THIS BOOK WILL HELP YOUR OPERATOR
SEE THAT HE GETS IT

Instruction Book 84591B

Superseded 84591A

MOTOR-DRIVEN AIR COMPRESSORS

Self-lubricating, Center Gear Type
CP-25, -27, -28, -29, -30
CP-127, -128, -130

When ordering supplies specify "General Electric"

GENERAL ELECTRIC COMPANY
SCHENECTADY, N. Y.
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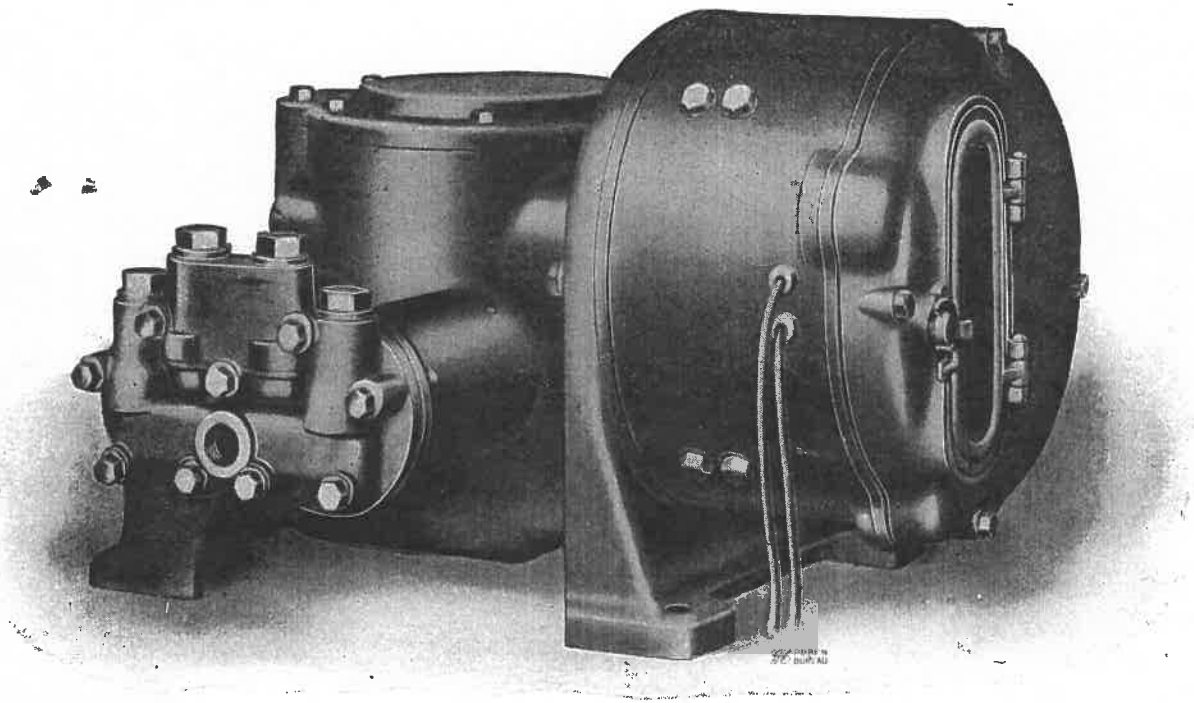


Fig. 1. CP-27-A Air Compressor

MOTOR-DRIVEN AIR COMPRESSORS

Self-lubricating, Center Gear Type CP-25, -27, -28, -29, -30 CP-127, -128, -139

INSPECTION

The motor-driven air compressors covered by this instruction book require very little attention but nevertheless should receive car barn inspection at regular intervals.

Fig. 4 shows the underside of the compressor as viewed from a pit. The oil drain "C" located at the junction of the motor frame and compressor frame does not normally discharge oil, but is provided as a safety device to permit the oil to escape in case the oil does not return properly to the crank chamber.

If oil appears on the compressor frame immediately below drain "C," the vent pipe "D" should be examined and thoroughly cleaned out if it is found in a clogged condition. A short piece of wire with its end bent at a right angle is commonly used for this purpose. In the absence of this, a long bladed screw driver or a clean stick will answer the purpose. In cleaning out the vent pipe care should be taken to draw any dirt which may have accumulated out at the bottom instead of pushing it up through the top into the crank chamber. A record should be kept of a compressor found in this condition, and if at the next regular inspection oil has reappeared on the compressor frame below drain "C," the ½-in. pipe plug "A" should be removed and the oil passage between the motor and crank chamber thoroughly cleaned out. When the oil fails to return properly to the crank chamber, it will usually be found that the trouble is due to the vent pipe being clogged, and it is, therefore, recommended that an examination of this vent pipe be made a part of regular inspection regardless of whether there is an accumulation of oil on the compressor frame below drain "C" or not. The general arrangement of the oil return passage is shown in Fig. 10. Instances where this passage has become clogged with sediment are very rare.

A ¾-in. pipe plug "E" is located at the bottom of a settling well between the armature shaft bearings. This plug should be removed and any sediment which may have collected drawn off at regular intervals of once a year or less. The upper end of this settling well is designated as "E" in Fig. 7.

The cap on the oil filler elbow should be removed at every regular inspection to observe the oil level in the crank chamber, although under average conditions it will only be necessary to add fresh oil on every third or fourth inspection.

Examination of commutator and brushes should be made a part of the regular inspection. Free access to these parts is provided through a door in the frame head.

CARE

LUBRICATION

After first oiling a new compressor, the machine should be operated for a few minutes to fill the various pockets in the crank chamber. The

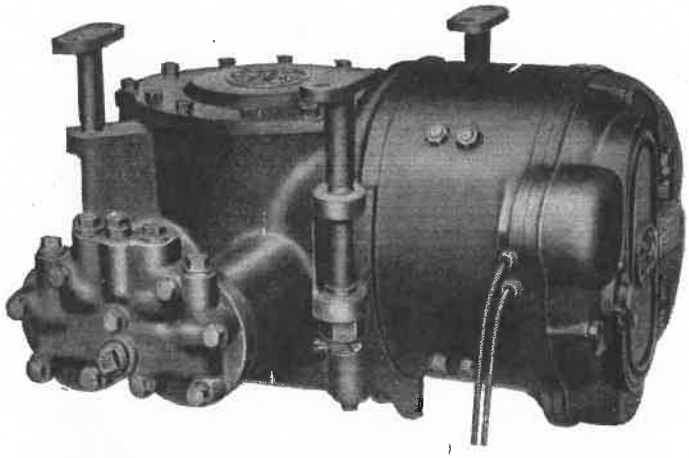


Fig. 2. Type CP-25-C Air Compressor

oil level should then be brought nearly to the top of the oil filling elbow. This elbow is placed low on the side of the crank case near the motor. Its height is such that it serves as an oil gauge. The maximum height of oil in the crank chamber being when the oil stands level with the top of the elbow. The compressor will be lubricated properly when the oil level is much lower than this. As stated in the previous section, the inspector should observe the oil level in the elbow at each regular inspection. Whenever he finds that the oil level has dropped approximately ⅜-in. below the top of the elbow, it is advisable, as a regular matter of routine, to add oil, bringing the oil level back to approximately ⅛-in. below the top of the elbow. Under ordinary conditions this will only require the addition of oil once in several inspections. All bearings are lubricated from the oil well in the bottom of the crank chamber. The system of distribution and return of the oil is shown in Fig. 5, 7, 8 and 10.

A high grade oil especially adapted for use in air cooled railway type air compressors should be used.

AIR INTAKE

It is very important that the air taken into the compressor should be clean and free from any grit in order to insure good operation of the valves and to prevent wear and cutting of the working parts. When the compressor is mounted under the car, the intake strainer should be

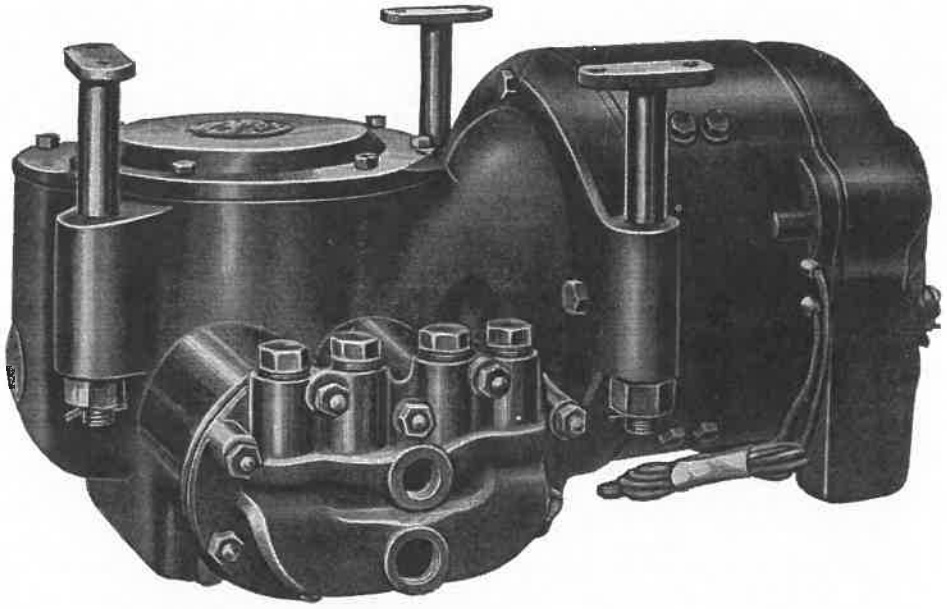


Fig. 3. Type CP-127-B Air Compressor

located inside of the car. If the compressor is used for stationary work, special attention should be given to locating the intake strainer in some place where the air is relatively clean. The strainer should be cleaned occasionally to remove any accumulation of dirt.

CLEANING

The period of operation before cleaning depends upon the service required of the compressor. The motor can be blown out by removing the motor frame head and using an air blast. This can be done without removing the compressor from under the car. When the motor frame head is removed there is free access to the motor and the brush-holders may be adjusted or replaced.

It is recommended that the compressor be taken from under the car before removing the crank chamber cover, this in order to prevent dirt from dropping into the crank chamber from the underside of the car. The large opening in the crank case permits easy access to the bearings and other parts.

