THE A7EL AIR BRAKE EQUIPMENT

Refer to Airbrake Handbook for instructions for operation of this equipment Pages H9 to H12.

The A7EL brake equipment is fitted to Df and Dg-Dh diesel electric locomotives. The brake valve fitted is the AH7 brake valve.

Summarised the principal points of advantage of this equipment over No. 4 type of brake valve and equipment is:

1. Instead of a triple valve and auxiliary reservoir on the locomotive a distributing valve is provided which is designed to supply air direct from the main reservoir to the brake cylinders. This device enables air to be available at all times to apply the locomotive brakes.

2. The locomotive brakes may be applied or released independently of the train brakes.

3. The locomotive brakes may be applied with any desired pressure, and this pressure is automatically maintained in the brake cylinders regardless of leakage, or variations in brake piston travel.

4. The locomotive brakes can be released at a retarded rate and thus prevent the locomotive surging away from the train; this only applies when automatic brake valve is in the release position.

5. The full use can be made of the release position of the drivers brake valve because of the fitting of an equalizing reservoir control valve. This offers maximum use of the excess pressure in the main reservoir for the prompt and efficient release of brakes on long trains. It also reduces the possibility of overcharging with the resultant re-application of brakes at the head of a train.

6. With a service application of the train brakes the locomotive brakes apply at a retarded rate so as to prevent coupling slack running in too rapidly. With an emergency application. However, the locomotive brakes apply promptly without restriction..

7. A "minimum reduction" feature is included which ensures that a minimum reduction of the equalising reservoir and brake pipe pressure of approximately 7lbs per square inch will be obtained when an automatic service application is being initiated. This will produce approximately 17lbs per square inch in the brake cylinder.

8. Feed valves and reducing valves are interchangeable.

9. The brake valve handle positions, insofar as the automatic brake valve is concerned, are identical with the No. 4 brake valve.

10. The brake valve handles can be removed, the automatic brake handle only in running position and the independent only in lap position. They are removed only when working in multiple with another diesel electric locomotive and the two locomotives are operated by one crew. When removed on the rear locomotive they must be locked away. They are also removed in the rear cab of a Df locomotive.

11. When the emergency position of the brake is used sand will be applied to the rails by allowing main reservoir air to flow via ports on the rotary to the sanding apparatus.

LESSON NO. 9

Refer to the air brake hand book page 62 fig. 80. This is named A7EL equipment it is the same as fitted to a Df looomotive. One brake pedestal and set of brake gauges removed would leave the equipment as fitted to a Dg and Dh.

BRAKE VALVE (AUTOMATIC PORTION):

Refer to the Air Brake Handbook pages 48-49-50-51. Any reference to high or low pressure governor control can be deleted as an air operated electrical governor is fitted with the A7EL brake equipment. Otherwise the rotary positions are the same as the A7EL except for ports which allow the operation of the sanding apparatus when the brake valve is placed in the emergency position.

The AH7 automatic brake valve has five operating positions as follows:

(1) Full Release position
(2) Running position
(3) Lap position
(4) Service position
(5) Emergency position

(1) FULL RELEASE POSITION

The purpose of this position is to provide a large direct air passage to enable main reservoir pressure to pass rapidly through (a) to the brake pipe. This hastens the charging or recharging of the air brake system and assists in obtaining a prompt and efficient release of the brakes. In this position the locomotive brakes, if applied, are permitted to release at a retarded rate only, so that the locomotive will not surge away from the rest of the train and cause coupling slack shocks. This retarded release feature is obtained by discharging the relay chamber pressure through a restricted port (h) in the rotary valve.

If the brake valve handle was allowed to remain indefinitely in release position the air brake system would be overcharged to main reservoir pressure. To avoid this the handle must be returned to running position after the train brakes have been released. As a warning against this being overlooked a small port (r) discharges main reservoir pressure to atmosphere whilst the handle is in release position with sufficient noise to attract the attention of the Enginedriver.

The equalising reservoir charges at a retarded rate through the equalising reservoir control valve and observation of the equalising reservoir pressure gauge by the Enginedriver will enable him to determine when to return the brake valve handle to running position.

The minimum reduction reservoir is vented to atmosphere.

(2) RUNNING POSITION

The brake valve must be kept in this position when the brakes are not being operated. In this position the port (h) in rotary valve connecting the control pipe to atmosphere is larger than in release position and the locomotive brakes therefore release at a faster rate than the train brakes, provided the independent brake valve is also in running position. The running position should not be used to release the train brakes. A large passage is open from the feed valve delivery port (d) via the rotary valve cavity (f) to the brake pipe so that the latter is charged with the full capacity of the feed valve, but cannot attain a pressure in excess of that to which the feed valve is adjusted. The chamber at the top of the equalising piston charges uniformly with the brake pipe keeping the pressure on both sides of the piston substantially equal.

LESSON No. 9.

The equalising reservoir charges at a restricted rate controlled by the choke in the equalising reservoir control valve, which is described in Air Brake Handbook, Page 56.

The minimum reduction reservoir is connected via the rotary valve to atmosphere by cavity (v).

(3) LAP POSITION:

This position is used when initiating a brake application and also hold the brakes applied after a service application until it is desired, either to make a further brake pipe reduction or to release the brakes. All ports are closed except those leading from the equalising reservoir to the minimum reduction reservoir, the charging of which results in the reduction of approximately 7 lbs. in the equalising reservoir pressure which automatically produces a corresponding reduction in brake pipe pressure immediately the brake valve handle is moved from running to lap position.

NOTE: "The minimum reduction reservoir is enclosed in the equalising reservoir as shown in Fig. 1. The volume of the minimum reduction reservoir is made so that when the air in the equalising reservoir is allowed to flow into it, the equalising reservoir pressure us reduced by approximately 7 lbs."

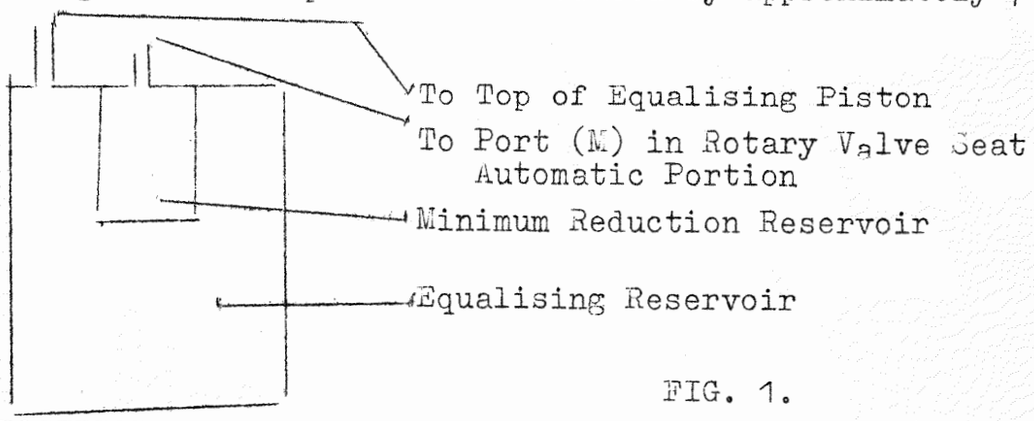


FIG. 1.

(4) SERVICE POSITION:

This position is used when it is desired to make a service brake application. The movement of the equalising piston produces a gradual discharge of brake pipe pressure which is also gradually terminated after the handle is returned to lap position and thereby prevents surges in brake pipe pressure which may kick off the forward brakes in the train.

In this position the rotary valve connects chamber "D" above the equalising piston to atmosphere via the preliminary exhaust port (e). As a result the brake pipe pressure lifts the equalising piston and flows to atmosphere through an exhaust fitting until the brake pipe pressure is slightly lower than that of the equalising reservoir, when the equalising piston reseats.

The equalising reservoir and minimum reduction reservoir are connected via the rotary valve.

(5) EMERGENCY POSITION:

This position is used when an immediate full application of the brake under emergency conditions is required. A large direct connection is made by the rotary valve from the brake pipe to atmosphere causing a sudden and heavy reduction in brake pipe pressure which produces maximum force in the shortest possible time.

In this position also a maintaining port is opened from the feed valve to the face of the relay piston in the distributing valve via the feed valve port in the rotary valve seat cavities (k) and (n) in the rotary valve, No. 2 control passage, the independent brake valve in running position, and No. 3 control pipe to distributing valve. This ensures against any possible shortage of relay chamber pressure such as might occur from leakage, or after a service application and release has been made immediately prior to an emergency application.

With the AH7 brake valve main reservoir air which is present on top of the rotary valve at all times whilst the brake valve isolating cock is open is admitting to the sand supply air line to operate the sanding apparatus.

THE BRAKE VALVE (INDEPENDENT PORTION):

Refer to Air Brake Handbook pages 51-52-53-54.

