P.R.R. STANDARD

Air Brake Examination

Questions and Answers

FOR

Locomotive Engineers

Firemen and Trainmen

Locomotive Repairmen and Inspectors

Car Repairmen and Inspectors
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Air Brake Examination
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PRICE, ONE DOLLAR

COMPiled BY
S. K. STEFFYY and H. O. MATTER
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Address all communications to
H. O. MATTER
1933 N. Seventh Street, Harrisburg, Pa.
Examination Questions and Answers for Enginemen and Firemen.

AIR PUMP AND GOVERNOR.

First Year's Examination.

Q. 1. How is the compressed air obtained?
A. With air pump.

Q. 2. How should air pumps be started?
A. Slow.

Q. 3. With the pump working, where is the compressed air first stored?
A. Main reservoir.

Q. 4. How and when should the steam and air cylinders be lubricated, 9½? Cross Compound?
A. After pump has been started, steam cylinder lubricated from lubricator. Air cylinder is lubricated from lubricator, or oil cups on air cylinder.

Q. 5. What kind of oil should be used to lubricate the steam and air cylinder?
A. Valve oil.

Q. 6. What method must be followed in lubricating the piston rod between packing nuts?
A. By using a swab.

Q. 7. What is referred to by the term 9½” pump? Cross Compound?
A. Diameter of cylinders. 8½ C. C. Compounding of steam and air.

Q. 8. Where are the drain cocks located for the 9½” and Cross Compound pumps?
A. One on each steam cylinder, one in steam passage to pump.

Q. 9. What are the instructions regarding drain or cylinder cocks on steam cylinders?
   A. Opened when pump is shut off and remain open until after pump has been started.

Q. 10. What bad results are obtained from running the pump too fast?
   A. Cause pump to run hot.

Q. 11. Why is it important to keep the air inlet strainer to pump clean?
   A. So as not to interfere with the air entering the pump.

Q. 12. What is the duty of the air pump governor?
   A. Shut the steam off the pump. When the required pressure has been obtained in main reservoir.

Q. 13. What air pressure is carried to, and operates the pump governor?
   A. Main reservoir pressure.

Q. 14. What are the instructions governing the operation of the sight feed lubricator to the air cylinders of the pump, and what bad results follow too free lubrication of these parts?
   A. Only when necessary to keep pump lubricated; waste of oil causing valves in pump to be gummed up, also causing bad results in brake valve, feed valve and other air brake valves on locomotive.

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AIR PUMP AND GOVERNOR.

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Second Year's Examination.

Q. 15. Are the 9½" and Cross Compound pumps single or double acting?
   A. Double acting.
Q. 16. Name the working parts of these pumps?
A. 9½" pump—Differential piston, main steam valve, reversing valve and rod, main steam piston, and air piston, two receiving and two discharge valves. 8½" C. C.—Same as the 9½", except an extra steam piston, air piston, four receiving valves, four intermediate and two discharge valves.

Q. 17. How is the motion of the pump reversed?
A. By admitting steam to the chamber on the outside of the large differential piston and then exhausting same to the atmosphere.

Q. 18. What causes the pump to reverse at half stroke?
A. Bent reversing valve rod.

Q. 19. When steam is turned into pump and it fails to start, how would you locate the trouble?
A. Cut steam pipe at pump to see if steam is getting through governor, then cut exhaust pipe to see if trouble is in the pump or exhaust pipe.

Q. 20. How many single strokes per minute should a 9½" pump be permitted to work? Cross Compound?
A. 9½"—Not to exceed 140 single strokes per minute. C. C.—Not to exceed 132 single strokes per minute.

Q. 21. Why would a higher speed be detrimental?
A. Cause pump to heat.

Q. 22. Give the name and location of the valves in the air end of 9½" pump? Cross Compound?
A. 9½"—Receiving valves on the air inlet side, discharge valves on the opposite side. 8½" Cross Compound—Receiving valves on air inlet side, intermediate valves between the two air cylinders, discharge valves on discharge pipe side.
Q. 23. What are the duties of the receiving valves? The discharge valves and intermediate valves in the Cross Compound pump?

A. To retain air after it has entered the pump. Discharge valves to retain the air after it has entered the main reservoirs. Intermediate valves to retain the air after it has entered the high pressure cylinder.

Q. 24. What is the proper lift of these valves?
A. 3-32 of an inch.

Q. 25. Name the working parts of the pump governor?
A. Cap nut, adjusting nut, tension spring, diaphragm ring, pin valve, governor piston and steam valve.

Q. 26. Trace the air through the governor, in the open and closed positions?
A. Air from the main reservoir first enters the governor under the diaphragm, unseating the pin valve, permitting air to pass to governor piston, forcing it downward, seating steam valve, shutting steam off from pump. The reduction of main reservoir pressure caused by leakage, while the pump is shut off, will allow pin valve again to be seated. The air between the pin valve and governor piston will escape to the atmosphere through vent port. The spring under the main piston, assisted by steam, will unseat the steam valve and again admit steam to the pump.

Q. 27. How is the governor adjusted to increase main reservoir pressure? To decrease main reservoir pressure?
A. Turning regulating nut to the right to increase main reservoir pressure; turning regulating nut to left to decrease main reservoir pressure.

Q. 28. Give some causes for air pump heating? For pounding?
A. Racing, bad rings in air cylinder, restricted air passage. Pounding—Too much oil, too much lift of air valves, loose nuts on piston rod, or pump loose on the bracket.

Q. 29. What should be done in case the pump becomes overheated?
A. If possible shut pump off or run very slow and try to locate what is causing the pump to run hot.

AIR PUMP AND GOVERNOR.

Third Year’s Examination.

Q. Trace the steam through the steam cylinder of the 9½” pump? Cross Compound pump?
A. 9½” pump—Steam enters the pump through the governor into a chamber where the main steam valve and differential piston are located. The steam having more force on the large end, will force the differential piston and main steam valve to the right, opening a port which admits steam to the bottom end of steam cylinder, forcing the main steam piston up, the main steam piston will move the reversing valve rod, which in turn moves the reversing valve to admit steam to the chamber on the outside of the large end of differential piston. The steam pressure on inside of the smaller piston then forces the differential piston and main valve to the left, admitting steam to top end of steam cylinder, also exhausting steam from bottom of steam cylinder. 8½” Cross Compound pump—Is practically the same as the 9½” pump, except the steam is exhausted from the high pressure steam cylinder to the low pressure steam cylinder, then to the atmosphere.

Q. Trace the air through the air cylinder of the 9½” pump? Cross Compound pump?
A. The pump making the up stroke, air is admitted at bottom end of air cylinder, through air inlet and bottom receiving valve. The air in top end of air cylinder being compressed and forced through the discharge valve to the main reservoir. 8½" Cross Compound—The air that is compressed in the low pressure air cylinder will be discharged to the high pressure air cylinder by the intermediate valves, then past the discharge valve to the main reservoir.

Q. 30. If air pump is working at good speed and pressure is not delivered to main reservoir, where would you look for trouble?

