ENGINEDRIVERS CORRESPONDENCE COURSE



## THE NO. 4 DRIVER'S EQUALISING BRAKE VALVE AND FEED VALVES:

The Driver's Equalising Brake Valve is that part of the air brake equipment by means of which the Enginedriver is enabled to control the action of the brakes. A sectional view of the brake valve is shown in Fig. 1. The rotary valve (4) is connected to the handle (6) by means of spindle (5), on the bottom of the rotary valve, the arrangement being such that any movement of the handle correspondingly moves the rotary valve which opens and closes the various ports as required. The brake valve also contains an equalising feature, the purpose of which is to assist the Engine-driver when making a service application of the brake. Brake pipe pressure is gradually and uniformly reduced, which is most important, as it produces the most satisfactory action of the train brakes. Without this feature, should the air be rapidly discharged from the brake pipe, and the exhaust then abruptly cut off, the air flowing from the rear to the front vehicles of the train may release the brakes on the front vehicles and produce severe "coupling slack shocks". The equalising arrangement is such that the Enginedriver does not discharge the compressed air direct from the brake pipe but from a small equalising reservoir connected by a pipe to chamber "T" on top of the equalising piston. The reduction of air pressure thus effected in this reservoir is then automatically repeated in the brake pipe by means of the equalising piston (11), which operates between the air pressure in chamber "T" and that in chamber "C" which is always connected to the brake pipe. This piston, the stem of which terminates in a discharge valve "U" moves according to the variation of pressure above and below it, and governs the exhaust valve in such a manner that the air pressure in the brake pipe must always equalise with that in the equalising reservoir connected with chamber "T". Even if the discharge of air by the rotary valve is abruptly stopped, the discharge valve "U" is always slowly and gradually closed by the piston when equilibrium of pressure is established throughout the train. During a service brake application, therefore, the equalising device will provide a uniform reduction of brake pipe pressure, thus ensuring a more uniform application of the brakes throughout the train.

## OPERATION:

There are five positions of the brake handle for operating the air brakes-

1. Charging and Releasing
2. Running
3. Lap
4. Service or Ordinary Application
5. Emergency Application

1. Charging and Releasing position -

When the brake valve handle is placed in this position, compressed air from the main reservoir flows through ports and

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passages in the rotary valve and its seat to the chamber above the equalising piston, seating the equalising piston, and feeds into the equalising reservoir.

At the same time, compressed air from the main reservoir passes to the brake pipe and to the chamber under the equalising piston. Direct communication is now established from the main reservoir to the brake pipe, and equal pressure exists on both sides of the equalising piston.

2. Running position -

When the brake valve handle is placed in this position, compressed air from the main reservoir flows through passages and ports in the rotary valve and its seat to the feed valve. The feed valve reduces main reservoir pressure to 80 lb per sq. in. and this air pressure passes direct to the brake pipe, and also to the chamber above the equalising piston and the equalising reservoir.

In this position, the brake pipe and equalising reservoir and the chamber above and below the equalising piston, are in equilibrium at the pressure controlled by the feed valve. The main reservoir pressure above the rotary valve provides an extra pressure of 25 to 30 lb per sq. in., which is available to ensure the proper release of the train brakes following a brake application.

3. Lap position -

When the brake valve handle is placed in this position all ports in the rotary valve as well as those in its seat are closed, and all communication between the main reservoir and the brake pipe and equalising reservoir is cut off, also between the brake pipe, the equalising reservoir and the atmosphere.

4. Service or ordinary application position -

When the brake valve handle is placed in this position, compressed air from the chamber above the equalising piston, and the equalising reservoir is permitted to escape to the atmosphere through the preliminary exhaust port. This causes a reduction of pressure above the equalising piston, and the pressure on the under side of the piston being greater, causes it to move upwards. This unseats the secondary exhaust port, allowing brake pipe pressure to escape to atmosphere. A reduction of brake pipe pressure applies the brakes.

When the desired reduction of equalising reservoir pressure has been made, the handle of the brake valve is returned to "lap" position. The brake pipe pressure will continue to escape through the secondary exhaust port until it is slightly less than that above the equalising piston and the equalising piston will move down reseating the secondary exhaust valve.

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5. Emergency Application -

When the brake valve handle is placed in this position a direct communication between the brake pipe and the atmosphere is established. The compressed air, therefore, escapes freely from the brake pipe causing a rapid application of the train brakes with full power. The air from the equalising reservoir and the top of the equalising piston also escapes to the atmosphere.

FULL DETAILS OF OPERATION:

See Air Brake Handbook, pages 13 - 18 for full details of the operation of the Automatic Brake Valve. Figure 3 illustrates the relative position of the rotary valve to the rotary valve seat when the handle is in the five positions. The dotted lines represent the rotary valve seat, and the full lines represent the rotary valve complete with handle. The illustrations shown in Figure 3 are to be used when studying from the Air Brake Handbook.

THE BRAKE VALVE DEFECTS:

Defects in the brake valve frequently interfere with the proper manipulation of the brake. See Clauses 11 to 15, pages 125 - 128, Air Brake Handbook for general defects, and how they may be located.

FEED VALVES:

The object of the feed valve is to maintain automatically a constant predetermined pressure in the brake pipe when the brake valve handle is in the running position, irrespective of the pressure existing in the main reservoir.

There are two different types of feed valves used on locomotives, the WING-VALVE TYPE and the M3 TYPE (which is used with the A7EL brake equipment). The two types of feed valves are shown diagrammatically in Fig. 5 - 6, in both the opened and closed positions. It will be noticed that the feed valves have two separate portions :-

(1) The portion which controls the passage of air from the main reservoir to the brake pipe consisting of slide valve, or wing valve, piston and spring.

(2) The regulating control portion consisting of adjusting spring, adjusting screw, diaphragm and regulating valve.

OPERATION OF THE WING VALVE FEED VALVE:

See Air Brake Handbook, page 19, for details of the operation of the wing valve type feed valve. When studying the operation, the illustrations shown in Fig. 5 are to be used.

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OPERATION OF THE M3 TYPE FEED VALVE:

See Air Brake Handbook, page 56, for details of the operation. The illustration shown in Figure 6, together with Figure 72 (Air Brake Handbook), are to be used.

FEED VALVE DEFECTS:

See Clauses 18 to 22, pages 128-129, Air Brak Handbook for general defects.

SLACK ADJUSTERS:

Refer to Air Brake Handbook, pages 34 - 38.

NON-AUTOMATIC BRAKE SYSTEM:

The diagrammatic arrangement of the automatic and straight air brake is shown in Fig. 50, page 39, of Air Brake Handbook.

The straight air brake comprises the following parts which are supplementary to those of the automatic brake equipment :-

1. A Pressure Reducing Valve to reduce the air pressure to 45 lb per square inch before it flows into straight air brake valve.

2. A Driver's Straight Air Brake Valve which enables air to be supplied to the brake cylinder.

3. A Double Check Valve which is located at the junction of both air brake systems and which automatically opens up communication between either brake system and the brake cylinder as determined by the operation of either of the Driver's Brake Valves.

4. A single Pointed Air Pressure Gauge which is located in the cab of the locomotive and connected to the straight air pipe. It indicates the brake cylinder pressure when a straight air brake application is made.

Refer to Air Brake Handbook, pages 39 - 41 for further details.