The independent brake valve has five operating positions as follows:

(1) Release position
(2) Running position
(3) Lap position
(4) Slow application position
(5) Quick application position

(1) RELEASE POSITION

In this position the locomotive brakes can be rapidly released at any time irrespective of the position of the distributing valve ports or of the position of the automatic brake valve and without disturbing the train brakes. A return spring serves to return the handle automatically from this position to running position as otherwise with the handle in release position the locomotive brakes could not be applied by means of the automatic brake valve. As a further precaution in the event of a return spring failure, reducing valve air blows through a warning port whilst the handle is in release position. In this position of the independent brake valve, air at reducing valve pressure (45lbs) is admitted via the rotary valve to the No. 4 independent release pipe which communicates with the lower face of the independent release valve piston of the distributing valve (see fig. 85, Air Brake Handbook). This piston then raises valves 56 and 53 from their seats and allows the air from the relay chamber to flow by way of No. 3 control pipe and the independent brake exhaust port, also through valve 56 which is open and through reduction of pressure on the bottom of the relay piston 7 and thereby releases the locomotive brakes. Valve 53 is a rubber seated valve on the AH7 brake and no ball valve is fitted.

(2) RUNNING POSITION

The independent brake valve handle should be carried in this position at all times when the independent brake is not in use. In this position communication is made between the No. 3 control pipe. and No. 2 control passage leading through the pedestal filling piece to the automatic brake valve. If the latter is in release or running position, and the triple valve portion of the distributing valve is in release position, the relay chamber pressure can release to atmosphere. In running position of the independent brake valve the No. 4 indpenedent release pipe is vented to atmosphere.

(3) LAP POSITION

This position is used to hold the independent brake applied after the desired brake cylinder pressure is obtained at which time all communications between operating ports is cut off.

(4) SLOW APPLICATION

This position is used when it is desired to apply the independent brake lightly or gradually. Air from the reducing valve is admitted to the No. 3 control pipe and thence through to the relay chamber and the lower face of the relay piston, resulting in a similar pressure being automatically reproduced in the locomotive brake cylinders. (The relay chamber air acting on the bottom of the relay piston forces it upward unseating the application valve, thus allowing main reservoir air to flow to the brake cylinder. When the pressure in the brake cylinder, acting on the top of the relay piston, is substantially equal tothe relay chamber pressure acting on the bottom of therelay piston, the relay piston will move down under under the influence of the application valve spring. The application valve is now seated and main reservoir air is prevented from flowing to the brake cylinders).

The No. 4 independent release pipe is vented to the atmosphere.

(5) QUICK APPLICATION POSITION

This position is the same in effect as slow application except that the pressure is more rapidly built up in the No. 3 control pipe. The reducing valve is adjusted to 45lbs, which is therefore the maximum brake cylinder pressure available with the independent brake. The return spring arrangement contained in the upper portion of the brake valve body ensures that the handle cannot be inadvertently left in the quick application position when slow application is desired. The No. 4 independent release pipe is vented to the atmosphere.

THE EQUALISING RESERVOIR CONTROL VALVE

(Refer to Air brake Handbook, page 56, for the description and operation).

THE DISTRIBUTING VALVE

The distributing valve, when actuated by the brake valve, performs the following functions:

(a) Permits air to flow to the brake cylinders.
(b) Maintains any desired pressure in the brake cylinder.
(c) Permits the air to exhaust from the brake cylinder.

The distributing valve consist of two portions designated the "triple valve portion" and the "relay portion". The two compartments in the reservoir to which the distributing valve is attached are termed the "Auxiliary chamber" and the "relay chamber".

Refer to the Air Brake Handbook, pages 57 to 59 Fig. 74 to 78, for the names of the different parts of the distributing valve.

The auxiliary chamber serves the purpose of the auxiliary reservoir to the triple valve portion, whilst the relay chamber is in effect a dummy brake cylinder which receives or is relieved of its supply of air as required by the action of the triple valve portion of the distributing valve or by the operation of the independent brake valve. Any pressure present in the relay chamber is automatically reproduced in the locomotive brake cylinder.

LESSON NO. 9

Figs 81 to 85, Air Brake Handbook, show the distributing valve diagrammatically. Study the coloured diagrams of the distributing valve, which are supplied with this lesson, as the description of its operation (pages 60-61 Air Brake Handbook) is being read. The following colour key shows the various relative air pressures that are shown on the coloured diagrams. (These coloured diagrams may be retained by the student).

Main reservoir pressure	Dark blue
Brake pipe pressure	Red
Auxiliary chamber pressure	Yellow
Relay chamber pressure	Brown
Brake cylinder pipe pressure	Green
Independent brake valve pressure	Dark Brown
Feed valve pressure	Light Blue

NOTES ON THE OPERATION

These notes are to be read in conjunction with the operation of the distributing valve (Pages 60-61). Fig. 81 shows the charging and running positions.

FIG. 83 AUTOMATIC SERVICE LAP

When the piston (32) moves down to the position shown, the graduating valve blanks off communication between the relay chamber and the safety valve, and between the brake cylinder and the No. 3 control pipe.

The air pressure existing in the relay chamber exerts a force upon the relay piston (this is described under the heading of "automatic service" position, page 60, Air Brake Handbook) and will cause air from the main reservoir to flow to the brake cylinder. This flow will continue until the pressure in the brake cylinder, acting on the top of the relay piston, is substantially equal to that in the relay chamber acting against the bottom of the piston. Under the influence of the application valve spring, the relay piston will now move down until the application valve (19) is seated and the flow of air from the main reservoir to the brake cylinder stops. If a further reduction of brake pipe pressure is made, the distributing valve will again assume "automatic service" position and return to "automatic service lap" position as previously described, unless an over-reduction of pressure occurs. In this case the operating ports will remain in "automatic service" position. Service port "Z" is made small so as to restrict the flow of compressed air to the relay chamber in order that the locomotive brakes will not act in advance of the train brakes and cause a severe run in of coupling slack.

FIG. 84 AND PAGE 61 AUTOMATIC EMERGENCY POSITION

The control pipe air flows through passage "J" past ball check valve 53, and not via passage "I" as shown in Air Brake Handbook. The ball valve on the A7EL is a rubber seated valve replacing the ball.

PAGE 61 AND FIG. 85 INDEPENDENT RELEASE POSITION

DEAD ENGINE DEVICE

The "dead engine" device is bolted to the distributing valve. A section view of the valve is shown in Fig. 81. When a "dead" locomotive, or more specifically a locomotive with the air compressors inoperative, is to be hauled by a "live" locomotive, the cock of the "dead engine" device must be opened to allow compressed air from the brake pipe to lift the spring loaded check valve (71) and pass through choke (82) to the main reservoir on the "dead" Locomotive charging it to a pressure of approximately 65lbs per

square inch for use in the air brake equipment of that locomotive. The spring (7A) has a value of 15lbs, or in other words, when the pressure above the check valve (71) is 15lbs per square inch, less than that under it, the valve closes. If the check valve had no spring equal pressure would be obtained on each side.

Both brake valves on the "dead" locomotive must be in running position and the brake valve isolating cock must be closed. At all other times the cock of the "dead engine" device must be closed. It is closed when the handle of the cock points towards the brake pipe connection to the reservoir, and open when it points towards the safety valve on the distributing valve.

SAFETY VALVE

The safety valve, attached to the distributing valve, communicates with the relay chamber and this limits the maximum brake cylinder pressure to 55lbs. The equalising slide valve and graduating valve controls the air pressure from the relay chamber to the safety valve (See Figs. 82, 84). It will be noticed that in the emergency position (Fig. 84) that the air from the relay chamber to the safety valve goes through a small port (a) in the slide valve. This restricts the flow of air and ensures that the pressure in the relay chamber and under the relay piston is maintained.
(Refer to Air Brake Handbook, page 62, for the description of the operation).

DUPLEX PRESSURE GAUGES

The A7EL air brake equipment has two Duplex pressure gauges, one registers main reservoir and equalising reservoir pressure, and the other registers brake pipe pressure and brake cylinder pressure.

BRAKE VALVE ISOLATING COCK

Refer to Air Brake Handbook (Page H11).

The brake valve isolating cock is attached to the pedestal and may be removed from it without disturbing pipe joints (see Fig. 54). The isolating cock controls the passage of air from the main reservoir to the automatic brake valve. When closed (see Fig. 79) bye-pass ports establish communication through the cock connecting the feed valve passage with main reservoir passage in the pedestal. When the automatic brake valve is in the running position (as it should be when the locomotive is assisting with the isolating cock closed) the air from the brake pipe passes through the feed valve passage, the bye-pass ports and the main reservoir passage to the top of the rotary valve in chamber "A". It is thus prevented from being blown from its seat when the brake pipe pressure is suddenly raised by the leading or controlling locomotive.

The brake valve isolating cock must be closed on the second locomotive when assisting a train or when the second locomotive is being hauled "dead", and both brake valve handles placed in the running position.

NOTE "Assisting" means two locomotives on a train or coupled together with no control jumper inserted and only the brake pipe hose coupled up.

A7EL BRAKE EQUIPMENT - ADJUSTMENTS

Enginedrivers must check these adjustments when the locomotive is in service and report any variations which may be indicated.

The feed valve controlling brake pipe pressure must be adjusted to 80lbs per square inch.

The reducing valve controlling independent brake application pressure must be adjusted to 45lbs per square inch. The safety valve must be adjusted to 55lb per sq. inch main reservoir pressure must be controlled between 105lb and 120lb per sq. inch.

