J-M Product
J-M Friction Tape has a
reputation earned by giv-
ing years of satisfactory
service. Woven from se-
lected sheetings, impreg-
nated with an insulating
compound and coated with
a high grade adhesive rub-
ber composition, it pro-
vides a safe covering for
exposed wires.
“Union” Signals Speed Traffic on P.R.T.

Philadelphia's newest high speed transit system, the Broad Street Subway, has been signaled by the Union Switch and Signal Company. This is a four-track structure having six interlockings in its seven-mile length. Trains are operated on close headway at the peak hours.

Our specialists are at your service without obligation.

1881 Union Switch & Signal Co. 1930
Swissvale, Pa.

Commonwealth

This truck stands the gaff of high-speed interurban service!

It's a Commonwealth Motor Truck. And the long service it gives at remarkably low maintenance has made it standard with many of the most progressive railways.

General Steel Castings Corporation
Commonwealth Division
Granite City, Illinois
INTERLOCK feature permits centralized operating responsibility... prevents opening of doors before car stops, or starting of car before doors close... and causes an emergency brake application if controller handle is released due to motorman's negligence or disability while car is in motion.

SAFETY CAR DEVICES CO.
OF ST. LOUIS, MO.
Postal and Telegraphic Address:
WILMERDING, PA.
CHICAGO  SAN FRANCISCO  NEW YORK
WASHINGTON  PITTSBURGH
Electric Railways to Spend 371 Millions This Year

Based on an Investment of More Than 5 Billions
... a Gross Revenue of Over a Billion ... and
the Highest Net Income They've Ever Made

THE electric railway companies
are budgeted to spend $371,-
220,000 during 1930 ... more
than a million dollars a day.

For new equipment and maintenance
alone, they expect to spend $251,-
530,000, an increase of more than
15 millions over 1929 ... more
than 25 millions over 1928.

It is significant that not only the
totals, but the appropriations for
each account are increasing. This
can only indicate that the mainte-
nance standards of the railways are
being steadily raised.

Increasing net profits, expanding
bus operations, favorable track re-
adjustments, larger purchases of
rolling stock ... all reflect the
great improvement in the financial
situation. Nearly 1,500 new cars
were purchased, and a larger num-
ber of old cars scrapped than ever
before, in 1929.

Electric Railway Journal's "Main-
tenance Contest" will be continued
in 1930 for the fourth successive
year, in cooperation with the Ameri-
can Electric Railway Engineering
Association. These contests have
aroused widespread interest in main-
tenance practices. Each year has
produced an increasingly large num-
ber of competitors, nearly 200
having submitted suggestions for
improved maintenance in 1929.

THIS YEAR, THEREFORE, the editorial pages, will have special signi-
ificance ... the advertising pages extraordinary value ... in

THE
ANNUAL MAINTENANCE NUMBER
of Electric Railway Journal
APRIL ISSUE
Advertising Forms Close March 19.
where Air improves service to the customer, in 8 ways

Dependable, economical air power is a vital factor in servicing the customers of a large office building.

Air assures water supply to the topmost stories. It controls furnace dampers, opens and closes elevator doors, operates doctors', dentists', jewelers', and barbers' equipment, ejects sewage. Eight tasks or more, are done by air for many modern office buildings.

For this service, as well as for factory service—trouble-free, automatic operation has made Sullivan single stage belted compressors popular.

Details of the Sullivan “WG-6” Compressor

Short belt drive, automatic control, sweep-control unloading, splash lubrication, Wafer Valves, rugged construction, ample bearing areas, water jacketed cylinders and heads, continuous economical service.

Capacities 68 to 500 cubic feet per minute. Catalog 83-I.

ANY of your highway crossings can be a “dead man’s” crossing—but none of them will have that expensive reputation if they’re protected with Nachod Highway Crossing Signals.

Durable and dependable, Nachods operate day and night. The powerful warning lights can be seen at a distance—combined with the vibrating bell, they give your crossings the best possible signal protection.

For more than a few properties, this economical highway crossing protection has paid profits. Write for details.

Nachod Spells Safety

Not alone on your crossings but throughout your system NACHOD equipment can spell safety. On those properties where accidents are the lowest you’ll find NACHOD protecting life, property and equipment—saving untold dollars—contributing to uninterrupted service.

NACHOD & UNITED STATES SIGNAL CO., Inc.
LOUISVILLE, KY.

WE ALSO MANUFACTURE: Turn-right Signals, Signals for Single and Double Tracks, Stub End Signals, Annunciator Signals, Headway Recorders.
GOOD SHOES are now imperative

Among the several improvements to trolley cars that permit faster operation in urban service are more powerful and quicker acting brake systems. They make great savings in time by increasing the rate of deceleration.

But the increased load on the brake shoes must be considered. The high speed, heavy pressures and quick application soon break down ordinary brake shoes. In this heavy duty service Diamond-S brake shoes are imperative. With their steel backs and expanded metal sinews holding them together, they maintain their full braking efficiency until worn to the limit.

The full economy of modern braking equipment cannot be realized unless Diamond-S brake shoes are a part of it.

The American Brake Shoe and Foundry Company
230 Park Ave., New York
332 So. Mich. Ave., Chicago

A complete manual covering generation, transmission and distribution of electricity

Here is a survey of the entire electric system. It meets an immediate need in the daily work of central station operators, draftsmen, inspectors, linemen, substation employees and students of electrical engineering.

ELECTRIC SYSTEM HANDBOOK

1131 pages, 5 x 8 inches, fully illustrated $5.00 postpaid

This book is the combined work of eight well-known engineers—each a specialist of wide reputation—and under the editorship of Clarence H. Sanderson.

Authentic and useful information is given on the fundamentals of electricity—generation—transformation—transmission—switching—trouble shooting—installation and inspection of wiring and equipment—etc., etc.

Section Headings
4. Motors.
5. Generating Stations.
6. The Transmission System.
7. Alternating Current Substations.
8. Railway Substations.
10. Distribution.
12. Inspection and Maintenance.

See this book for 10 days FREE!

Nothing can convince you of the value of this book as the book itself. Examine it—put it to work—study it—for 10 days without cost or obligation.

Fill out, clip and mail this Coupon!

McGraw-Hill FREE EXAMINATION COUPON


You may send me a copy of Sanderson’s Electric System Handbook for 10 days free examination. At the end of that time I agree to remit the price of $5.00 or return the book postpaid.

Signed ____________________________

Address ____________________________

City and State ____________________________

Official Position ____________________________

Name of Company ____________________________

(book sent on approval to retail purchasers in U. S. and Canada only.)
A New WHARTON Contribution to the Industry

The Wharton Flexible Wall Switch has a heel tightening device based on the principle of a split collar. By means of a bolt the wall is flexed or drawn in until it hugs the tongue heel; thus all play caused by wear is taken up. The nut of this bolt is located in the drain box and is readily accessible.

The tongue pin is 9½" in diameter and 6" deep. This construction eliminates a holding-down device, prevents kick-up and forward movement of the tongue.

Maintenance costs are lower on New WHARTON Crossings.

Send for bulletin 1 C.

William Wharton Jr. & Co. INCORPORATED
Easton, Pennsylvania

Pittsburgh SALES OFFICES: Chicago
Houston New York San Francisco Boston
Montreal Philadelphia Los Angeles Scranton

SYNOPSIS of A Long INDUSTRIAL STORY

For over thirty years the merits of brick pavements have made them first choice with electric railway officials for the paving of track areas.

For engineering data, write National Paving Brick Manufacturers Association, National Press Building, Washington, D. C.

Vitrified BRICK PAVEMENTS
We roll the mileage in—you roll it out

The process by which Carnegie Wrought Steel Wheels for interurban and city service are manufactured assures high resistance to the wear and tear of modern traffic conditions. A 10,000 ton hydraulic press imparts to the steel a homogeneous structure, free from irregularities that might cause failure. Then the wheel is thoroughly rolled, further refining the wearing surfaces. Mileage is forged in and rolled in—extra mileage that makes Carnegie Wheels the outstanding value in the wheel market today.

In city service these wheels have an added advantage in that cars may be speeded up with safety over crossings, with less possibility of damage to special track work.

Before you invest, investigate the many advantages of Carnegie Wrought Steel Wheels. Catalogue on request.

Carnegie Steel Company, Pittsburgh, Pa.
Subsidiary of United States Steel Corporation
STRONG TO BEAR BURDENS—LIGHT TO MOVE

\[ E = \frac{MV^2}{2} \]

ALCOA ALUMINUM

“FAST BECOMING A LOGICAL ECONOMIC FACTOR IN STREET CAR CONSTRUCTION”—SAYS THE J. G. BRILL COMPANY
Profit replaces loss when pay-load replaces dead-load

A 30% reduction in non-pay load has turned losses into profits for street car companies. Such an amazing slash in dead-weight is possible through the use of the light, strong Alloys of Alcoa Aluminum.

In this 2-page advertisement we show 4 actual examples of cars, built by The J. G. Brill Company, employing Alcoa Aluminum:

On page one we show an example of a production car built on the master-unit principle by The J. G. Brill Company. Cars of this type are operated in Lynchburg, Virginia.

Above (in center) is the Brill 4-Wheel Unit Car using Alcoa Aluminum Alloys, applied to the standardized design of the Third Avenue Railways, New York.

Above (lower left) is the Brill Electric Coach; the ultra modern version of the old trackless trolley, using Alcoa Aluminum and its Alloys for practically all metal parts.

Above (lower right). An Alcoa Aluminum Brill Master Unit Car. Quiet operation, together with a large decrease in power consumption, and more rapid acceleration, are brought about by building these cars of Alcoa Aluminum and its Alloys.

Our nearest office will gladly send a representative who is thoroughly familiar with the use of Alcoa Aluminum in transportation. He will tell you what has been done, and what is possible and practical for you to do.

ALUMINUM COMPANY of AMERICA; 2463 Oliver Building, PITTSBURGH, PA. Offices in 19 Principal American Cities.
Toughness...underfoot!

A flooring that knits and heals its bruises

Unique surfacing which steadily improves under the grind of heavy traffic—Carey Elastite Asphalt Plank. Dense, tough, indifferent to weather—can’t corrugate or crawl. For “L” platforms and runways, for overhead and interurban grade crossings, for car and repair shop flooring—the perfect, preformed traffic surface.

Everywhere electric traffic engineers are investigating it, recommending it, using it. Write and ask us for full information.

Philip Carey Products

Spy Run Bridge, Ft. Wayne, Indiana, smooth-surfaced with Carey Elastite Asphalt Plank. Notice also that the rails are cushioned with Carey Elastite System of Track Insulation.

The Philip Carey Company  Electric Railways Department
Lockland, Cincinnati, Ohio
Collection of Zone Fares
with the aid of
CLEVELAND FARE BOXES

The new MACDONALD VERTICAL MACHINE makes practical the collection of zone fares, with the aid of Fare Boxes.

The new device provides for trip records, traffic data and an accurate check on fares deposited.

Let us tell you more about this zone check issuing machine, its application to Cleveland Fare Boxes, how their combined use makes the collection of zone fares fast, safe and simple.

The Cleveland Fare Box Co.
4900 Lexington Ave., Cleveland, Ohio
Canadian Cleveland Fare Box Co. Ltd., Preston, Ont.
Change Carriers, "4-Way" Padlocks, Tokens, Coin Auditing Machines

PANTASOTE TRADE MARK
—the car curtain and upholstery material that pays back its cost by many added years of service. Since 1897 there has been no substitute for Pantasote.

AGASOTE TRADE MARK
—the only panel board made in one piece. It is homogeneous and waterproof. Will not separate, warp or blister.

Standard for electric railway cars and motor buses

Samples and full information gladly furnished.

The PANTASOTE COMPANY, Inc.
250 Park Avenue
NEW YORK

TOLEDO TORCHES

Weather won't dim them
Traffic won't upset them
Trucks won't break them
Thieves won't take them

—and our patented Economy Burner saves 50% in fuel cost—eliminates wick consumption. Look for our name on each TOLEDO Torch.

Insist on the genuine TOLEDO Torch — your dealer can supply you.

The Toledo Pressed Steel Co.
Toledo, Ohio
One of the Latest Type Lightweight-One-Man Interurban Cars built by CUMMINGS CAR AND COACH CO.
111 West Monroe St., Chicago, Ill.

The New ROLLER-SMITH Type BBT Bond Tester and Contact Bar

the most important development in bond testing in years

THE new R-S Type BBT Bond Tester is intended for use where the current in the rail is comparatively feeble or where such current is absent, as on new construction or at the ends of trolley lines where no cars are running beyond the point where tests are being made.

THE R-S Type BBT Bond Tester has over several times the sensitivity of the most sensitive bond tester heretofore made. It can be successfully used with the current from a single No. 6 dry cell. This dry cell and the battery switch and contacts are clearly shown in the illustration above.

EVERY man who is any way interested in bond testing should know all about this new instrument. If you will fill in and forward the coupon below a copy of new Bulletin No. G-200 will be sent you promptly. Or, better still, get in touch with the R-S office nearest you. There is one in every principal city.

"Over thirty-five years experience is back of Roller-Smith"

ROLLER-SMITH COMPANY
Electrical Measuring and Protective Apparatus

Main Office 2128 Woolworth Bldg., N. Y.
Works, Bethlehem, Penna.
Offices in Principal Cities in United States and Canada; Representatives in Australia, Cuba, Japan and Philippine Islands.

Please send new Bulletin G-200.

Name

Company

City

State

Position
A Tape That Workmen Like To Use

Workmen like DUNDEE "A" because it sticks in any kind of weather and because its edges are clean and don't fray.

Primarily, however, DUNDEE "A" is popular because it is a true friction tape. The adhesive compound is calendered into and through the fabric under heavy pressure. This gives a perfect bond between fabric and adhesive, making a more reliable product than tapes which are made by merely spreading the adhesive onto the cloth.

For all friction tape uses where low price is a factor, specify "DUNDEE 'A'" and get the most for the money.

THE OKONITE COMPANY
Founded 1878
THE OKONITE-CALLENDER CABLE COMPANY, INC.
Factories: Passaic, N. J. Patterson, N. J.
SALES OFFICES:
NEW YORK CHICAGO PITTSBURGH ST. LOUIS BOSTON
ATLANTA BIRMINGHAM SAN FRANCISCO
LOS ANGELES SEATTLE DALLAS
Novelty Electric Co., F. D. Lawrence Electric Co.,
Philadelphia, Pa. Cincinnati, O.

Cuban Representative: Victor G. Mendoza Co., Havana

Canadian Representative: Engineering Materials, Limited, Montreal

The 2000 Type

Bus Heater

Increased heating efficiency, simplified assembly, absolute insulation from body, easy installation and low cost are the features of the new 2000 type Heater. Supplement B-4 mailed on request, contains a complete description.
STRUCTURAL STEEL

Fabricated Steel Structures
for every purpose

Progress Picture, Power Station

Fabricated Structural Steel by AMERICAN BRIDGE COMPANY
Subsidiary of United States Steel Corporation

Manufacturers of STEEL STRUCTURES
of all classes, particularly
BRIDGES and BUILDINGS, Roof Trusses, Columns, Girders, Towers and Poles, etc.

General Office: 71 BROADWAY, NEW YORK, N. Y.
Contracting Offices in Principal Cities

Wherever Rails Cross

BUDA
ESTABLISHED 1881

SPECIAL TRACK WORK

THE BUDA COMPANY
Harvey (25) Illinois
And The Target Follows The Points

Style No. 37
RAMAPO Patent
Automatic Return
Switch Stand

This Ramapo Patent Automatic Return Switch Stand is for use in passing sidings or wherever it is desired that the switch, after being run through, shall be returned automatically to its original position. The sectional view below shows the mechanism.

Note, particularly, that the target always indicates the position of the switch points.

The Racor Retarding Dash Pot is a very desirable adjunct to such installations.

Sectional View
Showing Mechanism in Automatic Operation

Behind Racor Service stand nine plants specializing in the manufacture and distribution of railroad track turnout and crossing equipment, including Manganese Work for heavy traffic.

RAMAPO AJAX CORPORATION
RACOR PACIFIC FROG AND SWITCH COMPANY, Los Angeles - Seattle
CANADIAN RACOR IRON WORKS, Toronto, Niagara Falls, Ontario

This March, 1930 issue of the Electric Railway Journalcontains an article titled "Financial and Remit Agree," which discusses aspects of accounting for public utilities.

Accounting Procedures for Public Utilities

By

WARREN G. BAILEY, M. A.
Assistant Director, Business Research Corporation; Consultant to Public Utility Management and Procedure.

and

D. E. KNOWLES, C. P. A.
Lecturer in Public Utility Accounting Procedures, School of Commerce, Northwestern University; Industrial Engineer, Business Research Corporation.

Based upon actual accounting procedures and practices of America's most successful utilities, this comprehensive book covers the whole field of utility accounting—from Labor Changes to Dividend Payments. Scores of practical pointers drawn from first-hand contact tell how to devise, install and operate a complete and accurate accounting system in any utility—large or small—methods are brought out in full detail. The significant accounting procedures are discussed with respect to the uniform classifications of accounts, prescribed by the National Association of Railway and Utilities Commissioners.

Actual forms and record blanks are shown, clarifying the text and making it immediately usable for the accountant and executive.

Chapter Headings


See this book FREE—Mail this coupon

McGraw-Hill
FREE EXAMINATION COUPON


You may send me for 10 days' free examination a copy of Bailey and Knowles ACCOUNTING PROCEDURES FOR PUBLIC UTILITIES, $6.00 postpaid. I agree to return the book, or return it postpaid within 10 days.

Signed

(Please Print)

Address

City and State

Official Position

Name of Company (Please Print)

Books sent on approval to retail purchasers in U. S. and Canada only.)
THEY’RE NOT ALL ALIKE

Trolley wheels may look alike, they may even seem to be alike in the first few months of service—but it’s the test of long time service that counts.

It’s the maintenance crews in the shops that get to know

KALAMAZOO

trolley wheels and harps, and they know!

They know that Kalamazoo trolley wheels give less trouble, run longer and require less attention. Is it any wonder that Kalamazoo trolley wheels and harps are standard for many properties?

May we send you further information today?

THE STAR BRASS WORKS
KALAMAZOO, MICHIGAN

JOHNSON FARE COLLECTING SYSTEMS

Johnson Electric Fare Boxes and overhead registers make possible the instantaneous registering and counting of every fare. Revenues are increased 1½ to 5% and the efficiency of one-man operation is materially increased. Quicker boarding of passengers with resultant reduction in running time for the buses. Over 5,000 already in use.

When more than three coins are used as fare, the Type D Johnson Fare Box is the best manually operated registration system. Over 60,000 in use.

Johnson Change-Makers are designed to function with odd fare and metal tickets selling at fractional rates. It is possible to use each barrel separately or to groups to meet local conditions. Each barrel can be adjusted to eject from one to five coins or one to six tokens.

Roebling
Quality Products

Starter and Lighting Cable; Car Wire; Motor Lead Cable; Ignition Cables; Traffic Control Cable; Battery Wire.

Electrode Holder Cable
Electric Welding Cable
Arc Welding Wire
Gas Welding Wire

John A. Roebling’s Sons Co.
Trenton, N. J.
Drip Points for Added Efficiency

They prevent creeping moisture and quickly drain the petticoat in wet weather, keeping the inner areas dry.

The Above Insulator—No. 72—Voltages—Test—Dry 64,000
Wet 31,400, Line 10,000.

Our engineers are always ready to help you on your glass insulator problem. Write for catalog.

Hemingray Glass Company
Muncie, Ind.
Est. 1844—Inc. 1870

R 11 Double Register

A Fare Registration System that Gains the Confidence of ALL

The durability, accuracy, speed and convenience of International Registers has given them the nation-wide reputation for efficient service that they have enjoyed for over thirty years.

Electric operation gives the new types even greater speed, accuracy and convenience. Registers can be furnished for operation by hand.

The International Register Co.
15 South Throop St., Chicago

News • • • •

brief, late news flashes for the electric railway industry

To supplement the service of the regular monthly issues of Electric Railway Journal, a separate NEWS service appears on thirty-nine Saturdays during the year. This supplement keeps you in touch with court decisions . . . fare increases . . . new ordinances . . . association meetings . . . financial announcements . . . equipment purchases.

Subscription Price: For all countries taking domestic subscription rate, $2 per year. Combination with the monthly edition of Electric Railway Journal for $4 a year domestic rate.

ELECTRIC RAILWAY JOURNAL
475 TENTH AVE.
NEW YORK CITY

Enter my subscription to the Electric Railway Journal News. Bill me for $2.

Name ..............................................
Address ...........................................
City .............................................. State ........................................
"BOYERIZED" Car Parts Stand Up!

Think of the hard usage the average car gets! Think of the quick starting. Think of the sudden stopping. Is it surprising that ordinary car parts of untreated steel can't stand up? But Boyerized parts can—they are made for severe service. They last three to four times as long as ordinary parts. Boyerizing—a special process—gives these car parts tremendous wear-absorbing qualities.

"Boyerize" your cars, because, "to Boyerize is to Economize."

Send for details or quotations.

BOYERIZED PARTS

---

**BEMIS CAR TRUCK COMPANY**

**ELECTRIC RAILWAY SUPPLIES**

**SPRINGFIELD, MASS.**

Representatives:
F. F. Bodler, 903 Montdoree Bldg., San Francisco, Cal.
W. F. McKenney, 60-90 First Street, Portland, Ore.
J. H. Denton, 1228 Broadway, New York City, N. Y.
A. W. Arlin, 610 Delta Building, Los Angeles, Cal.

---

**TUCOLITH**

**THE FLOORING THAT HAS MET WITH GENERAL APPROVAL IN THE ELECTRIC RAILWAY FIELD**

**TUCO PRODUCTS CORP.**

**30 CHURCH ST., NEW YORK**

Railway Exchange Bldg., CHICAGO
<table>
<thead>
<tr>
<th>Engineers and Consultants</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Ford, Bacon &amp; Davis</strong></td>
</tr>
<tr>
<td>Incorporated</td>
</tr>
<tr>
<td>Engineers</td>
</tr>
<tr>
<td>39 Broadway, New York</td>
</tr>
<tr>
<td>PHILADELPHIA  CHICAGO SAN FRANCISCO NEW ORLEANS</td>
</tr>
<tr>
<td><strong>STEVENS &amp; WOOD</strong></td>
</tr>
<tr>
<td>Incorporated</td>
</tr>
<tr>
<td>Engineers and Constructors</td>
</tr>
<tr>
<td>60 John Street, New York</td>
</tr>
<tr>
<td>Transportation Examinations and Reports</td>
</tr>
<tr>
<td><strong>ALBERT S. RICHEY</strong></td>
</tr>
<tr>
<td>ELECTRIC RAILWAY ENGINEER</td>
</tr>
<tr>
<td>WORCESTER, MASSACHUSETTS</td>
</tr>
<tr>
<td>Examinations</td>
</tr>
<tr>
<td>Reports-Appraisals-Rates</td>
</tr>
<tr>
<td>Operation-Service</td>
</tr>
<tr>
<td><strong>CHARLES De LEUW &amp; COMPANY</strong></td>
</tr>
<tr>
<td>Successors to</td>
</tr>
<tr>
<td>KELKER, De LEUW &amp; CO.</td>
</tr>
<tr>
<td>Consulting Engineers</td>
</tr>
<tr>
<td>Transit Development</td>
</tr>
<tr>
<td>Operating Problems</td>
</tr>
<tr>
<td>Traffic Surveys</td>
</tr>
<tr>
<td>Valuations</td>
</tr>
<tr>
<td>111 W. WASHINGTON ST., CHICAGO</td>
</tr>
<tr>
<td><strong>HEMPHILL &amp; WELLS</strong></td>
</tr>
<tr>
<td>CONSULTING ENGINEERS</td>
</tr>
<tr>
<td>Gardner F. Wells</td>
</tr>
<tr>
<td>Albert W. Hemphill</td>
</tr>
<tr>
<td>APPRAISALS</td>
</tr>
<tr>
<td>INVESTIGATIONS Covering</td>
</tr>
<tr>
<td>Reorganization</td>
</tr>
<tr>
<td>Management</td>
</tr>
<tr>
<td>Construction</td>
</tr>
<tr>
<td>50 East 42nd St., New York City</td>
</tr>
<tr>
<td><strong>E. H. FAILE &amp; CO.</strong></td>
</tr>
<tr>
<td>Designers of</td>
</tr>
<tr>
<td>Garages — Service</td>
</tr>
<tr>
<td>Buildings — Terminals</td>
</tr>
<tr>
<td><strong>WALTER JACKSON</strong></td>
</tr>
<tr>
<td>Consultant on Fares</td>
</tr>
<tr>
<td>and Motor Buses</td>
</tr>
<tr>
<td>The Weekly and Sunday Pass</td>
</tr>
<tr>
<td>Differential Fares — Ride Selling</td>
</tr>
<tr>
<td>Holbrook Hall S-W-3</td>
</tr>
<tr>
<td>472 Gramatan Ave., Mt. Vernon, N.Y.</td>
</tr>
<tr>
<td><strong>THE BEELER ORGANIZATION</strong></td>
</tr>
<tr>
<td>Engineers and Accountants</td>
</tr>
<tr>
<td>JOHN A. BEELER, DIRECTOR</td>
</tr>
<tr>
<td>Traffic — Traction</td>
</tr>
<tr>
<td>Bus Equipment</td>
</tr>
<tr>
<td>Power-Management</td>
</tr>
<tr>
<td>Appraisals Operating and Financial Reports</td>
</tr>
<tr>
<td>Current issue LATE NEWS and FACTS free on request</td>
</tr>
<tr>
<td>52 Vanderbilt Avenue, New York</td>
</tr>
<tr>
<td><strong>J. ROWLAND BIBBINS</strong></td>
</tr>
<tr>
<td>CONSULTING ENGINEER</td>
</tr>
<tr>
<td>TRANSPORTATION UTILITIES</td>
</tr>
<tr>
<td>Transit-Traffic Development Surveys</td>
</tr>
<tr>
<td>Street Plans, Controls, Speed Signals</td>
</tr>
<tr>
<td>Economic Operation, Schedule Analyses, Bus Co-ordination, Rerouting, Budgets, Valuation, Rate Cases and Ordinances</td>
</tr>
<tr>
<td>EXPERIENCE IN 26 CITIES</td>
</tr>
<tr>
<td>2301 Connecticut Avenue</td>
</tr>
<tr>
<td>Washington, D. C.</td>
</tr>
<tr>
<td><strong>BYLLESBY ENGINEERING and MANAGEMENT CORPORATION</strong></td>
</tr>
<tr>
<td>231 S. La Salle Street, Chicago</td>
</tr>
<tr>
<td>New York Pittsburgh San Francisco</td>
</tr>
</tbody>
</table>

*Note: The text seems to be a list of engineering and consulting firms along with their services and contact information.*
SAFETY

GRiffin WHEEL COMPANY
Griffin Chilled Tread Wheels with Chilled Rims and Chilled Back of Flanges
for all City and Interurban Railway Service

1. 30 to 40% in annual wheel costs.
2. 20% in brake shoe consumption.
3. 10 to 15% reduction in track maintenance.
4. Approximately $2.00 to $3.00 per pair saving in maintenance costs—No turning required.

MILEAGE GUARANTEED

TRENTON TOWERS
Safest—fastest—most practical for bringing overhead construction within working range.

Forty-four years' experience give Trenton Utility Towers new features that mean reduced labor and maintenance costs. They provide safe, easy working conditions with no danger of collapse or tipping. The wide range of the revolving platform permits continuous trolley service while repairs are being made. Let us recommend a type for your work.

J. R. McCordell & Co.
391-401 So. Warren St.
Trenton, N. J.

Chillingworth
One-Piece Gear Cases

Seamless, Rivetless, Light in Weight

Chillingworth One-Piece Gear Cases will wear longer because they are made of tough durable deep drawing steel, properly annealed and supported by strong Malleable Iron Brackets, or Forged Steel if you prefer. They meet all operating requirements. Used extensively on rapid transit service.

Most steam road electrifications use Chillingworth Cases.

Chillingworth Manufacturing Co.
Jersey City, N. J.

H. U. WALLACE
All Work Under Personal Supervision

6 N. Michigan Ave. 420 Lexington Ave.
Chicago New York City
Phone LEXINGTON 8485

SAFETY SAVINGS

SAFETY SAVINGS

SAFETY SAVINGS

SAFETY SAVINGS
**SEARCHLIGHT SECTION**

**WANTED**


**MAN** with 20 years experience covering all details of mechanical dept., with company operating 1,000 cars would like position with mechanical apt., interested in making improvements and reducing costs. PW-200, Electric Railway Journal, 501 North Michigan Ave., Chicago, Ill.

**MR. MANAGER:** Am open for consideration for position superintendent transportation. Have broad experience, successful record. Highest references, can go anywhere. PW-202, Electric Railway Journal, Guardian Blvd., Cleveland, Ohio.

**SUPERINTENDENT** maintenance or operation; 18 years experience street railway work. Now employed, desires change. Any location. Best references. PW-201, Electric Railway Journal, Tenth Ave. at 36th St., New York.

**AGENTS WANTED**

Agents Wanted

For a portable high efficiency electric welder for street railway circuits. Portability such that one man can easily handle the machinery on the street. Machine is provided with pneumatic tires and springs so that it can be towed for long distances at high speed. Current consumption from five hundred volt trolley is twelve amperes for two hundred amperes in the arc circuit; welding capacity 200 amperes; maximum capacity three hundred amperes. Write to the Ecomoor Electric Products Co., 2400 Woodland Ave., Cleveland, O.

**NEW "SEARCHLIGHT" ADVERTISEMENTS**

must be received by 3 P.M., the 20th of the month to appear in the issue out the 1st of the month.

Address copy to the Searchlight Department

Electric Railway Journal

Tenth Ave. at 36th St., New York City

**INCREASE PROFITS**

By disposing of your idle equipment for CASH. Somewhere there is a BUYER for the equipment you no longer need.

**ADVERTISE IT!**

Wire, Write or Phone

Searchlight Department

Tenth Ave. at 36th St., N.Y.

**FOR SALE**

**PRICED TO SELL PROMPTLY**

This equipment is in good condition and must be moved quickly.

1 — 500 kw, G.E. A.C. Generator, Type ATB, Class 48-500-150, Form A, Serial No. 136340, 60 cy., 2,300 v., 150 amp. with: 5x4x6-in. Fiber & Stowell Corliss Releasing Gear Steam Engine, speed 150 r.p.m., steam inlet 9 in., exhaust 14 in. This engine is direct connected to the above generator. Located at Quincy, Illinois.

1 — 500 kw, G.E. A.C. Generator, Type ATB, Class 75-500-150, Form E, Serial No. 75844, 60 cy., 2,300 v., 200 amp. with: 20x10x10-in. Allis Chalmers Corliss Releasing Gear Steam Engine, steam inlet 10 in., speed 100 r.p.m., steam inlet 10 in., exhaust 14 in. This engine is direct connected to the above generator. Located at Quincy, Illinois.

1 — 50 hp, Curtis Steam Turbine non-condensing, speed 3,000 r.p.m., steam 150 lb., Form A, Serial No. 6132, direct connected to: G. E. D.C. Generator, Type CC-3, Form M, Serial No. 1180574, 230 amp. 125 v. Located at Quincy, Illinois.

**THE ALLITE CORPORATION**

636-638 Broadway, New York, N. Y.

**ELECTRIC RAILWAYS AND EQUIPMENT**


Among the other work just completed we have recently dismantled the entire trackless trolley line of Staten Island, New York and over 200 miles of overhead and some trackage of the Worcester Consolidated and Springfield Street Railway abandoned Suburban lines.

**WRITE US FOR PRICES**

Central Illinois Public Service Company

PUBLIC SERVICE BUILDING

SPRINGFIELD, ILLINOIS

N. C. STIREWALT, PURCHASING AND STORES AGENT
6—Light Weight
Double Truck
Passenger Cars

two to four years old—
weight 30,000 lbs.—excel-
 lent condition—ready for
immediate shipment.
Railway Motors.
Sweepers and Snow Plows.
Controllers. Compressors.
Reasonably priced.
Let us have your requirements.

FOR SALE

H. E. SALZBERG COMPANY, INC.
225 Broadway — Est. 1898 — New York City, N. Y.

Railways Purchased
in Entirety

When business judgment dictates the wisdom of abandon-
ing part or all of your electric railway equipment—don’t
let it rust away in idleness waiting for the chance piec-
meal buyer to gradually unburden you, at big losses.
Do the one practical thing. Sell it as a unit to
SALZBERG—complete with power plant, track, feeder
and trolley wire system and rolling stock.
You will get FAIR dealing and the highest prices that
are based solely on present day market values. Save
money, time and trouble. We will do our own dismantling.
No obligation for our proposition.

JAPANESE CARS

That’s what Cars looked like in 1891
when we bought our first Railroad. In
thirty-nine years Cars have grown
tremendously in size and so have we.

We specialize in

Purchasing and
Dismantling Railroads

Inquiries invited from any point in the
United States and Canada.

The Joseph Schonthal Company
Columbus, Ohio

REFERENCES
The Chase National Bank, New York
The Marine Trust Co., Buffalo
The Huntington National Bank, Columbus

THE PERRY, BUXTON, DOANE CO.

New and Relaying Rails
All Weights and Sections

We specialize in buying and dismantling entire
Railroads, Street Railways, and all other industrial
properties which have ceased operation. We fur-
nish expert appraisals of all such properties.

May We Serve You?

THE PERRY, BUXTON, DOANE CO.
Rail Department, Philadelphia, Pa. General Department, Boston, Mass.
Pacific Sales Office—Falling Building, Portland, Oregon
**Speeds repairing**

TRY this economical way to cut repairing time. Clean car and bus repair parts in a tank containing a solution of an Oakite material. With little or no scrubbing or scraping, they will be free from grease, dirt, and oil in a fraction of the usual time.

Oakite cleaning quickly removes coatings of muck and grime from repair parts, leaving them clean, easy to handle, and ready for instant work without wasting a mechanic's valuable time on further wiping or tedious scrubbing and scraping. Learn about the time and effort Oakite materials and methods will save you. Write for our booklets on yard, car shop and garage cleaning. No obligation.

Manufactured only by

**OAKITE PRODUCTS, INC., 283 Thames St., NEW YORK, N.Y.**

Oakite Service Men, cleaning specialists, are located at

**Albany, N.Y.; Allentown, Pa.; Baltimore, Battle Creek, Mich.; Boston, Bridgewater, Brooklyn, N.Y.; Buffalo, Camden, N.J.; Charlottesville, Tenn.; Chicago, Cincinnati, Cleveland, Columbus, O.; Dallas, Denison, Dayton, O.; Des Moines, Iowa; Detroit, Erie, Pa.; Fall River, Mass.; Flint, Mich.; Fresno, Ca.; Grand Rapids, Mich.; Harrisburg, Pa.; Hartford.**

Stocks of Oakite materials are carried in these cities.

---

**ALPHABETICAL INDEX**

This index is published as a convenience to the reader. Every care is taken to make it accurate, but Electric Railway Journal assumes no responsibility for errors or omissions.

<table>
<thead>
<tr>
<th>Index Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aluminum Co. of America</td>
<td>Insert 93-94</td>
</tr>
<tr>
<td>American Brake Shoe &amp; Foundry Co.</td>
<td>90</td>
</tr>
<tr>
<td>American Bridge Co.</td>
<td>99</td>
</tr>
<tr>
<td>American Brown Boveri Co., Inc.</td>
<td>68</td>
</tr>
<tr>
<td>American Car Co.</td>
<td>Third Cover</td>
</tr>
<tr>
<td>American Car &amp; Foundry Motors Corp.</td>
<td>Insert 57-60 &amp; 81-84</td>
</tr>
<tr>
<td>American Steel &amp; Wire Co.</td>
<td>63</td>
</tr>
<tr>
<td>American Steel Foundries</td>
<td>36-37</td>
</tr>
<tr>
<td>Beeler Organization</td>
<td>104</td>
</tr>
<tr>
<td>Bemis Car Truck Co.</td>
<td>101</td>
</tr>
<tr>
<td>Bender Body Co., The</td>
<td>110</td>
</tr>
<tr>
<td>Bethlehem Steel Co.</td>
<td>65</td>
</tr>
<tr>
<td>Billingsby Eng. &amp; Mfg. Corp.</td>
<td>99</td>
</tr>
<tr>
<td>Buda Co., The</td>
<td>104</td>
</tr>
<tr>
<td>Buchanan &amp; Layng Corp.</td>
<td>104</td>
</tr>
<tr>
<td>Collier, Inc., Barron G.</td>
<td>8</td>
</tr>
<tr>
<td>Cummings Car &amp; Coach Co.</td>
<td>97</td>
</tr>
<tr>
<td>Dayton Mechanical Tug Co., The</td>
<td>42-43</td>
</tr>
<tr>
<td>De Leon &amp; Co., Charles</td>
<td>104</td>
</tr>
<tr>
<td>De Vilbiss Co., The</td>
<td>55</td>
</tr>
<tr>
<td>Craddock Wheel Co.</td>
<td>44</td>
</tr>
<tr>
<td>Differential Steel Car Co.</td>
<td>Insert 69-72</td>
</tr>
<tr>
<td>Dodge-Brothers</td>
<td>104</td>
</tr>
<tr>
<td>Electric Railway Journal Filler</td>
<td>29-62</td>
</tr>
<tr>
<td>Electric Railway Improvement Co.</td>
<td>77</td>
</tr>
<tr>
<td>Electric Service Supplies Co.</td>
<td>18-19</td>
</tr>
<tr>
<td>Electric Storage Battery Co., The</td>
<td>49</td>
</tr>
<tr>
<td>Faile &amp; Co., E. H.</td>
<td>104</td>
</tr>
<tr>
<td>Firestone Tire &amp; Rubber Co.</td>
<td>28</td>
</tr>
<tr>
<td>Ford, Bacon &amp; Davis</td>
<td>104</td>
</tr>
<tr>
<td>&quot;For Sale&quot; Ads</td>
<td>106-107</td>
</tr>
<tr>
<td>General Electric Co.</td>
<td>20-21-22-23-24 &amp; Back Cover</td>
</tr>
<tr>
<td>General Motors Truck Co.</td>
<td>40-41 &amp; Insert 45-47</td>
</tr>
<tr>
<td>General Steel Castings Corp.</td>
<td>86</td>
</tr>
<tr>
<td>Goodrich Rubber Co., B. F.</td>
<td>66</td>
</tr>
<tr>
<td>Goodyear Tire &amp; Rubber Co.</td>
<td>39</td>
</tr>
<tr>
<td>Globe Ticket Co.</td>
<td>44</td>
</tr>
<tr>
<td>Griffin Wheel Co.</td>
<td>105</td>
</tr>
<tr>
<td>Hale-Kilburn Co.</td>
<td>10</td>
</tr>
<tr>
<td>&quot;Help Wanted&quot; Ads</td>
<td>106-107</td>
</tr>
<tr>
<td>Hemingray Glass Co.</td>
<td>102</td>
</tr>
<tr>
<td>Hemphill &amp; Wells</td>
<td>104</td>
</tr>
<tr>
<td>Heywood-Wakefield Co.</td>
<td>27</td>
</tr>
<tr>
<td>Illinois Steel Co.</td>
<td>26</td>
</tr>
<tr>
<td>International Motor Co.</td>
<td>32-33</td>
</tr>
<tr>
<td>International Register Co., The</td>
<td>102</td>
</tr>
<tr>
<td>Jackson, Walter</td>
<td>104</td>
</tr>
<tr>
<td>Johnson Fare Box Co.</td>
<td>101</td>
</tr>
<tr>
<td>Johns-Manville Corp.</td>
<td>85</td>
</tr>
</tbody>
</table>

---

**Kohlman Car Co.** | Third Cover
EXPERIENCE + QUALITY = ECONOMY

EXPERIENCE—Close contact with the Mechanical Departments of Electric Railways has enabled us to study their individual needs. Our aim is to supply Bronze Castings which will properly serve the intended purpose.

QUALITY—Secured by using the best ingredients obtainable. Our Castings are produced under constant laboratory control. Extensive machine shop facilities insure proper fitting materials.

ECONOMY—Quality Bronze Castings, made by experts will minimize replacements, and, obviously, labor costs and tie-ups of equipment will be cut down considerably. Economy is the ultimate result.

Armature Babbitt Metal

“Tiger” Bronze Axle and Armature Bearings

More-Jones Trolley Wheels and Harps

NATIONAL BEARING METALS CORP.

St. Louis, Mo.

New York, N. Y.

Jersey City, N. J.

Portsmouth, Va.

Pittsburgh, Pa.

St. Paul, Minn.
Utmost Comfort in this BENDER PALACE HYWAY COACH

Full Head Room for the Unexpected Overloads

This is the kind of a unit that operators find attracts business—the famous Bender Palace Hyway Coach.

The wide commodious interior, made possible through thinner, stronger sides, has an instant rider appeal. All windows raise all the way up—no mechanism to get out of order—no water wells to cause rusting or rotting of body. Stronger windows insure less glass breakage. The large overhead inside luggage galleries are cushion-edged for passenger protection. Head room is ample, allowing for the unexpected overloads.

And like all Bender Bodies, constantly improved construction features assure low maintenance . . . more time on the road . . . more years of service . . . greater returns on your investment.

THE BENDER BODY COMPANY, W. 62nd and Denison, Cleveland, O.
Sacramento Solves a Parking Problem

The twelve Sacramento Cars, built by the American Car Company, are operated on the principal line of the Pacific Gas & Electric system. These cars attract first-class patronage because they offer more than a relief from the parking problem; they are comfortable—safe—well ventilated and lighted.

From the operating point of view, this new equipment is equally satisfactory—light in weight and equipped with time-tested Brill 177-E Trucks which reduce maintenance costs to the minimum. Here, then, is another link in the chain of evidence that there is no better combination than Brill Cars equipped with Brill Trucks.

The J. G. Brill Company
Philadelphia

ASSOCIATE PLANTS
American Car Company, St. Louis, Missouri
The G. C. Kohlan Car Company, Cleveland, Ohio
Pacific Coast Representative, Bikko Bldg., San Francisco

BRILL MODERN ELECTRIC CARS
In describing the performance of three General Electric railway motors, Mr. C. C. Kantner, Master Mechanic of the Western Ohio Railway and Power Corporation, states:

"I just recently removed three armatures that were in good condition and gave us no trouble. As we had obtained an average of 702,232 miles from these armatures, I thought it would be economy to rewind them at this time before placing them back in car. As for the pinions, they have made the same mileage as the armatures."

Now, they have been rejuvenated with new coils, slot insulation, pinions, and other parts—all of General Electric manufacture and of the same quality as the original equipment. There is every reason to expect that armatures so repaired will duplicate their original performance record.

It pays to use General Electric renewal parts. In them you are certain of the same high quality that was built into the parts they are to replace.
For new tracks or replacements.... Street or Interurban R. R.... Una Bonds give you long time economy. Available in all types.... stranded or laminated. By using Duron Welding Wire, a solid homogeneous weld of great strength and conductivity results.

Let our engineers consult with you and explain the application of these bonds.

AMERICAN STEEL & WIRE COMPANY
Subsidiary of United States Steel Corporation
CHICAGO—all principal cities—NEW YORK

UNA BONDS
Increased speed for Old cars

The most important requirement of the modern street car is that its speed be great enough to beat the traffic on the green light and to hold that position.

Although many new cars will be bought embodying the latest ideas of rapid transportation, where old cars are operated with the new ones, full advantage of the new cars cannot be obtained without increasing the speed of the old ones.

A relatively inexpensive shunting equipment will help you solve this important problem.

Any Westinghouse transportation representative will be glad to discuss this with you.

Service, prompt and efficient, by a coast-to-coast chain of well-equipped shops.
Next Month

Underground Overhead

A timely article telling how the invisible overhead expense of keeping in stock an enormous number of different items and repair parts can be reduced by standardization.


Tenth Avenue at 36th Street
New York, N. Y.

CABLE ADDRESS: "MACHINIST, N.Y."
Car panels

...that

Centralize Circuit Control

The compact design of Westinghouse safety type car panels makes it possible to place the controls for a large number of circuits within a small space. Buzzer, lights and heater can be governed by the operator without leaving his place at the controls.

These panels are built-up of standard panelboard parts, which can be assembled in various ways to meet the space and circuit requirements of each application. The neat appearance and compact design are in keeping with the trend toward better car layouts.

Full safety to the operator is provided because the doors covering the switch and fuse compartments cannot be opened when the switch is "on".

When you buy new cars or recondition your old ones use Westinghouse car panels. Their reliability has been proved in service.

Service, prompt and efficient, by a coast-to-coast chain of well-equipped shops

Westinghouse
The type RP renewable pan trolley frog consists of a malleable iron galvanized body and a malleable iron galvanized anchor plate. The wires are clamped to the anchor plate, and the frog is hinged to it. Once the anchor plate is set correctly, it becomes a permanent fixture, and the frog body can be removed or replaced without interfering with the setting of the complete frog.

This frog is one of the recent additions to the extensive line of railway overhead equipment which Westinghouse is constantly improving in order that electric railway companies may obtain better operating economies.

Service, prompt and efficient, by a coast-to-coast chain of well-equipped shops
Adequate service is not enough
Said Mr. Paul Wilson at the C.E.R.A. meeting in January:

"Many of us are trying to render adequate service rather than attractive service."

It’s a nice distinction worthy of more than passing note. Even adequate service is not enough to sell the service. It must be more—it must be attractive.

Specifically, service, to attract, must sell a swift, silent, comfortable ride. Only on good track can you meet those specifications—and it’s your public that writes them.

Fortunately good track is so easy to have and so inexpensive to maintain with the equipment we sell.

Railway Trackwork Co.
3132-48 East Thompson Street, Philadelphia

AGENTS
Chester P. Gailor, 50 Church St., New York
Chas. N. Wood Co., Boston
H. F. McDermott, 208 S. LaSalle St., Chicago
P. F. Bodler, San Francisco, Cal.
Equipment & Engineering Co., London
For years O-B has seriously studied the factors which contribute to operating costs. As a result of this study, O-B has continuously offered the industry a great many devices designed to lengthen life and reduce maintenance—in brief to lower operating costs.

Longer Service and Lower Maintenance Win New Friends Daily

The O-B Duplex Frog is outstanding in its operating cost savings character. It is designed to provide longer life. This is effected by overlapping the runners so that the wheel does not come in contact with the pan of the frog. Current collection is better, with a marked reduction in arcing and pitting, resulting in long wheel wear as well as from 300,000 to 500,000 car passes per frog.

In addition, the O-B Duplex Frog is designed with a removable yoke, which permits complete replacement of a worn-out pan and the cam tips without disturbing the position of the trolley or span wires. This simple change is easily and quickly effected, as it is not necessary to use block and tackle, or respot the frog. When the yoke has been correctly “spotted” when first installed, the yoke becomes a permanent part of the overhead.

As a result of these time and money saving advantages, the O-B Duplex Frog has been chosen by alert overhead superintendents in such large cities as Boston, Baltimore, Buffalo, Cleveland, Louisville, Knoxville, St. Louis, Denver, St. Paul, Minneapolis and Montreal, as well as for scores of other properties.

Your selection of the O-B Duplex Frog; described on pages 38 and 39 of New Products Supplement No. 3 to O-B Catalog No. 20, is a step toward greater economy and efficiency in operation.

Ohio Brass Company, Mansfield, Ohio

Canadian Ohio Brass Co., Limited
Niagara Falls, Canada
April, 1930
ELECTRIC RAILWAY JOURNAL

Acorns Will Big Oaks

True, each saving may be small in itself, but the aggregate makes a very substantial sum—a marked reduction in operation expense, which directly increases net profits. Thus, like the little acorn, the small savings make a total which grows like the great oak.

Reliability, Durability and Efficiency are Proved by this Bond Installation

ABOUT four years ago, shortly after its introduction, the O-B Titon Bond was selected for the rebonding of the Niagara, St. Catharines and Toronto Railway. Engineers of this property made this choice after exhaustive service tests, and because O-B Titon Bonds were performing so satisfactorily elsewhere.

Results have been as anticipated. This important property has had no trouble since installing. In fact, the photographic illustration at the right indicates probably greater service life than was originally expected.

This service is representative of the service of O-B Titon Bonds everywhere, and is undoubtedly the reason why more than 125 properties in the United States, Canada and foreign countries have chosen O-B Titon Bonds.

Installation is by copper electrode arc welding, using O-B Duron Welding Rod, to the head of the rail. An internal copper sleeve, between the copper strand and steel terminal, damps out vibration. Terminal design provides for a beveling of deposited metal from the rail, which tends to deflect wheel traffic. These two advantages, plus the superior design and construction materially strengthen service life.

If you are interested in securing a rail bond of permanent low electrical resistance and high mechanical reliability, investigate O-B Titon Bonds. Refer to page 667 of O-B Catalog No. 20.

Ohio Brass Co.

New York Pittsburgh Chicago Cleveland St. Louis Atlanta Dallas Chicago Clevel Land St. Louis Atlanta Dallas Los Angeles San Francisco Seattle

Porcelain Insulators Line Materials Rail Bonds Car Equipment Mining Materials Valves

View of right of way of the Niagara, St. Catharines and Toronto Railway. The return circuit is efficiently maintained with O-B Titon Bonds.

Close-up of O-B Titon Bond installed on track of above property.

The O-B Titon Bond, showing terminal construction. View shows the side of bond which adjoins the rail.
Her Children Are More Critical

To our grandmothers a journey was an event. The novelty of it took the curse off many discomforts. It was a thrill merely to ride.

Nowadays, grandmother's children and their offspring go places. The ride is incidental. If railway travel is too uncomfortable, they go by some other way — usually in their own automobiles.

Wide-awake railways are doing everything to make travel supremely comfortable. Several outstanding companies are aggressively developing profitable passenger traffic. It is significant that HALE & KILBURN SEATS have been installed in the cars of those lines which are successfully merchandising comfort.

HALE & KILBURN SEATS

"A BETTER SEAT FOR EVERY TYPE OF MODERN TRANSPORTATION"

HALE & KILBURN CO.

General Office and Works: 1800 Lehigh Avenue, Philadelphia

SALES OFFICES:

Hale & Kilburn Co., Graybar Bldg., New York
Hale & Kilburn Co., McCormick Bldg., Chicago
Frank P. Rodler, 903 Monadnock Bldg., San Francisco

E. A. Thornwell, Candler Bldg., Atlanta
W. L. Jeffries, Jr., Mutual Bldg., Richmond
W. D. Jenkins, Prudential Bldg., Dallas, Texas
H. M. Euler, 140 N. Sixth St., Portland, Oregon
CHICAGO SURFACE LINES officials spent more than a year carefully investigating equipment for their feeder expansion program and then recommended the modern trolley bus as the best solution of their requirements.
TWIN COACH body design, unit strength, balanced weight, patron appeal, entry and exit arrangement, low platform and general adaptability won for it better than 70% of the orders placed by Chicago Surface Lines.
If you require a rail-less vehicle with modern body development and rider appeal the answer is—
A collapsible water-proof hood inserted in the brake cylinder as shown, is an effective means of preventing dirt and moisture that may sift in through the non-pressure head from reaching the cylinder walls... Keeping cylinders clean in this manner will reduce leakage, lengthen life of packing cups, and decrease maintenance expense. Many railroads are now realizing the benefits of this protector.