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DEFECTS:

If the double check valve does not make an airtight seat on the triple valve side, when the straight air brake is applied there will be a continual escape of air at the triple valve exhaust port. On the other hand, if the check valve does not make an air-tight seat on the straight air side with the automatic brake applied, there will be a blow at the straight air brake valve exhaust port with the straight air brake valve in release position until all air has been exhausted from the brake cylinders.

## MISCELLANEOUS DETAILS

BRAKE CYLINDERS:

Refer to Air Brake Handbook, pages 28 - 30.

SIZE OF BRAKE CYLINDER AND AUXILIARY RESERVOIR:

The size of brake cylinder is determined according to the weight of locomotive or vehicle and the braking effort required. It is sometimes necessary to provide two or more cylinders. The auxiliary reservoir is designed to suit the size of brake cylinder to ensure the correct functioning of the brake. These items are determined in the design office and are not a matter for discussion in these lectures.

The brake cylinder and auxiliary reservoir are designed so that with an 8 inch brake piston travel and 80lb per square inch pressure in the brake pipe, a reduction in the auxiliary reservoir will cause the brake cylinder to be charged as follows :-

5 lb per sq. in. reduction in auxiliary reservoir pressure will put a pressure of 2 lb per sq. in. in the brake cylinder.
10 lb per sq. in. reduction gives a pressure of 18 lb per sq. in.
15 lb per sq. in. reduction gives a pressure of 35 lb per sq. in.
22 lb per sq. in. reduction gives a pressure of 58 lb per sq. in.

Again with 80 lb per sq. in. in the brake pipe and with a brake piston travel of 4 in the auxiliary reservoir reduction and subsequent brake cylinder pressures are as follows :-

5 lb per sq. in. reduction gives a brake cylinder pressure of 11 lb per sq. in.
10 lb per sq. in. reduction gives a pressure of 36 lb per sq. in.
15 lb per sq. in. reduction gives a pressure of 60 lb per sq. in.
16 lb per sq. in. reduction gives a pressure of 65 lb per sq. in.

It will be seen from the above that long piston travel decreases the braking power because it gives a lower pressure on the piston for a given reduction. This is more marked with slight application than with a full one; further, any reduction in the auxiliary reservoir pressure in excess of 22 lb per sq.in. with an 8 in. piston travel and 80 lb per sq. in. in the brake pipe, or any reduction in the auxiliary reservoir pressure in excess of 15 lb per

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sq. in. with 4 in. piston travel and 80 lb per sq. in. in the brake pipe, will not apply the brakes any harder but only cause a waste of air because with these reductions the auxiliary reservoir and brake cylinder pressures will equalise and the brake cylinder pressure cannot be increased.

AUXILIARY RESERVOIR LEAKS:

If a slight leak exists on the auxiliary reservoir side of the triple valve, it will have no other effects than to cause a waste of air when the brake is off, and is equivalent to a brake pipe leakage. This slight leak will cause the brake to release after being applied because the leak will reduce the auxiliary reservoir pressure below that in the brake pipe, and the tripevalve piston will be forced to the release position.

If, however, the leak is bad it may prevent the auxiliary reservoir from being charged, making the brake on that vehicle inoperative.

For these reasons it is important that no leakage from the auxiliary reservoir should exist.

BRAKE PIPE LEAKS:

If there are leaks in the brake pipe the brakes are liable to creep on when not desired, especially if the brake pipe pressure is allowed to fall. When the brakes are applied these leaks will cause the brakes to go on harder than desired, owing to the brake pipe pressure falling the whole time the brake valve handle is in lap position.

Brake pipe leakage also slows down the rate of recharge of auxiliary reservoirs throughout a train and should be kept down to a maximum of 5 lb per sq. in. per minute on a train.

ADJUSTMENT OF BRAKE RIGGING:

Brake rigging should be adjusted as the brake cylinder piston travel exceeds the maximum working stroke. This adjustment should be made so that the brake cylinder piston travel is returned to the minimum working stroke and in such a manner that each block stands off the tread of the wheel an equal amount.

The maximum and minimum strokes of Westinghouse Standard brake cylinders are as follows :-

| Type of Cylinder | Working Maximum | Stroke, Minimum |
|---|---|---|
| Short Stroke | 5" | 1½" when not fitted with slack adjusters |

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MAIN RESERVOIR:

The compressor delivers air into the main reservoir, which is situated on the locomotive where it is stored for the purpose of -

(a) Charging the brake pipe and auxiliary reservoirs;
(b) Releasing the brakes after they have been applied, and
(c) Cooling and condensing out water or oil.

From the main reservoir the air has a free passage to the driver's brake valve isolating cock and the driver's brake valve.

The main reservoir capacity must be such as to provide air at a pressure sufficiently high to promptly release the brakes and recharge the auxiliary reservoirs. If the main reservoir capacity is low, the compressor may have to run at a high speed when the brakes are released in order to suplement the air supply, as the air stored in the main reservoir will not charge the "Auxiliaries" quickly enough.

When water is allowed to accumulate in the main reservoir, it not only reduces the space available for air storage, but it also works through into the brake pipe and auxiliary reservoirs, gumming up or rusting the various valves. Main reservoirs are provided with drain cocks which must be opened at each preparation in order to blow out any water that has accumulated. It is considered good practice to open the drain cocks when checking over the locomotive in service. Some main reservoirs are fitted with automatic drains.

The main reservoir pressure begins at the discharge valve of the compressor and ends on top of the rotary valve in the driver's brake valve when the driver's brake valve isolating cock is open.

The main reservoir and piping is tested by closing the brake valve isolating cock, and charging the main reservoir to a pressure of 80 lb per square inch. With the main reservoir charged to 80 lb per square inch, and the compressor shut off, the pressure must not fall at a greater rate than 3 lb per square inch per minute.

At the completion of this test the isolating cock is again opened.

AIR PRESSURE GAUGES:

Refer to the Air Brake Handbook, page 37, Duplex Air Pressure Gauge.

In the study of the driver's brake valve, it will be shown that there is direct communication between the equalising reservoir and brake pipe when the handle of the driver's brake valve is in certain positions only. In all cases, however, the air pressure will equalise.

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When the brake valve handle is in the release and the running positions the brake pipe and the equalising reservoir are connected. In addition to registering the pressure in the equalising reservoir and the chamber on top of the equalising chamber to which it is connected, the black hand of the Duplex Air Pressure Gauge indicates (substantially) the brake pipe pressure.

With the brake valve handle in lap and in emergency positions the black hand registers the equalising reservoir pressure only.

BRAKE VALVE ISOLATING COCK:

For the normal operation of the brake this cock must be open on the locomotive that is controlling the brakes on the train.

On all other locomotives which are placed on a train either being towed dead or assisting, the brake valve isolating cock must be closed and the automatic brake valve handle placed in release, and the straight air brake valve handle must be placed in release.

SELF-LAPPING STRAIGHT AIR BRAKE:

The self-lapping type of driver's brake valves have been developed to provide progressive control of the straight air brake equipment on locomotives and railcars.

These types of valves have no lap positions and the flow of air is automatically controlled according to the degree of handle movement, the valve automatically cutting off or lapping, when the pressure corresponding to the degree of handle movement has been reached in the brake cylinders. The brake cylinder pressure is entirely dependent on the degree of handle movement, both for application and release.