LESSON NO.9

COMPRESSOR :

The compressor is a two stage four cylinder type which is driven directly from the main engine crankshaft. It consists of two low pressure cylinders which draw air in through a filter and intake valves as the pistons move on the downward stroke. As the low pressure pistons move up the intake valves close and the discharge valves open which allows the air to be forced through to an intercooler which consists of a radiator with cool air passing round its tubes, this cools the compressed air inside the tubes before it is passed on to H.P. intake valves which open when the high pressure pistons move down. When the high pressure pistons move up the intake valves close and discharge valve opensand allowsthe air to be compressed into the main reservoir. A lubricating oil sump is fitted to the compressor and oil level must be checked whenever the locomotive is prepared. Shearing bolts are fitted into the drive shaft to the compressor to protect this shaft and the engine in case the compressor seizes.

CONTROL OF MAIN RESERVOIR PRESSURES :

As the compressor is driven direct from the diesel engine crankshaft, it runs all the time the diesel engine is running. To enable the main reservoir pressure to be maintained between 105 lb and 120 lb per square inch a governor is fitted which operates a magnet valve, which in turn operates an unloader valve. The operation of these valves is as follows : When main reservoir pressure is low the compressor charges the main reservoir until a pressure of 120 lb per square inch is reached. A pipe taken from the main reservoir allows main reservoir pressure to act against a diaphragm in the governor. The diaphram is spring loaded so that it will not operate until main reservoir pressure reaches 120 lb per square inch. When this pressure is reached it will cause the diaphram to move and close low voltage electrical contacts which will energise the solenoid of a magnet valve. The solenoid will cause the magnet valves armature to move and open an air valve which allows main reservoir air to flow to a large piston in an unloader valve the large piston moves up causing a spindle to open an exhaust valve which for a moment allows main reservoir pressure to escape to the atmosphere but when this occurs a non return valve closes and seals off the main reservoir. The compressor will now be working to the atmosphere, that is air being compressed by the compressor will take the least line of resistance which is via the open exhaust valve in the unloader valve to the atmosphere and the main reservoir is not being charged.

When main reservoir pressure drops to 105 lb per square inch the spring overcomes the main reservoir air pressure and causes the diaphragm to move in the opposite direction which opens the low voltage contacts of the governor de-energising the solenoid of the magnet valve which allows itsarmature to move assisted by the tension of a spring and close off the main reservoir pressure to the large piston of the unloader valve. At the same time the magnet valve opens an exhaust port and allows the air under the large piston of the unloader valve to escape. Air pressure plus the tension of a spring will now close the unloader valves exhaust valve closing off the exhaust port and moving the large piston down. The compressor will now overcome the main reservoir air pressure and non return valve to allow the main reservoir to be again charged to 120 lb per square inch.

When locomotives are coupled together for multiple unit working the main reservoirs of the units are coupled together by a coupling pipe and hoses thus ensuring that the air pressure on all locomotives is the same.

To ensure that all compressors arelcaded and unloaded simultaneously the governor contacts on each locomotive are connected to a synchronising train line which is coupled between units by the means of the jumper. As soon as any compressor governor closes the feed to all unloading magnet valves is completed and all compressors run light and work to the atmosphere until all compressor governors are open once again. An isolating cock is placed in the main reservoir air pipe to the compressor governor and must be open to allow the governor to work normally. If this cock is closed for any reason the compressors will charge the main reservoirs to the pressure that the safety valves are set to and they will open and relieve the pressure.

If for any reason any governor should stick closed all compressors will work off load and main reservoir pressure will not build up. In this case the defective governor must be found, opened and isolated by the means of the air isolating cock.

CONTINUOUS AIR PIPES

In addition to the brake pipe, themain reservoir, control and independent release pipes are continuous throughout all locomotives which are coupled together for multiple unit working.

AIR FLOW INDICATOR

The Air Flow Indicator is designed to give a pressure gauge indication of the quantity of air being delivered by the feed valve to the brake pipe in order that the enginedriver may check the air tightness of the brake pipe. A break-in-two of the train or a burst hose will provide a pressure gauge indication to the enginedriver that heavy brake pipe leakage has developed. The device has several other important advantages which will be referred to later.

A venturi tube located in the main reservoir pipe leading to the feed valve is employed as basis of the device. Pressure in the side branch of the venturi is reduced due to the velocity of the air passing through the venturi tube and this reduction of pressure is used to operate the indicator.

The controlling portion is a flexible diaphragm influenced by main reservoir pressure on one side and venturi side branch pressure on theoother. If no air is passing through the venturi tube the pressure on each side of the diaphragm are equal, but when air is flowing through the venturi tube a difference in pressure in proportion to the air flow exists between the two sides of the diaphragm.

Referring to the sketch showing the design of the control device, diaphragm 1 is connected to a piston valve 2 located in cylinder 3 which has ports A connected to atmosphere which vent air from chamber B when the diaphragm assembly is forced down. Main reservoir air enters chamber B via a drilled hole and choke 5 in the piston valve. Chamber B is also connected to one handof a duplex pressure gauge via pipe G. A light spring 6 exerts a sufficient upward force to hold the diaphragm and piston valve assembly up so that the ports A are covered by the piston valve.

When there is no flow of air through the venturi tube the pressures on both sides of the diaphragm are equal and the piston valve is in its upper position and the ports A are closed. Pressure in chamber B will therefore be equal to main reservoir and will be shown on both hands of the duplex gauge.

LESSON NO. 9

Should the feed valve commence to supply air to the brake pipe the action of the venturi tube will create a difference in pressure between the two sides of the diaphragm and the diaphragm and piston assembly will move down. The air from chamber B will escape to atmosphere at the ports A giving an audible indication and the hand of the duplex pressure gauge that is connected to chamber B will show a drop in pressure proportional to the difference in pressure on the two sides of the diaphragm. The flow of air from chamber B causes a drop in pressure on top of the piston valve main reservoir air acting on the bottom of the piston valve results in a upward force opposing the action of the diaphragm and the piston valve will control the discharge of air to atmosphere so that the forces acting on the piston equal those acting on the diaphragm resulting in greater sensitivity.

The drop in pressure indicated by the pressure gauge hand coupled to chamber B gives an indication to the Enginedriver of the volume of air passing to the brake pipe.

The advantages obtained from the use of the air flow indicator are summarised as follows:

INITIAL TRAIN CHARGING AND RELEASING AFTER BRAKE TESTS

The indicator shows the enginedriver when his train is almost charged and ready for the brake test. The indicator shows when the train is recharged and ready to go after the brake test. The rear reservoirs of a very long train may be from 5 to 10lb below full charge when the flow indicator shows full charge.

UNINTENTIONAL PARTING

With multiple unit diesel locomotives working near full power it is occasionally difficult to detect a break-in-two. The indicator immediately shows the change in brake pipe airflow and indicates to the enginedriver that he should investigate.

STARTING AFTER A STOP WITH LONG GOODS TRAINS

"Pull-apart" resulting from an attempt to start too soon can be avoided by observing the indicator to determine with the train is properly recharged and all brakes released.

BRAKE APPLICATIONS FROM THE REAR

A change of flow rate from the normal shown by the indicator tells the enginedriver of a new and greater brake pipe demand which may be caused by rear end brake application. This is helpful in preventing "Pull-Apart".

INSTRUCTIONS FOR THE OPERATION OF ALL AIR BRAKE EQUIPMENT

Refer to Air Brake Handbook.

A7EL AIR BRAKE DEFECTS AND FAILURES

Refer to Air Brake Handbook (pages 130 to 133) for some of the faults encountered with A7EL brake equipment.

Any instructions regarding the governor, governor breakdowns or governor control should be deleted as these do not apply to the A7EL brake.

NOTE : Clause 35, page 133 (control pipe broken) should now read as follows :-

If the control pipe breaks there is no cause for any delay, and it is not necessary to blind or flatten the pipe at the base of the pedestal, or at the distributing valve.

With a broken pipe the locomotive brakes can be applied and released by the automatic brake valve, but the emergency maintaining feature is lost. The locomotive brakes cannot be applied by the independent brake valve, but a release can be obtained.

The retarded release feature is inoperative and it will be necessary for the enginedriver to use the handbrake to prevent the locomotive from surging away from the train during a release of the brakes, if bunched braking had been used. The handbrake must also be used to hold the train while standing.

OTHER DEFECTS AND FAILURES :

1. Brake Pipe Leakage

Brake pipe leakage on the locomotive will cause the brake cylinder pressure to build up when the automatic brake valve handle is in the lap position. This defect can cause the overheating of the locomotive tyres, because each time the brakes are applied a higher locomotive brake cylinder pressure is obtained than necessary. When the brake cylinder pressure is noticed to be building up when in the "lap" position, full use must be made of the "independent release" position and the defect reported for attention.

A defective distributing valve can cause the brake cylinder pressure to build up. To be sure of the cause the following locomotive brake pipe leakage test should be made :

> "Make a 10lb. reduction from the standard pressure, leaving the brake valve in the "lap" position. Then observe the fall of brake pipe pressure on the gauge. The loss of pressure must not exceed 5lbs per minute."

NOTE : Should the leakage be less than 5 lbs per minute and it is observed that the brake cylinder pressure continues to build up, the distributing valve should be booked for attention.