A. Air inlet, broken valve or broken packing rings.

Q. 31. If receiving valve is stuck open, or broken, how will it affect the working of the pump? If stuck closed?

A. Causing the pump to work with uneven stroke.

Q. 32. If intermediate valves are stuck open, or broken, how will it affect the working of the pump? If stuck closed?

A. Causing the pump to work with uneven stroke.

Q. 33 If discharge valve is stuck open, or broken, how will it affect the working of the pump? Stuck closed?

A. Causing the pump to work with uneven stroke.

Q. 34. How can it be determined if the packing rings in air piston of pump are leaking?

A. By placing the hand on the inlet, and noting the suction of air.

Q. 35. What is the bad effect of a steam leak that reaches the air cylinder?

A. Will help to destroy lubrication of pump, and to cause water to form in main reservoir.
Q. 36. What is the small port in the spring casing above the diaphragm for?
A. To vent any air to the atmosphere that might leak by diaphragm.

Q. 37. Should the vent port through the casing below the diaphragm be stopped up and pin valve be leaking, what effect would it have on the governor?
A. To cause the pump to run slow or possibly stop the pump.

Q. 38. If drip port was stopped up, what effect would it have on the governor?
A. Cause governor to become inoperative.

Q. 39. How would you locate a leaky pin valve in governor?
A. By a continuous blow of air at vent port below diaphragm when pump is working.

BRAKE VALVE.

First Year’s Examination.

Q. 40. What are the duties of the automatic brake valve?
A. Used by the engineman to apply and release the brakes.

Q. 41. Name the different positions of the handle of the automatic brake valve?
A. Release, running, lap, service and emergency.

Q. 42. What are the duties of the feed valve, and in what position of the brake valve handle is the feed valve used?
A. To maintain a predetermined pressure in the brake pipe. Used in running position.

Q. 43. What color is pointer on duplex gauge, indicating main reservoir pressure, and equalizing reservoir pressure?
A. Red hand indicates main reservoir pressure. Black hand indicates equalizing reservoir pressure.

Q. 44. Explain the duty of the double heading cutoff cock?
A. To cut main reservoir pressure away from brake valve.

Q. 45. Why should the pump be kept running on the second engine?
A. To maintain main reservoir pressure in case of accident on the first locomotive.

Q. 46. Name the different positions of the straight air (S. W. A.) and (E. T.) independent brake valves?

BRAKE VALVE.

Second Year's Examination.

Q. 47. What valves in the automatic brake valve separate main reservoir and brake pipe pressures? Equalizing reservoir and brake pipe pressures?
A. Rotary valve. Equalizing discharge valve.

Q. 48. With handle of automatic brake valve in release position, how will pointers on gauge go up when pump is started?
A. Both pointers should go up together.

Q. 49. With automatic brake valve handle in release position, what valves are used and air is passing from where to where? Direct or indirect?
A. The rotary valve. Air is passing from the main reservoir to the brake pipe, to chamber (D) and to the warning port. Direct.
Q. 50. With automatic brake valve handle in running position, what valves are used and air is passing from where to where? Direct or indirect?

A. The rotary valve and the feed valve. Air is passing from the main reservoir by way of the feed valve, to the brake pipe, and to chamber (D). Indirect.

Q. 51. With the E. T. equipment and the handle of the automatic brake valve in holding position, what valves are used and air is passing from where to where? Direct or indirect?

A. Rotary valve and feed valve. Air is passing from the main reservoir, by way of the feed valve, to the brake pipe, and to chamber (D). Indirect.

Q. 52. With automatic brake valve in lap position what valves are used and air is passing from where to where? Direct or indirect?

A. The rotary valve is used. All ports in brake valve are closed.

Q. 53. With automatic brake valve in service position, what valves are used and the air is passing from where to where? Direct or indirect?

A. The rotary valve and the equalizing discharge valve are used. Air is passing from chamber (D) to atmosphere, through the preliminary exhaust, and from the brake pipe through the brake pipe exhaust to the atmosphere. Indirect.

Q. 54. With the automatic brake valve in emergency position, what valves are used and air is passing from where to where? Direct or indirect?

A. The rotary valve is used. Air is passing from the brake pipe and chamber (D) to the atmosphere. Direct.

Q. 55. What is the purpose of the equalizing reservoir connected to the chamber above the equalizing piston?
A. To increase the volume of air to chamber (D).

Q. 56. In making a service application, where does the first discharge of air escape and through what port? Where next and through what port?
A. From chamber (D) through the preliminary exhaust port to the atmosphere. And from the brake pipe, through the brake pipe exhaust to the atmosphere.

Q. 57. With double heading cut-out cock closed on second engine, in what position should brake valve handle be carried?
A. Running position.

Q. 58. With the handle of double heading cut-out cock in position No. 2, what ports are open and what are closed?
A. Port is open from the equalizing pipe to the top of rotary valve. Pipe from main reservoir to the brake valve is closed and the brake pipe exhaust is closed.

Q. Trace the air through the different positions of the independent brake valve?
A. Release Position—From the application cylinder to the atmosphere from the reducing valve through warning port to the atmosphere. Running Position—From the application cylinder to the automatic brake valve. Lap Position—All ports closed. Slow and Quick Application—From the reducing valve pipe to the application cylinder.

BRACE VALVE.

Third Year's Examination.

Q. 59. With brake valve handle in running position and no air is passing into brake pipe, where would you look for the trouble?
A. Feed valve or cut-out cock.
Q. 60. With the brake valve handle in running position, and brake pipe pressure runs up to main reservoir pressure, where would you look for the trouble?
A. Feed valve or a leak somewhere in the brake valve.

Q. 61. What defects in the brake valve, or its connections, will cause a loss of excess pressure?
A. A leak in rotary valve, feed valve, body gasket or cut-out cock.

Q. 62. How should a test be made for a leak in the double heading cut-out cock?
A. Make a reduction of brake pipe pressure. Close the cut-out cock and place brake valve handle in running position.

Q. 63. How should a test be made for a leak in rotary valve or body gasket?
A. By placing brake valve handle on lap position and noting the increase of chamber (D) pressure.

Q. 64. Is the rotary valve used in all positions of the automatic brake valve handle?
A. Yes.

Q. 65. In what position of automatic brake valve handle does equalizing discharge valve operate?
A. Service position.

Q. 66. Give some of the causes for the brake valve handle working hard?
A. Rotary valve dry, or rotary valve key gasket dry.

Q. 67. With brake valve handle in service position, and you can obtain no brake pipe exhaust, where would you look for the trouble?
A. Brake pipe exhaust closed. Leak of air into chamber (D), or preliminary exhaust port closed.
Q. 68. What should be done to cut out the air on all other engines but the one handling the brakes?
A. Place the cut-out cock in No. 2 position. Brake handle valve in running position.

Q. 69. How would you arrange to double head if the equalizing pipe was broken off on the engine to be cut-out?
A. Plug up broken pipe.

Q. 70. Locate the restricted port in the pipe connection to the equalizing reservoir?
A. In T connection at the brake valve.

Q. Trace the air through the brake valve in its different positions?
A. G-6 brake valve, release position—Air is passed from the main reservoir to the brake pipe, direct. To chamber (D), through two ports, from chamber (D) to black pointer on air gauge, to the atmosphere through warning port. Running position—From main reservoir to brake pipe by way of the feed valve to chamber (D), through one port, from chamber (D) to black pointer on air gauge. Lap position—All ports blanked. Service position—From chamber (D) and equalizing reservoir and black pointer on gauge through preliminary exhaust port to the atmosphere. From the brake pipe through the brake pipe exhaust to the atmosphere. Emergency position—From chamber (D) and the brake pipe to the atmosphere. Direct.