These types of brake valves have the advantage that they compensate automatically for leakage from the brake cylinders and piping, thus it is unnecessary to make further application to compensate for any leaks.

GENERAL DESCRIPTION:

Refer to the diagrams issued with this lesson.

Two poppet valves 4 and 12 connected by balance levers 37, are controlled by a handle operated cam 22 and a piston 7, the latter being balanced between a spring on one side and by brake cylinder pressure on the other side.

The main body 19 forms a pipe bracket to which all pipe connections are made, and it also houses the balance levers 37 and their anchoring yoke 36, together with the associated rollers, pins, etc.

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Attached by means of studs and nuts are the valve unit body 1A. (Containing the control piston and the poppet valves) and spindle guide 32, which provides the bearing for the spindle 21A on which the cam 22 is mounted.

The main reservoir pipe is connected to A and brake cylinder at B while connection C is open to the atmosphere.

HANDLE POSITIONS:

There are three handle positions - Release, Full Service, and Emergency.

The release position is used to make a full release of the brakes and the handle is kept in this position whilerunning.

The full service position is used to obtain a maximum brake cylinder pressure, and intermediate pressures are obtained by placing and leaving the handle in a position between release and full service. In this case a cylinder pressure is obtained in proportion to the extent of handle movement.

The emergency position is used in case of emergency and the maximum pressure is obtainedin the shortest time.

OPERATION:

Running -

Air flows from connection A through passage D to chamber E but is preventedin the release position, as shown in the illustration, from flowing to chamber F by valve 4. Chamber F is connected to the brake cylinders through connection B and also to exhaust connection C, through exhaust valve 12 chamber G and passage H. Thus the brake cylinders are connected to atmosphere and the main reservoir air is cut off.

APPLICATION:

In applying the brake, the handle is moved towards full service position when cam 22, which is keyed to handle spindle 21 A engages with cam follower 39. This is held together with rollers, by balance levers 37, which are anchored by yoke 36 at fulcrum pin 40. At the same time the two outside rollers 38 engage with inlet valve 4 and exhaust valve 12, the pressure at the cam follower 39 being distributed between the two.

The exhaust valve spring 13 is lighter than the inlet valve spring 5 and the first movement of the cam 22 therefore forces exhaust valve 12 against its seat in piston 7, thus closing the communication between the brake cylinder and the atmosphere. Piston 7 is prevented from moving by heavy spring 15 and the increased force produced by the cam as the handle is moved forward unseats the inlet valve 4 and allows air from the main reservoir to flow from connection A to connection B and thence to the brake cylinders.

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Chambers F and J are connected together by a small hole K, and air pressure in these two chambers begins to build up until it is sufficiently great to overcome the resistance of spring 15. Piston 7 is thus moved to the right, the amount of movement being dependent upon the pressure admitted by inlet valve 4. The pressure continues to move the piston until it is balanced by the increased spring resistance.

The exhaust valve moves with the piston and remains seated due to the pressure of inlet valve spring 5 acting through levers 37, exceeding the effort of exhaust valve spring 13. At the same time, the movement of levers 37 about centre roller 39 allows the inlet valve to close so that the brake cylinder pressure is governed by the pressure of the piston spring.

AUTOMATIC COMPENSATION OF LEAKAGE:

During a brake application, leakage occurring in the brake cylinder or piping will reduce the pressure in chamber J allowing spring 15 to move to the left and open the inlet valve by rotating the levers 37 about the centre roller 39.

When sufficient air has been admitted to re-establish the pressure in the brake cylinder, the pressure in chamber J will move the piston back to the right against the pressure of spring 15 and allow the inlet valve 4 to close again.

GRADUATED APPLICATION:

When increased brake cylinder pressure is required, further movement of the handle in the forward direction which will again open the inlet valve 4 until the pressure in chamber J has increased sufficiently to overcome spring 15 and move piston 7 far enough to allow the inlet valve to close again. Thus brake cylinder pressure is always directly proportional to the position or degree of handle movement.

GRADUATED RELEASE:

In release the reverse operation takes place. The return of the handle towards the release position withdraws the cam and allows the exhaust valve 12 to open until the pressure in chamber J and the brake cylinder has fallen sufficiently to allow spring 15 to move the pistoh to the left and close the exhaust valve. This operation takes place with each reduction of pressure made until the handle is in full release position.

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FULL RELEASE:

With the handle in full release position the exhaust valve remains open so that chamber J is in direct communication with atmosphere and the inlet valve remains closed.

EMERGENCY:

If the handle is moved to the extreme right-hand or emergency position the cam turns to such an extent that the hump (d) passes the roller 39 which then rides on to the radiused portion of the cam, with the effect that the inlet valve is held permanently open, and full pressure is admitted to the brake cylinders.

Before taking a locomotive into service the emergency feature should be tested and if no increase in pressure above normal service pressure is obtained, the fault should be attended to by the fitting staff. If this fault is not remedied it is possible to lose both Service and Emergency braking should spring 15 fail.

DEPOT TESTS:

Before leaving the Depot, even when the locomotive has been previously prepared, the Enginedrivermust satisfy himself that the hand and air brake apparatus on the locomotive is in a condition that will ensure satisfactory operation. Both automatic and independent brake valves must be operated in all positions and all brake cylinders observed that the brakes apply with the correct piston travel and that they fully release. Brake blocks must be observed to see that they are of adequate thickness and that they press firmly on the wheels when the brake is applied.

TESTING AIR COMPRESSORS AND GOVERNORS:

The air compressor and compressor governor must be tested to see that they are functioning correctly. The compressor should work without undue noise and should stop or unload as the case may be under the control of the governor and must restart or load when the main reservoir pressure has fallen to the correct value. The pressures are as follows :-

Da, Db load when pressure falls 125 lb and unload when pressure has risen at least 10 lb, but not more than 17 lb.

Df, Dg, Di, Dj load or start when pressure falls to 105 lb and unload or stop when pressure has risen at least 10 lb but not more than 17 lb.

Other classes, except TR, load or start when pressure falls to 95 lb and unload or stop when pressure has risen at least 10 lb, but not more than 12 lb.

TR load at 85 lb, unload at 100 lb.

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THICKNESS OF BRAKE BLOCKS:

Brake blocks must be examined to ensure that there is adequate thickness for the run on which the locomotive is rostered. Some brake blocks have a raised wear limit pad cast on the side about the middle of the block. While any of this pad is left the block is serviceable and is thick enough for any rostered run.

AIR PRESSURE LEAKAGE:

The brake pipe must be tested for leakage by making a 10 lb reduction then, in the case of the No. 4 brake valves, closing the brake valve isolating cock and placing handle in Running. With the 26L brake valves by turning the brake cut-off valve to Cut-out and with all other brake valves by leaving the brake valve in Lap. The brake pipe pressure is then to be observed over a period of one minute and must not drop more than 3 lb. The main reservoir system must be tested for leakage by noting the pressure drop, with the automatic brake valve cut-out and brakes released during the time the compressor is stopped or unloaded. Loss of pressure must not exceed 3 lb per minute.