DISTRIBUTING VALVE DEFECTS :

Should a continuous blow exist at the distributing valve exhaust when the brakes are applied, it is caused by release slide valve leakage, or a defective cage bush seal. When a blow exists at the exhaust when in the release position, this indicates a defective application valve. Both defects should be reported for attention.

EQUALISING RESERVOIR CONTROL VALVE DEFECTS :

Should it be observed that the equalising reservoir pressure gauge is slow in showing an increase in pressure during the recharge period, it indicates a partly blocked choke in the equalising reservoir control valve. The following test will indicate if the choke is clear.

"Place the automatic brake valve in service position until both the brake pipe and equalising reservoir pressures are reduced to zero. Then place the brake valve in the running position. With a constant brake pipe pressure of 80lbs. Note the time required to charge the equalising reservoir to 60lbs. This time must not be less than 54 seconds, or more than 64 seconds."

Before making the test make certain that there is no leakage on the pipe to the gauge. Air flow through the choke is small and a small leak has a large effect.

BROKEN PIPES

INDEPENDENT RELEASE PIPE BROKEN. With a broken independent release pipe it is not necessary to do anything in the way of blinding the pipe, etc. It is possible with the use of the independent brake valve to make an independent release of the locomotive brakes only after an independent application and provided the triple portion of the distributing valve is in the release position. Place the independent brake valve handle in the running position and relay chamber air will flow through the control pipe to the independent brake valve, through the control passage to the automatic brake valve and thence to the atmosphere. Brake cylinder air will force the relay piston down, closing the application valve and allowing the brake cylinder air to escape to the atmosphere through ports in the relay slide valve and distributing valve exhaust. This defect should be reported for attention, because when the automatic brake is applied, it is not possible to release the engine brakes and this will result in overheating of locomotive tyres.

HOSES BETWEEN UNITS BROKEN and no spare hoses on other side of headstock.

If the main reservoir hose burst between two locomotives and no spare hose is obtainable take the following action. Close the coupling cocks both sides of the burst hose. Close the isolating cocks on all compressor governors in the rear of the burst hose. The compressor governor on the leading locomotive will now control all main reservoir pressures but the safety valves on the main reservoirs to the rear of the burst hose will most likely lift and blow as these reservoirs will become overcharged.

NOTE

If the compressor governors isolating cocks are not closed on all trailing locomotives the rear governor can control the air pressure on the leading locomotive and as now the reservoirs are not coupled together main reservoir pressure on the leading locomotive will not build up.

If the control pipe hose burst between units treat the break down as a single locomotive but on no account close the coupling cock on the rear unit.

If the independent release pipe hose burst between unit close the coupling cocks either side of the burst hose. It will now be possible to make on independent release on the leading locomotive but not on the trailing locomotive. If the train pipe hose burst between units the hose will have to be replaced.

CHARGING MAIN RESERVOIR

Before starting the diesel engine the following cocks must be closed. Main reservoir drain cocks, all coupling cocks each end of the locomotive, dead engine device cock and all brake valve isolating cocks in non-operative cabs. The following isolating cocks must be open. Distributing valve isolating cock, governor isolating cock, main reservoir isolating cock, brake cylinder isolating cocks CCG isolating cock, ACS isolating cock, control reservoir isolating cocks, the brake valve isolating cock in the operative cab, the isolating cocks to the wheel slip device and the vigilance device isolating cock.

CHANGING OPERATING CABS

Refer to Airbrake Handbook. Page H12.

LIST OF QUESTIONS

1. Describe the operation of the automatic brake valve in each of its five positions.

2. Describe the operation of the independent brake valve in each of its five positions.

3. Describe the operation of the distributing valve in the following positions:

   (a) Charging positions
   (b) Automatic service position
   (c) Automatic service lap (see page 6 Lesson 9)
   (d) Automatic emergency position
   (e) Independent release position after automatic service.

4. Describe the operation of the "dead engine" device when in the open position, and state the main reservoir pressure that will be obtained.

5. What are the advantages obtained from the use of an airflow indicator?

6. Air pressure is maintained above the automatic rotary valve when the isolating cock is closed; where does this air come from and how is it fed to the rotary?

7. What defects would cause the locomotive brakes (a) to fail to apply when the automatic brake is used (b) to fail to release when the independent brake is used?

8. Should you find that the brake pipe was overcharged, say, to 120lbs, what procedure would you follow to release the train brakes?

9. What action would you take if any one of the following pipes were to break?

   (a) Branch pipe from main reservoir to distributing valve.
   (b) Equalising reservoir pipe
   (c) Minimum reduction reservoir pipe
   (d) Control pipe (Page 11 Lesson No. 9)
   (e) Branch pipe from brake pipe to the distributing valve.
   (f) Independent release pipe.

10. If a defect in a feed valve cannot be corrected while on the road, what should be done to enable the train to continue on its journey.

11. What defects will cause a continuous blow at the distributing valve exhaust when the brakes are (a) applied; (b) released?

12. If the independent brake will not apply and no blow exists at the warning port when the brake valve handle is placed in the release position, what is the cause?

LESSON NO. 9

LIST OF QUESTIONS

1. Describe the operation of the automatic brake valve in each of its five positions.

2. What is the purpose of the equalising reservoir control valve and describe how it operates?

3. Describe the operation of the distributing valve in the following posisitions :-

   (a) Charging and release positions
   (b) Automatic service position
   (c) Automatic service lap
   (d) Automatic emergency position
   (e) Independent release position after automatic service

4. Describe the operation of the "dead engine" device when in the open position, and state the main reservoir pressure that will be obtained.

5. What are the advantages obtained from the use of an airflow indicator and explain why?

6. What are the three functions of the distributing valve?

7. What defects would cause the locomotive brakes (a) to fail to apply when the automatic brake is used (b) to fail to release when an independent release of brakes is made after, an automatic service brake application

8. Should you find that the brake pipe was overcharged, say, to 120lbs, what procedure would you follow to release the train brakes?

9. What action would you take if any one of the following pipes were to break?

   (a) Branch pipe from main reservoir to distributing valve.
   (b) Equalising reservoir pipe
   (c) Minimum reduction reservoir pipe
   (d) Control pipe
   (e) Branch pipe from brake pipe to the distributing valve
   (f) Independent release pipe.

10. If a defect in a feed valve cannot be corrected while on the road what should be done to enable the train to continue on its journey.

11. What defects will cause a continuous blow at the distributing valve exhaust when the brakes are (a) applied; (b) released?

12. With the A7EL equipment how is the pressure automatically obtained and maintained in the locomotive brake cylinders.

13. How would you set up the brake equipment on :-

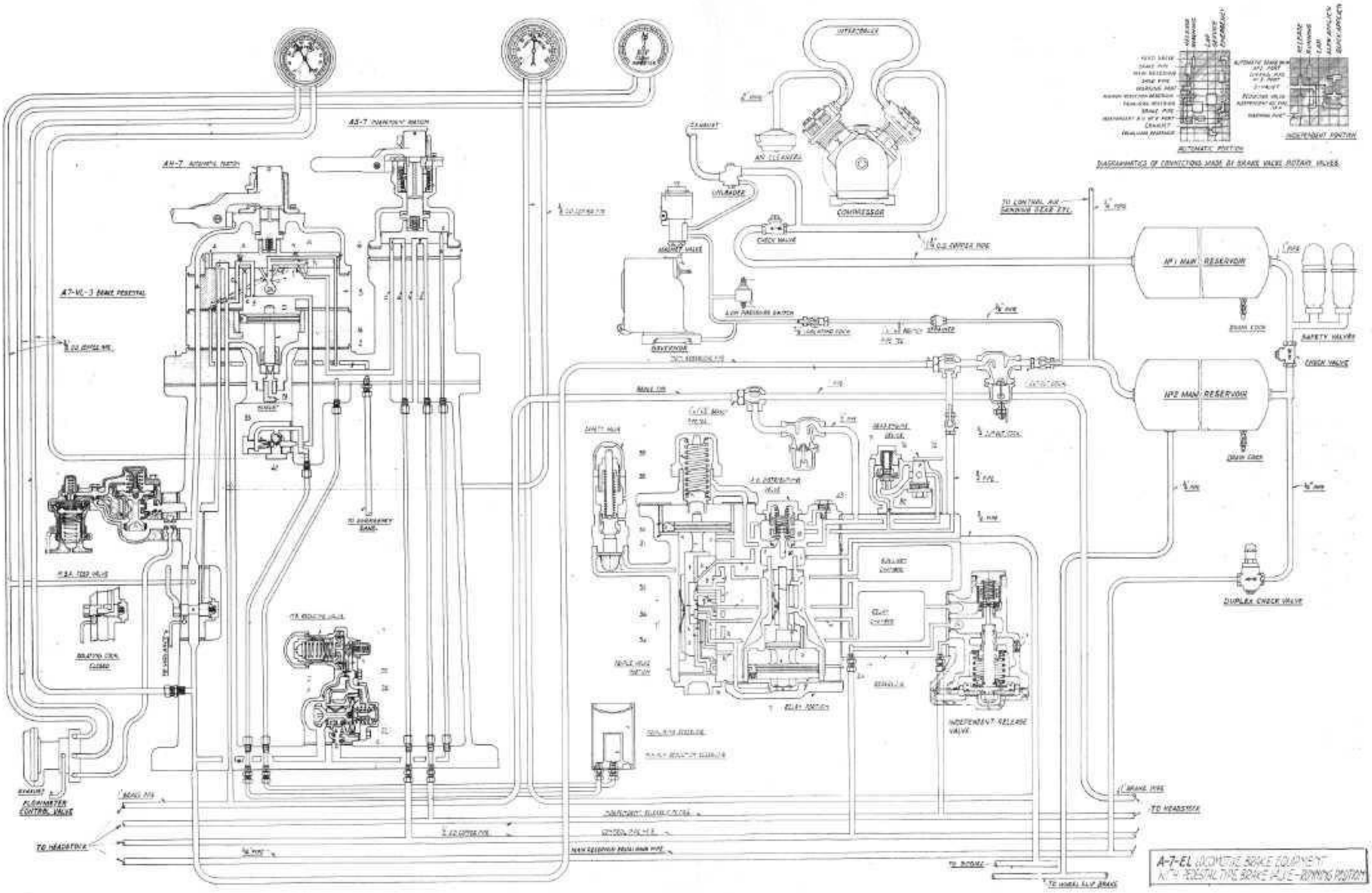
(a) A Lead or single locomotive?
(b) A Trail locomotive?
(c) An Assisting locomotive?
(d) A Dead locomotive?