WESTINGHOUSE Traction Brake Co.
General Office and Works
Wilmerding, Pa.
Safely

National Pneumatic door control equipment provides the safest, easiest and most convenient method by which passengers may enter and leave cars or buses. It is impossible for the doors to open while the car is in motion . . . it is impossible to proceed until all doors are closed. All possibility of boarding and alighting accidents is eliminated with NP equipment.

The tremendous number of passengers carried daily by electric railways presents a constant loading and unloading problem. That NP door control equipment solves this problem is clearly evident by the ever increasing number of NP equipped cars and buses found in operation year after year.

NATIONAL PNEUMATIC COMPANY
Graybar Bldg., New York
CHICAGO PHILADELPHIA
Manufactured for Canada by
Railway & Power Engineer, Corp., Ltd.

Quickly

The time required to take on and discharge passengers is reduced to a minimum by NP door control equipment. Doors are opened instantly by the operator upon coming to a full stop . . . the operator is set to start instantly when the doors close. This saving in time with NP equipment makes possible consistently faster schedules.

The NP Automatic Treadle Exit Door maintains the "circulating load" in one man operation and passengers are provided with . . . . . .
easiest way out
Announcing
A NEW AND IMPORTANT
ADDITION TO THE LINE OF

Keystone Bus Equipment

ELECTRIC Service Supplies Co. will at once take over the exclusive sale of the Mueller-Evans system of Motor Coach Heating and Ventilating System because of the many superior advantages it offers over other systems and because there is a definite need for such a system to provide fresh, warm air for bus riders. Certainly in a short time, its use must become universal.

In the Mueller-Evans system—air warmed in passage through the radiator is forced through a duct into the front end of the bus and directed toward the floor. This clean, warm air provides 1200 cubic feet each hour for each passenger.

There is no odor of gasoline or oil—not the slightest trace of Carbon Monoxide. Let us send you details.
—And the Latest Catalogs on Keystone Car and Bus Equipment

Keystone Car and Bus Equipment includes the items shown below—and hundreds of other car and bus accessories.

Car Equipment is listed in Catalog No. 7 and Bus equipment in Catalog No. 9.

If you do not have these catalogs—and you are purchasers of car or bus equipment—please write for the one you require.

---

Faraday Push Buttons
Golden Glow Headlights
Dome Type A Keystone-Ivanhoe Fixture
Dome Type S Keystone-Ivanhoe Fixture
Faraday Buzzers
Hunter Illuminated Signs
Faraday Car Signal Systems
Keystone Trolley Catchers

CE Supplies Co.

Branches—Bessemer Bldg., Pittsburgh; 88 Broad St., Boston; General Motors Bldg., Detroit; 318 N. Washington Ave., Scranton; Canadian Agents—Lyman Tube & Supply Company, Ltd., Montreal, Toronto, Vancouver.
Covington car fare is 10 cents cash, three tickets for a quarter. The street railway carried 7 ½ million more passengers in 1927 than in 1926. In 1928 it held the gain of the previous year and added another 1 ½ million passengers to it. In 1929, in spite of a general decline in business, the gains of the two previous years were practically maintained. This property is firmly convinced of the value of selling bulk transportation in advance to its patrons. This is borne out by the fact that the percentage of passengers using tickets has increased until it is now 86.31 per cent.

**Globe Ticket Company**

PHILADELPHIA, PA.

**Factories:**
- Philadelphia
- Los Angeles
- Boston
- New York
- Jacksonville

**Offices:**
- Syracuse
- Baltimore
- St. Louis
- Cincinnati
- Cleveland
- Pittsburgh

Phila., Pa.
You can be sure of G-E 1850 Insulating Paper. It doesn't carbonize, under motor operating heats. It resists moisture, and it's mechanically strong... doesn't split in tight slots, leaving hidden cause for later trouble.

There are no pinholes in it... no thin spots... no brittle patches.

Careful selection of pulps from all over the world, special processes, hot rolling under tremendous pressures, long manufacturing experience—in a plant devoted to this product—all these factors make G-E 1850 super insulating paper.

You will understand why it can add life to hard-driven motors if you will accept a sample from us. Write today to Section M-814, Merchandise Department, General Electric Company, Bridgeport, Conn.
The essential equipment

The modern light-weight car is the answer to a general demand for rolling stock of low initial cost and decreased maintenance. General Electric stands ready to supply the essential equipment for this service—equipment that has in every way kept abreast of the requirements of the railway industry.

This 25-horsepower motor, GE-264, has excellent characteristics for service in light-weight cars. Several features, such as constant-oil-level bearings and ventilated cover above commutator, add to its desirability for this class of service.

Type K-75 control with LB control handle is designed for light-weight cars. Although smaller and lighter than standard controllers, it embodies the latest improvements including hinged-type control fingers. The LB handle, which provides for opening and closing of the control contacts before the drum is moved, confines practically all arcing to the line breaker; all heavy currents are opened under the car.

G-E line-breaker equipment not only prevents a large percentage of the arcing that would otherwise occur in the controller, but it also protects the equipment from short circuits and overloads above a predetermined value. A substantial reduction in maintenance costs is thus made possible.
for light-weight cars

Type CP motor-driven compressors for air-brake service are the result of long experience in the design and manufacture of reciprocating air compressors. The many features that contribute to the reliability and long life of these units are of interest to every operator.

Exposure to the elements does not affect the Type EW resistor, because the units are made of special non-corrodible alloy; nor will vibration break it, because the alloy is flexible and has a high tensile strength. It weighs but half as much as a grid-type resistor of the same capacity.

-and if you want fast acceleration

The GE-301 motor (50 horsepower) was developed to meet the demand for fast acceleration in large cities where cars of greater seating capacity are required. This motor is provided with four commutating poles (unusual in a motor of this size) and constant-oil-level bearings.

PCM control provides automatically smooth, fast acceleration without discomfort to passengers. It has the largest number of steps available in any control and yet the construction and operation are simple. Ask for complete information concerning this modern device.

Magnetic track brakes are designed to increase safety in traffic. They provide the ability to stop quickly regardless of rail conditions and are a valuable aid to the maintenance of fast schedule speeds through heavy traffic areas.
G-E mercury-arc rectifiers demonstrate their flexibility

Interior view of Fall River station showing control panels

Interior view of Fall River station showing three General Electric mercury-arc rectifiers, each of 1,000-kw. capacity

this station converts either 25- or 60-cycle power

OF UNUSUAL interest is the installation of G-E mercury-arc rectifiers at the Fall River substation of the Eastern Massachusetts Street Railway Company. Normally, these rectifiers utilize 25-cycle power at 13,200 volts. However, the equipment is so designed that in case the 25-cycle power is interrupted, 60-cycle power at 22,900 volts can be substituted instantly. Other G-E equipment at this station includes transformers and complete manual switchgear.

The reliability of G-E mercury-arc rectifiers has been proved again and again through years of railway service. Your interest is invited. Address the nearest G-E office or General Electric Company, Schenectady, N.Y.

JOIN US IN THE GENERAL ELECTRIC HOUR, BROADCAST EVERY SATURDAY EVENING ON A NATION-WIDE N.B.C. NETWORK

GENERAL ELECTRIC
SALES AND ENGINEERING SERVICE IN PRINCIPAL CITIES
Improvement Plans Go Forward

DETERMINATION on the part of electric railway executives to carry out their full program of expenditures for improvements during 1930 remains unshaken. They believe that there is nothing in the present general business situation to necessitate any curtailment of their new equipment, construction and maintenance budgets. Expenditures planned by the industry for these purposes total more than $371,000,000. This was indicated by the survey appearing in the Annual Statistical Issue of Electric Railway Journal, published early in January.

But that was three months ago. They have been three months of economic uncertainty. Business trends have been hesitant. Electric railway traffic has declined sharply. To determine what effect, if any, these conditions might have on the improvement plans of the industry, this paper made a telegraphic survey covering railways in most of the principal cities in 27 states and Canada, as well as a considerable number of interurbans. Practically without exception these companies replied that they intend to carry out their program of extensions, betterments and maintenance as originally planned. “No reduction in expenditures contemplated.” “See no reason to change our plans.” “Our company is carrying out full program of expenditures,” are typical of the answers received. Detailed results of the survey are given in an article appearing elsewhere in this issue.

Preliminary steps have already been taken to carry out these improvement plans. Orders for more than 250 new cars have been placed since the first of January and announcement has been made of the prospective purchase of 200 additional cars in the near future. Approximately 500 new buses have been ordered by the electric railways during the past three months, with the purchase of 150 more pending. Activity has been evident also with respect to trackless trolleys. Orders have been placed for 41 of these vehicles, with the purchase of 100 more under consideration. Track construction, of course, is a seasonal activity. The work for this year is only just beginning. Orders placed for track material indicate that the electric railways are practically ready to begin the execution of extensive construction programs. Materials for the maintenance and construction of overhead line and power equipment also have been purchased in volume, indicating that activity in this department will not lag.

Expenditures made during the first three months of this year for new equipment, construction and maintenance represent only a relatively small part of the annual budget. During the next six months improvement plans will be pushed more rapidly. Electric railway men feel entire confidence in the fundamental soundness of the economic situation and in the continuing need for public transportation service. They are going forward with this program of extensions and betterments. This the Journal’s survey definitely substantiates.

Transportation Salesmen Who Wear Overalls

WHILE the first contact made by a transportation company’s patron is with the operator of the vehicle in which he is riding, an effective merchandising program must go far deeper than that. Important as it is to have neatly dressed, competent and courteous operators, it is equally important to have shop foremen and carhouse employees who measure up to their responsibilities. Train crews may be letter perfect in the performance of their duties and well versed in all the requisites of ride salesmanship, but the effect will be nullified if the cars themselves are dingy, dirty and noisy. Merchandising, in fact, begins in the shops and garage.

Poorly maintained rolling stock prevents successful merchandising in two ways. Cars and buses are the show windows of the local transportation industry. By their appearance, they attract or repel potential customers. Even strangers in a city, though they may not patronize its local transportation system, often gain a lasting impression of that city from the appearance of its street cars. Equally important is the fact that the vehicle operators themselves have little enthusiasm and interest in salesmanship unless they have worth-while service to sell. Just as surely as the craftsman must have proper tools if he is to perform good work, so too must the operator have a clean, well-maintained vehicle if he is to render good service. The shopman in his overalls is a salesman of transportation just as much as is the operator in his brass-buttoned uniform.

Putting Maintenance on a Production Basis

UNIT replacement has been generally accepted in many industries as the most efficient system of equipment maintenance. This system is akin to the mass production methods which have been instrumental in lowering manufacturing costs. Although the electric railway industry as a whole has been slow to adopt this practice the properties where it is followed are convinced of its effectiveness.

By centralizing the overhaul and repair of equipment parts, the unit replacement system results in better work being done at lower cost. On many railways it is customary to do minor overhaul work at the various carhouses whenever inspection discloses the need for it. Costs are higher when work is done in the individual
overhaul shop, and the time required for inspection and repair is considerably increased over that required under the unit replacement system. Centralization permits overhauling to be done at a steady rate by trained specialists working at maximum efficiency all the time. Moreover, the installation of modern machinery can be justified when it is kept in steady operation. This in turn results in further economies.

Another advantage of unit replacement is the reduction in the length of time required to overhaul a car. With the old system of bringing the car into the shop, stripping it of its equipment, overhauling each of the individual parts and then reassembling them, a period varying from three to twenty days is required. This represents a long term of inactivity during which the car is earning nothing. With the unit replacement system it is possible to bring in a car for overhauling, replace old parts with repaired parts, and get the vehicle back into service again much more quickly.

Of paramount importance, also, is the encouragement which the unit replacement system gives to preventive maintenance. With this system it is possible to overhaul spare parts at a central point and distribute them among the various operating stations so that worn parts can be replaced at the regular inspection periods. The presence of extra equipment which can be easily substituted for a suspected part encourages such substitution rather than the policy of "taking a chance" that such a part will last until the next inspection. Other advantages of the unit replacement system worthy of serious consideration are the closer supervision of overhauling work and the keeping of more accurate equipment records.

Perhaps the hesitancy on the part of electric railways to adopt this procedure has been due to the additional investment required to keep on hand the necessary extra equipment. While it is true that the unit replacement system requires at the beginning an additional investment in extra equipment, it permits a substantial reduction in the amount of repairs material which must be kept on hand at the operating stations. Regardless of the matter of investment, however, experience shows that this system is effective in preventing rolling stock failures in service. Undoubtedly the cost of such breakdowns, measured in public good will as well as in actual dollars and cents expenditures, is far greater than the cost of keeping on hand the extra equipment.

Junk Piles—Monuments to Progress

"JUNK is a horrid word," to paraphrase a current advertisement, and a junk pile is seldom good to look at. But, according to no less an authority than Dr. Julius Klein, Assistant Secretary of Commerce, these piles of discarded machinery, of cast-off equipment, are impressive monuments to American progress. They are in sight because progressive management prefers to have the junk outside the factory instead of inside and in use.

Generally speaking, the progression to the junk pile is accelerated by a desire to have in use only such equipment as will render satisfactory and economical service. Thus obsolescence rather than complete destruction of usefulness is the measure that determines when retirement is desirable—and necessary—if the business is to be conducted economically. Obsolescence indicates progress. It also indicates careful management, for equipment is seldom if ever discarded until an analysis has proved that the move is a wise one.

In the electric railway industry, a survey made by this paper a few years ago showed that 40 per cent of the machine tools in use were 20 or more years old. There is no indication that this proportion has changed materially. Another survey by this paper showed that 34 per cent of the passenger cars were more than 20 years old. Today there is an even greater proportion of old cars. While these pieces of animated junk will function after a fashion, it is self-evident that they cannot do the work of equipment designed today for today's need. Now is the time to build our monuments to progress by consigning the junk to the junk pile, where it belongs.

Interstate Bus Regulation Advanced

In the electric railway industry, a survey made by this paper a few years ago showed that 40 per cent of the machine tools in use were 20 or more years old. There is no indication that this proportion has changed materially. Another survey by this paper showed that 34 per cent of the passenger cars were more than 20 years old. Today there is an even greater proportion of old cars. While these pieces of animated junk will function after a fashion, it is self-evident that they cannot do the work of equipment designed today for today's need. Now is the time to build our monuments to progress by consigning the junk to the junk pile, where it belongs.

Junk Piles—Monuments to Progress

"JUNK is a horrid word," to paraphrase a current advertisement, and a junk pile is seldom good to look at. But, according to no less an authority than Dr. Julius Klein, Assistant Secretary of Commerce, these piles of discarded machinery, of cast-off equipment, are impressive monuments to American progress. They are in sight because progressive management prefers to have the junk outside the factory instead of inside and in use.

Generally speaking, the progression to the junk pile is accelerated by a desire to have in use only such equipment as will render satisfactory and economical service. Thus obsolescence rather than complete destruction of usefulness is the measure that determines when retirement is desirable—and necessary—if the business is to be conducted economically. Obsolescence indicates progress. It also indicates careful management, for equipment is seldom if ever discarded until an analysis has proved that the move is a wise one.

In the electric railway industry, a survey made by this paper a few years ago showed that 40 per cent of the machine tools in use were 20 or more years old. There is no indication that this proportion has changed materially. Another survey by this paper showed that 34 per cent of the passenger cars were more than 20 years old. Today there is an even greater proportion of old cars. While these pieces of animated junk will function after a fashion, it is self-evident that they cannot do the work of equipment designed today for today's need. Now is the time to build our monuments to progress by consigning the junk to the junk pile, where it belongs.

Interstate Bus Regulation Advanced

WITH the passage of the Parker bill by the House of Representatives on March 24 an important step was taken toward the regulation of interstate bus operations. Legislation on this subject has been under consideration by Congress since 1925, shortly after the United States Supreme Court decided that under the existing law neither the individual states nor any federal agency possessed authority to regulate this form of transportation. The situation created by the absence of regulation has been of direct concern to the electric railways, both from the standpoint of their own operations and those of their competitors. While general agreement has long existed among interstate bus operators that regulation of some sort was desirable, differences of opinion concerning certain details, and opposition from various sources outside the ranks of the operators have resulted in protracted delays.

In its present form the Parker bill empowers the Interstate Commerce Commission to supervise the interstate operation of passenger buses, acting through the state regulatory bodies where not more than three states are involved and with discretionary authority to refer cases to state bodies where more than three states are involved. The authority granted includes regulation of rates and fares and the requirement that the bus lines file liability insurance or indemnity bonds.

Buses are to operate under certificates of convenience and necessity, with regular routes and fixed termini. Operation of interstate buses on March 1, 1930, is to be considered prima facie evidence of convenience and necessity. This date is a change from that originally fixed in the bill, which was Jan. 1, 1930.

Some opposition was voiced to the passage of the bill on the ground that it would tend to stifle competition and create a monopoly. Obviously this argument has little merit as practically all states have laws governing intrastate transportation of persons by motor carriers, and the enactment of the proposed legislation is merely an extension of this principle to a type of operation which has heretofore been without adequate regulation. With a view to overcoming this objection, however, an amendment was made to the bill on the floor of the House providing that no consolidation, merger or acquisition of control should be approved if more than one of the groups involved was directly or indirectly engaged in railroad transportation.

The next step will be the consideration of the Parker bill by the commerce committee of the Senate. It is expected that the committee will conduct hearings before making any recommendations. While this will necessarily result in some additional delay it is to be hoped for the stability of the bus industry that favorable action will be taken at this session.
Hidden Assets

Few, indeed, of the millions of passengers who ride the electric railway cars every day have any realization of the far-reaching organization required to provide the safe and dependable service which they use. They would be amazed to know that on a property of average size, more than 8,000 different items must be kept constantly on hand in the storeroom in order to assure the reliability of the service. The amount of money tied up in these materials and supplies averages nearly half a million dollars, or about 5 per cent of the annual gross receipts. For the industry as a whole, a survey published elsewhere in this issue shows that there is a total investment of approximately $72,500,000 in materials and supplies kept in stock.

In this survey figures were secured from 42 electric railways of varying sizes in the United States and Canada, representing in the aggregate about one-quarter of the entire industry. Considerable variation was shown between the large and small companies, and also between different companies of the same approximate size. In general, however, the reports showed remarkable uniformity, and the averages of the large, medium-size and small groups, furnish a series of convenient yardsticks by which to measure the conditions on an individual property.

The survey also showed that there is a decided trend today toward buying in small lots at frequent intervals rather than in occasional large quantities. Most of the railways are following this practice, but not overlooking the price inducements offered for quantity purchases. The general rule appears to be that smaller amounts are bought unless the savings accruing from quantity purchase exceed the interest on the extra investment.

In the past few years standardization has been responsible for many substantial reductions in the quantity of materials and supplies kept in stock. This has been done by co-operative effort of the industry as a whole, and also by standardization on individual properties. Further progress in this direction is to be expected, but despite everything that can be done, the materials and supplies kept on hand to insure the continuity of service will always remain a "hidden asset" of enormous importance.

Electrification Proceeding on Its Merits

Indicative of the modern viewpoint in transportation circles which looks toward making the maximum use of the plant is the present activity in the field of steam railroad electrification. Thirty years ago, when electrification of main trunk lines was first proposed, the principal claim in its favor was economy of power supply as compared with steam. While the arguments advanced were valid enough, comparatively few installations were made for this reason. A more important factor was the impracticability of using steam in special locations, such as metropolitan terminals or tunnels. A number of years later, when the terminal installations had given ample proof that electric power was not only able to replace steam, but under certain conditions was doing things that steam never could accomplish, more roads began giving serious consideration to electrification.

Today the use of electric power is being extended rapidly. The Pennsylvania, a pioneer in electrification, will within a few years have the most comprehensive heavy installation in the world. The suburban electrifications of the Lackawanna in New Jersey and the Reading in Philadelphia are looked on merely as forerunners of much greater projects. Even the Cleveland terminal electrification, now about to start operation, appears to be only a step in the ultimate conversion of a large section of the New York Central.

Two of these new installations, the Pennsylvanian, which is a heavy trunk line system, and the Reading, which for the present comprises suburban service only, are being made with 11,000-volt single-phase alternating current. The other two are being made with 3,000-volt direct current. The Cleveland Union terminal electrification will handle heavy trains while the Lackawanna for the time being will use multiple-unit suburban trains only. Thus it appears that the sponsors of both systems consider them entirely suitable for practically all classes of electrification. It is quite significant that there are so few limitations to the type of supply that will give satisfactory service. To some extent, however, this wide choice has tended to retard rather than help the progress of electrification both in this country and abroad.

It is needless to recount the advantages of electricity. They are now well known to railroad men who have been following developments. With increasing use new advantages are being discovered which scarcely could have been predicted before any comprehensive installations had been completed. Accordingly the new electric roads are being watched with great interest. Their success is a foregone conclusion.

A Professor Speaks

Ideas that have long been held by electric railway men received new emphasis from the clear and forceful presentation made by Prof. Winthrop M. Daniels at a recent meeting of the New England Street Railway Club. Problems of transportation have occupied the attention of Professor Daniels for many years. His conclusions deserve consideration. When speaking of street traffic conditions, he said that "we are now engaged in the almost hopeless task of trying to force a 3-in. stream through a ½-in. nozzle," he created a picture the vividness and accuracy of which must appeal to every thinking person. Changing the metaphor, he pointed out that the arteries of local traffic in central shopping and business districts are suffering from high blood pressure. His listing of schemes which are merely palliatives, or which involve prohibitive expense, was extremely helpful.

Though there is a "no man's land" where competitive rivalry is acute between the private automobile and the public transportation agency, he believes that there is a definite core of traffic which can be handled only by the latter. In congested districts electric railway traffic represents the major movement and should receive dominant consideration. The convenience of the few as represented by parking and similar uneconomic uses of street space must give way to the convenience of the many as represented by the traffic on public transportation vehicles. At present the satisfactory operation of the electric railways is being seriously impaired by congestion. The railways cannot afford to sit back in the hope that this difficulty will be self-corrective. Only when they militantly, but without asperity, insist that their right is paramount, will they be able to operate satisfactorily. This they must do in their own interest alone, but in the interest of the public as a whole.
**Typical Statements Concerning Improvement Plans for 1930**

No changes in budget figures. Full expenditures expected.

Industrial conditions will not change new equipment and maintenance expenditures.

No reductions in expenditures are planned.

Have made no change in budgeted amounts for new equipment and maintenance expenditures.

No change on our property.

We do not anticipate any change in our budget for 1930 on account of industrial conditions.

See no reason to change our plans.

No change contemplated in our new equipment and maintenance expenditures.

Present industrial conditions will not affect contemplated expenditures for new equipment and maintenance.

There has been no change in our contemplated budget for 1930.

We do not anticipate any change in new equipment and maintenance expenditures.

No reduction in expenditures contemplated.

**TELEGRAPHIC reports received from electric railways throughout the United States and Canada show emphatically that no curtailment is contemplated in their new equipment, construction and maintenance programs for 1930. In view of the uncertainty of the general business situation today, a nationwide inquiry was made by ELECTRIC RAILWAY JOURNAL concerning the effect which this might have on previously announced plans. Replies were received from almost every company to which a telegram was sent, including railways operating in most of the principal cities in 27 states, as well as from a considerable number of interurban lines. The territory covered extends from Maine to California and from Canada to the Gulf of Mexico, with intervening areas covered approximately in proportion to the extent of electric railway operations. Practically without exception these railways state that they intend to carry out the full program of improvements specified in the confidential budget figures submitted last December for the Annual Statistical Issue of this paper. The wide geographical distribution of the railways replying to the inquiry, as well as the variety of business and industrial conditions existing in the territories they serve, assures the reliability of their reports as an index of what may be expected during the year.

Typical of the spirit of the replies is the statement of J. N. Shannahan, president Omaha & Council Bluffs Street Railway and chairman of the Advisory Council American Electric Railway Association. The telegram from Mr. Shannahan reads, “No change in plans submitted for your Annual Statistical Number. We will adhere to those plans during the year.” From A. G. Neal, vice-president and comptroller Washington Railway & Electric Company, comes the statement “We contemplate spending 100 per cent of each item listed on statement of capital and maintenance expenditures.” The president of a large railway in the East says “Our company is carrying out a full program of...
Electric Railway New Equipment, Construction and Maintenance Budget for 1930

<table>
<thead>
<tr>
<th></th>
<th>New Plant and Equipment</th>
<th>Maintenance Materials</th>
<th>Maintenance Labor</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Way and structures</td>
<td>$88,400,000</td>
<td>$35,790,000</td>
<td>$51,360,000</td>
<td>$175,550,000</td>
</tr>
<tr>
<td>Cars</td>
<td>31,800,000</td>
<td>36,520,000</td>
<td>50,200,000</td>
<td>118,520,000</td>
</tr>
<tr>
<td>Buses</td>
<td>19,560,000</td>
<td>19,650,000</td>
<td>12,470,000</td>
<td>52,020,000</td>
</tr>
<tr>
<td>Power equipment</td>
<td>8,950,000</td>
<td>10,320,000</td>
<td>5,600,000</td>
<td>25,150,000</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td></td>
<td></td>
<td>$371,220,000</td>
</tr>
</tbody>
</table>

Electric Railways Proceeding with Full Budget Program

New equipment, construction and maintenance expenditures to be made during 1930 in accordance with original plans. Total remains at $371,000,000 despite uncertainty of present business situation.

By JOHN A. MILLER, Jr.
Managing Editor
Electric Railway Journal

plans no change in its construction program but may adjust its maintenance budget to meet the decrease which has occurred in the number of revenue passengers carried.

To offset these possible reductions a number of other railways now plan to make larger expenditures in 1930 than were contemplated when figures were submitted for the Statistical Issue of the Journal. Of particular interest is the statement of Lucius S. Storrs, executive chairman United Railways & Electric Company of Baltimore: “The credit of this company has been so far improved that a complete rehabilitation is in view and we have decided to materially increase our budget for new expenditures in the matter of cars and buses.” In Detroit, General Manager Del Smith expects that the additional revenue derived from increased fares will permit the Department of Street Railways to add approximately 200 units of rolling stock to present equipment this year, as well as to make numerous other improvements not contemplated when budget figures were submitted. According to D. W. Harvey, general manager Toronto Transportation Commission, “Estimated new equipment and maintenance expenditures will be adhered to, with the exception that a greater amount will be expended for new buses.” The Regina Municipal Railway has increased its way and structures budget 50 per cent. Other companies have indicated the possibility of making increases in improve-

causen any change in the program of the Chicago, North Shore & Milwaukee Railroad, according to J. R. Blackhall, general manager. The company is planning to go through with all work as contemplated. He states that general conditions are beginning to show some improvement.

Increased traffic on the lines of the Montreal Tramways is reported by Col. J. E. Hutcheson, vice-president in charge of operation. He says that while curtailment has taken place in some lines of industry with a consequent increase in unemployment at this season, street railway riding has increased 3.66 per cent since the beginning of the year. D. W. Houston, general superintendent Municipal Railway of Regina, Saskatchewan, estimates that passenger revenue in 1930 will be about 10 per cent higher than in 1929.
Radical changes in design during the past few years have resulted in the development of electric railway cars which are very different from those of a decade ago. General appearance has been greatly improved. Riding qualities have been bettered. Much attention has been given to interior design and appointments. Means have been found to reduce noise and to increase the smoothness of operation. Higher rates of acceleration and braking have been attained. And last, but not least, improvements in design have produced substantial economies in operation. An important element in this development has been the reduction in weight made possible by the extensive use of aluminum and its alloys.

Although the use of aluminum in car construction dates back to 1904, when the Interborough Rapid Transit Company and the Chicago City Railway used the metal for several parts, and to 1905, when the J. G. Brill Company used aluminum sheets for the headlining of cars for the Manila Electric Railroad & Lighting Corporation, experimentation on a large scale did not begin until 1923. In that year the Illinois Central Railroad built a number of cars for suburban electrified service, using aluminum extensively. From that period forward the use of aluminum alloys in car construction became more and more frequent. Electric railways, recognizing the advantages of reducing car weight, introduced the lighter metal in a number of sample cars and later in larger orders. In an accompanying table are listed a large number of cars that have been built of aluminum, and others that have used this metal to a considerable extent. Several electric railways have designated that certain parts shall in the future be built of aluminum.

In the construction of buses, too, aluminum has been used for a number of years. Several manufacturers have used aluminum panels for a long time, as well as miscellaneous aluminum castings. It is interesting to note, also, that aluminum has gained a strong foothold in Europe in the construction of both street cars and buses. As early as 1911, Zurich, Switzerland, used aluminum for car panels, roof members and fittings.

This extensive development of aluminum alloys has come about as a result of their many advantages. Outstanding among the points in their favor are strength, light weight, ability to absorb impact loads—making for greater safety, non-corrosive qualities and economical maintenance.

Aluminum alloys have been developed which have
about the same physical properties as mild structural steel, except that the modulus of elasticity is about 10,000,000,000 instead of 30,000,000 for steel and the coefficient of expansion is about twice that of steel. Through the process of heat treating it is possible to obtain aluminum alloy members comparable in strength with steel members of equal size. The Aluminum Company of America has developed alloys to be used for various purposes, five of which are particularly suitable for electric railway car construction. The strongest alloys are known as 17 ST and 25 ST and have physical properties similar to mild steel. Their tensile strength is from 55,000 to 63,000 lb. per sq.in., their yield point from 30,000 to 40,000 lb. per sq.in. and their elongation from 25 to 18 per cent. They are used for all strength members, including structural shapes, side girder sheets, letterboards, anti-climbers, coupler bars, etc. Another alloy used rather extensively is 51 ST, also heat treated, and having a tensile strength of from 45,000 to 50,000 lb. per sq.in., a yield point from 30,000 to 40,000 lb. per sq.in. and an elongation of 18 to 10 per cent. It is used for some interior finish, seat frames and trolley poles.

By

CLIFFORD A. FAUST
Assistant Editor
Electric Railway Journal

for Car Construction

The alloy used for interior sheets, bulkheads, moldings, trim, sign boxes, conduits, cable ducts and other parts which do not require the greater strength of the other alloys is 3 S, with a tensile strength of 20,000 to 25,000 lb. per sq.in., a yield point from 15,000 to 20,000 lb. per sq.in. and an elongation of 20 to 3 per cent. The fifth alloy used is 195 HT, an aluminum casting alloy, heat treated after casting to obtain the desired mechanical properties. These vary upon the heat treatment process administered, the tensile strength varying between 28,000 and 50,000 lb. per sq.in., the yield point between 13,000 and 29,000 lb. per sq.in., and the elongation between 12 and 0 per cent. It is used for trolley bases and harps, fender parts, drawbar anchorages and other similar parts requiring strength and ductility.

Although as strong as steel, most aluminum structures weigh only about half as much. In parts where aluminum is used—the underframe, the body, the trucks, the motors and control and accessories—it has been found possible to obtain large reductions in weight. As will be seen in an accompanying table, savings in weight of 13,150 lb. have been made on some cars. In another table the structural members and equipment made of aluminum in the Cleveland Railway car are listed.

Among the more important results of light weight are less power consumption, satisfactory performance of smaller motors and other parts, higher acceleration, braking and running speed, less wear on the track structure, reduced wear of brakes and other parts, less strain on the framing, greater safety, better performance, reduction of unsprung weight of trucks and less noise.

Numerous tests have been made of power savings, resulting from lighter weight. All have shown very substantial reductions. One company reported savings varying from 15.7 per cent with a 23.1 per cent reduction in weight, to 46.2 per cent with a 33.3 per cent reduction in weight. By decreasing the weight of a car it is possible to use smaller motors with considerably less total rating, but which have a higher rating per pound of car. Similarly, many other parts, such as the controller and brake equipment, can be made smaller. Starting with higher acceleration, braking and running speed, made possible by lighter weight, a cycle is set up which includes fewer cars to maintain the same schedule, less power, fewer men, lower investment, etc.

The volume and cost of track work depends to a large extent upon the weight of the rolling stock operated. Light-weight cars can materially reduce the cost of track maintenance by subjecting the track to less wear. Because of the high accelerating and braking rates it is easier for an operator to handle a lighter vehicle. Consequently, these cars are usually handled much more efficiently and with greater safety.
## Equipment in Which Aluminum Has Been Used, with Weight Data

<table>
<thead>
<tr>
<th>Company and City</th>
<th>Equipment—Number and Type</th>
<th>Manufacturer</th>
<th>Date Equipment was Placed in Service</th>
<th>What Parts of the Vehicle are Aluminum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chicago City Ry., Chicago, Ill.</td>
<td>200 semi-convertible double-truck cars</td>
<td>J. G. Brill Co.</td>
<td>1905</td>
<td>Air pipe, hand rail and fittings.</td>
</tr>
<tr>
<td>Pennsylvania R. R., Philadelphia, Pa.</td>
<td>8 suburban multiple-unit cars</td>
<td>Pennsylvania R. R.</td>
<td>1925</td>
<td>All of super structure—poles, carlinas, sheaths, bulkheads, doors, etc.</td>
</tr>
<tr>
<td>Chicago &amp; North Western Ry., Chicago, Ill.</td>
<td>120 cars for suburban service</td>
<td>Pullman Car &amp; Mfg. Co.</td>
<td>1927</td>
<td>All sheets above underframe.</td>
</tr>
<tr>
<td>Cleveland Ry., Cleveland, Ohio</td>
<td>1 double-truck city car</td>
<td>Cleveland Ry.</td>
<td>Dec. 2, 1926</td>
<td>Body, underframe and trucks.</td>
</tr>
<tr>
<td>Pittsburgh Ry., Pittsburgh, Pa.</td>
<td>1 pair trucks</td>
<td>Wason Mfg. Co.</td>
<td>April 14, 1927</td>
<td>All except wheels, axles, springs and working parts.</td>
</tr>
<tr>
<td>Montreal Tramways, Montreal, Que., Canada</td>
<td>10 two-man city cars</td>
<td>Canadian Car &amp; Foundry Co.</td>
<td>1927</td>
<td>Framing and exterior sheathing.</td>
</tr>
<tr>
<td>St. Louis Public Service Co., then United Railways of St. Louis, St. Louis, Mo.</td>
<td>1 double-truck city car</td>
<td>United Ry. of St. Louis</td>
<td>Nov., 1927</td>
<td>Body and underframe.</td>
</tr>
<tr>
<td>Twin City Rapid Transit Co. Minneapolis, Minn.</td>
<td>25 city cars</td>
<td>Twin City Rapid Transit Co.</td>
<td>Dec., 1927</td>
<td>Body and underframe.</td>
</tr>
<tr>
<td>Cincinnati Street Ry., Cincinnati, Ohio</td>
<td>1 pair archbar trucks</td>
<td>Cincinnati Car Corp.</td>
<td>March, 1928</td>
<td>Sheets, posts and carlinas. Use new standard except underframes.</td>
</tr>
<tr>
<td>Utah Light &amp; Traction Co. Salt Lake City, Utah.</td>
<td>11 Versace electric coaches</td>
<td>Versace Corp.</td>
<td>Sept. 9, 1928</td>
<td>All except underframe members.</td>
</tr>
<tr>
<td>Delaware Electric Power Co. Wilmington, Del.</td>
<td>7 Versace electric coaches</td>
<td>Versace Corp.</td>
<td>Sept. 9, 1928</td>
<td>All except two underframe members.</td>
</tr>
<tr>
<td>St. Louis, Mo.</td>
<td>10 of same type</td>
<td>Canadian Car &amp; Foundry Co.</td>
<td>1929</td>
<td>Not delivered.</td>
</tr>
<tr>
<td>J. G. Brill Co.</td>
<td>6 of same type</td>
<td>Osgood-Bradley Car Co., Trucks by Timken-Detroit Axle Co.</td>
<td>June, 1929</td>
<td>Body and underframe. Trucks all except wheels, axles and springs.</td>
</tr>
<tr>
<td>Dept. of Street Rys., Detroit, Mich.</td>
<td>1 double-truck city car</td>
<td>Dept. of Street Rys.</td>
<td>July, 1929</td>
<td>Castings, posts and miscellaneous parts.</td>
</tr>
<tr>
<td>Louisville Ry., Louisville, Ky.</td>
<td>5 interurban trailers</td>
<td>St. Louis Car Co.</td>
<td>Sept., 1929</td>
<td>Not delivered.</td>
</tr>
<tr>
<td>Third Avenue Ry., New York, N. Y.</td>
<td>5 trailers of same type</td>
<td>Cincinnati Car Corp.</td>
<td>Sept., 1929</td>
<td>Body and underframe.</td>
</tr>
<tr>
<td>St. Louis Public Service Co., St. Louis, Mo.</td>
<td>1 four-wheel double-end city car</td>
<td>Canadian Car &amp; Foundry Co.</td>
<td>Nov., 1929</td>
<td>Exterior sheathing.</td>
</tr>
<tr>
<td>Board of Transportation, New York, N. Y.</td>
<td>300 subway cars</td>
<td>American Car &amp; Foundry Co.</td>
<td>March, 1930</td>
<td>Not delivered.</td>
</tr>
</tbody>
</table>

Aluminum was used for car construction as early as 1904. In that year and the one following, three companies adopted the lighter metal for sizable orders. Experimentation on a large scale, however, began in 1923, when the Illinois Central incorporated strong alloys in the design of several suburban cars.

During the latter part of 1926 the Cleveland Railway completed the first all-aluminum street car. In 1927 cars were built in Springfield, Montreal, Joliet, St. Louis and Minneapolis.
and Other Pertinent Information

| Weight of Aluminum Used in Lbs. | Total Weight of Vehicle in Lbs. | Weight Saved in Lbs. | Estimated Net Additional Cost of Aluminum per Pound of Weight Saved, in Cents | Weight per Seated Passenger in Lbs. | For Detailed Description Refer to the Issue of
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Live Load 88,000 motors on 66,000 trailer</td>
<td>52,000</td>
<td></td>
<td>1,620</td>
<td>1,189 motor car, 1,189 trailer</td>
<td>Oct. 8, 1904, March 4, 1905</td>
</tr>
<tr>
<td>4,985 average 140,000 motor cars</td>
<td>4,985 average 140,000 motor cars</td>
<td></td>
<td>1,182</td>
<td></td>
<td>April 8, 1905, Sept. 16, 1905</td>
</tr>
<tr>
<td>8,636</td>
<td>111,300</td>
<td>13,150</td>
<td>26</td>
<td></td>
<td>July 11, 1923</td>
</tr>
<tr>
<td>3,600</td>
<td>99,600</td>
<td>7,000</td>
<td>20</td>
<td></td>
<td>Jan. 8, 1927</td>
</tr>
<tr>
<td>6,647</td>
<td>30,300</td>
<td>12,901</td>
<td>20</td>
<td></td>
<td>Dec. 24, 1927</td>
</tr>
<tr>
<td>518 per track</td>
<td>1,100 per track</td>
<td>856</td>
<td>25.3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>735</td>
<td>23,450</td>
<td></td>
<td>521</td>
<td></td>
<td>March 24, 1927</td>
</tr>
<tr>
<td>2,275</td>
<td>33,400</td>
<td>3,200</td>
<td>22</td>
<td></td>
<td>May 4, 1927</td>
</tr>
<tr>
<td>650</td>
<td>35,900</td>
<td>1,200</td>
<td>22</td>
<td></td>
<td>Aug. 25, 1927</td>
</tr>
<tr>
<td>859</td>
<td>36,700</td>
<td>1,200</td>
<td>22</td>
<td>759</td>
<td>Sept. 3, 1927</td>
</tr>
<tr>
<td>10,000</td>
<td>23,722</td>
<td>13,500</td>
<td>20</td>
<td>817</td>
<td>Dec. 10, 1927</td>
</tr>
<tr>
<td>3,692</td>
<td>32,000</td>
<td>5,332</td>
<td>35.9</td>
<td>789</td>
<td>Dec. 17, 1927</td>
</tr>
<tr>
<td>1,372</td>
<td>27,670</td>
<td>2,618</td>
<td>17.3</td>
<td>542</td>
<td>Dec. 24, 1927</td>
</tr>
<tr>
<td>450</td>
<td>3,668</td>
<td>650</td>
<td>22.3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>16,000</td>
<td>36,640</td>
<td>1,330</td>
<td>713</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3,323</td>
<td>25,200</td>
<td>7,863</td>
<td>19.4</td>
<td>600</td>
<td>Jan. 16, 1928</td>
</tr>
<tr>
<td>1,595</td>
<td>14,500</td>
<td>2,282</td>
<td>24.1</td>
<td>483</td>
<td>July 29, 1929</td>
</tr>
<tr>
<td>3,579 motor cars</td>
<td>3,579 motor cars</td>
<td>4,900</td>
<td>625</td>
<td></td>
<td>Sept. 15, 1926</td>
</tr>
<tr>
<td>3,226 trailers</td>
<td>3,226 trailers</td>
<td></td>
<td>625</td>
<td></td>
<td>Jan. 12, 1929</td>
</tr>
<tr>
<td>2,300</td>
<td>29,150</td>
<td>2,500</td>
<td>40</td>
<td>550</td>
<td>Nov. 29, 1929</td>
</tr>
<tr>
<td>2,300</td>
<td>32,450</td>
<td>2,500</td>
<td>40</td>
<td></td>
<td>Nov. 29, 1929</td>
</tr>
<tr>
<td>27,000</td>
<td>39,000</td>
<td>1,330</td>
<td>530</td>
<td></td>
<td>Jan. 16, 1928</td>
</tr>
<tr>
<td>4,084</td>
<td>36,180</td>
<td>7,350</td>
<td>19.7</td>
<td>584</td>
<td>Jan. 16, 1928</td>
</tr>
<tr>
<td>35,000</td>
<td>28,900</td>
<td></td>
<td>729</td>
<td></td>
<td>Feb. 1, 1929</td>
</tr>
<tr>
<td>141,000</td>
<td>148,000</td>
<td>6,650</td>
<td>17.6</td>
<td>1,122 motor cars, 767 trailers</td>
<td>Mar. 9, 1929</td>
</tr>
<tr>
<td>2,300</td>
<td>29,150</td>
<td>2,500</td>
<td>40</td>
<td></td>
<td>June, 1929</td>
</tr>
<tr>
<td>2,300</td>
<td>32,450</td>
<td>2,500</td>
<td>40</td>
<td></td>
<td>Nov. 29, 1929</td>
</tr>
<tr>
<td>27,000</td>
<td>39,000</td>
<td>1,330</td>
<td>530</td>
<td></td>
<td>Oct. 12, 1928</td>
</tr>
<tr>
<td>4,084</td>
<td>36,180</td>
<td>7,350</td>
<td>19.7</td>
<td>584</td>
<td>Mar. 9, 1929</td>
</tr>
<tr>
<td>35,000</td>
<td>28,900</td>
<td></td>
<td>729</td>
<td></td>
<td>Jan. 16, 1928</td>
</tr>
<tr>
<td>2,300</td>
<td>29,150</td>
<td>2,500</td>
<td>40</td>
<td></td>
<td>June, 1929</td>
</tr>
<tr>
<td>2,300</td>
<td>32,450</td>
<td>2,500</td>
<td>40</td>
<td></td>
<td>Nov. 29, 1929</td>
</tr>
<tr>
<td>27,000</td>
<td>39,000</td>
<td>1,330</td>
<td>530</td>
<td></td>
<td>Jan. 16, 1928</td>
</tr>
<tr>
<td>4,084</td>
<td>36,180</td>
<td>7,350</td>
<td>19.7</td>
<td>584</td>
<td>Jan. 16, 1928</td>
</tr>
<tr>
<td>35,000</td>
<td>28,900</td>
<td></td>
<td>729</td>
<td></td>
<td>Jan. 16, 1928</td>
</tr>
<tr>
<td>2,300</td>
<td>29,150</td>
<td>2,500</td>
<td>40</td>
<td></td>
<td>June, 1929</td>
</tr>
<tr>
<td>2,300</td>
<td>32,450</td>
<td>2,500</td>
<td>40</td>
<td></td>
<td>Nov. 29, 1929</td>
</tr>
</tbody>
</table>

The great number built in 1928 and 1929, listed in the above table with several new on order, indicates that aluminum as a metal for car construction is beyond the pioneering stage and well advanced in the period of general acceptance by the industry.

During 1926, the Cleveland Railway built the first street car of aluminum, using this metal not only for the body and underframe, but also for the trucks.

low modulus of elasticity is probably responsible for this characteristic.

Another distinct advantage of aluminum is its ability to withstand atmospheric corrosion. Because of this resistance there is little tendency for paint to peel off, as it does quite frequently on steel. Tests conducted on cars long in service show no signs of corrosion.

During the development of aluminum for street cars it became apparent that it was desirable to isolate the motor ground circuits to prevent leakage of current through joints of aluminum and steel. One instance was encountered where a divided ground circuit caused electrolytic corrosion of an aluminum joint fastened with steel rivets. This was entirely corrected by proper grounding.

From the standpoint of maintenance, aluminum alloys have numerous advantages. Chief among these is the case with which the metal can be worked. A portable pyrometer for measuring heat intensity is necessary in a shop for the proper handling of aluminum alloys, and it attendant noise result with the use of aluminum because of its physical nature.

Greater safety results from the ability of aluminum to absorb impact loads without distortion. In the event of a severe impact, when the yield point of the metal is exceeded there is a tendency for the structure to hold together. I-beams, webs of channels, built-up girders and gusset plates bend but do not tear, as most grades of structural steel will do under similar strains. The

Equipment and Structural Members of the Cleveland Railway Car, Made of Aluminum

<table>
<thead>
<tr>
<th>Body</th>
<th>All side and end plates</th>
<th>Stops, front and center</th>
<th>Hand brake levers</th>
<th>Nash rail</th>
<th>Chair</th>
<th>Head light</th>
<th>Front platform stem</th>
<th>Gusset plates</th>
<th>Body bolster</th>
<th>Radial bar</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Motors</td>
<td>Gear cases</td>
<td>Pinion and commutator end housings</td>
<td>Pinion and commutator end cap</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Controller</td>
<td>Backframe</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Accessory Parts

- Bumper
- Fair box stand
- Stanchions
- Seat pedestals and framework
- Draw bar
- Headlight
- Headlight
- Heater duct
- Sign box
- Sand box
- Door shafts
- Conductor seat
- Trolley bar
- Ventilators
- Trolley guards
- Trolley catchers
- Brake cylinder parts
- Window screens
- Front draw head
- Compensator
- Gong

The Cleveland Railway Journal - April, 1929
Early in 1927 the Springfield Street Railway introduced its light-weight experimental car, with side members, letterboard and other parts of aluminum.

is desirable to have a pyrometer-controlled electric furnace, but no other equipment need be purchased. Punching, shearing, machining and riveting are all performed with the same tools that are used for steel. Bending cold must be watched and the particular qualities of the various grades and tempers of aluminum alloys known. Temperature control is essential for hot bending or forming, this process requiring a special technique.

Aluminum alloys can be welded with an oxy-acetylene torch and at the present time an electric welding apparatus is being developed. Although aluminum parts for replacement are more expensive than steel ones, this cost can be largely offset by the high salvage value.

Perhaps the greatest deterrent to the more general adoption of aluminum alloys for construction has been the higher cost of this material. The alloys used for car construction cost from 28 to 45 cents per pound or 9 to 15 cents per square foot, as compared with 3 to 6 cents for steel. However, the smaller weight of material required, the power savings possible, the lower first cost of motors and other parts and the lower maintenance cost of cars and track, largely offset the extra original cost. In terms of extra cost per pound of weight saved, 20 cents can be taken for an average. In the accompanying table listing cars using aluminum, the estimated additional costs of aluminum per pound of weight saved are shown. As will be noted, the figures vary from 12.3 cents to 45 cents. Since the net savings for those cars which were ordered in quantity vary from 15.3 cents to 22 cents, it is reasonable to assume the figure of 20 cents as the average.

Another important factor bearing on the cost is the lower initial investment for motors and other parts which can be made smaller. It has also been pointed out that if lighter equipment were adopted generally it would permit the use of a lighter track structure, which would materially lower the capital investment in this part of the system. This would be true also for the generating and transmission system.

At the time the first cars were made of aluminum practically all of the parts were made individually, involving a heavy extra unit cost. In addition, the pioneer designers of aluminum cars expended large amounts in preparing their designs and in carrying out other experimental work. Naturally, the costs of the first vehicles were much in excess of the old standard cars. As the car manufacturers become more and more accustomed to the fabrication of this metal and get the proper machinery and training for using it, the costs will continue to go down. Moreover, when aluminum cars are built in quantity, it is likely that the total cost of a car will be no higher than for a standard steel car.

As has been pointed out, aluminum was used in the construction of cars as early as 1904. In that year and the year following three companies received cars using aluminum to some extent. They were the Chicago City Railway, the Interborough Rapid Transit Company and the Manila Electric Railroad & Lighting Corporation. The Chicago car used aluminum for the air pipe, hand rail, fittings and other miscellaneous parts, while the Interborough used...
aluminum for the interior finish and miscellaneous castings in its cars. In the fifteen cars built by the J. G. Brill Company for the Manila company, aluminum sheet was used for the headlining. This metal was selected so that the cars would have a material which would withstand the ravages of the tropical insects without adding to the weight of the car.

In the early days of the local transportation industry wood was a satisfactory material for use in street car bodies. Later, however, came the need for a stronger material and metal began to replace wood. But aluminum was not ready. While it was effective in resisting the attack of insects in tropical countries, for the highly stressed portions of the structure it could not cope with steel. There were no strong alloys, and heat treating processes were unknown. In the next ten years, however, strong aluminum alloys were developed which have mechanical properties comparable with those of steel and which, at the same time, have the light weight of the parent metal.

The first attempt to reduce the weight of car equipment by means of strong alloys of aluminum was made by the Illinois Central Railroad, which constructed a number of cars for suburban service in 1923. These cars proved satisfactory, so 215 additional cars were built in 1925, with aluminum used for roof, seats, interior finish, doors, conduits, junction boxes, headlights and other miscellaneous parts. About this time the Pennsylvania Railroad went even further and constructed eight suburban cars for its service outside of Philadelphia with all aluminum superstructures. Practically everything above the underframe with the exception of a belt rail was constructed of aluminum. Shortly thereafter the Chicago & North Western Railway built 120 suburban cars having all aluminum sheets above the underframe. Both the Illinois Central and the Chicago & North Western have put additional cars in service since and have extended the use of aluminum somewhat over the original applications.

Among the first electric railways to use alloys were the Cleveland Railway, the Pittsburgh Railways, the Springfield Street Railway, the Chicago & Joliet Electric Railway, and the Montreal Tramways. In the car of the Cleveland Railway aluminum was employed not only in the body and underframe, but also in the trucks. Its total weight of 30,300 lb., represented a saving of 12,901 lb., over the standard car of the company. Because of the extensive application of the lighter metal and the great reduction in weight obtained, much interest was centered on this car.

The car designed by the Springfield Street Railway and built by the Wason Manufacturing Company used aluminum for the side members, letterboards, belt rails and body bolsters. Montreal introduced the first aluminum cars in Canada. In one order placed with the Canadian Car & Foundry Company in 1927 both the framing and exterior sheathing were of aluminum; in a second order all the sheathing was of this material. All metal in the car body and underframe of the Chicago & Joliet Electric Railway car was made of aluminum with the exception of the bolts, rivets and similar parts.

During 1927 a car for the United Railways of St. Louis and 25 for the Twin City Rapid Transit Company, all using aluminum extensively, appeared.

During the next year a few more vehicles were produced, among them being ten city cars for the Delaware Electric Power Company, by Brill, three cars for the Calgary Municipal Railway, built by the Canadian
Car & Foundry Company, a pair of Cincinnati Car Corporation trucks for the Cincinnati Street Railway, and eleven Versare electric coaches for the Utah Light & Traction Company. The latter order marked the first use of aluminum in the construction of trackless trolleys.

