

INSPECTION
of
LOCOMOTIVE BRAKE
and
SIGNAL EQUIPMENT

INSTRUCTION PAMPHLET

No. 5048

SEPTEMBER, 1944

(SUPERSEDING APRIL, 1943, ISSUE)

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COMPANY

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NEW YORK, N. Y.

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Inspection of Locomotive Brake and Signal Equipment

Air brake and signal equipment should be in good operative condition before the locomotive leaves the roundhouse to take its train out on the road, and in order that it may be known to be in such condition, the brake and signal equipment should be inspected after each trip of the locomotive, or day's work, and all defects found reported to the proper authority.

On the following pages instructions are given for checking the operation of the *air compressor, governor, brake valves, distributing valve, vent valve, and signal equipment*. Leakage limits for *main reservoirs, brake pipe and brake cylinders* are also covered as well as the inspection of *brake rigging and piston travel*.

In order that the air brake equipment may be maintained in a high state of efficiency, it is absolutely essential that tests be made at frequent and regular intervals, to determine the operative condition of the various devices of which it is composed, and furthermore that defective operation of the parts be remedied without delay.

Before testing the separate devices which require cleaning within certain prescribed periods, the stencil date should be examined in each case in order to ascertain if the device has been cleaned within the prescribed period.

The tests herein suggested should not be confused with the test codes used in connection with the standard Test Racks on which the individual devices may be accurately and thoroughly tested.

Steam Driven Air Compressor Test

Before starting the compressor see that the steam cylinder drain cocks are *open*.

Start the compressor and run it slowly until about 30 pounds main reservoir pressure is obtained then close the drain cocks and increase the speed, noting that the reservoir pressure increases at the normal rate; the strokes are uniform; there is no pounding; there is no leakage by the piston rod packing; both the steam and air ends of the compressor are free from leakage. It should also be known that the air strainer is in good condition and that the lubricating devices are in good working order. The compressor shall be tested for capacity as often as conditions may require, but not less frequently than once each three months.

Where a throttle valve is incorporated in the compressor piping, the following additional test should be made: With main reservoir drain cocks shut, main reservoir pressure atmospheric, and steam valve shut, open the steam valve wide. Observe that the compressor does not race or pound. Note the throttle valve changeover point on the main reservoir gage. This should occur between 25 and 40 lbs. and will be indicated by a speeding up of the compressor.

Motor Driven Air Compressor Test

The compressor shall be tested for capacity as often as conditions may require, but not less frequently than once every three months.

The minimum capacity of any compressor permitted in service shall be approximately 80 per cent of the capacity of the compressor when new.

Main Reservoir Leakage

Leakage from main reservoirs and related piping should not exceed an average of 3 pounds per minute in a test of three minutes duration, made after the pressure has been reduced 40 per cent below maximum pressure.

Brake Pipe Leakage

To test the brake pipe for leakage, make a 10 pound service reduction, (from 70 pound brake pipe pressure), place the brake valve handle in Lap position and note the fall in brake pipe pressure as indicated by the brake pipe air gage, not by the equalizing reservoir gage. This leakage should not exceed five pounds per minute.

Brake Rigging

Brake rigging should be maintained in a safe and suitable condition for service. Levers, rods, brake beams, hangers, and pins should be of ample strength, and not fouled in any way that might affect proper operation of the brake. All pins should be properly secured in place with cotters, split keys, or nuts. Brake shoes should be properly applied and kept approximately in line with the tread of the wheel.

Brake Cylinder Leakage

With a full service application from maximum brake pipe pressure, and with the cut-out cock in the supply pipe to the distributing valve closed, the brakes on the locomotive and tender should remain applied not less than five minutes.

Another method of testing for brake cylinder leakage is to apply the brakes, then close the supply pipe cut-out cock and observe the reduction in cylinder pressure as registered on the brake cylinder gage. If leakage is indicated, it may be determined which brake cylinders are at fault by proceeding as follows:

Close the cut-out cock in the line to the tender brake cylinder. If no leakage is now indicated, the tender brake cylinder or hose connection is at fault.

If leakage continues, close the cut-out cock in the line to the truck brake cylinder. Elimination of leakage will indicate that either the truck brake cylinder or the hose connection is at fault.

The condition of the trailer brake cylinder and hose connection may be determined in the same manner.