SECONDARY EXHAUST PORT:

The preliminary exhaust port allows air to escape from the equalising reservoir and from above the equalising piston to the atmosphere when the brake valve is placed in the service position. Brake pipe air then lifts the equalising piston which opens the secondary exhaust port and allows brake pipe air to exhaust to the atmosphere. As the brake pipe air pressure has to drop slightly below the pressure in the equalising reservoir before the secondary exhaust will close, it will depend on the length of the train as to how long the secondary exhaust port stops open. The volume of air in the brake pipe of a short train would be far less than there would be in a long train, thus the longer the train the greater volume of air there is to escape from the secondary exhaust port before the pressure will equalise with the equalising reservoir and allow the secondary port to be closed; thus the longer the train the longer the secondary exhaust port remains open.

GENERAL DEFECTS AND INSTRUCTION:

Refer to Air Brake Handbook, pages 125 to 129 for defects.

Refer to Air Brake Handbook, pages H1 to H8 for instructions.

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THE ENGINEDRIVER:

Everthing that has been said in previous lessons regarding the qualifications and responsibilities of the Locomotive Assistant applies equally to the Enginedriver. It is true that a Locomotive Assistant occupies a responsible position; that a spirit of enquiry is essential to success and that he must devote time, energy and enthusiasm to the effort of mastering the details of his work, but the Enginedriver is required to acquire the necessary knowledge to become proficient in the handling and running of the modern locomotive as well as supervising the work of the Locomotive Assistant.

INSTRUCTION BOOKS:

The instruction book for the guidance of locomotive operating staff clearly defines the main guiding principles to be observed by the Enginedriver in the course of his duties. The student is urged to make a close study of the book referred to above so that he will leave nothing to chance when booked on duty to run a train.

INSPECTION OF THE LOCOMOTIVE:

An Enginedriver's confidence in his locomotive largely depends on how much he knows about it. This entails close inspection of it, with a thorough search for defects. Special attention must be given to split pins, keys, bolts, checknuts, set screws, hangers, springs, tyres, fuel, oil and water leaks. A thorough examination and testing of the Westinghouse brake gear and equipment must be carried out.

PROMPTLY REPORT DEFECTS:

Some Enginedrivers omit to report defects unless they become serious. This is a big mistake for in locomotive running a small defect today may mean a serious breakdown tomorrow. As a regular precaution the Repair Book 54D should be examined before taking charge of the locomotive to see that any defects booked by the previous Enginedriver have received attention.

KNOWLEDGE OF SIGNALS:

It is necessary that the Enginedriver should have a thorough knowledge of all the various types of signalling in use over the road on which he runs his trains, and the greatest vigilance is needed, especially at nights, to correctly interpret the different signal indications.

KNOWLEDGE OF THE ROAD:

Next to having a complete knowledge of signals, a knowledge of the road is important. An Enginedriver is required to certify that he has a knowledge of the road before he is allowed to take charge of a train on any section of the line.

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Unless the Enginedriver has a good knowledge of the gradients, curves and general topography of the country he will not have the confidence to handle his train, with the result that at places where he ought to be gathering speed to help him up a steep bank, probably he would be trying nervously to steady his train by making heavy brake applications. On the other hand, he might have his train travelling at an excessive speed on a down gradient with many sharp curves to negotiate, with the result signals might be missed or over-run.

PRESENCE OF MIND:

Railway service demands constand vigilance, and it is essential that the Enginedriver be ready at all times to act with judgment and decision to avert possible accidents. He is required therefore to keep alert and vigilant at all times to meet any emergency that may arise, especially where familiarity with the road and train crossing may otherwise cause slackening of attention.

PREPARATION FOR THE ROAD:

After the Enginedriver has read, signed for and obtained his train advices, examined the notice cases for special instructions regarding the running of his train and other matters, signed the attendance book and checked the Loco 54D Repair Book to see that repairs booked to his locomotive have been completed, he will attend to the lubrication and other work connected with the preparation of his locomotive. The checking of fuel oil, lubricating oil, water levels, and the examination of the locomotive must be carried out systematically and in order that this can be done, the Enginedriver must adopt a system when preparing his locomotive for service.

Start at a given point and work around the locomotive checking, and finish up at the starting point. He must make sure that all spring and compensating gear, engine, and brake gear is examined. If necessary the brake gear must be adjusted so that the brake cylinder pistons have their minimum allowable travel.

BOOKING LOCOMOTIVE REPAIRS:

Enginedrivers must ensure that all repairs required to their locomotives are recorded in the Loco 54D repair book. Enginedrivers booked to run locomotives that do not run into a main depot must report repairs or adjustments required to their locomotives direct to their Locomotive Supervisors, and if such repairs are of an urgent nature the matter must be reported by telephone or telegraph.

When any special repairs or adjustments are necessary, or a defect is complicated or uncommon, the Enginedriver should interview the Locomotive Supervisor or Depot Foreman and explain the matter to him personally.

Enginedriver shall be held responsible for reporting promptly all defects or repairs to the locomotives on which they are booked to run, and if the defect comes under the notice of more than one engine crew due to crews changing over in a station yard or en route, it must be reported by each Enginedriver concerned.

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## LIST OF QUESTIONS

1. Describe the operation of the Driver's equalising brake valve in each of its five positions.

2. What is the object of the equalising reservoir?

3. How would you test the Driver's brake valve for a leaky rotary valve?

4. What effect would a leaky rotary valve have, when handling a train?

5. Does the brakepipe secondary exhaust port always remain open the same length of time in making a 10lb reduction with different lengths of trains, and state why.

6. What would cause an emergency application of brakes when the brake valve was placed in the service position?

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7. What would be the effect of a broken equalising reservoir pipe, or a leaking equalising reservoir, when the brake valve handle is put in the service position? How could it be rectified and how must the brake valve be operated?

8. How would you test for a defective equalising piston ring, and if found defective, how would you operate the Driver's brake valve?

9. What is the object of the feed valve?

10. Describe the operation of the M3 feed valve.

11. How would you test the operation of the feed valve?

12. What is the Enginedrivers responsibility regarding the booking of repairs?

13. What are the functions of the straight air brake?
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14 What indication would you get if a double check valve was defective?

15. What effect will a leak have on the auxiliary reservoir side of the triple valve?

16. What effect would brake pipe leakage have on the operation of the train brakes?

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## LIST OF QUESTIONS (Contd.)

17. What are the most essential details to be observed and how must the brakes be tested when making a depot test of brakes before entering service?

18. What are the advantages of the self lapping straight air brake?

19. If there was no increase in brake cylinder pressure when the self lapping straight air brake handle was placed in emergency, what action would you take and why?

