26-L BRAKE EQUIPMENT FOR LOCOMOTIVES

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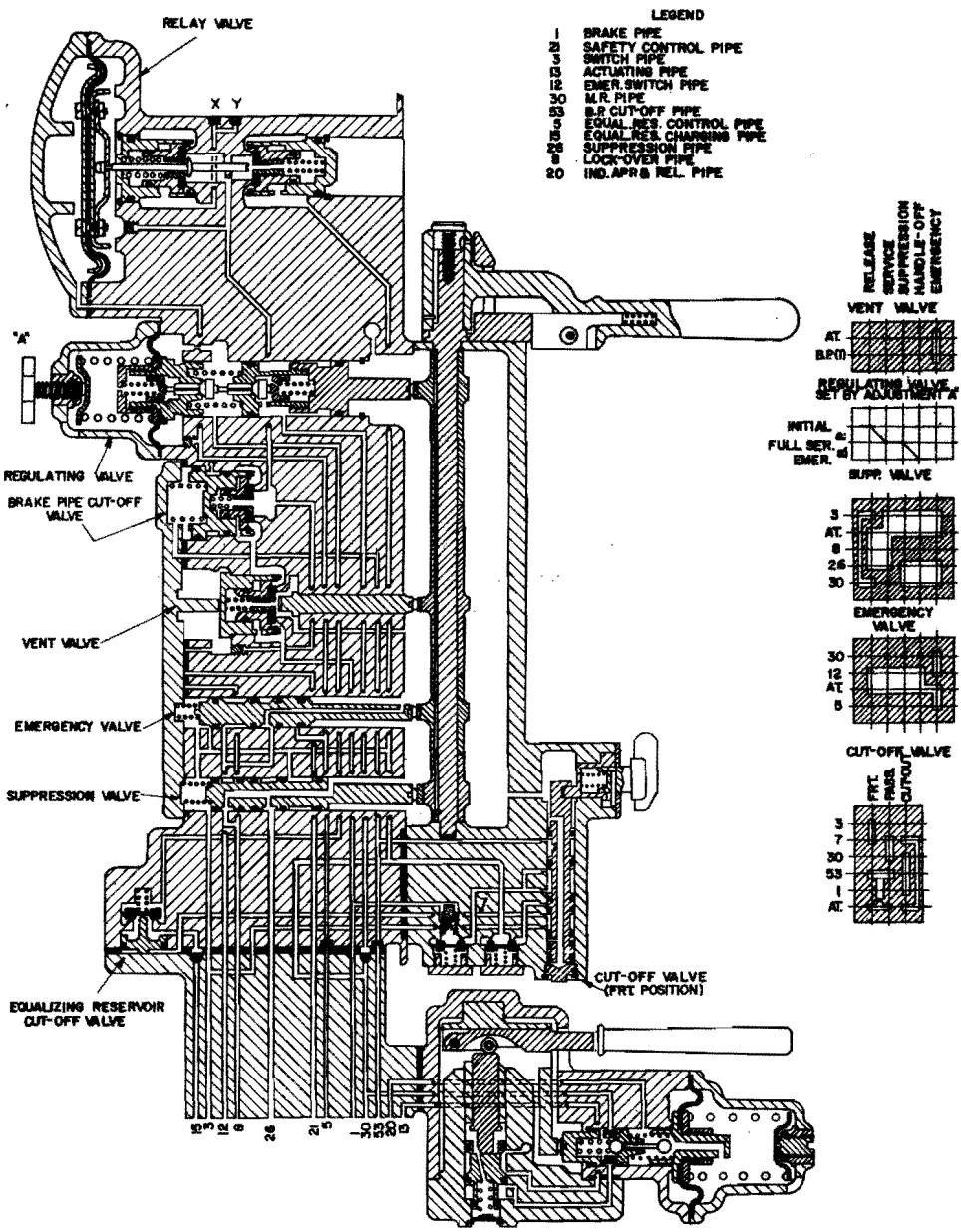


26-C Brake Valve - Diagrammatic View

26-C BRAKE VALVE

The 26-C brake valve is a self-lapping, automatic brake valve, arranged for use with the 26-L brake equipment suitable for application to switcher type locomotives. The brake valve, arranged with a pipe bracket, consists of two (2) main portions--the automatic portion designed for regulating the brake pipe pressure controlling both locomotive and train brakes, and the independent portion arranged to apply and release locomotive brakes independent of train brakes and to control the release of a locomotive automatic brake application independent of the train brakes.

The automatic portion is mounted on top of the pipe bracket and secured with four (4) studs, whereas the independent portion is attached to the front of the pipe bracket and secured with three (3) cap screws. All pipe connections are made to the bottom of the pipe bracket and thus provides a compact brake valve installation that occupies a minimum of space and eliminates much of the air piping in the cab. The pipe connections to the pipe bracket are designated numerically and are so identified on the diagrammatic drawing.

The 26-C brake valve is arranged for panel mounting. The entire valvular section of the valve is mounted behind the panel, necessitating only the handle operating portion and a cut-off valve section to appear on the face of the panel. The brake valve handle positions will be described below.

The cut-off valve cuts in and cuts out the automatic brake valve for purposes of cutting in and cutting out the brake valve, and to permit measurement of brake pipe leakage. By moving the brake valve handle to an appropriate service brake application position and turning the handle of the cut-off valve to cut-out position when the brake pipe exhaust ceases, this will therefore prevent the brake valve from maintaining leakage. Then the leakage of the brake pipe can be measured. The brake pipe leakage test will be covered in subsequent paragraphs.

For all normal operations of the locomotive as a controlling unit, the cut-off valve must be placed in either Freight or Passenger Position, depending upon the intended use of the locomotive. The porting in the cut-off valve portion also incorporates two (2) check valves which provide either brake pipe pressure or main reservoir pressure to the brake pipe cut-off valve, depending upon the existing higher pressure.

The automatic brake valve portion consists of the following details:

1. CONTROLAIR ® Valve, operated by a cam on the brake valve handle shaft, which regulates development of pressure to the equalizing reservoir charging pipe No. 15. This pressure is piped to port No. 5 and through the integral passage of the brake valve to the face of the diaphragm in the relay portion. Movement of the brake valve handle from release position to the service sector

causes this valve to reduce equalizing reservoir pressure in proportion to the handle movement. Movement of the handle to full service position causes equalizing reservoir pressure to drop sufficient to produce a full service brake application. Adjustment of the equalizing reservoir pressure in release position is made by adjustment of knob "A" on the rear of the regulating valve portion. The regulating valve portion is of a self-lapping type and will automatically maintain pressure developed by the valve against overcharge and against leakage.

2. The Relay Portion of the automatic brake valve consists of a relay valve which repeats equalizing reservoir pressure to the brake pipe. The relay portion is capable of either supplying or venting brake pipe pressure and acts as the supply valve for charging brake pipe pressure on the locomotive and train in release position of the brake valve. During application of the brakes, reduction of equalizing reservoir pressure by the control valve causes the relay portion to correspondingly reduce brake pipe pressure. The relay valve portion will maintain the brake pipe pressure against leakage in the brake pipe.

3. The Brake Pipe Cut-off Valve of the automatic brake valve interrupts the flow of air from the relay portion to the brake pipe to cut off this flow in the event of:
   (a) An emergency brake application.
   (b) Operation of the brake pipe cut-off valve.
   (c) Operation of any auxiliary device connected to the brake valve which requires interruption of the flow of air to the brake pipe for purposes of safety control, train control or overspeed brake applications. The brake pipe cut-off valve can be operated by spring pressure to isolate the relay portion of this brake valve from the brake pipe when the handle is placed in handle-off position or by air pressure from the brake valve cut-off valve or auxiliary brake application devices in event of train control, safety control or overspeed brake application.

4. The Vent Valve of the automatic brake valve is cam operated by the brake valve handle to produce a rapid drop in brake pipe pressure in emergency position of the brake valve handle, or by venting port No. 21 by an auxiliary device for purposes of creating an emergency brake application external of the brake valve. (Emergency brake application portion must be used in place of the vent valve cover to obtain this operation.)

5. The Emergency Valve of the automatic brake valve is cam operated by the brake valve handle and has two (2) functions. It provides air to port No. 12

for operation of power knock-out switches and other auxiliary functions which may be required to be operated in emergency position of the brake valve handle. The emergency valve also operates to quickly vent equalizing reservoir pressure, at the brake valve, in emergency position to insure rapid and prompt venting of the brake pipe.

6. The Suppression Valve of the automatic brake valve is cam operated from the brake valve handle shaft and provides air pressure to port No. 26 in suppression, handle-off and emergency position of the brake valve for proper operations of auxiliary devices used with the brake equipment. This portion is also operated when the brake valve handle is moved to full service position to release the auxiliary brake applications such as safety control, train control and overspeed. This valve also operates to supply air pressure to port No. 3 when the brake valve is in release position and to operate the equalizing reservoir cut-off valve.

7. The Equalizing Reservoir Cut-Off Valve of the brake valve is arranged to permit operation of trains employing both graduated and direct release type car equipments. With car equipments employing the direct release feature, the equalizing reservoir cut-off valve prevents recharge of the equalizing reservoir except in release position of the brake valve handle. The equalizing reservoir cut-off valve is, however, capable of maintaining brake pipe pressure against leakage with the brake valve handle in either release or service position. The equalizing reservoir cut-off valve is operated in Passenger Position of the cut-off valve to cause this valve to remain open. In Freight Position of the cut-off valve, the equalizing reservoir cut-off valve is open only in release position.