H-6 brake valve, release position—From main reservoir to brake pipe, to black pointer on small gauge to chamber (D) and black pointer on large gauge, from the feed valve to atmosphere through warning port. Direct. Running position—From main reservoir by way of feed valve to brake pipe, black pointer on small gauge, from brake pipe to chamber (D) and to black pointer on large gauge.
Indirect. And from application cylinder to atmosphere. Holding position—From main reservoir to brake pipe, to black pointer on small gauge by way of feed valve. From brake pipe to chamber (D) to black pointer on large gauge. Indirect. Lap position—All ports blanked. Service position—From chamber (D) and black pointer on large gauge, through preliminary exhaust port to the atmosphere. From brake pipe, black pointer on small gauge, through brake pipe exhaust to the atmosphere. Indirect. Emergency position—From brake pipe and chamber (D) to the atmosphere. Direct. From main reservoir to the application cylinder.

Q. 71. What defect will cause a continuous blow at brake pipe exhaust with handle of brake valve in release, running, holding, or lap position?

A. Defective equalizing discharge valve.

Q. 72. If pipe leading to brake pipe pointer on gauge breaks off, what will be the result and what repairs can be made to handle brake to destination?

A. Brake will apply in service application. Plug pipe toward brake valve. No gauge; brake by sound.

Q. 73. At what pressure is reducing valve adjusted, when used in connection with the straight air brake? Safety valve on brake cylinders?

A. Reducing valve set to 45 lbs. Safety valve set to 53 lbs.

Q. 74. Name pipe connections to the straight air brake valve?

A. Main reservoir, brake cylinder and exhaust pipe.

Q. 75. If straight air brake is applied and there is a blow at the triple valve exhaust port, where would the trouble be?

A. Double seated check valve leaking, automatic side.
Q. 76. With an automatic application of the brakes, and a blow at exhaust port of straight air brake valve, where would the trouble be?
A. Double seated check valve leaking, straight air brake side.

Q. 77. With the straight air brakes applied and the handle placed on lap position, what would cause a blow from the exhaust port?
A. Exhaust valve leaking in straight air brake.

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First Year's Examination.

Q. 78. In manipulating the "E. T." equipment, are the instructions practically the same as those for manipulating the automatic and "S. W. A." straight air brake?
A. Yes.

Q. 79. With this equipment, what is the normal position of both brake valve handles?
A. Running position.

Q. 80. Where must the air first be stored before an application of the air brakes can be made?
A. In main reservoir.

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Second Year's Examination.

Q. 81. What are the essential parts of the E. T. locomotive brake equipment?
A. Brake valves, distributing valve, air gauges, reducing valve, feed valve and necessary piping.
Q. 82. How many air gauges do we have on a locomotive using the E. T. equipment, what pressures do they indicate, where are these pipes connected?

A. Two. One large gauge, black pointer, equalizing reservoir; red pointer, main reservoir pressure. Small gauge, red pointer, brake cylinder; black pointer, brake pipe pressure.

Q. 83. Do you find the auxiliary reservoir and triple valves on locomotives equipped with the E. T. equipment?

A. No.

Q. 84. What takes the place of the triple valve and auxiliary reservoir?

A. The distributing valve and its reservoirs.

Q. 85. What are the duties of the distributing valve?

A. To apply and release the engine brake and charge the pressure chamber.

Q. 86. How many positions has the distributing valve? Name them.

A. Eight. Automatic and independent release, automatic and independent application, automatic and independent lap, emergency position and emergency lap.

Q. 87. Name the different pipes and their connections as used with the E. T. equipment?

A. Main reservoir supply pipe to automatic brake valve, reducing valve pipe, brake cylinder pipe, brake pipe branch pipe, application cylinder pipe, distributing valve release pipe, brake pipe and necessary pipes for air gauges and equalizing reservoir.

Q. 88. Name the different pressures used in operating the E. T. equipment?
A. Atmosphere, main reservoir, brake pipe, brake cylinder, reducing valve, equalizing reservoir, pressure chamber, application chamber and application cylinder.

Q. 89. Describe the automatic application of the brake with the E. T. equipment?

A. By placing the automatic brake valve on service position and discharging air from chamber (D) will cause the equalizing discharge valve to vent air from the brake pipe to the atmosphere. The reduction of brake pipe pressure will operate the equalizing piston slide valve and graduating valve in the distributing valve, which in turn will vent air from the pressure chamber to the application cylinder and chamber, the air in the application cylinder will move the application piston to the right, which in turn moves the exhaust valve to close the exhaust, and application valve to open communication from the main reservoir to the brake cylinder, applying the brakes on the engine and tender.

Q. 90. Describe the independent application of the brake with the E. T. equipment?

A. The independent brake valve in application position will allow air from the reducing valve pipe to flow into the application cylinder, moving the application piston to the right, closing the exhaust valve and opening the application valve, which allows the air from main reservoir to flow to the brake cylinder until pressure in brake cylinder equals the pressure in the application cylinder.

Q. 91. What is the purpose of the safety valve attached to the distributing valve, and what pressure is it adjusted to?

A. To take care of excessive brake cylinder pressure; 68 pounds.

Third Year's Examination.

Q. 92. How many air chambers are there in the distributing valve reservoir, and which is the larger chamber?
A. Two. Pressure chamber.

Q. 93. Name the operative parts in the distributing valve?
A. Application piston, application valve, exhaust valve, equalizing piston, slide and graduating valve, emergency valve, check valve.

Q. 94. What pressures are separated by the application piston? Application valve? Exhaust valve?

Q. 95. What pressures are separated by the equalizing piston? Equalizing slide valve?
A. Equalizing piston—Brake pipe and pressure chamber. Equalizing slide valve—Pressure chamber and application chamber and cylinder.

Q. 96. In service application, will pressures in brake cylinder on engine and tender be uniform with the pressure in brake cylinders in cars on the same train?
A. Yes.

Q. 97. What pressure is obtained in the engine brake cylinders from an emergency application with the high speed brake?
A. 90 to 92 pounds.

Q. 98. Will excessive piston travel or ordinary brake cylinder leakage effect the brake cylinder pressure on the locomotive?
A. No.
Q. 99. What will cause brake cylinder pressure to increase when brake valve and equalizing portion of the distributing valve is lapped after making a partial service application?

A. Brake pipe leak or leak of air into application cylinder of distributing valve.

Q. 100. What will cause brake cylinder pressure to decrease after brake valve is lapped?

A. Leak out of application cylinder.

Q. 101. What will cause a continuous blow at the automatic brake valve exhaust when the handle of both brake valves are in running position?

A. Rotary valve leaking, or equalizing slide valve or graduating valve in distributing valve.

Q. 102. How can you determine if the leak is from the main reservoir, rotary valve of independent brake or pressure chamber?

A. By making a 10-pound reduction with automatic brake valve place handle in holding position. If pressure in brake cylinder increases to 45 pounds, independent rotary valve is leaking. If pressure increases above 45 pounds, leak is from main reservoir or pressure chamber.

