

R.S. 77

VICTORIAN RAILWAYS

●

INSTRUCTION BOOK
FOR TRAINEE ENGINEMEN

Concerning

**Duties When Employed
As Fireman**

and the

**Operation of
Westinghouse Brake**

●

2839—62

Melbourne, July, 1963

PREFACE

This Book is printed for the purpose of assisting Trainee Enginemen to gain knowledge concerning certain of the duties required of Firemen.

Every Trainee before being allowed out as a Fireman will be subject to an examination on the Rules and Signals, and on Questions 1 to 30 herein, and after completing 2087 hours firing, will, in addition to re-examination in the above, require to pass an examination in Questions 31 to 60.

W. O. GALLETLY,
Chief Mechanical Engineer

**INSTRUCTION BOOK CONCERNING THE
DUTIES OF A FIREMAN AND WESTING-
HOUSE BRAKE FOR TRAINEE ENGINE-
MEN.**

GENERAL

1. Q. What are Fireman's duties in the commencement of a shift?

A. Every fireman must come on duty punctually at the time appointed, strictly sober and as clean and tidy as his duties allow.

He must sign on, peruse the sheet and notice boards, ascertain the number and location of his locomotive and proceed to it.

On arrival at the locomotive he must carry out the duties allotted to the fireman for the particular class of locomotive.

When the driver is ready to move on to a turntable, the fireman, where men are employed to turn the table, must see that it is in proper position. If no men are so employed, the fireman must place the turntable in the proper position and see that it is level or down at the end towards which the locomotive is approaching. He must keep a sharp look out whilst the locomotive is moving around the precincts of the locomotive depot.

2. Q. Do you understand that the fireman is entirely subordinate to the Driver and must carry out his instructions cheerfully and respectfully?

A. Yes.

3. Q. Do you also understand that this does not relieve the fireman of any responsibility in regard to signals, and that he must always be on the alert to act on his own responsibility.

A. Yes.

4. Q. What are the fireman's duties after leaving the shed and when on the road?

A. After leaving the shed the fireman must keep a sharp look out for fixed and other signals and

must at all times draw the driver's attention to anything he considers unsafe.

He must operate the vigilance control whilst the locomotive is in motion. Whilst moving about in yards, either shunting or going to or from train, he must keep a good lookout for employes working on the track ahead and for points, point indicators, discs and fixed signals within his view.

When the locomotive has set back on to the train the fireman must promptly couple it to the train, making sure the couplings are correctly united, connect the hose couple pipes and open both the brake pipe cocks.

When starting away from the platform, the fireman must exchange hand signals with the guard, as laid down in the Rules and Regulations, and look back until the last vehicle has passed the platform.

When leaving the yard or, in the case of a goods train when restarting after stopping, the fireman must exchange hand signals with the guard as soon as practicable after the train has started, to ensure that the guard is in the van. If no signal is received from the guard the fireman must so inform the driver.

At stations where no one is in charge, the fireman must assist with the shunting and van goods as required.

When approaching stations or level crossings the Fireman must keep a sharp look out and avoid all unnecessary duties that might distract his attention.

5. Q. What are the fireman's duties when exchanging the Staff?

A. He must press the vigilance control button for approx. 5 seconds immediately prior to exchanging the staff.

The staff exchange, either by hand or with the automatic exchanging apparatus, must be carried out as laid down in the Rules and Regulations or other instructions issued.

The staff when it is received must be immediately examined by the fireman, who must call out the names of the stations marked thereon and then hand the staff to the driver.

6. Q. What are the duties of the fireman when the locomotive is going out of service to the stabling point.

A. When instructed by the driver, he must close the brakes pipe cocks and disconnect the hose coupling pipe between the locomotive and the train and couple the hose pipes to the dummy couplings where provided then uncouple the locomotive from the train.

When proceeding to the stabling point he must keep a good lookout for signals and men working on the track.

On the arrival at the stabling point he must carry out the duties allotted to the fireman for the stabling of the particular class of locomotive concerned.