The automatic brake valve portion contains a handle that operates through the following positions:

1. Release Position.
2. Minimum Reduction Position.
3. Service Position.
4. Suppression Position.
5. Handle-off Position.
6. Emergency Position.

Automatic Brake Valve Operation

Release Position conditions the brake valve to charge the brake pipe. Main reservoir air enters port No. 30 in the pipe bracket, flows to the supply valve in the relay valve, to the suppression spool valve, the cut-off valve and thus to the equalizing reservoir cut-off valve piston. Main reservoir air also flows through the charging valve in the regulating valve to the check valve in the equalizing reservoir cut-off valve as well as to the face of the regulating valve diaphragm. Handle "A" of the regulating valve may be adjusted to regulate the pressure flowing

through the charging valve and thus control the pressure required in the equalizing reservoir. Whenever the force of the main reservoir pressure on the face of the diaphragm reaches the setting of the spring in the regulating valve, the charging valve is positioned to cut off the main reservoir air supply.

Main reservoir pressure on the equalizing reservoir cut-off valve piston positions the check valve in the open position. This permits main reservoir air to flow to port No. 15 in the pipe bracket and thus charge the equalizing reservoir as well as port No. 5 in the pipe bracket. Port No. 5 in the pipe bracket is connected through the brake valve to the face of the relay valve diaphragm. Continued build-up of air pressure on the face of the relay valve diaphragm initiates a movement of the diaphragm assembly and attached stem. Movement of the stem opens the supply valve and permits main reservoir air to charge the brake pipe chamber in the relay valve, the brake pipe cut-off valve, the vent valve and thus to port No. 1 in the pipe bracket to which the brake pipe is connected.

Whenever the pressure build up in the brake pipe chamber of the relay valve reaches that of the equalizing reservoir chamber in the relay valve, the diaphragm assembly and stem are positioned to permit the supply valve to close. The brake pipe is now fully charged; however, should brake pipe pressure drop due to leakage in the brake pipe, the existing higher pressure in the equalizing reservoir chamber in the relay valve will position the diaphragm assembly and stem to open the supply valve to increase brake pipe pressure until equalization is reached and the relay valve assumes a lap position again.

Service Position, which consists of a sector of the handle movement, regulates brake pipe pressure to a pressure lower than release position pressure and thereby causes application of both locomotive and train brakes. Intensity of the service brake application is increased as the handle is moved to the right. A minimum reduction notch is also contained in the brake valve quadrant. Movement of the brake valve handle to this position provides a reduction of approximately 6 to 8 psi pressure in the equalizing reservoir which in turn reduces brake pipe pressure similarly.

When the brake valve handle is placed in an intermediate service position, the suppression valve is positioned to connect ports Nos. 3, 8 and 26 to atmosphere. The charging valve in the regulating valve is also positioned to allow equalizing reservoir charging air to vent to atmosphere. The pressure differential that is initiated across the equalizing reservoir check valve permits the check valve to be lifted from its seat and thus the equalizing reservoir is also connected to atmosphere. The pressure differential that now exists across the diaphragm in the relay valve initiates a movement of the diaphragm assembly and stem to open the exhaust valve and thus permit brake pipe air to vent to atmosphere at the brake valve. Brake pipe air will continue to vent to atmosphere until air pressure equalization exists across the relay valve diaphragm. When this occurs, the diaphragm assembly and stem, with the aid of the relay valve springs, position

the assembly to allow the exhaust valve to close and thus the brake valve assumes a lap position.

When the brake valve handle is placed in full service position, the brake valve operates as previously described. However, the pressure in the equalizing reservoir as well as the brake pipe is permitted to drop a greater pressure and thus allow greater pressure to be applied to the brake cylinders.

Suppression Position is used for the purpose of nullifying any safety control, overspeed or train control brake application. When operating the automatic brake system, if the brake valve handle is placed in suppression position prior to a penalty application on sounding of the warning whistle, a penalty brake application may be avoided. However, the 26-C brake valve is so designed that whenever the brake valve handle is placed in suppression position, a full service brake application will be obtained. It is not possible to avoid getting a service brake application by cycling the brake valve handle; that is, by returning the brake valve handle to release position for a few seconds and then returning to suppression position, since the brake valve was originally conditioned for a service application.

In suppression position, the suppression valve is positioned to connect port No. 3 to atmosphere at the brake valve. Main reservoir pressure which is in port No. 30 is connected through the valve to port No. 26.

Handle-off Position is used to allow brake pipe pressure within the brake valve to reduce to zero and the various valves are positioned to make inoperative the normal operating functions of the brake valve. The brake valve handle, placed in handle-off position, conditions the brake valve spool valves to assume positions similar to that in suppression position.

Emergency Position is used to vent brake pipe at the fastest possible rate to produce an emergency brake application and to vent to zero the brake pipe pressure. The flow of air to the brake pipe is cut off in emergency position. The emergency valve is positioned to permit port No. 5 to vent to atmosphere at the brake valve, and main reservoir pressure is connected to port No. 12 which is connected to the selector valve whenever this valve is included in the brake equipment. Port No. 5, connected to atmosphere, permits equalizing reservoir air to drop to zero and thus the diaphragm assembly and stem in the relay portion are so positioned to open the exhaust valve in the relay valve and allow brake pipe air to vent to atmosphere. The suppression valve remains in the same position as in suppression of handle-off position. The vent valve is also manually positioned by the brake valve handle cam, to open and allow brake pipe air to vent to atmosphere through a large opening which permits the rapid drop of brake pipe pressure.

Brake Pipe Leakage Test

Prior to operation of the 26-L brake equipment, a leakage test must be performed. This is accomplished in the following manner:

1. The cut-off valve is positioned in either Freight or Passenger position, depending upon the make-up of the train.

2. The brake valve is gradually moved into service position, and the equalizing reservoir gage should be observed until a 15 psi reduction is obtained.

3. Since the pressure in the equalizing reservoir will drop faster than that of brake pipe, therefore, without any further movement of the handle, the brake pipe gage should then be observed until 15 psi brake pipe reduction is obtained.

4. At this moment, turn the cut-off valve to cut-out position. This cuts out the maintaining function of the brake valve.

5. From the instant that the cut-off valve is turned to cut-out position, the brake pipe gage should be observed and any possible drop in brake pipe pressure should be timed for one minute.

Dead Engine

The 26-L equipped locomotive may be hauled "DEAD" providing the brake valve is first conditioned for this type of locomotive movement. The brake valve handle would remain in release position, and the cut-off valve is placed in cut-out position. This permits brake pipe air to flow to the back of the brake pipe cut-off valve, thus cutting out the brake valve.

Whenever an "MU" type of valve is used with the 26-C brake valve, it must be remembered that the "MU" valve should be placed in "LEAD" position when the locomotive is hauled dead.

An emergency brake application can be obtained on a "DEAD" engine, since, with the movement of the brake valve handle to emergency position, a cam on the brake valve handle shaft manually opens the vent valve to permit brake pipe to vent to atmosphere at the brake valve.

Independent Brake Valve Operation

The SA-26 independent brake valve mounted on the front of the pipe bracket controls locomotive brake cylinder pressure. Movement of the handle thus actuates a cam which in tum positions the valve assembly to permit the exhaust valve to seat and thus open the supply valve. Main reservoir air pressure will flow from

port No. 30 to the supply valve and thus to the chamber that is connected to port No. 20. Port No. 20 would be connected to the relay valve that controls the brake cylinder pressure. As the air flows through the supply valve to port No. 20, it also flows to the face of the diaphragm in the independent brake valve. The build-up of air pressure on the diaphragm is opposed by the spring pressure on the diaphragm. Whenever the air pressure and the spring pressure become balanced, the valve assembly will assume a lap position and thus hold constant that pressure that is in port No. 20. If, as a result of leakage in line No. 20, the air pressure should drop, the diaphragm assembly would move to allow the supply valve to open and thus permit main reservoir air to again flow into delivery port No. 20.