20. Describe the air pressure leakage tests that must be made before entering service with a locomotive.

| Ref. No. | Name of Part. |
|---|---|
| 1 | Body |
| 2 | Rotary valve chamber cap |
| 3 | Piston chamber cap |
| 4 | Rotary valve |
| 5 | Handle spindle |
| 6 | Handle |
| 7 | Lock nut |
| 8 | Top nut |
| 9 | Handle spring |
| 10 | Handle stop |

| Ref. No. | Name of Part. |
|---|---|
| 11 | Equalizing piston |
| 12 | Piston packing ring |
| 13 | Union nut for main pipe |
| 14 | Brass collar for main pipe |
| 15 | Plug |
| 19 | Union nut — For equalizing reservoir connection |
| 20 | Union nipple — For equalizing reservoir connection |
| 23 | Equalizing valve seat |
| 27 | Spindle leather |

| Ref. No. | Name of Part. |
|---|---|
| 15 | Plug |
| 21 | Nut for fixing stud |
| 22 | Fixing stud |
| 28 | Feed valve stud and nut |
| 29 | Gasket—feed valve to body |

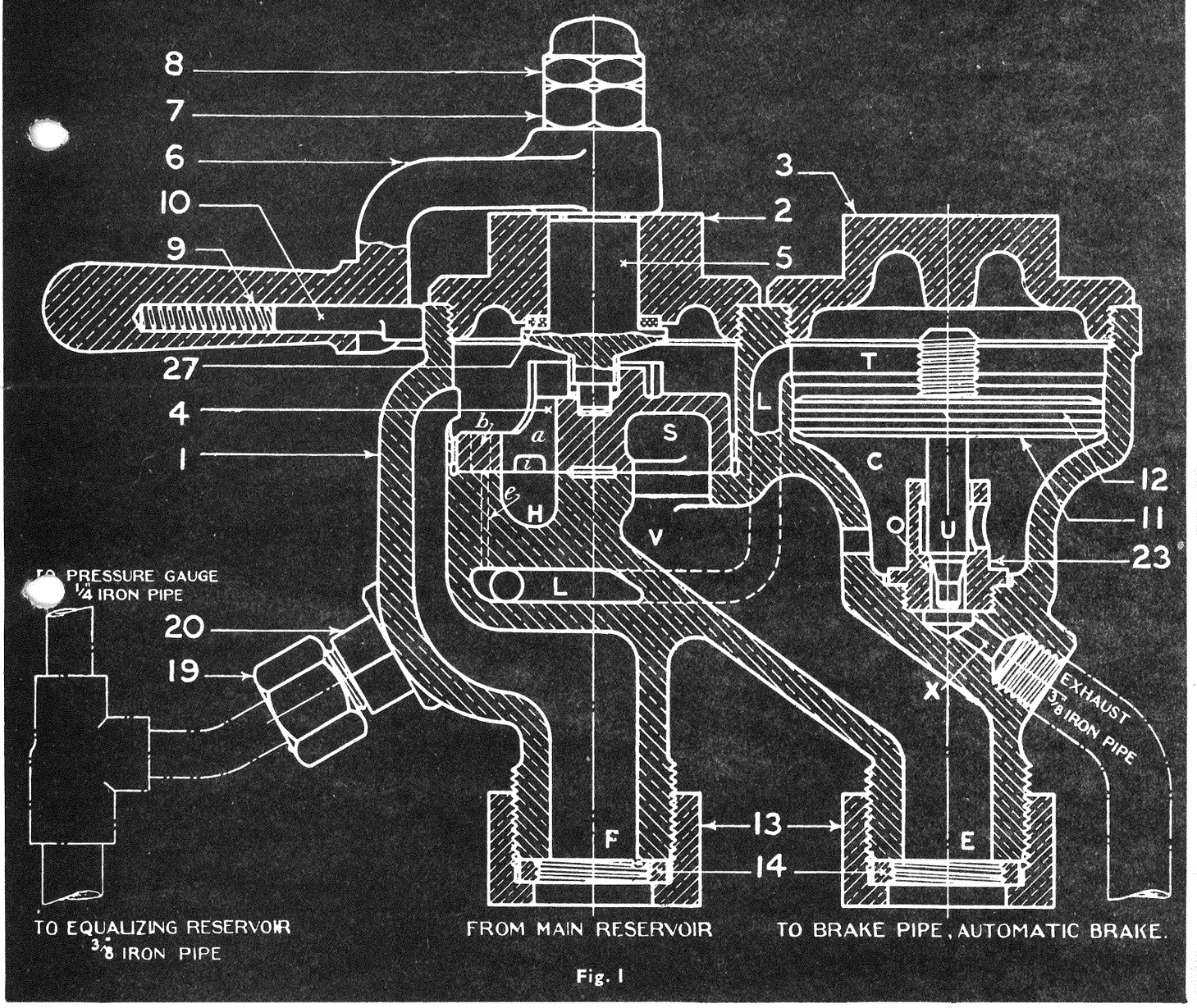



Fig. 1

| Ref. No. | Name of Part. |
|---|---|
| 1 | Body |
| 2 | Rotary valve chamber cap |
| 3 | Piston chamber cap |
| 4 | Rotary valve |
| 5 | Handle spindle |
| 6 | Handle |
| 7 | Lock nut |
| 8 | Top nut |
| 9 | Handle spring |
| 10 | Handle stop |
| 11 | Equalizing piston |
| 12 | Piston packing ring |
| 13 | Union nut for main pipe |
| 14 | Brass collar for main pipe |
| 15 | Plug |
| 19 | Union nut (For equalizing reservoir connection) |
| 20 | Union nipple (For equalizing reservoir connection) |
| 23 | Equalizing valve seat |
| 27 | Spindle leather |
| 15 | Plug |
| 21 | Nut for fixing stud |
| 22 | Fixing stud |
| 28 | Feed valve stud and nut |
| 29 | Gasket—feed valve to body |