Sparted on by the developments in the previous years, the industry brought forth an even greater number of cars using aluminum in the year 1929. Among these were an experimental car for the Pittsburgh Railways, by Osgood-Bradley; a double-truck car for the Department of Street Railways, Detroit; ten interurban cars for the Northwestern Pacific Railroad, by the St. Louis Car Company; a sample car for the Louisville Railway, manufactured by the Cincinnati Car Corporation; the United Traction Company car, built by the Cincinnati Car Corporation; the four-wheel city car of the Third Avenue Railway, manufactured by the J. G. Brill Company; fifteen cars for the British Columbia Electric Railway, built by the Canadian Car & Foundry Company, and a sample car of the St. Louis Public Service Company.

Among the more recent orders for equipment using aluminum are the four-wheel car of the Chicago & Joliet Electric Railway, designed by J. R. Blackhall; three double-truck cars of the Monongahela West Penn Public Service Company, by the G. C. Kuhlman Car Company; thirteen cars for the Youngstown Municipal Railway, of G. C. Kuhlman manufacture; 100 cars for the Brooklyn & Queens Transit Corporation, being built by Osgood-Bradley and Brill; 141 motor cars for electrified suburban service of the Delaware, Lackawanna & Western Railroad, and 300 subway cars for the city of New York, both these orders being filled by the American Car & Foundry Company.

Practically all of these cars have been described in detail in previous issues of ELECTRIC RAILWAY JOURNAL. In the accompanying table the dates of publication of these descriptive articles are shown, along with weight figures and other pertinent information.

With the rapid progress that has been made in the past seven years in the use of aluminum for car construction, and considering its many advantages, there is little doubt that this metal is destined to play an extremely important part in all future vehicle construction.

**Railway Distributes Picture Map**

As part of the celebration marking the 200th anniversary of the founding of the city of Baltimore, the United Railways & Electric Company printed and distributed a picture history map of the city illustrated in color in the medieval manner. This shows the company's car and bus routes as well as places of historic interest. The map folds up to pocket size. On the back are short sketches telling interesting facts about Baltimore's historic shrines. It has proved very popular with the public and demands were received by the company from individuals, department stores, hotels, etc., for extra copies.
Prominent way engineers give opinions on basic principles of track construction and explain their practices under numerous specific local conditions.

**Single Life versus Renewable Track**

Among the factors which determine the design of track laid in paved streets, the possibility of reconstruction at some future date under changed conditions imposed by new grades, street widening, or similar municipal requirements, is of prime importance. It might be thought that in the majority of large cities, alignments, width of streets and grades would have been permanently settled many years ago, but experience shows this is by no means the case. On account of changing conditions brought about by automotive developments within the past fifteen to thirty years, alterations continue to be made. Streets have been widened and straightened; paving construction has improved to meet the demands of greater motor vehicle loads and increased traffic. With a view to determining the effect which these changes have upon the design of electric railway track, the Journal has obtained the opinions of a number of prominent way engineers.

Advocates of single-life track construction feel that had their predecessors 15 to 30 years ago designed tracks on the basis that some parts could be allowed to remain in the ground and be used again now in a rebuilt track, it would have been a mistake. They ask what way there is of knowing what conditions will exist 15 to 30 years hence. Frank B. Walker, chief engineer, Eastern Massachusetts Street Railway, states that in his sixteen years’ experience on that New England property, in a section of the country which should be as settled as any other, there have been very few cases where a track has been reconstructed in the exact location and grade of the previous track. He further points out that the industry may be running buses instead of street cars in some places at the end of the normal life of present-day track. To spend any money on ties or foundations with the hope that when the rail is worn out, such material will be of benefit in reconstructing...
a new track upon the old, Mr. Walker considers would be extremely ill-advised.

The relative advantages of single life and renewable designs depend also to a considerable extent on soil conditions. H. M. Steward, superintendent of maintenance, Boston Elevated Railway, stresses this point in his discussion of the subject. He states that under certain conditions of soil it is necessary to support the track structure on a concrete bed, similar to the invert of a subway. On this concrete bed the track structure is built, using a minimum amount of material for surfacing. With this type of construction it is assumed that the concrete bed below the track structure would not have to be disturbed and that a second track could be built thereon. With other conditions of soil steel ties or some form of mechanical tie may be imbedded in concrete of suitable strength and thickness, the top of the concrete slab being at the proper distance from the head of the rail to allow the pavement required to be installed. Some engineers using this form of track construction are of the opinion that when the rails wear out it is possible to remove the old rail and install new ones, or by using a shallower rail, by raising the grade of the track, or by a combination of both, to build a new track structure on top of the old concrete foundation.

Mr. Steward further points out that where the soil conditions are more favorable, it is often not necessary to provide a concrete bed for the track structure, or to imbed the ties and a portion of the rail in concrete. Instead, wooden ties and a sufficient quantity of crushed stone ballast can be used to provide a satisfactory track. With this type of construction a concrete base to support the paving, approximately 6 in. in thickness, may be provided, upon which any type of pavement may be laid. When it becomes necessary to rebuild this type of track the ballast, at least, will be available for further use if it is properly cleaned, and it is also probable that the ties, if they have been properly treated, will be in sufficiently good condition to warrant their use for a second track.

Despite these views on the possibility of a renewable type track construction, Mr. Steward believes that a street railway has no permanent right in a public street, but instead, locates and builds its track only "at its peril." Street changes, necessitating complete relocation of a track area, or underground structures which are constantly being installed under or across the track, mean complete or partial reconstruction of the track and substructure. No matter how carefully a track may be constructed, it will be damaged to a very considerable extent if the paving between the rails or alongside the rails is not carefully installed to prevent water from entering.

With the possibility that all or some of these factors will enter into the problem, Mr. Steward does not believe it advisable to expend too large an amount of money with an expectation of building a permanent structure which will not be disturbed, in order that certain parts may be renewed without disturbing the balance.

In San Francisco, the adoption of single-life track construction has largely been governed by local soil conditions. B. P. Legaré, engineer, maintenance of way and construction, Market Street Railway, has found it impracticable to use a type of renewable track structure with the idea of saving a part of it when reconstruction becomes necessary. In that city there are several

In 1907, track on Market Street in San Francisco had to be raised 4 ft. to bring it back to original grade.
different kinds of soil. A great deal of the downtown, heavy traffic district is made up entirely of fill, over an area which was originally either water or mud flats. In these localities it is impossible to keep the grade of the street at any fixed elevation. Obviously, under this condition it would not be practical to construct a track with the expectation of only renewing the rail and utilizing the foundation at some future date. On the Main Street-Market Street line, Mr. Legaré has reconstructed the track twice in the last 24 years. In each case the street had sunk below the official grade and had to be brought back to that grade at the time of laying the new track. The first time it was raised approximately 4 ft. and the second time, at the same place, 3 ft.

In other localities of the city, where the soil does not settle and stays at practically a uniform grade, the Market Street Railway has been forced to renew track areas in conformity with changes in street structure made by the municipality. In order to meet the change in traffic conditions and the demands of modern motor vehicles, the city has tended to replace old pavement with more modern structures, which in many cases change the crown of the road. The city of San Francisco is replacing a large number of granite block pavements with asphalt, the latter requiring a much flatter crown than the block construction. This, of course, necessitates a change in the elevation of the track structure.

If the electric railway track were built on a permanent foundation, it would be awkward to find a rail that would fit the changed conditions, and such construction would be very expensive to tear out. Experience on the Pacific Coast has proved that, in a paved street, the redwood tie will last as long as the rail and should be renewed when the rail is renewed.

Further experiences in San Francisco are given by M. M. O'Shaughnessy, chief engineer, Municipal Railway of San Francisco. Although he has never used a type of construction in which only certain parts are renewable, his observation of such construction has always been that by the time the rails needed replacing, new ideas of construction or unsatisfactory results necessitated entirely removing the parts which were supposed to be permanent. This often resulted in excessive costs and sometimes abnormal delays. He feels that nothing has yet been brought forward to equal the wood tie construction on a resilient base. Standard construction of the Municipal Railway consists of wood ties laid on a substantial hard rolled sub-ballast. Experience has proved that in using California split redwood ties, the life of the wood is equal to that of the rail on all of the major routes. Complete reconstruction of such track is done at minimum expense and with the least disturbance to service.

M. M. Johnston, division engineer, the Connecticut Company, New Haven, Conn., in discussing his prefer-

Again in 1923, complete reconstruction of track structure had to be made on Market Street, San Francisco, when street was brought back to official grade.
be little fear that the ties will fail before the rail life is gone. In his opinion excessive rail movement, which is so destructive to the ties and pavement, usually develops from one or more of the following causes: Improper spacing of ties, poor tamping or spiking, and the failure to use tie plates when necessary to distribute the load and prevent rail cutting. If this movement is prevented by good designing and careful inspection, Mr. Johnston believes there should be very little trouble, if any, from tie failures.

Track structures built for single life as a unit, but with a maximum amount of salvage value when rail renewal becomes necessary, are considered by Howard H. George, superintendent of way department, Cleveland Railway, Cleveland, Ohio, as the ideal construction. Mr. George's experience has taught him that the design of a track structure should be governed by the following factors: The probable number of years the track will be required to be maintained in the location at which it is to be constructed; the volume of traffic it will be required to carry during that time; and the probability that, within its normal useful life, it will have to be disturbed for reasons beyond the control of the railway, as, for instance, changes in grade or alignment of the street.

These factors will all have an important bearing upon the type of track which should be built, but even when they are determined within a reasonable degree of accuracy, sound economics should control the final selection: Mr. George believes this goes much farther than first cost. The following conditions should be met: The design should provide reasonable assurance of the maximum useful life for the structure as a unit; it should be such as to insure the minimum amount of expense for maintenance during its useful life; it should be such as to permit the maximum amount of salvage when rail renewal becomes necessary, and this requirement takes into consideration the possibility of renewing with a different rail section than that used originally; it should be such as to make it entirely practicable to make any necessary repairs with a minimum interference with car operations, and finally, it should be such as to interfere for the shortest possible time, and to the least possible extent, with the public use of the thoroughfare on which it is constructed, either for its original construction, ordinary repairs, or for major renewals.

It has been Mr. George's experience over a period of 25 years that these requirements are best met by a type of construction which will permit the structure, from the ties down, to wear out at least two sets of rails. He prefers pressure-treated, creosoted wood ties, and believes that if proper and well-known rules and precautions are observed in constructing such track it will give excellent service during the normal life of the first rail, and when it becomes necessary to renew this rail, it can be accomplished with minimum expense and with the least interference to the public use of the street as well as car operations. Mr. George adds "What we must aim for is to reduce the cost per year of useful life of every unit in the track to the smallest figure practicable. But in any case, all the factors must be considered and not just a few."

That the question of single life versus renewable track construction hinges on the proper treatment of the paving problem is the opinion of W. R. Dunham, Jr., Department of Street Railways, Detroit, Mich. He believes that to determine the proper track construction the pavement must be considered as a part of that structure and that track should be designed so as best to fit in with it. A break-down in pavement even when laid around track built in the best possible way as a track structure, will inevitably cause high maintenance costs, together with the destruction of the track. The breakdown may be entirely due to the track construction. A pavement must be rigid if it is to withstand traffic; a flexible track cannot be built in a rigid pavement without destroying the pavement. To build a track in these days with the basic idea in mind of renewing a part of it 40, 30, or even 20 years hence in the face of ever-changing conditions in the industry, hardly seems warranted. Mr. Dunham's experience indicates the need for more thought for permanency and less for renewability.

It has been the standard practice of the Birmingham Electric Company, Birmingham, Ala., to construct track on creosoted ties with well-tamped ballast. On top of this is placed a 6-in. slab of concrete to hold the brick paving. According to A. Taurman, superintendent of equipment, way and structures, this type of construction has worked out very satisfactorily for the following reasons: Creosoted ties and blast-furnace slag are easily secured at reasonable prices; this type of track construction can be done under traffic; the territory along many of the streets in Birmingham is not very well developed and the gas, water, and sewer lines in many places have not been installed. This type of track construction readily lends itself to repairs when these lines are installed as the city develops.

The only criticism Mr. Taurman finds with this type of track construction is that when the rail is worn out the concrete slab may have to be removed, but he feels there is no reason why the ties and ballast should not be used. The type of rail he is using is 101-lb. T, with thermit-welded joints, which he estimates under traffic conditions will last from 20 to 25 years. In the downtown section, where traffic is heavy, the Birmingham Electric Company installs 122-lb. girder rail, and Mr. Taurman is of the opinion that track constructed where both vehicular and electric car traffic is heavy should have a permanent base if possible, so that when the rails are worn out they may be renewed with as little interruption to traffic as possible. He has recently found it necessary to renew rails in the downtown section where the track was constructed on this basis, and found that
the interruptions to traffic were very slight, compared with what they would have been if the entire foundation had had to be removed.

J. H. Haylow, chief engineer, Memphis Street Railway, Memphis, Tenn., states that experience in this city proved that a track foundation consisting of stone ballast, well drained, and creosoted pine ties covered with concrete will endure for at least 40 years. Also, that 7-in. standard A.E.R.E.A. rail, judging from his experience in other sections, will endure for 20 years. Why not, therefore, install another rail on the same foundation? By so doing Mr. Haylow believes that money can be saved, that the accident liability of the company can be reduced and that much inconvenience can be saved the company as well as the public. He believes that for a long period of time and the probability of change in grade of the track is slight. Mr. Roundey believes that a carefully constructed track area with a permanent foundation is economical and that rail renewals can be made without disturbance of the sub-structure.

C. A. Smith, superintendent roadway department, Georgia Power Company, Atlanta, Ga., believes that the question of single life or renewable type track construction depends principally on what is likely to be done in the street in the repaving or changing in grade at some future time. He states that it would not pay to go to any additional cost to make provision for the renewal of the rail on the old foundation if there was a likelihood that the grade of the street would be changed or that the type of pavement would be such that the original

these considerations constitute convincing evidence that it is not only good engineering but good business to construct a track foundation that will not be materially interfered with when the time comes to renew the rail. The standard type of track construction in Memphis is shown in an accompanying illustration.

In discussing his preference for renewable type track construction E. P. Roundey, engineer way and structures, New York State Railways, Utica, N. Y., takes into consideration the factors which affect the first cost, maintenance and replacement. He considers the three types of track structure most commonly used, namely, "steel tie and concrete ballast, wood tie and concrete ballast, and wood tie and stone or gravel ballast." The concrete-ballasted type, with either creosoted wood or steel ties, is the type which ordinarily will require renewal of the rail only. The wood tie and stone or gravel ballast type usually requires renewal of the ties as well as the rail, unless the ties are creosoted and protected from mechanical wear by tie plates.

Mr. Roundey's experience has shown that in some cases many of the ties in concrete-ballasted construction become loose by the time the rail is worn out so that much of the ballast has to be excavated and replaced. This costs about as much as it does to replace wood ties on stone ballast. However, when conditions of the subgrade are proper, the width of street definitely settled foundation could not be used. In some instances, however, such foundations can be provided at very little additional expense, and when the time comes for the rail to be renewed this can be done on the old foundation, if properly constructed, at a saving of a great deal of expense over the reconstruction of the whole track.

Many renewals of this sort have been made in Atlanta. For example, last year it was necessary to renew the rails and special work at Peachtree Street, near Currier Street. This special work curve of 9-in. guard section was built in 1915, the foundation being creosoted pine ties on grouted ballast. The estimated cost of tearing up the whole paving area, track and foundation and replacing them was approximately $12,000. It was anticipated, however, that the creosoted ties and grouted ballast would be in good condition and, therefore, the pavement was opened up for approximately 1 ft. on each side of each rail only; tierods were burned off; the old rail was taken out and a new 9-in. rail of exactly the same alignment laid on the old ties. The ties and foundation were found to be in good condition. Beveled tie plates were installed on each tie. In 1915, it was not the practice to use steel tie plates as it is now, and without these plates Mr. Smith has found that the life of a creosoted tie is determined by mechanical wear rather than by decay. The old tierods were burned off about 6 in. from the rail and new tierod-
terminals welded to the old rods. This eliminated the necessity of tearing up the pavement to install new tie-rods. The total cost of the job, carried on as outlined above, was $5,920, only about 50 per cent of what it would have cost to reconstruct the whole track, including the foundation and pavement. A sketch showing the tiered terminal is shown with this article.

Likewise, Mr. Smith's department has had many instances where it has been able to renew special work, such as double-track branch-offs, using the same design of work and same depth of rail, laying the new work on the old road bed, this road bed consisting of creosoted pine ties and grouted ballast. Whenever this can be done, it saves approximately 50 per cent of the total cost as compared with what the cost would be if the whole roadbed had to be reconstructed. The present practice in Atlanta on straight track is to use 80-lb. A. S. C. E. rail, beam construction with ties spaced 5 ft. on center, concrete pavement. The reasons for the adoption of this design are its low cost of construction and its permanence. Renewal of the rail without renewing the foundation in the future was not a primary factor. This, however, Mr. Smith thinks can be done.

The question as to whether it is more economical to build single-life or renewable track is one that requires careful consideration of the specific conditions to be met. This is the expression of H. F. Merker, formerly chief engineer, Brooklyn City Railways, Brooklyn, N. Y. Assuming that economy is the basis on which the question is to be considered, there should be some assumption as to what can reasonably be considered the life of a piece of track. Many tracks have been declared worn out, yet have carried cars for a considerable number of years thereafter by careful maintenance. The life of track has been variously taken at as low as 10 years and as high as 25, and furthermore there are tracks still in service as old as 30 years or more. Somewhere within this range, however, would lie the life that would have to be considered. In selecting the type of track for any specific condition Mr. Merker further considers the kind of pAVING to be used, and what assurance there is that when the track is later to be reconstructed the same type and design will be used. Again, what section of rail is to be used, and can it be determined what section will be used in future reconstruction? What will be the grade of the reconstructed track? What is the soil condition and does it require a rigid foundation to carry the track?

This latter question of soil conditions Mr. Merker considers an important one. If a rigid foundation is needed on account of local soil conditions (and this is frequently the case) then the foregoing questions shrink in importance, and it might be just as well to provide a renewable type of construction, as the loss would not be great if the conditions, by chance or otherwise, were unfavorable to renewal. If, however, there is doubt as to the kind of paving that would be used in reconstruction, or if there is a likelihood that another section of rail will be used, or if a change of grade is probable, and particularly if the local soil condition is such as to permit a much cheaper type of construction for base or foundation, then it would not seem good business to invest a large sum of money in a construction that is not really needed.

Mr. Merker states that there have been many localities where a track could safely be built with nothing under the ties but the natural soil, assuming that the ties used were standard wood ties, with the usual spacing. There would be needed, of course, a base for the paving, but when time came for a renewal, the entire structure could economically be scrapped and entirely renewed, allowing at the same time a change of type or section of rail, a different sort of paving, and at the same time any change of grade that might be required. Many soils, however, lack the supporting qualities necessary for this type of cheaper track construction. In such a case it would be far better to add the extra cost in building a track that would distribute the load, keep out the water and permit the renewal of the worn parts, which would be the rail, leaving the sub-structure to do additional service for another life. Mr. Merker concludes that in his opinion there is no one type or design of track that would meet all conditions, that each case or each locality must be carefully considered individually and the track structure designed accordingly.
At each scheduled repair, the mechanic in charge of engine inspection is responsible for the draining, cleaning and refilling of the crank case.

Sheer gate grease guns are used to lubricate steering and other chassis mechanisms.

**Economies Effected in Bus Lubrication**

**By Giving** special attention to the subject of bus lubrication, the Philadelphia Rural Transit Company, subsidiary of the Philadelphia Rapid Transit Company, has effected substantial savings. Maintenance practices carried on in its shops are regulated by the actual amount of service performed by each vehicle. All buses are gasoline-electric type Yellow Coaches, equipped with kilowatt-hour meters. Inspections, repairs and lubrication are scheduled according to these meter readings.

When the meter shows 3,500 kw-hr. service, which corresponds to approximately 2,500 miles, the bus is held out for a day and subjected to what is known as a “scheduled repair,” including thorough inspection, minor repairs, and complete lubrication. Each mechanic assigned to work on a part of the vehicle is held responsible for the proper functioning of that part. One man tests and greases all steering mechanism, another the rear end, and a third all electrical equipment. The mechanic assigned to brake inspection packs all the wheel bearings and the man in charge of engine repairs drains the oil, cleans the lower half of the crank-case and refills the case with the required amount of clean oil.

Routine oil replenishment is made each time the bus enters the garage, regardless of whether it has operated one trip or a full run. On long runs the oil and gasoline are checked on the street at scheduled periods of about every eight hours, and replenishment for buses in the north end of the city are made at the company’s filling station at Broad Street and City Line. On a number of vehicles which operate on outlying routes, special gaso-
line tanks of 80-gal. capacity, and 16-qt. oil cases have been installed, so that oil and gas will not have to be added during a full day's operation.

Two additional lubrications are based on a kilowatt-hour meter reading. At between 8,000 and 9,000 kw.-hr., all brakes are relined, at which time axles are disassembled and packed with grease and at 105,000 kw.-hr. the buses are routed to the general shop for complete overhaul.

Five grades of grease have been adopted as standard for heavier lubrication. Universal grade is used on the steering mechanism, in the universal, front and rear wheel bearings, fans and for all other chassis lubrication. A grade 600-W is used in the rears only, and a special ball-bearing lubricant, grade A, is used on all power generators and motors. A special water-pump grease is used on the water pump only. Medium grade oil is used for the lubrication of starting motors, lighting generators and distributors.

One oil, known as M.M. summer heavy, is standard throughout the property for engine lubrication. It is an all-year-round oil of such quality that the company has found it suitable for repeated reclamation. A mix-

ture of new and reclaimed oil in a ratio of 60-40 parts, respectively, has proved satisfactory and is supplied to the engine at scheduled repairs and at daily replacements.

A process whereby the oil drained from the crankcases is saved, reclaimed and mixed with new oil for use again is a prime economy factor in P.R.T.'s maintenance practices. When the mechanic at the garage, who is in charge of engine repair, drains the oil from the crankcase of the bus he stores it in steel drums for shipment to the reclaiming plant. When a truckload of drums has accumulated they are transported to a centrally located building which is used exclusively for the reclaiming of this oil and the reclaiming of waste. Here the oil is transferred to a series of 550-gal. storage tanks.

The equipment used in the reclaiming process consists of a mixing and treating tank, a centrifugal oil purifier for removing carbon, dirt and other inorganic matter, and a distilling apparatus for removing the water and reagent used and for restoring the viscosity. The same equipment is used for the reclaiming of oil drained from the crankcases of the taxicabs owned by the Philadelphia Rapid Transit Company as well as buses maintained for its other subsidiaries. Approximately 200 gal. of oil is put through the process on each day that the plant is in operation, three days each week being devoted to bus oils and two to those from taxicabs. Thus approximately 1,000 gal. of oil is reclaimed each week.
The process is begun by pumping the oil from the storage tanks into the mixing chamber where water and a reagent are added, the whole mixture then being heated to about 200 deg. F. and well agitated. The mixture is then pumped through a centrifuge at the rate of 80 to 100 gal. per hour, where the greater part of the foreign matter is removed. The clean oil is sent by gravity to the rectifier where the diluent is removed by a distillation process.

The oil is circulated through two electric heater elements to the top of the rectifier where it filters down over tile and again circulates until it has reached a temperature of 130 deg. C. Dry steam at low temperature is forced into the rectifier in an opposite direction to the oil flow. The gasoline and kerosene contents are vaporized and carried off by the steam to the top of the rectifier and into the condenser, to be collected and used around the plant for general cleaning purposes.

With each 10-deg. increase in oil temperature the steam admission valve is opened wider. By the time the oil has reached 195 deg. C. the valve is in full open position. At this temperature practically no more foreign elements are present and the process is completed. About 3½ hours of still operation are necessary to bring the oil back to its original viscosity. It is then passed again through the centrifuge to remove any final traces of dirt and then put into drums for shipment back to the various garages.

90 Per Cent of Oil Reclaimed

A very careful check is kept on the oil thus reclaimed. Each day a sample of the reclaimed oil is sent to the company chemist for inspection and comparison with the new oil as originally purchased. Approximately 90 per cent of the oil put through this process is reclaimed for re-use, the remaining 10 per cent being lost in the form of carbon and dirt.

The time required for the entire reclaiming process covers approximately ten hours and the process is handled by one man. The cost is slightly under 10 cents per gal., which includes labor and material, depreciation and maintenance, power and trucking.

---

Proper Lubrication Prolongs Life of Control Equipment

BY G. L. MOSES

Renewal Parts Engineer
Westinghouse Electric & Manufacturing Company

FROM an operating standpoint, it is much worse to “over-lubricate” control equipment than to neglect its lubrication. The important points to lubricate on electric railway control apparatus are the contact fingers and piston leathers, but such lubrication should be done sparingly. Frequent operation of drum controllers and other control apparatus, such as reversers, interlocks and sequence switches, in which contact surfaces move under fingers, may cause considerable wear to both finger and contact surface. This wear can be materially reduced by proper oiling. This should not be done, however, unless the controller can be kept clean and free from abrasive dust. The collection of such dust in the lubricant will increase the cutting, thus defeating the purpose.

Lubrication Schedule for Control Equipment

<table>
<thead>
<tr>
<th>Part</th>
<th>Lubricant</th>
<th>Period, Miles</th>
</tr>
</thead>
<tbody>
<tr>
<td>Main circuit controller fingers and contacts</td>
<td>Light oil</td>
<td>500</td>
</tr>
<tr>
<td>Master controller and interlock finger and contacts</td>
<td>Light oil</td>
<td>2,000 to 3,000</td>
</tr>
<tr>
<td>Controller bearings</td>
<td>Light oil</td>
<td>1,000 to 2,000</td>
</tr>
<tr>
<td>Air cylinders (and piston leathers)</td>
<td>Special oil</td>
<td>10,000</td>
</tr>
</tbody>
</table>

The proper lubricant for fingers and contact surfaces is a light machine oil. Vaseline should not be used, particularly in cold climates, as it is stiff, and, if not properly applied, may lift the finger off the contact causing failures in service.

The contacts and fingers should be clean and dry when the lubricant is applied. Kerosene may be used in cleaning them if necessary. The lubricating oil should be applied to fingers and contacts with a cloth or small brush. The apparatus should then be operated so that the fingers pass over the contact surfaces several times. Afterwards the surplus should be removed from finger tips and contact surfaces with a clean cloth.

Contacts where arcing is severe, such as main circuit drum controllers, should be lubricated frequently. This can be done at light inspection or once a week.

Caution Against Excessive Lubrication

A general use of oil in piston leathers, except during overhauls, is not recommended as the treatment of the leather provides sufficient lubrication for ordinary service. The excessive use of oil on piston leathers should be avoided as more damage may be caused from excessive oil than from too little. If severe service necessitates extra lubrication of piston leathers, the oil recommended by the manufacturer of the equipment should be used in small quantities as follows:

1. Inject through the hole in the top of the cylinder casting not more than ½ oz. (1 teaspoonful) every 10,000 miles.

2. Oil may be used more frequently should pistons shows signs of becoming gummy, but only in sufficient quantities as a solvent to obtain free operation until piston leathers can be cleaned or replaced.

This oil should be used during heavy overhaul when the pistons are removed from the cylinders. Pistons and cylinders should be coated well with this oil after being thoroughly cleaned. Approximately ½ oz. is required for each cylinder and piston.

Bearings of all rotating members, drums, pawls, rollers, etc., of control apparatus should have a light oil applied at every other regular light inspection period.

The accompanying tabulation indicates the parts requiring lubrication, the proper oils and the frequency with which they should be applied.
RECOGNIZING that good maintenance is an important factor in giving the type of transportation service demanded by the public, the management of the New Orleans Public Service, Inc., shortly after the reorganization of this property in 1920 placed the operation of the equipment department on an entirely new basis. The company undertook to improve the rolling stock in every possible way and to stimulate interest among the personnel employed in its maintenance. Change after change was made in the course of the next few years, each one contributing in some measure to lowering the cost and improving the quality of work. In July of 1924 the company instituted the unit replacement system, accompanied by a rigid program of inspection. Further modifications in the plan were made as they appeared warranted, but the general principles have been adhered to consistently.

The maintenance achievements of the New Orleans Public Service, Inc., during the past few years are well known to most equipment men. In November, 1920, the maintenance cost per car-mile of the railway was $0.057. For the year 1924 this figure was $0.02114, representing a reduction of $0.03586, or 62.9 per cent. For the year 1925 the figure was $0.01979; for 1926 it was $0.01958, and for 1928 it was $0.01919.

The results of preventive maintenance methods and a high standard of workmanship, however, are even more strikingly reflected in the record of pull-ins. For the year 1929 the company led the 27 members of the Electric Railway Association of Equipment Men, Southern Properties, with the remarkable record of 303,985 miles per pull-in chargeable to equipment, exceeding the second company on the list by 160,946 miles, the third by 161,223 miles and the fourth by 258,981 miles. In total pull-ins New Orleans was second among the 27 companies with the figure of 62,835 miles per pull-in. In this connection, it should be remembered that strike conditions in the city during 1929 were responsible for a number of cars being taken out of service. Over the period of the past nine years the company has made a remarkable record in increasing its average car mileage per pull-in for any cause. From 1921 to 1929, inclusive, the annual figures were 2,803, 10,168, 23,791, 37,080, 64,918, 100,838, 152,632, 121,001 and 62,835. In the matter of pull-ins for mechanical defects, the company has made the following record: 1921, 5,797; 1922, 1,247; 1923, 304; 1924, 118; 1925, 79; 1926, 56; and 1927, 35.

While increasing its standard of maintenance the company made a large decrease in the number of men employed. Figures for the Magazine and Carrollton shops show that 234 men were employed in 1921, 223 in 1922, 219 in 1923, 203 in 1924, 148 in 1925, 132 in 1926, 126 in 1927 and 112 in 1928. It will be noted that the last figure is less than half of that for 1921. By centralizing all overhaul work the company also was able to reduce the number of men employed at the outlying stations. Number of men employed at the stations, with the exception of the repair foremen and clerks, totaled 220 in 1921, 213 in 1922, 208 in 1923, 187 in 1924, 161 in 1925, 148 in 1926, 146 in 1927 and 135 in 1928. Another indication of the improvement in quality of work is shown by the steady reduction in the number of armatures requiring rewinding. Rewinds totaled 201 in 1923, 148 in 1924, 55 in 1925, 36 in 1926 and 30 in 1927.

Undoubtedly, the unit replacement system has contributed to a notable extent in these achievements. Among the important factors which have been instrumental in raising standards and lowering costs are the organization of the department of rolling stock and shops, each man in the set-up having his duties definitely outlined; supervision of all shop work by trained engineers; educational facilities for the foremen and department heads; regular monthly meetings of department heads, at which methods and costs are discussed; creation of competi-

**Shop Efficiency**

Overhaul of equipment has been put on mass production basis at New Orleans. Quality of work has been improved by specialization. Availability of extra parts at operating stations encourages preventive maintenance.
Improved by

Unit Replacement System

tion among the stations through comparison of records; careful selection of employees; an excellent morale, reflected all through the organization; elimination of all manufacturing in the shops; active participation in the Electric Railway Association of Equipment Men, Southern Properties, through attending meetings, exchanging ideas and comparing costs and records; installation of all necessary modern machinery and equipment; a rigid inspection system; use of the most modern shop methods; thoroughness in all repairs, and complete overhaul of all equipment. No single one of these factors is responsible for what is being accomplished, but all are important elements in the functioning of the rolling stock and shops department.

Periodic inspection in New Orleans is conducted in the five outlying stations on a 1,000 car-mile basis. Instructions are issued daily in written form to the station foremen, advising them which cars are due for examination. All pneumatic, electrical and mechanical equipment on the cars, from the trolley wheel down to the brake shoes, is thoroughly inspected, as well as the car body itself. If this inspection discloses that some repair work must be done, the work may or may not be done in the station, depending on the nature of the repairs. For example, no motor repairs are performed in the station; the car must be sent to the equipment overhauling department. Line breakers or circuit breakers may have their contact tips renewed in the station, but all other work must be likewise performed at the equipment overhauling department. Hence, each station is supplied with several line breakers, circuit breakers, lightning arresters, resistors, motormen's air brake valves, air compressors, governor, truck brake rigging, and wheel and axle replacement units. Therefore, as a general policy, only very light repairs are made in a station; parts requiring major repairs are replaced with tested units. In the case of the car body, the same policy is maintained. Seats, sash, doors, etc., in need of repairs must be replaced from material furnished by the body overhauling department.

Methods of Storing Replacement Units in the Shops of the New Orleans Public Service, Inc.
1. Section of the electrical repair room showing a number of extra armatures and field coils.
2. Removing motors and disassembling trucks at the Carrollton shop. Extra motors for substitution are stored in the corner at the extreme right of this view.
3. Wheel and axle units at the Magazine shop, ground and ready for replacement.
4. Extra air compressors with motors and railway motors ready to replace worn units.
5. One of the racks in the babbitting room where bearings are stored.
Extra Units Carried by the New Orleans Public Service, Inc., for Replacement

TRUCKS

Complete trucks
2 pair 76-E-2.
2 pair 39-K.
2 pair MCB.

Wheels
2 pair drivers for 76-E trucks with GE-263 motors.
2 pair drivers for 76-E-2 trucks with Westinghouse 306 motors.
4 pair idlers for 76-E-2 trucks.
4 pair drivers for 39-E-2 trucks with GE-263 motors.
4 pair pony wheels for 39-E-2 trucks.
2 pair drivers for MCB trucks with Westinghouse 306 motors.
2 pair drivers for MCB trucks with GE-263 motors.
4 pair idlers for MCB trucks.
1 pair idlers for 76 Baltimore trucks with Westinghouse 514 motors.

Miscellaneous truck parts
3 sets journal boxes for 76-E-2 trucks.
8 sets pony boxes for 39-E-2 trucks.
12 pair axle bearings, babbitt lined, for GE-263 motors.
10 wheel bearings for 76-E-2 trucks.
5 brakes for pony wheels of 39-E-2 trucks.
2 MCB truck bolsters.
2 body bolsters.
Several suspension bars for motors.
Brake equipment under separate head.

MOTORS AND CONTROL

Complete motors
2 pair Westinghouse 306-CB-4.
8 GE-263-A.
6 Westinghouse 514.

Miscellaneous motors
2 GE-247.
1 Westinghouse 510.
4 GE-263.

Gears
1 pair for Westinghouse 306 motors.
2 pair for GE-263 motors.
2 pair for GE-57 motors.

Armatures
6 pair for Westinghouse 306 motors.
6 pair for GE-263 motors.
6 pair for GE-57 motors.
6 for Westinghouse 514 motors.
6 for Westinghouse 247 motors.

Armature bearings
6 pair for GE-263 motors.
6 pair for GE-57 motors.

Brush holders
6 for Westinghouse 306 motors.
6 for GE-263 motors.
6 for GE-57 motors.
6 for Westinghouse 514 motors.
6 for Westinghouse 247 motors.

Gear cases
1 for Westinghouse 306 motors.
2 for GE-263 motors.
4 for GE-57 motors.
Extra bottom halves.

Control
1 K-25 JJ controllers.
14 K-36 controllers.
1 set edge-wound resistance for GE-263 motors.
2 sets resistors for Westinghouse 306 motors.
2 sets miscellaneous resistors.

BRACE EQUIPMENT

Valves
1 M-24 air valve.
12 PV air valves.
6 SL-1 air valves.
3 M-1-2A tripper valves.
1 reducing valve.
1 No. 14 double check valve.

Miscellaneous components
4 GE-247.
2 Westinghouse DH-14.
2 Westinghouse D-1-11.

Miscellaneous brake equipment
2 compressor cylinders, 8x12 in.
20 compressor cylinders, 16x12 in.
3 main cylinder piston rods.
6 Westinghouse S-4 air governors.
1 General Electric Ml air governor.
1 Westinghouse S-16 air governor.
6 DB-13 brake shoes (25 ordered when supply reaches 60).
8 shock absorbers.
Several brake levers, rods, equalizers and other parts of the brake rigging.

ELECTRICAL AND BODY

Overhead line breakers
10 General Electric MR-12.
10 Westinghouse 8-11-A.
5 General Electric MR-25-A.

Line breakers
5 General Electric 916.
5 Westinghouse 891-B.
5 General Electric DH-887.
1 Westinghouse UM-2-A.

Lighting arrester jars
12 sets for General Electric 2-cell aluminum arresters.
12 sets for Westinghouse LA aluminum arresters.

Miscellaneous components
2 complete sets of lightning arresters.
12 Ohio Brass trolley catchers.
6 General Pneumatic door engines.
1 fender.
2 H-B life guards.

Air compressors, governors, valves and other air equipment are overhauled in this room and held in reserve.

One class of work that is still carried on in the stations is the grinding of wheels. Wheels are changed at the station because this work can be done in a fraction of the time required for sending a car to the overhauling shop. Other work carried on by the stations besides the 1,000-mile inspection and the grinding of wheels consists of car oiling, cleaning, washing, emergency wrecker service, sanding and sprinkling.

From the foregoing it should not be thought that a great many equipment units require replacement in the stations. In reality, there is very little of this type of work done. Extra units are carried only to insure that cars are not sent out with equipment that is likely to fail. Why there are few replacements of equipment units due to failure is answered by the thorough method of overhaul.

All equipment changes made at the stations are reported to the superintendent's office on an "equipment change report," one of which is shown in an accompanying illustration. In this way a close check is maintained on all changes in equipment due to failure. This same form is used by the overhauling department. By triplicating the reports a complete record of the equipment on every car is maintained at the superintendent's office, the overhauling department and at the station.

All overhauling work is divided into two parts: first, car equipment overhauling, and second, car body overhauling and painting. Car equipment is overhauled on a 40,000 mile basis, the work being done at the Carrollton shop; car bodies are overhauled on an eighteen to twenty months' schedule, the work being done at the Magazine shop.

When a car has completed its 40,000 miles of service, it is sent to the car equipment overhauling department by order of the superintendent. This department is handled by a foreman who is responsible for the supervision of the shop employees. A shop engineer works with him and is responsible for the electrical or mechanical testing of every piece of equipment on an overhauled car, and for the general performance of the car itself. Records are kept of the mileage of the cars and they are summoned for overhaul at approximately the 40,000-mile mark, but the exact figure depends on conditions at the shop. By watching the records and properly summing up, an even flow is maintained through the shop.

When a car is received the following equipment is removed for overhaul: trucks with motors, air compressors, air governors, air equipment boxes, jamb cylinders, door engines, slack adjusters, air intake strainers, line breakers, circuit breakers, lighting arresters, rheostats, trolley bases and trolley catchers. Other equipment, which may require removal for overhaul, depending on its condition, consists of motorman's brake valves, air reservoirs, air gages, miscellaneous air valves, controllers, buzzers, life guards, door and step mechanism, register rods and straps, foot gongs, stanchions or grab handles, handstraps, motorman's steps and headlights. In general,
every piece of equipment must be gone over thoroughly.

Although most of the above parts are removed at each overhaul, because of the use of the unit replacement system, it is not necessary to hold the car until all of this original equipment is ready to be reassembled. As many extra parts as possible that have previously been overhauled are placed on the car and work concentrated on those units which are not replaceable. By this method the overhauling can be done on a steady production basis, permitting the cars to be quickly re-equipped with tested units. In an accompanying table are listed some of the many extra units which are retained as surplus parts at the Carrollton shop. As will be noted a sufficient number are kept to allow a great amount of flexibility in the overhaul work. Since the maintenance methods used by the New Orleans Public Service have been described in detail in previous articles in the Journal, they will not be outlined here. It is sufficient to say that all overhaul work is conscientiously and thoroughly done. The activities of this department are extremely detailed and are followed up continuously by the shop foreman and the shop engineer.

In reality the overhauling of a car body every eighteen to twenty months is a light overhaul and is classified as a "touch-up and varnish" job. At this time the doors, vestibule sash, side sash, seat bottoms, side curtains, motorman's curtains, sign box curtains, registers, register straps and bell ropes are removed from the car. Necessary carpenter work is done on the car body, after which it is painted. Removed doors, sash and seat bottoms are repaired if necessary and painted, curtains are given attention, registers overhauled, and register straps and bell ropes replaced if necessary.

When the condition of the car body requires a general overhaul, all equipment is stripped from the car, the necessary sheet metal or carpenter work is done, the old paint is burned off, and the paint surface restored, this job requiring about twelve days.

In the car body overhauling, as in the mechanical and electrical equipment overhauling, as many repaired units are substituted as is possible, in order to reduce the period of inactive service to a minimum.

Buses of the New Orleans Public Service, Inc., are inspected on four bases: daily, every 2,000 miles, every 20,000 miles and every 40,000 miles. No parts are replaced on the bus following the daily inspection, unless some serious defect is found. On the 2,000-mile inspection also all parts are examined and gone over carefully, but none replaced unless necessary. On the 20,000-mile inspection, however, a number of parts are replaced with overhauled and tested units. Among these are the vacuum tank, distributor, cylinder heads, junk heads, lighting generator, starter and horn. On the gas-electric buses the generator and driving motors are replaced with dipped, baked and tested units. Carrying the unit replacement system still further in the overhaul work, the company replaces a number of units with rebuilt ones, even in overhauling its bus engines. Among these units are the cylinder heads, water pump, carburetor and distributor or magneto.

<table>
<thead>
<tr>
<th>New Orleans public Service Inc.</th>
<th>ROLLING STOCK AND SHOPS DEPARTMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>EQUIPMENT CHANGE REPORT</td>
<td></td>
</tr>
<tr>
<td>Car No.</td>
<td></td>
</tr>
<tr>
<td>REMOVED</td>
<td>REPLACED BY</td>
</tr>
<tr>
<td>Type</td>
<td>Model</td>
</tr>
<tr>
<td>------</td>
<td>-------</td>
</tr>
<tr>
<td>Controller</td>
<td></td>
</tr>
<tr>
<td>Circuit Breaker</td>
<td></td>
</tr>
<tr>
<td>Line Breaker</td>
<td></td>
</tr>
<tr>
<td>Lightning Arrestor</td>
<td></td>
</tr>
<tr>
<td>Air Compressor</td>
<td></td>
</tr>
<tr>
<td>Governor</td>
<td></td>
</tr>
<tr>
<td>Motorman's Brake Valve</td>
<td></td>
</tr>
<tr>
<td>Engine</td>
<td></td>
</tr>
<tr>
<td>Bellies</td>
<td></td>
</tr>
<tr>
<td>Door Engine</td>
<td></td>
</tr>
<tr>
<td>Miscellaneous</td>
<td></td>
</tr>
</tbody>
</table>

All equipment changes made in the five stations and the Carrollton shop are reported on the above form.
1929 Was a GOOD YEAR

Gross and net revenues are holding steady, and on a large proportion of properties there has been an increase of business over 1928. Analysis of annual reports from 65 companies in this country and abroad presents significant operating statistics.

LAST year was a good one from the standpoint of electric railway operation. This is becoming more and more apparent as the annual reports of the properties become available. While there have been few outstanding increases in revenue, there have been few declines. Many companies have had an actual increase in passengers carried, although others have suffered losses varying in amount. The most marked result, however, is a reduction in operating expense that practically offsets losses in gross on the various properties, so that the net operating revenue is as good as or better than it was in the preceding year.

Up to the present time 65 reports for the calendar year 1929 or for various periods terminating within the year have become available. Sixty of these are for electric railway properties in the United States and Canada. Taken together, they present a fair average of the financial results of the year. In size the companies range from small properties, some with considerably less than $1,000,000 operating revenue, to the largest in the country. Of the 60 companies in the United States and Canada, twelve had revenues of less than $1,000,000, 33 had revenues of $1,000,000 to $10,000,000, and fifteen had revenues in excess of the larger figure. Only those companies operating railway or bus lines exclusively, or those larger utilities which present separate reports for their railway departments, are included in Table I. The entire survey, therefore, covers local transportation lines only.

The reports as published differ widely in form, depending on the primary purpose for which they were prepared. Most of them follow the standard-accounting form, and this has been adopted for the presentation in the tables, as it was in the analysis of reports presented in this paper last year. Some of the others, which did not follow this form exactly, could be brought in line with little difficulty. In this way they have been made fairly comparable. In some instances comparisons between 1929 and the preceding year were not available in the latest report. However, they were presented in previous reports and have been included for comparison. In a few instances the cumulative monthly reports have been used as the source of the figures. These are subject to minor adjustments, but the totals will be affected but little.

One significant fact that stands out in analyzing the figures is that there was no marked change in revenue for the year as compared with the preceding period. Despite all difficulties these 60 companies were able to take in revenues that in the aggregate differed but little from those of the previous year. This is the more worthy of note, in that companies of all sizes were con-

| Table I—Condensed Financial Reports of Electric Railway Properties, 1929-1928 |
|-----------------------------|-----------------------------|-----------------------------|-----------------------------|-----------------------------|-----------------------------|
|                            | Glendale & Montrose R., | Palatina & Santa Rosa R.R., | Market St. Railway,         | Municipal Railway,          | Denver Tramway Corp.,      |
|                            | 1929                 | 1929                        | 1929                         | 1929                        | 1929                        |
| Railway operating revenue  | $90,018              | $11,088                     | $2,319.66                    | $2,596.66                   | $2,254.62                   |
| Railway operating expenses | 92,926               | 416,664                     | 47,431                       | 63,782                      | 47,664                      |
| Net revenue, railway opera| $12,987              | $696,078                    | $1,458,068                   | $1,349,230                  | $2,102,520                  |
| Taxes                        | 4,452                | 3,800                       | 1,162.87                     | 1,162.87                    | 1,162.87                    |
| Operating income            | $87,530              | $72,025                     | $1,348,628                   | $1,348,628                  | $1,348,628                  |
| Non-operating income        | 1,360                | 1,302                       | 1,162.87                     | 1,162.87                    | 1,162.87                    |
| Gross income                | $88,890              | $73,325                     | $1,348,628                   | $1,348,628                  | $1,348,628                  |
| Net income                  | 1,162                | 1,169                       | 1,162.87                     | 1,162.87                    | 1,162.87                    |
| Operating ratio             | 1,162                | 1,169                       | 1,162.87                     | 1,162.87                    | 1,162.87                    |

|                            | 1929                  | 1928                        | 1929                         | 1928                        | 1929                         |
| Railway operating revenue  | $13,399.101           | $13,737.22                  | $7,789.97                    | $7,785.86                   | $1,141.122                   |
| Railway operating expenses | 13,346.906           | 10,739.127                  | 4,454.414                    | 4,454.414                   | 987.926                      |
| Net revenue, railway opera | $52.195              | $2,037.08                    | $3,334.53                    | $3,334.53                   | 1,141.122                    |
| Operating income           | $2,037.087           | $2,456.373                   | $6,438.573                   | $6,438.573                  | 1,141.122                    |
| Non-operating income       | 1,162                | 1,169                       | 1,162.87                     | 1,162.87                    | 1,162.87                    |
| Gross income               | $1,162                | 1,169                       | 1,162.87                     | 1,162.87                    | 1,162.87                    |
| Deductions from gross income | 1,162                | 1,169                       | 1,162.87                     | 1,162.87                    | 1,162.87                    |
| Net income                 | $1,162                | 1,169                       | 1,162.87                     | 1,162.87                    | 1,162.87                    |
sidered. Referring to Table II, it will be seen that in general the largest companies had the greatest number of instances of increases in revenue. Eleven out of fifteen in this class showed gains. This was due to an actual increase in traffic on most of them, since there were relatively few changes in fare during the year. As would be expected, the greatest losses in revenue occurred on the smaller properties, three showing increases and nine showing losses. The medium-sized companies were almost evenly balanced in comparative earnings with the year previous, sixteen taking in more gross and seventeen less.

The most marked effect in the year just past is the reduction in operating expense. Economies were effected in companies in all the classifications. It is rather remarkable, however, that the most marked savings in operation took place in both the largest and the smallest groups. Of the small companies, only two increased their expenses, while ten were able to reduce them.

### Table II—Significant Changes in Operation, 1928-1929

<table>
<thead>
<tr>
<th>Classifications and Electric Railways Properties</th>
<th>1928-1929</th>
<th>1929-1930</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chicago North Shore &amp; Milwaukee R.R.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gross revenue</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Increased in 1929</td>
<td>12</td>
<td>3</td>
</tr>
<tr>
<td>Decreased in 1929</td>
<td>3</td>
<td>16</td>
</tr>
<tr>
<td>Operating expenses</td>
<td>9</td>
<td>17</td>
</tr>
<tr>
<td>Increased in 1929</td>
<td>10</td>
<td>17</td>
</tr>
<tr>
<td>Decreased in 1929</td>
<td>4</td>
<td>18</td>
</tr>
</tbody>
</table>

### Table III—Range of Operating Ratios in 1929, Arranged According to Size of Properties

<table>
<thead>
<tr>
<th>Classifications and Electric Railways Properties</th>
<th>1928-1929</th>
<th>1929-1930</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating expenses</td>
<td>12</td>
<td>3</td>
</tr>
<tr>
<td>Range of operating ratios</td>
<td>33</td>
<td>15</td>
</tr>
<tr>
<td>Total number of companies</td>
<td>60</td>
<td></td>
</tr>
</tbody>
</table>

### Table I—(Continued)—Condensed Financial Reports of Electric Railway Properties, 1929-1928

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Gross revenue</td>
<td>$2,106,491,691</td>
<td>$2,106,491,691</td>
<td>$2,106,491,691</td>
<td>$2,106,491,691</td>
<td>$2,106,491,691</td>
</tr>
<tr>
<td>Net revenue, railway opera</td>
<td>$2,038,761</td>
<td>$2,038,761</td>
<td>$2,038,761</td>
<td>$2,038,761</td>
<td>$2,038,761</td>
</tr>
<tr>
<td>Deductions from gross income</td>
<td>$68,726,491</td>
<td>$68,726,491</td>
<td>$68,726,491</td>
<td>$68,726,491</td>
<td>$68,726,491</td>
</tr>
<tr>
<td>Net income</td>
<td>$728,736,571</td>
<td>$728,736,571</td>
<td>$728,736,571</td>
<td>$728,736,571</td>
<td>$728,736,571</td>
</tr>
<tr>
<td>Operating ratios</td>
<td>0.77</td>
<td>0.77</td>
<td>0.77</td>
<td>0.77</td>
<td>0.77</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Gross revenue</td>
<td>$2,106,491,691</td>
<td>$2,106,491,691</td>
<td>$2,106,491,691</td>
<td>$2,106,491,691</td>
<td>$2,106,491,691</td>
</tr>
<tr>
<td>Net revenue, railway opera</td>
<td>$2,038,761</td>
<td>$2,038,761</td>
<td>$2,038,761</td>
<td>$2,038,761</td>
<td>$2,038,761</td>
</tr>
<tr>
<td>Deductions from gross income</td>
<td>$68,726,491</td>
<td>$68,726,491</td>
<td>$68,726,491</td>
<td>$68,726,491</td>
<td>$68,726,491</td>
</tr>
<tr>
<td>Net income</td>
<td>$728,736,571</td>
<td>$728,736,571</td>
<td>$728,736,571</td>
<td>$728,736,571</td>
<td>$728,736,571</td>
</tr>
<tr>
<td>Operating ratios</td>
<td>0.77</td>
<td>0.77</td>
<td>0.77</td>
<td>0.77</td>
<td>0.77</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Gross revenue</td>
<td>$2,106,491,691</td>
<td>$2,106,491,691</td>
<td>$2,106,491,691</td>
<td>$2,106,491,691</td>
<td>$2,106,491,691</td>
</tr>
<tr>
<td>Net revenue, railway opera</td>
<td>$2,038,761</td>
<td>$2,038,761</td>
<td>$2,038,761</td>
<td>$2,038,761</td>
<td>$2,038,761</td>
</tr>
<tr>
<td>Deductions from gross income</td>
<td>$68,726,491</td>
<td>$68,726,491</td>
<td>$68,726,491</td>
<td>$68,726,491</td>
<td>$68,726,491</td>
</tr>
<tr>
<td>Net income</td>
<td>$728,736,571</td>
<td>$728,736,571</td>
<td>$728,736,571</td>
<td>$728,736,571</td>
<td>$728,736,571</td>
</tr>
<tr>
<td>Operating ratios</td>
<td>0.77</td>
<td>0.77</td>
<td>0.77</td>
<td>0.77</td>
<td>0.77</td>
</tr>
</tbody>
</table>

(See Page 207 for Footnotes)
Among the large companies, eleven out of the fifteen reduced their operating costs. The medium-sized group, where it might be expected large savings could be effected, showed correspondingly less gain in this direction, seventeen having lower costs and sixteen higher.