WESTINGHOUSE AIR BRAKE

7. Q. What power is used to operate the continuous brakes on locomotives and trains?

A. Compressed air.

8. Q. How is the compressed air obtained?

A. The air is compressed by an air compressor fitted to the locomotive.

9. Q. Describe the principle of the Westinghouse automatic air brake.

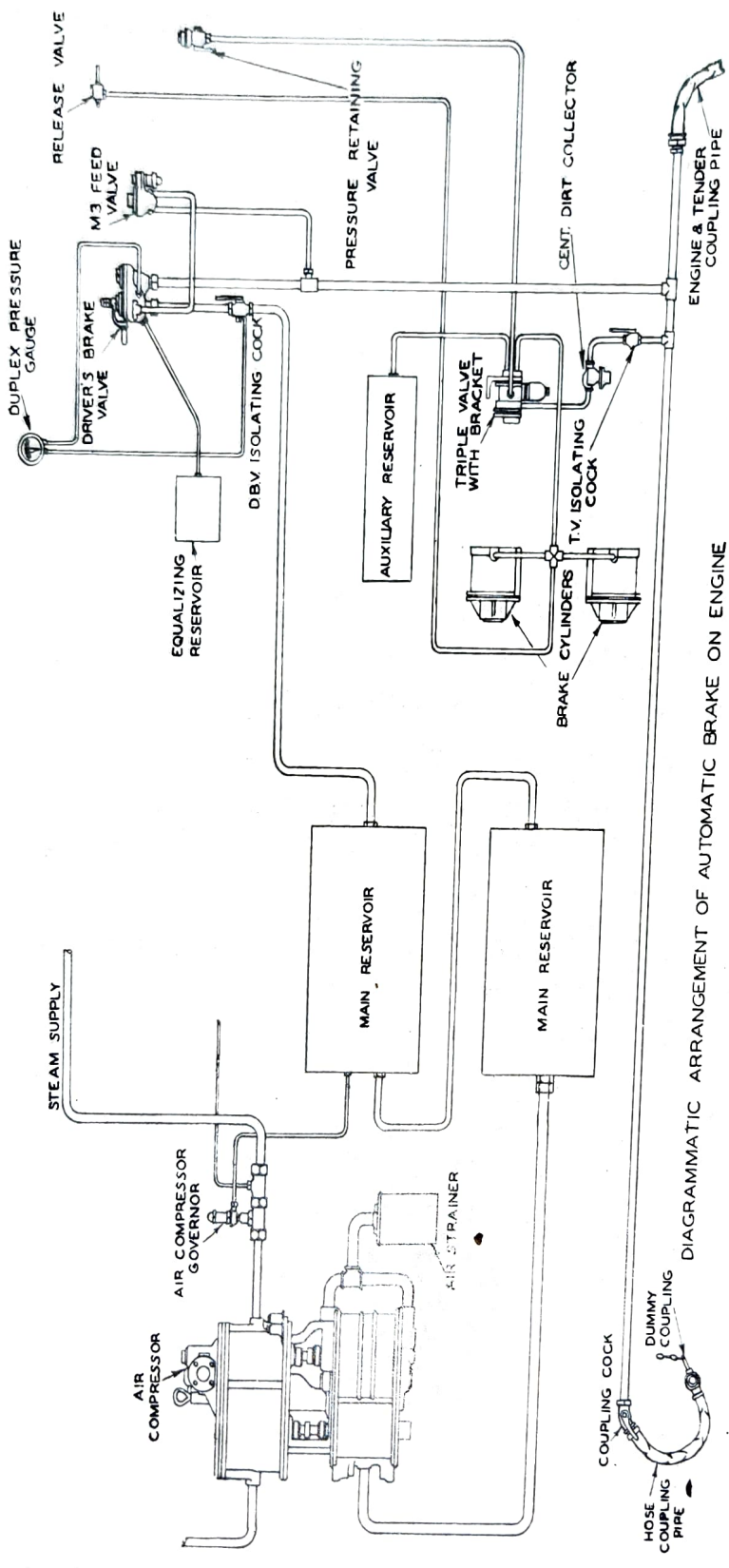
A. It is a compressed air system operating as a continuous brake throughout the train. The reducing or increasing of air pressure in the brake pipe controls the application or release of the brake respectively.