Q. 103. Can the engine brake be applied with the automatic valve if the independent brake valve is in release position?

A. No.

Q. 104. How can it be determined if application valve is leaking? Exhaust valve?

A. Continuous blow at the distributing valve exhaust, when brake is released, application valve is leaking. A continuous blow at distributing valve exhaust when brake is applied, exhaust valve is leaking.

Q. 105. What could be done if the brake cylinder pipe was broken off? Branch pipe at distributing valve?
A. Brake cylinder pipe broken—Close cut-out cock in distributing valve supply pipe; no brake on engine. Branch pipe—Blank pipe next to brake pipe; use automatic brake on train and independent brake on engine.

Q. 105. What could be done if the main reservoir supply pipe was broken off? Application cylinder pipe?


Q. 107. What could be done if distributing valve exhaust pipe was broken off? Reducing valve pipe?

A. Distributing valve exhaust pipe—Just let it go. Reducing valve pipe—Plug pipe next to reservoir pipe.

Q. 108. What would be necessary to do should the brake rigging be broken on tender equipped with the "E. T." equipment having an auxiliary reservoir and triple valve?

A. Close cock in brake cylinder pipe from distributing valve. Close cock in branch pipe to triple valve and bleed pipe auxiliary reservoir.

Q. 109. When is the safety valve attached to the distributing valve in communication with the application cylinder?

A. All positions except service lap.

Q. 110. How would you proceed to test the automatic and independent brake valves and distributing valve?

A. After the standard pressures have been obtained make a five-pound brake pipe reduction, and with brake valve on lap, note what pressure was developed in brake cylinders, also note by air gauges that brake cylinder pressure is not affected by leaks or that there are any leaks affecting the brake pipe.
pressure, after which place brake valve on holding position to note that engine brakes remain applied, after which place brake valve on running position and note what pressure the feed valve closes at, also that engine brakes release. After being charged up make a full service application and note the time required to make a 20-pound chamber (D) reduction, also that equalizing discharge valve responds promptly, that there is no indication of undesired quick action, also how much brake cylinder pressure was obtained, after which place brake valve on release position and allow the brake pipe to charge a few pounds higher than feed valve closes at, then return to running position and note what pressure the feed valve opens at. The brake should then be applied in full with the independent valve and note how much brake cylinder pressure is obtained and that there is no leak affecting the brake cylinder pressure and that this valve will release engine brakes in running position if the automatic valve is on running, or will release engine brakes in release position if automatic brake is applied.

BRAKE PIPE AND CONNECTIONS.

First Year's Examination.

Q. 111. How many cocks on main brake pipe and where are they located?
   A. Two. One at each end.

Q. 112. How does handle of angle cock stand when open? When closed?
   A. Open—In line with pipe. Closed—Crossways of pipe.

Q. 113. How can it be determined whether angle cocks or cut-out cock is open if handle is missing?
   A. By a port mark on top of cock.

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Q. 114. How many branch pipes lead away from the main brake pipe on locomotives? On tenders?
A. On locomotive—Two. Tender—One.
Q. 115. On which one of these branch pipes is the cut-out cock located, and for what purpose?
A. Pipe leading to triple valve. To cut out the triple valve.
Q. 116. What must be done after cutting out a defective brake?
A. Bleed the auxiliary reservoir.
Q. 117. Why should the air be drained from auxiliary reservoir?
A. To prevent the brake from applying.

BRAKE PIPE AND CONNECTIONS.

Second Year’s Examination.

Q. 118. If main brake pipe was broken off on a passenger car so that it could not be used, what could be done to carry air to rear cars?
A. Use signal pipe.
Q. 119. If found necessary to drill a car to rear of train on account of broken brake pipe, how should the hose couplings and angle cocks be arranged between the cars?
A. Couple hose, close angle cock on car with broken pipe and open cock on car ahead.
Q. 120. In case of a bad leak at coupling gaskets, what could be done to stop the leak?
A. Renew gaskets.
Q. 121. How many strainers must the air pass through in the brake pipe and triple valve?
A. Two.
BRAKE PIPE AND CONNECTIONS.

Third Year's Examination.

Q. 122. If a branch pipe is broken between the main brake pipe and cut-out cock on passenger equipment car, how could it be repaired?
   A. Reverse the pipe.

Q. 123. What improved features are found in the new style angle cock handles?
   A. A lock.

Q. 124. What passenger equipment cars have more than one complete air brake equipment, requiring a branch or cross-over pipe to each triple valve?
   A. Steel Pullman cars.

Q. 125. How would you proceed to cut out one of these brakes on account of defects or failure to the brake rigging?
   A. Same as brake on any other car.

TRIPLE VALVE.

First Year's Examination.

Q. 126. Name or describe the different styles of triple valves on engines, tenders and cars?
   A. On engines, plain triple valves. Tenders and cars, quick acting triple valves.

Q. 127. Where is the plain triple valve used?
   A. On engines.

Q. 128. Where is the cut-out cock located to cut out the plain, improved or quick acting triple valves?
   A. Plain triple valves—In triple valve. Improved—In branch pipe. Quick acting—In branch pipe.
Q. 129. On the plain triple valve, how do you place cut-out cock handle to use automatic, straight air, or to cut out the brake?
A. Automatic—In line with branch pipe. Straight air—Handle down to triple valve. Cut out—Midway between these two positions.
Q. 130. To charge the auxiliary reservoir with air, in what position would you place the handle of cut-out cock on branch pipe?
A. Crossways of pipe.

TRIPLE VALVE.

Second Year's Examination.

Q. 131. What are the functions possessed by the K triple valve in addition to those of the H type of quick-acting valves?
A. Quick service and retarding release.
Q. 132. Name the several working parts of the plain triple valve?
A. Triple piston, slide valve and graduating valve.
Q. 133. Name the additional working parts of the quick-acting triple valve?
A. Emergency piston, emergency valve and check valve.
Q. 134. How many positions has the quick-acting triple valve?
A. Four.
Q. 135. How many positions has the K type of triple valve?
A. Six.
Q. 136. Through what port does the air pass from the brake pipe into the auxiliary reservoir?
A. Feed groove.
Q. 137. Why is the feed port made so small?
A. To make brake uniform.

Q. 138. With triple valve in release position and a constant pressure of 70 pounds in brake pipe, how long will it take to charge the auxiliary reservoir from 0 to 70 pounds?
A. One minute and a half to two minutes. Engine and car the same.

Q. 139. What causes the triple piston to move from release to application position?
A. Brake pipe reduction.

Q. 140. What causes the triple piston to move from application to release position?
A. Increase of brake pipe or reduction of auxiliary pressure.

Q. 141. Why does triple valve go to lap position?
A. Difference in pressures not sufficient to move triple to release.

Q. 142. Does the brake apply any harder in an emergency application with the plain triple valve than in full service?
A. Applies quicker, but not harder.

TRIPLE VALVE.

Third Year's Examination.

Q. 143. What is the duty of the triple piston? Slide valve? Graduating valve?
A. Triple piston—Open and close feed groove and moves slide and graduating valve. Slide valve—Registers ports between auxiliary and brake cylinder and between brake cylinder and atmosphere. Graduating valve—Measures the air from auxiliary to brake cylinder in service application.
Q. 144. What is the duty of the emergency piston? Emergency valve? Check valve?