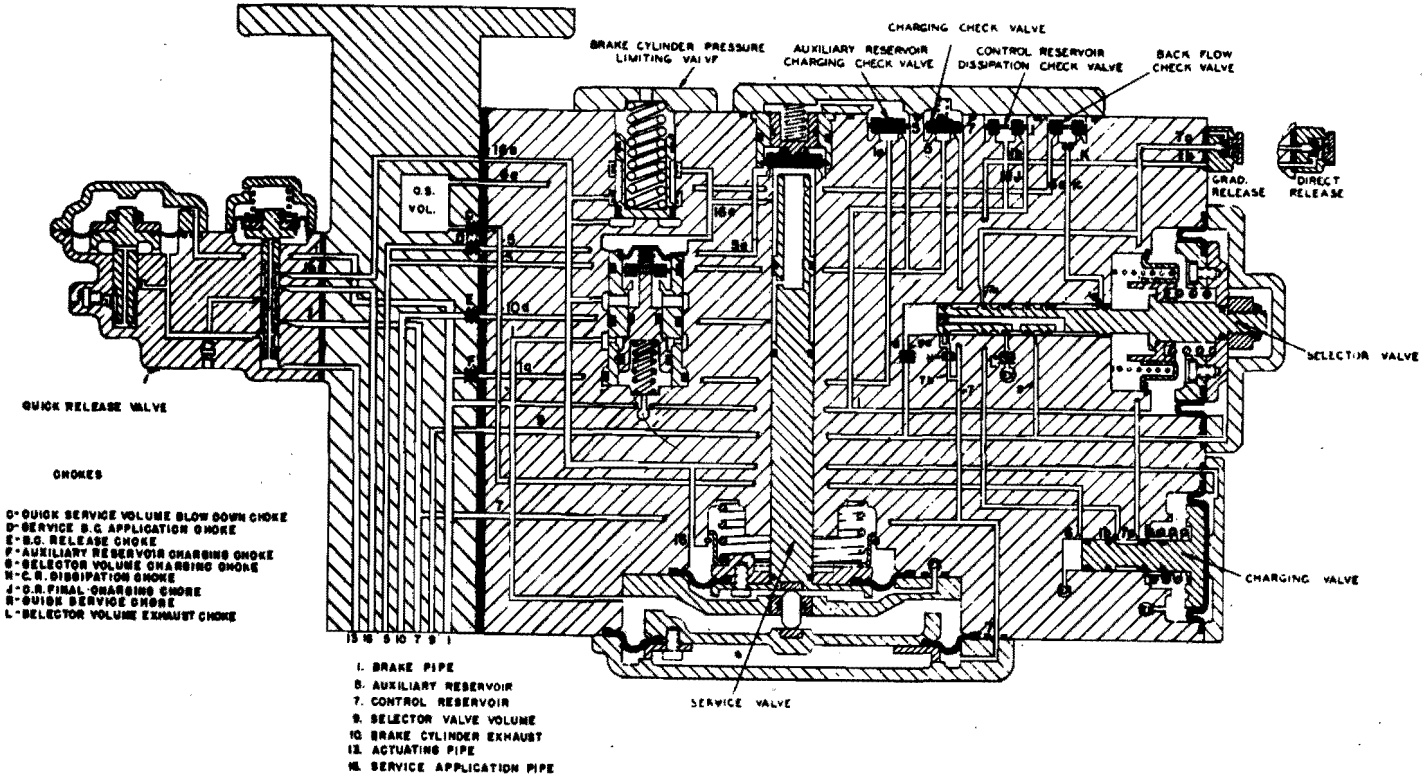
Depression of the independent brake valve handle whenever the handle is in release position, causes the release of any automatic brake application existing on the locomotive. Main reservoir air flows into port No. 13, which, in turn, is connected to the quick release portion of the control valve which functions to release the locomotive brakes.

26-F CONTROL VALVE

The 26-F control valve is an automatic type of control valve consisting of a pipe bracket to which are attached a service portion and a quick release portion. The control valve is capable of responding to service rate or emergency rate of change of the brake pipe pressure and thus develops a brake cylinder pressure from brake pipe reductions with reference to a control reservoir pressure.

The pipe connections to the pipe bracket are designated numerically and are so identified on the diagrammatic drawing.

The Service Valve Portion contains a service spool valve, which includes two (2) diaphragms selected for proper reference of brake cylinder pressure development guided by reduction in brake pipe pressure. The application and release valve element controls the movement of the air from the auxiliary reservoir to the relay valve. Whenever a reduction in brake pipe pressure occurs, the service spool valve assembly moves upward and thus opens the application valve. The service valve spool element also serves to exhaust, at the control valve, the controlling air pressure of the relay valve, whenever the brake pipe pressure is increased. The diaphragm area ratios, together with the spring arrangement included in the service valve portion, permit stable operation of the automatic brake together with proper development of brake cylinder pressure to operate satisfactorily with other systems of automatic air brake control. The service portion also includes a charging valve that functions to cut off the flow of air from the quick service volume to atmosphere, and also cuts off the dissipation of control reservoir air to the brake pipe during graduated release action of the control valve.



26-F Control Valve - Diagrammatic

Four check valves are provided for:

(a) Charging the auxiliary reservoir from the brake pipe.

(b) Charging the control reservoir from auxiliary reservoir.

(c) Dissipating control reservoir air into brake pipe during direct release action of the control valve.

(d) Dissipating brake pipe air from the spring chamber of the selector valve to the quick service volume during the initial stages of a brake application.

A direct or graduated release cap is also located on the service valve portion. Its position is determined by the type of service in which the control valve is to be used.

The selector valve, designed into the service portion of the 26-F control valve, provides a feature that enables the control valve to be satisfactorily trained with D-22 brake equipment. It also provides the direct release function when required.

The service valve portion also contains two (2) brake cylinder limiting valves which will limit the maximum brake cylinder pressure not only in service applications but also in emergency applications. These pressures would be determined by the load of the springs within the limiting valves.

The Quick Release Valve Portion in the 26-F control valve is designed to permit release of an automatic brake application developed by the service portion of the control valve. Upon depressing the independent brake valve handle, air pressure developed at the brake valve flows to the control valve, thus causing the operation of the small diaphragm in the quick release valve portion. Movement of this diaphragm and stem interrupts and vents to atmosphere the air pressure developed in the line connected to the relay valve. Operation of the small diaphragm in the quick release valve portion initiates the operation of the larger diaphragm and stem. This permits the control reservoir air to vent to atmosphere a sufficient amount to equalize the control reservoir pressure with the brake pipe pressure and thus prevent reapplication of the brakes upon release of the independent brake valve handle.

Control Valve Operation

With the brake valve in Release Position, brake pipe air flows to the brake pipe connection or port No. 1 of the control valve. From port No. 1, the air flows to the following passages and chambers:

1. To the quick release valve and thus to the chamber above the large diaphragm.

2. To the spring chamber of the selector valve.

3. To the brake pipe diaphragm chamber in the service valve.

4. To the brake cylinder emergency limiting valve, where the brake pipe pressure overcomes the force of the spring and moves the spool valve to its downward position.

5. To the control reservoir dissipation check valve.

6. To the auxiliary reservoir charging check valve, where the auxiliary reservoir line is charged and, in the interim, the auxiliary reservoir line charges the control reservoir line.

7. Control reservoir air flows through choke plug H to the spool valve chamber of the selector valve and thus through choke plug G to charge the selector reservoir.

If the brake system is fully charged, the identical pressures will exist above and below the large diaphragm in the service valve, and, with the aid of the large spring, the diaphragm assembly will be positioned in its downmost position during Release Position of the automatic brake valve.

When the brake valve handle is positioned in Service Position, the brake pipe pressure in Port No. 1 will be reduced the amount as determined by the position of the brake valve handle. This reduction of brake pipe pressure will occur in the brake pipe chamber above the large diaphragm in the service valve. The differential pressure that exists across the diaphragm will initiate a movement of the diaphragm assembly and stem to open the application valve. Reduction of brake pipe pressure also occurs in the spring chamber of the selector valve. The pressure differential that exists across this diaphragm positions the diaphragm assembly and stem to permit the following to occur:

1. Control reservoir air, charging the selector reservoir through choke plugs H and G, is cut off at the selector spool valve.

2. Quick service action occurs when brake pipe air in the spring chamber of the selector valve flows to the backflow check valve and hence to the quick service volume. The air pressure in the quick service volume in the pipe bracket is dissipated through choke plug C and thus to the passage which leads to the charging valve where the exhaust port is located.

When the application valve is opened by the upward movement of the service valve stem, auxiliary reservoir air connected to the port No. 5 in the pipe bracket is admitted into the system. This air flows through the brake cylinder service limiting valve and hence to the following chambers:

1. To the face of the charging valve diaphragm, thus initiating a

a movement of the charging valve which cuts off the exhaust of brake pipe air from the quick service volume to atmosphere.

2. To port No. 16 in the pipe bracket and hence to the relay valve.

3. To the large spring chamber in the service valve where continued build-up of pressure forces the diaphragm assembly downward until the combined forces of the spring, the air pressure in the spring chamber and the brake pipe pressure balance the force of the control reservoir air pressure. Whenever this balance point is reached, the service valve will assume a Lap Position.

4. Auxiliary reservoir air flows to the underside of the brake cylinder service limiting valve. Whenever this air pressure increases to a point in excess of the force of the spring, the spool valve moves upward and thus cuts off any further flow of auxiliary reservoir air through the control valve. The value of the spring force thus limits the maximum pressure delivered to the relay valve during a service application.

Whenever high brake pipe pressures are employed, it is possible to get over reductions with the 26-F control valve; however, an over reduction will not have any effect upon the brake cylinder pressure, since the brake cylinder pressure is determined by the load of the springs in the service and emergency limiting valves.

In Emergency Position of the brake valve, the 26-F control valve functions similarly to that described above; however, several additional features designed into the control valve would be utilized as follows:

1. The increased pressure differential across the diaphragm in the selector valve, as a result of the greater drop of brake pipe pressure, thus positions the diaphragm to enable the valve to not only momentarily provide those features obtained during a service application, but also now the spool valve is positioned to bottle up the selector volume as well as the control reservoir volume.