Altogether, 36 out of the 60 properties were able to effect reductions in total operating expense. The combination of increased earnings on many properties and operating economies on them and on some of the others where business declined was effective.

### Table I—(Continued)—Condensed Financial Reports of Electric Railway Companies, 1929-1928

<table>
<thead>
<tr>
<th>Location</th>
<th>1929</th>
<th>1928</th>
<th>1929</th>
<th>1928</th>
<th>1929</th>
<th>1928</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Earnings</td>
<td>Expenses</td>
<td>Net</td>
<td>Income</td>
<td>Earnings</td>
<td>Expenses</td>
</tr>
<tr>
<td></td>
<td>Operating</td>
<td>Operating</td>
<td>Revenue</td>
<td>Operating</td>
<td>Operating</td>
<td>Operating</td>
</tr>
<tr>
<td></td>
<td>$</td>
<td>$</td>
<td>$</td>
<td>$</td>
<td>$</td>
<td>$</td>
</tr>
<tr>
<td>Boston Elevated Railway, Boston, Mass.</td>
<td>$12,254,241</td>
<td>$12,222,093</td>
<td>$48,176</td>
<td>$48,150</td>
<td>$9,055,278</td>
<td>$9,055,278</td>
</tr>
<tr>
<td>Revere Beach &amp; Lynn R.R., Boston, Mass.</td>
<td>$1,002,418</td>
<td>$1,068,548</td>
<td>$5,652,654</td>
<td>$7,141,403</td>
<td>$28,685</td>
<td>$30,787</td>
</tr>
<tr>
<td>Union Street Railway, New Bedford, Mass.</td>
<td>$1,229,079</td>
<td>$1,229,035</td>
<td>$184,744</td>
<td>$186,110</td>
<td>$103,832</td>
<td>$103,649</td>
</tr>
</tbody>
</table>

| Boston Elevated Railway, Boston, Mass. | 2,024,747 | 2,090,188 | 8,252,156 | 8,252,156 | 9,055,278 | 9,055,278 |
| Revere Beach & Lynn R.R., Boston, Mass. | 1,002,418 | 1,068,548 | 6,358,654 | 7,141,403 | 28,685 | 30,787 |
| Union Street Railway, New Bedford, Mass. | 1,229,079 | 1,229,035 | 184,744 | 186,110 | 103,832 | 103,649 |

| Operating expenses | 2,024,747 | 2,090,188 | 8,252,156 | 8,252,156 | 9,055,278 | 9,055,278 |
| Revere Beach & Lynn R.R., Boston, Mass. | 1,002,418 | 1,068,548 | 6,358,654 | 7,141,403 | 28,685 | 30,787 |
| Union Street Railway, New Bedford, Mass. | 1,229,079 | 1,229,035 | 184,744 | 186,110 | 103,832 | 103,649 |

| Operating expenses | 2,024,747 | 2,090,188 | 8,252,156 | 8,252,156 | 9,055,278 | 9,055,278 |
| Revere Beach & Lynn R.R., Boston, Mass. | 1,002,418 | 1,068,548 | 6,358,654 | 7,141,403 | 28,685 | 30,787 |
| Union Street Railway, New Bedford, Mass. | 1,229,079 | 1,229,035 | 184,744 | 186,110 | 103,832 | 103,649 |

| Operating expenses | 2,024,747 | 2,090,188 | 8,252,156 | 8,252,156 | 9,055,278 | 9,055,278 |
| Revere Beach & Lynn R.R., Boston, Mass. | 1,002,418 | 1,068,548 | 6,358,654 | 7,141,403 | 28,685 | 30,787 |
| Union Street Railway, New Bedford, Mass. | 1,229,079 | 1,229,035 | 184,744 | 186,110 | 103,832 | 103,649 |

| Operating expenses | 2,024,747 | 2,090,188 | 8,252,156 | 8,252,156 | 9,055,278 | 9,055,278 |
| Revere Beach & Lynn R.R., Boston, Mass. | 1,002,418 | 1,068,548 | 6,358,654 | 7,141,403 | 28,685 | 30,787 |
| Union Street Railway, New Bedford, Mass. | 1,229,079 | 1,229,035 | 184,744 | 186,110 | 103,832 | 103,649 |

| Operating expenses | 2,024,747 | 2,090,188 | 8,252,156 | 8,252,156 | 9,055,278 | 9,055,278 |
| Revere Beach & Lynn R.R., Boston, Mass. | 1,002,418 | 1,068,548 | 6,358,654 | 7,141,403 | 28,685 | 30,787 |
| Union Street Railway, New Bedford, Mass. | 1,229,079 | 1,229,035 | 184,744 | 186,110 | 103,832 | 103,649 |

| Operating expenses | 2,024,747 | 2,090,188 | 8,252,156 | 8,252,156 | 9,055,278 | 9,055,278 |
| Revere Beach & Lynn R.R., Boston, Mass. | 1,002,418 | 1,068,548 | 6,358,654 | 7,141,403 | 28,685 | 30,787 |
| Union Street Railway, New Bedford, Mass. | 1,229,079 | 1,229,035 | 184,744 | 186,110 | 103,832 | 103,649 |

| Operating expenses | 2,024,747 | 2,090,188 | 8,252,156 | 8,252,156 | 9,055,278 | 9,055,278 |
| Revere Beach & Lynn R.R., Boston, Mass. | 1,002,418 | 1,068,548 | 6,358,654 | 7,141,403 | 28,685 | 30,787 |
| Union Street Railway, New Bedford, Mass. | 1,229,079 | 1,229,035 | 184,744 | 186,110 | 103,832 | 103,649 |
is seen from the change in operating income. Among the 60 companies, 34 were able to show a greater operating income after deducting operating expenses and taxes. In this figure lies the real measure of effectiveness of the operating policy followed for the year. Again it is significant that the groups containing the largest and the smallest railways are the ones which had the greatest gains in net. Eight of the twelve small companies made a better showing in this respect than they did in 1928, and eleven of the fifteen large companies showed similar gains. In the middle group, fifteen companies showed gains and eighteen showed reductions from 1928.

Operating ratios fall within a range not far different from that indicated last year. Only one small company had an operating ratio of more than 1.00. Three small companies for which operating expenses and taxes are not separated were not able to cover both these items of expense out of revenue. They are part of a larger system which as a whole was able to pay expenses by a considerable margin. The remaining 56 companies analyzed were able to pay operating expenses out of receipts. One small and one medium-sized company had operating ratios between 0.90 and 1.00. Thus 41 out of 44 companies for which information was available were able to keep their operating ratios below 0.90. This speaks well for the efficiency of management. At that, only one small, one large, and six middle sized properties had higher than 0.80 for the operating ratio.

Although it sometimes has been questioned whether the small companies are able to operate efficiently, two of those with receipts of less than $1,000,000 were able to operate at less than 0.70. These are both interurban railways, the Galveston-Houston Electric Railway, with a ratio of 0.563, and the Charleston Interurban Railroad, with 0.614. The six companies with ratios below 0.70 in the middle class are the Denver Tramway, 0.688; the Honolulu Rapid Transit Company, 0.694; the Grand Rapids Railroad, 0.627; the New York, Westchester &

Table I—(Continued)—Condensed Financial Reports of Electric Railway Companies, 1929-1928

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1929</td>
<td>1928</td>
<td>1929</td>
<td>1928</td>
<td>1929</td>
</tr>
<tr>
<td>Railway operating revenue.</td>
<td>$7,421,195</td>
<td>$7,425,475</td>
<td>$1,866,507</td>
<td>$1,852,753</td>
</tr>
<tr>
<td>Before expenses.</td>
<td>$4,971,108</td>
<td>$4,974,782</td>
<td>$329,120</td>
<td>$329,120</td>
</tr>
<tr>
<td>Net revenue, railway op.</td>
<td>$2,450,087</td>
<td>$2,450,693</td>
<td>$1,537,387</td>
<td>$1,523,633</td>
</tr>
<tr>
<td>Taxes.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Operating income.</td>
<td>$2,084,437</td>
<td>$2,084,437</td>
<td>$1,313,437</td>
<td>$1,313,437</td>
</tr>
<tr>
<td>Non-operating income.</td>
<td>$1,164,045</td>
<td>$1,164,045</td>
<td>$1,164,045</td>
<td>$1,164,045</td>
</tr>
<tr>
<td>Gross income.</td>
<td>$3,248,582</td>
<td>$3,248,582</td>
<td>$2,476,482</td>
<td>$2,476,482</td>
</tr>
<tr>
<td>Deductions from gross income.</td>
<td>$2,248,880</td>
<td>$2,248,880</td>
<td>$1,293,280</td>
<td>$1,293,280</td>
</tr>
<tr>
<td>Net income.</td>
<td>$999,702</td>
<td>$999,702</td>
<td>$1,183,202</td>
<td>$1,183,202</td>
</tr>
<tr>
<td>Operating ratio.</td>
<td>0.30</td>
<td>0.30</td>
<td>0.563</td>
<td>0.563</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1929</td>
<td>1928</td>
<td>1929</td>
<td>1928</td>
<td>1929</td>
</tr>
<tr>
<td>Railway operating revenue.</td>
<td>$6,844,072</td>
<td>$6,848,076</td>
<td>$1,436,165</td>
<td>$1,436,165</td>
</tr>
<tr>
<td>Before expenses.</td>
<td>$4,370,097</td>
<td>$4,372,476</td>
<td>$343,097</td>
<td>$343,097</td>
</tr>
<tr>
<td>Net revenue, railway op.</td>
<td>$2,473,975</td>
<td>$2,475,600</td>
<td>$1,093,068</td>
<td>$1,093,068</td>
</tr>
<tr>
<td>Taxes.</td>
<td>$1,376,876</td>
<td>$1,378,020</td>
<td>$291,680</td>
<td>$291,680</td>
</tr>
<tr>
<td>Operating income.</td>
<td>$1,097,099</td>
<td>$1,097,580</td>
<td>$791,386</td>
<td>$791,386</td>
</tr>
<tr>
<td>Non-operating income.</td>
<td>$1,164,045</td>
<td>$1,164,045</td>
<td>$1,164,045</td>
<td>$1,164,045</td>
</tr>
<tr>
<td>Gross income.</td>
<td>$2,261,144</td>
<td>$2,261,144</td>
<td>$1,955,431</td>
<td>$1,955,431</td>
</tr>
<tr>
<td>Deductions from gross income.</td>
<td>$1,244,445</td>
<td>$1,244,445</td>
<td>$912,388</td>
<td>$912,388</td>
</tr>
<tr>
<td>Net income.</td>
<td>$1,016,699</td>
<td>$1,016,700</td>
<td>$1,043,043</td>
<td>$1,043,043</td>
</tr>
<tr>
<td>Operating ratio.</td>
<td>0.445</td>
<td>0.445</td>
<td>0.530</td>
<td>0.530</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1929</td>
<td>1928</td>
<td>1929</td>
<td>1929</td>
<td>1929</td>
</tr>
<tr>
<td>Railway operating revenue.</td>
<td>$5,494,051</td>
<td>$5,495,125</td>
<td>$2,497,800</td>
<td>$2,497,800</td>
</tr>
<tr>
<td>Before expenses.</td>
<td>$3,080,560</td>
<td>$3,080,560</td>
<td>$1,314,800</td>
<td>$1,314,800</td>
</tr>
<tr>
<td>Net revenue, railway op.</td>
<td>$2,413,491</td>
<td>$2,414,565</td>
<td>$1,183,000</td>
<td>$1,183,000</td>
</tr>
<tr>
<td>Taxes.</td>
<td>$1,055,481</td>
<td>$1,055,481</td>
<td>$582,101</td>
<td>$582,101</td>
</tr>
<tr>
<td>Operating income.</td>
<td>$1,358,010</td>
<td>$1,359,084</td>
<td>$662,124</td>
<td>$662,124</td>
</tr>
<tr>
<td>Non-operating income.</td>
<td>$1,055,481</td>
<td>$1,055,481</td>
<td>$582,101</td>
<td>$582,101</td>
</tr>
<tr>
<td>Gross income.</td>
<td>$2,413,491</td>
<td>$2,414,565</td>
<td>$1,183,000</td>
<td>$1,183,000</td>
</tr>
<tr>
<td>Deductions from gross income.</td>
<td>$1,055,481</td>
<td>$1,055,481</td>
<td>$582,101</td>
<td>$582,101</td>
</tr>
<tr>
<td>Net income.</td>
<td>$1,358,010</td>
<td>$1,359,084</td>
<td>$662,124</td>
<td>$662,124</td>
</tr>
<tr>
<td>Operating ratio.</td>
<td>0.565</td>
<td>0.565</td>
<td>0.563</td>
<td>0.563</td>
</tr>
</tbody>
</table>

| Italia figures indicate deficit. |
|----------------------------------|---------------------------------------------|-----------------------------------------------|----------------------------------|-----------------------------------|
| Includes taxes.                  | $	ext{Combined statement of "common fund" companies.}$ |
| *Years ended June 30.            | **Deduction of $4,335 for retirements from this amount was made in 1928.** |
| *For comparative purposes taxes are computed for 1929 at $332,402 and for 1928 at $328,116.** |
| *Before depreciation.             | **Net after equipment and joint facility rents.** |
| *After deducting depreciation of $3,701,648 in 1929 and $2,907,939 in 1928.** |
| *After depreciation.              | **Subject to adjustments.** |
| *Years ended Jan. 1.              | **Twelve-month statement for calendar year.** |
| *Includes City's 55 per cent of divisible net receipts.** |
| *These figures represent amounts transferred to stabilization fund. In 1929 after adjustment for taxes, power refund and payment of bond interest and dividends on preferred stock the net increase in stabilizing fund was $45,387; in 1929 after similar action the net increase in stabilizing fund was $135,105.** |

**Note to Financial Reports:**

- Includes City's 55 per cent of divisible net receipts.
- These figures represent amounts transferred to stabilization fund. In 1929 after adjustment for taxes, power refund and payment of bond interest and dividends on preferred stock the net increase in stabilizing fund was $45,387; in 1929 after similar action the net increase in stabilizing fund was $135,105.
### Table IV—Electric Railways or Controlled Bus Companies on Which the Passengers Carried in 1929 Exceeded Those in 1928

<table>
<thead>
<tr>
<th>Company</th>
<th>Increase Per Cent 1929 Over 1928</th>
<th>Company</th>
<th>Increase Per Cent 1929 Over 1928</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aurora, Elgin &amp; Fox River Electric Company, Aurora, Ill.</td>
<td>2.81</td>
<td>Pennsylvania-Ohio Public Service Company, Youngstown</td>
<td>0.56</td>
</tr>
<tr>
<td>Illinois &amp; Joliet Electric Company</td>
<td>3.98</td>
<td>Allison &amp; Logan Valley Electric Railway</td>
<td>1.90</td>
</tr>
<tr>
<td>Chicago Surface Lines</td>
<td>1.00</td>
<td>Beaver Valley Motor Coach Company, New Brighton, Pa.</td>
<td>0.79</td>
</tr>
<tr>
<td>Illinois Northern Utilities Company, Freeport</td>
<td>10.37</td>
<td>Beaver Valley Electric Company</td>
<td>16.07</td>
</tr>
<tr>
<td>Illinois Power &amp; Light Corporation, Galesburg</td>
<td>1.48</td>
<td>Utica Transit Company, Utica, N.Y.</td>
<td>7.19</td>
</tr>
<tr>
<td>Illinois Power &amp; Light Corporation, Peoria</td>
<td>3.93</td>
<td>Otisville Transit Company, Ohi City, Pa.</td>
<td>1.79</td>
</tr>
<tr>
<td>Chicago, South Shore &amp; South Bend, Michigan City, Ind.</td>
<td>15.40</td>
<td>Pittsburgh Electric Railway &amp; Light Company</td>
<td>74.55</td>
</tr>
<tr>
<td>Gary Railways Company</td>
<td>4.86</td>
<td>Lewiston &amp; Roselie Electric Railway</td>
<td>1.70</td>
</tr>
<tr>
<td>Indiana Service Corporation, Ft. Wayne</td>
<td>8.54</td>
<td>Milwaukee Electric Railway &amp; Light Company</td>
<td>20.35</td>
</tr>
<tr>
<td>Southern Indiana Electric Company</td>
<td>1.22</td>
<td>North Carolina Street Railway, New York, N.Y.</td>
<td>1.19</td>
</tr>
<tr>
<td>Houghton County Tractio Company, Houghton, Mich.</td>
<td>0.33</td>
<td>Wisconsin Power &amp; Light Company, Madison</td>
<td>10.55</td>
</tr>
<tr>
<td>Saginaw Transit Company, Saginaw, Mich.</td>
<td>1.73</td>
<td>Alabama Power Company</td>
<td>4.83</td>
</tr>
<tr>
<td>Public Service Coordinated Transport, Newark, N. J.</td>
<td>0.02</td>
<td>Kentucky Utilities Company, Paducah</td>
<td>1.24</td>
</tr>
<tr>
<td>Salem &amp; Penn Grove Tractio Company</td>
<td>0.28</td>
<td>Gulfport &amp; Mississippi Coast Tractio Company</td>
<td>2.25</td>
</tr>
<tr>
<td>Manhattan &amp; Queens Tractio Corporation</td>
<td>1.59</td>
<td>Lynchburg Traction &amp; Light Company</td>
<td>10.06</td>
</tr>
<tr>
<td>Interborough Rapid Tractio Company</td>
<td>3.94</td>
<td>Virginia Public Service Company, Hampton</td>
<td>0.79</td>
</tr>
<tr>
<td>New York Rapid Tractio Corporation</td>
<td>3.44</td>
<td>Des Moines Central Iowa Railroad</td>
<td>1.60</td>
</tr>
<tr>
<td>freight, Falls Railway</td>
<td>3.00</td>
<td>Des Moines Southern Railway, Mason City, Iowan</td>
<td>5.21</td>
</tr>
<tr>
<td>Third Avenue Railway System</td>
<td>3.39</td>
<td>Missouri City &amp; Clear Lake Railroad, Mason City, Iowan</td>
<td>7.08</td>
</tr>
<tr>
<td>Community Traction Company, Toledo</td>
<td>3.22</td>
<td>Tri City Railway, Davenport, Iowan</td>
<td>6.71</td>
</tr>
<tr>
<td>Dayton &amp; Troy Electric Railway</td>
<td>11.14</td>
<td>Waterloo, Cedar Falls &amp; Northern Railway</td>
<td>5.16</td>
</tr>
<tr>
<td>Dayton &amp; Western Tractio Company</td>
<td>0.38</td>
<td>Missouri Valley Public Service Company</td>
<td>3.62</td>
</tr>
<tr>
<td>Ohio Public Service Company, Massillon, Ohio.</td>
<td>6.43</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Boston Railway, 0.621; the Texas Electric Railway, 0.631, and the Houston Electric Company, 0.631. In this list are found railroads of widely differing types, including city, interurban and rapid transit. Among large systems operating in the low ratio class are the United Railways & Electric Company of Baltimore, 0.678; the Long Island Railroad, 0.671, and the Philadelphia Rapid Transit Company, 0.691. Here again is a wide variance in class of service.

### Traffic Increase on Many Properties

That traffic increased on many electric railways is indicated by figures collected by the American Electric Railway Association for the past five years. From these it is found that there were increases in passenger traffic on 77 properties last year. Some of these are not representative, since they are due in whole or in part to inclusion of additional lines purchased, or for other reasons have been excluded from consideration. The remaining companies are listed in Table IV, together with the per cent increase in traffic of 1929 over 1928. The gains range all the way from 0.02 to 74.55. As in the other figures, the gains are distributed over the small, medium and large properties. Some of the largest increases in traffic are on small systems. This indicates that the need for transportation, even in communities of minor importance, has not disappeared, and that there is an opportunity for improvement in small city systems and on certain of the interurban lines.

### Private Car Converted for Parlor-Buffet Service

**For the use of parties on chartered trips a private car of the Terre Haute, Indianapolis & Eastern Traction Company has been converted into a luxurious parlor-buffet car. Built several years ago, this car was recently rehabilitated in the company's shops with furnish with new draperies, linen and tableware. A large lounge compartment, library nook and front and rear observation platforms provide accommodations for 25 passengers.**

Large windows of circular glass reaching almost to the floor afford a clear view from both front and rear platform. In addition to leather upholstered easy chairs, the car is furnished with a long center table, folding card tables and several commodious divans. A small galley and pantry, containing an alcohol range, refrigerator, cupboard and serving table, is located at the center of the car, as a lavatory. The car may be chartered for trips to any point on the T. H. I. & E. system or connecting electric lines for a minimum of 25 full fares. A porter is assigned to the car to prepare refreshments and attend to the needs of the passengers. The car is motorized and is operated as a single unit under ordinary circumstances. Illustrated circulars are mailed to those who contemplate chartering the parlor-buffet car for private parties. If a party numbering more than 25 has to be accommodated, a trailer is attached to the car, or the car is attached to a regular train if the service permits.

**Attractive interior of converted parlor-buffet car of the Terre Haute, Indianapolis & Eastern Traction Company.**
Trends in Material Purchasing Analyzed

Survey shows that the inventory value of materials and supplies kept on hand by the electric railway industry totals approximately $72,500,000, representing 1.2 per cent of company valuation and 5.6 per cent of annual gross receipts. Total annual expenditures amount to $181,500,000. Railways buying small lots more frequently. Speed of delivery and standardization important factors.

TROUGH their purchasing and stores departments the electric railways of the United States and Canada carry on one of the largest merchandising and industrial operations in America. In the course of a year these departments spend millions of dollars in the markets for materials, supplies and equipment with which to maintain their properties and carry out needed improvements. They also accumulate and sell scrap materials to the value of many thousands of dollars, while the elimination of waste products and obsolete materials runs, in the course of a year, into high figures.

Through a survey made by the JOURNAL, covering 42 electric railways, representing 21,755 passenger cars and 10,118 miles of track, it has been determined that the average total stores inventory for the entire industry is approximately $72,500,000. This investigation further showed that there is a complete turnover of stores materials slightly over 2 times per year, which indicates that the total amount spent in the course of twelve months is $181,500,000.

This figure checks closely with the data obtained from the electric railways for the record of expenditures, published in the January Statistical and Progress Number. For 1929, the industry expended $100,535,000 for maintenance materials alone. Most of these materials, of course, are handled by the stores department. To this amount must be added a large proportion of the $81,890,000 for way and structures, new plant and equipment, smaller proportions of the new plant accounts for cars, buses and power equipment, which had a combined total of $53,580,000, and a large proportion of the $20,720,000 for bus operating supplies. Assuming that these budget figures, submitted at the end of each year by the electric railways, are an indication of the amounts spent by the purchases and stores departments, the expenditures for materials have remained at a high figure for a number of years and have actually shown an increase in the past two years. According to estimates for the current year, another increase will be shown.

Other information secured in the survey indicates that the number of items kept in stock on a property of average size is over 8,000 and the inventory value is $460,000. This amount represents 1.2 per cent of the total railway valuation and 5.6 per cent of the annual gross receipts. It was also found that companies are buying small lots more frequently rather than occasional large lots; that compared with 1925 a majority of the companies are buying smaller quantities and buying more frequently; that wherever an increase in speed of delivery has been effected the railways have been able to reduce their inventory; that certain of the companies have been able to reduce their stocks by company or industry standardization, and that many companies use the A.E.R.E.A. standards.

Summarized Inventory Data of 42 Electric Railways

<table>
<thead>
<tr>
<th>Number of Passenger Cars</th>
<th>Miles of Track</th>
<th>Number of Buses</th>
<th>Items in Stock</th>
<th>Inventory Value, in Dollars</th>
<th>Ratio of Inventory Value to Total Company Valuation, in Per Cent</th>
<th>Ratio of Inventory Value to Annual Gross Receipts, in Per Cent</th>
</tr>
</thead>
<tbody>
<tr>
<td>14 large f total.........</td>
<td>14,670</td>
<td>6,872</td>
<td>1,847</td>
<td>216,184</td>
<td>13,166,000</td>
<td>...</td>
</tr>
<tr>
<td>railways \ average......</td>
<td>1,047</td>
<td>491</td>
<td>132</td>
<td>15,450</td>
<td>941,000</td>
<td>1.03</td>
</tr>
<tr>
<td>13 medium-sized railways \ total...</td>
<td>5,126</td>
<td>2,328</td>
<td>1,018</td>
<td>120,615</td>
<td>4,875,000</td>
<td>1.15</td>
</tr>
<tr>
<td>\ average...</td>
<td>394</td>
<td>179</td>
<td>78</td>
<td>9,280</td>
<td>375,000</td>
<td>1.41</td>
</tr>
<tr>
<td>15 small: f total.......</td>
<td>1,959</td>
<td>918</td>
<td>283</td>
<td>54,230</td>
<td>1,281,000</td>
<td>1.20</td>
</tr>
<tr>
<td>railways \ average......</td>
<td>131</td>
<td>61</td>
<td>19</td>
<td>3,620</td>
<td>85,400</td>
<td>1.41</td>
</tr>
<tr>
<td>Total of 42 f total.....</td>
<td>21,755</td>
<td>10,118</td>
<td>3,148</td>
<td>341,029</td>
<td>19,322,000</td>
<td>1.20</td>
</tr>
<tr>
<td>railways \ average......</td>
<td>518</td>
<td>241</td>
<td>75</td>
<td>8,120</td>
<td>460,000</td>
<td>1.20</td>
</tr>
</tbody>
</table>

Electric Railway Journal—April, 1930
This chart represents the annual purchases of a large city electric railway company expressed in dollars per million car-miles.

Each class of purchase has been summarized separately and given a rank on the chart according to its importance. The prices of all materials used are net to the operating company, and do not include discounts, transportation charges, taxes or labor. Each bar is divided according to the percentage of the total amount purchased from the following sources: (1) from local wholesalers, (2) from other local sources of supply, and (3) from non-local manufacturers.
For the purpose of analyzing the data secured, the 42 companies were divided into three groups, their representation in each group being determined by the number of passenger cars, number of buses and miles of track. Group one, consisting of the larger properties, includes fourteen electric railways with 14,670 passenger cars, 6,872 miles of track and 1,847 buses. Group two consists of thirteen medium-sized railways, with 5,126 passenger cars, 2,348 miles of track and 1,018 buses. The third group has fifteen companies, with 1,959 passenger cars, 918 miles of track and 283 buses. In analyzing the various factors investigated, reference will be made to these three groups.

The returns showed an extremely wide variation in the number of items kept in stock. In the large group this figure varied from 3,500 to 45,000; for the small group, it ranged between 1,200 and 6,500. So many factors govern the number of parts it is necessary to keep in stock, however, that considerable variation is to be expected. Standards of maintenance, whether or not the company generates its own power, whether or not it operates buses, and the degree to which materials are standardized, all have an important bearing on this figure. Naturally the larger companies require many more items than the smaller ones. For the former the number of items in stock averaged 15,450; for the medium-size railways it averaged 9,280, and for the smaller companies the average was 3,620. For all 42 railways, the average number of items was 8,120.

Analysis of the inventory values of the railway shows the same wide variations that exist for the items in stock. For the larger companies the inventory value ranged between $2,500,000 and $375,000; for the smaller ones it varied between $216,000 and $16,000. Average inventory values were $941,000 for group one, $375,000 for group two, and $85,400 for group three. In all 42 companies the average inventory value was $460,000. Although the number of items in stock and inventory values showed wide variations, the percentages of total company valuation and annual gross receipts, represented by the inventory value, were more nearly constant within the groups. In group two, for example, the percentages of total company valuation ranged between 7 and 1.85. The average inventory figures by groups, in per cent of total company valuation were 1.03 for group one, 1.15 for group two, 1.41 for group three and 1.20 for the complete list. The larger percentages for the smaller groups is explained by the necessity for keeping a certain fixed number of parts for the maintenance of equipment, regardless of how many vehicles are in operation.

In relation to the annual gross receipts the inventory values for the larger companies averaged 5.61 per cent. For the medium-size companies, the per cent was 5.37, for the smaller ones 5.75, and for all 42 companies 5.60. Although there were a few wide variations from the average figures for each group, most of the companies were in the range of from 5 to 6 per cent.

Buying Small Lots More Frequently

Almost every company indicated that it was buying its supplies more frequently and in smaller amounts. This was particularly true for supplies for the maintenance of cars and even more so for buses. Materials for track construction and maintenance, on the other hand, are bought less frequently according to the reports. Several railways stated that they buy spikes, rail and other track supplies only once a year. Most of the railways which indicated that they were buying smaller amounts, qualified their statement by mentioning factors which influenced the buying of larger quantities occasionally. It is apparent that few railways are buying small amounts unless they can get the same price as would be tendered them for a quantity purchase. In those cases where discounts or other price inducements for large purchases are not offered for small quantities, most of the companies buy the larger amounts. Probably the generally accepted rule used is that small orders are placed unless the savings in cost obtained by a quantity purchase exceed the interest on the money tied up.

Another important factor with regard to ordering is the source of supply and the resulting time of delivery. Most companies specified that where the supplies were secured from local sources or nearby cities smaller amounts were secured. Products obtained from manufacturers at distant points are ordered in larger quantities. Of course, local and market conditions, as well as emergencies, have an important bearing on the amount and frequency of the buying. Only one company expressed itself in favor of large orders as a general principle. This company stated that it orders its supplies to last six months, to eliminate the added expense, mistakes and "red tape" of frequent ordering.

Compared with 1925 almost all of the companies are ordering smaller quantities and more frequently. Several of those who stated that there was no difference in their ordering of 1925 and 1929 added that they have been buying in as small quantities as possible for several years.

Speed of Delivery Reduces Inventory

That the increased speed of delivery has been an important contributing factor in reducing the inventories of many railways was affirmed by the majority of answers received. Although one or two stated very emphatically that speed of delivery had assisted in reducing their inventories, the majority indicated that it was a contributing but not a major factor.

The greatest factor in reducing stock has been standardization by both company and industry. On those properties which have made real attempts to standardize their materials, very substantial reductions have been obtained. Some of the reductions reported were 50 per cent, 40 per cent, 20 per cent and 18.4 per cent. One company said that it had reduced its stock from $3,096,000 in 1924 to $2,040,000 at the end of 1929. Still another reported a decrease from $1,250,000 in 1926 to $750,000 in 1929. A few companies mentioned that it was impossible for them to reduce their stock because of the frequent changes in equipment.

Standards of the American Electric Railway Engineering Association are used wherever possible on a majority of the properties which replied. Three stated that they did not use these standards to any great extent and one mentioned that they were used only for scrap sorting, but all the others indicated that they were using them wherever possible or practicable.

Two companies indicated that they were using the A.E.R.E.A. standards almost 100 per cent. In the case of one company, they are used 10 per cent for maintenance of way, 80 per cent for electrical parts and 15 per cent for mechanical parts. In general, the majority of companies are adopting the standards wherever possible, and there is a decided move in favor of their general adoption.
Reading Company's Philadelphia Suburban

PROGRESS on the work of electrifying the lines of the Reading Railroad in the vicinity of Philadelphia is approximately up to schedule. It is expected to start operation a year from this spring or early summer. Ground was broken for the first of the catenary foundations June 18 of last year, and at present a force of 40 engineers and draftsmen is engaged in the design and about 650 men are on the outside construction, exclusive of work that is being contracted for.

The first stage in the electrification of the Reading was authorized by the board of directors on Oct. 25, 1928. Only preliminary work had been done prior to that date. Inasmuch as this is the first electrification work the company has done, it was necessary to develop all standards, plans, specifications, methods of procedure, etc., from the beginning, and to organize a force for this purpose. This of necessity has consumed some time.

The map shows the territory being electrified. The initial electrification extends from Reading Terminal to Lansdale on the Bethlehem branch, to Langhorne on the New York branch, to Harrow, and to Chestnut Hill. It consists of 50 route-miles and 110 track-miles, and covers the most important of the suburban services. The suburban electrification may be extended to Norristown, Doylestown and Trenton, and when the through freight and passenger services are electrified, would be extended to Bethlehem, Bound Brook, and possibly Reading and Pottsville.

A contract for power has been entered into with the Philadelphia Electric Company for 25-cycle, 13,200-volt alternating current to be supplied at Wayne Junction, 5 miles from Reading Terminal. This contract is for a term of twenty years, which allows the power company to amortize the investment in equipment installed for the railroad. Initially, the power is billed at established rates for railroad loads in this territory. When the railroad demand reaches a definite amount, the rates are based on the actual cost of
Heavy suburban service will be given by 11,000-volt single-phase motor car trains on the initial section of the Reading’s electric system. It is planned to extend the road later and to include main line freight and passenger service.

power to the power company, including both operating and fixed charges. This will result in a very reasonable cost of power and will enable the railroad to share in the economies which the power companies have made and surely will continue to make in generation, transmission and distribution.

A load curve for the future suburban, through freight and through passenger load in the general Philadelphia area is reproduced. This shows a maximum hour demand of 45,250 kw. and a load factor of 59.5 per cent.

The importance of a favorable power rate, and one frequent substations and the narrow restricted rights-of-way this system is particularly economical in first cost. It is also advantageous from the standpoint of minimizing inductive interference in communication lines.

For extensions to Bethlehem, New York, etc., 66,000-volt, single-phase transmission lines will be used. Due to the Central Railroad of New Jersey’s having a very heavy suburban service, a source of power for the New York end is considered a necessity.

Electrification

Making Rapid Progress

that is made more favorable by increasing loads as well as increasing load factor, is apparent when it is seen that the Reading Company’s power bill, after through electrification for the Philadelphia territory, will be around $1,500,000 per year.

To furnish this power the Philadelphia Electric Company will run underground, 13,200-volt, 60-cycle lines from Westmoreland substation to Wayne Junction, and at the latter point erect a frequency changer station. Two 15,000-kw. motor-generator sets will be installed initially, while the station will have an ultimate capacity of six such sets. Power will be delivered to the railroad substation bus at its Wayne Junction substation.

The three-wire system, with 36,000-volt transmission will be used in the suburban zone. This system with a lower transmission voltage is used on the New Haven, and in a modified form on the Virginian electrification. It has also been successfully used in Sweden.

The substations consist of auto-transformers connected between the 36-kv. transmission wires and the trolley wire with the one-third point connected to the rails.

Due to the number of stub lines with consequent columns is used in the four- and five-track territory between the substations.

The zone initially being electrified has an exceptional number of interlockings and junction points. There are nine interlocking plants in the first 10 miles of railroad between Reading Terminal and Jenkintown. All contact wires are sectionalized at these points and this results in complicated catenary wiring and the necessity for a large number of trolley circuit breakers.

In the event of trouble or faults in the catenary system, these being much more frequent than in a power company’s distribution system, selective action of the circuit breakers is necessary. Several new schemes of obtaining selectivity have been studied and actually tested out, with small proportional currents in a network set up to duplicate the railroad’s distribution system.

Supervisory control will be used to operate all circuit breakers and sectionalizing disconnects between substations.

Two Types of Catenary Structures

The catenary and transmission structures are of two general types. A fabricated truss supported by H columns is used in the four- and five-track territory be-
Copper-bearing trusses accompanying designed of due to the restricted right-of-way and proximity of buildings along either side of the railroad makes necessary carrying the transmission wires on masts mounted on the truss. Due to the frequent interlockings, there are many signal bridges in this territory and the catenary bridges are designed to accommodate the new signals which are hung from the trusses. These bridges are fitted with ladders, walkways and cages for signal maintenance, all the old signal bridges being removed.

North of Wayne Junction the H columns are run up to carry the transmission wires and H section crossbeams instead of trusses are used. Copper-bearing steel is used for all the lighter steel members as an additional protection against corrosion. No transverse guys are used but longitudinal guys for dead ends and at wire crossings. Considerable pains have been taken in the structure and catenary design to standardize as much as possible, keeping the number of types of structures, fittings, etc., to a minimum.

Foundations are all designed with anchor bolts and both gravity and side-bearing designs are used. An unusually large number of special foundations were necessary on account of interferences and restricted right-of-way. Some of these are shown in accompanying illustrations.

Two different types of inclined catenary are being installed. The first is the conventional type in which a bronze trolley wire is supported from an auxiliary copper messenger, which in turn is supported by a bronze main messenger, using three wires in all, and 300-ft. spans. This is being used between Reading Terminal and Langhorne. The second type has only two wires, a bronze trolley wire being supported from a composite copper and bronze messenger cable with 250-ft. spans. It is to be installed between Jenkintown and Lansdale, and on the Hatboro and Chestnut Hill branches. This type is simpler, lighter and less expensive and the structures can be somewhat less expensive also. We will thus have a comparison of these two types to use in making decisions for further electrification work. It is felt, however, that the latter type of catenary will give entirely satisfactory results, particularly with the method by which we plan to collect the current.

**New 11,000 Train Bus Line Connectors Developed**

Two pantographs will be in contact with the wire at all times and connected together electrically on the car or locomotive. At least one of these pantographs will be sure always to be in contact with the wires, and as they are in parallel this should minimize if not eliminate sparking.
Connectors between cars couple the 11,000-volt train bus lines automatically. This device was designed and developed by the Reading engineers. The cover at the left is removed to show the construction.

With this method, on a ten-car multiple-unit train only two pantographs would be in operation, instead of all ten as in the ordinary scheme where every motor car is independent of all others. This should result in materially less trolley wire and pantograph shoe wear, also less damage to wires and pantographs in the event of a pantograph fouling the wire system, a not infrequent occurrence.

However, the use of such a system for our trains necessitates an 11,000-volt bus line run along the tops of the cars and a means of connection between the cars which is automatic in its operation. Such a connector was not available and the manufacturing companies were requested to develop one. The designs proposed were not considered adequate or satisfactory, so we undertook to design such a device. This has been done and a bus line connector has been built and operated successfully on two steam cars for the last three months. This connector, shown in one of the illustrations, will be used on the new cars.

While this method of operation has not been used in this country, the use of two pantographs bussed together on locomotives is common practice in Europe and results obtained were carefully checked with operating and maintenance people abroad.

LIGHTWEIGHT CARS WILL BE USED

While there will be nothing radical about the new cars, they will incorporate many refinements and improvements and will show considerable weight reduction over most existing cars of their size. All will be motor cars and will seat 80 passengers, and each will be equipped with two single-phase commutating motors of 250 hp.

There has been great activity in the alternating-current single-phase traction motor field within the last few years. We now have six single-phase motor-car motors to choose from, where a few years ago there were only one or two. It is expected that the latest types will show superior performance and maintenance. Even greater activity in locomotive motor design has taken place and is taking place in anticipation of the Pennsylvania requirements, and the Reading will fortunately be able to profit by this when it buys locomotives.

There has fortunately been time to give considerable thought to the layout and equipment on the cars. This has resulted in reducing the amount of conduit, wire, and air piping to what seems to be an irreducible minimum. The layout has been made such as to be most accessible for inspection and maintenance. Improvements have also been made in the ventilating apparatus and ducts, and a new system, designed by the railroad, of filtering snow and dirt from the ventilating air is to be used.

Motors have been so arranged that they can be removed from the trucks without removing the truck from under the car and the car body can be lifted from the trucks without disconnecting ventilating connections. A new design of truck has been tested out for several months on one of our steam cars in regular service and may be used on the new cars.

The high cost of heating electric trains is not generally
realized. The energy for this purpose during the heating season amounts on different roads to from 20 per cent to as much as 40 per cent of the total energy used. To reduce this to a minimum, consistent with comfort to the passengers, a double thermostat control will be used, a 70-deg. thermostat being used only during the time the engineman is in the cab and a 50-deg. thermostat at all other times. Also provision is made whereby the engineman can change from the high to the low thermostat for all cars in the train when approaching a terminal to economize on the heat.

A new automatic door-closing device will be used which automatically closes all end doors in the train as soon as the train starts after the station stop. This, in addition to having heat, will avoid drafts due to doors being left open until they are closed by the trainmen.

**SHOP FACILITIES AT WAYNE JUNCTION**

To handle the inspection and repair of the cars and future locomotives, and to store them during the day when not in use, a new car shop and storage yard is nearing completion at Wayne Junction. The shop has five tracks, three for inspection, two for repairs. It is 320 ft. long and can be extended to twice its present length for future requirements. This shop is being pushed to completion for use as a construction storehouse and headquarters for the overhead construction, as it is strategically located for this purpose.

Adjacent to the shop will be the frequency changer substation, the Wayne Junction transformer substation, linemen's maintenance headquarters, and the load dispatchers' office, which will make this location the electrification headquarters. This should make a compact and efficient operating arrangement.

Lastly, the large amount of work in preparing the railroad for electrification should be touched on. Additional clearance has to be provided where required for the overhead wires; grade crossings are to be eliminated; direct current signaling has to be changed over to alternating current; underground conduit has to be installed; telephone wires have to be put in cable and in some localities underground; foreign wire crossings rearranged and eliminated; new storage yards built, and many other changes made. Cost of this work in our case will be approximately equal to that of the electrification proper, including the new cars. Later will come training of the present personnel to operate and maintain the equipment.

All engineering work for the electrification is being done by the Reading Company; also all construction work, except buildings, is being done by railroad construction forces organized for this purpose.

---

**Care Essential in Stringing Trolley Wire**

Expansion and contraction with temperature must be taken into account if lines are to be kept tight and breaks prevented

*By J. F. NEILD*

Electrical Engineer, Toronto Transportation Commission

---

IN THESE days of rapid street car service operated on close headways, the trolley wire demands serious consideration, first as to kind and second as to method of erection. The kind of wire depends on such physical conditions as grades, curves, etc., and on such operating conditions as the amount of energy required for the starting and acceleration of the rolling stock, the frequency of stops, etc. The materials available for practical purposes range from hard-drawn copper trolley wire, which is suitable for long tangent routes having infrequent service, to high-strength low-conductivity bronze trolley wire backed up by heavy feeder capacity for close headway trains, curves, loops, etc.

This part of the subject has been fairly well covered in technical journals and manufacturers' advertising matter and information is easily obtained.

The erection of the wire is just as important as the use of the proper kind of wire. The greatest care must be exercised to avoid any nicks, cuts or scratches, as these materially affect the life of the wire.

The trolley wire should be as nearly parallel to the track as it is physically possible to make it, depending on a not too rigid cross-span for flexibility. It is in trying to erect the overhead structure in such a manner as to obtain this condition that one meets problems.

For instance, 1 mile of unstressed copper trolley wire will contract in length approximately 4 1/2 ft. for a decrease in temperature of 100 deg. F. Consequently, if the trolley wire is strung too tightly at high summer temperatures it will probably snap at the slightest provocation under sub-zero conditions. At the same time, to obtain the maximum life from the trolley wire, it is advisable to keep the sag as small as possible.

In Toronto, which has a climate similar to that of other Northern cities, temperature variations have been recorded during the period of electric railway operation from 20 deg. F. below zero to 104 deg. F. above zero. Trolley wire must be strung so that it will not fail at the extremes of this range. The tension and sag curves at various temperatures in the accompanying illustration have been computed for our own conditions; that is, so
that the maximum stress at 20 deg. F., below zero with a loading of 1/2 in. of ice and 8 lb. per sq.in. wind pressure, will not exceed half the ultimate strength of the wire. The fact that all of these maximum conditions are not apt to occur at the same time simply adds another factor of safety to the calculation.

On any other property it would appear that to obtain the maximum wear from the trolley wire it would be advisable to derive the relation between temperatures and tensions to conform exactly with normal expected weather conditions. Bronze trolley wire, of course, may be strung at greater tensions than the hard-drawn copper wire on account of its higher ultimate strength.

A dynamometer inserted between the trolley wire clamp and the blocks in pulling up the trolley wire gives a direct measurement of the tension. The measurement of sag, when made accurately with a level and corrected for exact length of span, is a good check on tension of trolley wire already in place. It is not accurate enough to measure the sag from the rail, as an almost imperceptible grade in the track is enough to throw the results out considerably.

At the present time the problem of the correct tension of trolley wire and span wire for varying conditions is being taken up in study by a special committee of the Power Division of the American Electric Railway Engineering Association with the idea of establishing a set of tables and curves that will cover more generally the different variable factors.

In Toronto, during the past few years, we have replaced as much trolley wire as possible in the cold weather while the wire is near its maximum contraction. As a result the wire is rarely called upon to exceed its original stringing tension.

I have not given any data as to the broken trolley wires per year on this system. Information on this subject appeared in the issue of Electric Railway Journal for January, 1930, page 48. The results indicate that, even under the severe conditions encountered in Toronto, little difficulty has been experienced with trolley wire breaks.

**Thawing Frozen Water and Conduit Pipes**

**By H. A. Brown**

*Foreman Return Circuit, Scotch and Signal Division*  
*Cleveland Railway*

**Frequently** during the winter months, it is necessary to thaw out frozen water or conduit pipes. To do this work quickly and efficiently the Cleveland Railway often uses the regular rail joint bonding equipment. This unit consists of a 600-volt rotary converter and a transformer which provides 1,500 amp. at 12 volts potential across the two secondary leads, each of which is about 20 ft. long. The leads are connected to the ends of the frozen section of pipe or conduit and the current applied for about one minute. This is usually sufficient to thaw out the frozen pipe. The use of the bonding device for this purpose has saved a great amount of time and sometimes has saved a complete pipe renewal.
Preferential Traffic Rights for Street Cars

Rapid multiplication of motor vehicles has profoundly influenced both the street railways and the steam railroads. This new agency of transportation has made itself felt both in the field of passenger traffic and in the way it has affected the business of operation. It is a commonplace to say that the private automobile has cut heavily into the passenger traffic of both the steam railroad and the street railway, and that the motor truck—in a lesser degree—has taken over some part of the short distance merchandise traffic of the steam railroads. The decline in the passenger revenue of the steam roads since 1923 has been not far from 10 per cent, and the reduction in passenger-miles about the same, the commutation traffic showing, however, an increase of about 10 per cent, with the shrinkage coming in regular passenger service where the average journey has increased from 54.6 miles in 1922 to 73.2 miles in 1928.

The decline in street railway and associated bus traffic is computed by the Electric Railway Journal to have been from 116 to 101 revenue rides per capita from 1902 through 1929, but riding patronage for the past few years has been about constant. This is the more encouraging from the fact that the registration of automobiles has in the same period been constantly rising. The gross passenger receipts of the street railways, unlike those of steam railroads for passenger service, have for the past four or five years shown a decided increase, those for 1929 being the greatest in their history. This is largely due to the increase in the individual fare which on the average has risen from the old nickel fare to about 8 cents.

From these rather bald facts several inferences may be drawn as to the influence of private motor car competition upon the two related industries. The menace to the street railways was immeasurably the greater. Passenger traffic is overwhelmingly their main source of revenue, whereas with the steam roads it contributes only one-fifth as much revenue as freight. In numerous cases the steam roads, by substituting gas-electric or motor-bus operation for regular passenger service over lines of sparse traffic, have actually saved by the lower cost of operation, whereas the diversion of trolley traffic to the private automobile is practically a dead loss to the street railway.

Nor do the street railways have much collateral compensation for this loss of traffic, whereas the steam railroads from the transportation of automobiles, auto trucks, auto parts and tires alone derived almost 5 per cent of their carload freight revenue in 1928. Petroleum oils, refined and other gasolines yielded more than as much again, and if road-building material be added, it can be seen that the steam railroads have had a handsome offset in increased freight tonnage and revenue to the not incon-

Mass transportation must be expedited. Many plans for relief of congestion are merely palliatives. Parking should be radically restricted or abolished on important thoroughfares. Dominant consideration must be given to the major movement.

By WINTHROP M. DANIELS
Professor of Transportation
Yale University
siderable shrinkage in their gross passenger revenue.

It ought, of course, to be added that the steam railroads have lost some of their short distance freight traffic to the motor trucks. But there are two considerations that diminish the importance of this factor. The first is the railroad's own adoption of the motor truck, which can be run to advantage, particularly in cutting down the daily number of way freight trains formerly operated. The second is that short-distance, less-than-carload merchandise traffic is commonly understood to yield very thin net revenue. So that the abatement to be made in the railroads' gain of tonnage and revenue, directly and indirectly traceable to the motor vehicle, is not of overwhelming significance.

The multiplication of the private automobile has legislated both the steam railroad coach and the street railway car to a wholly secondary place, if measured in the relative number of passenger-miles covered collectively by each type of vehicle annually. It has drawn from the rails much traffic that will never be regained. It has, however, created a much vaster amount of traffic than it ever attracted away from the railroads or the railways. But it has been demonstrated that there is a core of passenger traffic the automobile is powerless to absorb. It can never absorb long-distance high-speed passenger traffic. It can never absorb commutation traffic nor the mass movement of city traffic in commission hours.

There is still a no man's land where the competitive rivalry is acute — where it remains to be seen whether the railroads and street railways, both supplemented by their own automotive adjuncts of trucks and buses, can coax back to themselves and away from the private automobile and the private truck, the marginal traffic which for the moment can be handled by either.

In the matter of operation, the millions of private motor cars and trucks have created problems of an entirely different character for the steam roads and the electric railways. The former operate, of course, upon their own right-of-way, whereas the electric railway and the thousands of buses operated as extensions use the city streets and the public highways. Upon an exclusive right-of-way, the physical obstacles from motor vehicle operation are at a minimum. To this almost the only exception is at grade crossings where the many fatalities create a serious situation, and intensify the demand for more complete crossing protection or even the still more expensive separation of grades. But apart from this situation, it may fairly be said that the problem of physical operation of steam railroads has not been seriously complicated by motor vehicle operation.

Indeed, in some respects motor truck operation has been of direct advantage to the steam roads, particularly in their interchange of merchandise freight in large terminals. Of course, so far as railroads use the motor truck or motor bus as adjuncts, these vehicles encounter the same operating difficulties on the streets as confront the motor vehicle generally; and this field is one which in large centers is growing rapidly. The Pennsylvania Railroad only recently filed a schedule according free passenger transfer by bus to parties of 25 to points within Manhattan, the Bronx, Brooklyn and Newark where their tickets apply to or from designated territories upon that carrier's lines. But apart from this railroad use of buses and trucks, and from crossings at grade, the multiplication of motor traffic has not created serious operating problems for steam railroads.