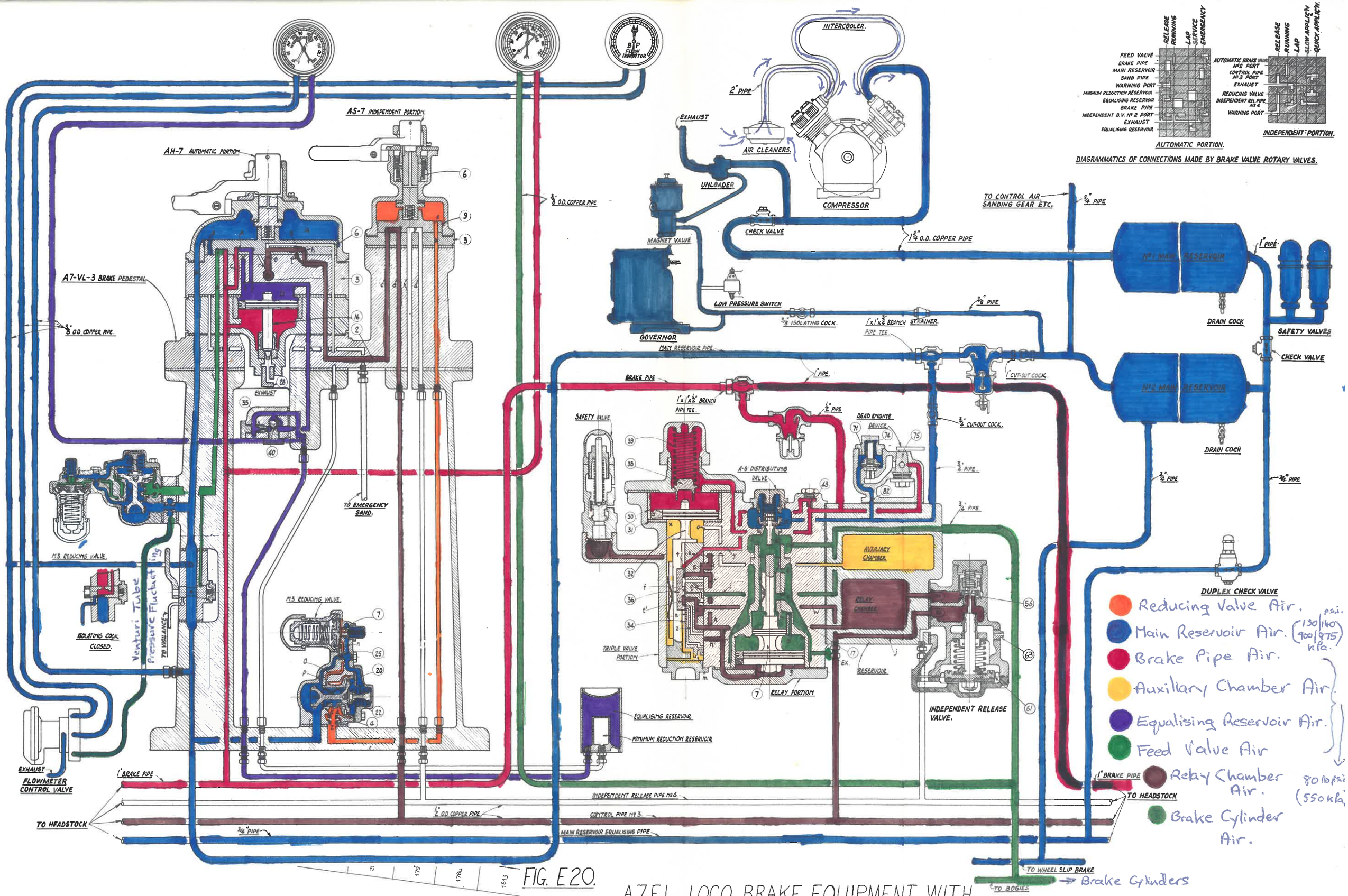
14. What ports are open in the brake valve isolating cock :-

(a) When the cock is closed?
(b) When the cock is open?

15. Describe fully how :-

(a) An independent application of the locomotive brakes is made.
(b) The locomotive brakes are released after an independent application.


AS-7 INDEPENDENT SWITCH
AH-7 AUTOMATIC SWITCH
A7-VC-3 BRAKE PEDESTAL
AIR STRAINER
COMPRESSOR
UNLOADER
CHECK VALVE
SAFETY VALVE
LOW PRESSURE SWITCH
DRIVEWHEEL
MAIN RESERVOIR
DRAIN COCK
DUPLEX CHECK VALVE
TO CONTROL AIR SERVICE TANK ETC.
TO HEADSTOCK
TO BOGIE
TO WHEEL SLIP BRAKE
INDEPENDENT RELEASE VALVE
AUTOMATIC PISTON
INDEPENDENT PISTON
DIAGRAMMATIC OF CONNECTIONS MADE BY BRAKE VALVE ROTARY VALVES
A-7-EL LOCOMOTIVE BRAKE EQUIPMENT
A7-VC PEDESTAL TYPE BRAKE VALVE - ROTARY PISTON



DIAGRAMMATICS OF CONNECTIONS MADE BY BRAKE VALVE ROTARY VALVES.

FIG. E20.

A7EL LOCO BRAKE EQUIPMENT WITH AH7 AUTOMATIC BRAKE VALVE FITTED (Running Position)