10. Q. Name the principal parts of the Westinghouse air brake?

A. Air compressor, air compressor governor, main reservoir, automatic brake valve, independent brake valve, brake pipe, distributing valve or triple valve and auxiliary reservoir, brake cylinder, pressure gauges and brake pipe cocks.

11. Q. What is the function of the compressor governor?

A. It controls the working of the air compressor so as to avoid excessive air pressure in the main reservoir.



DIAGRAMMATIC ARRANGEMENT OF AUTOMATIC BRAKE ON ENGINE
ORDINARY EQUIPMENT.
FIG. 1.

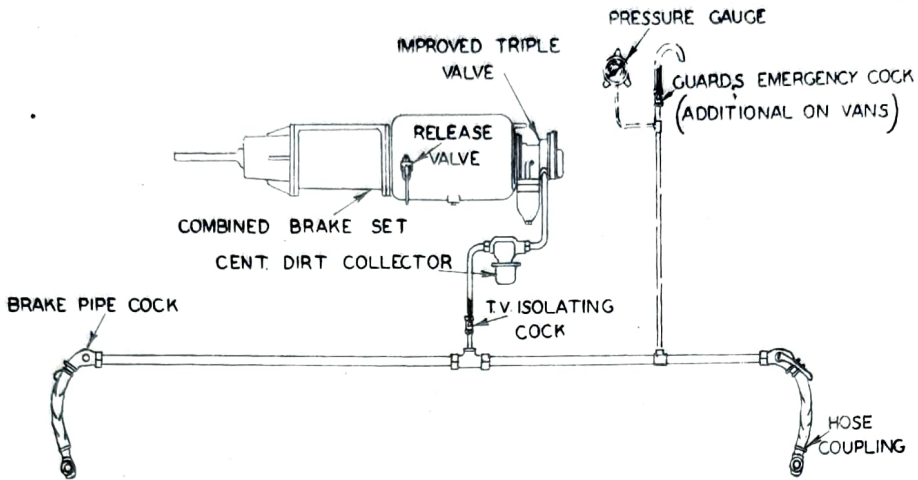


FIG. 2.

Diagrammatic Arrangement of Automatic Brake on Goods Vehicle.

12. Q. What is the function of the Main Reservoir?

A. A storage of compressed air to charge and release the brakes and to operate other pneumatic devices on locomotive.

13. Q. What is the function of the Drivers Automatic Brake Valve?

A. To control the flow of air to and from the brake pipe to charge, apply and release the brakes.

14. Q. What is the Brake Pipe?

A. It forms a continuous brake connection throughout the train and conveys the compressed air from the drivers brake valve to the triple valves throughout the train.

15. Q. What is the function of the Triple Valve?

A. To control the flow of air from the brake pipe to auxiliary reservoir to charge the brake, from the auxiliary reservoir to the brake cylinder to apply the brake and from the brake cylinder to atmosphere to release the brake.

16. **Q. What is the function of the Auxiliary Reservoir?**

A. A storage of air to apply the brake.

17. **Q. What is the function of the Distributing Valve?**

A. It is fitted on locomotives equipped with the A6-ET- or A7-EL brake equipment and functions in a manner similar to the triple valve and auxiliary reservoir.

18. **Q. What is the function of the Brake Cylinder?**

A. It transmits the expansive force of the compressed air from the auxiliary reservoir through the brake rigging to the brake blocks, forcing them against the wheels.

19. **Q. What are Brake Pipe Cocks used for?**

A. They are placed on the brake pipe on both ends of locomotives and vehicles and are used to make the brake pipe complete at the end of any vehicles as required.