If leakage continues after the foregoing tests, the driver brake cylinders are responsible.

Piston Travel

STEAM LOCOMOTIVES

The minimum piston travel, which should be maintained as closely as practical, should be sufficient to provide proper brake shoe clearance when the brakes are released.

The maximum piston travel must not exceed the following:

Driving wheel brake.....	4.	6
Engine truck brake.....	6.	8
Tender brake.....	7.	9

LOCOMOTIVES OTHER THAN STEAM

(a) Minimum brake cylinder piston travel shall be sufficient to provide proper brake shoe clearance when the brakes are released.

(b) The maximum piston travel, when locomotive is standing, shall not exceed 6 inches for brakes on driving wheels when journal boxes are provided with shoes and wedges. When shoes and wedges are not provided, the maximum piston travel may be 7 inches.

On swivel trucks where the brakes on more than one truck are operated by the same cylinder, the maximum piston travel shall not exceed 7 inches. Where the cylinder operates the brakes on one truck only, the maximum piston travel may be 8 inches.

Feed Valve and Reducing Valve Tests

It is recommended that if during inspection of brake equipment any irregularity of feed valve or reducing valve operation is observed, the feed or reducing valves be removed from the locomotive and tested on a standard feed valve test rack which is described and illustrated in Instruction Leaflet No. 2388 for "B", "C", "J" and "M" type valves, and Instruction Pamphlet No. 30 for "F" type valves.

Feed valves and reducing valves should be cleaned at least once every six months.

Steam Compressor Governor Test

Unless the standard excess pressure of the road is different, when the automatic brake valve handle is in running position, the main reservoir pressure should not be less than twenty pounds more than the brake pipe pressure; and when the automatic brake valve handle is in lap position, the main reservoir pressure should increase to the adjustment of the high pressure governor top.

With the automatic brake valve handle in Lap position, the low pressure governor top is cut out, so that any variation from the standard of the road, with the handle in this position, will be caused by the high pressure governor top. The adjustment should be corrected by removing the check nut and turning the regulating nut to increase or decrease the pressure.

If the main reservoir pressure is more or less than the standard for the road, with the automatic brake valve handle in Running position, it indicates that the regulating spring in the excess or low pressure governor top is out of adjustment. The adjustment should be corrected in the same manner as that for the high pressure top. With the SF governor, it is important that the brake pipe pressure be correct, as this pressure in addition to spring pressure operates the excess pressure governor head.

Electric Compressor Governor Test

When used in connection with the automatic air brake system, the governor shall be so adjusted that the compressor will start when the main reservoir pressure

is not less than 15 pounds above the maximum brake pipe fixed by the rules of the carrier, and will not stop the compressor until the reservoir pressure has increased not less than 10 pounds.

The governor shall operate within 5 pounds above or below the pressures fixed.

Governors failing to operate properly should be removed, checked and adjusted on an individual test rack.

Automatic Brake Valve Test

The handle of the automatic brake valve should operate easily; if it does not, it is probably due to a dry rotary valve or to a dry rotary valve key gasket, and indicates that the brake valve should be removed for proper cleaning and lubrication.

If the handle latch becomes dry it will cause the handle to move over the notches with considerable resistance. A few drops of oil will remove this difficulty and permit the handle to move with proper freedom.

The time required for the valve to discharge the equalizing reservoir pressure should be carefully noted. To determine this, place the brake valve handle in service position. The time to reduce equalizing reservoir pressure twenty pounds should be nominally as follows:

From 70 pounds pressure.....	10 seconds
From 80 pounds pressure.....	9 seconds
From 90 pounds pressure.....	8 seconds
From 110 pounds pressure.....	6 seconds

Rotary valve leakage of sufficient amount to necessitate repair is unusual. If a leakage test is desired, however, place the brake valve handle in Service position

and make a 20 pound reduction. Return the handle to Lap position and note whether the brake pipe pressure increases; if so, it indicates rotary valve or brake valve gasket leakage.

To insure that the brake valve is functioning properly in each position it may be inspected as follows:

Release position—In this position the warning port should blow and if brake pipe angle cock is opened, there should be a heavy continuous blow from the hose, and main reservoir pressure should fall at a rapid rate.

Running position—It should be noted that the pressure regulators (governor and feed valve) maintain the main reservoir and brake pipe at the pressures required in the service to which the locomotive is assigned.