A. Emergency piston—Unseats the emergency valve. Emergency valve—Permits brake pipe pressure to enter the brake cylinder. Check valve—Pre­vents brake cylinder pressure returning to brake pipe.

Q. 145. Describe the flow of air through the triple valve in all positions?

A. Release position—From brake pipe to auxiliary reservoir, brake cylinder to atmosphere. Service—From auxiliary to brake cylinder. Lap—All ports would be closed. Emergency—From brake pipe and auxiliary to brake cylinder.

Q. Are the feed ports in different kinds of triple valves of the same size?

A. No.

Q. 146. Give some of the causes for undesired quick action?

A. Dirty triple, broken graduating spring, graduating pin, restricted air ports, triple used on the wrong equipment, bad leak or brake pipe pressure close to triple, light reduction on long trains.

Q. 147. How does one triple valve going to quick action affect the rest of the triple valves in the train?

A. Causes all triple valves to go to emergency.

Q. 148. Name the defects in the quick-action triple valve that will cause a blow at the exhaust port?

A. Leaky side valve, body gasket, emergency valve, check case gasket or induction pipe.

Q. 149. How can it be determined whether air escaping at the triple valve exhaust port, is coming from auxiliary reservoir or brake pipe?

A. By closing cut-out cock.

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Q. 150. If the emergency valve remains off its seat and a strong blow escapes at the triple valve exhaust, how could you get the valve seated?
A. Bleeding auxiliary reservoir with brake cut out and cut in quick or use the emergency.

Q. 151. What is the effect of an auxiliary reservoir leak to the atmosphere?
A. To release brake.

Q. 152. Should brake be applied and release without the escape of air from triple valve exhaust, what is the defect?
A. Brake cylinder leakage.

Q. 153. What is gained by the quick-service feature of the K valve?
A. Quicker and harder application of the brake.

Q. 154. What is gained by the retarded feature of the K valve?
A. To hold slack of train together while brakes are being released.

Q. 155. Does this valve otherwise operate uniformly with other quick-acting valves?
A. Yes.

MAIN RESERVOIRS, AUXILIARY RESERVOIRS, BRAKE CYLINDERS AND RETAINING VALVES.

First Year's Examination.

Q. 156. Where does main reservoir pressure begin and end? Brake pipe pressure?
A. Main reservoir pressure begins at the air pump and ends at the brake valve. Brake pipe pressure begins at brake valve and ends at triple valve.
Q. 157. Where does auxiliary reservoir pressure begin and end? Brake cylinder pressure?
A. Auxiliary reservoir pressure begins at triple piston and ends at side valve. Brake cylinder pressure begins at slide valve and ends at slide valve.

Q. 158. How should the release valve on auxiliary reservoir be operated to release the brake?
A. Bleed until you hear a blow from the brake cylinder.

Q. 159. What is the duty of the pressure retaining valve?
A. To retain a pressure in brake cylinder with triple valve on release.

Q. 160. How many kinds in use?
A. Two.

MAIN RESERVOIRS, AUXILIARY RESERVOIRS, BRAKE CYLINDERS AND RETAINING VALVES.

Second Year's Examination.

Q. 161. What is main reservoir pressure used for?
A. Used for charging the brake pipe.

Q. 162. Name the operating parts in the brake cylinder?
A. Release spring, piston head, follower plate, packing leather, expander ring.

Q. 163. Why is the leakage groove placed in the brake cylinder?
A. To get rid of any small amount of air that gets to brake cylinder at undesired times.

Q. 164. What causes the brake piston to return to release position?
A. Release spring.
Q. 165. Where is the pressure retaining valve located, and to what is it connected?
A. On end of car. Connected to brake cylinder pressure.

Q. 166. What pressure does the two-position retaining valve hold in cylinder?
A. 15 pounds.

Q. 167. What pressure does the three-position retaining valve hold in the brake cylinder with the handle at an angle of 45 degrees to the pipe? At right angle to the pipe?
A. 45 degrees to the pipe—50 pounds. At right angle—25 pounds.

MAIN RESERVOIRS, AUXILIARY RESERVOIRS, BRAKE CYLINDERS AND RETAINING VALVES.

Third Year's Examination.

Q. 168. How is the size of the auxiliary reservoir proportioned to the size of the different brake cylinders?
A. Four to one.

Q. 169. How is the packing leather held against the wall of the brake cylinder?
A. By an expander ring.

Q. 170. How many main reservoirs are on H-6-a, H-8, E and K classes of locomotives?

Q. 171. Is there a difference in the main reservoir capacity on freight and passenger locomotives?
A. Yes.
TRAIN AIR SIGNAL AND HIGH SPEED BRAKE.

First Year's Examination.

Q. 172. What is the purpose of the train air signal equipment?
   A. To transmit signals to engineman.

Q. 173. How many pounds pressure is carried in the signal pipe?
   A. 45 pounds.

Q. 174. From where is this pressure obtained?
   A. Main reservoir.

Q. 175. What kind of cocks are found on locomotives? On cars?
   A. Stop cocks.

Q. 176. What additional apparatus must be applied to a locomotive or car to operate the high speed brake?
   A. High speed reducing valve.

Q. 177. What pressure is carried in main reservoir and brake pipe when using the high speed brake?
   A. Main reservoir, 130 to 140 pounds. Brake pipe, 110 pounds.

Q. 178. What pressure operates the automatic reducing valves attached to the brake cylinder?
   A. Brake cylinder pressure.

TRAIN AIR SIGNAL AND HIGH SPEED BRAKE.

Second Year's Examination.

Q. 179. How is the pressure in signal pipe reduced from main reservoir pressure to 45 pounds?

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A. By a reducing valve.

Q. 180. What other valves do we have with the signal equipment in connection with the pressure reducing valve?

A. Signal valve.

Q. 181. Where does the branch pipe lead to from the signal pipe on a passenger car?

A. Car discharge valve.

Q. 182. How should the car discharge valve be operated to make a reduction in the signal line?

A. Open quickly.

Q. 183. What period of time should intervene between each pull of the cord?

A. Two or three seconds.

Q. 184. To what pressure is the high speed reducing valve adjusted?

A. 60 pounds.

Q. 185. When using the high speed brake (110 pounds) do we get any more pressure in the brake cylinder from a 10 or 15-pound reduction than when carrying 70 pound?

A. No.

Q. 186. In making an emergency application of the high speed brake, how much pressure do we get in the brake cylinder?

A. 85 to 88 pounds.

Q. 187. Would it be advisable to use the emergency application carrying 110 pounds pressure at a very slow speed?

A. No.

Q. 188. What is the rule in regard to using high pressure on locomotive, tenders or cars that are not equipped with the automatic reducing valve?

A. High pressures maintained.
TRAIN AIR SIGNAL AND HIGH SPEED BRAKE.

Third Year's Examination.

Q. 189. Is there a cut-out cock on the signal pressure reducing valve?
A. Yes.

Q. 190. If the pressure reducing valve is adjusted properly and cut-out cock open and no air will pass to signal line, where would you look for the trouble?
A. At choke fitting in reducing valve.

Q. 191. When coupled to two or three cars, whistle responds correctly to a pull of a cord, and if more cars are coupled it will not respond from any car in the train, where would the trouble be located?
A. In signal valve.

Q. 192. If the signal cord is pulled twice properly and one long blast is obtained, where would the trouble be?
A. In signal valve or reducing valve.