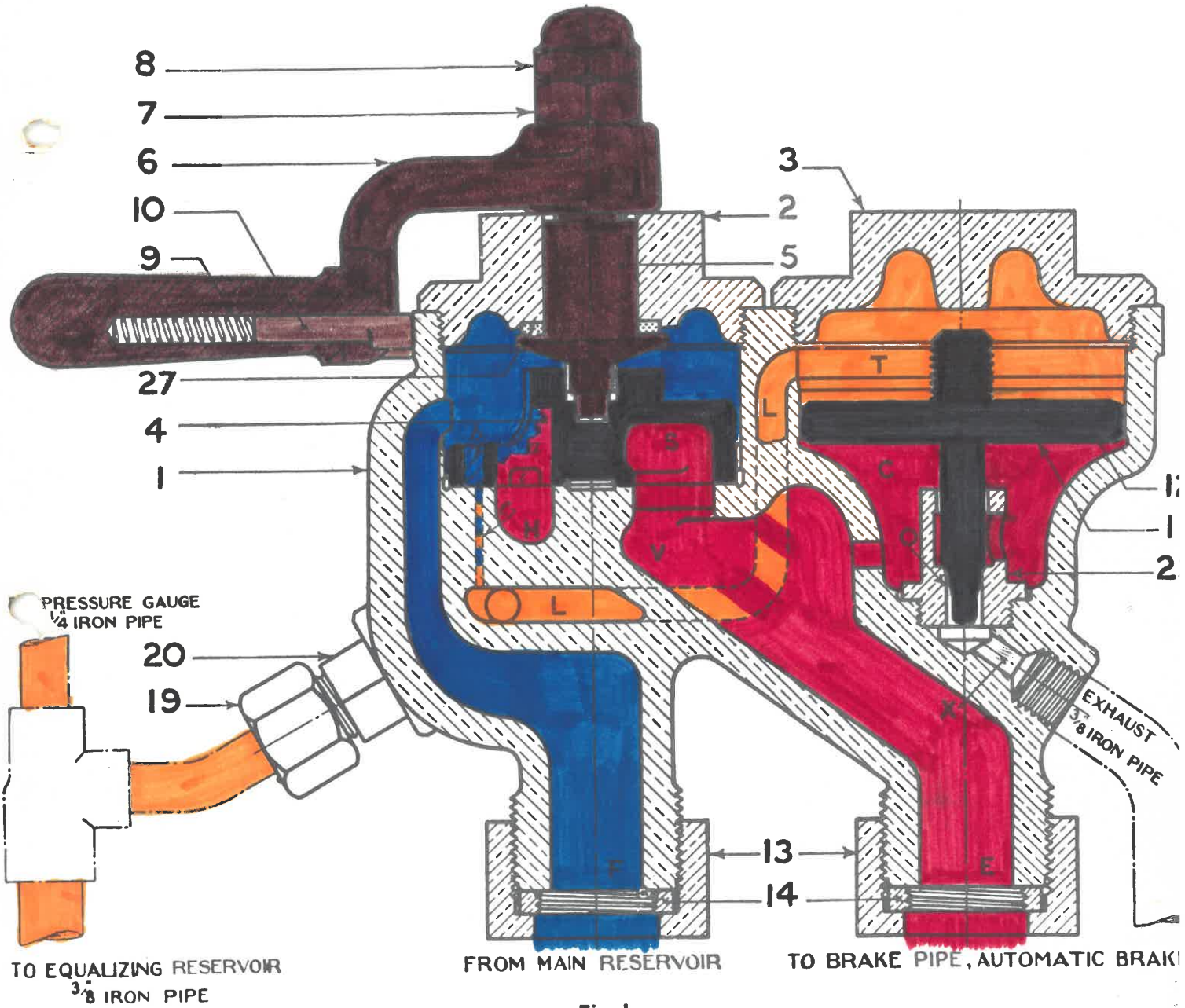
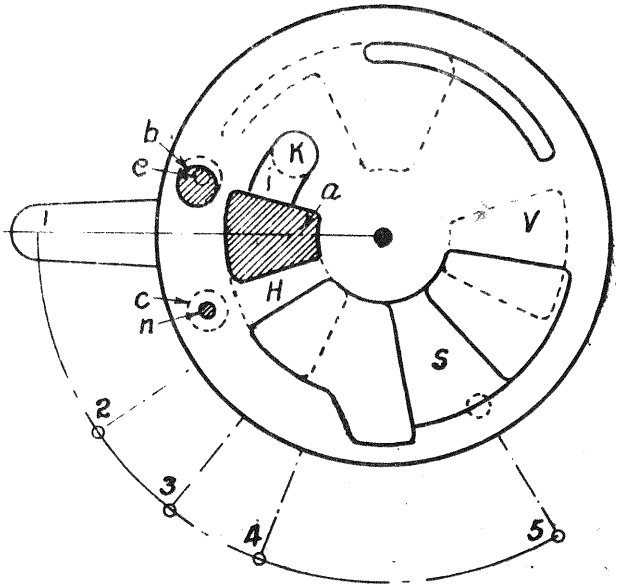
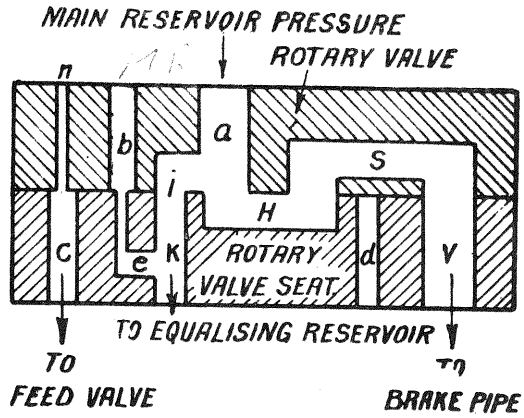


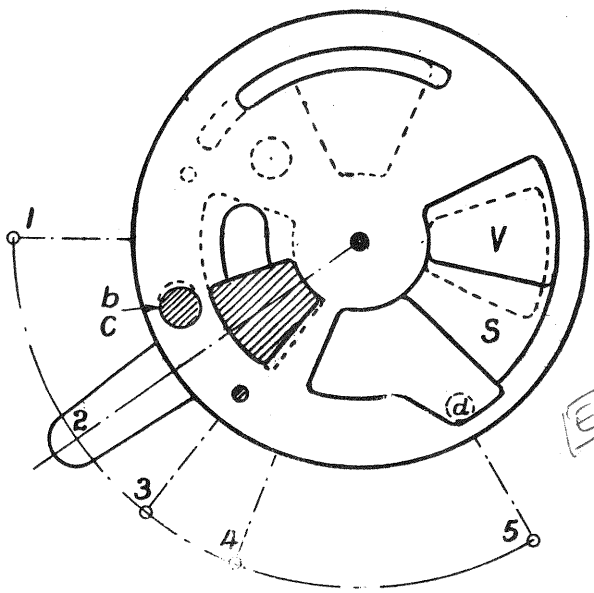

**Fig. 1**

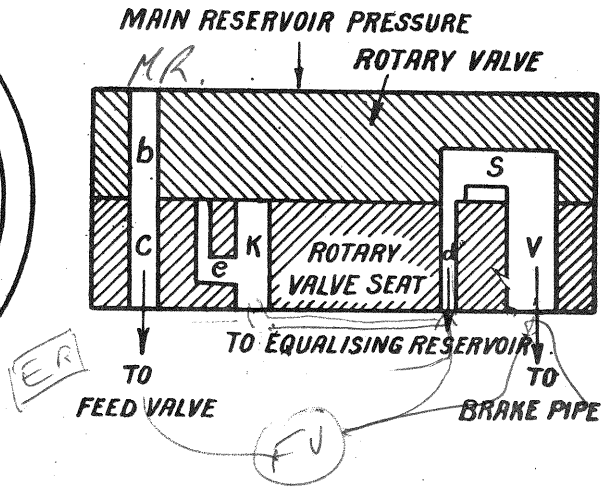
# ENGINEDRIVERS Nº 4 EQUALIZING BRAKE VALVE