H-6 AND K-14 BRAKE VALVES—*Holding position*—It should be noted by the brake cylinder gage that the brakes do not release or cylinder pressure increase following an application.

H-6 AND K-14 BRAKE VALVES—If, with the handle in *Release*, in *Running* or in *Holding* position, there is a constant leak at the brake pipe service exhaust, it indicates that the equalizing discharge valve is defective or is off its seat. When such a leak is caused by dirt on the seat, making a heavy service application and then releasing will cause the equalizing piston to rise and the escape of air will usually dislodge the foreign matter and permit the valve to seat properly.

L-8-PA BRAKE VALVE—*First Service Position*—It should be noted that the first service position cut-out cock handle is in position marked "IN." The equalizing

reservoir pressure should drop 5 to 6 pounds at the regular service rate, and a total reduction of 20 pounds (from 70 pounds) should be obtained in the equalizing reservoir pressure in approximately two minutes. During the test, open the angle cock slightly and note that brake pipe pressure does not drop faster than the equalizing reservoir pressure. Place the first service cut-out cock handle in position marked "OUT" and, with the automatic brake valve handle in First Service position, no reduction should be obtained in the equalizing reservoir pressure.

Service position—It should be noted that the equalizing piston lifts promptly after movement of brake valve handle to service position and seats promptly upon return to lap position; also that there is no leak from the brake pipe exhaust port after the equalizing discharge valve seats.

Emergency position—It should be noted that the reduction of brake pipe pressure is at an emergency rate and that the emergency action is secured. With the double heading cut-out cock closed, move the automatic brake valve handle to emergency position and observe that the emergency relay valve (where used) opens to cause a drop of brake pipe pressure at an emergency rate. See that the usual increase in brake cylinder pressure over that obtained with a service application is obtained and that the safety valve on the distributing valve is blowing.

Brake valves failing to meet requirements of the preceding tests should be removed for investigation on the standard A.A.R. test rack. Instruction Pamphlet No. 5039-20 Sup. 1 covers the testing of brake valves on the No. 4-B Test Rack.

Independent Brake Valve Test

It should be noted that the brakes can be applied and released at the usual rate, also that an independent release may be made after an automatic application, and that the reducing valve controls the cylinder pressure at the desired amount, and that no leakage exists.

If the handle works hard it may be caused by a dry rotary valve or a dry rotary valve key gasket; if the return spring does not return the handle from release to running, or from quick to slow application position, the valve will have to be removed and examined for the cause.

A leaky rotary valve in the independent valve may cause the brake cylinder pressure to increase during a partial independent application to the limit of adjustment of the reducing valve.

Brake valves failing to meet requirements of above tests should be removed for investigation on the standard A.A.R. test rack. Instruction Pamphlet No. 5039-20 Sup. 1 covers the testing of brake valves on the No. 4-B Test Rack.

NOTE—No. 8 Type Brake Valve—Refer to page 16 for test of the Controlled-Emergency nullifying feature.

Distributing Valve Test

With 110 pounds brake pipe pressure it is not so easy to determine just the point where the leakage is occurring as it is with 70 pounds brake pipe pressure. With 110 pounds pressure the safety valve is set at a figure which is below the equalizing point of the pressure and application chambers; therefore, when testing the distributing valve it is better to use 70 pounds brake pipe pressure.

Distributing valves should be removed from the locomotive, and cleaned and tested on the A.A.R. standard test rack at least every six months.

NO. 8-A DISTRIBUTING VALVE

To test the distributing valve for excessive friction in the moving parts; after the system is fully charged, make a six pound brake pipe reduction. If the brakes fail to apply, the cause is probably leakage of the application portion, or friction of the equalizing portion, or leakage by the equalizing piston packing ring, or improper operation of the reduction chamber cut-off valve. If the brakes fail to apply on a six pound reduction, the distributing valve should be removed for regular test on the 4-D Test Rack as covered by Instruction Pamphlet 5039-20, Sup. 2.

If the brakes do apply, increase the reduction to 10 pounds and note that there is no leak from the application cylinder and chamber by observing the brake cylinder gage which should show no loss in pressure. The cylinder pressure should be approximately 18 pounds. If cylinder pressure increases, it will most likely be caused by a reduction in brake pipe pressure due to brake pipe leakage.