2. The auxiliary reservoir air flows from the application check valve to the brake cylinder service limiting valve, and the brake cylinder emergency limiting valve. The brake pipe pressure in the emergency limiting valve drops sufficiently to permit the spring to move the spool valve upward, thus unseating the check valve, permitting the auxiliary reservoir air to flow unrestricted to the relay valve as well as the other associated member chambers in the control valve. Whenever brake cylinder pressure reaches a point high enough to overcome the force of the emergency limiting valve spring, the spool valve will be forced downward and thus close the check

valve which cuts off any further flow of any air to the relay valve.

Graduated or Direct Release function can be obtained with the 26-F control valve, depending upon the position of the cap. During the release of the locomotive brakes and with the cap on the control valve positioned for Graduated Release, the flow of air from the control reservoir is directed to the selector volume through the selector spool valve chamber and the choke plug G. However, if the cap is positioned for Direct Release, the flow of air from the control reservoir is directed to the brake pipe through the selector spool valve, the release cap and the control reservoir dissipation check valve.

In Release Position of the brake valve, the brake pipe pressure is increased, and when this higher pressure is admitted into the brake pipe chamber above the large diaphragm in the service valve, all of the combined downward forces position the diaphragm assembly and stem to permit the relay valve air to vent to atmosphere through the service valve stem and thus to port No. 10 in the pipe bracket. It must be remembered that the air on the face of the charging valve diaphragm is also vented to atmosphere which permits the spring to move the charging valve to its normal position. The continued build-up of brake pipe pressure in the brake cylinder emergency limiting valve overcomes the force of the spring and thus retains the spool valve down, permitting the check valve to remain seated.

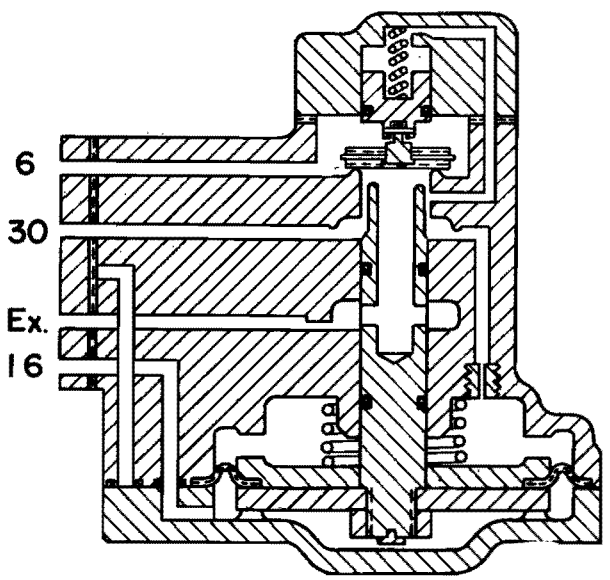
The quick resease portion of the 26-F control valve functions to release only the locomotive brakes after an automatic brake application has been made. Main reservoir air flows from the independent brake valve when the handle is depressed. This air enters port No. 13 in the pipe bracket of the 26-F control valve and thus to the underside of the small diaphragm of the high pressure valve. The force of the air pressure overcomes that of the spring, and the diaphragm assembly and stem are positioned in an uppermost position. Control reservoir pressure may then flow through the valve stem to the underside of the large diaphragm in the quick release portion. The pressure of the control reservoir being higher than that of brake pipe, positions this diaphragm assembly and stem in its uppermost position. With both diaphragm assemblies and stems now in the uppermost position, the air in port No. 16, which is connected to the relay valve, is permitted to vent slowly to atmosphere through an exhaust port, whereas the air in the control reservoir connected to port No. 7 is also permitted to vent to atmosphere at a very slow rate through an exhaust port. The control reservoir will continue to vent to atmosphere until the brake pipe pressure exceeds that of control reservoir when at such a time the differential pressure across the large diaphragm will be reversed and the diaphragm assembly and stem will be forced downward, thus cutting off the exhaust of control reservoir air to atmosphere. The decrease of control reservoir air pressure is necessary, since it must be reduced a sufficient amount to equalize with brake pipe pressure and thus prevent reapplication of the locomotive brakes upon the release of the independent brake valve handle.

J-1 RELAY VALVE

The J-1 relay valve is a diaphragm-operated, self-lapping valve which functions to supply and exhaust brake cylinder air pressure during brake applications.

Controlled air pressure admitted to port No. 16 acts upon the face of the large diaphragm, initiating a movement of the diaphragm assembly and stem. The stem opens the check valve and thus allows the supply air that enters into port No. 6 to flow through the check valve and thus to port No. 30, which is connected with the spring side of the large diaphragm as well as the brake cylinders. Brake cylinder air pressure, combined with the spring force, oppose the further movement of the diaphragm assembly as initiated by the controlled air pressure. An equalization of forces across the diaphragm positions the diaphragm assembly and stem to allow the check valve to seat and also allows the valve to remain in lap position.

The maintaining feature of the J-1 relay valve operates if an air leak exists in the brake cylinders. The pressure in port No. 30 and also in the chamber on the spring side of the large diaphragm would drop and thus permits the diaphragm assembly and stem to move and open the check valve. Supply air would again flow into port No. 30 and the spring chamber until equalization of forces would again be reached. The diaphragm assembly and stem would therefore again be positioned to permit the valve to remain in lap position.



LEGEND	
Port No.	Description
6	Supply
16	Control
30	Delivery

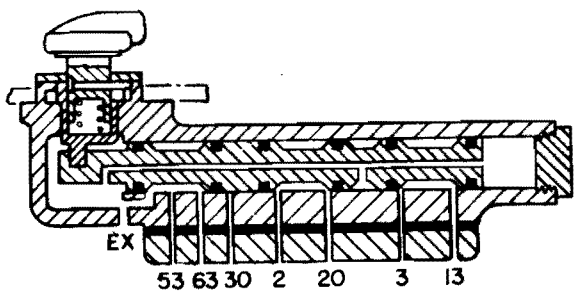
J-1 Relay Valve - Diagrammatic

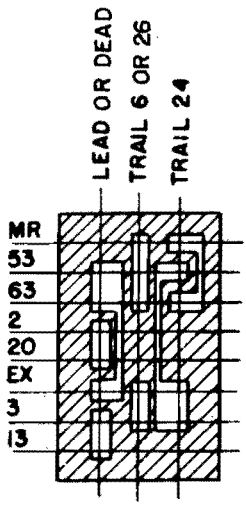
A reduction of controlled air pressure would initiate the movement of the diaphragm assembly and stem and thus permits brake cylinder air pressure to exhaust from the relay valve. A graduated release of brake cylinder pressure may also be obtained whenever the controlled air pressure is intermittently released. The pressure differential across the diaphragm positions the stem to exhaust the brake cylinder air pressure. When brake cylinder pressure is reduced sufficiently on the spring side of the diaphragm, equalization of pressure again occurs across the diaphragm, and the valve moves to lap position.

MU-2A VALVE

The MU-2A valve is a three-position valve, arranged with a pipe bracket, and is used to enable a 26-L equipped locomotive to be multiple-united with not only 6 or 26 type equipment but also with a 24-RL equipped locomotive. The MU-2A valve pilots the F-1 selector valve which is a device that enables the equipment of one locomotive to be controlled by the equipment of another.

The three positions of the MU-2A valve are: "LEAD OR DEAD," "TRAIL-6 OR 26" and "TRAIL-24".





LEGEND

2 IND. APP. & REL. PIPE (B.V.)
3 ACTUATING PIPE (B.V.)
13 ACTUATING PIPE (B.V.)
20 IND. APPL. & RELEASE PIPE LINE
30 MAIN RESERVOIR
53 MULTIPLE UNIT CONTROL PIPE
63 MULTIPLE UNIT INTERLOCK PIPE

MU-2A Valve - Diagrammatic

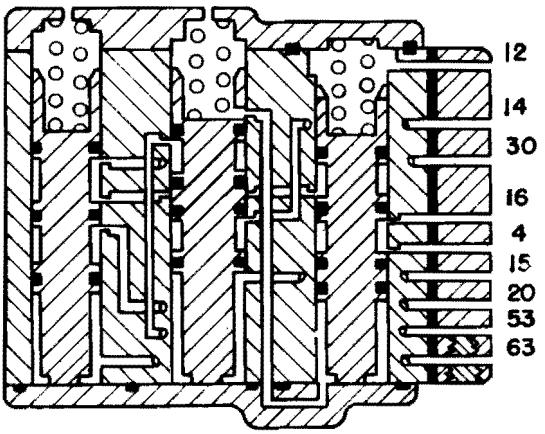
In "LEAD" position, main reservoir pressure in port No. 30 is blanked, and ports Nos. 53 and 63 are connected to exhaust at the MU-2A valve. Independent brake control pressure emanating from the independent brake valve is connected to port No. 2 of the MU-2A valve through the spool valve and to port No. 20. Port No. 20 at the MU-2A valve is connected to not only port No. 20 of the F-1 selector valve where the air is blanked but also to port No. 16 of the J-1 relay valve to provide for independent brake applications on the lead locomotive. The actuating pipe at the independent brake valve (port No. 13) is connected to port No. 3 of the MU-2A valve through the spool valve and to port No. 13 in the MU-2A valve. Port No. 13 is connected to the actuating pipe at the 26-D control valve.