COMPLETE DISASSEMBLING

Any occasion for the removal of all parts of this compressor should be very infrequent on account of the very efficient lubrication and liberal proportions of the parts. The arrangement of parts is such that any one part can be removed with very little disturbance of the other parts. The following paragraphs give instructions for taking out all

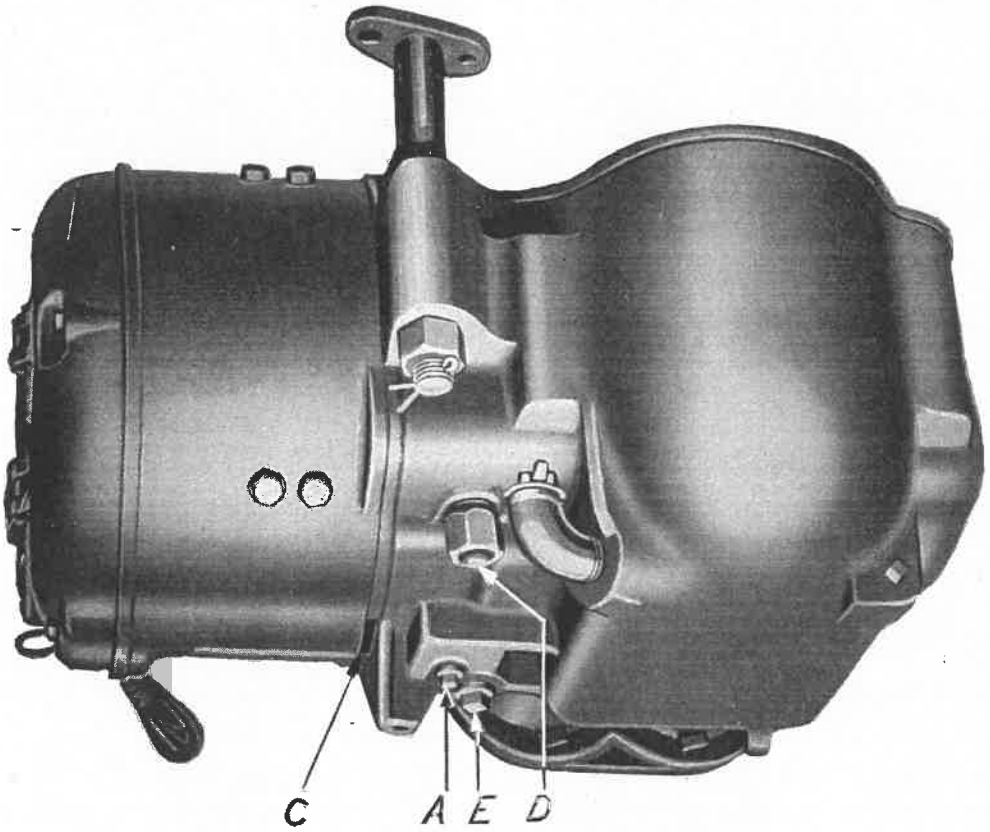


Fig. 4. Type CP-27-B Air Compressor View from Below

parts of the compressor. Each step in this complete disassembly is numbered and the few necessary steps for removing any single part are noted by number under the heading "sequence of operations for removing single members."

1. Place a block under the feet at the motor end of the compressor. This will cause the oil in the pocket between the armature bearings to drain back the crank chamber instead of flowing into the motor when the armature is removed. (See Fig. 7.)
2. Remove the motor frame head.
3. Turn back the brush-holders by removing one tap bolt in each and loosening the other.

4. Remove the crank chamber cover.
5. Loosen the valve chamber plugs.
6. Remove the cylinder head.
7. Uncouple the connecting rod of one piston at the crank shaft. (Fig. 8.) Turn the crank shaft by meads of the armature until the connecting rod can be lowered to the bottom of the crank chamber. Turn the hinge bolt until it rests along the top of connecting rod.

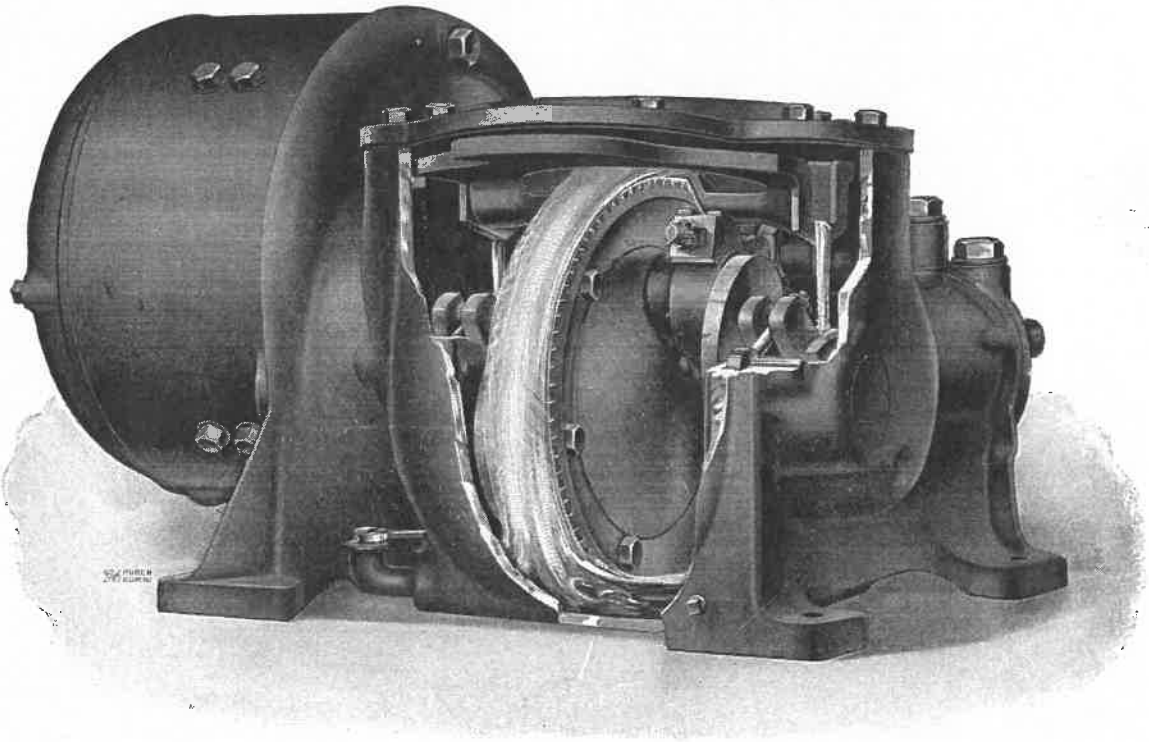


Fig. 5. Type CP-27 Air Compressor Showing Method of Lubrication

8. Push out the piston from the cylinder. Each piston snap ring will remain in its own groove without special precautions. In case the compressors are fitted with sectional piston rings, such as were used some years ago, special care must be taken to prevent the piston rings from springing out of their grooves, as it is important that each section be kept in its own circle and each circle in its own place. Each circle of three sections has its sections numbered on each end. Ends with the same numbers should be assembled together. Each circle of three sections must be kept separate from other circles in order to benefit by the numbers on the ends of the sections. The shims, half round washer and nuts should be replaced on the hinge bolt of the connecting rod in case these have been removed.

9. Place an open end wrench on the pinion nut, allowing the wrench to rest against the compressor frame. A wrench should then be used on the commutator end of the armature shaft to turn the shaft out of the pinion nut. One blow of a hammer on this wrench is usually necessary to start the nut. As the shaft is unscrewed from the nut,

Fig. 6. Air Compressor Intake Strainer

the nut travels back against the stop plug and then acts with the shaft and stop plug as a jack screw to force the shaft out of the taper fit in the pinion.

10. The armature is now entirely free and can be taken out. The pinion nut and lock washer and the thrust collar should be picked up before the armature shaft is wholly withdrawn from the pinion.

11. Loosen the nuts and turn back the hinge bolts and bearing caps of the crank shaft. (Fig. 8.) Lift out the crank shaft, gear and the crank shaft linings.

12. The field coils can be removed by disconnecting the leads and unscrewing the tap bolts that hold the poles in place on the magnet frame.

13. The armature bearing linings can be removed by turning out the screw dowels (Fig. 7) and forcing the linings out with draw bolts.

14. The wrist pin can be driven out by removing the screw dowel. Care must be taken to drive this pin out from the end which has no dowel, as the fit in the piston is larger on the dowel end.

15. If the valves are removed, care should be taken to return each to its proper place. The intake valve has a vent in the bottom and the delivery valve a vent in the side.

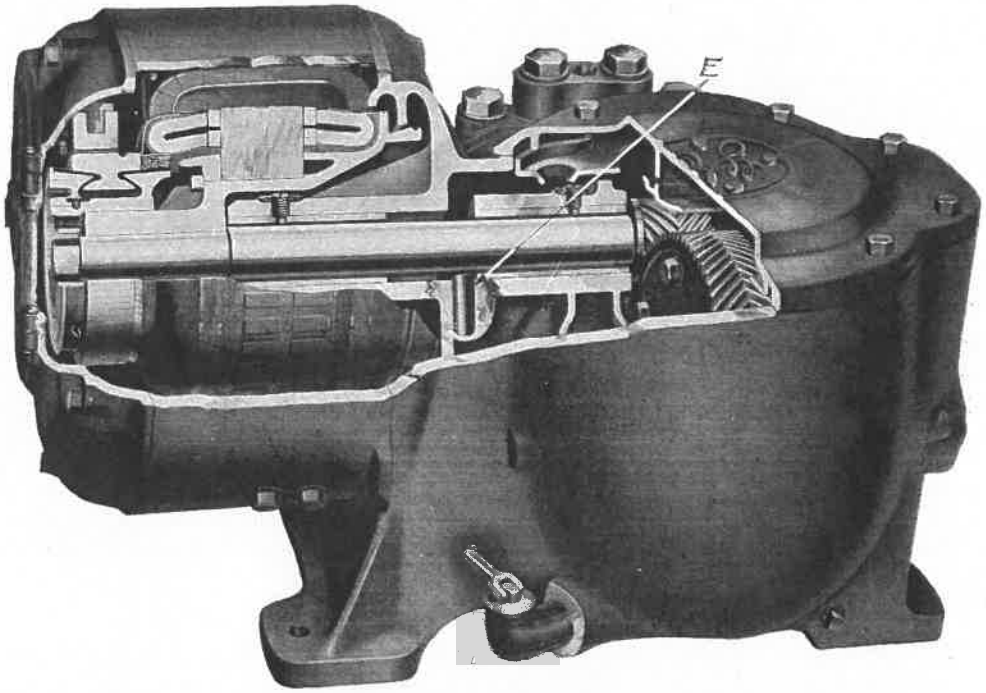


Fig. 7. Type CP-27 Air Compressor, Section View Showing Motor End

SEQUENCE OF OPERATIONS FOR REMOVING SINGLE MEMBERS

Armature removal—Use steps 1, 2, 3, 4, 9, 10.

Field coil removal—Use steps 1, 2, 3, 4, 9, 10, 12.

Gear and crank shaft removal—Use steps 1, 2, 3, 4, 7, 9, 11, slide the armature along so that the shaft will clear the gear, lift out the gear and crank shaft.

Piston and connecting rod removal—Use steps 4, 6, 7, 8.

OVERHAULING

When overhauling the compressor, it is recommended that the frame be washed out with kerosene or gasolene to remove all grit and oil. There are three pipe plugs which should be removed. One is at

the bottom of the settling well between the armature bearings (see "E," Fig. 4, the top of the settling well is designated "E" on Fig. 7); the second plug is under the passage where the oil, thrown off by the bell end of the armature, returns to the crank chamber (see "A," Fig. 4 and 10); the third is in the side of the crank chamber, near the crank shaft bearing which is farthest from the motor (see "B" on Fig. 10).