A leak past the automatic rotary valve, the independent rotary valve, the equalizing slide valve or the graduating valve in the distributing valve may also cause the cylinder pressure to increase after a partial automatic service application.

Blow at brake cylinder exhaust in release position only, indicates application valve leakage.

Blow at brake cylinder exhaust in application position only, indicates exhaust valve leakage.

Blow at brake cylinder exhaust both in application and release positions, indicates application valve leakage.

A leaky application valve may or may not cause an intermittent blow.

To determine the source of leakage, with 70 pounds pressure, proceed as follows: After the brake application is made (ten pounds reduction), observe to what figure the brake cylinder pressure rises; if it increases to fifty pounds and remains constant, it indicates brake pipe leakage (which always exists to a greater or lesser degree and, therefore, will eventually produce equalization), or a leak from the pressure chamber into the application chamber usually past the equalizing slide valve.

To determine if increase of brake cylinder pressure is due to leakage past the equalizing slide valve or controlled-emergency valve slide valve, release the brake and note if there is a blow at the direct exhaust of automatic brake valve when the handles of both brake valves are in running position. A blow will indicate equalizing slide valve or controlled-emergency valve slide valve leakage. If graduating valve is leaking sufficiently to

cause increase in the application chamber pressure after a partial service application and causes the equalizing slide valve and piston to move to release position, it will not release the locomotive brakes unless the engine is second in a double header with the automatic brake valve cut-out, or when the brass plug has been removed from the side of the automatic brake valve to provide for the release of locomotive brakes when the brake valve is in lap and the distributing valve equalizing piston is in release position.

With the brake applied, leakage which will increase the brake cylinder pressure to the adjustment of the safety valve (presuming it is adjusted to a value higher than equalization) will indicate a leaking automatic brake valve rotary. With the independent brake applied, leakage which will increase the brake cylinder pressure to the adjustment of the safety valve will indicate a defective reducing valve. If the brake cylinder pressure increases to the adjustment of the reducing valve and stops, a leaky independent brake valve rotary is indicated.

If the brake cylinder pressure will not reduce in graduations properly, it may be a leak past the by-pass check (47) in the distributing valve between brake cylinder and application pipe pressures.

To determine if the by-pass check valve is at fault, place the dead engine cap in Dead Engine position, which closes the connection between the brake cylinder passage and the application pipe.

No difficulty in graduating off the brake cylinder pressure will then indicate that the trouble is the leaky check valve.

If the brake releases after an automatic application, when the automatic brake valve handle is placed in Release position, it is caused by a leak from the distributing valve application pipe. If the brake releases after an independent application, it is caused by a leak in the distributing valve application pipe.

If the brakes release after an automatic application, it may be caused by a leak from the distributing valve body gasket or piston seal.

If the brakes release after an independent application, it may be caused by leakage past the distributing valve body gasket, reduction cut-off slide valve, or safety valve.

The cut-off valve (96), which affords protection against loss of locomotive brake in event of the application pipe breaking, should be tested for possible leakage. To make this test, obtain 15 pounds brake cylinder pressure by means of the automatic brake valve, then close the double heading cock and place both brake valve handles in Running position. Leakage of brake cylinder pressure will indicate leakage past the cut-off valve.

The controlled-emergency valve should be cut in (when used) and checked. In automatic emergency, the brake cylinder should charge from 0 to 50 pounds in approximately 36 seconds.

The controlled-emergency nullifying feature of the independent brake valve should be tested by making

an emergency brake application with the controlled-emergency feature cut in. Wait until about 10 pounds brake cylinder pressure is developed, then move the independent brake valve handle to Quick Application position. Brake cylinder pressure should immediately increase to maximum pressure at a fast emergency rate.

A weak or broken equalizing piston graduating spring is indicated by the equalizing piston and slide valve going to emergency position, when making partial service applications.

To determine adjustment of the safety valve, place the automatic brake valve handle in emergency position and note on the brake cylinder gage the pressure at which the safety valve opens, which should be between 65 and 70 pounds. Return the automatic brake valve to lap position and note the closing pressure of the safety valve which should be within 3 pounds of the opening pressure. The safety valve should be adjusted for 68 pounds. This test must be made with not more than 70 pounds brake pipe pressure and with the controlled-emergency feature cut out.