When the 26-L equipped locomotive is trailed behind a locomotive using No. 6 or 26 brake equipment, the MU-2A valve is positioned in "TRAIL-6 OR 26" position. Ports Nos. 2, 13 and 20 are blanked at the MU-2A valve, and port No. 3, which is connected to the actuating pipe emanating from port No. 13 at the independent brake valve, is connected to exhaust at the MU-2A valve. Main reservoir pressure flowing to the MU-2A valve to port No. 30 is connected through the spool valve to ports Nos. 53 and 63, which are, in turn, connected to ports Nos. 53 and 63, respectively, at the F-1 selector valve. This positions the F-1 selector valve to allow brake cylinder equalizing pipe air, port No. 14, to be connected to port No. 16 and to port No. 20, both of which are connected through the double check valve and thus to port No. 16 in the J-1 relay valve during a brake application from the lead locomotive.

When the 26-L equipped locomotive is trailed behind a locomotive using 24-RL brake equipment, the MU-2A valve is positioned in "TRAIL-24" position. Ports Nos. 2 and 20 are blanked and ports Nos. 3 and 53 are connected to exhaust at the MU-2A valve. Main reservoir pressure entering port No. 30 is connected to port No. 63, which, in turn, is connected to port No. 63 of the F-1 selector valve. This positions the F-1 selector valve to permit brake cylinder equalizing pipe air to flow to port No. 14 and thus to port No. 20 in the F-1 selector valve, the double check valve and thus to port No. 16 in the J-1 relay valve during brake application initiated from the lead locomotive.

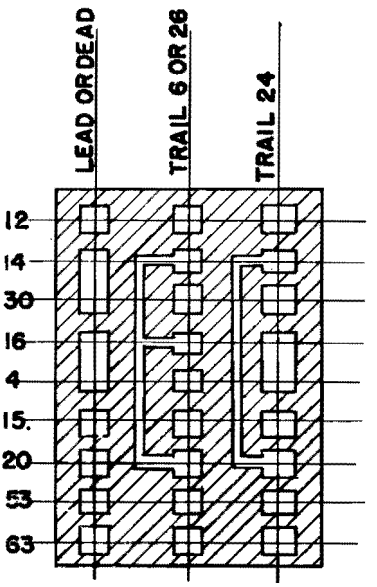
F-1 SELECTOR VALVE

The F-1 selector valve performs the function of arranging the brake equipment on the locomotive to lead or trail other types of brake equipment. It performs the function of protecting a trailing locomotive brake equipment by automatically re-setting the brake control to lead position in the event of a separation between locomotive units. The selector valve consists of three sections. The protection valve is controlled by pipe No. 15. The transfer sections are controlled by pressure in pipes Nos. 53 and 63. Connections are made as shown in the positioning charts for the positions "LEAD", "TRAIL-6 or 26 Equipment" and "Trail-24 Equipment". Operation of the selector valve



LEGEND

4 AUT. B. CONTROL PIPE
12 EMER. PIPE
14 B. CYL. EQ. PIPE
15 M.R. EQ. PIPE
16 APP. PIPE
20 INDEP. APP. & REL. PIPE
30 B. CYL. PIPE
53 M.U. CONTROL PIPE
63 M.U. INTERLOCK PIPE



F-1 Selector Valve - Diagrammatic

is under control of the MU valve located in the locomotive cab.

Lead Position

When 26-L equipped locomotive is leading a 6 or 26 equipped locomotive, pressure to ports Nos. 53 and 63 of the selector valve are vented and connections made as shown under lead position of the positioning diagrammatic. Control valve pressure flows from port No. 4 to No. 16 and from there to the relay valve of the locomotive. Pressure from the brake cylinder line flows from port No. 30 to port No. 14 and hence to the brake cylinder equalizing pipe of the lead locomotive. The brake cylinder equalizing pipe is used to control brakes on trailing units.

Trail-6 or 26 Equipped Locomotives

When the 26-L equipped locomotive is trailing a 6 locomotive, operation of the selector valve is performed by applying pressure to ports Nos. 53 and 63 of the selector valve, causing the selector valve to assume position as shown in the position diagrammatic under Trail-6 or 26 locomotive. Under this condition, air pressure from the brake cylinder equalizing pipe enters port No. 14 and flows to ports Nos. 16 and 20, and thus to the relay valve of the trailing locomotive. Brakes are thus applied on the trailing locomotive in the same manner as brakes are applied to the lead locomotive.

Trail-24 Equipped Locomotives

When a 26-L equipped locomotive is trailing a locomotive equipped with 24 type brake equipment, the F-1 selector valve is positioned by applying air pressure to port No. 63 of the selector valve, and the selector valve makes the connections as shown on the position diagrammatic under Trail-24. Under this condition, pressure from the control valve enters port No. 4 and flows directly to port No. 16, actuating the relay valve of the locomotive equipment. Air pressure also enters port No. 14 from the brake cylinder equalizing line and flows to port No. 20 of the selector valve. This air pressure also actuates the relay valve of the locomotive brake equipment. The brakes on the trailing locomotive are thus actuated by either an automatic brake application or an independent brake application initiated by the leading 24-RL brake equipment.

P-2 BRAKE APPLICATION VALVE

The primary function of the P-2 brake application valve is to cause a full service application of the brakes when initiated by the following features:

1. Overspeed Control
2. Trail Stop Control
3. Safety Control

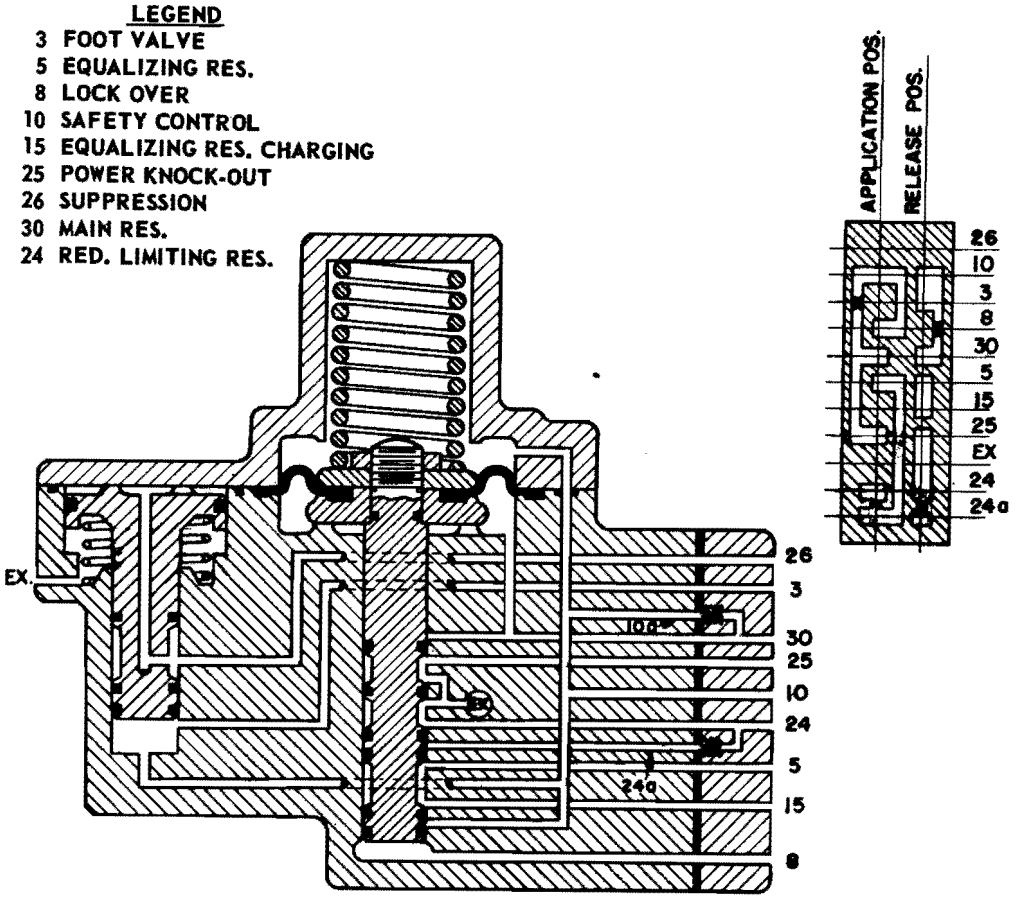
The P-2 brake application valve is mounted on its own separate pipe bracket. The pipe connections to the pipe bracket are designated numerically and are so identified on the diagrammatic drawing.

The P-2 brake application valve is adapted to provide brake applications when auxiliary braking devices are conditioned for stopping a train. With the locomotive equipment charged and operating normally, main reservoir air enters Port No. 30 in the pipe bracket and the integral passages of the application valve. Here the air positions the diaphragm assembly and spool valve to permit the flow of air to the ports in the pipe bracket, which are connected to the auxiliary braking devices.

The application valve diaphragm and spool valve are held in normal, or release position, by the action of the piston spring. In release position, the spool valve makes the following connections:

1. Main reservoir air from Port No. 30 enters the chamber on the spool valve side of the diaphragm.

2. Main reservoir air passes through the choke, in the body to passage 10a that connects to Port No. 10 or the safety control pipe. The air also enters the chamber on the spring side of the diaphragm and also flows to the passage that leads to Port No. 3 or the foot valve pipe.