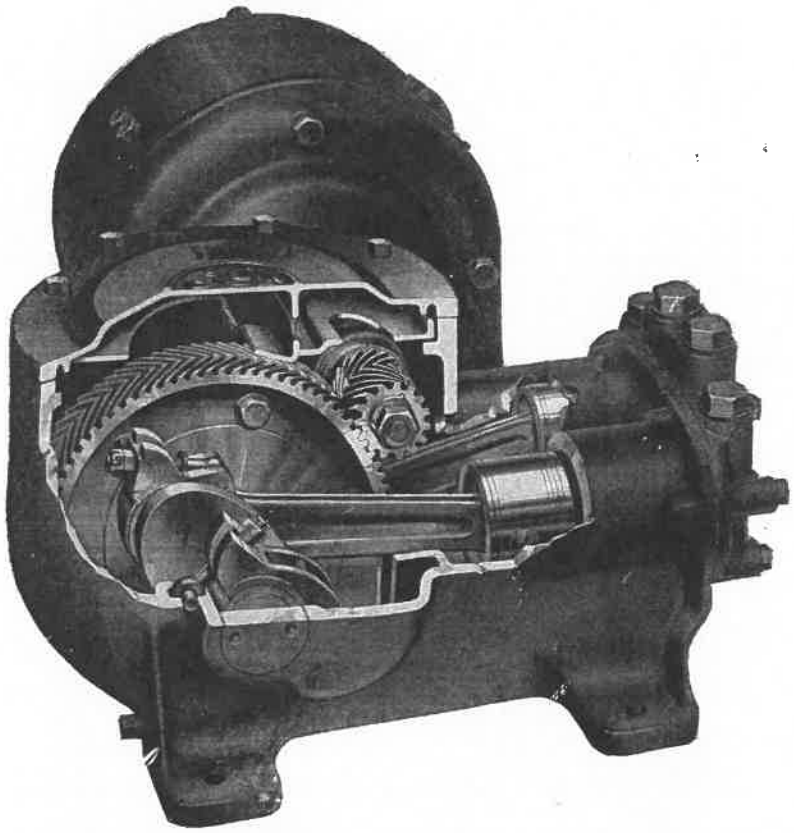


Fig. 8. CP-27 Air Compressor, Section View Showing Compressor End

The stop plug used in forcing the shaft from the pinion should not be removed unless it becomes necessary to take out the armature bearing linings.

The cylinder head should be carefully washed out with kerosene or gasolene.

RE-ASSEMBLY

The various operations for re-assembling should be performed in the reverse order to that given above with the following precautions: See that all pipe plugs are set tight. Try the crank shaft when setting

up the nuts on the hinge bolts to make sure they are not set tight enough to cause the shaft to run hot; neither should these nuts be loose enough to allow the bearings to move in their seats. Make sure that

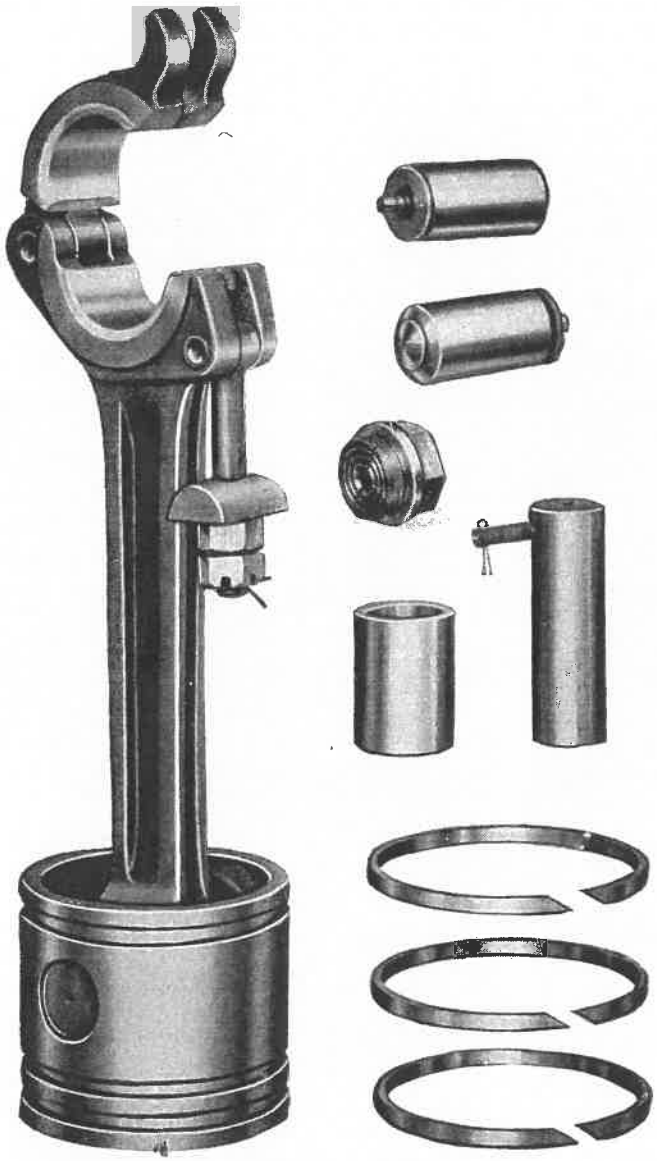


Fig. 9. Piston, Piston Rings, Valves, Connecting Rods, for CP-27 Air Compressor

the thrust collar is not caught between the shoulder at the end of its seat and the pinion. This collar should be perfectly free to move on its seat on the shaft. Compress each piston ring flush with the piston before inserting it in the cylinder so that the side of the ring will not be injured by driving it against the cylinder end. Adjust the rods until

a sufficient freedom is obtained to avoid heating without allowing an amount of play which will result in pounding. This can be determined by moving the rods sidewise on the crank pins and by turning the crank shaft. One or more of the original shims should be removed when wear will permit. Correct adjustment is important to give satisfactory operation.

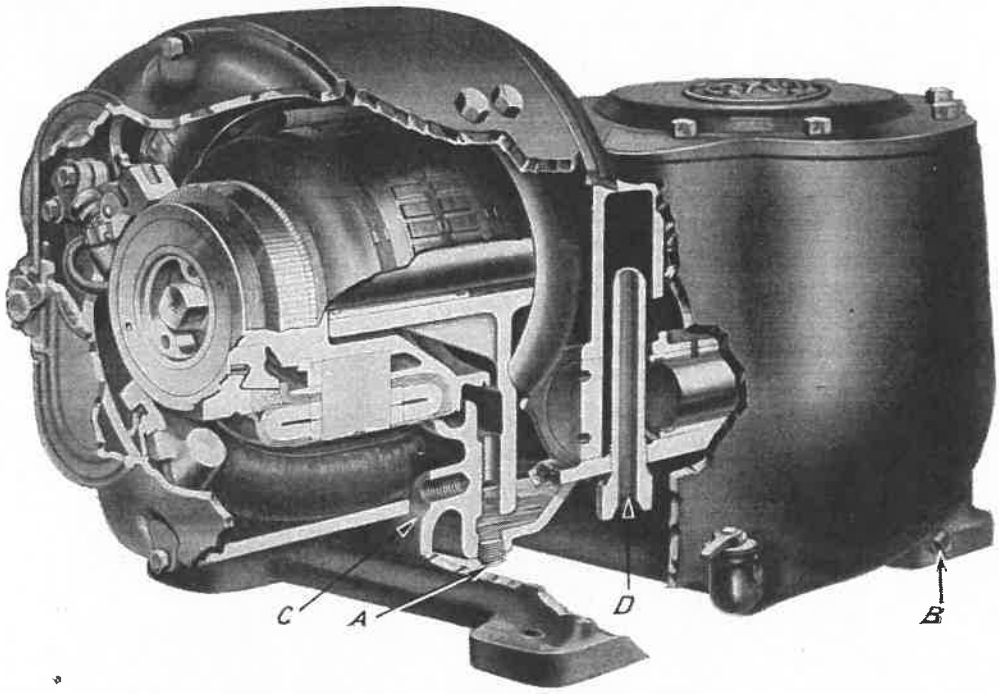


Fig. 10. Type CP-27-A Air Compressor Showing Vent Pipe and Oil Return to Crank Chamber

The surface of the crank chamber cover and the corresponding surface of the crank chamber should be shellacked and assembled with the gasket while the shellac is still wet. Any part of the old gasket which may have adhered to the surface should be removed.

As previously stated it is important to keep each valve in its own place. Valves are often re-ground when there is no occasion for it. In case there is any doubt about the valve action, the valves and cylinder head should be thoroughly cleaned and then tried again. In case it is necessary to regrind, it is well to use a valve seat hand reamer (Fig. 14) to scrape the valve seat to its original form and grind the small amount necessary to produce a seat. Excessive grinding distorts the shape of the valve seat from concave to convex and causes unsatisfactory valve action.