20. **Q. How is the Brake Pipe made continuous throughout the train?**

A. By means of flexible hose couplings which are fitted with coupling heads so arranged that they can be readily coupled or uncoupled.

21. **Q. What are the operating positions of the Automatic Brake Valve?**

- A. 1. Charging or Release.
2. Running.
3. Lap.
4. Service.
5. Emergency

22. Q. What are the operating positions of the Independent Brake Valve?

- A. 1. Release.
2. Running.
3. Lap.
4. Slow application.
5. Quick application.

23. Q. How are the Air Brakes applied on a train?

- A. (a) Purposely.
By a reduction in brake pipe pressure brought about by the operation of the automatic brake valve, opening the brake pipe cock at either end of the train, or by the operation of the passenger communication gear.
- (b) Accidentally by the train dividing, a burst hose coupling pipe or by any other air pipe rupture between the air compressor and the triple valve on any vehicle in the train.

24. Q. How are the brakes applied by the Automatic Brake Valve?

A. By moving the handle of the automatic brake valve to the service or emergency position which allows brake pipe air pressure to escape to the atmosphere.

25. Q. What is the function of the Independent Brake Valve?

A. To control the flow of compressed air from the main reservoir to the brake cylinder and from the brake cylinder to atmosphere to apply and release the air brake on the locomotive independently of the train.

26. Q. How are the Automatic Brake released?

A. By moving the handle of the automatic brake valve to the charging or release position.

27. **Q. How is the Independent Brake released?**

A. By moving the handle of the independent brake valve to the release position.

28. **Q. How are the hose coupling pipes between vehicles united and made air tight?**

A. By placing the coupling heads face to face almost at right angles and then turning the projecting lugs into the corresponding grooves. Each coupling head is fitted with a rubber packing ring so arranged that when the coupling heads are united the packing rings are forced together by air pressure and made air tight.

29. **Q. After coupling the hose pipes together what must be done?**

A. The corresponding brake pipe cocks must be fully opened.

30. **Q. What must be done before disconnecting the Hose Coupling Pipes?**

A. The corresponding brake pipe cocks must be closed.

SIDE OPERATED BRAKE PIPE COCK

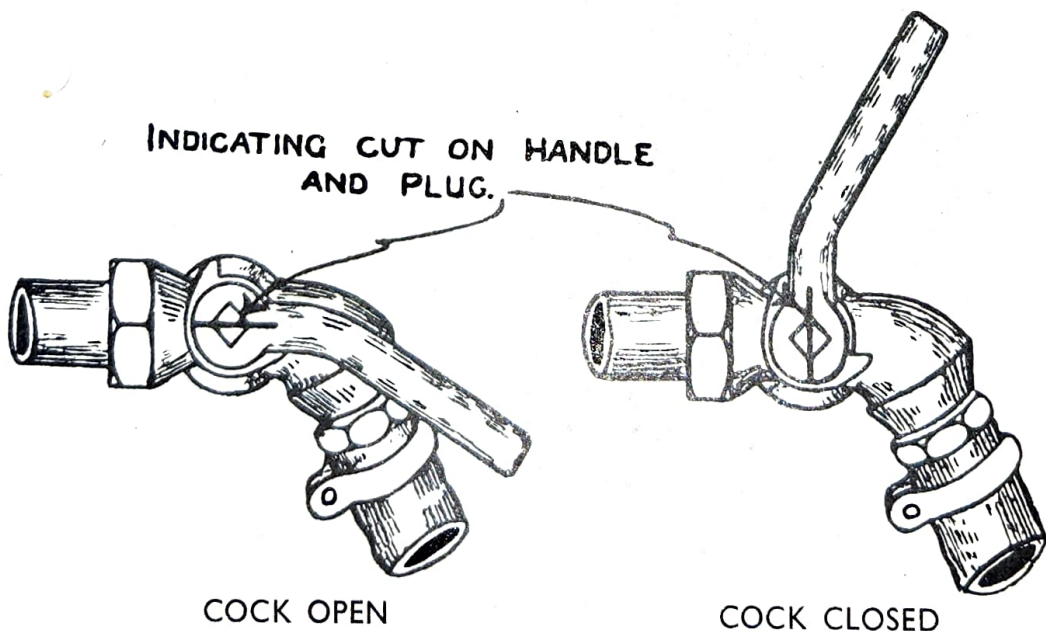


FIG. 3.