P-2 Brake Application Valve - Diagrammatic

3. Equalizing reservoir charging pipe, Port No. 15, is connected with the equalizing reservoir pipe, Port No. 5. This permits the equalizing reservoir charging air flowing from the brake valve to pass through the application valve and thus charge not only the equalizing reservoir but also the equalizing reservoir chamber in the relay valve located in the brake valve.

During a penalty application, the air pressure is reduced in Port No. 3 of the application valve. Subsequently, the air pressure in the spring chamber is also reduced. The diaphragm assembly and spool valve are then positioned to a penalty application position as a result of the differential that exists across the diaphragm. This action connects the integral passages in the spool valve to the other passages in the body of the application valve that lead to ports in the pipe bracket.

In penalty application position, the movement of the diaphragm assembly and spool valve makes the following connections:

1. Main reservoir air in Port No. 30 and in the diaphragm chamber on the spool valve side enters into the passage that connects Port No. 25 and thus to the power knock-out switch.

2. Main reservoir air, which passes through the choke, in the body and through the integral passage 10a in the application valve body, is thus connected to Port No. 8. The chamber on the spring side of the diaphragm, as well as the timing reservoir that is connected to Port No. 10, is also integrally connected to Port No. 8. Port No. 8 is connected to the lock-over pipe which extends to the brake valve.

3. Equalizing reservoir charging air, Port No. 15, is blanked at the spool valve.

4. Equalizing reservoir air, Port No. 5, is connected through the spool valve to passage 24a, containing a choke plug, and thus to Port No. 24 to which is connected a reduction limiting reservoir. Equalizing reservoir air is now also connected to the reduction limiting reservoir.

To prevent a penalty application within the allowable delay time, the brake valve handle is moved to suppression position and the following action occurs:

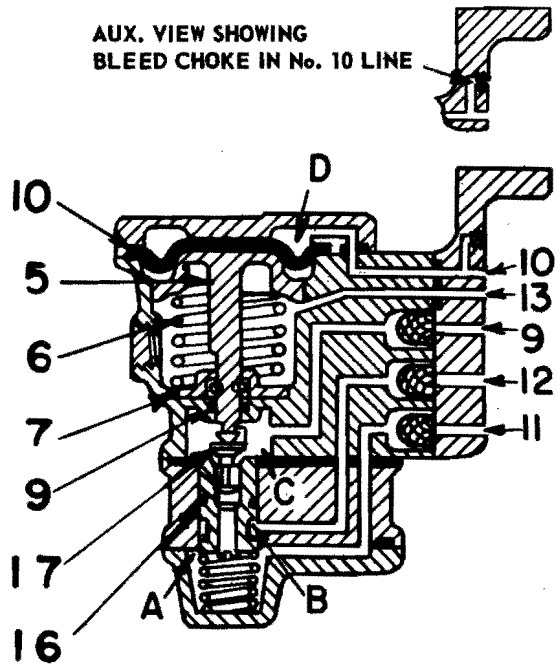
1. The exhaust of air at the brake valve as a result of the open passage provided in Port No. 8 is now cut off.

2. Main reservoir air supplied from the suppression valve in the brake valve flows through the connecting pipe to Port No. 26 in the application valve. The large piston in the application valve is actuated and thus cuts off the flow of air from the chamber of the spring side of the diaphragm to Port No. 3.

3. Main reservoir air, however, is continuously supplied to the chamber on the spring side of the diaphragm, through the choked port in the application valve body. The continued build-up of this pressure once again positions the diaphragm assembly and spool valve in normal or release position.

BREAK-IN-TWO PROTECTION FEATURE

The break-in-two protection feature as installed with 26-L brake equipment utilizes the HB-5 and H-5-A RELAYAIR Valves. These valves are similar in construction except that the spring chamber under the diaphragm in the HB-5 RELAYAIR Valve is connected to port No. 13 in the pipe bracket. In the H-5-A



HB-5 RELAYAIR® Valve - Diagrammatic

RELAYAIR Valve, the spring chamber under the diaphragm is vented to atmosphere through a wasp excluder in the body, and thus port No. 13 is entirely eliminated from the pipe bracket.

A typical break-in-two installation is illustrated in the line piping diagrams at the end of the pamphlet.

During normal operation, brake pipe air is fully charged and thus pipes No. 10 and No. 13 and the 90 cu.in. reservoir are also fully charged to position the HB-5 RELAYAIR Valve in its uppermost position. With the RELAYAIR Valve in this position, port No. 11 is connected to port No. 9, and main reservoir supply in port No. 12 is cut off at the valve. Whenever a break-in-two occurs, the brake pipe air pressure in pipe No. 13 drops rapidly, thereby reducing the air pressure in the spring chamber in the HB-5 RELAYAIR Valve. The air pressure in the 90 cu.in. reservoir as well as in port No. 10 also begins to drop; however, with the choke fitting installed, the air pressure exhausts to brake pipe at a very slow rate. The air pressure retained in port No. 10 of the HB-5 RELAYAIR Valve forces the piston downward and thus connects main reservoir air in port No. 12 to port No. 11.

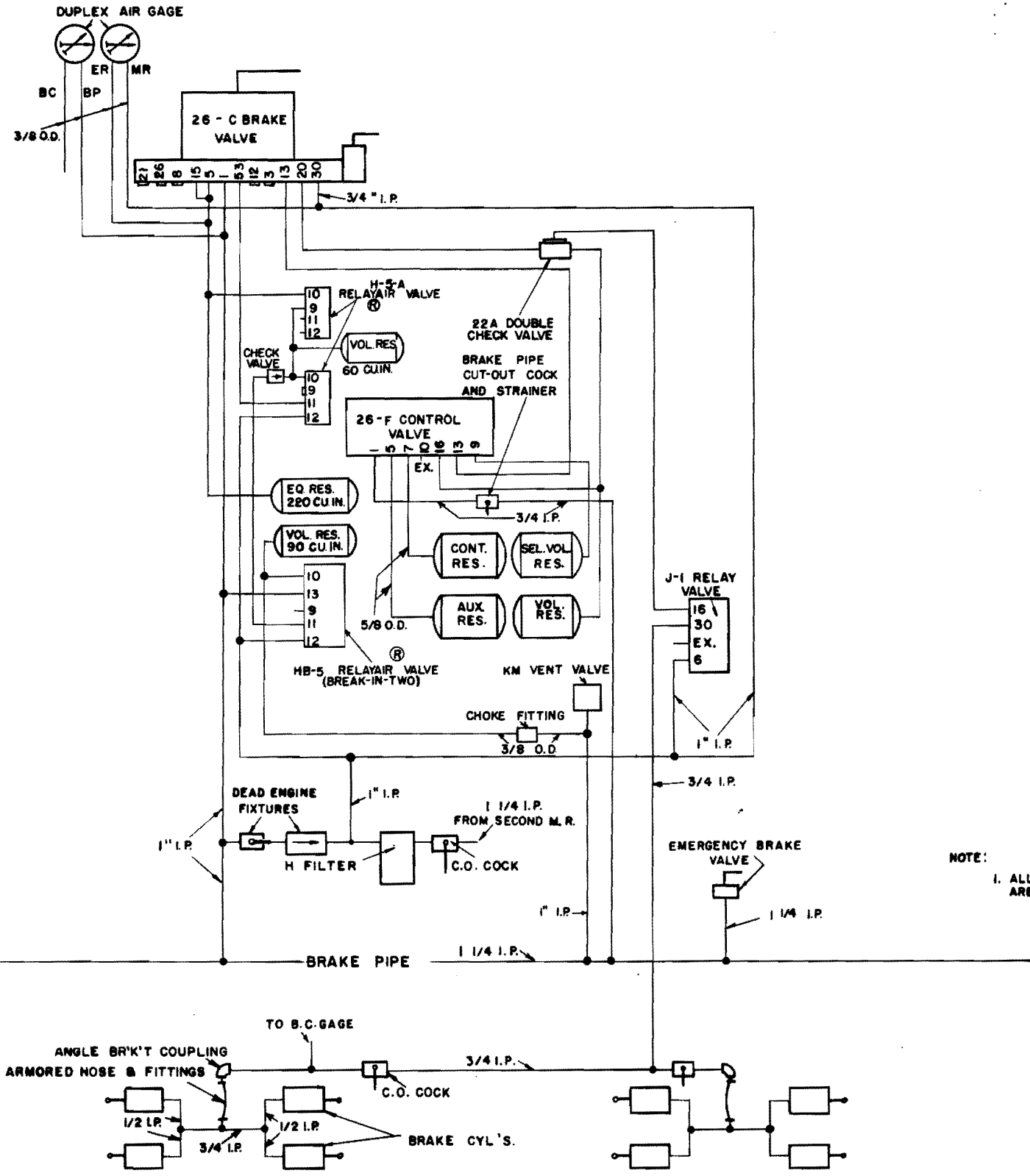
Main reservoir air supplied to port No. 11 flows to the check valve and to the following places: (1) the 60 cu.in. reservoir; (2) port No. 9 in the top H-5-A RELAYAIR Valve; and (3) port No. 10 in the bottom H-5-A RELAYAIR Valve.