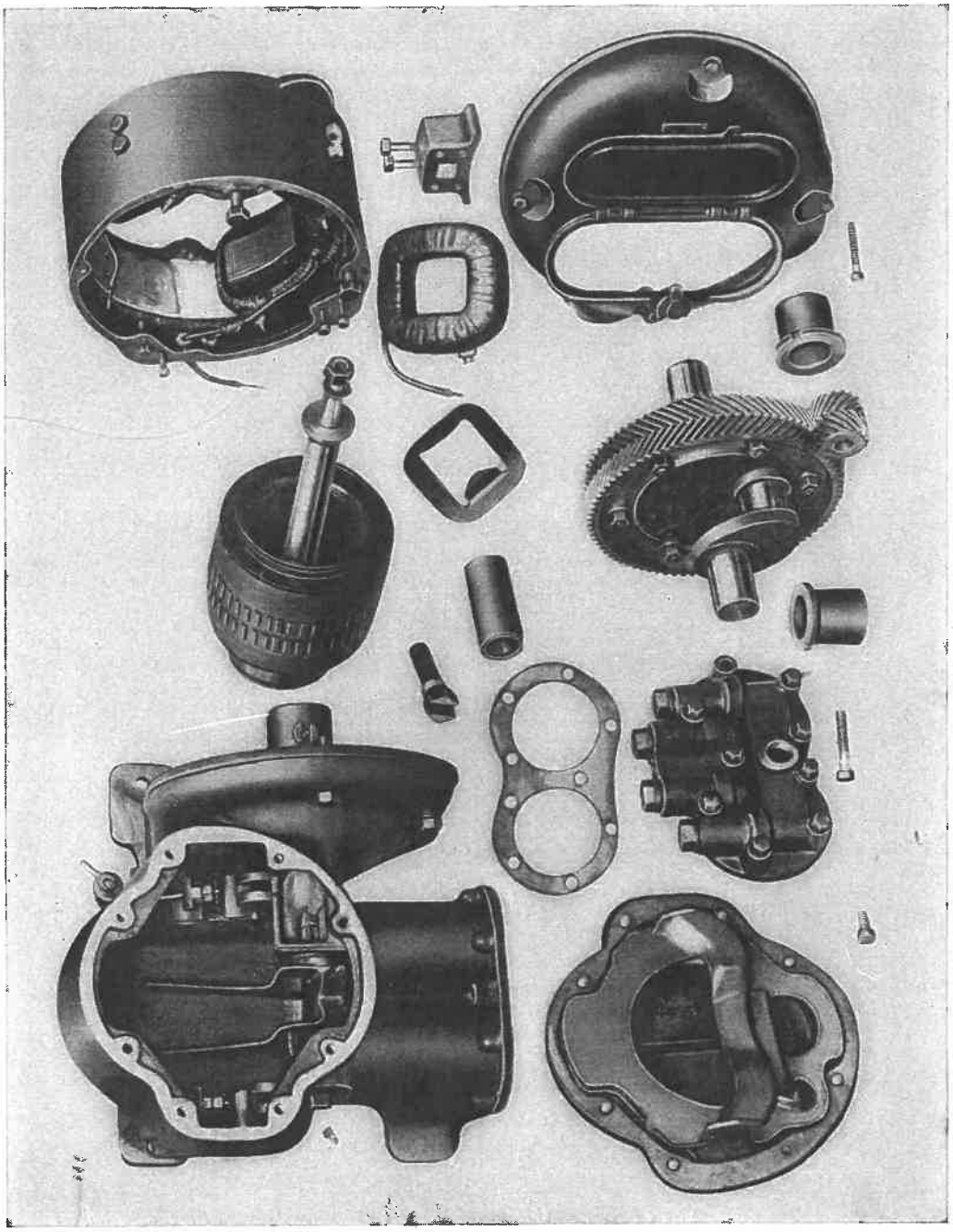


Fig. 11. Type CP-27-A Air Compressor Disassembled

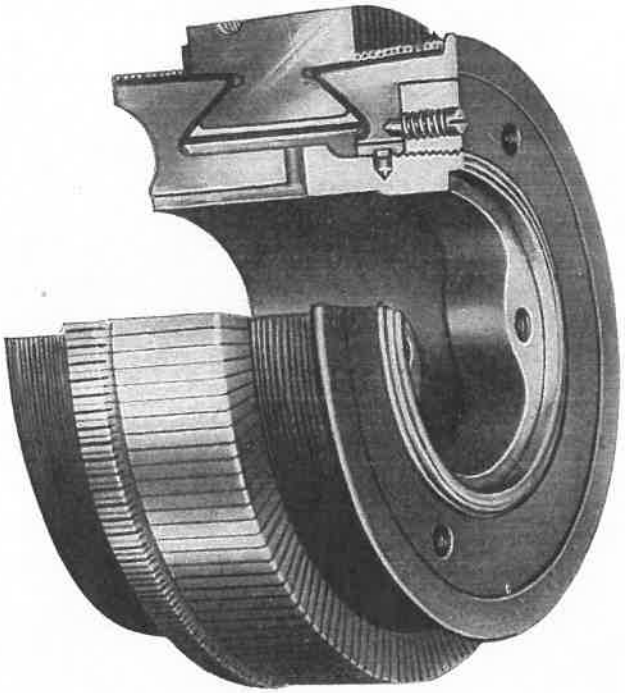


Fig. 12. Commutator for Type CP-27 Air Compressor

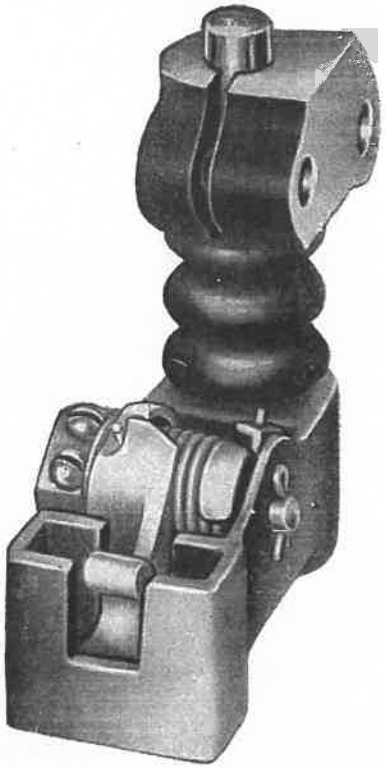


Fig. 13. Brush-holder for Type CP-27 Air Compressor

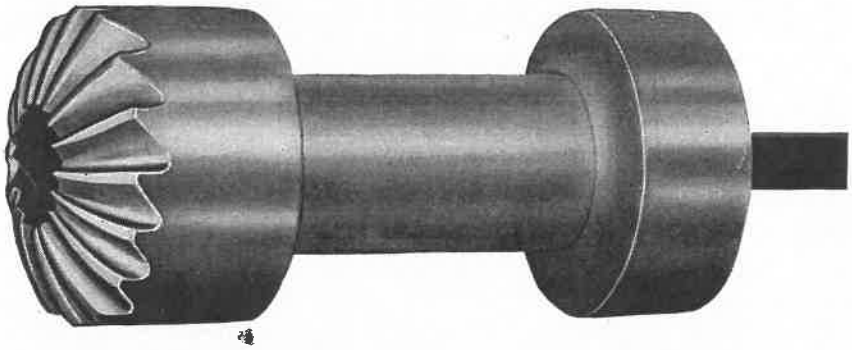


Fig. 14. Valve Seat Reamer for Air Compressor

CONNECTION DIAGRAMS

Connection diagrams applying to the 600- and 1200-volt direct current compressor motors of the various types are given herewith. Connection diagrams for motors of other types will be furnished on application.

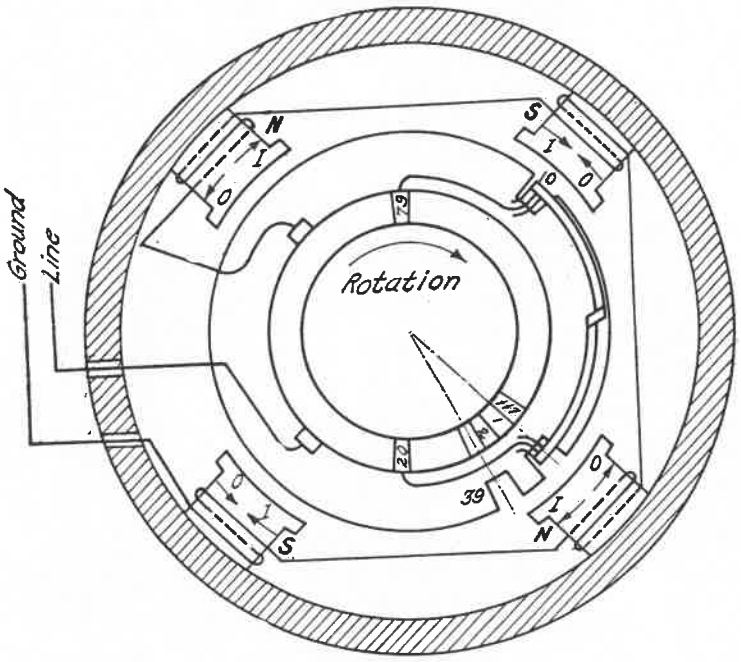


Fig. 15. Connections of Armature and Field Winding for CP-25, 600-volt Air Compressor

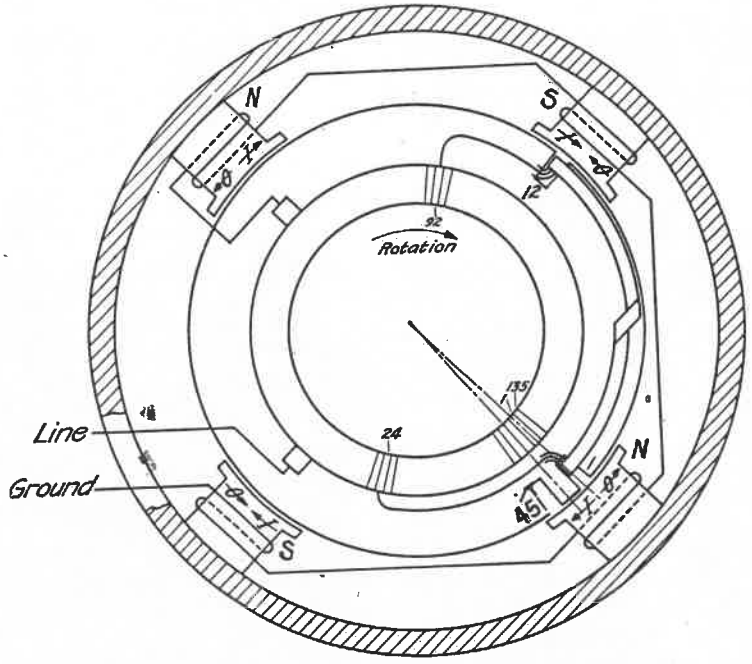


Fig. 16. Connections of Armature and Field Winding for CP-27, 600-volt Air Compressor

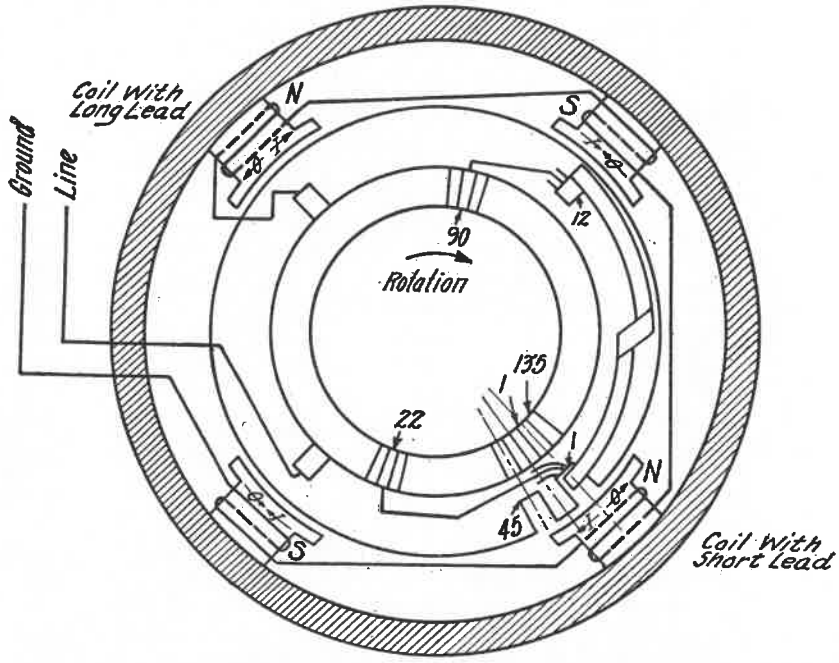


Fig. 17. Connections of Armature and Field Winding for CP-28, 600-volt Air Compressor