While the motor vehicle disturbed in only a minor degree the physical operation of the steam railroad, it may be said to have almost disrupted the operation of street railways. The arteries of local street traffic in central shopping and business centers are suffering from high blood pressure; they are ordinarily congested, and not infrequently are wholly clogged. The ability of surface car lines to maintain the headways requisite for mass transportation morning and night has been threatened or impaired. The prospective dispersion of the currying public has also created bewilderment as to the permanency of routes to be operated. The dilemma has grown until it involves not the operation of the surface lines alone but the far wider problem of city planning in general.

The root of the difficulty lies, of course, in the fact that the area of our paved thoroughfares was a century ago designed to accommodate the horse-drawn traffic of that time. We are now engaged in the almost hopeless effort of trying to force a 3-in. stream through a 4-in. nozzle. And as if the job were not difficult enough, we have accentuated it by diminishing the already inadequate roadways by the practice of parking. The difficulty is intensified by the rapidly increasing number of motor vehicles. Plant an overplus of seeds in a garden patch and they will choke and kill each other just as surely as would so many weeds.

There have been devised numerous remedies which in different places operate with a differing degree of success. But they all suffer from one of two defects—either they are mere palliatives, or else they involve such vast expense that they can seldom be practically used. Among the palliatives—helpful in themselves, but incapable of affecting a radical cure—are: (1) abolishing the left hand turn; (2) restricting the narrower streets to one-way traffic; (3) staggering opening and closing hours of business houses and theaters; (4) confining heavy trucking of coal or garbage and refuse to night or early morning hours; (5) improving the operation of traffic light signals so as to speed and not to obstruct traffic; (6)
providing by-pass streets for traffic which has no need to occupy main thoroughfares; (7) the skip-stop plan for the trolley cars; (8) the boulevard-stop plan; (9) uniform traffic codes such as prescribing whether turns on the red light may be made without stopping, or only after stopping, or not at all; (10) requiring loading and unloading platforms for stores to be constructed within building lines and not projecting upon the sidewalk; (11) provision by the city, by private garages or by business houses (for their customers) of parking spaces off the streets; (12) limited parking (generally ineffectual and unenforceable); (13) prohibition of parking, or at least its restriction to non-congested areas. This baker's dozen of remedies, however, are merely palliatives. "Anti-Fat" is no remedy for the dropsey.

Then there come the more ambitious remedies such as street widening, double-decked streets, arcaded sidewalks, city-zoning with a limitation on the height of buildings abutting on the streets, over-passes at the junctions of crowded motor traffic lanes, underground escalators for pedestrians, and finally subways costing millions of dollars a mile. It is tolerably safe to say that except in the largest and densest urban centers these remedies will involve prohibitive expense.

Where, amid this jumble of ill-assorted plans, does the future operation of street railways come in, and along what lines does their hopeful future lie? As one wholly inexpert in street railway operation I would venture the following suggestions: First, they must put in a claim, not only in their own interest, but equally in the interest of the car-riding public, that in congested urban sections during commission hours they must be given a preferential use of streets and public thoroughfares. When it is remembered that a car with 60 passengers takes perhaps one-twentieth of the street area necessary for the accommodation of 20 or 25 private automobiles with the same number of riders, a strong argument can be made for such preferential right-of-way as may be necessary to expedite the mass movement of the riding public for definite periods both morning and night. Parking on such thoroughfares should be radically restricted or abolished. "The essence of the public easement in the highways is passage. Parking is the antithesis of passage," says one of our legal lights; and "Storage on the highways is trespass" on the abutting owner, and a common nuisance to the public. The inconvenience of the few ought to give way to the convenience of the many, and dominant consideration should be shown to the major movement.

This result will not be attained until a campaign of education has taught the merchant that parking before his door is not only an injustice to the public, but is dispersing his own customers to more accessible local sub-centers, and is opposed to his own long-run interests. Once the merchant is convinced, the road-hog and the curb-hog can be taken into camp.

It is also to be noticed that the very inertia which opposes any thorough remedy for street congestion is, in a way, self-corrective. The growth of sub-centers for independent shops and branch stores and even for banks, and the rapid migration of business away from the narrower streets to the wider avenues and thoroughfares should warn the standpatters that they are standing in their own light.

There can be little question that the present tendency is to contract rail mileage and to expand bus-route mileage. Figures can be given to show that bus-route mileage is already 50 per cent of street railway track mileage, and the passenger mileage by bus is a growing percentage of total passenger-miles. Absolutely and relatively, track mileage is on the decline. Last year witnessed a net shrinkage of track amounting to more than 1,000 miles. It has yet to be shown that the bus can ever wholly supersede the car on rails in city transportation.

One final suggestion is ventured. Is it too much to expect that the vehicle designer will contribute to the preservation and even the popularization of the riding habit, both by car and by bus? In some ways, the typical street car is an efficient instrument, but in the same way that a military tank or an armored car is an efficient instrument. It has about the same life as a railroad box car. It can and does stand up under heavy usage. Both the car and the efficient braking apparatus make notably for safe operation. Much of the older equipment, however, is unattractive. Access by steep steps, through narrow platform entrances, limited ventilation, and often a single difficult exit are not calculated to allure traffic. The street railway buses seem to have improved upon the car in these respects, and more particularly in the seats. The bus, however, has a life of only five to six years, and its upkeep and retirement costs must be high. It lacks the staunchness which is the street car's basic merit. But the lure of line, style and color, convenience and design cannot be permanently neglected if the electric street car is to maintain the popularity its utility deserves.

**"Bus Transportation" Offers Awards**

IN AN effort to stimulate further improvement in motor bus operating methods and practices among the motor carriers in the United States and Canada, *Bus Transportation* has set up six awards for the most outstanding examples of progress made in maintenance practices and methods.

The six awards are divided among three different classes of companies:

(a) Those companies operating 3,500,000 or more bus-miles annually in revenue service; (b) Those companies operating 1,000,000 and less than 3,500,000 bus-miles; (c) Those companies operating less than 1,000,000 bus-miles annually in revenue service.

For the most outstanding example of progress made in maintenance practices and methods to date by any carrier in each of the three classes mentioned, a medal plaque and a certificate of award to the carrier, and in addition $500 in cash to be employed in any manner it elects. For the second most outstanding system of maintenance practices and methods, honorable mention will be given in the shape of a certificate of award, and a medal plaque. All awards will be based on (1) the record of results achieved, and (2) the explanation of the maintenance practices and methods employed.

The committee of awards consists of the following:


The awards will be announced at the annual convention of the National Association of Motor Bus Operators, to be held in Chicago, Sept. 18 and 19, 1930.
Anchoring Armature Core Bands

BY J. S. DEAN
Westinghouse Electric & Manufacturing Company

BY ANCHORING the ends of core bands on railway armatures, which are subject to severe mechanical strain due to centrifugal force when the armature is rotating at high speed, the service life of these bands can be materially lengthened. The bands should be wound in place on the core, using a high-grade tinned-steel wire having an ultimate tensile strength of 200,000 lb. per square inch. Preferably a 14 B&S gage wire should be used and wound at a tension ranging from 200 to 250 lb. Under the core bands a strip of 0.012-in. tinned sheet steel extending the entire way around the armature should be installed. If these methods are followed it is not necessary to use tinned strips on the end bands over the extension of the coils, at both the front and the rear ends of the windings.

Clips of 0.012-in. tinned sheet steel should be equally spaced (about every third or fourth slot) around the armature. These should be placed under the steel strip over the coils and not on top of the teeth.

At the start and finish of the band wire four of these clips should be placed about 1 to 1½ in. apart, to hold the ends securely. The ends of the wire should be anchored by bending them at the start and finish around the tinned clips for about ¾ in., as shown in the sketch.

While ordinary half-and-half solder is widely used for this class of work, pure tin is much stronger and has a much higher melting point than the half-and-half solder. A high-melting-point solder has recently been developed by one manufacturer which is used to solder the bands on all of his railway motor armatures. Reference to the table shows the relatively high melting point of this new alloy.

<table>
<thead>
<tr>
<th>Materials</th>
<th>Melting Point Degrees Centigrade</th>
</tr>
</thead>
<tbody>
<tr>
<td>Half-and-half solder</td>
<td>188</td>
</tr>
<tr>
<td>Pure tin</td>
<td>322</td>
</tr>
<tr>
<td>High-melting-point solder</td>
<td>300</td>
</tr>
</tbody>
</table>

In connection with the use of this special alloy solder, the repairman will find it a big help to use a very hot soldering copper weighing about 5 or 6 lbs. This has been found essential to do a good soldering job on the bands.

Signal Bell on Tower Truck*

BY H. A. BROWN
Foreman Return Circuit, Switch and Signal Division
Cleveland Railway

POWER trucks of the switch and signal division of the Cleveland Railway have been equipped with signal bells, so arranged that a workman on top of the tower may signal the driver regardless of the tower height or position of the turntable. This device is a great help to the trouble crews, especially when working under noisy traffic conditions. Current for the signal is obtained from the regular battery, tapped at the required voltage, the iron tower leg plates and turntable being utilized as current conductors. The signal bell is mounted in the drivers cab and the push button control is mounted on top of the tower within convenient reach.

*Submitted in Electric Railway Journal Prize Contest.

Wiring diagram of signal system installed on tower trucks of the Cleveland Railway
of the workmen. In order to assure good electrical contact at all times between the tower leg plates and the table plate, reconstructed push buttons are used in which the center has been replaced by a piece of $\frac{1}{4}$-in. brass rod through which it is possible to pass current. The push buttons are mounted in each of the tower leg plates, with the binding posts electrically connected to the iron leg plates, and with the $\frac{1}{4}$-in. brass rod (under spring pressure) in sliding contact with the adjacent parallel tower leg plate. The same method is used for obtaining good electrical contact between the tower leg irons and the table plate. In this manner a closed circuit is provided when the control button is closed, regardless of the tower height or the position of the table. These bell installations have resulted in a saving of time both to the maintenance crews and to cars on the line approaching a point under repair.

Increasing Height of Span Wire Poles

FOLLOWING street widening operations in New Haven, an effective method was recently adopted by the Connecticut Company for increasing the height of its span wire poles. When the pole line was set back it became necessary to raise the height of the span wire connection to the pole in order to maintain the trolley wire at the proper elevation. This brought the span wire too close to the feeder wires carried on crossarms at the top of the poles. Instead of installing taller poles, it was decided to add short sections of pipe to the top of the existing poles, holding the extensions in place by means of malleable iron clamps, as shown in the accompanying illustration. This permitted the necessary separation of the span wires and feeder wires without the expense of replacing the poles.

Door Engine Used for Pressure Lubrication

BY CHARLES HERMS

General Foreman San Diego Electric Railway

FOR lubricating universal joints of the Spicer type, an obsolete door engine was reconstructed in the shops of the San Diego Electric Railway. With the aid of this apparatus, considerable time has been saved when universal joints had to be greased. A feature of this lubricator is that an indicator shows when the grease is entering the cylinder and when it is being pressed out and into the object to be lubricated. The apparatus has a nozzle pressure of 1,500 lb. and discharges 4 cu.in. of grease in ten seconds. It can be recharged in two seconds. To recharge the lubricator, a cock is turned to vent the air from the cylinder, after which the grease, under 150 lb. pressure, passes through the 1-in. check valve and forces the 1-in. piston up to its maximum position.

The Alemite hose also has a vent cock at the end which fastens on to the Alemite fittings. This is to permit the mechanic to cut off the flow of grease at will and at the same time release the pressure on the chuck so it can be removed from the fitting. A $\frac{1}{4}$-in. ball valve is provided to prevent the compressed grease in the Alemite hose from expanding back into the 1-in. cylinder when releasing for recharge. The 1-in. bushing and head were made of an old car axle, while the piston of the same diameter has 0.002-in. clearance.
Ball Bearing Under Brake Handle*

BY W. H. McALONEY
Superintendent of Equipment Georgia Power Company
Atlanta, Ga.

ELIMINATION of wear on the sanding slide of the M-28 brake valve in general use on safety cars has been accomplished by the Georgia Power Company by placing an S.K.F. ball bearing under the handle. Wear on the slide of the brake valve handle formerly caused many complaints by car operators. In order to eliminate this trouble a type S.K.F. No. 203 ball bearing has been installed in the brake handle, as shown in the accompanying illustration. This has greatly reduced the friction and overcome the wear on both brake handle and sand bail.

Detecting Broken Rails*

BY CARL W. EVANS
Underground Distribution Engineer
San Antonio Public Service Company

FINDING the location of broken rails has been greatly facilitated on the lines of the San Antonio Public Service Company by means of a car equipped with a direct-current ammeter on each rail and two steel-wire brushes used as track contactors. When trying to locate broken rails, the car is driven slowly over the track to be tested. This is done after midnight when regular traffic has ceased, while one man is watching the ammeters. As long as continuity of the track is not broken the ammeters indicate only a small amount of current since they are shunted across only a short section of track. In passing over a broken rail, the ammeter shunted across the broken rail indicates almost the full car current during the interval that the break in the rail lies between the rail contactor and the wheels. If the car is traveling at a fair rate of speed the broken rail is indicated by a sudden swing of the ammeter, and notation is immediately made of the exact location.

Demountable Dolly Used in San Diego*

BY CHARLES HERMS
General Foreman San Diego Electric Railway

A DOLLY used by the San Diego Electric Railway to take the place of a street car's truck when one of the axles is broken consists of two axles with small wheels and two double side members resting on the axles, as shown in the accompanying illustration. This dolly can be assembled or taken apart in a few minutes. When using the dolly it is necessary to jack up the car, roll the dolly under it, and lower the car until the wheels rest on saddles between the sides of each member. Pins which support the saddles are made of 14-in. steel bar. Due to the design of the dolly, the weight of the car is carried directly on the dolly wheels and no bending action is set up in the dolly axles.

*Submitted in Electric Railway Journal Prize Contest.
Insulating Sleeve Protects Test Points*

BY T. E. BRINDSON
Electric Shop Foreman
Kansas City Public Service Company

PROTECTION to the workmen engaged in testing electrical equipment in the shops of the Kansas City Public Service Company has been afforded by the development of an insulating sleeve which covers the positive test point. Previous to the development of this device both positive and negative test points were unprotected and workmen received electrical shocks on various occasions. With the new apparatus the negative point is left bare but the positive point is inclosed in fiber tubing inside a wooden sheath. When the apparatus is not in use this sheath covers the metal point, being held in position by a coiled spring. When it is desired to use the apparatus the sheath is pulled back thereby compressing the spring and leaving the test point exposed. This arrangement also provides protection for the test point should it fall on the floor or come in contact with grounded metal.

Reverser Protectors Prevent Tampering

BY BENJAMIN H. HALL
Foreman West Penn Railways, McKeesport, Pa.

PROTECTORS have been installed on the tops of B-50 controllers by the West Penn Railways as a means of preventing passengers from turning the reverser barrels at the rear of the car with their hands. Without the shields it was found that passengers frequently would do this, making the rail brake inoperative or causing the motors to buck when the front end controller was turned on.

The protector is made of 1/4-in. sheet steel and is fastened by means of three machine screws tapped into the top of the controller case. Dimensions and the method of installation are shown in the accompanying diagram. It costs little to install these shields and their use has removed a source of annoyance. As a safety precaution, they may save lives and damage to equipment.

Preventing Grease from Entering Armature Bearing

BY W. B. OSBORN
Master Mechanic
Southern Public Utilities Company
Charlotte, N. C.

TO PREVENT the heavy grease used for lubrication of gears from entering the armature bearing, the Southern Public Utilities Company, Charlotte, N. C., has adopted the practice of welding a ring to the pinion. This ring is placed against the pinion, on the opposite side from the nut which holds it on the armature shaft. A soft steel band of 4 x 1/4-in. dimensions is used for the ring, the diameter depending on the size of the shaft. The bearing should be turned down at the pinion end in order to leave a little space between the bearing and the ring attached to the pinion. This method of preventing the heavy grease from entering the armature bearing has been used at Charlotte for several years and results have proved to be most satisfactory.

Bus Wheel Aligner*

BY W. R. FAIRCLOTH
Garage Foreman Virginia Electric & Power Company
Portsmouth, Va.

ACCURATE wheel alignment for buses of the Virginia Electric & Power Company at Portsmouth, Va., has been attained by the use of a wheel aligner, made in the company shops. The device used for this purpose has a base made from 2 x 1/8-in. flat iron with a
piece of 3/4-in. iron pipe serving as a brace for two 19-in. uprights of 2x3-in. flat iron. Two 3/4-in. bolts 8 in. long are inserted through a 1/2-in. tap and can be so adjusted as to fit flush against the tire rims. In use the aligner is placed first in front of and then in the rear of the axle, permitting the mechanic to see at a glance whether or not the wheels are parallel. It was made at a cost of only $2.50. The life of tires has been greatly increased since the aligner has been in use, while the number of replacements is decreasing steadily.

Iron Rod Acts as Dam for Weld Metal

By F. B. Habercam
Superintendent of Welding
United Railways & Electric Company
Baltimore, Md.

WHERE it is desired to electric seam weld rail joints fitted with standard bolted joint plates, the United Railways & Electric Company of Baltimore finds it effective to use a piece of 4-in. square iron along the entire top edge of the plates as a dam for the weld metal. The ends are welded to hold the rod in place, and the usual welding procedure is then followed. This method applies where the splice bars are not disturbed, but whenever possible it is better to dismantle the joint and, while the splice bars are off, weld the 1/2-in. square rod along the under side, to the bars. The joint is then reassembled and welded in the usual manner. The weld can be puddled so that the 1/2-in. square rod, splice bar and rail are all thoroughly welded, with a maximum depth of penetration. This method may be used on any type of joint where there is not sufficient welding shell on the splice bars. It applies particularly to cases of joint repairs to old bolted joint track, where it has been found satisfactory.

*Submitted in Electric Railway Journal Prize Contest.

Hammer Operated by Compressed Air

By A. G. Pirkle
Assistant Engineer Roadway Department
Georgia Power Company
Atlanta, Ga.

By CONVERTING an old 31/4-in. rock drill into a compressed air hammer, the Georgia Power Company has obtained an efficient machine for maintaining roadway tools such as tampers, cleavers, picks, etc., on which there is a considerable amount of blacksmith work to be done. The drill was mounted on a 10-in. I-beam anchored 4 ft. in concrete, and fastened to it by 31/4x5-in. steel plates bolted to the flange of the I-beam with 10 1/4-in. bolts. The plates were bent and the ends welded to the frame of the drill. A ratchet which caused the drill to rotate at each stroke was removed. The hammer was forged from tool steel, to the desired size and shape, and the stem made to such diameter and length as to fit in the drill socket. The hammer is held in the socket with a 1-in. U-bolt, in the same manner as the drill. Air pressure of 100 lb. is used in operating the hammer and a foot control was installed whereby the air valve may be opened or closed as the case may be. The feedscrew in the top is used in raising or lowering the hammer to suit the various sizes of work. It is estimated that at least three times as much work can be done with the air hammer than with a hand hammer in the same amount of time.
High Voltage Test Discloses Equipment Weakness

By H. S. Williams
Assistant Superintendent of Equipment
Department of Street Railways, Detroit

PREVENTION of equipment failures in service has resulted in Detroit from the use of a high voltage breakdown test. So successful has it been that the Department of Street Railways now makes it a practice to give all cars coming into the shops a test with 1,500 volts alternating current between wiring and ground.

![Graph showing failures per cent from 1924 to 1929](image)

Equipment failures have been reduced at Detroit, due largely to high voltage tests.

During 1924 and 1925, when this system was first used, not all incoming cars were tested, so the maximum benefit was delayed. In 1927, however, all were “shot” with a resulting breakdown of 38 per cent of the cars. The following year the number of cars which showed failure was reduced to 21 per cent and so far this year further reduction is apparent. In 1924 when these high potential tests were started the record showed a little over 7,000 miles per pull-in while the 1929 record shows over 14,000 miles. While this improvement is not due entirely to the high voltage testing, a large share of it is attributed to this method of detecting weakness.

Portable Oxyacetylene Apparatus*

By A. B. Copeland
Superintendent of Construction Way Department
Cleveland Railway

TO ELIMINATE the cumbersome handling of an oxyacetylene burning outfit, the Cleveland Railway has designed a special truck to carry the necessary apparatus. Often it was found that trucks or cars equipped with cutting equipment could not reach desired spots because insufficient room was available for maneuvering. The small carriage developed to solve this problem can be moved into any small space. It is mounted on two wheels of 12½-in. diameter, and when not in use stands in an upright position. A platform to support the tanks is made of two layers of ¼-in. oak plank, two holes being cut in the lower layer to accommodate the upper ends of the tanks. This arrangement, together with a metal clamping strap at the top, holds the tanks firmly in position. A removable box, attached to the top of the truck, contains gages, tools and other implements. In the lower compartment of this box is a special space for carrying the hose. The weight of the carriage, equipped, is 600 lb.

Lighted Brooms Help Coach Cleaners*

By Hoy Stevens
Superintendent of Maintenance Motor Coach Department
Cleveland Railway

![Image of lighted brooms](image)

ILLUMINATED brooms are one of the novelties developed in the coach maintenance department of the Cleveland Railway. The unit, as illustrated, consists of a broom, lamp, wire guard, extension cord and reel, the latter mounted on a standard dust box. The outfit is simple, and was made from ordinary garage supplies. With this arrangement it is possible to illuminate any part of the floor of the coach, regardless of its location in the garage, and with little or no delay from short or tangled extension cords. The dust box can be run under the rear door of a double-deck coach or the front door of a single-deck coach. The floor can be swept thoroughly and dust and dirt seen where formerly they were not noticed, on account of the dark. The garage lights were found of little value and even the interior lights of the coach did not illuminate under the seats, in corners or under heater pipe guards. Moreover, when the battery voltage was low the lighting was poor and it was not advisable to keep all the lights on for the time needed to do the cleaning.

*Submitted in Electric Railway Journal Prize Contest.
Supply Car for B.-M.T. System

While repairs to equipment for subway and elevated cars of the Brooklyn-Manhattan Transit System ordinarily are made at the Coney Island shops, it is frequently necessary to change armatures, field coils and wheels at other shops. To transport material to and from various shops a supply car is used. The car used for this purpose is provided with equipment for rapid and easy handling of heavy parts and for safe and convenient storage during transportation.

The car is equipped with a 2-ton circular crane in the center portion which is arranged to handle material in and out of the side doors. This crane is electrically operated and easily lifts and lowers material that formerly had to be loaded and unloaded upon flat cars or in box cars by manual labor when transported from one shop to another. The crane is circular and may be swung out either side of the car when the doors are open, and an electrically-operated extension may be projected from the arm, if it is necessary, and then withdrawn back inside the arm when the crane is ready to be swung back into the car. A switch near the motorman’s cab controls the power for the operation of the crane, so that it cannot be operated unless the switch is thrown in place. This is one of many safety features governing the operation of the crane.

Loading and unloading are done by the shop forces and not by the car crew. A shopman at each shop is instructed in the operation of the crane and his task on the arrival of the car is to operate it. The car resembles a U. S. mail car in appearance, with sliding doors on either side. It is painted red and has the symbol of the B.-M.T. Lines in colors. It is 48 ft. 3 in. over all and is 8 ft. 7 in. wide. The car body itself is 37 ft. 6 in. long with open platforms at either end on which guard rails are mounted.

About 72 sq.ft. of open storage space is provided at one end of the car for large size material, while the other end is occupied by steel lockers which are suspended from the ceiling. These are used for small size material and for broken lots. Room is also provided for the storage of some material under the lockers. The center of the car is taken up by the crane.
New Products for the Railways’ Use

Chuck Spindle Equipped with Roller Bearings

TO PROVIDE for double thrust which occurs in cylinder reconditioning work, an additional roller bearing has been introduced in the chuck spindles of the ½-in. and ¾-in. heavy-duty drills manufactured by the United States Electrical Tool Company, Cincinnati, Ohio. It is claimed that this additional bearing facilitates operation and prolongs the life of the drill.

Special Dash-Illuminating Headlight

INCORPORATING the advantages of the standard O-B Type DCP 500-watt incandescent headlight, a new interurban light has been designed which illuminates the car dash and also provides sufficient track illumination for city and suburban service. Completely enclosed in an aluminum case, weighing only 29½ lb., it is fitted with a heat-resisting plain glass lens in the door, an 11-in. glass reflector and a 500-watt incandescent lamp set in a mogul receptacle making it possible to pick up dark objects as far away as 1,500 ft. in clear weather. Dash illumination is furnished by means of five smaller lamps connected in series and arranged to direct the light beams through prismatic lenses set in the sides and bottom of the headlight case. When in use in interurban service, the 500-watt lamp with the aid of the prisms supplies the dash as well as the track illumination. Dimming is accomplished by cutting out the large light and only employing the five small lights, using a single switch fitted with two on and one off positions. Two of the five smaller lights are set directly behind 4-in. semaphore lenses in the bottom of the door. These lights are sufficient to pick up switch points while traveling at a moderate rate of speed.

This new headlight is made for either portable or stationary mounting and can be used on any car wired for 4-amp. headlights, and using resistances of 500 watts and 115 volts. The five small lights are intended to be accommodated in freight cars for use in freight car lighting. The lights are fitted with a switch which gives a non-glare “white” light or a more intense “red” light. The headlight is made by the Ohio Brass Company, and is claimed to be simple, durable and economical.

A new upholstery material with mohair surface and rubberized back

Car Loading Plate with Patterned Surface

LOADING of freight cars is said to be facilitated by use of a “diamondette” plate developed by the Alan Wood Steel Company of Conshohocken, Pa. This plate is rolled from open hearth steel, of either ½-in. or ¾-in. thickness. It has a raised, patterned surface which will accommodate the smallest of truck wheels without jolting or shifting the load. The raised diamonds give the truck operator a firm foothold, the absence of which in plain plates has created a certain hazard. “A.W.” diamondette car loading plates are flanged on one end and bevelled on the other end. This construction automatically gives the plate a grip on both car floor and platform as soon as the load comes on to the plate.

Waterproof Upholstery Material

NUMEROUS advantages are claimed for a new waterproof upholstery material recently brought out by Lesher-Whitman & Co., Inc., 881 Broadway, New York. The front surface of this material is mohair cloth while the back is coated with 14-oz. rubber. Since moisture does not damage the fabric, it can be cleaned by washing in the regular way. The smooth, hard surface is said to retain its original freshness for a long time. It is also moth proof and vermin proof. These qualities are said to make it an extremely serviceable material for upholstering the seats of electric railway cars and buses.

Patterned loading plate facilitate car loading
### Monthly and Other Financial Reports

<table>
<thead>
<tr>
<th>Location</th>
<th>Report Period</th>
<th>Operating Revenue</th>
<th>Operating Expenses</th>
<th>Taxation</th>
<th>Gross Income</th>
<th>Net Income</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Market Street Railway, San Francisco, Cal.</strong></td>
<td>January, 1930</td>
<td>728,404</td>
<td>678,269</td>
<td>100,136</td>
<td>44,224</td>
<td></td>
</tr>
<tr>
<td></td>
<td>February, 1930</td>
<td>724,608</td>
<td>629,915</td>
<td>94,993</td>
<td>45,652</td>
<td></td>
</tr>
<tr>
<td></td>
<td>March, 1930</td>
<td>592,670</td>
<td>566,209</td>
<td>12,461</td>
<td>36,258</td>
<td></td>
</tr>
<tr>
<td></td>
<td>April, 1930</td>
<td>592,670</td>
<td>629,512</td>
<td>12,461</td>
<td>36,258</td>
<td></td>
</tr>
<tr>
<td></td>
<td>May, 1930</td>
<td>1,291,356</td>
<td>1,265,374</td>
<td>12,461</td>
<td>36,258</td>
<td></td>
</tr>
<tr>
<td></td>
<td>June, 1930</td>
<td>1,291,356</td>
<td>1,265,374</td>
<td>12,461</td>
<td>36,258</td>
<td></td>
</tr>
<tr>
<td></td>
<td>July, 1930</td>
<td>1,291,356</td>
<td>1,265,374</td>
<td>12,461</td>
<td>36,258</td>
<td></td>
</tr>
<tr>
<td></td>
<td>August, 1930</td>
<td>1,291,356</td>
<td>1,265,374</td>
<td>12,461</td>
<td>36,258</td>
<td></td>
</tr>
<tr>
<td></td>
<td>September, 1930</td>
<td>1,291,356</td>
<td>1,265,374</td>
<td>12,461</td>
<td>36,258</td>
<td></td>
</tr>
<tr>
<td></td>
<td>October, 1930</td>
<td>1,291,356</td>
<td>1,265,374</td>
<td>12,461</td>
<td>36,258</td>
<td></td>
</tr>
<tr>
<td></td>
<td>November, 1930</td>
<td>1,291,356</td>
<td>1,265,374</td>
<td>12,461</td>
<td>36,258</td>
<td></td>
</tr>
<tr>
<td></td>
<td>December, 1930</td>
<td>1,291,356</td>
<td>1,265,374</td>
<td>12,461</td>
<td>36,258</td>
<td></td>
</tr>
<tr>
<td><strong>Jacksonville Traction Co., Jacksonville, Fla.</strong></td>
<td>January, 1931</td>
<td>97,358</td>
<td>97,358</td>
<td>97,358</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td></td>
<td>February, 1931</td>
<td>97,358</td>
<td>97,358</td>
<td>97,358</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td></td>
<td>March, 1931</td>
<td>97,358</td>
<td>97,358</td>
<td>97,358</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td></td>
<td>April, 1931</td>
<td>97,358</td>
<td>97,358</td>
<td>97,358</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td></td>
<td>May, 1931</td>
<td>97,358</td>
<td>97,358</td>
<td>97,358</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td></td>
<td>June, 1931</td>
<td>97,358</td>
<td>97,358</td>
<td>97,358</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td></td>
<td>July, 1931</td>
<td>97,358</td>
<td>97,358</td>
<td>97,358</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td></td>
<td>August, 1931</td>
<td>97,358</td>
<td>97,358</td>
<td>97,358</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td></td>
<td>September, 1931</td>
<td>97,358</td>
<td>97,358</td>
<td>97,358</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td></td>
<td>October, 1931</td>
<td>97,358</td>
<td>97,358</td>
<td>97,358</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td></td>
<td>November, 1931</td>
<td>97,358</td>
<td>97,358</td>
<td>97,358</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td></td>
<td>December, 1931</td>
<td>97,358</td>
<td>97,358</td>
<td>97,358</td>
<td>0</td>
<td></td>
</tr>
</tbody>
</table>

**Business Conditions Show Improved Trend**

ROBERT B. DAVIES, statistical editor of the McGraw-Hill Publishing Company, Inc. publisher of ELECTRIC RAILWAY JOURNAL, says there is little doubt but that the closing weeks of the first quarter of the year witnessed a distinct upward trend in general trade and industrial operations. He has just returned from a 17,000-mile tour which covered every section of the United States, and advances as a composite view of business men that while current business is only fair and collections are slow, both are decidedly more favorable than was thought possible last November and that material improvement may be expected as the spring opens up. Mr. Davis sees the general business and industrial outlook for the second quarter as well as for the remainder of 1930 distinctly favorable as the first quarter closes. With most of the industrial groups, including general construction, now definitely on the up-grade, and general trade expanding with the unusually late spring season, prospects are brighter than at any time since the recession set in last fall. Admittedly, the first quarter of the year was definitely one of adjustment to an entirely different economic plane, but the year 1930 promises to stand out as one of unusual stability in trade and industry. Mr. Davis feels that the closing months of 1930 should witness the opening of a period of prospering business and industrial operations.
The Interstate Bus Bill Passed by House March 24

Regulatory Measure Providing Board of Administration Amended Slightly. Large Majority Recorded. Goes Now to Senate for Approval

WITH slight amendments to the grandfather clause and the administrative sections, the House passed the Parker interstate bus bill on March 24 by a vote of 219 to 115. Although the opposition was somewhat more pronounced than expected, the amendments were not allowed to get together surprising to House leaders, who anticipated that effective use would be made of the "state rights" argument. Despite these protests and the objections of those opposed to bus operation by steam and electric railways, it was evident during the passage of the bill that the majority of the House members do not look with suspicion upon long-distance operations by large companies.

This was indicated by the case with which amendments were voted down that sought to prevent the acquisition of interstate bus lines by competing companies. Other amendments designed to restrict bus operations by steam carriers and electric railways were rejected. It was decided, however, to adopt a provision to permit the establishment of competing service in cases where the existing bus line is operated or controlled by a railroad. In this connection, the charge was made that the bill was not conceived to answer public demand, but was written by the steam and the electric railways.

The administrative section was amended so as to provide for the extension of greater regulatory powers to the state groups at the discretion of the Interstate Commerce Commission. In bus operations covering no more than three states, the groups of state commissions already are permitted to initiate regulation. The amendment allows the Interstate Commerce Commission to refer matters pertaining to regulation to groups of more than three states. At the request of the committee that drafted the bill, it was agreed to make decisions by the state groups by a majority of the members rather than by unanimous consent, as was provided in the original language.

It was also decided to permit the state boards to waive such matters of regulation as they may agree upon and to allow the Interstate Commerce Commission to make direct determinations of the points involved. In this manner, smoother enforcement is provided and the state boards are relieved of the necessity of deciding questions considered of major importance, as stated. As to the grandfather clause, as the section is called dealing with the issuance of certificates for operation, an amendment was adopted that extends the time of priority of operation from January 1 to March 1, 1930. It is thus provided that bus lines that were in operation on March 1 shall be given prior consideration in the issuance of the authorizing certificates.

The bill now goes to the Senate.

Fare Case on Chicago "L" Dragging

Corporation Counsel Ettelson of Chicago, called upon by the City Council three months ago to explain his handling of the elevated rate case, has failed to meet the Council's demand. His reply to inquiries is "too busy." The plea of the Chicago Rapid Transit Company, made to the Illinois Commerce Commission two years ago, was backed by a mass of evidence in favor of increased fares, but was combattеd by only one witness for the city. Attorneys for the "L" lines obtained the raise on a temporary injunction from the federal court, and there the matter has rested. Two weeks ago Mr. Ettelson sought an order from the federal court to force the city to appropriate money to enable him to continue litigation, which involves appraisal of the properties of the elevated company. The Council also asked Mr. Ettelson to report on the leases under which the Chicago, North Shore & Milwaukee, the Aurora, Elgin & Chicago and other lines enter Chicago over the tracks of the "L." and on the question of whether the federal court has any jurisdiction to rescind or revise these leases.

COMING MEETINGS


April 9-10—Central Electric Railway Master Mechanics Association, Mansfield, Ohio.

April 29-May 1—United States Chamber of Commerce, Washington, D. C.

May 14-15—Association of Electric Railway Equipment Men, Middle Atlantic States, Scranton, Pa.


(News Continued on Page 232)
New Snow Fighting Methods
Adopted in Buffalo

Alertness of International Railway Wins
Editorial Commendation from Local Newspapers—Plea for Public Co-operation Effective

LAST winter the International Railroad, Buffalo, N. Y., maintained the largest snow-fighting fleet of equipment in its history. It comprised 30 plows of two different types, 25 sweepers, one ice cutter and 18 trucks to sand viaducts as well as to transport switch and shovel gangs from point to point.

Within the city limits of Buffalo, the company operates 220 miles of track and its total system covers 450 miles of track. During the winter, the company kept a staff of more than 200 men ready for snow fighting. Men who do this work are paid on a basis of time and a half for actual time on the snow-fighting equipment.

While snow fighting was at its peak during December, the company placed a poster in all stations commending car operators for their helpful co-operation. This poster said:

I.R.C. Co-operators:
Every one of you is to be heartily congratulated and commended for your co-operation during the many trials we have endured during the past week.
Beset by almost every conceivable handicap—street, snow and the partial destruction of our car shops, capped by the severe blizzard on Friday—every man on the system threw himself into the fray and made it possible for I.R.C. to continue its service to the Niagara area.
I wish I might shake the hand of every one of you—your accomplishment makes me more proud than ever of the splendid body of I.R.C. men for whom no task is too great.

B. J. Yungbluth, President.

Folders placed in the “Read As You Ride” boxes on all street cars and buses urged the public to co-operate in the effort to fight snow and keep traffic moving. A bulletin signed by President Yungbluth gave five suggestions for helping to maintain adequate service. They were:

Clear only such sidewalk space as is necessary for free movement of pedestrians.
Heap all snow along the curb. Avoid throwing it into the streets.
Discourage parking on main arteries and all-night parking on any trolley street.

Discourage the practice of backing trucks to the curb.

Midnight photograph showing how a parked automobile blocks the snow fighters in their effort to rid the streets of snow from curb to curb.

Encourage your motor ing friends to keep clear of street cars, tracks, when they can, so that the vast majority of users of city streets, who ride the street cars, may have an unobstructed right-of-way, and may reach their destinations without delay.

Letters embodying similar recommendations were sent by President Yungbluth to officials of all the community business organizations in Buffalo with the suggestion that the recommendations be given the widest possible publicity. The company pointed out in these letters that all-night parking on streets where car lines are operated interrupts the efficient cleaning of the streets of snow from curb to curb, thus forcing motor vehicle traffic into the car tracks with subsequent delays and congestion. Formerly the railway cleared its own tracks and left the accumulated snow along rapid transit routes serving the 240 municipalities in the North Jersey area. It was suggested that the Manhattan loop could be operated by the Interborough, or failing that, by the Hudson & Manhattan Railroad.

Ambitious New Jersey Rapid Transit Plan Revived

Officials of the North Jersey Transit Commission have announced their intention to submit to Governor Morgan F. Larson within the next two weeks a recommendation for enactment of pending legislation to create a rapid transit financing body.

The pending bill calls for creation of a district or regional plan organization, in the nature of a public corporation, to finance any or all of the comprehensive program included in the 1926 report.

The legislation now pending in Trenton would, if passed, provide the machinery for carrying out, in part or in whole, the recommendations of the 1926 report. The commission has already adopted a general policy of pushing the local New Jersey improvements first. The 1926 report suggested a Manhattan loop originating in the Jersey meadows near the present Manhattan Transfer, and running by tube to Battery Place, in New York City, and thence uptown to 57th Street and thence westward and under the Hudson River to New Durham and back to the point of origin.

The report called also for a Paterson-Newark-Irving high-speed line. Included in the report were suggestions for other routes serving the 240 municipalities in the North Jersey area.
Rochester, N. Y.— The New York Street Railway, Rochester Lines, has established a corps of uniformed motorcycle officers to patrol its lines and terminals. The object is to prevent boys from stealing rides on the rear of street cars and buses, to guard company property from vandalism and to protect patrons in stations on the outskirts, particularly at night. The men assigned to this work will be equipped with high-speed cars. The city police are co-operating with the railways.

Philadelphia, Pa.—Stockholders of the Philadelphia Rapid Transit Company have elected Alexander Knox and Boyd Garbutt directors to succeed J. McCarty and N. H. Pettit. These two men, together with F. J. Harris, constitute the employees' representatives on the board. Other directors were re-elected. The stockholders also approved a management agreement under which Philadelphia Rapid Transit gross earnings will be allotted to Management.

Seattle, Wash.—An appropriation for double-tracking of the Municipal Street Railway line on Eighth Avenue South, estimated to cost $37,452, asked of the City Council by Superintendent of Public Utilities Avery, has been taken under advisement by the Council utility committee, pending a study of the whole improvement program and the financing plans involved.

Michigan City, Ind.—Officials of the Chicago, South Shore & South Bend Railroad have laid plans with the secretary of state, certifying to a change in the number of directors to thirteen and to an increase in the capital stock by 10,000 shares of preferred having no par value.

Trenton, N. J.—The Senate has passed a bill which would appropriate $375,000 from toll revenue as New Jersey's share in the construction of the Camden-Philadelphia bridge. The measure now goes to the House of Assembly, Pennsylvania is also to contribute $375,000. Senator Richards pointed out that the original bond act for the construction of the span specifically designated that all revenues collected aside from maintenance and operation costs should be used to retire the bonds. Senator Stewart and Senator Powell declared that the Bridge Commission intended to lay rails and that the action had only been deferred. Presumably both Philadelphia Rapid Transit and Public Service Coordinated Transport would be in a position to operate cars over the structure.

Colorado Springs, Col.—The Myron Stratten Home Corporation, owners of the Colorado Springs & Interurban Railway, in its financial report for 1929, shows that the tramway was operated at a loss of $64,631. The company is substituting buses on some lines, and keeping the overhead at a minimum. The company will not have to be curtailed materially.

Trenton, N. J.—Wage contracts for a three-year period were signed by the Trenton Transit Company and its employees. The present wage rate is to endure for three years. Platform boys will receive 61 cents an hour for the first three months and 63 cents hourly for the next nine months. After the initial year of service they will be paid 76 cents an hour. Power house and other employees are also paid on a sliding scale.

Oakland, Cal.—Alfred J. Lundberg, president of Key System Transit Company, and vice-chairman of the readjustment committee, announced on March 22 that subscriptions to new preferred stock under the company's reorganization plan would raise $182,875 more than necessary to insure payment of first mortgage bondholders. Deposits of first mortgage bonds now are more than 98 per cent out standing; general and refunding more than 95 per cent; collateral trust notes more than 76 per cent; prior preferred stock more than 85 per cent; and preferred stock more than 52 per cent, and common less than 1 per cent.

Binghamton, N. Y.—A contest is being conducted by the Tri-Cities Traction Company at the Binghamton Central High School for verses for car cards. For some time now, cards have been run in cars, the size of the regular ad advertisement cards but placed in a rack furnished by Collier—at the end of the car on the signal box. In the past the company has made its own copy, emphasizing safety, comfort, convenience, etc., but about the first of the year the company put in a four-line bit of poetry signed by a patron. That started something. Copy began to come in, and now the message is being changed every week and the poetry contest started.

New York, N. Y.—On April 3, beginning at 10:30 a.m., the Department of Sanitation and Structures will hold public auction at public notice of the office of the department, Room 1800, Municipal Building, Borough of Manhattan, old structural steel trolley plates, gratings, columns, girders, steel trolley poles, rails, copper trolley wire, etc., now stored at the various locations mentioned in the advertisement and under the terms and conditions set forth in the City Record. This equipment was part of the property of the Manhattan Rapid Transit Company. Three-Cent subway fares will be operated but replaced with a bus route.

Philadelphia, Pa.—An ordinance to permit the Philadelphia Rapid Transit Company to operate the South Broad Street subway on its full-serve, beginning April 20, has been sent to the Council by Mayor Mackey. The ordinance also authorizes the Mayor to negotiate a new lease beyond the expiration of the present lease, under which it is retaining all of the subway receipts pending a permanent agreement. On negotiation of the lease the provision that the subway shall be re troactive to the date of the "gentlemen's agreement," effective, Dec. 1, 1928.

News Flashes for the Industry

To supplement the service of the regular monthly issues of Electrcal Railway Journal, a separate News service appears on 39 Saturdays during the year. The supplement keeps you in touch with fare increases, court decisions, association meetings, financial and corporate news, equipment purchases, civil and personnel. Read the Electric Railway Journal NEWS!
Roanoke's Circulating Sales Manager

Since August, 1929, the Roanoke Railway & Electric Company has employed a sales manager and public relations man whose labors are both diversified and unusual.

One of his primary jobs is to ride the cars and buses to observe the operating habits of the men, the appearance of the vehicle, and the attitude of the patrons. In this respect, his work is not unusual, but his ways of correcting any difficulties found are out of the ordinary.

Instead of passing on his findings for action by C. B. Short the general manager, the sales manager is authorized to try personal instruction or persuasion first. As an expert in equipment, he discusses and demonstrates correct starting and stopping with the man at fault, and emphasizes what correct handling of equipment means in the easier sale of the ride. Uneven starting, overmuch running in second, and rough and excessive braking are all shown to be avoidable.

All this is handled in good humor, and not even the superintendent of transportation would be notified unless indifference should be shown after several attempts to cure.

In discussing the work of this official, Mr. Short said that success of the job depended almost entirely on starting with the right type of man. The Roanoke man is a native of the city who started as a policeman, then made good as a plain clothes man, was an automobile salesman for eight years, then changed to the jobs of Pullman conductor and dining-car steward in turn. Here is a man who knows how to cater to the whims of the public, and to deal with the infirmities of operating men and transportation equipment. It took some time to find the right combination, but the results indicate that there is a market for the ride salesman.

A Cordial Welcome to the Pacific Coast

Routine matters were the principal subject of discussion at a meeting of the executive committee of the American Electric Railway Association held in New York on March 21. Reports of various committees and of the managing director and the general secretary were presented. Plans for the 49th annual convention were considered and a vote of thanks tendered to Libe St. Clair for his work in preparing an attractive booklet in conjunction with the various transportation.

Recent legislative developments in Washington were outlined by Leslie Vickers. Changes in the method of selecting winners in the Brady Safety Award Contest were announced. In behalf of the California Electric Railway Association, G. J. Kuhrtz, president Los Angeles Railway, assured those present a cordial welcome on the Pacific coast next June.

Jurisdiction of Court in Louisville Fare Case Upheld

The United States Court of Appeals at Cincinnati, Ohio, on March 22 upheld the decision of the Western Kentucky District Federal Court, at Louisville, Charles I. Dawson, judge, in the 10-cent cash fare case of the Louisville Railway against the city of Louisville.

The decision at Cincinnati affirmed jurisdiction of the United States District Court at Louisville, the city having contended that the federal court had no jurisdiction in the matter. A constitutional question was involved, and the company had endeavored to show that enforcement of a 7-cent fare would be confiscatory and in violation of the Fourteenth Amendment.

The decision will probably mean further trial in the local federal court on the merits of the case, as the matter of jurisdiction has been settled.

The district court in Louisville formally granted a temporary injunction to the railway last fall, preventing the city from interfering with the company in the matter of collecting a higher rate of fare. The city then went to the appellate court for a ruling on jurisdiction.

Decree of Foreclosure Entered Against New York State Railways

Foreclosure of mortgages covering the property of the New York State Railways, ordered by Federal Judge Bryant upon application of owners of mortgage bonds on which interest is in default, will become effective April 1.

Benjamin E. Tilton and Wallace E. Pierce, receivers, will continue in that capacity during the foreclosure, which Judge Bryant authorized on March 25 on application of the Security Trust Company, Rochester. The trust company is acting as trustee for owners of $16,457,000 in consolidated mortgage bonds on which interest was defaulted on Feb. 1 and $1,500,000 in other bonds. Judge Bryant also ordered a complete audit and survey to be made of the railways' property.

Indiana Merger Arguments Concluded

Arguments in the proposed $70,000,000 merger of Insull-controlled utilities in Indiana were concluded on March 21 before the Public Service Commission. The hearings were resumed on March 17, after a recess of nearly three months. Attorneys for the petitioning companies were given until April 5 to file a brief, and counsel representing objectors fifteen days after that. The commission will then take action on the petition of opposing attorneys for dismissal of the case on grounds that merger of gas, electric, water, ice and transportation utilities is unlawful and that the commission has no jurisdiction in the matter.

Wage Scale Renewed in Memphis

Trainmen of the Memphis Street Railway, Memphis, Tenn., have agreed to the renewal of the present wage scale for another year. In a letter addressed to E. W. Ford, vice-president of the railway, the operators said:

"We are not at this time agreeing to the present wage scale because we feel it is just or fair, but we are doing so as a matter of patriotism, with the hope that at the expiration of two months, officials of the railway will be glad to show the same consideration toward our membership and agree to an increase commensurate with the cost of living, standard of living, services performed, and conditions under which the services are performed."

Selling Tickets from House to House in El Paso

An interesting experiment is now being made by the El Paso Electric Company, El Paso, Tex., in house-to-house selling of street car rides. F. L. Grissom has been selected as the operator-salesman and has been calling upon resident in Kern Place. Results of the experiment are encouraging but they do not cover a period long enough to make them conclusive. The outlook is promising, however, and should ticket sales warrant it, the plan will be extended to other sections.

Full- and half-fare tickets are sold in strips in any amount desired and the customer may buy for cash or on credit. The primary object is to sell full-fare tickets sufficient to permit two rides a day for a 30-day period. All sales are made at the regular rate of fare, but the opportunity to have these charged on the regular bill for electric service is an advantage that appeals to many patrons.

Meticulously Garbed Men Who Sell the Service in Roanoke
Through Limited Bus Service Suggested for Akron

The Northern Ohio Power & Light Company, Akron, Ohio, has submitted a suggestion to the Akron City Council that an experiment be made on the West Street bus lines looking toward a through limited service in an effort to speed up service.

In general, the plan is to provide limited service on the long-haul lines; i.e., after a bus makes the last regular stop in the downtown business area, it will proceed to a certain outlying point without any intermediate stops. The intermediate section between the business area and the outlying point which will be the first stop of the limited bus is to be served by local buses making all stops. This system will give the long-haul passengers faster service without undue sacrifice on the part of the close-in riders. The company realizes that to deprive close-in riders of frequent headway will discourage short-haul riders, but it also realizes that to encourage long-haul riders it must make the service more attractive by getting riders to their destination in less time than is now required.

The suggestion is also based on the theory that most of the company's bus routes were established to render service to outlying territory and no other transpor-
tation service and it was never intended that these bus routes should supplement or compete with the already established rail service. The attitude of the company is that when two or more lines are operated on the same street or on parallel streets through necessity on account of routing, the bus routes serving outlying districts should not be required to serve the intermediate territory also in competition with routes already established and capable of rendering adequate and sufficient service within the intermediate territory.

Wants Columbus Railway to Be Self-Sustaining

A reduction in electric current rates in Columbus, Ohio, hinges entirely on the question of whether the railroads will allow unlimited current service at 8 cents cash, five tickets for 35 cents, according to Benjamin W. Marr, president and general manager of the Columbus Railway, Power & Light Company. The City Council has asked that the company promise to reduce power rates when the higher fares become effective. Mr. Marr believes it will be possible to reduce power rates by fall.

Some time ago Mr. Marr announced that the fare will be increased, effective April 1. Immediately, the City Council directed City Attorney Davies to block the proposed increase by injunction. The issue is complicated by the fact that the company is operating without a franchise. The position of the council is that no change in fares will be countenanced unless the company obligates itself to serve the city over a period of years. The present fare is 6 cents cash and five tickets for 25 cents.