The air pressure increases above the diaphragm in the lower H-5-A RELAYAIR Valve, and this pressure forces the piston downward to connect port No. 12 with port No. 11. With main reservoir air pressure now supplied to port No. 11, the air flows to port No. 53 in the brake valve, which is connected to the Brake Pipe Cut-Off Valve and also to an exhaust port in the Cut-Off Valve where the exhaust of air gives the engineman an audible warning that a break-in-two has occurred.

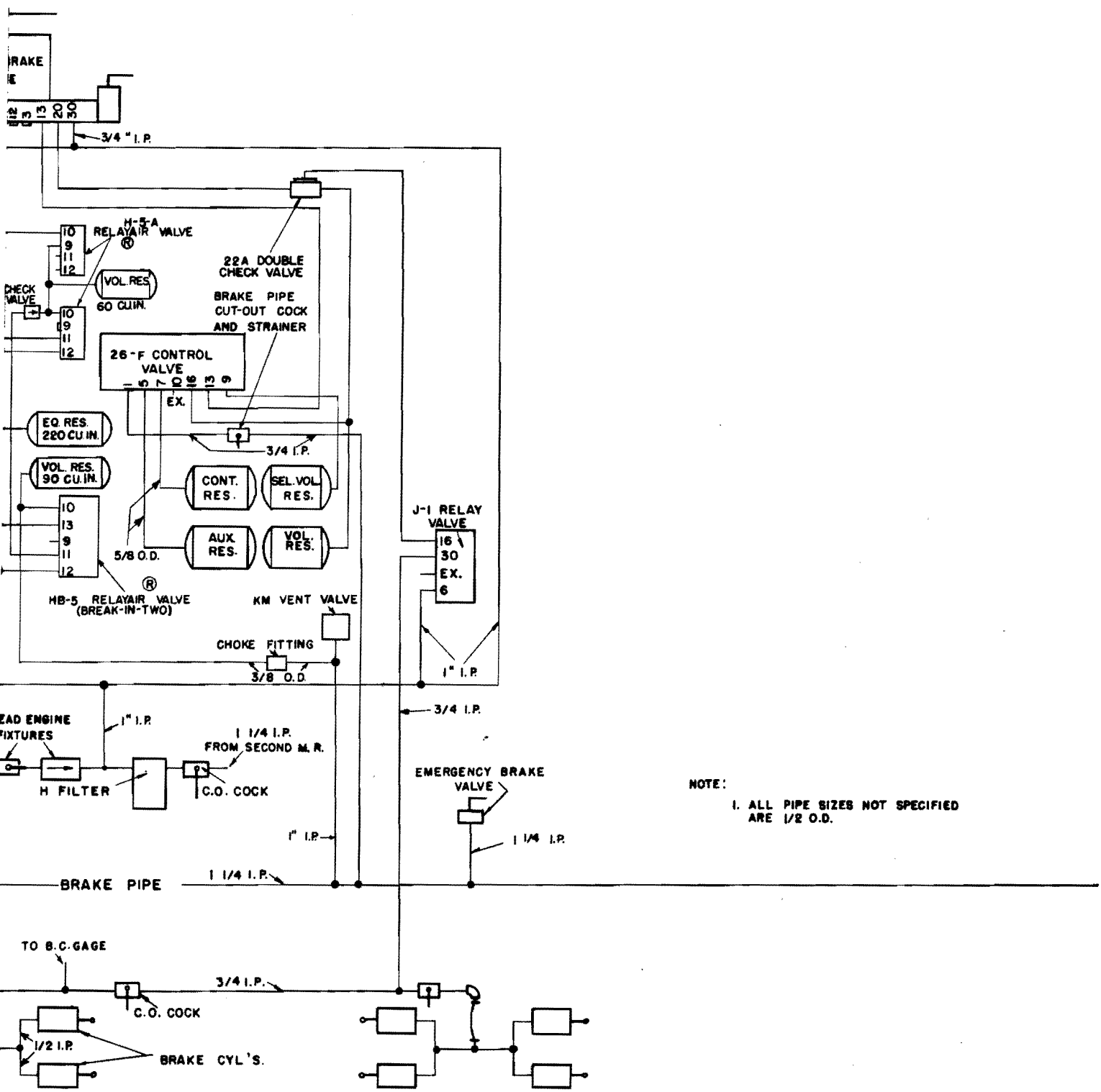
Whenever all of the air in the 90 cu.in. reservoir has exhausted through the choke fitting into the brake pipe, the force of the spring in the HB-5 RELAYAIR Valve moves the piston upward and thus cuts off any further flow of main reservoir air from port No. 12 to port No. 11.

Main reservoir air is now trapped in the 60 cu.in. reservoir and the associated pipes as a result of the closing action of the check valve. This trapped air pressure continues to hold down the piston in the lower H-5-A RELAYAIR Valve, and thus permits main reservoir air to continue to flow through the H-5-A RELAYAIR Valve and thus to the brake valve.

The engineman is thus required to make a brake application and, whenever equalizing reservoir air pressure is reduced a sufficient amount, the piston in the upper H-5-A RELAYAIR Valve, which normally is in a downward position, can now assume an upper position and, as a result of this, port No. 9 is connected to port No. 11. With these passages connected, the air that was previously trapped in the 60 cu. in. reservoir and the associated pipes is now vented to atmosphere. The piston in the lower H-5-A RELAYAIR Valve can now move upward to reset the valve which cuts off the flow of main reservoir air to port No. 53 in the brake valve.