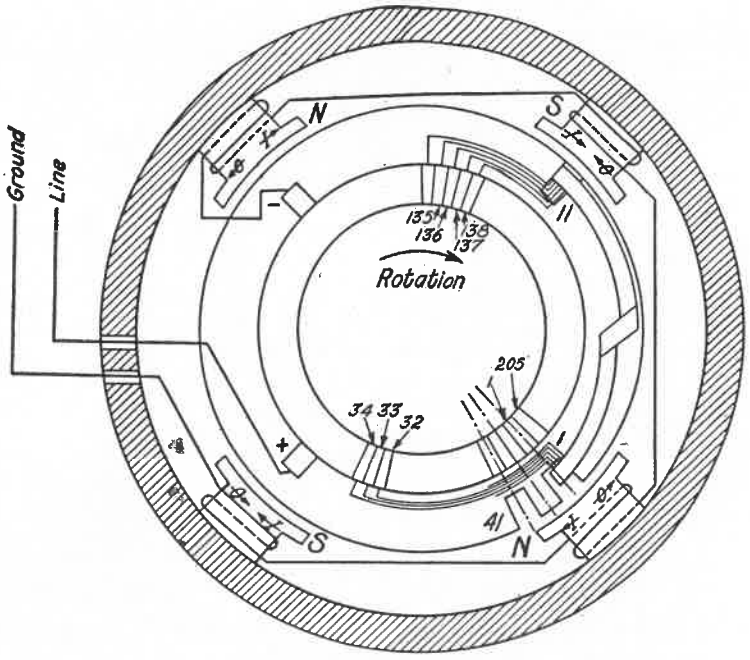


Fig. 18. Connections of Armature and Field Winding for CP-29 and CP-30, 1200-volt Air Compressor

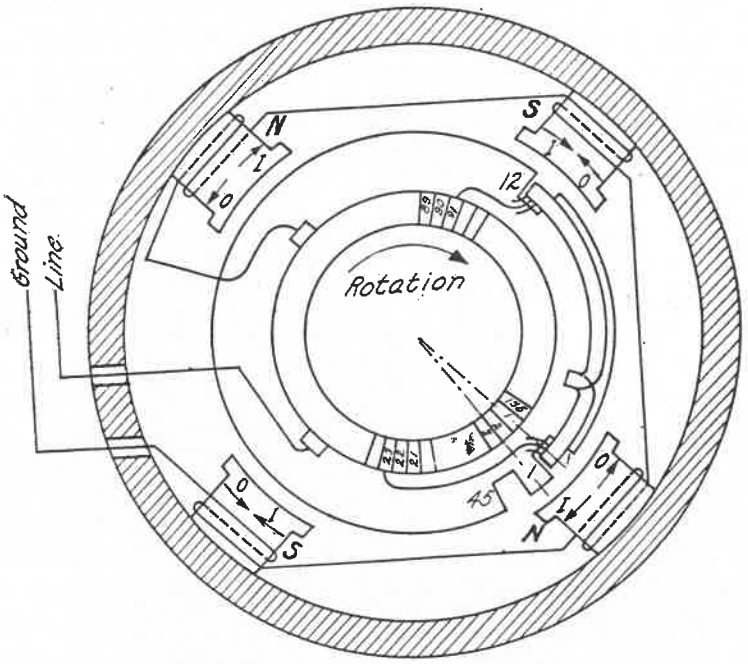


Fig. 19. Connections of Armature and Field Winding for CP-30, 600-volt Air Compressor

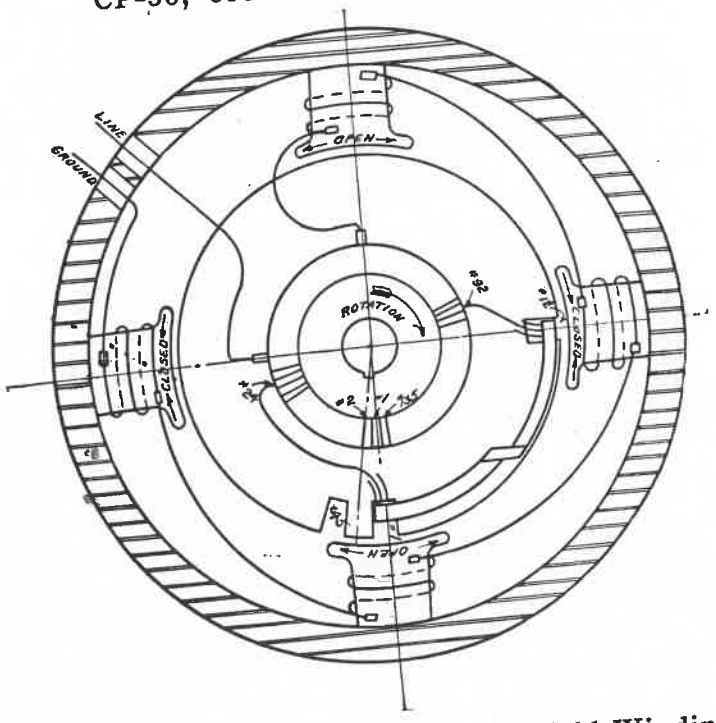


Fig. 20. Connections of Armature and Field Winding for CP-127, 600-volt Air Compressor

INDUCTION MOTOR-DRIVEN AIR COMPRESSORS, CPT-27, -28, and 30

All of the instructions given in the preceding pages for the care and handling of the railway type compressors will apply equally to industrial types so far as the compressor ends of the units are concerned.

An unloader has been developed which can be furnished for use with induction motor-driven industrial air compressor sets. It is very important that an unloader be included in each installation unless the power supply conditions from which the compressor set is to operate

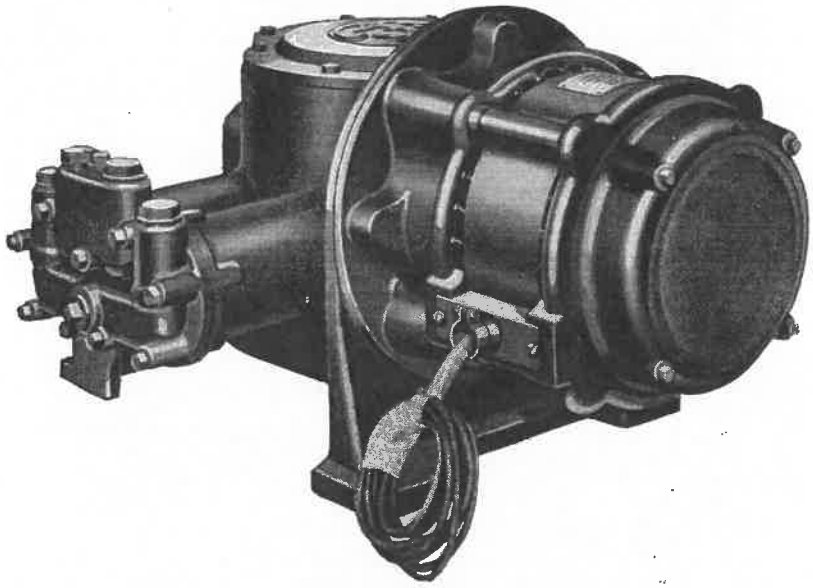


Fig. 21. CPT-28-B Air Compressor

are exceptionally favorable. The reason for the use of the unloader is that the compressor motor when starting up the compressor against its normal load pressure, requires for a fraction of a second at start, several times more than its normal power supply. The unloader assists the motor by reducing the delivery pipe to atmospheric pressure whenever the governor cuts out the compressor regardless of whatever pressure may be maintained in the reservoir or any part of the system on the other side of the unloader.

We recommend the use of unloaders unless the user is absolutely sure that the conditions of installation are such as will maintain full voltage across the motor terminals at the momentary peak demand when the compressor is starting up against load.

The induction motors are of a very simple and sturdy construction and trouble rarely occurs in their operation. Instruction card No. IC81300-C which covers Type K polyphase induction motors will be furnished on application.

The construction of these compressors is shown in Fig. 21 and 22.

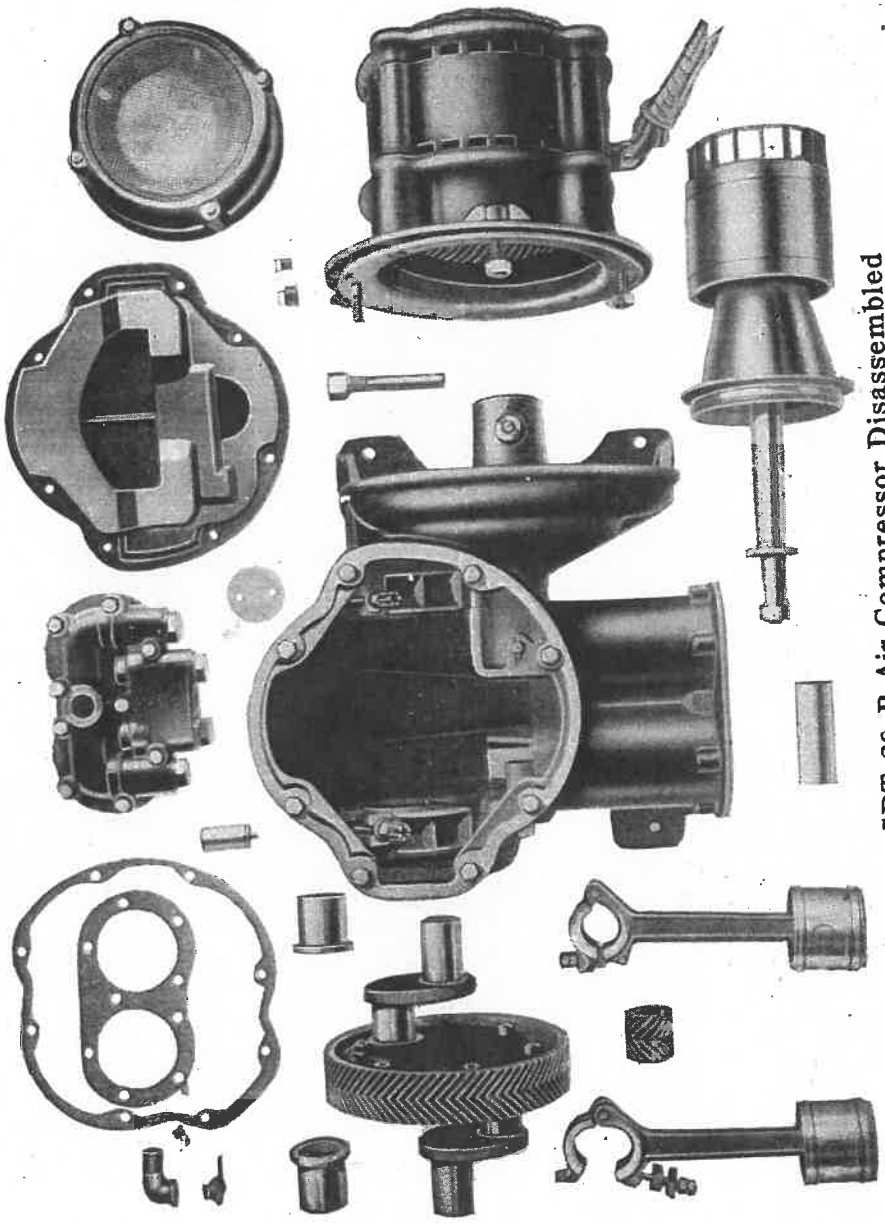
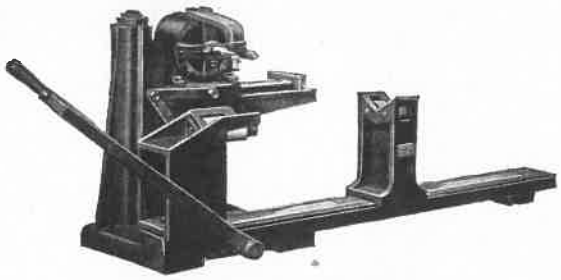


Fig. 22. CPT-28-B Air Compressor Disassembled

COMMUTATOR GROOVING MACHINES

Portable Machine—Form 3



Stationary Machine—Form 2

The Form 3 machine is a simple portable outfit which can readily be moved to any part of the shop, clamped to the armature and thus completely groove the commutator in a few minutes.