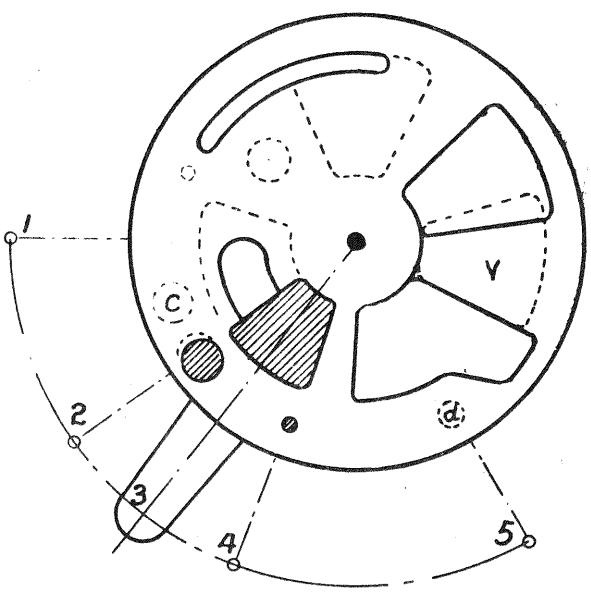



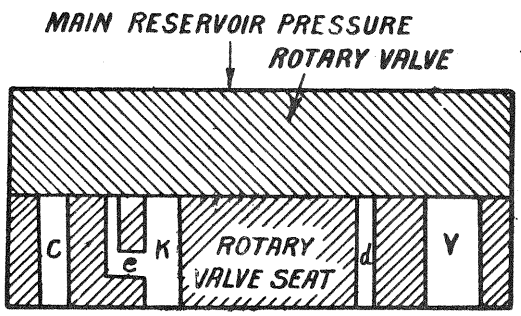

## RELEASE POSITION



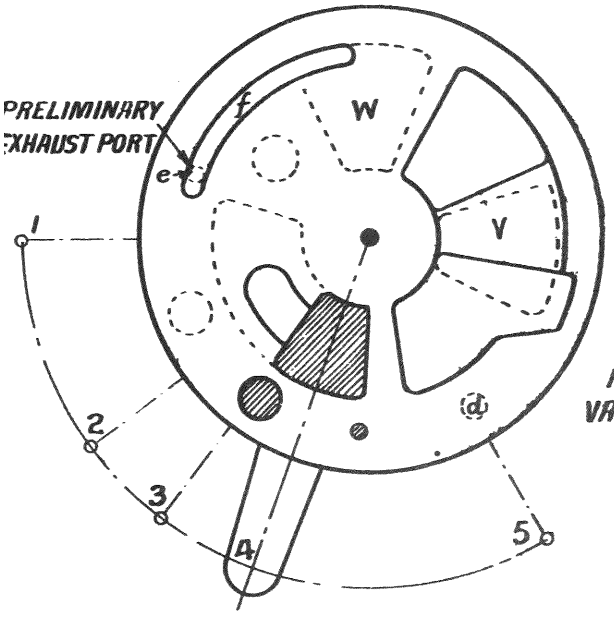



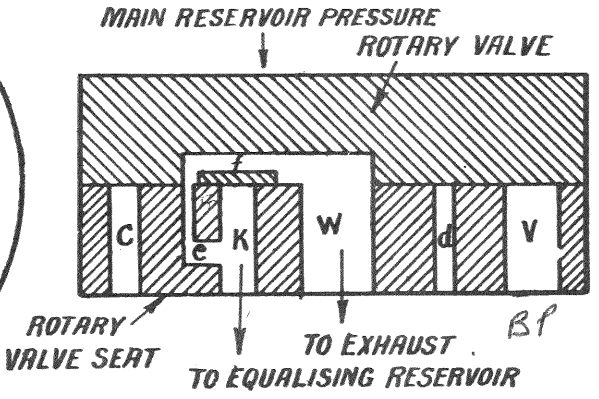

## RUNNING POSITION



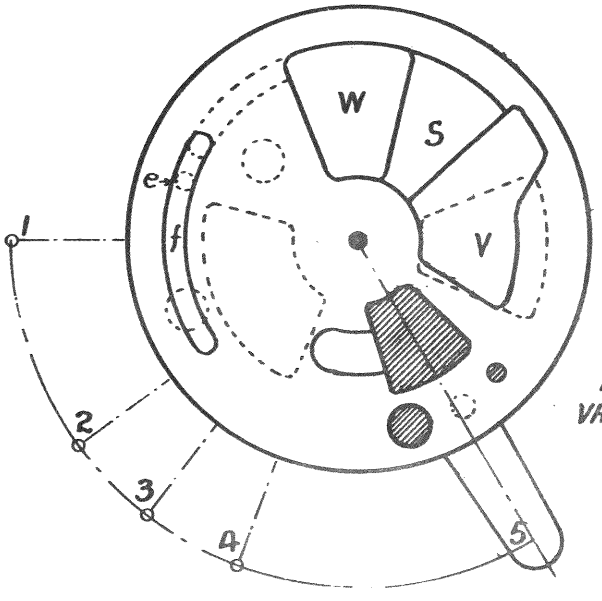



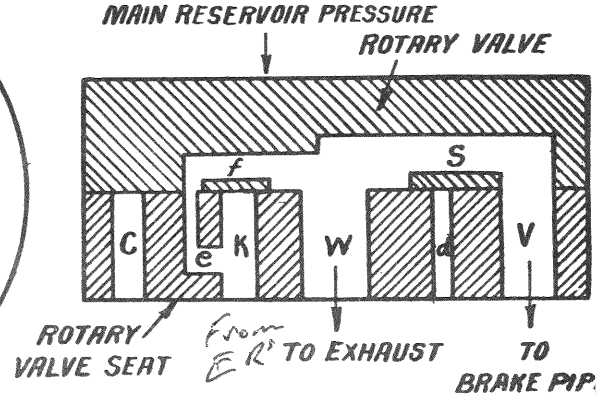

## LAP POSITION




**SERVICE POSITION**



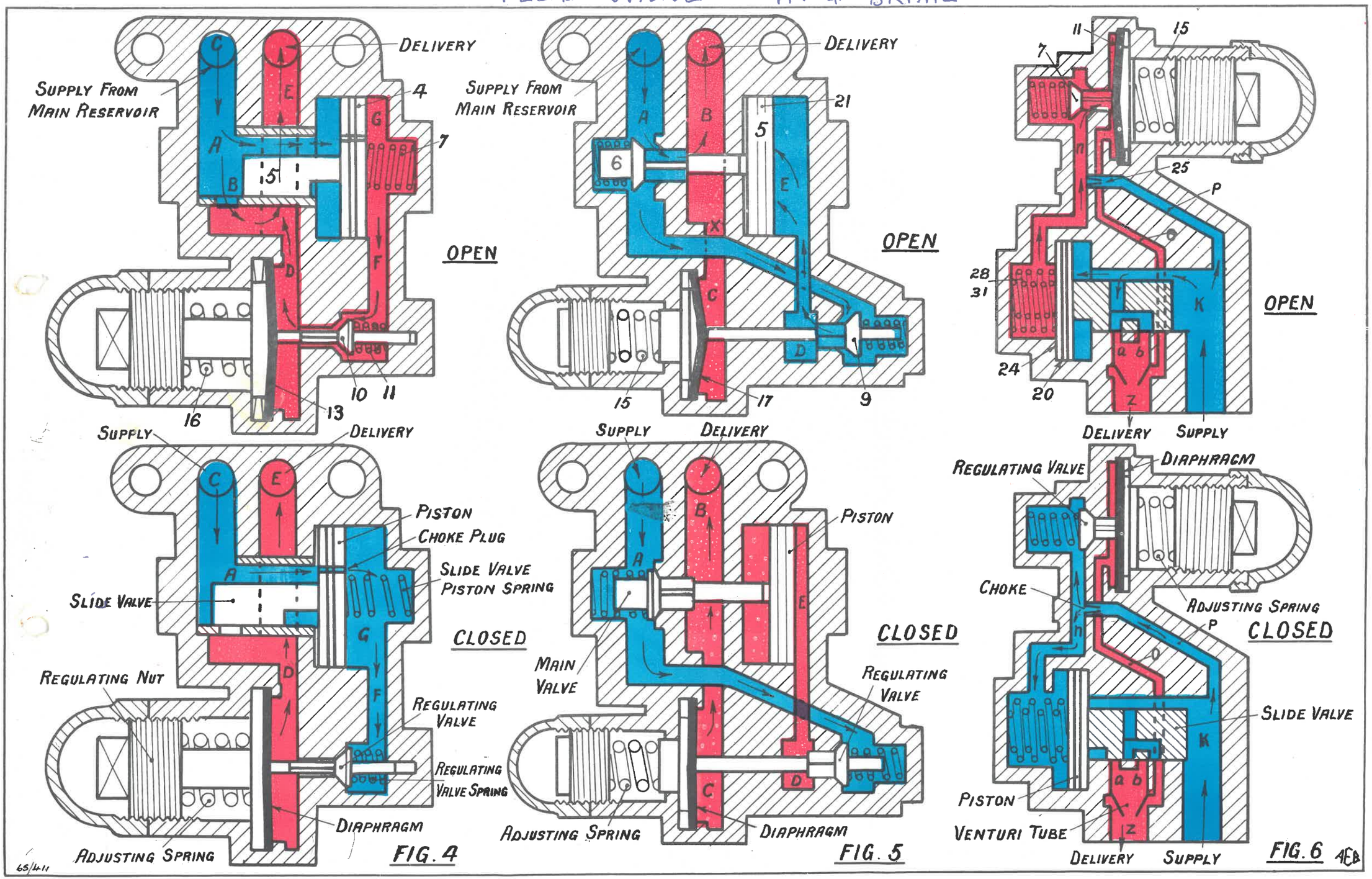