QUESTIONS FOR ACTING FIREMAN BEFORE BEING CLASSIFIED AS FIREMAN

Before being classified as fireman an acting fireman will in addition to a re-examination in the knowledge required for an acting fireman, be required to undergo an examination in questions 31—60 and have a more extensive knowledge of the Rules and Regulations.

31. **Q. What device is provided on locomotives to maintain a constant pressure in the brake pipe?**

A. An M3 feed valve maintains 70 lbs per sq. inch brake pipe pressure whilst the automatic brake valve is in running position.

32. **Q. What is meant by reserve pressure, and how much reserve pressure is usually carried?**

A. Reserve pressure is the pressure that is carried in the main reservoir in excess of that carried in the brake pipe. It ranges from 30 lbs to 40 lbs. per sq. inch.

33. **Q. What is the use of reserve pressure?**

A. The increased pressure when passed into the brake pipe through the automatic brake valve in release position forces the triple valves to release position and recharges the auxiliary reservoirs.

34. **Q. Why is it important to maintain all air brake apparatus free from leakage?**

A. In order to get efficient service from the air brakes and economy in compressed air consumption and also to prevent undesired automatic application of the air brakes as a result of brake pipe leakage.

35. **Q. Why is it important before starting a train to know that the brake pipe cocks are fully open throughout the train with the exception of those at the front and rear of the train?**

A. Because otherwise the train would not be under full control as all brakes at the rear of any closed brake pipe cock would be inoperative.

36. **Q. How can it be determined that the necessary brake pipes cocks are open and the brake pipe continuity complete before the train is started?**

A. By ensuring that the regulation air brake tests are carried out before departure.

37. **Q. What is the function of the triple piston in the triple valve and what controls its movement?**

A. To operate the graduating valve and slide valve, and to open and close the feed grooves. Its movement is controlled by the variation of brake pipe pressure.

38. **Q. What is the function of the Triple Valve Slide Valve?**

A. To control the flow of compressed air from the auxiliary reservoir to the brake cylinder, the brake cylinder to the atmosphere, the brake pipe to the bulb, and the bulb to the atmosphere.

39. **Q. What is the function of the Graduating Valve?**

A. To regulate the flow of compressed air from the auxiliary reservoir to the brake cylinder.

40. **Q. What is the function of the Bulb on the Improved Triple Valve?**

A. It ensures a more simultaneous action of the brakes throughout the train by providing a local reduction of brake pipe pressure in conjunction with the reduction made by the automatic brake valve.

41. **Q. Why do the bulbs of improved Triple valves vary in capacity?**

A. They vary in capacity according to the length and volume of the brake pipe of the vehicle on which the triple valve is used.

42. Q. Why do exhaust nipples vary in size?

A. They vary in size according to the size and volume of the brake cylinder, so as to obtain a uniform release of the brakes on all vehicles throughout the train.

43. Q. On A7EL brake equipment, where is the automatic brake valve isolating cock fitted and explain its purpose.

A. The brake valve isolating cock is fitted on the brake pedestal and when open it allows compressed air from the main reservoir to flow to the automatic brake valve.

When two or more locomotives are coupled to a train the air brake is under the control of the driver of the leading one, by the isolating cock on his brake pedestal being open and all others closed. When the cock is closed a by-pass port in the plug allows brake pipe air to flow through the feed valve delivery passage and the main reservoir passage in the pedestal to the top of the rotary valve of the automatic brake valve so as to prevent it being blown off its seat when the brake pipe pressure is suddenly raised from the leading locomotive.

On locomotives fitted with the vigilance control apparatus, when the cock is closed, a port also connects brake pipe pressure to the vigilance control apparatus, and prevents its operation.