This machine has adjustable stops, which direct the travel of the saw to the brush surface of the commutator. It is equipped with a floating driving shaft which permits the grooving of a number of slots at one setting of the armature and an angular adjustment which can be used when the commutator bars are not exactly parallel to the shaft.

Loosening of the clamp bolts is unnecessary as a slight tap with the hand readily shifts the saw from slot to slot. The clamp is lined and will not mar the armature shaft.

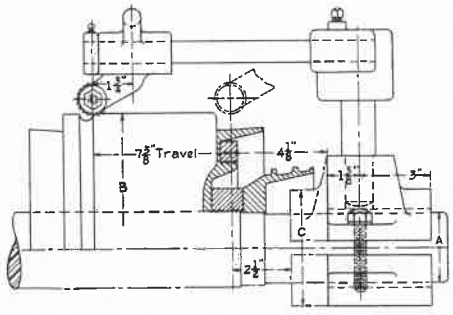
The driving shaft is equipped with universal toggle joints and provision is made for either belt or motor drive.

The Form 2 machine meets the need of large railways for a stationary shop tool.

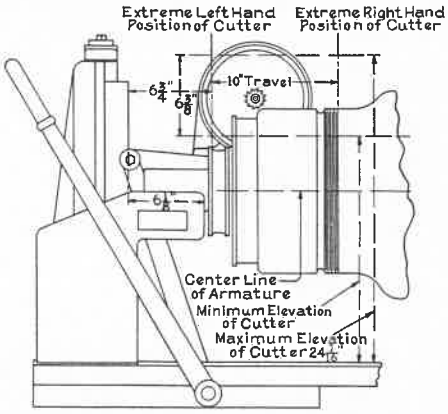
The base is provided with adjustable pillow blocks having "V" shaped bearing surfaces with brass rollers

The slide arm is designed for both vertical and angular adjustment, the latter adjustment to be used where the commutator bars are not exactly parallel to the shaft.

The rotating saw is mounted on the end of the motor shaft which is extended and supported by an offset bearing, which readily permits the grooving of commutators having ears. Owing to the small size of the motors used with these machines, no starting resistance is necessary.



Form 3 Portable Commutator Grooving Machine



Form 2 Stationary Commutator Grooving Machine

PORTABLE TYPE

DIAMETERS	DIMENSIONS IN INCHES (Based on a Cutter Diameter of 1⅜ In.)						
Shaft diameter (A)	2¼	2½	2¾	3	3¼	3½	3¾
Max. comm. dia. (B)	11	11¼	11½	11¾	12	12¼	12½
Diam. at C.	4 7/8	4 25/32	5⅛	5 13/32	5 13/16	6 6/32	6½

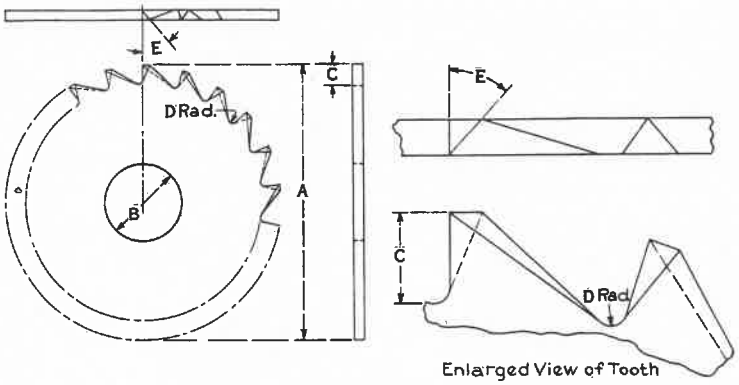
STATIONARY TYPE

DIAMETERS	DIMENSIONS IN INCHES (Based on a Cutter Diameter of 1⅜ In.)						
Shaft diameter	2¼	2½	2¾	3	3¼	3½	3¾
Max. possible comm. dia.	20 9/16	20 5/16	19¾	19 9/16	19⅛	18¾	18⅜
Max. possible arm. dia.	20	20	20	20	20	20	20

General Electric Company, Schenectady, N. Y.

SALES OFFICES IN ALL LARGE CITIES

COMMUTATOR GROOVING MACHINES



High Speed Steel 22-Tooth Grooving Saw

A = 1 5/8 In. B = 3/8 In. C = 3/32 In. D = 1/64 In. E = 40 Deg.

Catalog No.	Thickness in Inches
2672300P1	0.020
2672300P2	0.025
2672300P3	0.030
2672300P4	0.035
2672300P5	0.040

These saws are *cut* from a solid bar of metal, and are hardened, ground, and sharpened. This method produces an absolutely true tool of uniform thickness. A saw will usually groove several commutators with one sharpening and can be resharpened many times, making it far more efficient than an ordinary punched saw which cannot be resharpened. The teeth should be resharpened with angles approximately as shown in the above sketch.

Commutator Hand Scraper

The hand scraper is for removing mica fins which are left in the slot by the grooving saw. A triangular curved file is sometimes used for removing the copper projections, but the removal of a very thin portion of the commutator surface by turning in a lathe, using a special high-speed steel tool (trade name No. 3 Stellite), is recommended. The remaining copper burr left on the trailing edge of each commutator bar can be removed by the hand scraper above illustrated. A final polishing with sandpaper will make a smooth surface which is necessary for good commutation and long life of brush.

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THE REPAIR OF RAILROAD EQUIPMENT AND RECLAIMING OF SCRAP MATERIAL WITH THE ELECTRIC ARC IN RAILROAD SHOPS

By J. J. LILES

REPRINT

From issue of August, 1922

The Repair of Railroad Equipment and Reclaiming of Scrap Material with the Electric Arc in Railroad Shops

By J. J. Liles

Baltimore Office, General Electric Company

Labor saving machinery of all descriptions is to be found in the modernized railroad shop. Lifting magnets, motor-driven trucks and conveyors are now considered necessities to meet the changed economic conditions in American railroading.

The electric arc welding outfit has won its permanent place in the railroad shop for repairing all manner of locomotives and car parts and for renovating arch bars, frogs, and other forms of railroad material.

With these uses of the electric arc we have been familiar for many years but railroad engineers will be keenly interested in the application of the electric arc to the dismantling, for the purpose of repairs, of steel cars, tenders, locomotives, etc., and in its further application to the reclaiming of scrap material in general.

The C. & O. Railway Company, one of the Chicago-Atlantic Coast routes, has installed a large amount of equipment primarily for the above purpose. The equipment is distributed over the system, and installed at its principal shops. The machines vary in size, depending upon the amount of work to be done at the different points. The capacities of the motor generator arc welding sets range from 500 to 2000 amp. at 75 volts.

The big saving in the above mentioned work with the electric arc is secured by the ease with which they burn off rivet heads. In this connection, the following data may be of interest:

Cost of burning off rivet head with the arc and backing the rivet with air	$.0158 ea.
Cost of cutting off rivet head and backing the rivet with air	.035 ea.

These costs include labor only as no costs covering interest and depreciation have been compiled. Current, however, has been estimated very closely at 60 kw-hr. per 1000 rivets and at a cost of 1 cent per kw-hr. It is the opinion of the Motive Power Department that the necessary machinery for burning, including the air equipment necessary for backing and for use on horizontal burning, would cost less than a complete pneumatic equipment.

With the pneumatic method of removing rivets, two car men and one helper can cut and back out an average of only 640 rivets in one day of 8 hours. With the arc, data which have been gathered show that two burners and one backer can remove an average of 1700 rivets per day of 8 hours; and this average can be maintained over a long period. However, the writer saw several weekly records which showed an average for six days of 8 hours each, of 2400 rivets per day. The greatest number burned in one day by one man was 1486 rivets in 8 hours. Data also show that an average of 579 rivets can be burned

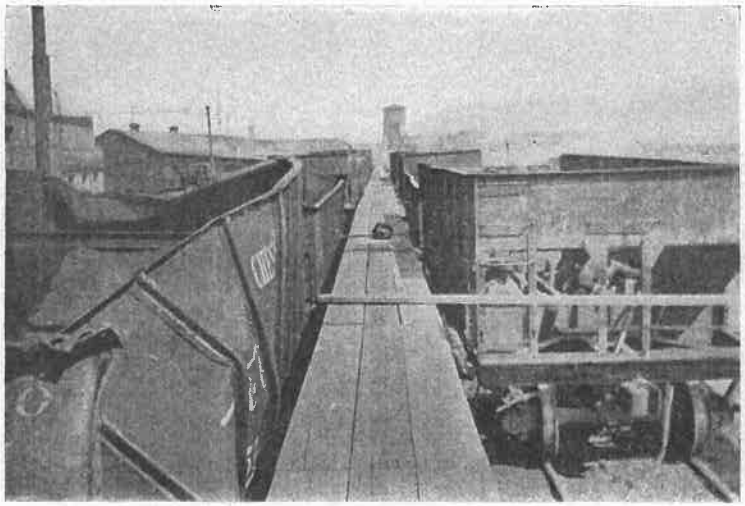


Fig. 1. The center one of three platforms, 400 ft. long, with line-up of cars ready for the burners