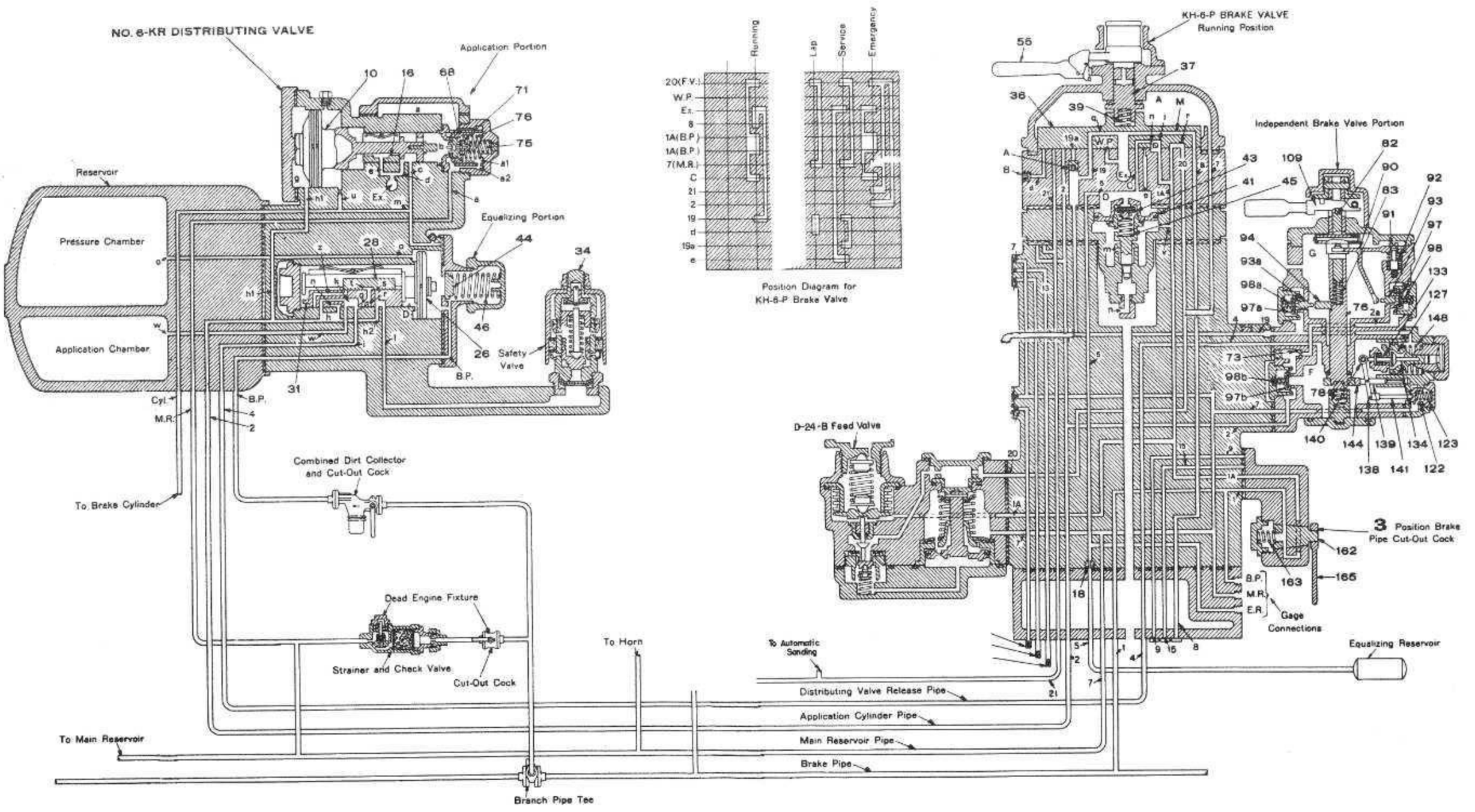


Plate 1 Diagrammatic - Basic Equipment; Running Position with Brakes Fully Released and Equipment Fully Charged

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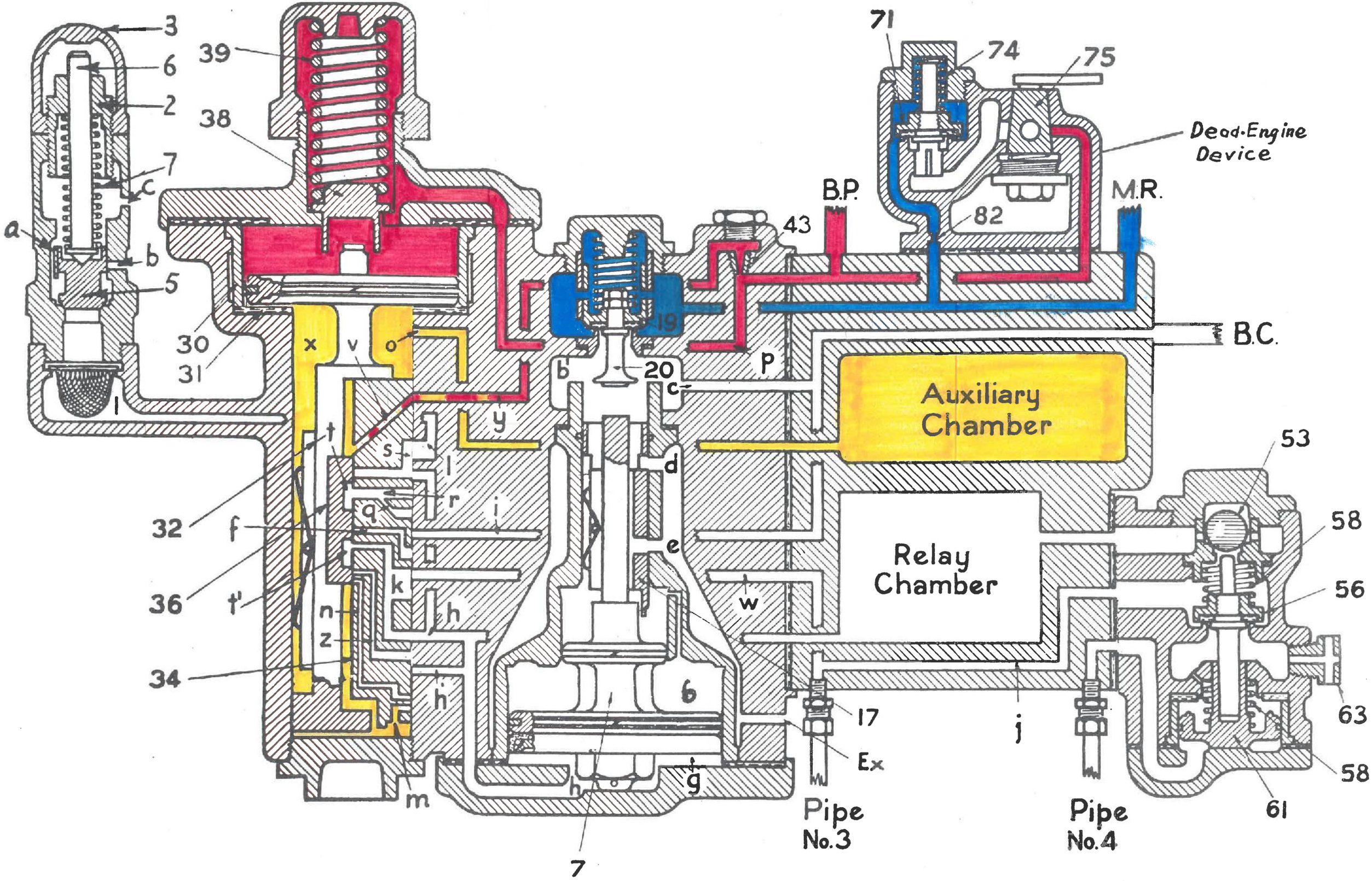


FIG. E14 - CHARGING.

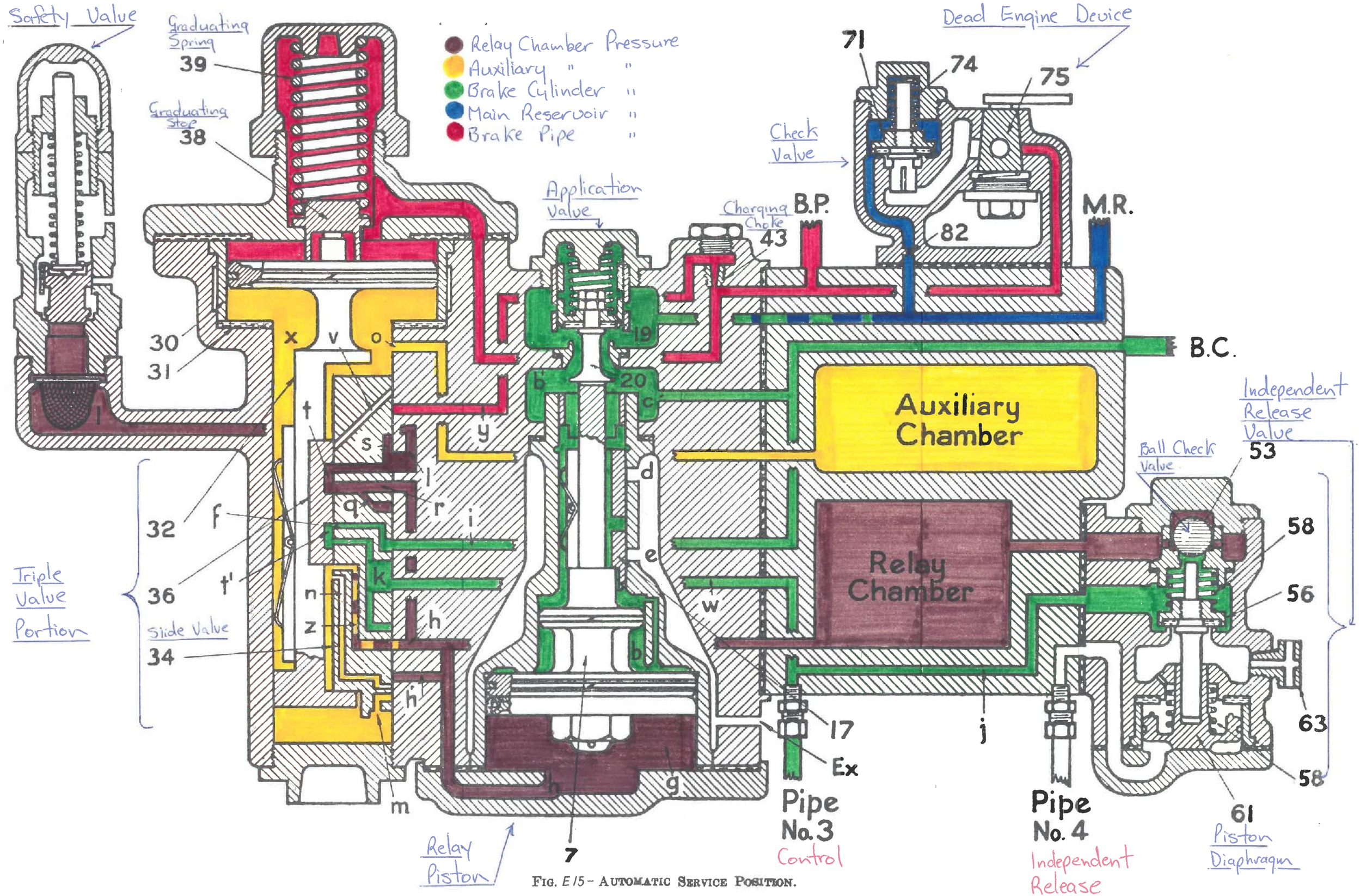


FIG. E15 - AUTOMATIC SERVICE POSITION.