44. Q. Describe the Distributing Valve.

A. The distributing valve consists of two portions, 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".

45. Q. What is the purpose of the "Auxiliary Chamber" and the "Relay Chamber"?

A. The auxiliary chamber serves the purpose of the auxiliary reservoir to the triple valve portion,

while the relay chamber is in effect a dummy brake cylinder which receives or is relieved of its supply of compressed air as required by the action of the triple valve portion of the distributing valve. When air pressure is present in the relay chamber, it is duplicated in the locomotive brake cylinders by the action of the relay portion, which receives a practically unlimited supply of air from the main reservoir.

46. Q. What controls the distributing valve and what are its functions?

A. The distributing valve is controlled by the position of the automatic and independent brake valves. Its functions are to allow compressed air to flow from the main reservoir to the brake cylinders on the locomotives, to maintain any desired pressure in the brake cylinders, and to allow air from the brake cylinders to exhaust to atmosphere and to charge the auxiliary chamber.

47. Q. On A.7.E.L. equipment where are brake cylinder safety valves fitted and why?

A. Brake cylinder safety valves are fitted to the equalizing portion of the distributing valve and to the No. 3 control pipe to prevent excessive pressure in the relay chamber and consequently in the brake cylinders.

**48. Q. (a) What is the Dead Engine Device?
(b) Why is it provided?**

A. (a) It is a plug cock and spring loaded valve fitted to the distributing valve so that when the cock is in the open position air can flow from the brake pipe to the main reservoir and charge it to approximately 50 lb. per sq. inch.

(b) To enable the brakes to be used on a loco. of which the compressor is not working and which is part of a train.

49. Q. When two locomotives fitted with A.7.E.L. equipment are coupled together for multiple unit operation what is the position of the brake valve isolating cocks and the brake valves on both locomotives?

A. **Trailing Unit.** All brake valve isolating cocks closed. All automatic brake valves in running position, and independent brake valves in lap position. Remove the brake handles from these positions and place in the glove box.

Leading Unit. Non Driving End. Brake valve isolating cock closed. automatic brake valve in running position, independent brake valve in lap position.

Driving End. Place brake handles in position, automatic brake valve in running position, independent brake valve in lap position, brake valve isolating cock open.

50. Q. For what purpose is the Brake Pipe Indicator fitted on locomotives?

A. The brake pipe indicator is fitted to locomotives for the purpose of providing the driver with an immediate indication that an irregular reduction has occurred in the brake pipe pressure due to the following causes :—

- (a) Passenger emergency communication apparatus, or conductors valve has been operated.
- (b) The guard has operated the guards' emergency cock in the brake van.
- (c) The train has broken away in two or more portions.
- (d) A hose coupling pipe has burst or become uncoupled, or the brake pipe or other related piping has become ruptured.

51. Q. What is the difference between the Air Compressors of Diesel and 'L' Electric Locomotives?

A. On diesel locomotives, the air compressor is mechanically driven and is attached to the end of the main crank shaft and runs at engine speed. To prevent the compressor working continuously compressing air, a compressor governor controls the operation of unloader valves which are fitted on the suction side of the low and high pressure cylinder heads, to unload the compressor to atmosphere when maximum main reservoir pressure is reached. The compressor is then running free.

When the minimum pressure is reached, the unloader valves seat and close off communication to atmosphere. The compressor is now working under load compressing air until maximum main reservoir pressure is again reached.

On 'L' Electric Locomotives, two air compressors are fitted and are motor driven directly from the 1500 volt supply, and their operation is controlled by a compressor governor.

52. Q. What is the difference between an M3 Feed Valve, and an M3 Pressure Reducing Valve?

A. There is no difference in their construction, but they differ in pressure setting for the purpose they are required.

The M3 feed valve maintains a constant predetermined pressure in the brake pipe when the handle of the automatic brake valve is in the running position.

The M3 pressure reducing valve reduces main reservoir pressure to a predetermined pressure for use in the brake cylinders on the locomotive.