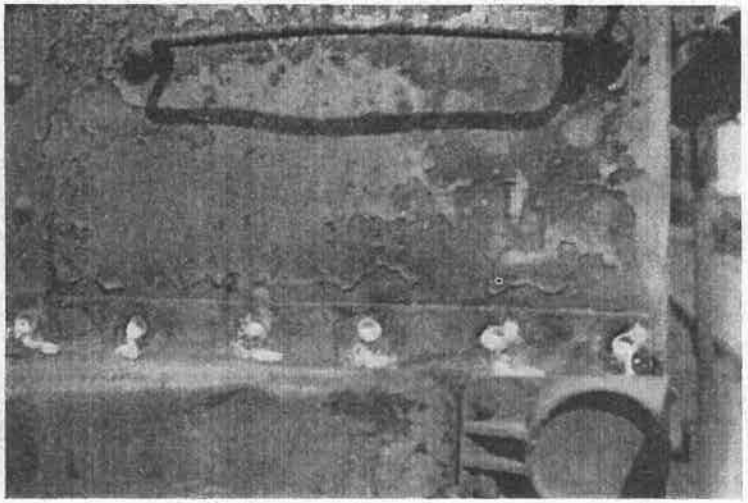


Fig. 2. Rivet Heads burned flush with surface of car

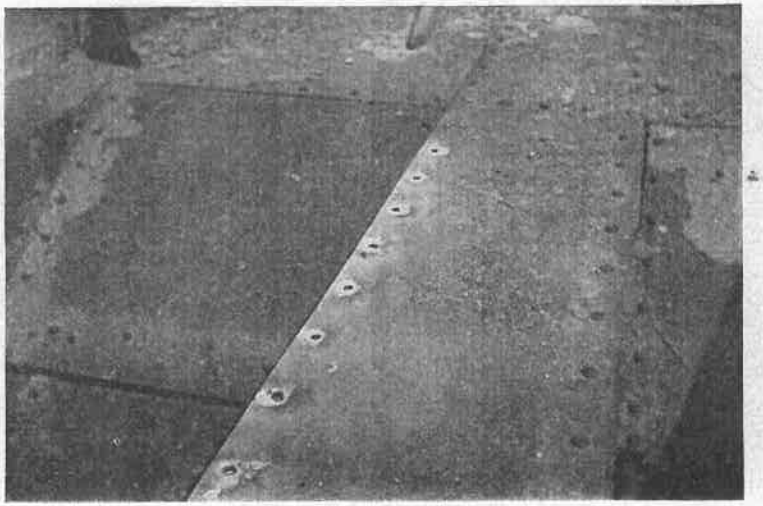


Fig. 3. Sample of Floor Work. These eight rivets were burned at the rate of 400 per hour

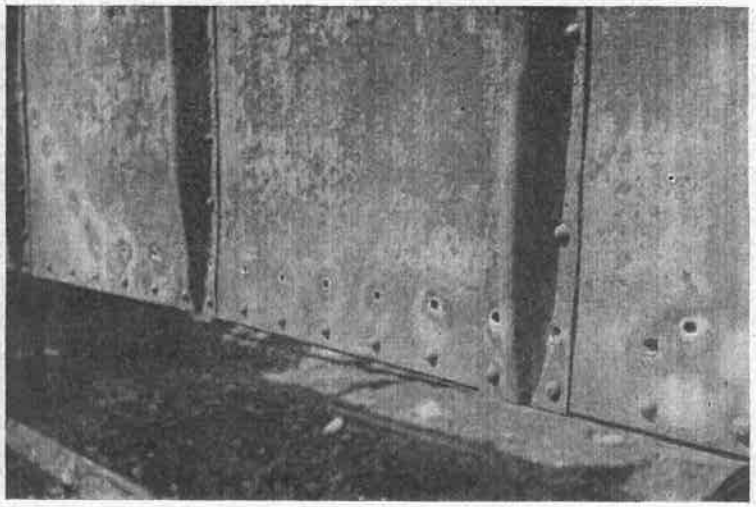


Fig. 4. After the Rivets are Backed. The rivet holes are not damaged by the arc

with each 1-in. by 10-in. graphite electrode. Two burners and one backer can remove damaged parts of cars ahead of 60 repair men.

A current of 400 to 500 amperes and graphite electrodes 1 in. in diameter were used to obtain the above results. Larger currents could be used, but the advantage gained, in number of rivets burned, would be offset by the difficulty in handling the heavy arc, the danger of burning adjacent metal, the cost of very heavy cable and the difficulty in handling the cable. After careful experiments, it was decided that 400 to 500 amperes was the most economical and that an arc of ½ in. to ¾ in. was most effective.

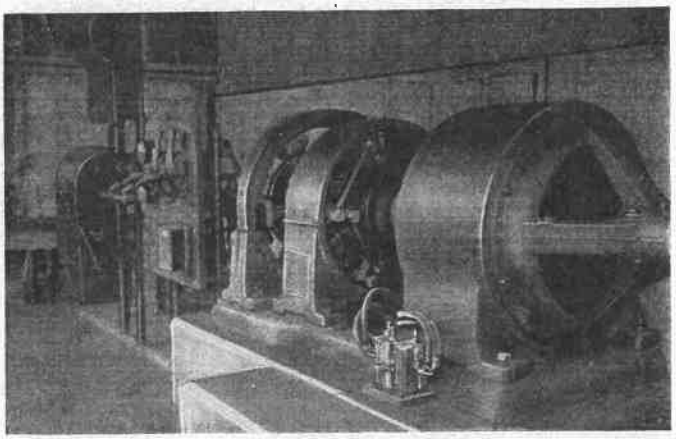


Fig. 5. Motor-generator Set and Control (225-h.p. induction motor; 150-kw., 75-volt generator) for supplying energy to five operators per shift

Fig. 1 shows the way the equipment is lined up when it is to be scrapped or repaired. A number of cars can be assembled and the burning and backing operations concluded without having to move the cars at all, plug-in stations being installed at frequent intervals. Platforms, several hundred feet long and about 6 ft. high, are built between the tracks. When the operator has worked out of reach from the ground, he finishes by sitting or standing on the platform. Supported under this platform is the negative cable with frequent plug-in stations and ballast resistance;—500 amp., .04 ohms at each station. The tracks completing the circuit are well bonded. Sometimes the necessary supply of current cannot be obtained on account of poor contact between the track and the body of the car. In such cases, a simple jumper is provided for clamping to the rail and body of the car.

The motor-generator sets are located in close proximity to the work in order to avoid excessive drop in voltage. The operators become very proficient in handling the arc. The heads of the rivets are burned off flush with the surface of the car. Fig. 2 shows rivets after the heads have been burnt off flush with the car. This illustration also shows that the molten metal on the vertical work falls away by gravity. Note the metal lodged on bumper beneath the rivet.

At several shops, the location of the work is more or less prominent and employees on other work are continually passing and are prone to look at the arc. On this account, it is necessary at times to do the rivet burning at night, the equipment being utilized during the day on general welding work.

Face shields of the double window type are used. The inner window is of clear glass and the outer window of colored glass and hinged at the bottom and held in place by coil springs This arrangement enables the operator to get a clear vision of his work by pulling down the colored glass and without removing his shield.

In some cases where the air hammer is used for cutting off the rivet heads, a man is required to guard the work with a board or broom to prevent the head of the rivet hitting anyone who may be passing or at work nearby. Accidents from this cause were common before air was discarded.

The electrode holders are mostly made in the railroad shops. The operators' hands are protected by circular shields about 12 in. from the electrode holder. The operators dress in ordinary workmen's overalls with no special hand or foot protection. All rivets after burning are dislodged with air punches. One backer only is necessary for two burners.

Floor rivets are burned as fast as those on vertical surfaces. A very ingenious device was developed by one of the company's employees for removing the molten metal by air; in this device a small air hose is brought to within 5 in. of the arc and when the operator is ready to blow away the molten metal, the arc is momentarily broken and a slight thumb pressure on the air valve cleans the horizontal surface for backing the rivets. See Fig. 3.

A difficulty frequently experienced with the air hammer is the removing of rivet heads on springy surfaces. One can readily see the extra time required with air when the metal gives with each blow; with the electric arc this difficulty does not occur.

When patching is to be done, the foreman will chalk mark the locations of holes, and the operator with a single contact burns a hole of sufficient diameter to take the rivets required for the repairs.

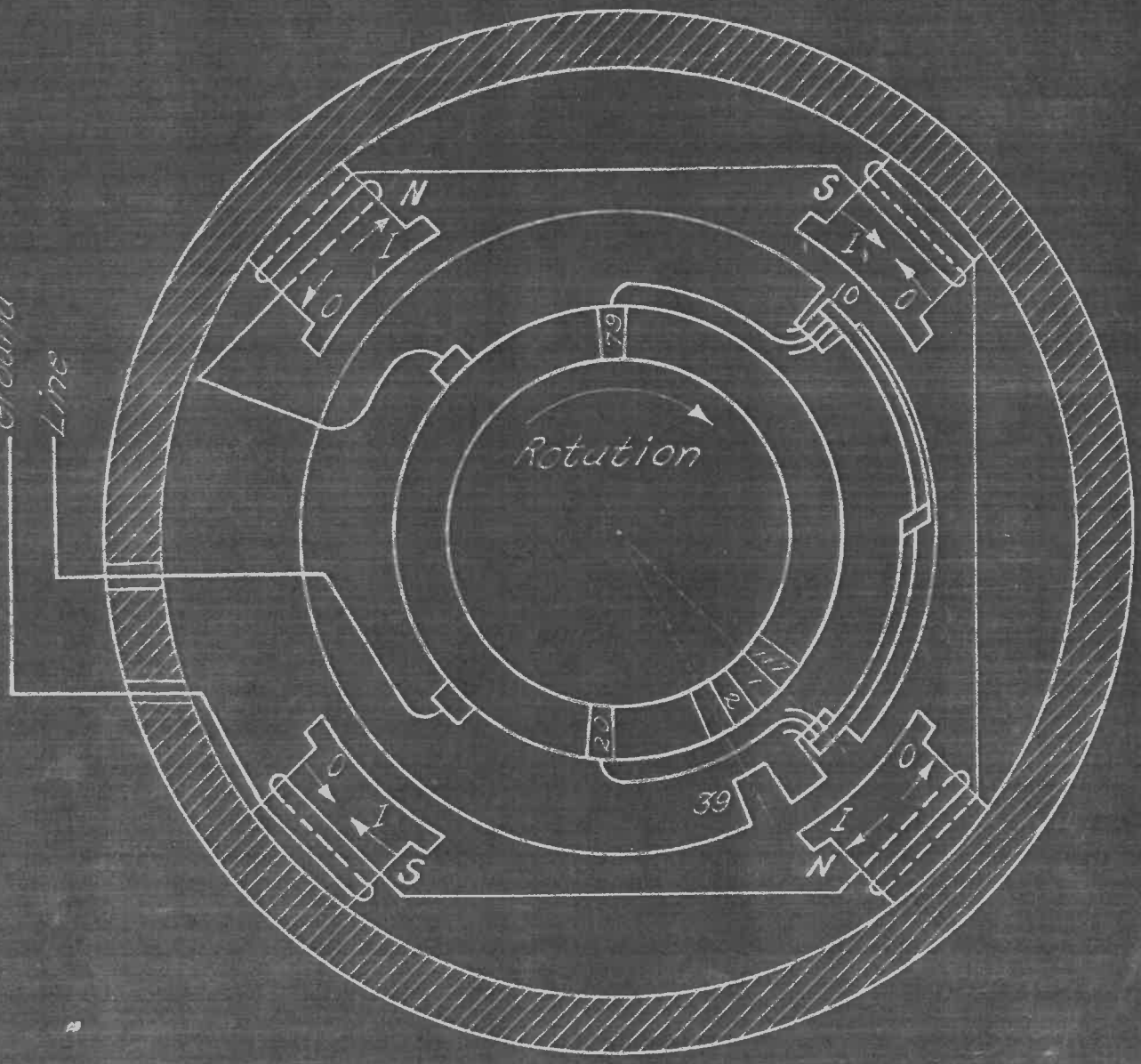
A close inspection after burning and after the work has cooled will show that the rivet is not welded to the car, the circular line of the rivet being clearly seen. The experienced operator confines his arc to the rivet head and does not burn the car or damage the rivet hole. Fig. 4 shows an example of the work after heads have been burned and the rivets backed out. Note the clean finish of the work and that the holes show no indication of the rivet being welded to the car during the process of burning.