Q. 193. If two blasts of the signal whistle are given when cord is pulled once, where would the trouble be?
A. Signal valve.

Q. 194. If proper reductions are made in the signal line and the whistle does not respond, where would you look for trouble?
A. Signal valve or whistle.

Q. 195. When using the high speed brake and making a full service application, how much pressure will be obtained in the brake cylinder?
A. 72 to 75 pounds.
Q. 196. How many full service applications of the brake can be obtained without recharging the auxiliary reservoirs?
   A. Three.

Q. 197. When making an emergency application with the high speed brake, will a higher brake cylinder pressure be obtained than when making a full service application?
   A. Yes.

Q. 198. Will the brake cylinder pressure obtained when making an emergency application with the high speed brake remain constant during the stop?
   A. No.

Q. 199. In coupling a locomotive to cars carrying high speed pressure (110 pounds), how would you proceed to get rid of the high brake pipe pressure and proceed with the least possible delay?
   A. Maintain the high pressure.

Q. 200. What other reservoirs are charged with air pressure on certain passenger equipment cars in addition to the auxiliary reservoir?
   A. Reservoirs for carburetor light and water raising system.

Q. 201. How do the reservoirs for the carburetor and water raising system receive their supply of air?
   A. Reservoir for carburetor light receives its air from the auxiliary reservoir through a check valve and is charged to 110 pounds. Reservoir for water raising system receives its air from the auxiliary reservoir, through a governor and is charged to 110 pounds.

Q. 202. Does it take longer to charge a passenger equipment car having the carburetor lighting system and the water raising system?
   A. Yes.
Q. 203. How many cut-out cocks are there to this equipment and where located?
   A. Two. One in branch pipe from brake pipe to U. C. valve; one in brake cylinder pipe.

Q. 204. Is each reservoir equipped with a drain cock?
   A. Yes.

Q. 205. Should the air brake become defective on the car and it is necessary to cut it out of service, what must be done?
   A. Close cut-out cock in branch pipe and drain three small reservoirs.

Q. 206. Why was a cut-out cock located in the brake cylinder pipe?
   A. For convenience of car inspectors.

Q. 207. When making repairs to any part of the brake rigging, in what position should this cut-out cock be placed?
   A. Crossways of pipe.

INSTRUCTIONS.

First Year's Examination.

Q. 208. What must first receive attention with reference to air brakes?
   A. The air pump.

Q. 209. How is the automatic brake applied and released?
   A. By increasing or decreasing brake pipe pressure.

Q. 210. When should the straight air brake valve be used?
   A. When handling an engine alone or while releasing automatic brake.
Q. 211. What are the instructions in regard to draining main reservoirs?
A. At the end of each trip.

Q. 212. How many pounds pressure is carried in main reservoirs, passenger and freight?
A. Passenger—130 to 140 pounds. Freight—100 pounds.

Q. 213. Why do we carry a higher pressure in the main reservoir than the brake pipe?
A. To insure a prompt recharging of brake pipe.

Q. 214. What is meant by the term: "One application of the brake?"
A. Brake to be applied and released.

Q. 215. How do you apply the brake to make a service stop or to reduce speed? To make an emergency?
A. A service application. Brake applied in the emergency.

Q. 216. How many different ways can the automatic brake be applied from the train?
A. By opening the angle cock on the rear car or using the emergency valve.

Q. 217. How can it be known when the brake pipe and auxiliary reservoir are fully charged?
A. By lapping brake valve and noting black pointer on air gauge.

Q. 218. When fully charged, how do the pressures stand in both brake pipe and auxiliary reservoir?
A. Pressures equal.

Q. 219. After a train is made up and fully charged at a terminal point, how must a terminal test of the brakes be made?
A. A full service application of 25 pounds should be made, trainmen or inspectors will then go along...
train to see if the brakes on all cars have applied, after which brakes will be released, then pass along train to note that all brakes have again released, and report to engineman how many brakes were applied, how many cars in train and condition of brakes.

Q. 220. What kind of a signal should trainmen or inspectors give to apply brakes for a test? To release brakes?

A. Signal to apply brakes is given with a hand, flag or lamp swung horizontal above the head. To release brakes, hand, flag or lamp held at arms length above the head.

Q. 221. How many pounds brake pipe reduction must be made to apply brakes for test?

A. 25 pounds reduction.

Q. 222. After brakes are examined and signal given to release, what is required of trainmen or inspectors before a test of the brakes is completed?

A. Trainman or inspector will pass along train to note that brakes have all released.

INSTRUCTIONS.

Second Year’s Examination.

Q. 223. Name the different pressures required to maintain and operate the automatic brake? The straight air brake?

A. Atmosphere, main reservoir, brake pipe, auxiliary reservoir, brake cylinder. Straight air brake, main reservoir, brake cylinder.

Q. 224. What brake would you use to hold a locomotive or car when standing on descending grade or siding?

A. Hand brake.
Q. 225. What modification to the terminal test is permitted where yard testing plants are used?
A. Road test.

Q. 226. When necessary to make additional application of the brake for test, what is the communicating signal to engineman?
A. A hand, flag or lamp swung horizontal above the head.

Q. 227. What instructions should be followed when making up a freight train?
A. All cars should be coupled up, cocks in their proper positions, retaining valves turned down, and hand brakes released.

Q. 228. What instructions must be followed when cutting off a car or locomotive from a passenger train? From a freight train?
A. Passenger—Angle cocks closed at both ends of car. Air hose parted by hand, air left out of brake pipe and drain auxiliary reservoirs, leaving bleed cock on reservoir open on passenger cars. For freight cars—Practically the same.

Q. 229. What must be done to cut out a defective brake?
A. Close cut-out cock in branch pipe, bleed auxiliary reservoir.

Q. 230. If main reservoirs were partly filled with water, how would it affect the operation or maintenance of the brake?
A. It would interfere in charging brake pipe to release brakes.

INSTRUCTIONS.

Third Year's Examination.

Q. 231. When handling a passenger train, how should the ordinary stops be made. With one or two applications.
A. With two applications.
Q. 232. What is the rule when making a two-application stop?

A. Brake should be applied hard on first application and speed of train reduced, when first application should be released, and a light application made to make the stop.

Q. 233. Why make the second application light?

A. To prevent sliding of wheels at slow speed and making rough stops.

Q. 234. At what speed would it be most desirable to make the first release when making a stop of this kind?

A. 12 to 15 miles per hour.

Q. 235. Why should the brake valve be placed on lap position after making the first release when a second application is desired?

A. To allow pressures in break pipe and auxiliary reservoir to equalize and brake cylinder pressure to escape.

Q. 236. In steadying a train around a curve, when should the brakes be applied and released?

A. Brake should be applied on straight line, and released when train comes to the curve.

Q. 237. What is the standard piston travel for engine and tender brake cylinders?

A. Equalized American driver brake, 4 inches. Cam driver brakes, 1½ to 3½ inches. Tender brake 6 inches.

Q. 238. If train does not have the required percentage of air brakes in service, under what arrangements would you be permitted to haul the train?

A. By order from the Superintendent.
Q. 239. In case of failure making train brakes inoperative, what action should be taken?