<table>
<thead>
<tr>
<th>Conспектus of Indexes for March, 1930</th>
</tr>
</thead>
<tbody>
<tr>
<td>Compiled for Publication in ELECTRIC RAILWAY JOURNAL by ALBERT S. RICHET</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Street Railway Fares</th>
<th>Latest</th>
<th>Month</th>
<th>Year</th>
<th>Last Five Years</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Apr. 1929</td>
<td>May 1930</td>
<td>1929</td>
<td>1928</td>
</tr>
<tr>
<td></td>
<td>2.94</td>
<td>2.79</td>
<td>2.78</td>
<td>2.76</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Electric Railway Materials</th>
<th>Latest</th>
<th>Month</th>
<th>Year</th>
<th>Last Five Years</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Apr. 1929</td>
<td>May 1930</td>
<td>1929</td>
<td>1928</td>
</tr>
<tr>
<td></td>
<td>141.6</td>
<td>142.9</td>
<td>142.7</td>
<td>142.5</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Electric Railway Wages</th>
<th>Latest</th>
<th>Month</th>
<th>Year</th>
<th>Last Five Years</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Apr. 1929</td>
<td>May 1930</td>
<td>1929</td>
<td>1928</td>
</tr>
<tr>
<td></td>
<td>231.7</td>
<td>231.7</td>
<td>231.7</td>
<td>231.7</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Electric Ry. Construction Cost</th>
<th>Latest</th>
<th>Month</th>
<th>Year</th>
<th>Last Five Years</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Apr. 1929</td>
<td>May 1930</td>
<td>1929</td>
<td>1928</td>
</tr>
<tr>
<td></td>
<td>203.0</td>
<td>203.4</td>
<td>203.8</td>
<td>204.2</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>General Construction Cost</th>
<th>Latest</th>
<th>Month</th>
<th>Year</th>
<th>Last Five Years</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Apr. 1929</td>
<td>May 1930</td>
<td>1929</td>
<td>1928</td>
</tr>
<tr>
<td></td>
<td>206.8</td>
<td>206.5</td>
<td>206.3</td>
<td>206.1</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Wholesale Commodities</th>
<th>Latest</th>
<th>Month</th>
<th>Year</th>
<th>Last Five Years</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Apr. 1929</td>
<td>May 1930</td>
<td>1929</td>
<td>1928</td>
</tr>
<tr>
<td></td>
<td>92.1</td>
<td>93.4</td>
<td>94.7</td>
<td>96.0</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Wholesale Commodities</th>
<th>Latest</th>
<th>Month</th>
<th>Year</th>
<th>Last Five Years</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Apr. 1929</td>
<td>May 1930</td>
<td>1929</td>
<td>1928</td>
</tr>
<tr>
<td></td>
<td>11.22</td>
<td>11.38</td>
<td>11.54</td>
<td>11.70</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Retail Food</th>
<th>Latest</th>
<th>Month</th>
<th>Year</th>
<th>Last Five Years</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Apr. 1929</td>
<td>May 1930</td>
<td>1929</td>
<td>1928</td>
</tr>
<tr>
<td></td>
<td>153.0</td>
<td>154.4</td>
<td>155.8</td>
<td>157.2</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Cost of Living</th>
<th>Latest</th>
<th>Month</th>
<th>Year</th>
<th>Last Five Years</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Apr. 1929</td>
<td>May 1930</td>
<td>1929</td>
<td>1928</td>
</tr>
<tr>
<td></td>
<td>158.8</td>
<td>160.4</td>
<td>162.0</td>
<td>163.6</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Industrial Activity</th>
<th>Latest</th>
<th>Month</th>
<th>Year</th>
<th>Last Five Years</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Apr. 1929</td>
<td>May 1930</td>
<td>1929</td>
<td>1928</td>
</tr>
<tr>
<td></td>
<td>123.5</td>
<td>124.0</td>
<td>124.5</td>
<td>125.0</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Bank Clearings</th>
<th>Latest</th>
<th>Month</th>
<th>Year</th>
<th>Last Five Years</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Apr. 1929</td>
<td>May 1930</td>
<td>1929</td>
<td>1928</td>
</tr>
<tr>
<td></td>
<td>96.5</td>
<td>95.2</td>
<td>94.0</td>
<td>92.8</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Business Failures</th>
<th>Latest</th>
<th>Month</th>
<th>Year</th>
<th>Last Five Years</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Apr. 1929</td>
<td>May 1930</td>
<td>1929</td>
<td>1928</td>
</tr>
<tr>
<td></td>
<td>54.8</td>
<td>54.8</td>
<td>54.8</td>
<td>54.8</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Wage Scale Renewed on New York State Lines</th>
</tr>
</thead>
<tbody>
<tr>
<td>The New York State Railways and its employees in Rochester, Utica and Syracuse have reached an agreement on a wage scale for the coming year. At simultaneous meetings held in the three cities, the members of the Amalgamated Association voted to continue the same wage scale for the period of the receivership.</td>
</tr>
</tbody>
</table>

Benjamin E. Tilton and Wallace Pierce, appointed by Federal Judge Frederick H. Bryer as receivers of the railroads in January, conducted the negotiations for the company.

The wage scale calls for payment of 55 cents per hour to workmen on city two-man cars; 57 cents for interurban employees and 60 cents for one-man car operators.

It was provided that should the receivership be terminated within a year the contract will be carried over to April 1, 1931.

In other years negotiations have been prolonged and usually the contract was signed in May or June and made retroactive to April 1.

Wage Proposal Rejected in Oregon

Employees of the Pacific Northwest Public Service Company, Portland (formerly Portland Electric Power Company), have rejected the company's offer to split 50-50 with them any increase in revenues over the revenues of the year 1926 as a result of the increase in fare recently made effective. Nearly a year ago members of the Amalgamated Association sought an increase of about 10 cents an hour for platform men and like increases for shop and track men, but the management stated that while it could not consider increasing wages under then existing conditions it would negotiate the question as soon as it might be granted in the present fare in place of a definite wage increase. If an agreement is not reached by negotiation, the case will be arbitrated in accordance with existing arrangement.

Proposal for City Operation in Springfield, Ohio, Rejected

The City Commission, Springfield, Ohio, has denied the request of the Cincinnati & Lake Erie Railroad to take over and operate the Springfield Street Railway. The Commission held that the company's proposal was impractical. After turning down the company's proposal to operate the local service, the commission ordered it to cease and desist from operating freight trains through the city. Following action of the Commission in ending negotiations with the Cincinnati & Lake Erie company, the city inquiries for bids for a local transportation system which may include bus, electric lines or a combination of both. The bids will close on April 4.

ELECTRIC RAILWAY JOURNAL—Vol. 74, No. 4

234
Militant Policy Helps Indiana Intercity

During the first two months of 1930, the Indianapolis & Southeastern Railroad carried 15 per cent more passengers than in the corresponding period last year. Important improvements in service effected since the reorganization of the line in August, 1928, are largely accountable for this steady increase in patronage.

Within the last eighteen months, thirteen new one-man parlor type cars have been purchased and all passenger service on the railroad is now operated with this new and modern equipment. A bus connection from Greensburg, serving Batesville, Sunman, Manchester, Aurora, Lawrenceburg and Cincinnati, was put into effect a little more than a year ago and five roundtrips daily are made on this line.

For the better handling of freight an additional freight motor car was equipped in 1929; twelve freight trailers were constructed in the company's shop and new stock pens were erected at Arlington for the shipment of live stock.

The main high-tension line has been rebuilt in the last few months to the entire distance and the trolley wire has been rehabilitated and reinforced. It is expected that by May 1 the entire overhead structure will have been gone over and put in first-class condition.

Where the old company gave approximately the same service, the new company is giving hourly service on both the Connersville and Greensburg divisions, and on the Greensburg division half-hour service has been restored. A truck connection out of Greensburg has been established to give direct overnight service to Osgood, Versailles, New Point and Batesville.

On Sundays, a rate of one-way fare plus 10 cents for the round-trip, is in force.

Pertinent Papers Read at Illinois Meeting

Of the four addresses delivered at the annual convention of the Illinois Electric Railway Association at Springfield, March 19, one dealt with the trolley bus, one with increasing interurban passenger revenue by reducing fares and one with Chicago's freight service, center town work. At an election of officers Guy A. Richardson, Chicago Surface Lines, was elevated from vice-president to president, succeeding C. H. Jones, Chicago, South Shore & South Bend Railroad, Michigan City, Ind. R. B. MacDonald, Moline, Tri-City Railway, was made first vice-president and H. A. Johnson, Chicago Rapid Transit Company, second vice-president. George W. Schwener, Springfield, was re-elected secretary-treasurer not only of the Electric Railway Association but also of the Illinois State Electric Association and the Illinois Gas Association which held their annual conventions in conjunction with the railway meeting.

F. G. Hamilton, Gary, Ind., of the Gary Electric Railway, said that his company has made a large reduction in fares to increase passenger revenue. Against the opposition of the convention, he reduced the fare from 4 cents to 2 cents, a decrease of 50 cents, or 75 per cent, was sliced off the one-way fare between Gary and Indiana Harbor, rates being reduced from 24 cents to 15 cents. As a result traffic increased by leaps and bounds during the next few months. Whereas the average number of passengers handled per month during the six months previous was only 8,006, the average for the six months following the reduction jumped to 15,000. Average monthly revenue for the six months previous to July, 1928, was only $1,767, but following the 75 cent per fare reduction average monthly revenue increased to $1,926. The average monthly revenue for 1929 was $12,214, which compares with $4,124 in 1924, the best year, and $1,876 in 1928, the poorest revenue year.

The one-way fare between Crown Point and Gary was reduced from 45 cents to 20 cents, a decrease of 23 cents, or 53.3 per cent, similar reductions averaging 39.6 per cent were put in effect to intermediate points. At the same time the improved red bed and the sleeper equipment permitted a reduction of five minutes in running time between Gary and Crown Point. The old cars made the trip in 66 minutes, whereas the new cars made the trip in 50.

Figures on revenue are not so encouraging as the figures on passenger traffic. Still, they seem to indicate that the new and low rates have restored the declines the past four years. The monthly average of $2,077 for 1928 is $50 under the monthly average of the three months of 1929 previous to the change in fare, $2,027, while for the eight months following it is $2,079.

W. C. Wheeler, engineer of equipment, Chicago Surface Lines, asserted that "the Chicago Front Entrance, Center Exit Car," that for suggested city traffic where riding habit is such that interchange is frequent, it is possible to separate the central car and allow the cars coming in causing confusion by the people who must work their way through the tangle. It is thought that this condition will remedy itself to a certain extent as the passengers become more accustomed to the cars."

John B. O'Connell, assistant superintendent of transportation, Chicago Surface Lines, quoted from a table showing that the rides on public transportation systems in New York, with its population of more than 6,000,000, are more than five times per capita those of Lexington, with its population of 67,000. He said:

"It is obvious that the popular usage of automobiles in the smaller cities. These cities do not have the traffic problems of the larger ones and the private automobile to serve its own more easily. The desirable features of the passenger automobile, this task is not altogether impossible since the factors of economy and elimination of the inconvenience of terminal facilities necessitate a system of operation of public transportation vehicles."

After describing in detail the construction of the overhead system in his address on "Solving the Overhead and Collection Problems of Trackless Trolley," Lee Birch, engineer transportation department, Ohio Brass Company, said:

At the present time experiments are being conducted on a special device for the purpose of making the swivel he had in the will of the operator. Other experiments are being conducted on a "pull down" mechanism for lowering one trolley on the trolley car. The experiments are being made on a ground shoe which will enable the pantographs to get positive contact with the street car rail. These experiments are believed to be the limit of a complete trolley car. Such a device is deemed necessary in some instances.

Chicago Co-ordination

Real progress is being made on Chicago's new transportation co-ordination ordinance, and the committee of bankers, heads of transit companies and council members expected to fill in the missing financial sections by March 29, so that the ordinance can be submitted to the city council. The different issues of securities embraced among the present outstanding obligations of the transportation companies, it is believed that the Council will now pass the ordinance by April 15, and that the measures can be presented to the people at a special referendum meeting on April 15. One of the most important steps recently taken toward this end came on March 20 when the city transportation committee attached the Illinois Central Railway to the board of directors, the board of directors being the only one of the recommendations on a financial set-up made by the committee of bankers, and followed most of the steps desired by the companies.

Once Overs

By C. D. Batchelor

Snapping the Millennium

"Madam, we are happy to welcome you as a patroness of our service. Take our humble servants."

On Jan. 1 the company began giving patrons, after 4 p.m., from any agency office in "Chicago," the privilege of buying a round-trip ticket for the regular one-way fare, good after 4 p.m. and returning the same evening.

Several months ago all live stock rates were materially reduced.
Eighteen Lines to
Be Rerouted in
Busy Brooklyn

During the next few weeks the Brooklyn & Queens Transit Corporation, Brooklyn, N. Y., will put into effect a plan for rerouting the various surface lines in the downtown Brooklyn area for the purpose of improving trolley operation and traffic movement.

To carry out the plan, decided in cooperation with the Brooklyn Borough President and the Police Commissioner, representatives of the Brooklyn Civic organizations, new curves, switches and special track work are being installed by the railway at a cost of approximately $100,000. The complete rerouting plan affects eighteen surface lines entering the downtown Brooklyn area and is designed to simplify the operation of surface cars by eliminating, wherever possible, crossings and left-hand turns.

The changes in surface car operation and traffic regulation are based on an intensive study of the factors affecting the traffic situation in downtown Brooklyn in an effort to find some measure of providing immediate relief for the existing congestion. In addition to spending $100,000 for changes in track layout, the Brooklyn & Queens Transit Corporation is purchasing 100 new cars, with modern equipment, such as to provide for rapid acceleration and retardation, at a cost of $1,000,000 to help speed up the movement of surface cars. All of the changes proposed are of an experimental character.

The results of this experiment in the Borough Hall area will aid in the development of plans to improve trolley service and traffic movement in other sections.

Revere Beach Increase
Authorized

The establishment of an exit fare in addition to the fare paid on boarding the train has been authorized by the Department of Transportation using an increase between certain stations in the schedule of the Boston, Revere Beach & Lynn Railroad. The new schedule becomes effective May 31.

The company had filed a new schedule in which it was proposed to increase the fare between stations in Lynn and stations in Boston and Winthrop from the 10-cent cash fare of 10 cents to 15 cents, providing, however, for the sale of twelve tickets for $1.50, thus establishing a 15-cent cash fare or a 12-cent ticket fare.

The commission held that the proposed rates per mile of transportation are less than those charged by any railroad in the commonwealth. On this basis the commission held that the proposed rates were not unreasonable. The fare between Lynn and Revere is 10 cents. It is neither unreasonable nor unfair to require passengers riding from Lynn to Boston or Winthrop to pay an additional charge of 25 cents, if tickets are used, or of 5 cents, if a cash fare is paid, for riding the extra distance from Revere to Boston or Winthrop. If by reason of the changed rates the company derives a revenue in excess of that necessary to maintain its credit, the commission directs that the excess be devoted to necessary repairs and to the improvement of the service.

Under the company’s proposal, all persons leaving the stations at West Lynn and Lynn would pay 5 cents, or present an exit coupon, in addition to the 10-cent cash fare already paid, and all persons entering those stations were to pay a 15-cent fare. Those passengers intending to leave the train within the 10-cent zone would obtain in the box office a redemption coupon entitling them to receive 5 cents at the station where they left the train. This plan the commission did not approve.

The commission also directed a change in the schedule to provide half-fare for students.

Free Shoe Shines for London
Subway Passengers

Two automatic shoe-cleaning machines have been installed at Morden station, the south London suburban terminus of the Underground Railway, and passengers may now polish their shoes free of cost. If a traveller is not satisfied with the first operation of the brush, he may give repeat orders to the machine, and there is still no charge.

This innovation is due to the large quantities of mud which have been brought to the station and the railroad cars by passengers employed in the neighboring building estates in course of development. The machines have been placed between the platforms and the platform. If the experiment is successful the Underground may install similar machines at other London subway stations in areas where building estates are being developed or where many laborers patronise the subway.

Disraeli Said:
“"All of us live too much in a circle. Nature is more powerful than education.”
SEE NATURE—
DEVELOP YOUR EDUCATION
by
Attending the
49th A.E.R.A. Convention
at
San Francisco, Cal.,
June 23 to 26 inclusive
THE GOLDEN WEST IN JUNE IS NATURE AT HER BEST

New Omaha Rerouting
Acclaimed

During the first week of the latest rerouting of the Omaha & Council Bluffs Street Railway, which went into effect on March 2, not one complaint was registered in contrast to the many received during the original rerouting, put into effect on Dec. 6.

Under the latest rerouting there has been a drop of 25 per cent in the number of transfers issued, compared with the first rerouting program, indicating that the desired result of taking the largest possible number of commuters directly to their homes to their work is being achieved.

The new system requires 114 "base cars" as against 108 on the first rerouting and 112 on the original system. The bus system, consisting of seventeen buses, has not been changed. It met with immediate approval.

The new routing was made easier by the fact that power from three new substations was available for the change. One more new substation is now in the process of construction.

An effective good-will gesture on the part of the company was the running of a series of advertisements in the newspapers the evening of the first business day the new system was in effect, with largest headlines which read: "Thank You For Your Co-operation." Extracts from the advertisement read:

The people who were inconvenience by the rerouting seemed to remember that they too, are just human beings doing the best we can. It is therefore natural that our relations with our patrons be friendly...

We want to thank all the very riders for their friendly co-operation with us in making our rerouting change successful. We feel positive that this co-operation will continue.

In a few days before all the lines and schedules were worked smoothly. Time and energy mean nothing to us in bringing about this desirable result.

Harvard Award to Westinghouse

The Harvard Award, for the "general or institutional advertising campaign conspicuous for the excellence of planning and execution," established by the late Edward W. Bok, has been presented to the Westinghouse Electric Manufacturing Company. It is the first made to a national institutional advertising campaign in newspapers since the founding of the award.

The award was established in 1923 in the belief that recognition of this kind would stimulate excellence in the planning and execution of advertising. It also would afford, the founder stated, an educational opportunity through the focusing of public attention upon advertising of excellence and provide a means to encourage advertising workers through public recognition of their work.

Westinghouse advertising had consisted of a series of twenty announcements, nearly all of which were a full newspaper page in size. They appeared in leading newspapers of the United States and for the most part were included in rotogravure sections.

The advertisements told, in simple terms, of the great service electricity is rendering today's world—in industry, in transportation, in home, in office. They were "institutionalized" by citing the important contributions made by Westinghouse in expanding the uses of electricity.

The series was part of a Westinghouse newspaper advertising campaign which had its inception in 1928.

Passenger’s shoes are polished for nothing at this London station

Electric Railway Journal April 1930

236
PERSONAL MENTION

Guy A. Richardson

Heads Illinois Association

Vice-President and General Manager of Chicago Surface Lines Honored by Election to Important Sectional Association Post

Guy A. Richardson, vice-president and general manager of the Chicago Surface Lines, was elected president of the Illinois Electric Railway Association at the recent meeting of that body in Springfield. This another association activity is added by this executive, never too busy to render aid in the councils of the industry with which he has so long been identified. Few executives have larger responsibilities than he, yet he has always given freely of his time to work of this kind, more recently as a member of the policy and the membership committees of the American Electric Railway Association and at present as second vice-president of that body.

Guy Richardson has had a wide experience in railway operation. He first attracted national attention by his work at Seattle, Wash., in which city he rose from the post of assistant superintendent of the Seattle Electric Company to superintendent, only to be drafted by the U. S. Shipping Board. But that is getting a little ahead of the story. For the sake of sequence it would perhaps be better to stick to the strictly chronological order. Born in Boston, Mass., in 1882, Mr. Richardson secured his education in the public schools of that city and of Newton, Mass., and was graduated from the Mechanic Arts High School in 1900, later taking a postgraduate course in machine shop work and mechanical drafting. In 1901 he entered the service of the Boston Elevated Railway with the status of an apprentice and an understanding that his education was to include training in a number of the company's departments. In this capacity he worked in the shops, power stations and on the cars as motorman.

During the summer of 1903 he was transferred to the electrical engineering department and remained there until September, 1904, when he accepted a position with the Boston & Northern Street Railway as inspector of car repairs. In May, 1905, he went with Stone & Webster, and was assigned to the Houghton County Traction Company, in the copper country of the Michigan peninsula, as assistant superintendent. On Nov. 1, 1906, he was promoted to the position of superintendent of the property.

Prior to Mr. Richardson's advent on the job at Houghton it was the custom for the line to be snow-bound for weeks at a time with little more than a perfunctory effort to keep it clear. Mr. Richardson interpreted it to be his job to keep the line open, which he succeeded in doing. And anyone who knows what the snows are in the upper Michigan copper country realizes the prodigious task that confronted Mr. Richardson.

In January, 1910, Mr. Richardson was transferred to Seattle, as assistant superintendent of transportation, and by the end of the year he had been made superintendent of that department. In a high-trigger situation as regards public relations, the new superintendent acquitted himself in a manner that won the respect of a hypercritical city administration and did much to restore the property to public esteem. During the war period Mr. Richardson was drafted by the shipping board to assist in layout out a transportation system to serve the Hog Island ship yard, near Philadelphia. Other work of a consulting capacity at about this period included surveys for the Brooklyn Rapid Transit Company and the Chicago Elevated Railways.

When the property of the Seattle Electric Company was acquired by the municipality, although he received flattering offers from the then Mayor of the city, Ole Hanson, to stay and run the job, Mr. Richardson chose to try his fortune elsewhere and accepted a position as superintendent of transportation with the Philadelphia Rapid Transit Company. With that company he rose rapidly to the position of vice-president in charge of transportation, but resigned in October, 1922, and shortly afterwards went with the Chicago Surface Lines, with which property, as stated before, he now fills the position of vice-president and general manager.

Thomas A. Mcconnell, for seven years assistant manager of the Yellow Cab, Inc., Newark, N. J., has been appointed acting manager of the Yellow Cab Division of the National Electric Transit Company, operating electric railway and bus lines. Mr. McConnell and his staff will have their headquarters in Public Service Terminal, Newark.

W. A. Robertson in Fort Worth Post

W. A. Robertson, recently appointed general superintendent of the Northern Texas Traction Company, Fort Worth, Tex., has been connected with Stone & Webster properties since 1900. Before going to Fort Worth he was connected with the Jacksonville Traction Company for more than four years, having been made general superintendent of that Florida property in June, 1924.

Mr. Robertson was born in Gallatin, Tenn., 1889. After completing his education in the schools of that state he moved to Houston, Tex. His first business connection was with the Southern Pacific Railroad in the stores department as general clerk and price clerk. He served in these capacities from January, 1909, to Aug. 1, 1910. On leaving the Southern Pacific Railroad he went to work for the Houston Electric Company in the accounting department, and has been connected with Stone & Webster properties since August, 1910. Mr. Robertson worked in various capacities for the Houston Electric Company until June, 1920, at which time he was transferred to the Galveston-Houston Electric Railway as superintendent of transportation of its interurban line between Houston and Galveston. On Jan. 1, 1922 he was made superintendent of railways of the Eastern Texas Electric Company, Beaumont, Tex.

As stated previously he was transferred to Jacksonville, Fla., in June, 1924, as general superintendent of the Jacksonville Traction Company and from that company after more than four years he was transferred to Fort Worth, Tex., where his work has to do with a system of about 200 miles of railway.

D. E. Watson Heads Terre-Haute-Indianapolis System

David E. Watson, Indianapolis, was elected president of the Terre Haute-Indianapolis & Eastern Traction Company at a special meeting of the board of directors. He takes the place left vacant by the death of Robert Hixson. Mr. Waton assumed his new duties immediately. He has been general attorney for the company for some years and has charge of all legal matters connected with the merger now under consideration. He will continue to supervise the company's legal business. L. H. Hixson was re-elected vice-president of the company.
Peter Witt in New Cleveland Post

Accepts Five-Year Contract as Consultant to Van Sweringens, Now Engaged in Co-ordinating Street Railway and Rapid Transit Services

PETER WITT, street railway consultant and former street railway commissioner at Cleveland, Ohio, has accepted a five-year contract as consultant for Metropolitan Utilities, Inc., the Van Sweringen company which controls the Cleveland Railway under a voting trust arrangement, and also controls the Cleveland Interurban Railway, the Van Sweringens' Shakerm Heights rapid transit lines, and Rapid Transit, Inc., the company which will control other Van Sweringen rapid transit lines radiating along railroad rights-of-way from the new Cleveland union terminal.

The contract was negotiated by George D. McGwinn, vice-president of the Cleveland Union Terminals Company. On two occasions in the past few weeks, Mr. Witt declined the job of consultant, but he was finally persuaded to accept the post because he felt he would have an opportunity to assist in the creation of the co-ordinated transportation system in Greater Cleveland.

Mr. Witt said:

"I was informed by Mr. McGwinn that the people back of him are going to do everything possible to give the car riders what they are entitled to. Since they approached it in that light, I concluded it was a real opportunity. I will consult with Metropolitan Utilities officials, and also offer my own proposals."

Mr. Witt was railway commissioner of Cleveland from 1912 to 1916 during the regime of former Mayor Newton D. Baker. After leaving the commissioner’s office, Mr. Witt took up consulting work, giving advice on railway problems in Seattle, Boston, Philadelphia, Toronto and other cities. He also developed the Peter Witt type of street car.

During the period from 1924 to 1928 Mr. Witt was a member of the Cleveland City Council, which, under the Taylor grant, has sole authority over railway operations. The Republican-Democratic coalition which controlled the Council declined, however, to heed Mr. Witt’s proposals on railway matters. Oddly enough, one of the reasons Mr. Witt ran for the Council was to try and block the union terminal project. He was one of the original proponents of the plan to have the union station built on the lake front.

The fact that Mr. Witt is to advise the Van Sweringens not only on the co-ordination of rapid transit and street railway services, but also on the operations of the Cleveland Railway, is regarded as an indication that the Van Sweringens are of the opinion that the Taylor grant is no longer an effective plan for operations, so far as placing control of operations in the hands of the company.

As he started on his new job, Mr. Witt pointed out that the entire Cleveland Railway system is now carrying no more passengers than it did in 1914. He quoted figures and then added:

"These figures show that the remedy thus far applied, increasing the rate of fare, is worse than the disease. The potential car rider is to be captured the rate of fare for the man who rides 8 blocks must be made considerably less than for one who rides 8 miles.

Peter Witt is acknowledged to be one of Cleveland’s most picturesque public figures. At 60, his hair is black, but hardly a trace of gray. His figure is slender and tall, and his manner is bitter and sarcastic in public criticism from the platform, but mild and benign in private.

He began life as a molder, single taxer and a Socialist street corner orator and was won over by Tom Johnson (whom he had been attacking) as was a tax expert and city clerk under Johnson; as mentioned previously, under Mayor Newton D. Baker he was railway commissioner.

* L. B. Herrington Heads Lexington Company

Announcement was made on March 22 at Lexington, Ky., by J. P. Pope, vice-president, and W. B. Chess, president and general manager, of the Kentucky Traction & Terminal Company, owner of the Kentucky Traction & Terminal Company, that L. B. Herrington, president of the Kentucky Utilities Company, Louisville, had been elected president of the company, controlled by the Kentucky Securities Corporation, which was recently bought by Middle West Utilities Company. Included in the Lexington Utilities Company is the Consolidated Coach Corporation.

The Lexington Utilities Company operates the railway, power, and other services in Lexington and through its subsidiary, the Kentucky Traction & Terminal Company, the interlocking lines to Frankfort, Paris and other points.

Mr. Herrington succeeds P. M. Chandler, New York, as president. Martin and Samuel Insull, G. T. Bogard and A. A. Tuttle, Louisville, are new members of the board of Lexington Utilities. Mr. Pope and Thomas A. Combs, of Lexington, are hold-over members. Mr. Chandler, F. W. Bacon, R. P. Buell, New York; H. A. Loeb and H. P. Clark, Philadelphia, and C. E. Mollison, Chicago, are new members of the board. Mr. Bogard of Kentucky Utilities becomes vice-president; Mr. Tuttle, treasurer; G. C. Jones, secretary treasurer; and Mr. Quayle, B. Perigo and L. W. Haley are assistant treasurers.

T. H. Steffens Heads Oklahoma Association

At the Oklahoma Utilities Association convention, held in Tulsa, March 11, 12 and 13, T. H. Steffens, president of the Sand Springs Railway, was elected president of the association. Steffens is a director in a number of industrial enterprises. He is deeply interested in civic affairs and is a member of the Rotary Optimist, Tulsa Traffic and Tulsa Athletic clubs. Tulsa Chamber of Commerce, vice-president of the Tulsa State Senate, is a Shriner and a trustee of the Sand Springs Home.

Mr. Steffens was born in St. Louis, Mo., on March 1, 1883. There he was educated and there he entered the service of the Frisco Railway in 1900, where he was employed until May, 1911. He then became associated with the late Charles Page and went to Oklahoma in connection with the building and operating of the Sand Springs Railway, between Sand Springs and Tulsa. This property has grown from a 7-mile single track to a double-track line with an industrial trackage of 30 miles serving approximately 80 industries and distributing houses. The line was constructed in a virgin territory with no outstanding industries.

* Henry B. Wood Assumes Broader Duties

Henry Blake Wood has been appointed chief electrical engineer of the Stone & Webster Engineering Corporation, Boston, Mass. Mr. Wood was graduated in 1896 from the electrical engineering course at Purdue University. After four years in the testing and switchboard engineering departments at the Schebesta works of the General Electric Company he was sent to the Boston office of that company in switchboard sales and engineering activities.

In 1917 Mr. Wood entered the Stone & Webster Engineering Corporation's organization as engineer in the electrical division, and in the summer of 1926 was made assistant to the chief electrical engineer, his work has embraced a wide variety of public utility and industrial undertakings, including a hydro-electric investigation in Japan in 1928 and numerous engineering jobs in continental United States.

Electric Railway Journal—Vol.74, No.4 238
New Officers for Reorganized Indiana Road

Raymond R. Smith, formerly vice-president and general manager of the Chicago, South Bend & Northern Indiana Railway, and the Southern Michigan Railways, later receiver for the two lines, has been elected president of the new company, the Indiana Railway, Inc., which will take over these properties.

Mr. Smith, as receiver for the lines, conveyed the title to the new company and the records immediately the end of the period of involved legal technicalities which have been in progress for months.

In accordance with a policy of placing the lines as far as possible under local control, three other South Bend men were elected to important posts.

George R. Green, general superintendent of the lines as formerly organized, was made general manager of the new company.

Harry Weir, local attorney, was made vice-president and general counsel.

Oren A. Small, former secretary of the old lines, was made secretary and treasurer under the reorganization plan.

Alfred E. Dieterich, New York City, whose father, the late C. F. Dieterich, was president of the lines as lately constituted, was elected chairman of the board of directors.

Mr. Smith, in addition to being president, was chosen chairman of the executive committee.

No change in the rest of the official personnel of the lines is contemplated.

The new directors are as follows: A. E. Dieterich, New York City, chairman of the board; R. R. Smith, South Bend, Ind.; Amos H. Plumb, Emporia, Kan.; Alva L. Kittelman, Muncie, Ind.; Harry R. Wair, South Bend, Ind.; William Carnegie Ewen, New York City, and one vacancy to be filled later.

The executive committee is to be R. R. Smith, chairman, and Alva L. Kittelman and Harry R. Wair.

The terms of the reorganization of the company were made the subject of a detailed study in the Electric Railway Journal during 1930, when the lines were before the commission, at which time they were also the subject of editorial comment.

C. L. Seavey Heads California Commission

Clyde L. Seavey was recently elected president of the California Railroad Commission for 1930, in conformity with the policy followed by the commission in recent years of rotating the presidency among its members for a one-year term.

Commissioner Seavey succeeds Commissioner Thomas S. Louttit as the presiding officer of the commission, who held that position during 1929. He has served on the commission since Jan. 1, 1923, having been reappointed by Governor C. C. Young on Jan. 1, 1929. He served as president of the commission in 1923 at which time he was also the subject of editorial comment.

Prior to his appointment to the Railroad Commission President Seavey served as city manager of Sacramento. Before accepting that appointment, he had been connected with the state government for many years as member of the state board of examiners, state board of control, state tax commission, state civil service commission, as well as in other special capacities of importance. Mr. Seavey is a Republican. He was born at Dixon, Ill.

H. R. Frederick, for the last two years assistant manager of the Steubenville, East Liverpool & Beaver Valley Traction Company, Steubenville, Ohio, which operates between Beaver, Pa., and Steubenville, has been named general manager. He succeeds C. A. Smith, who has been elected president. Mr. Frederick has been associated with the company for eight years. He was engineer in charge of maintenance of way for six years. Prior to that he was a civil engineer for the Pennsylvania Railroad.

Morse DellPlain Honored for His Utility Leadership

Morse DellPlain, Hammond, Ind., was honored at a testimonial banquet at the Union League Club in Chicago on March 15 in recognition of his leadership in public utilities. Mr. DellPlain is now president of the Northern Indiana Public Service Company, vice-president of the Midland United Company, vice-president of the Chicago, South Shore & South Bend Railroad, and president of the newly organized Calumet Railways, Inc., which proposes to rehabilitate the Hammond, Whiting and East Chicago railway lines.

Mr. DellPlain has rapidly made a name for himself in and about Chicago by his able handling of utility problems and the versatility he has displayed in the discharge of his duties, explained in part by the range of his previous experience. He was born in New Orleans, La., in September, 1880. Most of his early life was passed in the Republic of Mexico. From 1890 to 1896 he was employed by the Central & South American Telegraph Company as an operator on the isthmus of Tehuantepec. He later took up the electrical engineering course at Syracuse University. In 1903 to 1905 he was an apprentice in the shop of the Electric & Manufacturing Company at East Pittsburgh, Pa., and worked for the Pennsylvania Railroad at the Syracuse, N. Y., office from 1905 to 1909. He became power engineer for the Syracuse Lighting Company in February, 1909, and on Jan. 1, 1918, was appointed sales manager for that company. This position he resigned to become vice-president and general manager of the Northern Indiana Gas & Electric Company, predecessor of the Northern Indiana Public Service Company, in Hammond, Ind. Mr. DellPlain is a member of the American Institute of Electrical Engineers and the American Society of Mechanical Engineers.

Joe Brennan New Carhouse Superintendent at Cincinnati

Joe Brennan has stepped up another rung on the ladder of promotion with the Cincinnati Street Railway, Cincinnati, Ohio, which has taken him away from Eighth Street division. Joe is now superintendent of carhouses, succeeding the late Walter Lee Frazier. Mr. Brennan began his street railway experience with the company at Cincinnati as a hill boy in 1895. Two years later he became a mechanic in the Clifton-Elim carhouse and was promoted a few years later to the position of night foreman in that division. In 1901, he transferred to the same carhouse taking the position of day foreman there. In 1905, he took the same position in the Avenue carhouse, and in 1921 he went to Eighth Street, where he served as foreman up to his present promotion.

A. F. Townsend, manager of the Northern Texas Traction Company, the Northern Texas Electric Company and the Tarrant County Traction Company, Fort Worth, Tex., has been elected president of these three firms, replacing George H. Clifford, Boston, now president of the Stone & Webster Service Corporation. Mr. Townsend will continue as manager of the three Stone & Webster subsidiaries located at Fort Worth, Amatus A. Chamberlain, treasurer of the Northern Texas Traction and Tarrant County Traction Company, was named treasurer and assistant secretary of those companies. The Northern Texas Electric Company is the parent company of the Texas Motor Coaches, Northern Texas Traction Company and the Tarrant County Traction Company, the latter operating the Fort Worth-Clearance interurban line.

A. Stuart Pratt Retires

A. Stuart Pratt, vice-president of the Stone & Webster Service Corporation, Boston, has resigned, following many years of executive responsibility in the management of utilities with which this company is associated. He has rendered distinguished service in the supervision of the power companies at Cape Breton, Nova Scotia, Brockton, Mass., was recognized some years ago by his promotion to the vice-presidency of the centralized management organization at Boston. He was an associate in some of the exactions of business life. He is one of the best-known and most highly regarded executives in the Stone & Webster organization.
C. D. Emmons Resigns as President at Baltimore
C. D. Emmons, for eleven years president of the United Railways & Electric Company, Baltimore, Md., resigned on March 26. His resignation was accepted after the board had passed resolutions expressing appreciation of his service. Lucius S. Storrs, executive chairman, was elected to succeed him. Mr. Storrs will continue as chairman as well as president of the Board of the President of the company. Mr. Emmons announced that he would establish an office in varying capacities. It was indicated that he would specialize in public utilities. He planned to sail from New York on March 29 on the Minnetonka for a short visit in Europe.

Mr. Maltbie to Finish Philadelphia Work
Appointment of Dr. Milo R. Maltbie as chairman of the New York Public Service Commission is not expected to interfere with continuation of his work in connection with the audit of the Philadelphia Rapid Transit Company's books. Mr. Maltbie was selected as successor of Mr. R. R. Morey, who will be present at a conference of experts before President Judge Harry S. McDevitt of the Common Pleas Court, where a reorganization of the relations between the city and the company is under consideration. Other experts are drawing up separate recommendations for the Mayor, the City Council and the company.

"Bert" Sanders Leaves Kansas City Public Service
E. B. Sanders, for ten years in charge of the commercial department of the Kansas City Public Service Company, Kansas City, Mo., has resigned as advertising manager and an advertising agency in Cleveland, Ohio, as representative of the Barron's Advertising Company. He is succeeded at Kansas City by A. H. Wood, son of B. F. Wood of Stevens & Wood, Inc., New York City. Mr. Wood has been a cadet engineer with the Public Service Corporation of New Jersey. Before that he was with Barron Collier, Inc., in New York. "Bert" Sanders, as he is familiarly known, has long been connected with newspaper and advertising activities, his apprenticeship including intensive training under Henry J. Allen, former Governor of Kansas, known as one of the most expert mentors and appraisers of newspaper talent in the United States. His work of few men in the public relations field with utilities has attracted more favorable attention than has that done by Mr. Sanders.

E. R. Norris has been appointed assistant to the vice-president according to an announcement issued by J. S. Truitt, vice-president in charge of manufacturing of the Westinghouse Electric & Manufacturing Company. Mr. Norris, formerly general works manager, will now be responsible for all plant facilities of the company, manufacturing methods, cost reduction and inspection. Mr. Norris has been associated with the Westinghouse company since 1892.

Mr. Maltbie to Finish Philadelphia Work
Appointment of Dr. Milo R. Maltbie as chairman of the New York Public Service Commission is not expected to interfere with continuation of his work in connection with the audit of the Philadelphia Rapid Transit Company's books. Mr. Maltbie was selected as successor of Mr. R. R. Morey, who will be present at a conference of experts before President Judge Harry S. McDevitt of the Common Pleas Court, where a reorganization of the relations between the city and the company is under consideration. Other experts are drawing up separate recommendations for the Mayor, the City Council and the company.

"Bert" Sanders Leaves Kansas City Public Service
E. B. Sanders, for ten years in charge of the commercial department of the Kansas City Public Service Company, Kansas City, Mo., has resigned as advertising manager and an advertising agency in Cleveland, Ohio, as representative of the Barron's Advertising Company. He is succeeded at Kansas City by A. H. Wood, son of B. F. Wood of Stevens & Wood, Inc., New York City. Mr. Wood has been a cadet engineer with the Public Service Corporation of New Jersey. Before that he was with Barron Collier, Inc., in New York. "Bert" Sanders, as he is familiarly known, has long been connected with newspaper and advertising activities, his apprenticeship including intensive training under Henry J. Allen, former Governor of Kansas, known as one of the most expert mentors and appraisers of newspaper talent in the United States. His work of few men in the public relations field with utilities has attracted more favorable attention than has that done by Mr. Sanders.

E. R. Norris has been appointed assistant to the vice-president according to an announcement issued by J. S. Truitt, vice-president in charge of manufacturing of the Westinghouse Electric & Manufacturing Company. Mr. Norris, formerly general works manager, will now be responsible for all plant facilities of the company, manufacturing methods, cost reduction and inspection. Mr. Norris has been associated with the Westinghouse company since 1892.

OBITUARY
E. F. Peck
E. F. Peck, long connected with the engineering and management firm of Peck, Shannahah & Cherry, and its predecessor, Allen & Peck, Inc., is dead. Mr. Peck had not been active in utility work since 1921 when he was run down by an automobile and injured, but he was active in that field, very active, for many years, the years of the formative stages of the industry, in which he played a conspicuous part.
To electric railway men, he is perhaps best known as a member of the firms previously mentioned, as an officer of the Schenectady Railway, and as an associate of John N. Shannahah in the work of rehabilitating the railway property at Hampton, Va. To men in the light and power field, he is perhaps best known as a pioneer Thomson-Houston man, an officer of the Citizen's Electric Illuminating Company, and the Kings County Electric Light & Power Company, Brooklyn, N. Y., now both included in the system of the Brooklyn Edison Company, Inc., and as an officer of the Schenectady Illuminating Company and the Mohawk Gas Company. Incidentally the credit is his indirectly for securing the financial co-operation of the late Charles L. Coffin in the Thomson-Houston Company, later succeeded by the General Electric Company.
Born in New Britain, Conn., in 1861, he entered the elementary school of New Britain with the American Electrical Company, New Britain, Conn. This company subsequently became the Thomson-Houston Company, and Mr. Peck was one of the earliest electrical experts to be enticed by this company to install its apparatus. Moreover, he was in charge of the Thomson-Houston Company's exhibit at the Franklin Institute Fair in 1884, the first exhibit devoted solely to electrical apparatus held in the United States. Afterward, he had charge of the same exhibit at the World's Fair in New Orleans in 1884-1885. It was from the Thomson-Houston Company that Mr. Peck resigned in 1885 to become general manager of the Citizens' Electric Illuminating Company, Brooklyn, N. Y. He continued in this capacity until 1897.
when he entered the engineering and supply business in New York City under the firm name of the Peck Electrical Company.

In 1895 Mr. Peck was appointed general manager of the Kings County Electric Light & Power Company, Brooklyn, a position he held until 1902, when he was appointed general manager of the Schenectady Railway. As indicated before, at Schenectady he was an officer in both the Schenectady Illuminating Company and Mohawk Gas & Electric Company in addition to being general manager of the railway, all being under General Electric control at that time. Later the ownership passed to the New York Central Railroad, and the Delaware & Hudson Company, but Mr. Peck remained with them in active charge until 1912, when he resigned to devote his entire time to the interests of Allen & Peck, Inc. The following year, he was elected president of the Hagerstown & Frederick Railway, serving also at the same time and in after years as vice-president of the New York & South Side Point Railway & Electric Company.

Among the cities in which Mr. Peck was engaged in installing electric light plants in the early days of the industry were Boston, Fall River, Lynn and Haverhill, Mass., Columbus and Springfield, Ohio, St. Louis, Mo., and Portland, Me., for the Schenectady Railway also worked conspicuously. Not only did he introduce many innovations in the operation of the local street lines, but he made the company’s interurban between Schenectady and Albany one of the outstanding lines of its kind in the East.

When Peck, Shaw & Harlan & Cherry was organized, Mr. Peck brought to it just that jeaver of matured judgment and experience that enabled him to balance the work of the younger men, fired with enthusiasm for accomplishment in a field in which it is not by any means so easy to score an outstanding success. One of the offices which Mr. Peck filled outside the direct line of his managerial work was that of president of the New York Electric Light Association in 1910. He had long been a member of the American Institute of Electrical Engineers.

* Alexander L. Black

Alexander Leslie Black, a vice-president of Ford, Bacon & Davis, and a vice-president of the Market Street Railway, San Francisco, from 1916 to 1925, died at San Francisco on March 3 at the age of 60. Mr. Black had been vice-president of the New Orleans & Lake Ponchartrain Bridge Company. He joined the organization of Ford, Bacon & Davis, New York, N. Y., in 1912 as engineer in charge of their southern properties. He was born in New Orleans, La., in 1871. He attended private schools in New Orleans and New York and was graduated from the Science High School and Columbia College in 1890. He engaged in mining work in the West and Mexico for three years, and was employed for a few months as assistant engineer on the Colorado & Southern Railroad Survey of New Orleans. In 1894-1895 he had charge of the reconstruction for electric operation of the St. Charles Street Railroad, New Orleans, and was associated with that company supervising operation and constructing extensions under orders. Orleans Light & Power properties were consolidated. For a long while he was engineer for the New Orleans Railway & Light Company, controlling the New Orleans street railways and lighting properties.

* Peter Junkersfeld

Peter Junkersfeld, since 1922 a vice-president with the construction and engineering division of Stone & Webster, died suddenly. Shortly after the beginning of a new farm near Sodor, Ill., he acquired his early education at the school in the vicinity of his home, and then entered the University of Illinois from which institution he graduated as Bachelor of Science.

In the fall of 1895 he established a construction company, lasting a period of 24 years, when he entered the employ of the Chicago Edison Company, now the Commonwealth Edison Company. From various capacities in power plant operation, he rose in the organization until in 1909 he became assistant vice-president, supervising contracting, engineering, construction and operating work.

After serving with distinction in the army during the World War he returned to the Commonwealth Edison Company, serving therefor only a short period. In April, 1919, Stone & Webster engaged him as engineering manager in charge of the engineering division and executive division of the division of construction and engineering. In February, 1922, he became a member of the staff of McClellan & Junkersfeld, Inc., engineers and constructors. Six years later his firm was merged with the division of construction and engineering of Stone & Webster and Mr. and Mrs. Junkersfeld became a vice-president.

* Joseph H. Bragdon


Mr. Bragdon was a member of the executive committee and of the board of directors of the McGraw-Hill Publishing Company. He was past president of the New York Business Publishers Association and a past president of the Associated Business Papers, the latter office being the highest honor in the publishing profession can offer. At the time of his death he was a member of the board of governors of the Advertising Federation of America.

Mr. Bragdon was born in Melrose, Mass., on June 9, 1887. His father, Joseph H. Bragdon, founded Textile Manufacturers Journal in 1894. When the son graduated from Yale in 1911, he joined the staff of that publication. In 1915 he was active in a merger which joined Textile Manufacturers Journal & World Record into one publication, Textile World.

* C. A. Kincade

C. A. Kincade, head of the electrical distribution department of the Kansas City Public Service Company, Kansas City, Mo., unexpectedly died of meningitis on March 14, from heart disease. Mr. Kincade was born on Jan. 2, 1877, in Middletown, N. Y., the son of John W. Kincade, and was employed by the old Metropolitan Street Railway, Kansas City in 1900 as a gripman on the old Twelfth Street cable line. Three years later he was transferred to the Kansas City electrical department as a subsection operator and a year later became asistant to the electrical engineer. In 1907 he was placed in charge of all overhead lines and maintenance in the Kansas City electrical department and in 1918 became superintendent of electrical distribution.

John Wermsdorfer, 80 years old, employed by the United Railways & Electric Company, Baltimore, Md., for 58 years, died on Feb. 20. He was pensioned about ten years ago, and was used to serve as vice-president of the United Railways Twenty-Five-Year Club.

Mr. Wermsdorfer started as a track walker, but advanced step by step to be foreman of the track department.

* Cecil R. Pillsbury, assistant treasurer of the General Steel Castings Corporation at Granite City, Ill., died at Philadelphia, Pa., on Feb. 19. Mr. Pillsbury was 53 years old. He started with the Commonwealth Steel Company as a checker at $2 a day sixteen years ago. He gradually advanced until he was assistant treasurer, a position which company merged with the General Steel Castings Corporation last July.

Jacob H. Maag, former of maintenance of way and structures of the Los Angeles Railway, Los Angeles, Cal., died in that city on Feb. 27, at the age of 71, after forty years service. He had been spent in railroad construction work, and he was one of the eye-witnesses to the joining of the rails uniting San Francisco and Los Angeles on Sept. 5, 1876, at Lang Station, near Newhall, Cal. From 1882 to 1904 he was section foreman for the Southern Pacific Railroad and then he entered the employ of the Los Angeles Railway as foreman of maintenance of way and structures, a position which he held for nearly 26 years.

* Nathaniel C. Robbins, New York advertising sales representative of Power, a McGraw-Hill publication, and veteran of service with the Astor Battery in the Spanish-American War, died in New York, N. Y., on March 16, following an illness of three months. Mr. Robbins was graduated from Cornell University in 1894. In addition to his service with the Astor Battery, he was a widely known veteran of the Seventh Regiment, New York National Guard. At the close of his service he joined the staff of the New York Sun, a position which he held until he became associated with the Hill Publishing Company, then publisher of Power. He had served that company and its successor, the McGraw-Hill Publishing Company, since 1900.

* Oliver B. Barrow, for more than 30 years St. Louis representative of the American Steel & Wire Company, died on Feb. 25. He was born in Janesville, Wis., in 1863. He was a member of the St. Louis representative of the American Steel & Wire Company in 1900.

* George Wright, chairman of the Toronto Hydro-Electric Commission, died at his home in Toronto, Ont., on March 17, in his 64th year. Mr. Wright, who had been a member of the Toronto Transportation Commission, operating the municipally-owned railway and bus system in Toronto. He was among the first of the province of Ontario who saw the possibilities of public development of hydro-electric plants, and was closely associated with the late Sir Adam Beck in the early days of the enterprise.
Comfort and Speed on New Allegheny Valley Cars

BY J. G. INGLIS
General Engineering Department
Westinghouse Electric & Manufacturing Company

TWELVE new, high-speed, light-weight cars have completely modernized the rolling stock on the lines of the Allegheny Valley Street Railway, a subsidiary of the West Penn system.

The line runs parallel to the Allegheny River near the city of Pittsburgh, Pa. One branch extends upstream from New Kensington to Natrona, approximately 7 miles; the other extends downstream to Aspinwall, 11.73 miles. Service on the upper branch was formerly provided by six cars operating on a 15-minute headway with a 90-minute round-trip time. Two extra cars were operated in the rush hours, as the community is an industrial center.

Complete but without load, the new cars weigh 32,100 lb., have quadruple 1425-A motors (35 hp., 300 volt) geared 4.75:1 with WN drive to 22-in. wheels. The control is double-end K-75 with TA handle switches and lightweight Type M resistor. The free running speed of the new cars is 43.5 m.p.h., approximately 10 m.p.h. faster than the old ones. Seating capacity has been provided for 48 passengers, with well-upholstered, reversible seats finished in Spanish brown leather. Wide windows, narrow sashes, good lighting and an unobstructed view at the front of the car have been combined to make the ride of the passenger as pleasant as possible.

The mounting of the motors and WN drive as well as some of the features of the truck construction are of special interest. The trucks are the Cincinnati Car Corporation's cantilever type with certain modifications to care for WN drive. A transverse tubular motor support carries one-half of the motor weight, while the other half of the motor weight and half of the gear unit weight are held by clevis castings supported by the transom. Positively centered thermid disk couplings are used. The link between the gear unit and the clevis casting has a ball and socket joint at each end, permitting freedom of motion in any direction to take care of the movement of the car axle. The brake rigging is the West Penn standard, helping to give a very neat appearance to the truck. Traverse leaf springs and coil journal-box springs contribute to the riding qualities of the car. Brake hangers are so constructed that noise is eliminated even when the parts become worn. Rigid attention was given to all factors which would promote riding comfort.

There are several ways in which the motor and drive helped to meet the requirements of the railway-company in this application. Chief among these is the matter of weight reduction. By utilizing a high-speed motor wound for 300 volts, high temperature insulation and a double-reduction drive, sufficient clearance was obtained to permit the application of 22-in. wheels. The resulting economies in weight were sufficient to bring the total car weight to 32,100 lb., without the necessity of utilizing aluminum construction except in the rails and around the wheels. The body weighs 18,700 lb., while one truck complete with motors weighs 6,600 lb., with rolled-steel wheels, or 6,900 lb. with cast-steel wheels. This truck weight is the lightest of any WN drive truck in operation. The 6,600 lb. for the truck with rolled-steel wheels corresponds to 7,850 lb. for a truck recently built and equipped with axle-hung 35-hp. motors, 26-in. rolled-steel wheels. This corresponds to a reduction of 3,500 lb. per car and, if axle-hung motors had been considered for the Allegheny Valley cars, such an increase in car weight would have been the most certain and a prohibitive application of 35-hp. motors for the schedule desired.

Through the utilization of 22-in. wheels, it has been possible to construct the cars with only one step and without a ramp in the floor. This reduces accident hazards and claims and cuts down the stop time, permitting higher schedule speeds. The latter is of special interest to the transportation department of the company because the schedule under which the cars will operate is a difficult one. The gear ratio had to be chosen so that a high balancing speed would be available where there was an opportunity to use it, while a high accelerating rate was desired in the frequent-stop service.