Occasionally a car is brought in which seems beyond repair, but the damaged parts are removed so fast with the arc that repairs can be made speedily and at a minimum expense. The repair yards are nearby and very little time is consumed in removing cars from the track where the burning is done. The car department has planned its work for convenience and there is no duplication in handling of any material.

There is under consideration the installation of a small traveling crane to follow the backers so that loose pieces can be removed quickly and at little cost.

All of this work is directly under the Superintendent of Motive Power and everyone is very enthusiastic over the results being obtained.

Connections of Armature and Field Winding for CP-25-A 600 Volt Air Compressor



Motor	A	I	F
CP-25-A	52094	840 / 497	11c348-9

Checked C.L. Priest

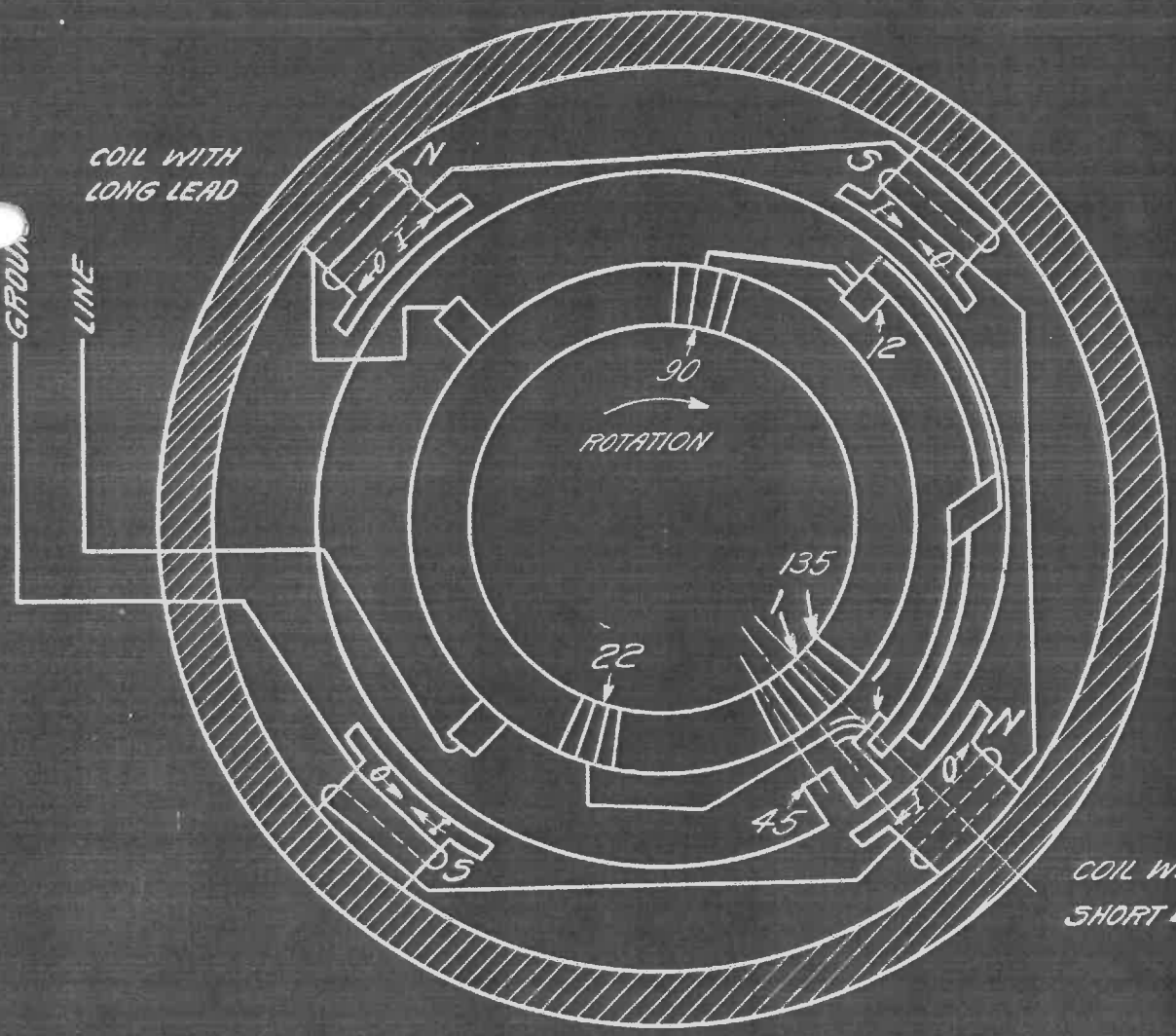
17 Oct. 1913

Engineering Dept.
General Electric Company

DS39681

D.S.K-15770

CONNECTIONS OF ARMATURE AND FIELD WINDING FOR CR. 28-A- 600 VOLT AIR COMPRESSOR



MOTOR	A	I	F
CR. 28-A	52034	840 473	111145-6

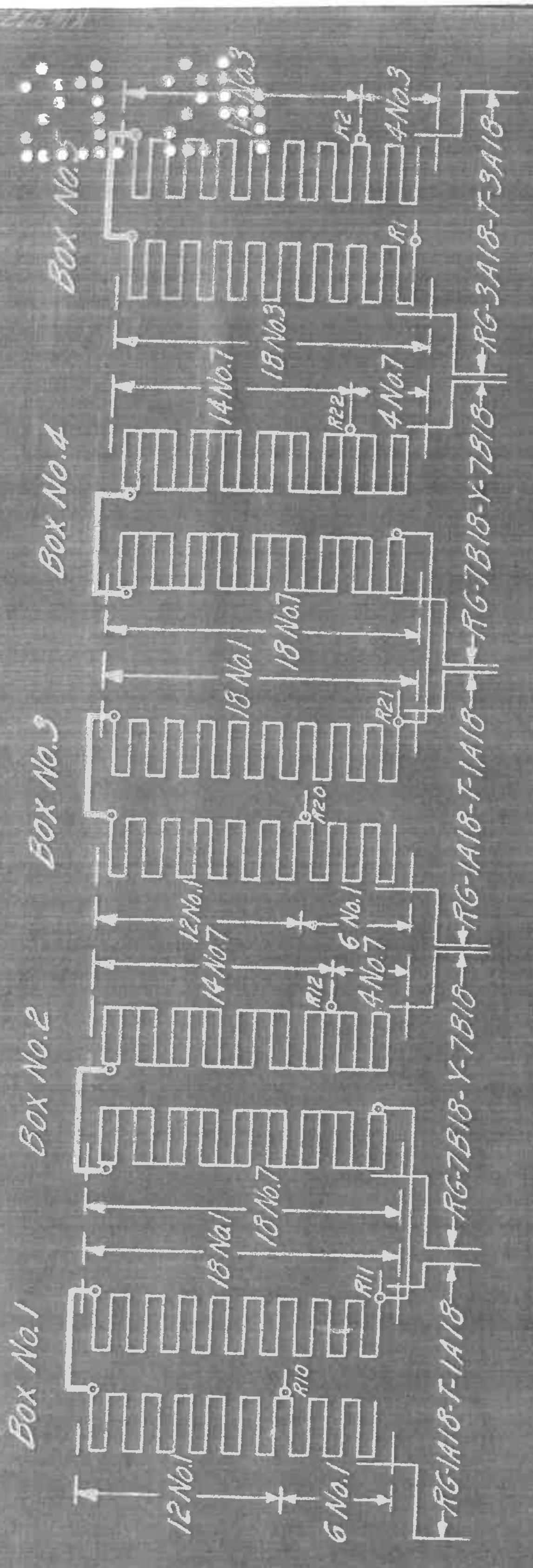
(2) RETRACED MAY 23-1924

DRAWN BY CP MAR. 8. 1910 INSPECTED BY M. McELHANEY MAY 23 24

D.S.K-15770

GENERAL ELECTRIC COMPANY – ERIE, PA.

FF-449 5M 11-2-23



Resistance per Division
R10-R11 = .285 Ohms
R11-R12 = .256 "
R20-R21 = .285 "
R21-R22 = .256 "
R1 - R2 = .464 "
Total = 1.546 "

Two terminals to be assembled at R11 and R21

Connections of RG Rheostats for use with PC-10-F Motor Controller and Two Motors

4 May 1917
Changed

K 1637239

Checked C.A.B. C.E.G.

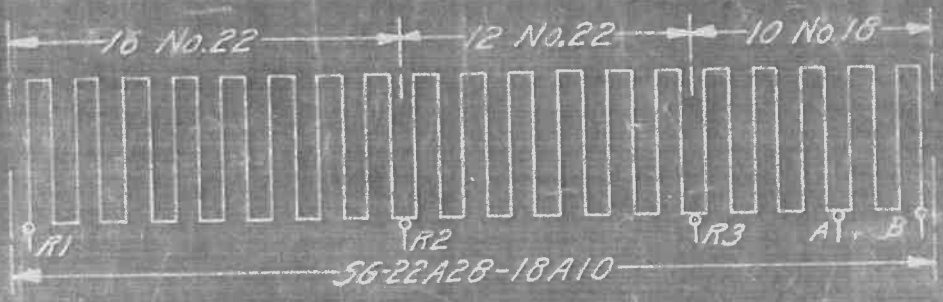
Approved Rwy. Equip. Dept.

GENERAL ELECTRIC COMPANY, SCHENECTADY, N. Y.

DRAWN BY V. WESTCOTT 13 Apr 1917 INSPECTED

K1637239

7 21 24



Resis. per Division
for K-63 Controllers.

R1 - R2 = 3.52 Ohms
R2 - R3 = 2.64 "
R3 - B = 1.80 "
Total = 7.96 Ohms

Resis. per Division
For K-10 Controllers

R1 - R2 = 3.52 Ohms
R2 - R3 = 2.64 "
R3 - A = 1.08 "
A B = .72 "
Total = 7.96 Ohms.

Frames per K1818048 Gr. 5
Terminals per M1107985 Gr. 4
Mount resistor so that grids run parallel to track

When resistor is used with:
K 63 Controller
Connect R4 to terminal B

When resistor is used with:
K 10 Controller
Connect R4 to terminal A
Connect R3 to terminal B

(4) REVISED NOV. 4, 1919
(3) REVISED JUNE 11, 1919
(2) REVISED SEPT 10 1918

Connections of 56 Resistor
for use with K-10 and K-63 Controllers.

K 1637272

Checked P.C.D. H.C.H.

Approved RW4 Equip Power

GENERAL ELECTRIC COMPANY, SCHENECTADY, N.Y.

K. W. WESTCOTT Draughtsman

The Initials of a Friend