A. Report accident to Superintendent.

Q. 240. How can it be determined, from the engine, when testing brakes, if they went into undesired quick action?

A. By noting air gauge, also brake pipe exhaust.

Q. 241. When and how should a road test of the brakes be made?

A. Road test of brakes is made by making a service application. Trainmen to note that brake has applied on rear car in train, after which brakes will be released and note that brakes have released on last car. This test to be made every time a change is made in the make-up of train that will necessitate the opening and closing of angle cocks.

Q. 242. When should a running test of the brake be made?

A. When required by rule. Brake should be applied while train is running and noted by the engineer that brakes are holding.

Q. 243. When furnishing trainmen with air brake hose for use on cars, what instructions are in force, in order that enginemen may secure a new hose and make proper charge?

A. A form should be made out and given to the engineer showing the number and initial of car that hose is to be used on.

Q. 244. Should the brakes apply suddenly from the train, what action must be taken, and what train rules govern cases of this kind?

A. Engine should be shut off, brake valve placed on lap or emergency position and all tracks protected as soon as train stops.
PROFICIENCY IN SERVICE.

Third Year's Examination.

Q. 245. After engine is coupled to train, what should the engineer do before the air is turned into the brake pipe?
A. Engine moved ahead.

Q. 246. When picking up cars en route not charged with air, what should be done before leaving side track?
A. Air should be turned into the car before leaving the siding.

Q. 247. Can a car with an inoperative hand brake be placed as the rear car in the train?
A. No.

Q. 248. What is the rule in regard to the use of retaining valves in train service?
A. To be used in descending grades or where stops are likely to be made.

Q. 249. How should brake be coupled up and handled when two or more engines are coupled to train?
A. Brakes should be operated from lead engine.

Q. 250. Can you give the communicating air whistle signals?
A. When standing—Two blast of signal whistle, signal to start. Three while standing, back train. Four while standing, to apply or release brakes. Five while standing, to call in flagman. When running—Two blasts, to stop at once. Three blasts, stop at next station. Four blasts, reduce speed. Five blasts, increase speed. One blast while running, to be answered by the engineer by two short blasts of steam whistle, signal whistle blowing once after be-
ing answered by engineer would indicate that brakes are sticking on train.

Q. 251. What is the rule to follow in case of a broken train?
   A. If train parts in air, engine to be shut off, brake valve placed on lap or emergency position, and protect all tracks until it is known that they are not obstructed. If train should part where there is no air, trainman to give the engineer a broken train signal and front portion of train should be kept moving until it is known that rear portion has been stopped.

Q. 252. Should the straight air brake be used to bunch the slack on long trains?
   A. Not for the ordinary stops.

Q. 253. In applying the brake you hear preliminary exhaust blowing properly and the brake pipe gauge pointer does not drop when the brake pipe exhaust opens, where would you look for the trouble?
   A. Between the brake valve and the air gauge.

Q. 254. In making a ten-pound reduction and brake valve placed in lap position and the brake pipe exhaust continues to blow indefinitely, where would you look for the trouble?
   A. Leak of air from chamber (D) or its connections.

Q. 255. If the preliminary exhaust port was stopped up or for any cause we could not get the equalizing discharge valve to raise, how could the brake be applied?
   A. By making a service application in the emergency position of the brake valve.

Q. 256. Does it take any longer to make a five-pound reduction through the preliminary exhaust with a long train than with a short one?
   A. No.
Q. 257. Does it take any longer for the air to go through the brake pipe exhaust on a long train than a short one, the same reduction being made on the gauge?
A. Yes.

Q. 258. Can trains be handled successfully with bad leaks in the brake pipe?
A. No.

Q. 259. Is a leak in the brake pipe always a reduction of pressure?
A. No.

Q. 250. Under what condition should angle-cock be used to make a reduction in brake pipe to apply the brakes and stop the train?
A. In cases of emergency to prevent an accident or loss of life.

Q. 261. If air is escaping from exhaust port of retaining valve and the handle is turned up to stop it, what would be the result?
A. Would cause the brake to apply.

Q. 262. Where and when on this division should the pressure retaining valve be used?
A. In descending grades or where stops are likely to be made.

Q. 263. When applying brakes in service application the preliminary exhaust blows properly and brake pipe gauge pointers do not drop or brake pipe exhaust open, where would you look for trouble?
A. A leak of air into chamber (D).

Q. 264. Should pipe leading to equalizing reservoir be broken, or to lose the reservoir entirely, what could be done?
A. Blank the broken pipe, blank the brake pipe exhaust.
Q. 265. In case of a failure of this kind, where should handle or brake valve be carried?
A. Running position.

Q. 266. When so repaired, how could brake be applied in making a service station stop?
A. By using emergency position of brake valve.

Q. 267. What would cause the brake pipe exhaust to stop blowing about as soon as the brake valve is placed in lap position when testing brakes on long train?
A. An obstruction in brake pipe, or quick action near engine.

Q. 268. In handling freight trains, what reduction in brake pipe pressure should be made on first application?
A. Eight to ten pounds.

Q. 269. With long trains, how should the brakes be released?
A. Brake valve to remain in release position, proportionate to length of train or style of triple valves. (To be demonstrated on rack.)

Q. 270. If brake pipe exhaust is broken between brake valve and double-heading cut-out cock, what should be done?
A. On engine handling train let pipe go. Report defect at terminal. On second engine double-heading with brake cut out, pipe to be blanked.

Q. 271. If brake valve handle is placed on lap position and brake pipe pointers on gauge loses pressure, how can it be determined whether auxiliary reservoirs are not fully charged or that there is a leak in brake pipe?
A. By watching the black pointer on air gauge, the pressure in brake pipe will drop to an equalization of auxiliary pressure by placing the brake valve on lap. If leak is from brake pipe, pressure will drop to zero.
Q. 272. In what way is the construction of the air brake hose coupling different from the train air signal hose coupling.

A. Brake hose coupling is larger than signal hose coupling.

Q. 273. Should you observe the pressure on the air gauge when making brake pipe reduction for service application?

A. Yes.

Q. 274. With brakes fully applied, will the brakes having long or short piston travel release first?

A. Long piston travel.

Q. 275. After stopping a train on descending grade, should the air or hand brake be used to hold the train for an indefinite period?

A. Hand brakes.

Q. 276. If main reservoir pressure falls when a brake application is made, what is the cause and what should be done to remedy the trouble?

A. Indicating a brake cylinder leak. To remedy, move independent brake valve handle to release position.

Q. 277. Make a twenty-five pound reduction then release and re-apply the brake so as to secure a twenty-five pound brake cylinder pressure?

A. (To be demonstrated on rack.)

Q. 278. Release brake after service application and re-apply so that the brake pistons are out but no pressure shown on brake cylinder gauge?

A. (To be demonstrated on rack.)

Q. 279. At what time would this be an advantage?

A. In making station stops for passenger trains.
Q. 280. How can the brake be operated on an engine equipped with the E. T. brake equipment when the air pump becomes disabled on engine, if two or more engines are in the same train or if in moving dead engines?

A. By using the dead-engine feature. If no dead-engine feature, unscrew adjusting nut in feed valve until tension is taken off spring, place brake valve handle in running position, cut-out cock in number one position, blank train line exhaust.