53. **Q. Explain the method of operating the air brake, when it is necessary to change ends on a locomotive.**

A. Move the handle of the automatic brake valve to the service position and make a full equalizing application and return the handle to lap position, then close the brake valve isolating cock, and place the automatic brake valve handle in running position and the independent brake valve handle in lap position and remove the handles. At the other end of the locomotive, place the handles in position on the brake valves, and open the brake valve isolating cock.

54. **Q. Describe the method of coupling up the Air Brake Equipment between one Diesel Electric or 'L' Electric Loco. to another to run in multiple unit.**

A. When the locomotives are coupled together, couple up the brake pipe hoses and the main reservoir hoses and open their respective angle cocks, then couple up the No. 3 control pipe hoses, and couple up the No. 4 independent release pipe hoses on one side of the locomotives and open their respective angle cocks at both ends of the hoses between the locomotives.

55. **Q. When a "Dead" Diesel Electric or "L" Electric Locomotive is to be hauled by a Live Diesel Electric or "L" Electric Locomotive describe the methods of arranging the air brake equipment on both.**

A. When the locomotives are coupled together, couple up the brake pipe hoses and the main reservoir hoses and open the angle cocks, couple up No. 3 control and No. 4 independent release pipes and open their respective angle cocks.

On the "Dead" unit see that the brake valve isolating cocks are closed and the automatic brake valve is in running position, the independent brake valve is in lap position at each end of the locomotive, and remove the brake valve handles.

On the “ **Live** ” unit, see that the brake valve isolating cock is closed at the non-driving end and remove the brake valve handles, automatic in running, independent in lap position.

At the driving end, place the brake valve handles in position on the brake valves and open the brake valve isolating cock.

‘ T ’ Class locomotives are fitted with one brake pedestal only.

NOTE : When a “ **Dead** ” electric locomotive is being hauled by a “ **Live** ” Electric locomotive to run as **light engines**, the main reservoir, No. 3 control and No. 4 independent release pipes must **not** be coupled.

On the “ **Dead** ” Unit, at the leading end, place both brake valve handles in the running position and open the cock on the dead engine device on the distributing valve.

An application and release of the air brakes must be made, and the air brake must apply and release on both units.

56. **Q.** On locomotives equipped for Dynamic Braking what device is fitted to prevent simultaneous operation of the Dynamic Brake and the Air Brake on the locomotive ?

A. A regenerative interlock, which is attached to the distributing valve of the locomotive.

57. **Q.** What is the purpose of the Regenerative Interlock ?

A. (1) To prevent simultaneous operation of the dynamic brake and the air brake on the locomotive.

(2) To apply the air brake on the locomotive in the event of failure of the dynamic brake when the air brake is applied on the train.

58. Q. On locomotives equipped for Dynamic Braking, what is the function of the Automatic Control Switch?

A. To release the dynamic brake and to apply the air brake on the locomotive, when an emergency air brake application is made.

59. Q. For what purpose is the Vigilance Control Apparatus fitted on locomotives?

A. It is fitted in the interest of Safe Working.

60. Q. Describe the principle of the Apparatus and the Firemans duties in conjunction with same.

A. A warning blow of air will occur at about 2 minutes intervals, which must be cancelled by pressing a button located near the fireman's seat, for a period of not less than 3 seconds nor more than 5 seconds. Should the button be pressed for less than 3 seconds the interval between warning blows will be less than 2 minutes. If the button is not pressed within a limited time a whistle will sound, which can only be stopped by pressing the button. Should the button be pressed for a prolonged period the whistle will sound and will continue for some time after the button is released.

The whistle cannot be stopped by repeated pressing of the button as it will lengthen the period of the whistle.

When the warning blow occurs, the fireman must, before pressing the button satisfy himself that the driver is alert.

A similar button is provided on the drivers side for use by the driver when the fireman is otherwise necessarily engaged.

Before commencing any necessary duty such as exchanging the staff or hand signals, the fireman must press the button for a period of about 5 seconds.