NO. 6 AND 14 TYPE DISTRIBUTING VALVES

To test the distributing valve for excessive friction in the moving parts; after the system is fully charged, make a ten-pound service brake reduction and note that the application cylinder and its connections (and the safety valve) are not leaking, by observing the brake cylinder gage which should indicate no loss of pressure. Then release the brake, and after fully released make a six-pound service reduction and note if brakes apply promptly. If they fail to apply it is caused by undue friction of application pistons and supply valve, or of the equalizing slide valve and piston, or to leakage by the equalizing piston packing ring. If the brakes fail to apply on a six-pound reduction the distributing valve should be removed for regular test on the 6-ET (I. P. 5039-9 and I. C. 2398) or 4-D (I. P. 5039-20 Sup. 2) test racks.

If brakes apply properly, make further reduction to a total of ten pounds and note if cylinder pressure gradually increases beyond what it should be for a ten-pound reduction, which is 25 pounds. If cylinder pressure increases, it will most likely be caused by a reduction in brake pipe pressure due to brake pipe leakage.

A leak past the automatic rotary valve, the independent rotary valve, the equalizing slide valve or the graduating valve in the distributing valve may also cause the cylinder pressure to increase after a partial automatic service application.

Blow at brake cylinder exhaust in release position only, indicates application valve leakage.

Blow at brake cylinder exhaust in application position only, indicates exhaust valve leakage.

Blow at brake cylinder exhaust both in application and release positions, indicates application valve leakage.

A leaky application valve may or may not cause an intermittent blow.

To determine the source of the leaks, with 70 pounds pressure, proceed as follows: After the brake application is made (ten pounds reduction), observe to what figure the brake cylinder pressure rises; if it increases to fifty pounds and remains constant, it indicates brake pipe leakage (which always exists to a greater or lesser degree and, therefore, will eventually produce equalization), or a leak from the pressure chamber into the application chamber usually past the equalizing slide valve.

To determine if increase of brake cylinder pressure is due to leakage past the equalizing slide valve, release the brake and note if there is a blow at the direct exhaust of automatic brake valve when the handles of both brake valves are in running position. A blow will indicate equalizing slide valve leakage. If graduating valve is leaking sufficiently to cause increase in the application chamber pressure after a partial service application and causes the equalizing slide valve and piston to move to release position, it will not release the locomotive brakes unless the engine is second in a double header with the automatic brake valve cut-out, or when the brass plug has been removed from the side of the automatic brake valve to provide for the release of locomotive brakes when the brake valve is on lap and the distributing valve equalizing piston is in release position.

With the brake applied, leakage which will increase the brake cylinder pressure to the adjustment of the safety valve (presuming it is adjusted to a value higher than equalization) will indicate a leaking automatic brake valve rotary. If the brake cylinder pressure increases to the adjustment of the independent reducing valve and stops, a leaky independent brake valve rotary is indicated.

If the brake releases after an automatic application, when the automatic brake valve handle is placed in release or holding position, but remains applied after an independent application, it is caused by a leak from the distributing valve release pipe between the automatic and the independent brake valve. If the brake releases after an independent application, but remains applied with an automatic application, it is caused by a leak in the distributing valve release pipe between the distributing valve and the independent brake valve. If the holding feature of the automatic brake valve has been eliminated, it will release in Holding position the same as in Running.

If the brakes release after an automatic or an independent application, it may be caused by a leak from the application cylinder pipe, application cylinder cap or gasket, or safety valve.

A broken application piston graduating spring is usually indicated by a succession of quick exhausts from the brake cylinder exhaust.

In cold weather the distributing valve should be drained by means of the drain plug.

If the emergency slide valve in the quick action cap leaks, it can be detected by a constant blow from the brake cylinder exhaust while the brakes are released, but to distinguish a leak through the emergency slide valve from one through the application slide valve, close cut-out cock in the supply pipe to the distributing valve. If the leak gradually ceases it is an application valve leak; if it continues it is an emergency slide valve leak.

To test for a leaky check valve in the emergency cap, make a continuous service application, reducing the brake pipe pressure about twenty pounds below the point of equalization, then close the double heading cock and observe the brake pipe pressure gage for an increase of pressure; if no increase is perceptible the check valve is tight.