DEAD-ENGINE DEVICE – in any position of distributing value.

Brake Pipe pressure.
Main Reservoir pressure.
Auxiliary Chamber Pressure.
Brake Cylinder Pressure.
Relay Chamber Pressure.
Independent Brake Value Pressure.

71 Spring-loaded at 15 p.s.i. (100 kPa)

Check value here would actually be in 'OPEN' position – not seated as shown.

74

75

Cock-plug is OPEN

B.P.

M.R.

82

43

39

38

30

31

x

v

o

19

20

b

c

B.C.

Auxiliary Chamber

53

t

s

y

l

q

r

i

d

e

58

32

f

k

w

Relay Chamber

56

36

t'

n

z

h

exhaust choke

34

h

b

17

63

Ex

j

58

g

m

61

7

Pipe No.3 (Control)

Pipe No.4 (Independent Release)

FIG. E 18 – INDEPENDENT RELEASE POSITION AFTER AUTOMATIC SERVICE.

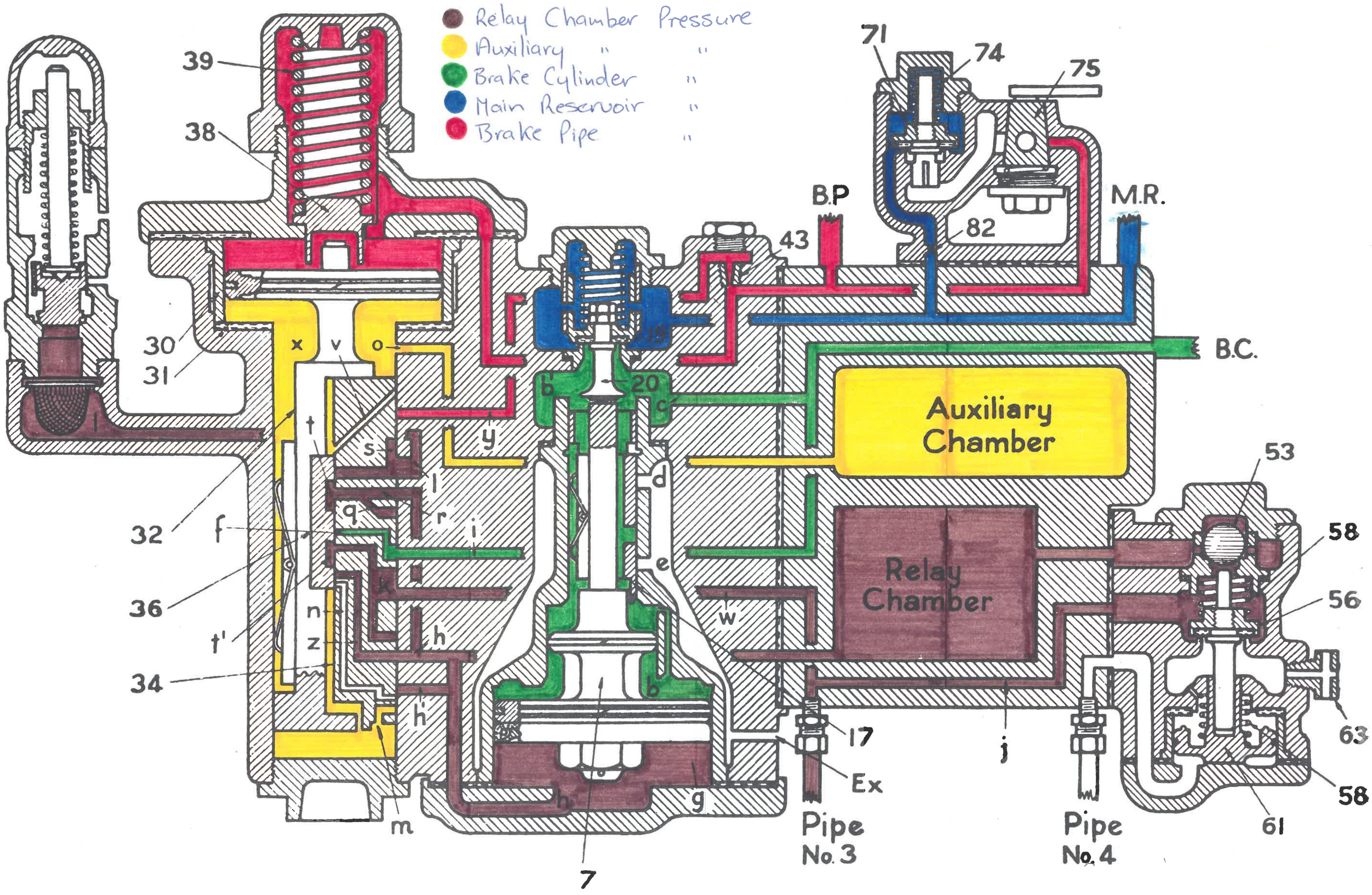


FIG. E 16 - AUTOMATIC SERVICE LAP POSITION.