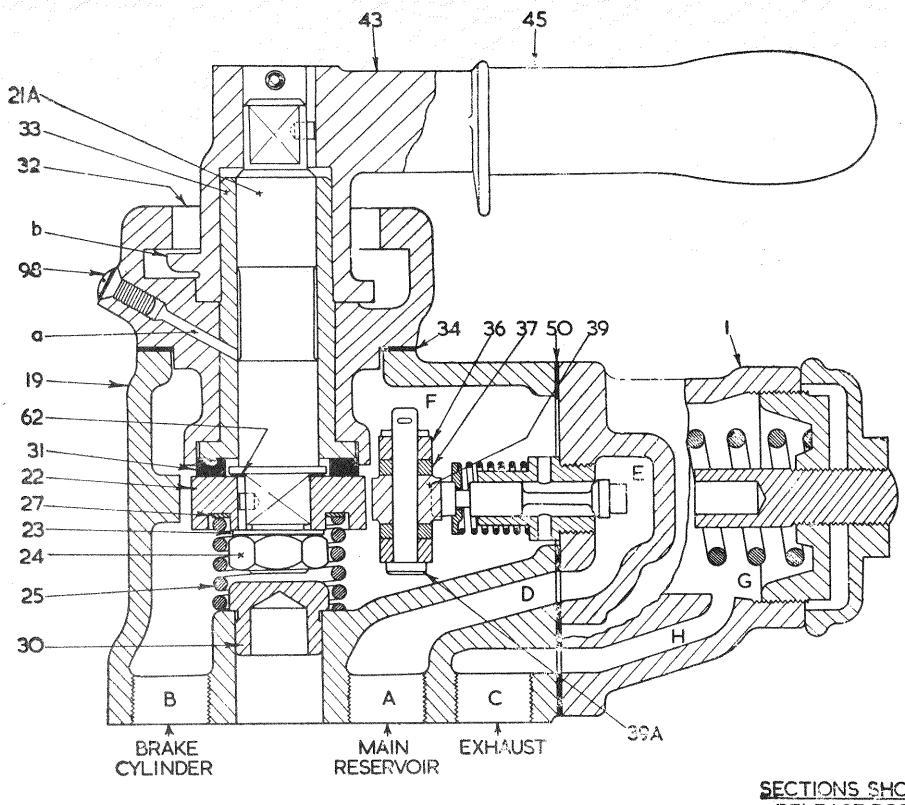

**EMERGENCY POSITION**

# FIG. 3
# THE FIVE POSITIONS OF THE AUTOMATIC BRAKE VALVE

AEB

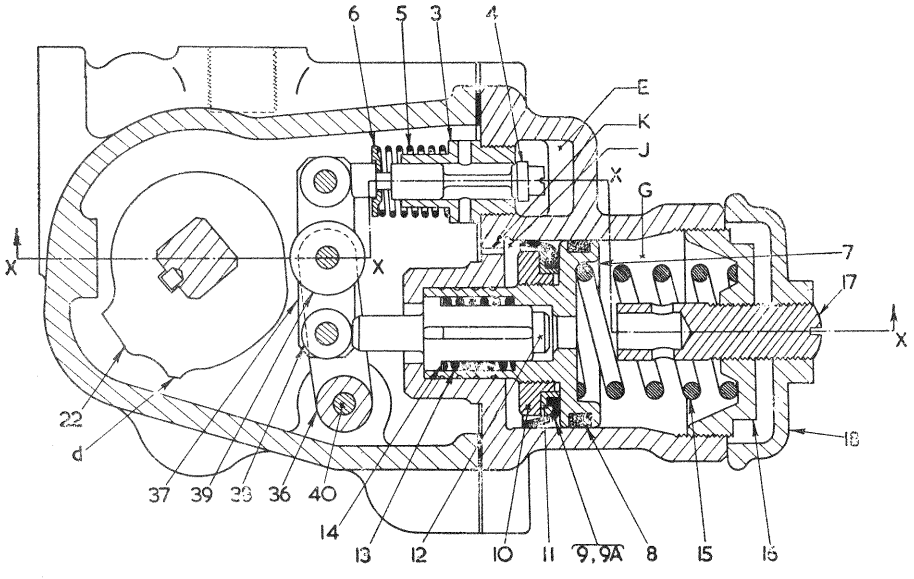
FEED VALVE – No 4 BRAKE

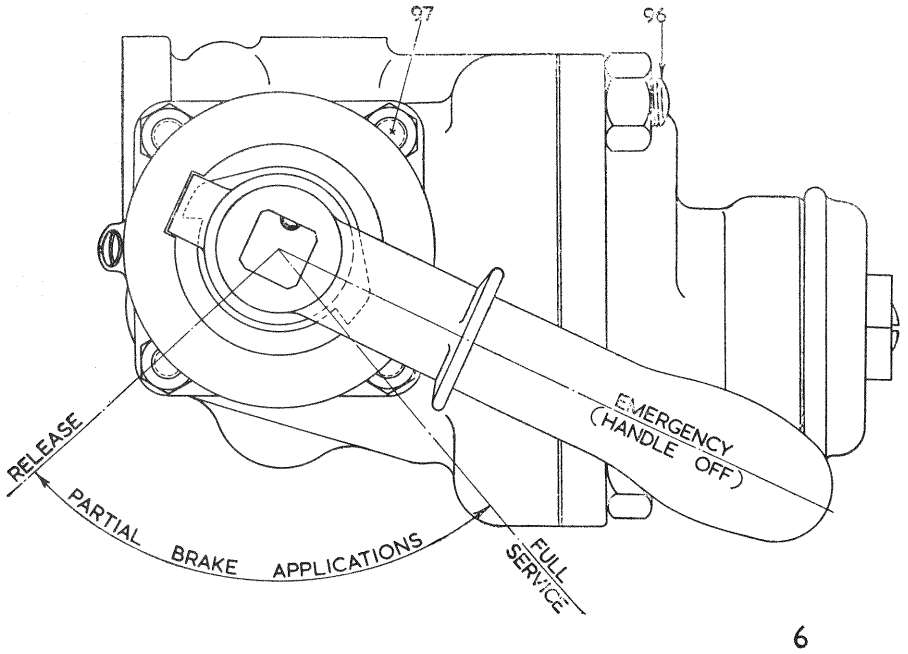





SECTION ON LINE X-X-X-X

SECTIONS SHOWN IN RELEASE POSITION






**SELF-LAPPING DRIVER'S BRAKE VALVE. Type W.**