A weak or broken graduating spring is indicated by the equalizing piston and slide valve going to emergency position, when making partial service applications, and a quick rise in brake cylinder pressure to about sixty-five pounds.

To determine adjustment of the safety valve, place the automatic brake valve handle in emergency position and note on the brake cylinder gage the pressure at which the safety valve opens, which should be between 65 and 70 pounds. Return the automatic brake valve to lap position and note the closing pressure of the safety valve which should be within 3 pounds of the opening pressure. The safety valve should be adjusted for 68 pounds.

Distributing valves should be removed from the locomotive, and cleaned and tested on the 4-D or 6-ET test rack at least every six months.

Signal Equipment Test

Inspector's Dummy Coupling and Test Gage should be connected to signal hose. Reduce the air pressure to standard, if necessary. The signal whistle should respond promptly when a reduction is made in the signal pipe, and if any irregularity is noted, the signal valve should be removed for test in accordance with instructions covered in Instruction Leaflet No. 2377 for old style signal valve, or Instruction Leaflet No. 2377-1 for the Type "C" signal valve.

If the whistle blows (with a tight signal pipe) when an independent application of the brake is made, it is because of dirt on the signal pipe check valve or because of a leaky condition of this valve, or of the reducing valve allowing signal pipe pressure to increase above 45 pounds.

A leak in signal pipe pressure should be made with the inspector's dummy coupling and the amount of fluctuation of the reducing valve noted. This fluctuation should not exceed 2 pounds. Close the supply cut-out cock, and the gage (on the inspector's dummy coupling) may also be used to check the amount of signal pipe leakage, which should not exceed two pounds per minute.

If the signal equipment does not have a supply cut-out cock to cut off the reducing valve, place the independent brake valve in Slow Application position, then place the automatic brake valve handle in Emergency position until brake cylinder pressure equalizes, after which return both brake valve handles to Lap position. The signal whistle must not blow within a minute; to do so indicates signal pipe leakage.

Brake Pipe Vent Valve Test

Inspection of the brake pipe vent valve should include a 30 pound service reduction with the automatic brake valve. Observe that the vent valve exhausts air, but does not assume emergency, which will be indicated on the gage by a quick drop of brake pipe pressure.

After the over-reduction, place the automatic brake valve handle in emergency position and observe that the vent valve opens, which will be indicated by strong flow of air from the vent valve exhaust. If the vent valve does not open, see that it is not plugged or closed.

Should the vent valve produce emergency during the service reduction, or should it fail to open when the brake pipe is reduced at an emergency rate, the vent valve should be removed for test in accordance with test code as covered by Instruction Leaflet No. 2386.

No. 5-ET Equipment

H-5 Automatic Brake Valve Test

As this brake valve is piped somewhat different from the H-6, some variation in the method of testing will be necessary. So far as the easy movement of the handle is concerned, the same methods apply as in the case of the H-6.

A leak at the brake pipe exhaust is treated in the same manner as it is in the H-6 brake valve, and the time required to reduce the equalizing reservoir pressure twenty pounds should be the same.

A leaky rotary valve or body gasket is tested for by first placing the handle in service position until all the brake pipe and equalizing reservoir pressure is reduced to zero, then closing the double heading cock and placing the handle on lap. This leaves the rotary valve with main reservoir pressure on top, and if it leaks or the body gasket leaks the pressure will gradually increase in the short length of brake pipe and in the equalizing reservoir, and it will be indicated by the black hand of the duplex gage.

SF Independent Brake Valve Test

The handle should be tested to see that it moves freely. If it does not, proceed as directed for a stiff working handle on the S-6 brake valve.

To test for a leaky rotary valve, place the handle on lap and then note if any blow is discernible at the end of the open application chamber pipe. (See distributing valve test).

No. 5 Distributing Valve Test

What has been said relative to testing of the application piston, application valve, exhaust valve, brake cylinder and the graduating springs in the No. 6 distributing valve applies to the No. 5, but because of the difference in the method of piping these two equipments, it is necessary to employ a little different method in testing for leakage in the No. 5.

After charging up to standard pressure, make a six-pound reduction to see that the brakes apply. If they do not, it indicates undue friction in the equalizing slide valve and piston, or in the application valve or piston, or to leakage by the equalizing piston packing ring, and the distributing valve should be removed for regular test on the standard test rack. A filling piece, N. Y. A. B. Pc. TA 753 (W. A. B. Pc. 66464), is provided for testing No. 5 distributing valves on the test racks employed for testing No. 6 distributing valves.