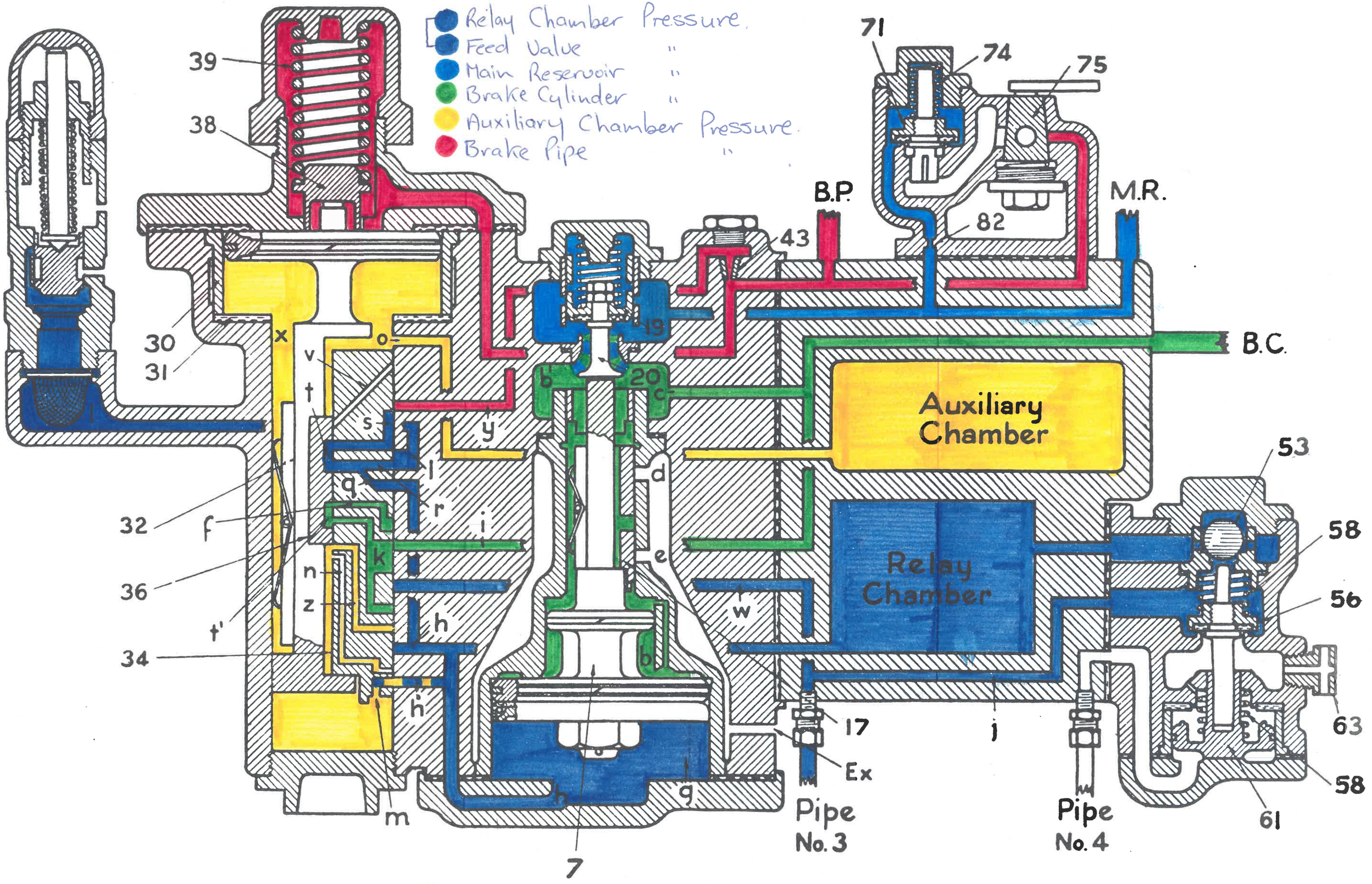
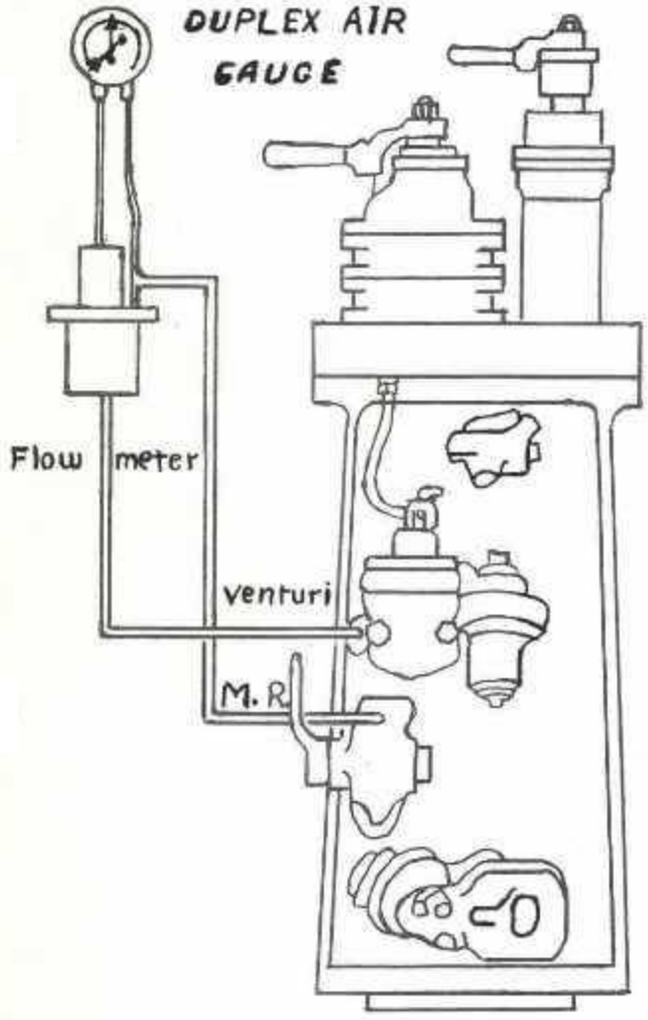
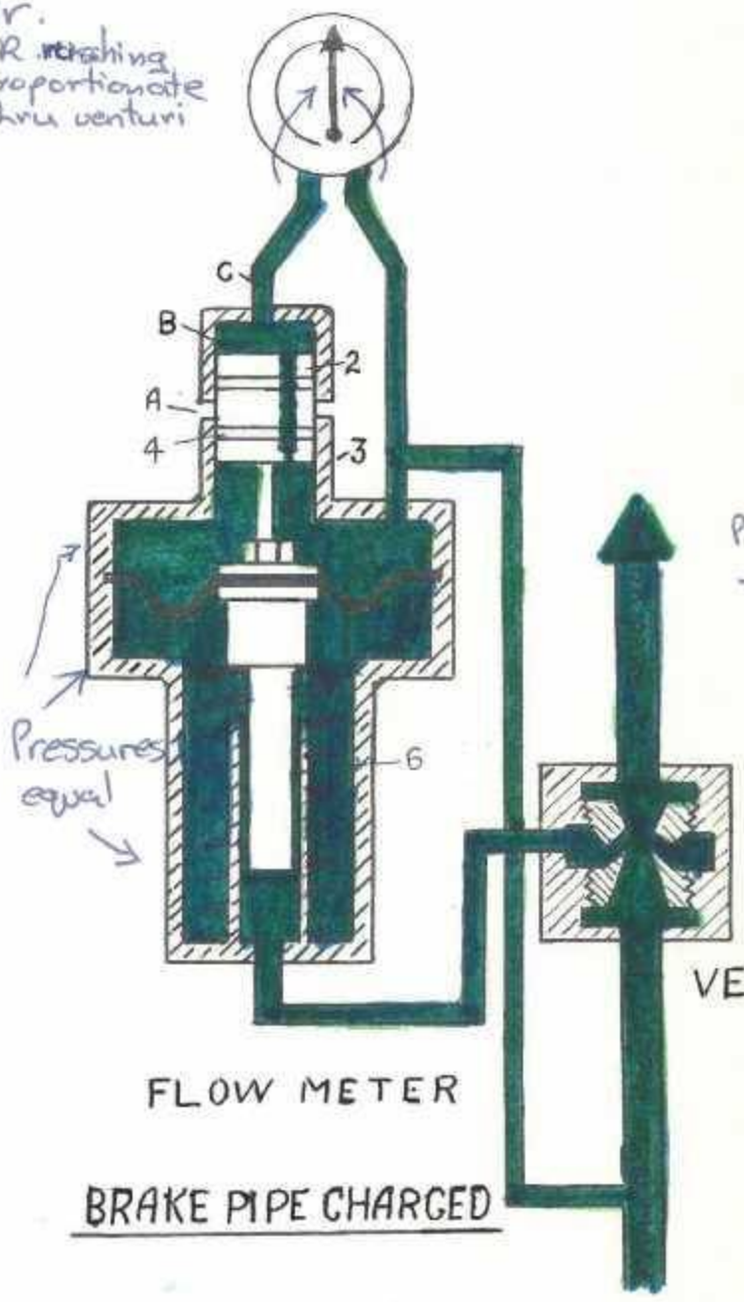


FIG. E17 - AUTOMATIC EMERGENCY POSITION.

Main Reservoir ~~pressure~~ air.
Lower pressure caused by M.R. rushing thru venturi. This pressure is proportionate to the velocity of M.R. passing thru venturi tube.



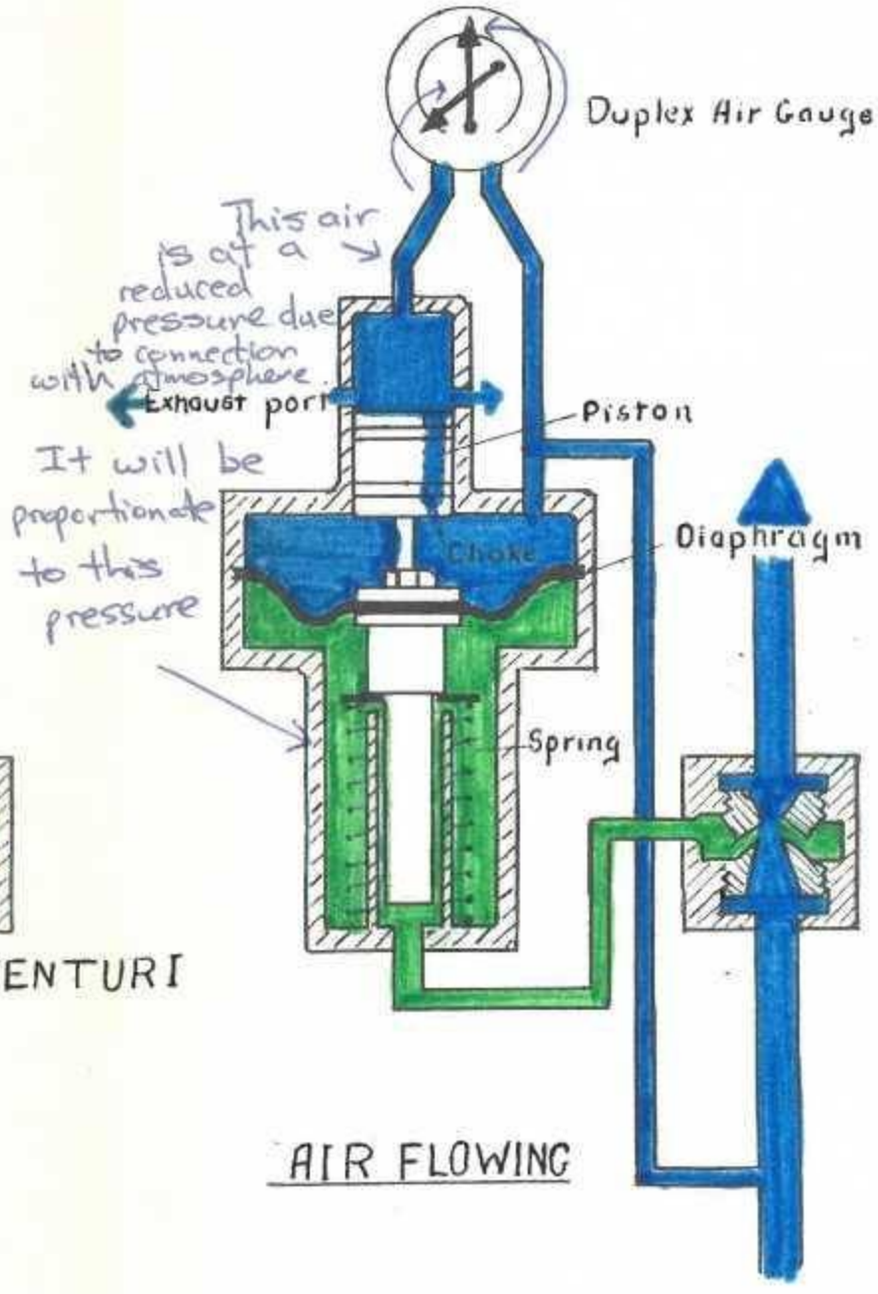
A6. P.L Brake valve



FLOW METER

BRAKE PIPE CHARGED

VENTURI



AIR FLOWING

AIR FLOW INDICATOR. DIAGRAMMATIC.

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