New Brooklyn Cars Now in Service

The first of an order of 100 trolley cars, ordered during the latter part of last year by the Brooklyn Queen Trade Corporation, have arrived and are now in service in that city. It is expected that the entire 100 cars will be in service within the next two months. The order was divided between the Osgood-Bradley Car Company, of Worcester, Mass., and the J. G. Brill Company, each concern supplying 50 cars.

Cars are equipped with four 35-hp. motors, and the control equipment is of the automatic acceleration type similar to that used on subway cars. This feature makes the new cars especially effective in congested traffic areas as it is expected to enable them to keep abreast of, if not outdistance, automobile traffic using the same streets. This type of control permits the car to pick up speed rapidly and automatically and without any noticeable jolting as it changes from one speed to another. Acceleration is provided at the rate of 3 m.p.h. per second and deceleration, or braking, at the rate of 21 m.p.h. per second. This is an unusually high rate of acceleration for a surface car and is required to enable the cars to pick up speed, when starting, as rapidly as an automobile. Control and motor
Wide windows, ample and well distributed illumination and comfortable seats contribute to the attractiveness of the new Brooklyn cars.

Equipment was provided by the Westinghouse Electric & Manufacturing Company.

The new cars are of the front entrance, center exit type, and are equipped with prepayment fare turnstiles. In order to give maximum seating capacity, single-end control is provided. The cars have seats for 54 passengers. Leather upholstered, spring cushioned seats are supplied, the supports and backs of which are made of aluminum. Thirty-two of the seats are arranged in pairs—ten pairs on one side of the car and six pairs on the other—and the remaining 22 seats are single seats running lengthwise along the sides and around the rear end. This arrangement is designed to provide a maximum of aisle space.

Detailed specifications include:

- Air brakes: Westinghouse
- Armature bearings: Plain
- Axles: 3½-in. Carnegie
- Car signal system: Faraday
- Compressors: Westinghouse D-H-16
- Conductors: Steel
- Destination signs: Hunter illuminated roll
- Door mechanism: Consolidated Car Heating
- Floors: Folding
- Energy saving device: Artisan
- Fare box: Perry, on passmeter
- Finish: Enamel
- Floor covering: Tufted
- Gear and pinions: Nutall
- Hand brakes: National Brake Company
- Heaters: Railway Utilities Company
- Headlights: Ohio Brass Company
- Healdlinig: Aluminum
- Journal bearings: Plain
- Journal boxes: J. G. Brill Lamp fixtures: Electric Service Supply Company
- Motors: 4 Westinghouse, No. 516-A, inside hang
- Roof material: Wood, canvas covered
- Safety car devices: Westinghouse
- Seal seats: O. M. Edwards Company
- Seating material: 50 seats, leather; 20 seats, wood
- Slack adjusters: Westinghouse
- Steps: Stationary
- Step treads: Fehren
- Trolley catchers: Ohio Brass Company
- Trolley base: Ohio Brass Company
- Trolley wheels: Ohio Brass Company
- Trucks: J. G. Brill, 175-E-1
- Ventilators: Railway Utilities Company
- Wheels: Rolled steel, 26 in. diameter
- Lifeguard: H-B

By the use of aluminum for interior panels and headlining, with the car body itself constructed of steel, the weight is kept to 37,000 lb. The roof is of the arch type with twelve ventilators. Porcelain handrails suspended from the ceilings at a height of 6 ft. from the floor take the place of hand straps. The floors are of the same composition as the floors of subway cars, a ½-in. layer of this composition being laid over steel sheets ¾ in. thick. Each car cost approximately $16,000.

Contracts Awarded for New Baltimore Cars

Of the 150 new street cars which have been ordered by the United Railways & Electric Company, of Baltimore, announcement of which appeared in ELECTRIC RAILWAY JOURNAL News of March 22, 1930, 100 will be built by the J. G. Brill Company and 50 car bodies will be supplied by the Cincinnati Car Company. The Brill Company is to supply trucks for the entire order. The total estimated cost of the new rolling stock is set at $2,550,000.

The new cars are to be of all-steel construction and will embody all of the latest developments making for passenger comfort, quick loading and alighting; and quiet operation. Front entrance and center exit arrangements will be incorporated in the design, the passengers depositing their fares as they pass the conductor, who is to be stationed near the center of the car. Quick acceleration and deceleration will be provided so as to enable the new cars to take their place in high-speed traffic.

Prior to the awarding of the contracts, representatives of a number of car builders as well as appliance manufacturers were invited to Baltimore and acquainted with the company’s ideas, following which a number of tests were made at the Carroll Park shops of the United Railways & Electric Company. Complete specifications are not at present available but will be announced at an early date.

North Shore Line Receives 25 New Motor Cars

Twenty-five new all-steel passenger motor cars, costing approximately $850,000, have been delivered to the Chicago, North Shore & Milwaukee Railroad by the Standard Steel Car Company, of Hammond, Ind. This makes a total of 40 new all-steel motor cars purchased by the North Shore Line during the past two years.

The new cars are provided with easy-chair type seats upholstered in Byzantine plush, a double heating system (hot water

General view of five-car train made up of new all-steel coaches, 25 of which have been placed in limited service on the North Shore Line.
and electric) thermostatically controlled, two toilets and a smoking compartment in each car, an auxiliary lighting system for emergencies, larger windows increasing visibility for passengers, and individual ventilators in each window, as well as electric fans and ceiling ventilators in each car. Each car has four motors with a total of

ANNOUNCEMENT is made that the City of Detroit, Department of Street Railways, will open bids on April 11, 1930, for the furnishing of 130 cars of the Peter Witt type.

Individual easy chairs are a feature of the new coaches recently acquired by the North Shore Line for service between Chicago and Milwaukee

The 500 bp, and weighs 51 tons. Improved air-brake equipment and motor control are important mechanical features. The cars are painted in the new North Shore Line colors, orange with maroon trimmings, adopted as a measure of public safety by increasing the visibility of trains.

Trolley Buses Arrive in Knoxville

Four trolley buses, intended for service on the Cumberland and Kingston Pike lines of the Knoxville Power & Light Company, have arrived in that city and will be placed in regular service about May 1. The coaches, which seat 42 passengers each, were supplied by the Cincinnati Car Corporation at an approximate cost of $50,000.

Trolley Surface Lines Orders

Trolley Buses

As the result of the substantiation of the rights of the Chicago Surface Lines to supply bus service to certain sections of that city, orders have been placed for a total of 41 trolley buses to provide service over about 17 miles of route. The necessary expenditure has been authorized by the court and the new rolling stock is to be in service before next week. Twenty-nine of the vehicles will be built by the Twin Coach Company, of Kent, Ohio; six are to be supplied by the J. G. Brill Company, and six by the St. Louis Car Company. The buses are to be powered with two 50-hp. motors and will be supplied with four-wheel air brakes.

Twin Coach Company has also recently supplied two urban type coaches to the Milwaukee Electric Railway & Light Company and five 40-passenger urban type coaches to the Boston Elevated Railway. The Boston Elevated Railway has also added two 40-passenger metropolitan type coaches, which were supplied by the American Car & Foundry Company, the North Coast Transportation Company, of Seattle, Wash., has also received two ACF 264-in. wheelbase chassis.

The White Company, of Cleveland, reports the sale of eight of its Model 65 buses to the Denver Tramway Company; four Model 50B buses to the Middlesex & Boston Street Railway, of Newtonville, Mass.; and one Model 54A bus to the Super Power Company, of Springfield, Ill.

J. G. Brill Orders for Equipment

Exceed 1929

Receipt of an order from the United Railways & Electric Company, of Baltimore, for car bodies and equipment aggregating in value more than $2,000,000, puts the business of the J. G. Brill Company for the first quarter of 1930 about 10 per cent of orders received during the same period of 1929. Sales in the first three months of the current year have been running at the same rate as in 1929, but with the addition of the order from Baltimore sales will amount to approximately $4,000,000, or just about double the amount of the first quarter of that year. Unfilled orders on the books on Jan. 1, 1930, are said to have approximately the same as those for the previous year.

Bendix and Westinghouse New Company

Announcement is made jointly by the Westinghouse Air Brake Company and the Bendix Aviation Corporation of the formation of a new company to be known as Bendix-Westinghouse Air Brake Company, the entire capital stock of which is to be held by the Bendix Aviation Corporation and the Westinghouse Air Brake Company.

The new company will continue the operation of what has heretofore been the separate divisions of the Westinghouse Air Brake Company and will continue to supply the well-known Westinghouse air brake equipment for buses, trucks and other types of automotive vehicles. Westinghouse will continue the manufacture of the automotive air brake equipment for the new company.

General Electric Had Record

Year in 1929

In volume of orders received, shipments billed, and in total profits and earnings per share of common stock, the year 1929 was the best in the history of the General Electric Company, according to the annual report for that year, just released by Gerard Swope, president. Orders received increased 28 per cent over 1928. Sales billed increased 23 per cent, net income from sales showed an increase of 24.5 per cent and earnings per share of common stock increased 25 per cent. Profits available for dividends amounted to $67,289,880, equivalent after dividends on special stock, to $8,97 per share on the no par common.

Substantial expenditures were made during 1929 for the consolidation of manufacturing plants, and the year 1929 was the best in the history of the General Electric Company, according to the annual report for that year, just released by Gerard Swope, president. Orders received increased 28 per cent over 1928. Sales billed increased 23 per cent, net income from sales showed an increase of 24.5 per cent and earnings per share of common stock increased 25 per cent. Profits available for dividends amounted to $67,289,880, equivalent after dividends on special stock, to $28,87 per share on the no par common.

Substantial expenditures were made during 1929 for the consolidation of manufacturing plants, and the year 1929 was the best in the history of the General Electric Company, according to the annual report for that year, just released by Gerard Swope, president. Orders received increased 28 per cent over 1928. Sales billed increased 23 per cent, net income from sales showed an increase of 24.5 per cent and earnings per share of common stock increased 25 per cent. Profits available for dividends amounted to $67,289,880, equivalent after dividends on special stock, to $8,97 per share on the no par common.

It was the best in the history of the company, according to the annual report. In volume of orders received, shipments billed, and in total earnings per share of common stock, the year 1929 was the best in the history of the company.
Safety...

Put yourself in the position of a motorman who has to compromise the factor of security because of questionable brakes.

Could you meet schedules 100% and maintain an accident free record?

National Brake Company, Inc.
890 Ellicott Square
Buffalo, N. Y.

Canadian Representative:
Lyman Tube & Supply Co., Ltd., Montreal, Can.
The Ellcon Co., General Sales Representatives
50 Church St., New York

PEACOCK
Staffless Brakes
TEXACO provides an entirely new system of electric railway lubrication and a new car-journal lubricant. Texaco Lovis Oil and the system, in which the use of Texaco Oil Seals is an important factor, promise to save hundreds of thousands annually for the industry.

Here are the advantages:
1. A substantial saving in power; 2. Increased car operating speeds; 3. Reduced waste consumption; 4. Lower labor costs; 5. Lower maintenance; 6. A saving in oil house costs; 7. Lower costs for lubrication.

The new Texaco System is now being put into effect on many of the leading lines of the country. Texaco Lubrication Engineers will, on request, arrange for conclusive tests on any road.

Write The Texas Company.

THE TEXAS COMPANY 17 BATTERY PLACE, NEW YORK CITY
OFF IN LESS THAN 3 MINUTES

"K" RIMS SAVE TIME ON TIRE CHANGES

The ease with which Goodyear Type "K" Rims are slipped on and off despite rust, dirt, or ice is a big reason for their success. They come off your tires in an instant—THREE MINUTES OR LESS is enough.

Type "K" Rims are light, trim, and cool running. Built in two sections, one split and one endless, they are powerful and yet easy to handle. Your drivers and repair men will like this light and mechanically able equipment.

Change-overs from solid or cushion tires to pneumatics are simple matters with Type "K" Rims. You just cut down your old wheels and weld on single or dual Type "K" felloes. Then, more power, smarter appearance, and less trouble all around.

Write today to Goodyear, Akron, Ohio, or Los Angeles, California for detailed information on sensible Type "K" Rim equipment for trucks or buses.

THE MAN WHO CHANGES THE TIRES LIKES GOODYEAR TYPE "K" RIMS

GOODYEAR TYPE "K" TRUCK AND BUS RIM EQUIPMENT
BUS owners throughout the country are adopting Cities Service and Koolmotor gasoline, oils and greases because they know that every Cities Service product has undergone the gruelling test of actual service in the fleet of more than 4,000 motor vehicles operated by Cities Service subsidiaries.

For example—buses in Mansfield, Ohio, operated by The Ohio Public Service Company, a Cities Service subsidiary, travelled 235,000 miles in 1929 and carried 692,000 passengers. Koolmotor gasoline, Cities Service bus oil and Cities Service greases help in the efficient operation of these buses, in maintaining schedules and in minimizing expense.

Cities Service engineers who have worked out the problems of Cities Service transportation fleets will gladly study your bus problems and recommend the scientifically correct lubricants and fuels that will help reduce your maintenance costs and safeguard your expensive equipment.

CITIES SERVICE COMPANY
60 Wall Street
New York City
Buses Prove Cities Quality

Company:
The Ohio Public Service Company

Location of Property:
Mansfield, Ohio

Yearly Bus Mileage:
235,000 miles

No. of Passengers Carried:
692,000

Cities Service Products Used—
Koolmotor Gasolene
Cities Service XX Bus Oil
Cities Service Greases
SPRAY painting equipment used in industry today must measure fully up to the speed and efficiency of the most advanced production units in other departments.

DeVilbiss spray systems for use in railway finish maintenance operations—cars, buses, and buildings—are engineered with a complete understanding of the demands that will be made upon them.

This involves a constant study of the changing methods and improved devices which progress brings into every highly competitive operation. Users of DeVilbiss spray systems never find their finishing operations lagging behind improvements made in other directions. DeVilbiss equipment is designed with a complete understanding of all the processes employed in the plant where the DeVilbiss system is used. The constant improvement in every detail of a DeVilbiss spray outfit is reflected in a constantly lowering cost of finishing by reason of new economies in time consumed, labor and materials. You can always learn from DeVilbiss whether your finishing operation is as modern, efficient and economical as it should be. Such information costs you nothing. It may save you much.

DeVilbiss Provides Everything Needed

Spray guns of various types and sizes.
Pressure feed paint tanks and containers.
Spray booths, exhaust fans, and approved lighting fixtures.
Air compressing equipment.
Air transformers and accessories.
Air and fluid hose and connections.
Complete outfits from the smallest hand-operated units to the largest industrial installations.

DeVilbiss Spray-Painting System

THE DEVILBISS COMPANY

272 Phillips Ave., Toledo, Ohio

Sales and Service Branches

New York  Philadelphia  Cleveland  Detroit  Indianapolis  Chicago  St. Louis  San Francisco  Los Angeles  Windsor, Ont.

Direct factory representatives in all other territories
A Comfortable, Sanitary and Modern Seat!

HERE is a seat which maintenance engineers will appreciate. Its close-woven cane webbing back and cushion are easy to keep clean. The genuine leather facing on the cushion reinforces the seat at the greatest point of wear. In addition, the individual backs and deep, spring cushions are shaped to allow proper posture and leg freedom. Mechanism rails are set in and the frame of the chair is made of selected Northern hard-grained ash, further strengthened by malleable iron braces.

Write to the nearest Heywood-Wakefield sales office for complete details of the 327-M Special and other popular bus and electric railway seats in our line.

HEYWOOD - WAKEFIELD COMPANY

BOSTON, MASSACHUSETTS

516 West 34th St., New York City
J. R. Hayward, Liberty Trust Bldg., Roanoke, Va.

439 Railway Exchange Bldg., Chicago, Ill.
A. W. Arlin, Delta Bldg., Los Angeles, Calif.
The G. F. Cotter Supply Co., Houston, Texas

The Railway and Power Engineering Corporation
133 Eastern Ave., Toronto; Montreal, Winnipeg, Canada

If you have not received a copy of our new Bus Seat Catalogue, write for it.
ALMOST SEVEN MILLION MILES
LAST YEAR

The coaches of Consolidated Coach Corporation travel the roads of Kentucky and Tennessee. They penetrate into Indiana and Ohio—they cross the state lines of the two Virginias. The coaches of the Kentucky Coach Company travel entirely on city streets. The combined mileage of these two operations totaled 6,919,491 miles in 1929—all on Goodyears. For more than three years now, no other tires have been used except Goodyears, because these companies, like so many others, have found the long mileage, the stamina, the freedom from delays, the safe, surefooted traction of Goodyear Tires best suited to their demands of safety, maintained schedules and economy. More people ride on Goodyear Tires than on any other kind—for the very good reason that experience has demonstrated Goodyear superiority.

Isn't this a good reason for asking a Goodyear Truck and Bus Tire Service Station Dealer about the extra benefits these famous tires could bring to your fleet?

THE GREATEST NAME IN RUBBER

GOODYEAR

ON YOUR NEXT COACHES SPECIFY GOODYEARS
YEAR AND A HALF AGO WE BOUGHT OUR FIRST a.c.f.—TODAY WE HAVE 30 a.c.f. COACHES IN OPERATION
61 motor coaches on 78 miles of routes, running 3,200,000 miles in 1929, carrying 45,000 passengers each day

Record of Bee Line purchases of Q.C.C. coaches

8* in July, 1928
2* in September, 1928
2† in September, 1928
10* in February, 1929
2* in May, 1929
4** in July, 1929
4** in March 1930

*Q.C.C Model 508-9D11, 33-passenger urban coach.
†Q.C.C Model 601-2D9, 23-passenger urban coach.
**Q.C.C Model 512-3D15, 40-passenger urban coach.
The Bee Line is one of Long Island's most important motor transport lines. The experience of the men who have built this business from scratch, is worth any operator's attention. Listen to Mr. H. B. Carter, President of the Bee Line:

"A year ago last August, we bought our first O.C.C. coaches—five 33-passenger jobs. Since then, we've reordered several times, and at present, we have 32 O.C.C. busses in operation. Twenty-two of them are 33-passenger models. Two are 23-passenger jobs which we use on cross routes. And eight are Metropolitan street-car-type models, which we keep busy all day long on our heaviest runs.

"Mileage? Well, the first five jobs have been on the road now for eighteen months and every one of them shows 120,000 miles or better. We keep detailed cost records on every coach we run, and these O.C.C. coaches show an average operating cost, including overhead and everything, of about 29¢ a mile.

"We didn't choose O.C.C. blindly. We've used several makes of coaches, and they have all been good. But the things O.C.C. offered were quite a little better . . . more passenger comfort, and that is a very important point in any operation . . . more inside room . . . more air space . . . better appearance."
"And then Q.C.C are six cylinder jobs. That means smoother operation, and we have found that they don’t cost any more to run than fours. We’ve had less trouble with them. They’ve stayed on the road better than any coaches we’ve ever had. Our routes run normally through level country, but for the last year or more, long stretches both on the Merrick Road and the Hempstead Turnpike have been under construction, and we’ve had to run constantly over extremely rough detours.

"They say that the proof of the pudding is in the eating. Well, if that is the case, all I can say is that for the last nineteen months, we haven’t added any coaches except Q.C.C. And they have certainly given us record service!"

The Q.C.C Metropolitan Coach and the advantages it offers you

An operating life of ten to fifteen years at a minimum. A seating capacity:a third greater, and a standee capacity of 100 to 150% greater, than the usual 230” wheel base coach. Body maintenance practically eliminated. The all steel body-chassis is built as a single unit of 16-gauge steel panel-plates riveted to steel posts, which are integral parts of the chassis structure. A six cylinder Hall-Scott engine designed expressly for bus service and improved by seven years of constant refinement. The Metropolitan is built by the American Car and Foundry Motors Company—your guarantee of quality and satisfaction.

**BRIEF SPECIFICATIONS**

- **Wheelbase**: 230”.
- **Capacity**: 40 seated passengers.
- **Construction**: All steel; body-chassis built as a single unit.
- **Engine**: Hall-Scott, 6 cylinder 120 H.P.
- **Drive Shaft**: Only 24”.
- **Tires**: 38”x9”. (single front, dual rear).
- **Transmission**: 3 speed.
- **Rear Axle**: Worm drive, full floating.
- **Weight distribution, loaded**: ½ on front axle; ½ on rear axle.

Mechanical or gas-electric drive available.

**a.C.C**

AMERICAN CAR AND FOUNDRY MOTORS COMPANY, 30 Church St., New York City
Typewritten Simultaneously in Every one of your Offices

Branch Office Executive receives the message as it is typed in headquarters

Sending the message from headquarters to the field

All messages received may be pasted on letterhead size paper for filing

Telephone Typewriter Service speeds modern business by providing instantaneous typewritten communication between the different units of an organization. It weaves together headquarters, factories, branch offices and warehouses almost as closely as though they were under one roof.

A large metal company uses the service to connect its New York office with its mill in West Virginia. Orders, general information, administrative matters, specifications, cost estimates, stock on hand, shipments, etc., are reproduced instantly and accurately at either end. A tobacco company transacts much of the business between its plants in southern states by telephone typewriter.

Several hundred messages are exchanged each day. Telephone Typewriter Service is proving its worth for banks, manufacturing concerns of all kinds, public utilities, government departments, insurance companies, export firms, department stores, travel bureaus. It makes executive control easier and more complete. Facilitates immediate action on vital matters. Transmits important business information while the information is still of value. It is quick, accurate and private.

Would constant, unlimited, two-way written communications be of value to your business? Telephone Typewriter Service can be fitted to your exact requirements. Your Local Bell Telephone Business Office will gladly give you complete information.
When age makes modernize

DODGE BROTHERS
maintenance costly, with Dodge Coaches for lower costs

Maintenance is essential to efficient motor coach operation—as every experienced operator knows. But excessive maintenance costs need not be tolerated. Worn-out coaches that require costly repairs are actually a liability. » » » Operators, large and small, have proved conclusively the wisdom of periodic replacement—modernization with Dodge Brothers Motor Coaches. With these practical coaches—the 21-passenger Street Car or the 16-Passenger Parlor Coach—owners are enabled to lower their maintenance costs, lower their operating costs and please their patrons.
Simplex Multiple Unit Clasp Brakes
with Safety for P. R. T.

Braking today is an important consideration. Upon braking depends faster service and better schedules even though there are frequent stops.

Philadelphia Rapid Transit chose Simplex Multiple Unit Motor, Trailer and Truck Clasp Brakes for their 154 subway cars. P. R. T. service necessitates exacting brake requirements. The answer was complete Simplex installation—SPEED WITH SAFETY.

Simplex Multiple Unit Clasp Brakes give quick and smooth retardation and full release permitting rapid acceleration. Passenger comfort is assured. Wear and tear on truck equipment is minimized. Brake and truck maintenance is reduced.

The American Steel Foundries has an engineering staff which will develop the entire brake rigging design for efficient brake application. Due to different truck and underframe construction each clasp brake design is subject to an individual engineering study. Let us cooperate with you.
A Comfortable, uninterrupted ride is the best method a traction company can employ in overcoming automobile competition. Attractive car service removes the incentive for the motorist to provide his own transportation—especially in view of the ever-increasing difficulties of parking. Riding comfort begins with the track. Carnegie Steel Cross Ties provide the foundation for a smooth, repair-free track—a track that saves wear and tear on rolling equipment and greatly enhances its comfort—a track providing long, continuous service. Carnegie Ties are easily installed. The bolt and clip by which the rail is secured are simple and efficient. The unit cost (cost per foot of track per year) is considerably less than for wood ties. Carnegie Steel Cross Ties will prove a profitable investment—particularly from the standpoint of passenger satisfaction ... New booklet on request.

Carnegie Steel Company - Pittsburgh, Pa.
Subsidiary of United States Steel Corporation
Mica in every form
for A.C. motor insulation

Protect A. C. motors and generator slot cells and coil phase sections with built-up mica! That's the way to assure lasting maintenance-free performance and the maximum of operating efficiency. Super-Micanite is practically indestructible under the heat and vibration of the severest motor and generator operation.

Flexible Super-Micanite in sheets or strips, Micanite Coil Insulation, Rope Paper and Mica, Micanite Paper, and Micanite Tape represent the built-up mica insulations ideal for A. C. machines. And the Mica Insulator Company offers in addition a complete line of Varnishes, Armco Paper, Varnished Cambric Tubing, in fact, a performance-proved electrical insulation for every need from slots to leads.

MICA INSULATOR COMPANY
Cleveland  Pittsburgh  Cincinnati  Birmingham
San Francisco  Los Angeles  Toronto  Seattle
Mica Insulation  Oiled Cloth Insulation
EITHER way you look at it—getting and holding more patrons for your cars, or cutting your operating costs—the result is "velvet".

Timken Worm Drive for street cars helps both ways.

Less noise, less weight, smooth speed—these attract and hold more riders. Power savings, lower costs of maintaining rails and equipment—these cut operating expense.

THE TIMKEN-DETROIT AXLE CO., DETROIT, MICH.
Worm drive for electric railway cars
A PROFITABLE

Uniform Performance in Service .......... Lower Average Wheel Costs.

When

THE ULT

The National Malleable and Cleveland,
Better and More Effective Car Maintenance
All Factors Leading To Economical Operation
Using

Steel Castings Company
Ohio, U. S. A.
GOOD WILL IS IMPORTANT—DON'T RUIN IT WITH FUMES

Good will is important to any business... it is a priceless asset to the transportation company. If your motor coaches are releasing objectionable fumes... if they are gassing pedestrians and potential patrons... they are seriously endangering good will and your business.

The sulphur and impurities that are present in many fuels and lubricants, are a major cause of obnoxious combustion odors. Red Crown Gasoline and Polarine Motor Oil, highly refined, pure and practically free from sulphur, do not produce these stifling combustion odors.

As a motor fuel Red Crown ranks at the top, giving power, mileage, economy. Polarine is pure and rich, supplying thorough, efficient lubrication to the motor. Working together they give that perfectly balanced performance which insures dependable service and low cost operation.

A test will convince you that Red Crown and Polarine form an ideal combination for your motor coaches.

STANDARD OIL COMPANY
(INDIANA)

910 S. MICHIGAN AVE. CHICAGO, ILL.

RED CROWN GASOLINE
POLARINE MOTOR OIL
True Temper Tapered Rail Joint Shim

The Remedy for Low Joints caused by wear

The above shows Joint Shim in position with angle bar removed.

The above shows Joint Shim in position between Bar and Ball of Rail.

Other True Temper Products for Electric Railway Use:

Safety Rail Forks
Railroad Scuffle Hoes
Ice Chisels

Road, Gravel and
Cleaning Rakes
Sidewalk Cleaners

Send for a free copy of our Catalog RADI, which describes these and other True Temper Products for Electric Railway use.

THE AMERICAN FORK & HOE COMPANY
General Offices: CLEVELAND, OHIO; Factory: NORTH GIRARD, PA.

District Offices

Representatives at
Boston, Denver, Detroit, Minneapolis, St. Louis and San Francisco

Foreign Representatives
Young & Co., 44 Whitehall St., New York, N.Y., and
Mack

IS ONCE MORE THE CHOICE
OF THE
CINCINNATI STREET RAILWAY
COMPANY

Prominent Mid-Western Traction Company adds 10 Model BC (Intermediate Sixes) To Its Mack Fleet.
In 1926, the Cincinnati Street Railway Company made its first bus purchase. That the service has proven popular is evidenced by the fact that today, a fleet of 98 is being operated. Of this number, 53 are Macks.

Recently, replacement of some of the older equipment became necessary. Basing its decision on Performance and Low Maintenance Costs; the company purchased 10 Mack Model BC city type buses equipped with Mack built bodies.

On the books, and on the road, the company has found that economy and dependability are synonymous with Mack. Added to these tangible features is the equally important feature of Good Will; indicated by the unsolicited praise from both drivers and passengers.

Invariably, where comparisons are available the choice is Mack

Mack buses are built with four or six cylinders in standard wheelbases ranging from 202$\frac{1}{2}$'' to 265''. Mack standard bus bodies are built for either city or interstate service with seating capacities ranging from 21 to 41 passengers.

Mack Trucks, Inc.
25 Broadway, New York, N. Y.

Mack Model BC Six Cylinder Buses
do you believe in evolution?

EVER SINCE 1874, when the Bastet Magnetic Engine appeared, designing engineers have been developing bigger and better motors. The basic principles embodied in the early designs have been applied more efficiently. New methods of construction have been adopted. The rugged, welded frame, synchronous motor, 10,000 times more powerful than its little forerunner, symbolizes this evolution. Many steps in this record of progress may be attributed to the development and constant improvement of National Pyramid Carbon Brushes.

The synchronous motor of today is the last word in efficiency. Maintenance has been reduced to a minimum. The load current reaches the stator windings without moving contact and only the direct current excitation of the revolving field is carried by the brushes and slip rings. But the selection of the proper brush grade is important. The ring surface must be kept well polished, free from spots or undue wear.

This, like the many other brush problems arising through the years, has been successfully solved by the unsurpassed research facilities of National Carbon Co., Inc. Electrical industry has presented thousands of uses for carbon brushes and a National Pyramid Brush has been available for each use.

The Eveready Hour, radio's oldest commercial feature, is broadcast every Tuesday evening at nine (New York time) from WEAF over a nation-wide N. B. C. network of 30 stations.

NATIONAL CARBON COMPANY, INC.

Unit of Union Carbide and Carbon Corporation

Carbon Sales Division

Branch Offices and Factories
New York Pittsburgh Chicago Birmingham San Francisco
Introducing the New W
Observation
215 inch Wheelbase

A noteworthy addition to an already famous Yellow Coach family.

A new high headroom Parlor Observation Coach, wheelbase, 215 inches... body width, 96 inches... seats for 25 passengers with 33\(\frac{1}{2}\) inch seat centers or optional for 21 passengers with individual reclining chairs on 38 inch seat centers. Maximum comfort. A roominess far beyond any previous coach design... yet the cost per passenger capacity due to standard design and construction, is unbelievably low.
It is powered with an engine whose capacity and flexibility has stood the test of time. Its quietness, freedom from vibration and quick, smooth acceleration make the maximum in rider appeal. Its brakes are quick and sure; ample for any emergency. Its ease of handling is comparable only to that of a passenger car.
All of the excellent chassis features which made the Type W-185 coach so popular has been continued in this 215 inch chassis, with the addition of heavier construction for increased capacity.

This new Parlor Observation coach takes rank as the first small capacity coach with all of the advanced engineering features and passenger comfort found in the finest of large parlor coaches.

In fact the body construction is so similar to the new 33 passenger Yellow 250 inch wheelbase parlor coach that many body parts and sections are interchangeable.

**Standard Seating Plan**
Comfortable parlor chairs for 25 passengers on 33½ inch seat centers.

**Optional Seating Plan**
Luxuriously roomy. Widely spaced reclining chairs for 21 passengers on 38 inch seat centers.
Filling an important place in capacity for inter-city service between the 21 passenger and the 29 passenger coaches, it can be confidently predicted that the "W-215" will meet with the same popular approval accorded its predecessor, the "W-185", of which over 800 were sold in a little more than a year.

GENERAL MOTORS TRUCK CO. - - - - - - - Pontiac, Mich.

SUBSIDIARY OF YELLOW TRUCK AND COACH CO.

It pays to Standardize

With the addition of this new model operators requiring vehicles of different capacities and types may now standardize on any combinations of Type "W" and Type "U" coaches for city service, parlor de luxe service or inter-city work. Capacities range from 16 to 25 passengers with a choice of two different engines. Bodies and a majority of chassis parts and many body parts, are interchangeable. Maintenance is greatly simplified. Capital tied up in parts inventory can be greatly reduced. Standardization means greater operating flexibility, greatly simplified maintenance and better all around economy.

Type "U1" 185" w. b. 16 pass. Parlor Coach.
Type "U" 185" w. b. 21-23 pass. City Service Coach.
Type "U" 185" w. b. 21 pass. Observation Parlor Coach.
Type "W" 185" w. b. 17 pass. Parlor Coach.
Type "W" 185" w. b. 21-23 pass. City Service Coach.
Type "W" 185" w. b. 21 pass. Observation Parlor Coach.
Type "W" 212" w. b. 21-25 pass. Observation Parlor Coach.

Features

Wheelbase—215 inches.
Engine—Cadillac V Type—8 cyl.
Generator—12 volt, 600 watt.
Transmission—Four speed.
Clutch—Twin disc.
Service Brakes—Duplex hydraulic four wheel with booster.
Emergency Brake—Propeller shaft.
Pull on type.
Rear Axle—Underslung worm.
Tires—36 x 8.25.
Overall length of coach—27 feet, 7½ inches.
Overall width of body—96 inches.
Head room, at front in aisle—79½ inches.
Head room, at rear in aisle—73¾ inches.
Standard seating—25 passenger on 33½ inch seat centers.
Optional seating—21 passengers, all reclining on 38 inch seat centers.
Interior luggage racks, also outside baggage rack.
Heating—Hot water, blower type.
On This Famous Bus Network Extending
FROM THE
GREAT LAKES
TO FLORIDA
THE MISSISSIPPI
TO THE
ATLANTIC

Goodrich was the Natural Choice

C. S. WARNER, President of the Interstate Transit, Inc. (Colonial Stages), which
operates a great bus network extending
from the Great Lakes to Florida and from
the Mississippi to the Atlantic Seaboard,
makes the following statement:

“In developing this long haul, efficient
bus service one of our first considerations
was tires. Due to past experience in an-
other operation, our natural choice was
Goodrich, as we had to consider known
tire quality and consistent performance.

“As you see from the territory covered,
we strike about every conceivable kind of
road and temperature condition. We are
glad to tell you that Goodrich Tires have
played an important part in helping us
expand this operation and maintain our
schedules.”

The B. F. Goodrich Rubber Co., Estab-
lished 1870, Akron, Ohio. Pacific Goodrich
Rubber Co., Los Angeles, Calif. In Canada:
Canadian Goodrich Co., Kitchener, Ont.

Goodrich HEAVY DUTY Silvertowns

- SPECIFY GOODRICH ON YOUR NEW BUSES -
This is what street car operation is like. With Timken lowered starting and rolling resistance—starts are made smoothly like this instead of jerking like this and, stops like this instead of this.

And in addition, maintenance costs are lowered. Loads, radial and thrust, are completely carried and enduring service is entrusted to Timken tapered construction, Timken *POSITIVELY ALIGNED ROLLS* and Timken steel, exclusively combined in Timken Tapered Roller Bearings.

THE TIMKEN ROLLER BEARING CO., CANTON, OHIO
Ample Heat

with the Utility Cross Seat Heater fitted with Cromalox Strips delivers 100 per cent output for the electric energy input. Listed as standard by the Underwriters' Laboratories.

properly controlled
and
efficiently
regulated

with the Utility Thermometer Control that keeps air in the car at uniform temperature for which it is set and the Utility Regulator which has been tested for 100,000 contacts and did not show damage to contacts or loss of accuracy in regulation.

means passenger comfort
and profitable operation

Besides heat, clean, fresh air is a definite requirement for passenger comfort. Utility system of ventilation scientifically provides fresh, dustless air and ample circulation without wasting heating current.

Let us figure on your heating and ventilating equipment, either for new cars or for modernizing your existing facilities.

RAILWAY UTILITY COMPANY
2241 TO 2247 INDIANA AVE. CHICAGO, ILLINOIS
HITENSO "BB"
Trolley Wire
—an Anaconda Development

Where service conditions are severe... where traffic interruptions are costly... where the overhead wire is supported under elevated structures or along the ceilings of subways, the conductor must be strong enough to stand the stresses and strains of service for long periods without replacement.

For such exacting conditions Anaconda developed Hitenso "BB"* trolley wire. This copper-cadmium alloy has a minimum conductance of 82% and a wearing life almost two and one-half times longer than hard drawn copper. Yet it can be handled as easily as copper and by the same methods.

Investigate Anaconda Hitenso "BB" trolley wire. It has been thoroughly tested over a period of years and has made good in actual usage. We recommend it to the industry. Engineering data and complete information furnished promptly.

*Trade-Mark Registered U.S. Patent Office.

ANAconda WIRE & CABLE COMPANY

General Offices: 25 Broadway, New York
Chicago Office: 111 West Washington Street
Sales Offices in Principal Cities
THE BUDA COMPANY
HARVEY [Chicago Suburb] ILLINOIS
DAYTON OFFSET TIES

The use of Dayton Offset Ties shown above not only requires less excavation and less amount of concrete but affords greater reinforcement to the structure at points of greatest tensile strain. These points are at the top of the concrete and underneath the rails. (Note 2 reinforcing rods running longitudinally under each rail.)

THE DAYTON INTEGRAL SYSTEM OF
THE DAYTON MECHANICAL
Upon the permanence of concrete in track structure depends the life of the structure itself. In this question of structure life the whole problem of track maintenance is involved.

To achieve this permanence, each component part of the track structure — foundation, tie and rail must be welded into an integral whole in order that the impact of car wheels and traffic which introduces an element of force, is not allowed to destroy it. For concrete of itself cannot resist this force. Although it has compressive strength in abundance, it has little tensile strength and cannot be subjected to vibratory strain. Steel has tensile strength but it transmits vibratory strain and *vibratory strain destroys concrete*. To set these elements up in your track structure without first providing for their protection is like putting the cat in with the canary with no barrier between. Dayton Ties provide this barrier. Destroying vibration is absolutely dissipated before it reaches the concrete by a special feature incorporated only in Dayton Ties. Permanency of the track structure is thus obtained — and permanency means low maintenance.

When you dig up your tracks — remember these facts. Relay with Dayton Ties *and for the last time*.

Send for your copy of this book

**TRACK AND PAVING STRUCTURE TIE CO.,- DAYTON, OHIO**
BACK TO NORMAL

Buy generously... without Extravagance.
Save regularly... without Stinting.

These are the Signs of Good Times

Prosperity

Car Card Advertising Almost Everywhere
MAINTENANCE OF PROSPERITY

Constructive well directed advertising offers progressive business men substantial returns. It is a vital factor in the maintenance of prosperity.

Car card advertising is a business builder. Not only has it contributed to the success of national and local enterprise, but also, in so doing, it has worked constantly toward the maintenance of prosperity. Thus it has helped to induce a steadily increasing use of transportation facilities.

BARRON G. COLLIER INC. CANDLER BLDG. N.Y.C.
TO THE COAST
... for the Convention

Each Delegate may view the exhibits on his way to the Convention this year.

The Convention Number will carry articles on:

A.E.R.A. CONVENTION
San Francisco
JUNE 23-26

This year the A.E.R.A. Convention will be in San Francisco but the Exhibits will be in the Special June 14th Convention and Exhibit Number of Electric Railway Journal.

There will be no exhibits at the Convention. The latest improvements in machinery, parts and equipment, must be exhibited... pictured and described... in the advertising pages of Electric Railway Journal's Convention and Convention Report Numbers.

The editorial pages will tell of the trend and developments in equipment that are contributing, toward greater comfort, safety, speed... better appearance, operation and maintenance. The advertising pages will show what each manufacturer has to contribute toward these ends.
For the thousands who have to stay at home (unfortunately everybody can’t go to San Francisco!) the Convention Exhibit and Convention Report Numbers of Electric Railway Journal will represent the exhibits, meetings, new developments, new business relationships, all the interest and enthusiasm that go to make up these annual meetings.

The fact that there will be no Convention Exhibits this year places a larger responsibility on Electric Railway Journal, but we feel certain of the whole-hearted support of manufacturers in our effort to place before the whole industry as complete a picture as possible of this year’s Convention.

Remember! More than a million dollars a day is budgeted to be spent this year. Advertising should bring better results than ever before!

The Convention Report Number will carry the only full report of the entire convention . . . meetings, discussions, resolutions, social doings, outstanding happenings, personals, etc., etc. It will be chock full of interest to those who attend as well as to those who stay at home, and will be retained permanently by many readers.
NATIONAL
ARMATURE BABBITT METAL
TROLLEY WHEELS
"TIGER" BRONZE AXLE
AND
ARMATURE BEARINGS

for Quality
Approved
for City and
Interurban Cars

The approval given National products has come from far and wide and recognition of National quality and economy is growing continually.

It is only natural that National products are so well received and so extensively used. Back of their manufacture is a story of research, development, and cooperation with the traction industry that determined the success of these products.

National products are highly economical from the standpoint of first and last cost. You can safely standardize on them in keeping with your modernization program.

Our specialists will be glad to confer with you and help you solve those problems.

NATIONAL BEARING METALS CORPORATION
More-Jones Division
ST. LOUIS, MO.


Trolley Wheels and Harps
Armature Babbitt Metal
“Tiger” Bronze Axle and Armature Bearings
Below: This is the machine—the "Mortar-Flow" pulsatator—that has revolutionized the method of concrete paving track.

When the "Mortar-Flow" principle is used, rails are vibrated. The track structure receives 5000 vibrations per minute. Concrete flows and sets. Water and air are forced to the top. The most minute crevices are completely filled. Poles vanish.

Above: Unretouched photo of rail and tie plate showing "Mortar-Flow." Observe how air and water are forced out. Also the perfect bond that results from the absence of all voids.
Here is the Plan

THE "MORTAR-FLOW" PRINCIPLE, as applied to paved track construction, was first developed for use with Steel Twin Ties, in order to obtain a better bond between rail, tie and concrete.

However, the "Mortar-Flow" Principle improves any type of paved track construction in which concrete has a part, either as paving foundation or track foundation.

High frequency agitation of concrete is recognized by leading Electric Railway men as a tremendous advance in track technique. They wish to gain the advantages of this method.

Many have inquired if it is possible to obtain the "Mortar-Flow" equipment—that gives to the concrete greater density and bonding strength—for track construction other than with Steel Twin Ties.

It is to meet this desire of Electric Railway men—and in answer to their inquiries—that we have formulated the following plan:

1. The "Mortar-Flow" Pulsator may be rented for vibrating the concrete around track for any type of paved track construction.

2. The service makes available the machine—the "Mortar-Flow" Pulsator—suitable in gauge, rail and electric drive for the particular job. It also includes the services of our field engineer to instruct your track foreman and operator in its use.

3. The charge is a flat rental, based on the single track footage of the job and the amount of track to be vibrated.

Complete information about the "Mortar-Flow" Principle is contained in "Uniformed Paved Track," the 1930 Paved Track Note Book. If you have not received a copy write for it.

Further details of our new policy will be gladly furnished upon request.

7% More Concrete

This type of Steel Twin Tie concreted with the "Mortar-Flow" method of paved track construction was installed by the Capital Traction Company, Washington, D. C., in May 1929.

This track has been in operation about a year. Temperatures have ranged during that time from zero to 100° F. Yet, there is no indication of any separation between the rails and concrete.

It is interesting to note that—due to the greater density caused by the elimination of air and the filling of the minute voids by the vibrating method—the actual amount of concrete needed was 7% per cent more than the estimated amount. (For details see Electric Railway Journal for March 1930, Page 120.)
The I. R. T. and the B. M. T.
carrying 70% of New York's traffic
select Socony lubricants

NEW YORK'S two great subway, elevated and
surface car systems — the I. R. T. and the
B. M. T.— carry approximately 70 per cent of the
total traffic in Greater New York. In 1929 an
average of more than six million people a day
depended upon these two systems.

Thus, it is imperative that schedules be main-
tained. The slightest delay is serious. Socony is
proud that, for so important a factor in smooth
operation as lubrication, Socony industrial and
automotive lubricants were chosen to lubricate
the power plants and rolling stock of these two
systems.

We submit this additional example of Socony
performance for your consideration in selecting
lubricants.

SOCONY
INDUSTRIAL LUBRICANTS
AUTOMOTIVE LUBRICANTS

STANDARD OIL COMPANY OF NEW YORK
DETROIT DOES IT!

In the automobile center of the World, the Department of Street Railways, City of Detroit, maintains and operates a street railway track system second to none . . . . . . . . . . .
Mr. John B. Timson
General Sales Manager
Metal and Thermit Company
New York City, New York

My dear Mr. Timson,

Agreeable to your request, I am enclosing several photographs showing the Thermit welding process as it was applied in our track construction work on Grand River Avenue. I am enclosing, also, other photographs which you may feel free to use in anyway that you desire.

We feel that we have accomplished a great deal in our track construction work by concentrating our forces on major repair jobs, and during the past three years we have been able to completely rehabilitate seventy miles of track, thereby bringing our entire track structures to a point where they are in a high state of efficiency. At the time the lines were purchased from the privately owned company in 1922, the City's transportation system comprised 374 miles of track, while the system today operates over 483 track miles, or an increase of 59 miles.

The Department of Street Railways now operates 1,096 street cars, and 261 motor coaches, serving an area of 146 square miles, and transporting approximately one and one-half million passengers daily.

Yours very truly,

[Signature]

General Sales Manager

The Thermit welding process helps to give smooth, fast transportation in Detroit.

Street railway transportation is a growing industry in Detroit. Track mileage has grown from 374 to 483 in the past seven years. An addition of 59 miles of track is certainly an indication of healthy growth. And much of the existing track has been rebuilt and modernized.

Thermit-welded joints are standard practice in Detroit on both new track and reconstruction. The accompanying chart indicates the way the use of Thermit has grown in Detroit as each succeeding year shows the superior quality and lowered maintenance cost of Thermit-welded track.
Another view of Woodward Avenue, downtown section of the City of Detroit.

### Number of Joints THERMIT-WELDED in Detroit

<table>
<thead>
<tr>
<th>Year</th>
<th>Number of Joints</th>
</tr>
</thead>
<tbody>
<tr>
<td>1926</td>
<td>1,000</td>
</tr>
<tr>
<td>1927</td>
<td>2,000</td>
</tr>
<tr>
<td>1928</td>
<td>3,000</td>
</tr>
<tr>
<td>1929</td>
<td>4,000</td>
</tr>
</tbody>
</table>

Starting with 1,714 Thermit-welded joints in 1926, the Dept. of Street Railways has increased its use of Thermit every year. The total in four years is 9,000 Thermit joints. Of this total only 55 or 0.60% have failed, but there have been no failures on new rail.

### Standard steel tie track construction costs in Detroit

- **Cost per mile double track**
  - Material: $74,000.00
  - Labor: $46,000.00
  - Total: $120,000.00

Rail and ties laid, lined, and surfaced—1,200 lin. ft. D. T. per eight (8) hours.
Thermit joints applied and ground—75 per eight (8) hours (21 men, 3 preheaters).
Concrete base, 2½" deep, cost $7.00 per cu. yd., 1,200 lin. ft. D. T. per eight (8) hours.
Compressed concrete paving 5" deep, $1.20 per sq. yd., 1,200 lin. D. T. per eight (8) hours.
Minimum labor rate $6.00 per hour.

Thermit-welding Tee rail—showing crucible in place, with charge.
Thermit-welding Tee rail—after reaction has taken place, but before removing moulds.

Detroit boasts fine rolling stock. Modern cars, well maintained, operating on smooth-surfaced Thermit-welded rails, give swift and quiet transportation.
Reconstruction work in Jefferson Ave., Detroit. 3200 feet of new track laid and Thermit-welded beside the old without stopping cars.

Five miles of track rebuilt at $13,350 below the engineer’s estimate . . . . . . . . . .

Two and one-half miles of double track on Jefferson Avenue, Detroit had to be rebuilt under heavy traffic. The estimate was $200,000. The job was started May 16, and completed July 2 . . . . . one and one-half months. The estimated cost was $200,000. The actual cost $186,652.39, a saving of $13,350.

On this job the report of Mr. P. A. Kerwin, Supt. of Ways and Structures, to the General Manager, reveals the unique time- and labor-saving methods used in replacing track. This method, it will be noted, was made possible by Thermit-welding the joints.

"The performance of this entire work," says the report, "within the estimated cost including those features not anticipated, as well as the dispatch with which the job was done, was made possible by the methods adopted, which I do not believe have ever been used elsewhere. The main feature was the setting up of a single track alongside the old tracks, which were kept in operation; which new section was completely tie-rodded, Thermit-welded, and ground while in this position. During the night, in the period of forty minutes service (between 1:00 and 3:00 A.M.) the old rail was cut out with acetylene torches and the new track slid into place. At the start of the job we put into place 1500 foot sections of single track; at the close of the job we were putting in 2200 foot sections . . . . "

The Metal & Thermit Corporation’s engineers are experienced and practical track men. They may be able to show you ways and means of saving money. Consultation and estimates gladly furnished without obligation.

METAL & THERMIT CORPORATION
120 BROADWAY, NEW YORK, N.Y.

PITTSBURGH  CHICAGO  BOSTON  SOUTH SAN FRANCISCO  TORONTO
Wire entanglements that developed the rectifier

For four long years, wire entanglements isolated neutral Switzerland. Copper could not get through. Rotating converters that required large quantities of copper were almost impossible to manufacture.

In that time of wire entanglements fifteen years ago, the steel-jacketed, large-capacity, mercury arc power rectifier was developed to the point of commercial practicability. True, the failures were numerous and costly; the experimentation still more costly; but they were cheap compared with copper.

As a result, the mercury arc power rectifier of today is twenty years ahead of the position it would have occupied in a normal peace-time development. The rectifier stands today a perfected, dependable, commercial product.

AMERICAN BROWN BOVERI CO., INC.
CAMDEN, N. J.
The Big Swing is to U.S. Tires

THE LANG TRANSPORTATION COMPANY
OF LOS ANGELES

—Another great Bus Fleet recently equipped with the

U. S. ROYAL
HEAVY SERVICE

UNITED STATES RUBBER COMPANY WORLD'S LARGEST PRODUCER OF RUBBER
Maintenance Costs are Lower with WHARTON Special Trackwork

Because dependable, soundly engineered special trackwork reacts so favorably on earnings, leading railway companies specify Wharton Trackwork...of TISCO Manganese Steel.

Whether your trackwork requirements are for complicated layouts, for subway or surface lines, steam crossings, slotted work, or for only a single piece, Wharton Special Trackwork will enable you to keep each item of maintenance at a minimum.

Send for complete details relative to Wharton trackwork specialties...or consult with Wharton engineers on any special trackwork problem.

William Wharton Jr. & Co., Inc.

EASTON, PENNSYLVANIA
TULC will....

1. Reduce the Number of Your Hot Bearings.
2. Save in the Cost of Your Maintenance.
3. Lengthen Your Oiling Periods.

Tulc is the true maintenance lubricant. Only TULC—made especially for lubrication of electric railway equipment—can give you these results.

It stays put—doesn’t drip or run off—does a real job of lubricating. It definitely reduces maintenance costs. Make a test of TULC.

The UNIVERSAL LUBRICATING CO.
Cleveland, Ohio
April, 1930
ELECTRIC RAILWAY JOURNAL
81

Products

Roebling

Electrical Wires and Cables give assurance of satisfactory power and lighting service from producer to consumer. Experienced workmen; carefully controlled processes of manufacture from copper bar to finished product; forty-five years of research development and production have made Roebling Electrical Products a standard of quality and reliability.