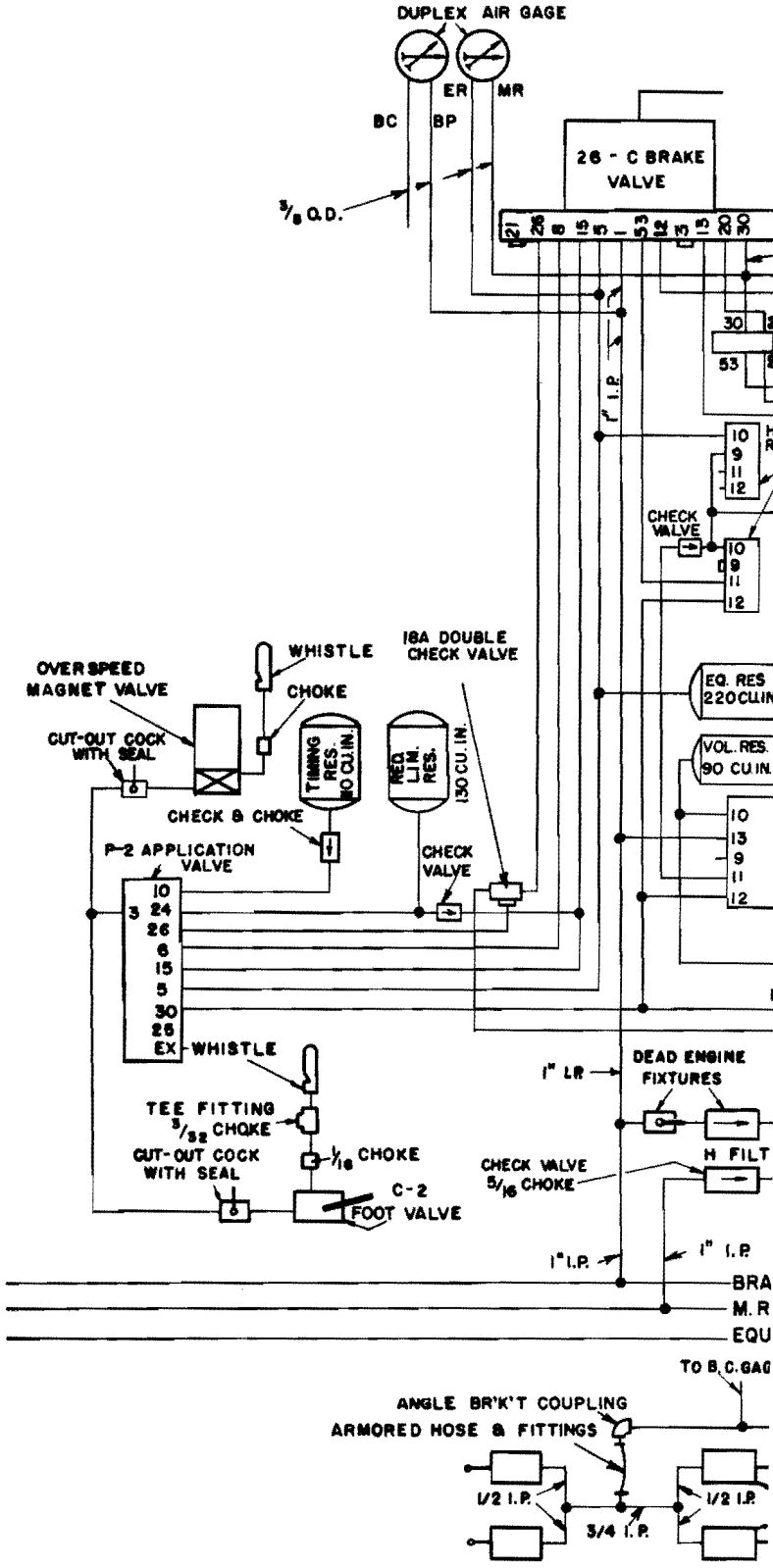
26-L Brake Equipment - Piping Diagram

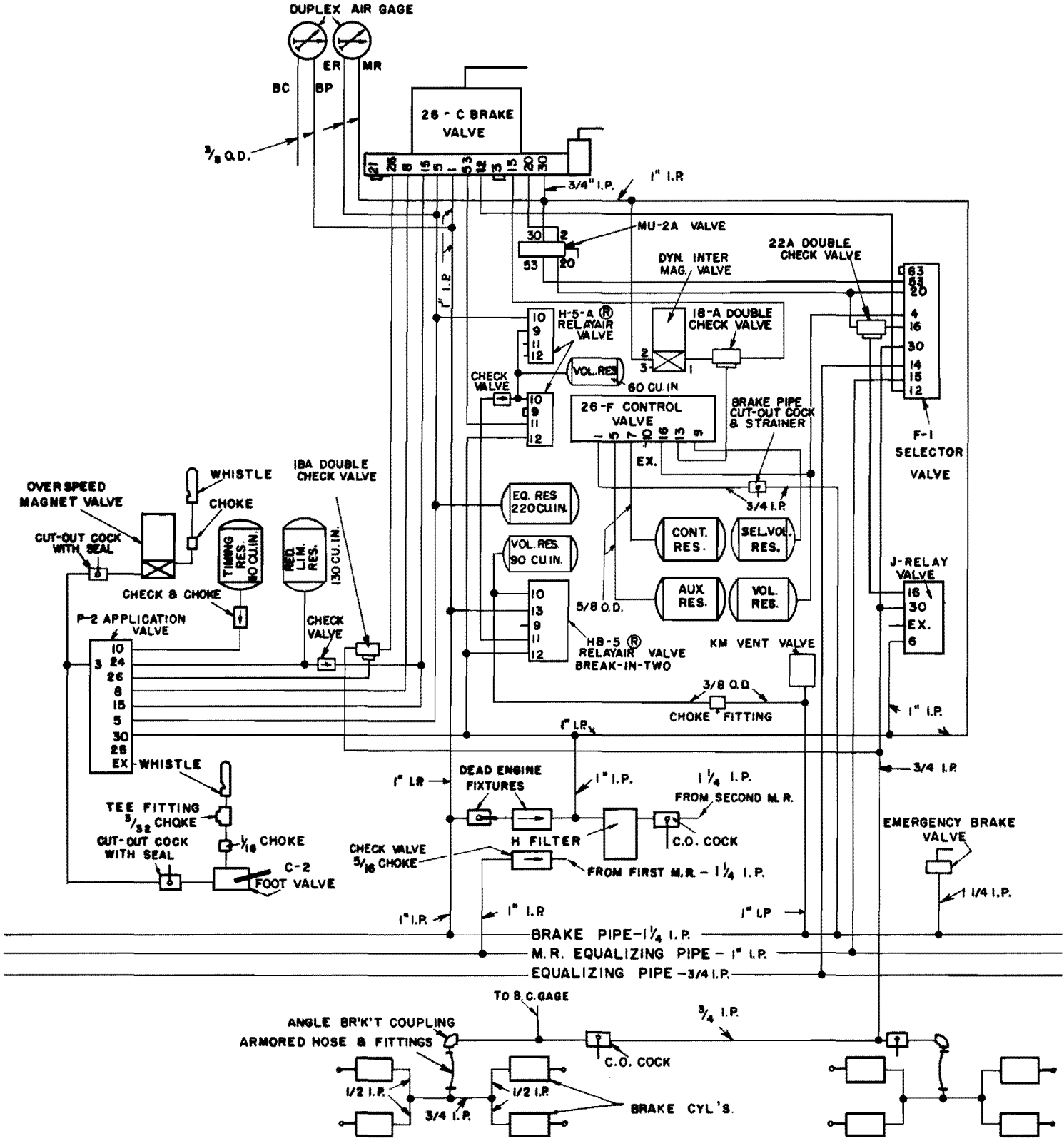


NOTE:

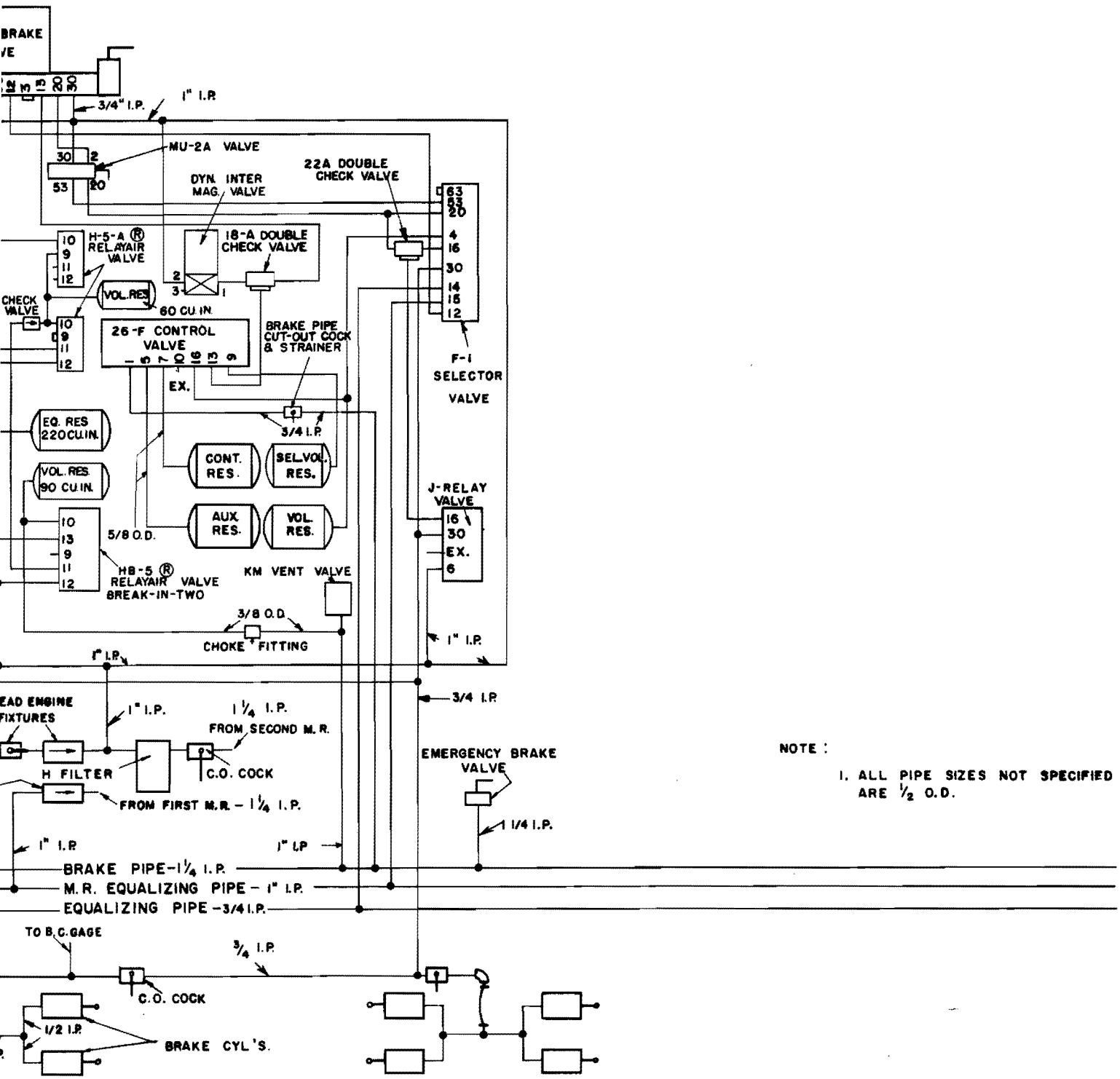
1. ALL PIPE SIZES NOT SPECIFIED ARE 1/2 O.D.

26-L Brake Equipment - Piping Diagram


DUPLEX AIR GAGE
ER
MR
BC
BP
3/8 O.D.
26 - C BRAKE VALVE
1" I.P.
CHECK VALVE
OVERSPEED MAGNET VALVE
WHISTLE
CHOKE
CUT-OUT COCK WITH SEAL
TIMING RES. 80 CU.IN.
CHECK & CHOKE
18A DOUBLE CHECK VALVE
REQ. L.I.N. RES.
130 CU. IN.
CHECK VALVE
P-2 APPLICATION VALVE
10
3 24
26
6
15
5
30
26
EX
WHISTLE
TEE FITTING 3/32 CHOKE
CUT-OUT COCK WITH SEAL
1/16 CHOKE
C-2 FOOT VALVE
EQ. RES 220 CU.IN.
VOL. RES. 90 CU.IN.
DEAD ENGINE FIXTURES
1" LP
CHECK VALVE 5/16 CHOKE
H FILT
1" I.P.
1" I.P.
BRA
M. R
EQU
TO B.C.GAG
ANGLE BR'K'T COUPLING
ARMORED HOSE & FITTINGS
1/2 I.P.
3/4 I.P.
1/2 I.P.



26-L Brake Equipment Arranged for Multiple Unit Operation - Piping



NOTE :

1. ALL PIPE SIZES NOT SPECIFIED ARE 1/2 O.D.

L Brake Equipment Arranged for Multiple Unit Operation - Piping Diagram