Charge up and make a partial service application, using a ten-pound brake pipe service reduction, and observe the brake cylinder gage closely to note if there is a gradual increase of brake cylinder pressure above that due to a ten-pound reduction. If there is, it denotes leakage from some source into the application chamber, or brake pipe leakage.

To determine the source of this leakage, observe the following: If the brake cylinder pressure increases to

forty-five pounds and remains constant at that pressure, it is the rotary valve in the independent brake valve that is leaking. If the pressure increases to 50 pounds and remains constant at that point (from seventy-pounds brake pipe pressure), it is due either to brake pipe leakage or to leakage through equalizing slide valve. If it increases to the point of adjustment of the safety valve (fifty-three pounds) and causes it to blow, it indicates either a leaky automatic rotary valve or a leak from the maintaining port in the equalizing slide valve seat, or possibly a leak from the brake pipe through the double heading cock.

A quick method of determining accurately the source of leakage into the application cylinder is: Release the brakes and recharge the pressure chamber, then disconnect the application chamber and double heading pipe at the distributing valve, and note if any leakage is perceptible from these pipes or from the openings made at the distributing valve.

Make a light brake pipe reduction of from six to eight pounds, and note if there is a continued blow from the opening at the application chamber pipe connection; if there is, it denotes a leak past the equalizing slide valve in application position or by the graduating valve. If there is a blow from the application chamber pipe connection or from the double heading pipe connection at the distributing valve when the equalizing valve is in release position it indicates leakage past the equalizing slide valve in this position.

After making these tests the application chamber and the double heading pipes should be coupled up and tested for leakage. This should be done by making a full independent application. The safety valve should be adjusted for fifty-three pounds, and it should be tested for leakage by making a full service reduction, and then for operating correctly by making an emergency application to see that it opens and relieves the brake cylinders of excess pressure, and that it closes at the proper pressure.

GENERAL INSTRUCTIONS

If, after making a service application, and with automatic brake valve handle on lap, the brake pipe exhaust continues to blow, look for a leak in the equalizing reservoir or its connections, including those to the air gage, and for a leakage in the inner tubes of the air gage. Due to the small volume of brake pipe pressure of a lone engine as compared to the brake pipe volume of a long train, the equalizing piston may operate properly when tested in roundhouse but will fail to seat when the engine is coupled to a train. Consequently, due care should be exercised to locate and remedy any leakage from the equalizing reservoir or its connections when trouble of this nature has been reported by engineers.

If the main reservoir pressure is materially reduced, or the number of compressor strokes increase considerably when the brakes are applied, it indicates a very leaky condition of the brake cylinders and their connections.

8-ET Equipment

Apply brake with the independent brake valve and examine the application pipe and connections back to the brake valve, also the safety valve, and note that they are tight.

If the brake leaks off with the independent brake valve in Lap position after an independent application, it is caused by a leakage in the application pipe, or in the safety valve.

No. 6-ET and 14-EL Equipment

Apply brake with the independent brake valve and examine the distributing valve release and the application chamber pipes and all their connections back to the brake valves, also the application cylinder cap and the safety valve, and note that they are tight.

If the distributing valve release pipe leaks between the independent and automatic brake valve, the effect will be to destroy the holding feature of the automatic brake valve when releasing the train brakes.

If the release pipe leaks between the distributing valve and the independent brake valve, it will prevent an independent application of the brakes remaining applied.

If the brake leaks off with both the automatic brake valve and the independent brake valve applications, it is caused by a leakage in application cylinder pipe, in the application cylinder cap or in the safety valve.

CROSSED APPLICATION CYLINDER AND DISTRIBUTING VALVE RELEASE PIPES—When these pipes are crossed, the brake will apply and release in the usual way unless the equalizing piston of the distributing valve should move from release position, which would prevent a brake application with the independent brake valve, or if the brake had been applied with the automatic brake valve, it could not be released by the independent brake valve with the automatic brake valve on lap. To test therefor, apply the brake with the automatic brake valve, return the handle to lap and see if the brake can be released with the independent brake valve; failure to release will indicate crossed pipes.