Large stocks of finished material are carried in our warehouses throughout the United States in order to provide "demand" service to our customers. We list a few of our products:

- Arc Welding Electrodes
- Gas Welding Wire
- Electric Arc Welding Machine and Trailing Cable
- Electrode Holder Cable
- Power Cables for Overhead and Underground Transmission
- Magnet Wires

ROEBLING
ELECTRICAL WIRES & CABLES

John A. Roebling's Sons Company	Trenton, New Jersey
Cut Refinishing Costs Over 50%

With this Modern Spray Painting Equipment

Reduction in labor cost . . . reduction in out-of-service time . . . reduction in reserve rolling stock . . . smoother, more durable finish . . . these are the advantages of Duco or other lacquer finishes when you are equipped with proper facilities for rapid application. Spray Booths are not a standardized commodity . . . they must be designed to meet the requirements of the object to be painted, and the existing conditions in the individual paint shop. The layout of your paint shop and the design of your Spray Booths demands the services of Mahon Specialists. On the ability of these Spray Booth Specialists depends the fire safety of the installation, the degree of efficiency, and the cost of operation. Mahon engineers are available to you, and will gladly lay out the most efficient, most economical Spray Booth installation obtainable for your particular requirements. Mahon Spray Booths are now in operation throughout the United States and Canada, France, South Africa, Australia, Brazil, Java and the Argentine. You are invited to arrange a consultation with Mahon engineers at your convenience.

THE R. C. MAHON COMPANY
DEtroIT, MICHIGAN
Manufacturers of Spray Booth and Exhaust Systems for every purpose.

MAHON
SPRAY BOOTHs & EXHAUST STACKS
DESIGNED FOR FIRE SAFETY
The coming of fine weather will release a rush of vehicular traffic. And it will become necessary for the electric railways which traverse heavily traveled districts to provide some means of protecting the thousands of motorists who will be on the roads. Better protection for locations on thickly traveled or thickly populated districts could hardly be found than automatic signals.

“Union” HC-5 Highway Crossing Signals provide a surer protection than that afforded by watchmen or the manually operated crossing gate. “Union” Highway Crossing Signals are working every minute of the twenty-four hours and they relieve the crossing of the consequences which are likely to occur if a watchman fails. And their distinctive indications shout in a language all can understand: “A car is coming.”
27 Out Of 34

Placed Repeat Orders

Thirteen years ago we gave, gratis, 34 Tool Steel pinions to 34 different electric railway companies who had not before used them.

We recently checked up. Out of the 34 companies 27 have placed repeat orders. The 27 companies have purchased a total of 628 gears and 2,057 pinions.

Thus is shown the fact that 79% of the companies who accepted the trial pinion have ordered more. Not once but several times.

Surely such a recommendation proves Tool Steel Gears and pinions "best by test."

"Tool Steel" Gears Reduce Maintenance

The Tool Steel Gear & Pinion Co.
Elmwood Place, Cincinnati, Ohio
DURING the past 40 years, the name LORAIN has been identified with many important developments in track equipment. The Dixon Tongue Switch—developed by LORAIN—is a solid casting of manganese steel. In addition to the Tadpole Heel feature, the Tongue is held in place by means of the Heel Plate which is provided with a raised floor to carry the car wheels on their flanges over the tongue heel. This eliminates the usual pounding of wheel tread on heel of tongue in the trailing position.

The Heel Plate is made of heat-treated cast chrome nickel steel, which facilitates the building up of floor by electro-deposit welding. The hold-down bolts and nuts are sealed with asphaltum to exclude moisture. Write our nearest District Sales Office for quotation.

The Lorain Steel Company
JOHNSTOWN, PA.

SUBSIDIARY OF UNITED STATES STEEL CORPORATION

PRINCIPAL SUBSIDIARY MANUFACTURING COMPANIES:

American Bridge Company
American Sheet and Tin Plate Company
American Steel and Wire Company
Carnegie Steel Company
Cyclone Fence Company
Federal Shipbuilding and Dry Dock Company
Illinois Steel Company
Minnesota Steel Company
National Tube Company
The Lorain Steel Company
Tennessee Coal, Iron & R. R. Company
Universal Portland Cement Company

Pacific Coast Distributors—United States Steel Products Company, San Francisco, Los Angeles, Portland, Seattle, Honolulu. Export Distributors—United States Steel Products Company, New York City

Lorain Sales Offices—ATLANTA CHICAGO CLEVELAND DALLAS NEW YORK PHILADELPHIA PITTSBURGH
Walter Bates Steel
EXPANDED SQUARETRUS
Trolley Poles

Four of the expanded angles shown above make one pole, including all lattice members.

Equally strong in all directions. Smooth surfaces, no bolt heads protruding.

Pole No. 10935—35' 0" overall weighs 414 pounds. Safe working load 1430 pounds.

Price, $20.65.

Complete line of accessories.
Bigger motors are needed for the fast starts which speed up city service. They put heavier strains on axles and armature shafts.

Reduce maintenance costs by specifying "Standard" Steel Armature Shafts and Axles for all equipment.

STANDARD STEEL WORKS COMPANY
PHILADELPHIA, PA.

<table>
<thead>
<tr>
<th>Products:</th>
<th>Steel Axles</th>
<th>Steel Springs</th>
<th>Armature Shafts</th>
<th>Rolled Steel Wheels</th>
</tr>
</thead>
<tbody>
<tr>
<td>New York</td>
<td>Chicago</td>
<td>St. Louis</td>
<td>Richmond</td>
<td>Portland</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>San Francisco</td>
</tr>
</tbody>
</table>
The figures above show a few of the many industries and the machinery manufacturers that use SKF anti-friction bearings.

**IN EVERY INDUSTRY — PREFERRED**

Look at the illustration of this advertisement again... nine representative industries... and in each SKF stands supreme. Forty-eight American railroads use SKF Bearings. Sixty-five airplane or aircraft equipment manufacturers use them. And in all the others, the manufacturers who build the machinery upon which these industries depend select SKF.

Why? Certainly not merely because SKF is the “Highest Priced Bearing in the World.” Certainly not merely because it IS high-priced.

...But because the bearing-wise engineer insists upon getting the performance— the dependability—the real economy of “The Highest Priced Bearing in the World.”

Nothing Is Apt to Cost So Much As the Bearing That Cost So Little

SKF INDUSTRIES, INCORPORATED

40 East 34th Street, New York, N.Y.

SKF

THE HIGHEST PRICED BEARING IN THE WORLD
A NEW HEAVY DUTY DESIGN FOR BUSES TRUCKS AND TRACTORS

LONG MANUFACTURING COMPANY DETROIT, MICHIGAN
SEAT MAINTENANCE
made easy

The operator who uses General Leathers for covering both bus and electric car seats doesn’t have a very tough maintenance problem on his hands. The task of keeping them up to a high standard is comparatively simple.

Easily washed with soap and water, they are clean and fresh every day. The attractive colors are fast, maintaining the original interior color scheme for the bus throughout its life.

No repairs are needed for General Leathers. These durable coverings often last the life of the bus. In fact, General Leathers seem to improve with hard usage because these genuine leathers are specially tanned for constant rough service.

Specify General Leathers for new rolling stock, or order direct for replacements. On quantity orders hides are cut directly from furnished patterns to eliminate all waste. Write for Samples.

Our Specialties which we Recommend for this Purpose:

Majestic Full Grain Leathers
20th Century Spanish Leathers
Genesco Leathers
Salon Hand Buffed Leathers

America’s Largest Producers

GENERAL LEATHER COMPANY

Makers of Famous Tried and Proven “00” Leathers

NEWARK, N. J.
Illustration: The SIXTH STREET BRIDGE over Allegheny River at Pittsburgh, Pa., selected by a national jury appointed by AMERICAN INSTITUTE OF STEEL CONSTRUCTION as the most beautiful bridge completed in 1928.

The STRUCTURAL STEEL in the superstructure of this bridge was produced by Carnegie Steel Company, and FABRICATED and ERECTED by

AMERICAN BRIDGE COMPANY

Subsidiary of United States Steel Corporation

General Offices: 71 Broadway, New York, N.Y.

Contracting offices in New York, Boston, Philadelphia, Baltimore, Pittsburgh, Cincinnati, Cleveland, Detroit, Chicago, St. Louis, Minneapolis, Duluth, Salt Lake City and Denver.

Manufacturers of Steel Structures of all classes particularly

BRIDGES and BUILDINGS

Pacific Coast Distributors:
U.S. Steel Products Co., Pacific Coast Department
San Francisco, Calif.
Los Angeles, Calif.
Honolulu, T.H.

Export Distributors:
United States Steel Products Company
30 Church Street, New York, N.Y.
"Our railway traffic is heavy—our upkeep costs are light"
Erected 28 years ago and still going strong

This feeder cable, erected 28 years ago by the Columbus, Delaware and Marion Electric Company, is a striking example of the reliability of aluminum cable.

Withstanding elements, for 28 years, this aluminum feeder has never been down—except once—and then a pole fell on it. The conductor is all-aluminum cable 397,500 cir. mils. The line potential is 600 volts.

28 years ago this aluminum feeder cable was the most economical line to buy and erect. Today, a similar line constructed of aluminum would still cost far less than any competitive material.

Is it any wonder that Public Utility Companies are using more and more aluminum feeder cable? Let us send you full particulars both about all-aluminum cables and A.C.S.R.—Aluminum Cable, Steel Reinforced. ALUMINUM COMPANY of AMERICA; 2463 Oliver Building, PITTSBURGH, PENNSYLVANIA.
Alcoa Aluminum Bus Bars save 25 cents on every dollar in installations such as this

Where maximum efficiency in service from bus bars must be obtained, Alcoa Aluminum Bus Bars are the obvious choice for several reasons.

In the matter of first cost, Alcoa Aluminum Bus Bars are cheaper because, for the same current carrying capacity, their weight is only 48% that of other metals commonly used for this work.

In the matter of the erection of the bars, Alcoa Aluminum Bus Bars also bring substantial savings. In the first place their light weight permits the design and erection of lighter supporting structures. Then too, the work of bending and assembling is speeded up—the bars are worked with surprising ease and labor costs are materially reduced.

Another unique advantage of Alcoa Aluminum Bus Bars is that they have a much lower operating temperature than bus bars made of competing metal.

Tables of weights, carrying capacities and other technical data are contained in the booklet, “Aluminum Bus Bars”. May we send you a copy? ALUMINUM COMPANY of AMERICA; 2463 Oliver Building, PITTSBURGH, PENNSYLVANIA.
Simplifying Tubular Pole Maintenance

M.I.F. Accessories for Tubular Poles provide the desirable combination of simplicity, durability, economy in first cost installed, high salvage value, etc., for the following phases of maintenance operations:

**Ground-Line Corrosion**—*C-Clamps* are used for those cases where there is no factory sleeve, or where that sleeve may be readily cut off. This Clamp has uniform internal diameter throughout to fit each of the standard sizes of pipe used.

**A-Clamps** are used where there is nominal reduction of 1" in external diameter of pipe, from sleeve to pole. This Clamp has two internal diameters, the upper being smaller.

**Upper Joint Corrosion**—*A-Clamps* are used for reinforcement where the upper section is nominally 1" smaller in external diameter and the lower section is un-swaged.

**B-Clamps** are used where the reduction is less, the lower section being swaged, and averaging about 3/4". This Clamp also has two internal diameters, the upper being smaller.

**Corrosion in Pole Steps, or under Upper Collars**—*C-Clamps* are used on bridges, etc., at corroded section—in some cases with short length of pipe of same diameter clamped in, replacing the corroded section.

**Pole Top Extensions**—*C-Clamps* in smaller sizes for extensions with pipe of same diameter, in street widening operations requiring raising of span wires, feeders, etc., at poles; also for supplementary circuits such as street lighting, traffic lights, etc.

**A-Clamps** similarly used with pipe 1" smaller.

**Temporary Construction**—Build up poles of any required height from poles on hand, lengths of pipe and *C-Clamps* or *A-Clamps*. All material salvaged following grade changes, street widening, etc. Clamps may be used either top or bottom of pole.

**Anchorage**—Williams Pole Mounts will anchor poles on bridges, retaining walls or rock—for permanent construction also.

Send for Sales Bulletin No. 3, featuring Accessories for Tubular Iron Poles.

Other M. I. F. Pole Hardware Specialties of interest to the Street Railways are

Insulated Suspension Hangers with split insulators for signal conductors, traffic light cables, etc.

Span Hangers with knob insulators for two conductors spaced 8" apart, for service parallel or perpendicular to span wire.

Guy Hooks and Eye Nuts. Send for new Guying Specifications.

Crossarm Gains for attaching wood arms to tubular or wood poles.

Williams Pole Mounts for economical salvaging of wood poles, or for special new construction—such as on rock, bridges, retaining walls, etc.

Send for full data and samples of items in which you are interested.

---

**MALLEABLE IRON FITTINGS COMPANY**

**Pole Hardware Department**

Factory and New England Sales Office: Branford, Conn.

Middle Atlantic States Sales Office: 30 Church St., New York, N. Y.

General Sales Agents elsewhere in U. S.

LINE MATERIAL COMPANY, South Milwaukee, Wis.

Canadian Manufacturing Distributor: Line & Cable Accessories, Limited, Toronto

---

Send for Sales Bulletin No. 3, featuring Accessories for Tubular Iron Poles.
Reduce maintenance weldable,

The illustrations below and at the left show the installation of a Bethlehem Silico-Manganese Three-way Turnout. This special work was assembled in Bethlehem's Frog and Switch Plant before shipment, as is all Bethlehem Special Work, making installation easy and assuring correct track alignment and perfect-fitting sections.

The wear-resisting Silico-Manganese frogs and mates used in this turnout will stand up under the impact of heavy traffic and have the added advantage of being easily repaired and built up on the job by any of the standard methods of welding.

Below are shown a Bethlehem Silico-Manganese Mate and a Frog, similar to those used in the turnout illustrated above. Bethlehem Silico-Manganese Mates and Frogs show remarkable shock- and wear-resisting qualities due to the Silico-Manganese steel of which they are made. The mates and frogs are of one-piece construction and can be easily welded to connecting track by any of the standard methods.
INSTALLATIONS of Bethlehem Trackwork at heavy-traffic intersections have demonstrated the ability of Silico-Manganese steel to stand up under continuous pounding.

The wear-resisting properties of Silico-Manganese steel are well established. It is accepted as the standard for high-grade tools, such as punches, chisels, shear blades, etc., as well as for highest-grade automobile springs and other parts subject to shock and wear. Silico-Manganese steel of tool-steel quality, possessing great tensile strength, is used in the manufacture of this new trackwork.

The weldability of Bethlehem Silico-Manganese Trackwork has brought many new advantages. It is readily welded by any of the standard methods, such as electric-arc, oxy-acetylene and Thermit welding.

Bethlehem Silico-Manganese Trackwork can be installed at all heavy-duty locations with confidence that it will stand up—not only under today's traffic, but under the still greater traffic volume of tomorrow.

BETHLEHEM STEEL COMPANY

BETHLEHEM, Pa.


Cincinnati, Detroit, Chicago, St. Louis

Pacific Coast Distributor: Pacific Coast Steel Corporation, San Francisco, Los Angeles, Portland, Seattle, Honolulu.

Export Distributor: Bethlehem Steel Export Corporation, 23 Broadway, New York City.

Bethlehem Silico-Manganese Crossing and Turnout installed at a busy traffic intersection in a large eastern city.

Bethlehem Silico-Manganese crossing assembled in Bethlehem's Frog and Switch Plant before shipment. Every crossing is assembled in well-lighted shops by careful workmen, assuring easy assembly and installation in the field.

with this wear-resisting trackwork
The name EARLL in the electric railway industry is associated exclusively with trolley catchers and trolley retrievers. Specializing on these two devices year after year, EARLL has produced devices which are superior in every detail.

Improvements and refinements developed by years of experience have made EARLL Trolley Catchers and EARLL Trolley Retriever the best that money can buy.

In 16 countries EARLL Trolley Catchers and Retriever are giving the utmost in service with a minimum of attention and maintenance.

Simple—light weight—quick—certain in action, these two devices are indispensable to good trolley car service. They facilitate operation, make faster schedules possible, protect overhead, poles and rolling stock.

*Fill the oil reservoir only once every 3 months.*

C. I. EARLL
YORK, PA.
U. S. A.
In the OKONITE factory, Dundee tape is frictioned in this heavy callender which forces the adhesive into and through the mesh of the fabric. The wide roll of frictioned material is then slit into suitable widths, rerolled and packed.

DUNDEE "A" FRICTION TAPE DOES NOT SEPARATE

In addition to the ready adhesiveness of Dundee "A" friction tape, it has a definite homogeneousness that is rarely found in the lower price tapes.

The original process for making friction tape involved rubbing (frictioning) the adhesive compound into and through the mesh of cotton fabric by means of heavy callender rolls. From this process the product originally took its name.

But the high speed production of cheap tapes precludes the use of these frictioning rolls. In their place is substituted a spreading machine which merely surfaces both sides of the fabric with the sticky compound. The fault of this process is that the adhesive is not thoroughly worked into the fabric and may separate from it when the tape is unwound, leaving spots which are not sufficiently covered with the adhesive. Obviously, such a surfaced tape has not the permanent adhesive qualities of a friction tape made by the frictioning process.

Dundee "A" friction tape is a true friction tape made by the frictioning process, and the adhesive will not separate from the fabric under any condition.
FIFTEEN ways to speed up car and bus repairs, and reduce track maintenance costs, with air power—are illustrated by one of the largest city railways in the world.

Before air paint guns were used in the shops, two men with brushes used to paint a car in eight hours. Now they do it with paint sprays in one hour.

Air drills bore 26 holes through 2-in. platforms in 15 minutes; and 66 holes an hour for the platforms of steel cars.

Compressed air grinders, riveters, rivet cutters, and numerous air hoists are also at work.

Air tests brake valves, and pneumatic doors; and works in gas furnaces and soldering torches. Sandblasting and cleaning apparatus are other possibilities.

One of the Sullivan compressors is a single stage unit installed 21 years ago. The other is a modern Sullivan Balanced Angle Compressor.

The flexibility and convenience of air not only cut labor costs for the railway—but they may reduce the investment in rolling stock.

Even a small compressor, such as the Sullivan belt 68-ft. machine, will earn a substantial profit. Sullivan Compressors are available to 5100 feet capacity, for all drives.

For track maintenance, Sullivan Portable Compressors, Rock Drills, Concrete Breakers, Clay Spaders, and Portable Hoists are available to suit all conditions.

Send for these Booklets 83-R, 83-W, and "Speed Up With Air."

SULLIVAN

Sullivan Machinery Company
809 Wrigley Bldg., Chicago
Offices in all principal cities of the world
GARY
WROUGHT STEEL WHEELS

Are made to meet the most
Exacting Conditions to which Modern Transportation is subject

Illinois Steel Company
Subsidiary of United States Steel Corporation
General Office
200 South LaSalle Street, Chicago
"NOTHING SUCCEEDS LIKE SUCCESS"

That is an old saying that well applies to Art Rattan Seats for use in street cars. The success of Art Rattan Seats is proved by their steadily increasing use in the bus field. Now manufacturers of street cars find that Art Rattan Seats add definite sales value to their products.

Sturdy frames, smart tailoring, luxurious upholstery, greater comfort result from long seat building experience and a knowledge of what the car builder requires to meet car riders demands.

ART RATTAN WORKS, INC.
Builders of DeLuxe Bus Seats
CLEVELAND • • • • • • OHIO
Where Safety and Appearance Dominate

In the heart of a busy city, where safety must be maintained at its maximum, there is nothing so important in the selection of electric line poles as the certainty of their strength and endurance. Another important factor, of course, is their appearance.

Both of these requirements are embodied in the tubular steel pole and reach their maximum effectiveness in NATIONAL Poles, because of their great strength and reliability under severe conditions of service and their clean cut, neat appearance which adds to rather than detracts from the built-up surroundings.

Wherever the factors of safety and appearance dominate, it will pay you to specify NATIONAL Poles. Made by the largest manufacturer of Tubular Products in the world, with facilities for meeting a wide range of specifications in pole construction. Ask for Bulletin No. 14—Tubular Steel Poles.

For additional protection against atmospheric corrosion use NATIONAL Copper-Steel Line Poles. Steel containing a small percentage of copper makes it more resistant to corrosion caused by alternate wet and dry conditions. The fact that tubular poles are constantly exposed to such conditions, makes the use of copper-steel particularly desirable for this purpose. Ask for Bulletin No. 11—Copper-Steel Pipe.

NATIONAL TUBE COMPANY • Pittsburgh, Pa.
Subsidiary of United States Steel Corporation
To be modern in design and construction is characteristic of Differential track laying equipment.

Outstanding for its modern features is the Differential Locomotive Crane Car.

One man, from a revolving turret, controls the crane for any loading or unloading operation, for handling rails and bridge timbers, pole setting or special track work.

The Differential Crane is fast, conforms to Electric Railway clearances, does not impede traffic on adjacent tracks.

Equally modern are Differential Dump Cars, Differential 3-Way Dump Trucks and Clark Concrete Breakers.

Comparative cost records of representative Electric Railways prove that Differential modern equipment substantially reduces track laying costs.
On the assumption that every motor transport operator is vitally interested in making the quickest possible stops in the shortest number of feet, the Automotive Air Brake is recommended as the one method of control which offers these advantages with incomparably smooth, effortless operation and perfect safety.

Put your present stopping ability to the yardstick test . . . Compare the result with the flexibility of modern, Automotive Air Brakes and you have the answer to the wide-spread acceptance power brakes enjoy today.

In making these comparisons, specialists in the art of power brake control are always ready to assist you. These men are technically trained to render invaluable consulting service to the fleet operator and may be had by addressing the BENDIX - WESTINGHOUSE AUTOMOTIVE AIR BRAKE COMPANY at Pittsburgh, Penna.
Here is the Logical POLE for City Streets

No one considered pole appearance a few years ago. Poles were an engineering problem only. Now, the public is protesting vigorously against the unsightly curb-line forest of many of our cities.

A score of leading utilities have effectively silenced this agitation by installing Union Metal Fluted Steel Poles. Union Metal Poles were designed particularly for city streets. Instead of separate poles for each utility, one set carries all street electrical equipment. And the poles, themselves, are attractive. The perfect taper, the fluting, and the decorative base and cap remove the pole from the merely utilitarian classification. Property owners never object to this type of equipment. And so Union Metal Poles build good will, permanently and effectively.

We would like to tell you about some of the many interesting installations and applications of Union Metal Poles. Write the nearest representative for complete information.

THE UNION METAL MANUFACTURING COMPANY
GENERAL OFFICES AND FACTORY • CANTON, OHIO
SALES OFFICES: New York, Chicago, Philadelphia, Cleveland, Boston, Los Angeles, San Francisco, Seattle, Dallas, Atlanta
DISTRIBUTORS
Offices in all principal cities

UNION METAL
DISTRIBUTION POLES
"TALKIE"—a success on street car

... with Johns-Manville insulation

By successfully presenting a talkie in one of their cars as it traveled through the noisy streets of San Francisco, the Market Street Railways demonstrated to the public in a dramatic way the new quiet that has been put into more than 100 of their old cars by the use of Johns-Manville Acoustikos Felt—a form of body insulation.

In all types of railway equipment, the reduction of noise is becoming increasingly important. To solve this problem is comparatively simple. There are several forms of J-M Insulation that will effectively keep out external car noises. For many years J-M Insulation has acted as a sound deadener on railroad passenger cars throughout the country. It is easily adapted to re-built street cars as well as new cars. The diagram at the right shows the simplicity of its application.

On one high speed electric railway system, nine hundred cars have been J-M Insulated to provide car comfort for passengers. Recently another three hundred electric cars were so equipped. Wherever street railways have installed J-M Insulation passenger traffic has been increased. It is a worth-while investment in riding comfort that is rapidly becoming a necessity. Let us tell you more about this sound-absorbing idea made possible by J-M Insulation. The coupon will bring you complete information.

The Market Street Railways, with the cooperation of the Public Theatres and the use of J-M Insulation showed for the first time in moving picture history a talking picture in a street railway car. A schedule was so figured that the car would leave at a certain street at the beginning of the picture and make a complete circuit of the city of San Francisco, without stopping, arriving at the point of departure just as the picture ended.
THE SHORT ARC LEAPS

Flash! The short arc leaps in between the round terminal and the steel rail, clings without spluttering. A short arc makes the best weld and Erico AT-R Bonds are designed to make a short arc easy to hold. Only a small amount of metal is required in order to secure a large contact area with the rail. Note the sleeve protecting the bond cables from welder's arc.

The current path through the weld metal to the rail is the shortest possible, contributing greatly to the low resistance of the bonded joint.

We will be glad to send detailed information and samples. Write.

The Electric Railway Improvement Company
2070 E. 61st Place, Cleveland, Ohio

Write for details and prices.
Waiting time of patrons is reduced by possible shorter headway between cars... time consumed in making stops decreased by quick brake application... standing time of cars reduced by rapid passenger interchange... and quick get away permitted by prompt release of the brakes.

SAFETY CAR DEVICES CO.
OF ST. LOUIS, MO.
Postal and Telegraphic Address:
WILMERDING, PA.

CHICAGO       SAN FRANCISCO       NEW YORK
WASHINGTON    PITTSBURGH
A TROLLEY WHEEL
—seems to be a simple thing

BUT it isn't. It has to race along the wire, rain or shine, sparking when ice collects, pounding against trolley ears, and keep running smoothly all the time.

KALAMAZOO

trolley wheels and harps are built by experts — experts who devote their time and energies to no other task. Kalamazoo trolley wheels are the result of over a quarter of a century of study. Is it little wonder that they have received the respect of the industry—that they are standard equipment wherever the best is recognized?

May we send you bulletins and complete information?

The Star Brass Works
KALAMAZOO, MICHIGAN

CONTINUOUS JOINT BARS FOR WELDING

THE RAIL JOINT CO.
165 Broadway, New York, N. Y.
More Osgood Bradley Cars...Hyatt equipped

Street railway and interurban cars, with Hyatt Quiet Roller Bearing journals, are smoother running and easier riding...both contributing factors to punctual service, public good will, and, therefore, increased patronage.

Sturdy Hyatt bearings reduce friction and wear, cut power consumption and eliminate the costly maintenance of brass bearing journals.

Hyatt equipped cars waste no time or power when starting, and gather speed faster. The jerking, common with friction bearing journals, is eliminated.

The outstanding economies of Hyatt operation have won the endorsement of many American properties. Hyatt engineering counsel, for new cars or changeover on existing equipment, is available at your call.

HYATT ROLLER BEARING COMPANY
Newark Detroit Chicago Pittsburgh Oakland

HYATT
ROLLER BEARINGS
PRODUCT OF GENERAL MOTORS
COMMONWEALTH
TRUCKS ELIMINATE REPAIR AND
MAINTENANCE COSTS

COMMONWEALTH Devices are backed by an engineering and designing skill of such high grade as to assure perfect products. They are standard equipment on many railroad cars and Locomotives. The Commonwealth Motor Truck, due to its faultless construction and performance, leads the field for which it is designed.

Write for full information, then make your own comparisons.

GENERAL STEEL CASTINGS CORPORATION
COMMONWEALTH DIVISION
GRANITE CITY, ILLINOIS

Street Railway Officials!

The MERGOTT CARFARE CARRIER

A Great Help to You and Convenience to Your Riders

Sell the Mergott Carfare Carrier at cost to your riders or distribute them complimentary. This handy token container eliminates making change; saves time and confusion and prevents mistakes. The Mergott Carfare Carrier produces good will, and, on the reverse side, can carry your advertising message to every patron. Write now for full particulars; samples and quotations.

The J. E. MERGOTT COMPANY
Manufacturers
318 to 368 Jelliff Ave.
Newark, N. J.
Where the going is TOUGHEST

WHERE trolley wire is attached to overhead switches, —ears,—hangers,—pulloffs, and on curves, a material of Phono-Electric’s strength, conductivity, toughness, and ductility can easily prove itself.

Phono-Electric has met the demands of outdoor use under every condition, resisting shocks and stresses with an ample margin of safety.

Possessing a tensile strength approaching that of steel, Phono-Electric provides the same advantages over steel span wire that it does over copper trolley wire.

It is a specialized alloy offering the strength and resistance to corrosion indispensable to the modern overhead—including clamps, hanger rods, bolts, nuts, and wire. Economy of maintenance and consistently reliable service are by-words with Phono users.

Write to Bridgeport for facts on the application of Phono Alloys for the entire catenary structure.

"Phono-Electric" Bronze Alloy TROLLEY & SPAN WIRE

BRIDGEPORT BRASS COMPANY, General Offices, East Main St. BRIDGEPORT, CONN.
To cut down on replacements—Boyerize

Replacing "disabled" parts makes operating expenses soar. Cut down on these needless expenditures.

"Boyerize!"

Boyerized Parts on your cars will outlast ordinary car parts of untreated steel three to four times. A special process—Boyerizing—enables these parts to resist wear and tear.

Keep your cars in operation by replacing with Boyerized Parts—they will out-live the cars themselves.

Check over the list—send for quotations

BEMIS CAR TRUCK COMPANY
Electric Railway Supplies
REPRESENTATIVES:
F. F. Bodler, 903 Monadnock Bldg., San Francisco, Cal.
W. F. Mckenney, 62-66 First Street, Portland, Ore.
J. H. Beston, 1539 Broadway, New York City, N. Y.
A. W. Arlin, 519 Delta Building, Los Angeles, Calif.

The Indestructible Barricade

Quickly erected, using standard sized lumber, the TOLEDO Folding Steel Horse is rigid, strong and will outlast a dozen wooden horses. Folds compactly. Eight heights, 18 to 60 inches. Ask your dealer or write us for prices.

TUCO PRODUCTS CORP.
30 Church St., New York
Railway Exchange Bldg., Chicago

The Flooring That Has Met With General Approval in the Electric Railway Field

FLEXOLITH
A manual of finance for the average business

All the perplexing financial questions which confront the average business man are carefully analyzed in this practical volume. Tested ideas, methods and policies which contribute to the financial soundness of the business organization are discussed in detail.

**Applied Business Finance**

By EDMUND E. LINCOLN

Economist, International Telephone and Telegraph Corporation; formerly Chief Statistician and Economist, Western Electric Company, Inc.

826 pages, 5 x 8 inches, with 114 forms and tables

$5.00 postpaid

The experiences of more than 125 totally different kinds of businesses and industries and several thousand separate concerns are represented in this volume. The book from end to end sets forth the point of view and the seasoned experience of the conservative and thoroughly successful business man. It stresses those underlying principles of finance which have stood the test of years of experience and which, today, are endorsed by the leaders in their field.

Answers Every Financial Question

Whether your problem is launching a business enterprise, reorganization, raising new capital, or handling any of the various financial situations in your business, you will find in this manual the sound information which will guide you to the results you desire. In addition, this book analyzes and presents the financing problems involved in the actual production and selling of goods.

The Business Executive's Viewpoint

Special emphasis is laid on the practical service this book offers to those executives responsible for the internal financial organization and administration of their firms. Anyone who handles or contributes to the financial stability of a firm—or who expects to assume this responsibility some time—will find a wealth of practical data in this work.

SEE THIS BOOK FOR TEN DAYS FREE

—Simply mail the coupon

**McGraw-Hill**

FREE EXAMINATION COUPON


You may send me a copy of Lincoln's APPLIED BUSINESS FINANCE, $5.00 postpaid, for 10 days' free examination. I agree to remit for the book, or return it, postpaid, within 10 days of receipt.

Name

Home Address

City and State

Name of Company

Occupation

(Fixed sent on approval to retail purchasers in U. S. and Canada only.) E. 4-28

**BRICK PAVEMENTS**

Perm Positive Control During Construction

Supervision during construction is simplified if you build a brick-surfaced pavement.

The brick themselves can be inspected prior to use. Made in modern plants, they are uniform in size, appearance and wearing qualities. There is no guess-work as to what the quality of the finished pavement will be.

Long life with low upkeep and the ease with which the track structure may be repaired make brick the ideal pavement for track areas.

For further information, address National Paving Brick Manufacturers Association, 1245 National Press Building, Washington, D. C.

**VITRIFIED BRICK PAVEMENTS**

Face the Future—Pave with Brick
The New Chicago Surface Lines car

One of the 33 new type, center exit cars built by—

CUMMINGS CAR AND COACH CO.
111 W. Monroe St.
Chicago, Ill.

A Fare Registration System that Gains the Confidence of ALL

The durability, accuracy, speed and convenience of International Registers has given them the nation-wide reputation for efficient service that they have enjoyed for over thirty years.

Electric operation gives the new types even greater speed, accuracy and convenience. Registers can be furnished for operation by hand.

The International Register Co.
15 South Throop St., Chicago

Drip Points for Added Efficiency

They prevent creeping moisture and quickly drain the petticoat in wet weather, keeping the inner area dry.

The Above Insulator—No. 72—Voltages—Test—Dry 84,000
Wet 21,600. Line 10,000.

Our engineers are always ready to help you on your glass insulator problem. Write for catalog.

Hemingray Glass Company
Muncie, Ind.
Est. 1848—Inc. 1870
New Brake Riggings make Diamond-S Brake Shoes imperative

The new, quick acting, heavy duty brakes which have been designed, put heavier demands on brake shoes. It is now more necessary than ever to get shoes that will stand up under the strain. Where, in more leisurely days of the past, ordinary cast iron might get by, today only a scientifically made brake shoe will deliver economical and satisfactory service.

Diamond-S brake shoes have demonstrated on many electric railways that their scientific construction lowers the cost of brake shoe maintenance. Their economy and greater dependability make their selection imperative for the exacting service of modern operation.

The American Brake Shoe and Foundry Company
230 Park Ave., New York
332 So. Mich. Ave., Chicago

Heavy Service on the Milwaukee Electric Railway & Light Co.

NACHOD rear protection 3-indication color light signals protect the fast and frequent movements on this progressive and high-speed interurban.

Nachod Spells Safety
Brilliant indications with a reserve lamp for each indication display.

RED—Stop. YELLOW—Proceed prepared to stop at next signal. GREEN—Proceed.

The motorman knows the condition of the track two blocks in advance and is always prepared by the yellow whenever the stop signal is to be displayed. Normal closed circuits of the highest safety with normal closed contactors.

Nachod signals are also made for single track, absolute and permissive, for stub-ends and for highway crossings. Nachod Headway Recorders, overhead trolley contactors and relays operate from the 600 volt trolley circuit.

Put your problem up to us.

Nachod & United States Signal Co., Inc.
4777 Louisville Ave., Louisville, Ky.
We Also Manufacture
Turn-right Signals, Automatic Block Signals for Single and Double Track, Stub End Signals, Annunciator Signals, Headway Recorders.
JOHNSON FARE COLLECTING SYSTEMS

Johnson Electric Fare Boxes and overhead registers make possible the instantaneous registering and counting of every fare. Revenues are increased 1½ to 5½% and the efficiency of one-man operation is materially increased. Quicker boarding of passengers with resultant reduction in running time for the buses. Over 5,000 already in use. When more than three coins are used as fare, the Type D Johnson Fare Box is the best manually operated registration system. Over 60,000 in use.

Johnson Change-Makers are designed to function with odd fare and metal tickets selling at fractional rates. It is possible to use each barrel separately or in groups to meet local conditions. Each barrel can be adjusted to eject from one to five coins or one to six tokens.

Johnson Fare Box Co.
4619 Ravenswood Ave., Chicago, Ill.

PANTASOTE TRADE MARK

—the car curtain and upholstery material that pays back its cost by many added years of service. Since 1897 there has been no substitute for Pantasote.

AGASOTE TRADE MARK

—the only panel board made in one piece. It is homogeneous and waterproof. Will not separate, warp or blister.

Standard for electric railway cars and motor buses

Samples and full information gladly furnished.

The PANTASOTE COMPANY, Inc.
250 Park Avenue
NEW YORK

STUCKI SIDE BEARINGS

SPECIAL CARBON STEEL
HEAT TREATED

LARGE WEAR SURFACES
FREE ROLLER
ONLY TWO PARTS

A. STUCKI CO.
OLIVER BLDG., PITTSBURGH, PA.

Canadian Representative:
The Holden Co., Ltd., Montreal, Canada

Special Maintenance

Study every car item this spring. Sometimes overlooked details later cause the most trouble.

"Silver Lake Trolley and Bell Cord for replacements on all cars." This order has made durable, economical Silver Lake products standard for the industry. Specify Silver Lake this spring.

Samples on request.

SILVER LAKE COMPANY
Newtonville, Mass.
Chillingworth One-Piece Gear Cases

Seamless, Rivetless, Light in Weight

Chillingworth One-Piece Gear Cases will wear longer because they are made of tough durable deep drawing steel, properly annealed and supported by strong Malleable Iron Brackets, or Forged Steel if you prefer. They meet all operating requirements. Used extensively on rapid transit service.

Most steam road electrifications use Chillingworth Cases.

Chillingworth Manufacturing Co.
Jersey City, N. J.

REPRESENTATIVES

CANADA
Railway & Power Eqn. Co.
J. W. Gethe

ENGLAND
Tool Steel Gearing & Equip Co.
A. P. Champion

Safe on Trailing Through

The Racor Three-in-One Switch Stand (Style No. 100-A) combines in one compact housing three distinct features:

1. **Rigid Switch Stand**
   For free hand operation in either direction. Points must be fully thrown before switch stand can be latched, target always indicating actual position.

2. **Automatic Return**
   Two springs housed in switch stand base, independently connected with switch stand spindle through roller bearings, either of which springs would automatically return trailed switch points to original position when set against train movement.

3. **Retarded Return**
   An adjustable oil cylinder, housed in switch stand base, allows free opening of points but retards their return so that points will remain open until last pair of wheels has passed, when points will be returned, as slowly as may be desired, until almost completely returned; then the points rapidly close into position.

Behind Racor Service stand nine plants specializing in the manufacture and distribution of railroad track turnout and crossing equipment, including Manganese Work for heavy traffic.
<table>
<thead>
<tr>
<th>Name</th>
<th>Address</th>
<th>Services</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ford, Bacon &amp; Davis</td>
<td>39 Broadway, NY</td>
<td>Engineers, Consulting Engineers, Constructors</td>
</tr>
<tr>
<td></td>
<td></td>
<td>PHILADELPHIA CHICAGO SAN FRANCISCO NEW ORLEANS</td>
</tr>
<tr>
<td>Stevens &amp; Wood</td>
<td>60 John Street, NY</td>
<td>Transportation Examinations and Reports</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Philadelphia CHICAGO SAN FRANCISCO NEW ORLEANS</td>
</tr>
</tbody>
</table>
| Albert S. Richey     | Worcester, MA    | Electric Railway Engineer, Examinations, Reports, Appraisals, Rates, Rates of Operation, Service |}
| Hemplill & Wells     | 50 East 42nd St., New York | Consulting Engineers, Appraisals, Investigations, Valuations, Reorganization, Management, Construction |
| E. H. Faile & Co.    | 441 Lexington Ave., New York | Designers of Garages, Service Buildings, Terminals |}
| The Beeler Organization |                  | Engineers and Accountants, Traffic - Traction, Bus Equipment, Power Management, Appraisals, Operating and Financial Reports |
|                      |                  | Current issue LATE NEWS and FACTS free on request                       |
| J. Rowland Bibbins   | 2301 Connecticut Ave., Washington, D.C. | Consulting Engineer, Transportation Utilities, Transit-Traffic Development, Surveys, Street Plans, Controls, Speed Signals, Economic Operation, Schedule Analyses, Bus Coordination, Rerouting, Budgets, Valuation, Rate Cases and Ordinances |
| Bylesby Engineering and Management Corporation | 231 S. La Salle Street, Chicago | New York Pittsburgh San Francisco |
| Walter Jackson       |                  | Consultant on Fares and Motor Buses, The Weekly and Sunday Pass, Differential Fares - Ride Selling |}

Note: The table format is used to display the list of engineers and consultants in a structured way.
A Personal Want—
can invariably be filled by a friend.

For Every Business Want
"Think SEARCHLIGHT First"

The Searchlight Section of this issue covers the current business wants of the industries in which this paper is read.

H. U. WALLACE
All Work Under Personal Supervision
6 N. Michigan Ave. 420 Lexington Ave.
Chicago New York City
Phone LEXINGTON 8480

ELECTRIC RAILWAY JOURNAL
123

May Issue Closes APRIL 16th

Early receipt of copy and plates will enable us to serve you best—to furnish proofs in ample time so changes or corrections may be made if desired.

Electric Railway Journal.

The P. Edward Wish Service
50 Church St., NEW YORK
Street Railway Inspection DETECTIVES
131 State St., BOSTON

THE P. EDWARD WISH SERVICE
50 Church St., NEW YORK
Street Railway Inspection DETECTIVES
131 State St., BOSTON

A Business Want—
must be satisfied by someone in your industry.

THERE'S A TRENTON TOWER for Railway Work, too!

From our forty-four years' experience we have built this Treton Utility Tower to handle overhead construction on the railroads. It operates on ARA standard gauge track and has a wheelbase of 8 feet. Body platform 6 feet wide, 12 feet long, and about 7 feet from top of rails to top of platform. Equipped with brakes, Pin Couplings, and Rail Clamps so track can be locked in position.

J. R. McCARDELL AND COMPANY
301-401 S. WARREN ST., TRENTON, N. J.

The 2000 Type N-L

Bus Heater

Increased heating efficiency, simplified assembly, absolute insulation from body, easy installation and low cost are the features of the new 2000 type Heater. Supplement B-4 mailed on request, contains a complete description.

The Nichols-Lintern Co.
7960 Lorain Ave., Cleveland, Ohio
SEARCHLIGHT SECTION

EMPLOYMENT and BUSINESS OPPORTUNITIES—USED and SURPLUS NEW EQUIPMENT

UNDISPLAYED—RATE PER WORD:
Positions Vacant and all other classifications, excepting Headline, 10 cents a word, minimum $1.00 an insertion, payable in advance.

Proposals, 40 cents a line an insertion.

New "SEARCHLIGHT" Advertisements
must be received by 5 P.M., the 20th of the month to appear in the issue out the following month.

Address copy to the Searchlight Department
Electric Railway Journal
Tenth Ave. at 36th St., New York City

POSITION VACANT


POSITIONS WANTED

SUPERINTENDENT—maintenance or operation; 18 years experience street railway work. Now unemployed, desires change. Any location. Best references. PW-201, Electric Railway Journal, Tenth Ave. at 36th St., New York.

SUPERINTENDENT—transportation, broad experience, successful record dealing with labor, public, public officials, increasing revenue, decreasing expense. Excellent references. PW-203, Electric Railway Journal, Guardian Bldg., Cleveland, Ohio.

WAGER—supervising as carhouse foreman, broad experience, best of references. Will go anywhere. PW-204, Electric Railway Journal, Tenth Ave. at 36th St., New York.

YOUNG man, four years with public relations and advertising department of large property wishes change. Technical graduate, capable of establishing and managing department. Can do anywhere, on first offer, in three days. PW-206, Electric Railway Journal, 226 No. Michigan Ave., Chicago, III.

AGENTS WANTED

Agents Wanted
For a portable, high efficiency electric welder for street railway circuits. Portability such that one man can easily handle the machine on the street. Machine is provided with pneumatic tires and springs so that it can be towed for long distances at high speed. Current consumption from five hundred volt trolley is twelve amperes for two hundred amperes in the arc circuit. Normal welding capacity two hundred amperes; maximum capacity three hundred amperes. Write to the Economy Electric Products Co., 2400 Woodward Ave., Cleveland, O.

FREE BULLETIN

MONARCH Machinery Company, 300 No. Third Street, Philadelphia, Pa.—24 page bulletin of "Monarch "used and surplus presses, threading machines, boring mills, drilling machines, grinders, lathes etc. Illustrated and priced. Copy free on request.

Wanted to Purchase

Electric Railways in Their Entirety
HIGHEST PRICES PAID
DISMANTLING DONE BY US

The Allite Corporation
666-638 Broadway, New York, N. Y.

THE PERRY, BUXTON, DOANE CO.

New and Relaying Rails
All Weights and Sections

We specialize in buying and dismantling entire Railroads, Street Railways, and all other industrial properties which have ceased operation. We furnish expert appraisals of all such properties.

May We Serve You?

THE PERRY, BUXTON, DOANE CO.

Rail Department, Philadelphia, Pa. General Department, Boston, Mass.
Pacific Sales Office—Falling Building, Portland, Oregon

4000 Tons 85-Lb. ASCE Rail
with angle bars in stock ready for immediate shipment. Attractive prices quoted.

M. K. FRANK
15 Park Row, New York, N. Y.

Double Truck Cars
3—Modern light weight, for sale direct to a street railway, also Double Truck Snow Plow
All in first class condition.

INTERSTATE Street Railway Company
Attleboro, Massachusetts

Searchlight can help you—

HUNDREDS of miscellaneous business problems pertaining to Civil Engineering and Construction can be quickly and easily solved through the use of the Searchlight section of this publication.

When you want additional employees, want to buy or sell used or surplus equipment, seek additional capital or have other miscellaneous business wants—advertise them in the Searchlight Section for quick, profitable results!

Think "SEARCHLIGHT" first
The Last Word in Modern Cars!

6—Light Weight Double Truck Passenger Cars
two to four years old—weight 30,000 lbs.—excellent condition—ready for immediate shipment.

Railway Motors.
Sweepers and Snow Plows.
Controllers. Compressors.
Reasonably priced.
Let us have your requirements.

H. E. SALZBERG COMPANY, INC.
225 Broadway — Est. 1898 — New York City, N. Y.

Railways Purchased in Entirety
When business judgment dictates the wisdom of abandoning part or all of your electric railway equipment—don’t let it rust away in idleness waiting for the chance piece-meal buyer to gradually unburden you, at big losses.

Do the one practical thing. Sell it as a unit to SALZBERG—complete with power plant, track, feeder and trolley wire system and rolling stock.

You will get FAIR dealing and the highest prices that are based solely on present day market values. Save money, time and trouble. We will do our own dismantling. No obligation for our proposition.

H. E. SALZBERG COMPANY, INC.
225 Broadway — Est. 1898 — New York City, N. Y.

FOR SALE

12—All Steel PASSENGER CARS
Seating Capacity 59. All in first class condition, recently painted and equipped for train operation.

1—All Steel 2—Semi-Steel FREIGHT MOTORS
Baldwin Truck H. L. Control
W. 333 Motors, Straight and Automatic Air.

Prices upon Application

The Joseph Schonthal Company
COLUMBUS, OHIO

MAKE YOUR SELECTION

FROM 173 BIRNEY CARS
(60 May Be Sold)

Now in Operation Splendid Condition Low Price

For Complete Information Write:
W. M. McKee CO.
601 Commonwealth Bldg., PHILADELPHIA, PA.

FROM SALE

1000 K. W. and 500 K. W.
W. 841 Westinghouse modern type Synch. Motor Generator Sets
D.C. Volts 877/600 A.C. Volt, 2 ph., 60
F. 2100 comp’d, w/d. Interpole Generators set
80% F. F. Motors with Direct Conn.
Speed 1000 Kw., 900 r.p.m. 500
Kw., 1200 r.p.m. complete A.C. and D.C.
control switchboards.

Condition Strictly First Class
For Particulars Apply
JOHN D. CRAWBUCK CO.
Empire Bldg., Pittsburgh, Pa.
Keeps cars clean

CAR and bus passengers patronize the rapid transit lines that keep their equipment attractive. Dirty seats, windows, floors, fixtures and paintwork should not be allowed to discourage patronage, when everything can be kept clean so easily the economical Oakite way.

Oakite cleaning materials and methods quickly remove grime and dirt from cane, wooden or upholstered seats; rinse away stains and greasy marks from porcelain or enamel fixtures; keep windows clear and sparkling; restore paintwork’s original freshness.

Write for our booklet “Oakite for Railroad and Car Shops.” It contains scores of formulas for doing car and bus cleaning jobs economically and speedily. Your request for a copy incurs no obligation.

Oakite Service Men, cleaning specialists, are located in the leading industrial centers of the U. S. and Canada

Manufactured only by OAKITE PRODUCTS, INC., 268 Thames Street, NEW YORK, N. Y.

OAKITE
Industrial Cleaning Materials and Methods
$58.50 SAVED—a typical electric railway installation is making this saving on single job—200 brake-shoe pins formerly cost them $75.00 now their Smith works alone and the job figures $16.50.

BLacker "B" Power Sledges always Cut in Half Time and Labor Cost—while doubling Anvil Capacity and Output.

200% INVESTMENTS as used by—

American Car & Foundry Company
American Gas & Electric Company
Aurora, Elgin & Fox River Elec. Company
Beaver Valley Traction Company
Bronxville-Manhattan Transit Company
Cincinnati Street Railways
City of Detroit—Street Railways
Cleveland Street Railways
Cleveland Pneumatic Traction Company
Commonwealth Edison Company
Community Traction Company
Eastern Massachusetts Street Railways
Erie (Pa.1 Street Railways
General Electric Company
Hoge Track & Locomotive Works
Jenkins Valve & Spring Company
Lehigh Valley Transit Company
Long Island R. R.
Milwaukee Electric Railway & Light Co.
New York Central R. R.
Northern Pacific R. R.
Page Steel & Wire Company
Philadelphia Rapid Transit Company
Pressured Steel Car Company
Public Service of New Jersey
Rockford Electric Company
St. Louis-Southwestern R. R.
Schmaltz & Co. Street Railways
Stone & Webster Engineering Company
West Penn Power Company
Westinghouse Electric & Mfg. Company
Wilkes-Barre Railways

YOUR MAINTENANCE COSTS can also be Cut in Half—no obligation in sending for the full story—let us mail you this folder at once—return the coupon today.

HammERS BLACker Power SLedge

BLacker engineering corp. Grand Central Terminal, New York City.

Gentlemen:
We have . . . . Blacksmiths and . . . . Helpers. Without obligation to us, you may give us your new list on your BLacker "B" POWER SLedge.

This: Company

Address
Charter Business Grows as operators adopt the new BENDER CLUB COACH

CHARTER BUSINESS is profitable business. The Bender Club Coach has been especially created to increase your opportunities for this business . . .

... for regular operation of extra fare de luxe coaches, special trips for suburban theatre goers, conventions, special excursions, sight-seeing tours.

Look at it as critically as you please. What beauty of line—how trim, yet how commodious! Clear view in all directions . . . complete protection with non-shattering glass all around. All luggage carried in inside overhead luggage racks.

Not a single comfort feature has been omitted. Luxurious divans and lounges deeply upholstered in beautiful and durable cloth or leather. Magazine stand and writing desk. And radio, too—if you want it. Actually a drawing room on wheels! Seats 25 passengers.

You, too, can profitably add this revenue producing unit to your line.

THE BENDER BODY COMPANY, W. 62nd & Denison, Cleveland, Ohio
CONFIDENCE

Increasing activity in car and truck purchases—large orders placed within recent months—indicate but one thing—CONFIDENCE in the industry’s future. Incidentally the usual preference shown for Brill equipment—particularly in quantity purchases—apparently shows continued CONFIDENCE in its satisfactory performance.

Maintenance ceases to be a problem with

BRILL TRUCKS
HASKELITE ROOFS

cut operating costs

Since the energy consumed in electric operation varies almost directly with the weight, any saving in dead weight represents a direct saving in operating costs.

An efficient and popular means of saving considerable weight in car roofs, side panels, and floors, is the use of HASKELITE—the blood-albumin glued plywood—and its metal-faced companion, PLYMETL. The car illustrated above is a typical recent example of lightweight construction. The Cincinnati Car Company, builders, shows HASKELITE for the roof. Complete construction details are given in the description published in this magazine recently.

Roof panels of HASKELITE can be furnished molded to any desired curvature, to simplify roof construction. The material itself is lightweight, strong, stiff, and is unequalled for water resistance.

Engineering data on both products and their applications to street car and bus construction gladly furnished.

HASKELITE MANUFACTURING CORPORATION
120 South LaSalle Street, Chicago, Illinois

There is a Representative in your Territory.
Name on application.