Q. 281. Name some of the causes for brakes sticking?

A. Improper method of releasing brake or trying to release brakes after a light application.

Q. 282. How should the brake valve be handled to prevent brakes sticking?

A. Brake valve should remain in release position proportionate to length of train or style of triple valves.

Q. 283. Have you noticed there is a new passenger brake equipment in service on a number of steel passenger equipment cars?

A. Yes.

Q. 284. What is the object of this new air brake equipment?

A. To give a better brake equipment.

Q. 285. What is the name of this equipment when complete?

A. Common standard Universal Valve, Type U. C., Brake Equipment.

Q. 286. Will this brake operate in harmony with other air brake equipment in the same train?

A. Yes.
Q. 287. What brake pipe pressure is necessary to release the brake after an emergency application?
A. Ninety pounds.

Q. 288. Why is it important in making up trains or shifting cars that the brake pipe pressure should not be reduced sufficiently to cause the protection valve to apply the brake in the emergency?
A. To prevent delay, due to time which would be required to restore brake pipe pressure to ninety pounds before the brakes can be released.

Q. 289. Will less than a five pound pressure reduction apply this brake?
A. No.
Examination Questions on the Subject of Air Brakes and Instructions For Trainmen.

GENERAL QUESTIONS ON THE AIR BRAKE SUBJECT.

Q. 1. What do you understand by the term automatic air brake?
A. The brake that is self-acting or will work within itself.

Q. 2. What are the essential working parts of the automatic brake as applied to a car?
A. Triple valve, auxiliary reservoir, brake cylinder, the necessary piping and cocks.

Q. 3. Name the different air pressures necessary to maintain and operate automatic brake?
A. Atmosphere, main reservoir, brake pipe, auxiliary reservoir, brake cylinder.

Q. 4. What is used to compress the air?
A. Air pump.

Q. 5. Where is the compressed air first stored?
A. Main reservoir.

Q. 6. How many pounds pressure is stored in main reservoirs, passenger and freight?
A. Passenger 130 to 140 pounds. Freight 100 pounds.

Q. 7. Where does brake pipe pressure begin and end?
A. Begins at brake valve and ends at triple valve.

Q. 8. What is the brake pipe pressure used for?
A. Used to charge the auxiliary reservoir and operate the triple valve.

Q. 9. How many pounds pressure is carried in brake pipe, passenger? Freight?
A. Passenger 110 pounds. Freight 70 pounds.

Q. 10. From the brake pipe, where does the air go?
A. From brake pipe to auxiliary reservoir.

Q. 11. What pressure is it then called?
A. Auxiliary reservoir pressure.

Q. 12. How many pounds pressure is carried in the auxiliary reservoir, passenger? Freight?
A. Auxiliary reservoir 110, passenger. Freight, 70 pounds.

Q. 13. What is the auxiliary reservoir pressure used for?
A. To apply the air brake.

Q. 14. When air leaves the auxiliary reservoir, where does it go?
A. To the brake cylinder.

Q. 15. After the air leaves the brake cylinder, where does it go?
A. To the atmosphere.

Q. 16. What valve is used to control the passage of air from auxiliary reservoir to brake cylinders?
A. Triple valve.

Q. 17. To what pressure is the retaining valve connected?
A. Brake cylinder pressure.

Q. 18. How is the automatic brake applied and released?
A. By increasing or decreasing the brake pipe pressure.

Q. 19. How is the service application obtained? Emergency?
A. Service application obtained by reducing brake pipe pressure slow and gradual. The emergency obtained by reducing brake pipe pressure quick and sudden.

Q. 20. How many different ways can the automatic brake be applied from the train?
A. By opening the angle cock on rear of train or by using the conductors emergency valve.

Q. 21. How should the release valve on auxiliary reservoir be operated to release the brakes?
A. Release valve to be held open until air starts to flow from brake cylinder.

Q. 22. After stopping a train on a descending grade, should the air or hand brakes be used to hold the train for an indefinite period?
A. The hand brakes.

Q. 23. Explain in detail how the train could be secured with hand brakes?
A. If hand brake is working against the air brake, the air brake should be released before the hand brake is set.
Q. 24. Have you noticed there is a new passenger brake equipment in service on a number of steel equipment cars?

A. Yes.

Q. 25. What is the object of this new air brake equipment?

A. To give a better equipment.

Q. 26. What is the name of this equipment when complete?

A. Westinghouse Universal Common Standard Electro Pneumatic (Type U. C.)

Q. 27. Will this brake operate in harmony with other air brake equipment in the same train?

A. Yes.

Q. 28. If the brake pipe pressure is reduced to 35 pounds in making service application and the brakes set in quick action, is the equipment defective?

A. No.

Q. 29. What brake pipe pressure is necessary to release the brakes after an emergency application?

A. Ninety pounds.

Q. 30. Why is it important in making up trains or shifting cars that the brake pipe pressure should not be reduced sufficiently to cause the protection valve to apply the brakes in the emergency?

A. To prevent delay, due to time which would be required to restore brake pipe pressure to 90 pounds before the brake can be released.

Q. 31. Will less than a five pound service reduction apply this brake?

A. No.
Q. 32. What is the line of pipe called that extends from one end of the car to the other?
A. Brake pipe.

Q. 33. What cocks are found in this pipe?
A. Angle cocks.

Q. 34. How does the handle of angle cock stand when open? When closed?
A. When open—In line with pipe. Closed—Crosswise of pipe.

Q. 35. How could the position of angle cock be known if handle was missing?
A. By port mark in top of cock.

Q. 36. How many branch pipes lead away from brake pipe on freight cars?
A. One.

Q. 37. Where does it lead to?
A. To the triple valve.

Q. 38. Is there a cock in this branch pipe?
A. Yes.

Q. 39. Why is there a cut-out cock placed there?
A. To cut out the brake.

Q. 40. In what position should handle of this cock stand to cut out the brake?
A. In line with pipe.

Q. 41. What else should be done after cutting out the brake?
A. Bleed the auxiliary reservoir.

Q. 42. Why drain the auxiliary reservoir?
A. To prevent brake from applying.
Q. 43. Under what conditions would you apply cut-out card M. P. 276?

A. For all defects (air brake) found on freight cars.

Q. 44. Where should the cut-out card be placed?

A. For all defects in main brake pipe or branch pipe to cut-out cock the card should be placed, one at each end, at angle cock. For all defects beyond cut-out cock, such as triple valve, brake cylinder, brake rigging, card to be placed on branch pipe close to triple valve.

Q. 45. In case of a broken branch pipe between main brake pipe and cut-out cock, how could it be repaired?

A. Reverse the pipe.

Q. 46. If main brake pipe was broken so it could not be used on a passenger equipment car, what could be done?

A. By using signal line.

Q. 47. If necessary to drill a car to rear end of train, what should be examined before placing it there?

A. Hand brake.

Q. 48. A car having a defective air and hand brake, in what part of the train can it be safely moved to the nearest terminal?

A. To be hauled between other air brake cars.

Q. 49. When necessary to drill a car to rear of train on account of broken brake pipe, how should the hose couplings and angle cocks be arranged between the two rear cars?

A. Hose to be coupled up, angle cock closed on car with broken pipe and open on the car ahead.

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Q. 50. In case of a bad leak at coupling gaskets, what can be done to stop the same?
A. Renew the gasket.

TRIPLE VALVE, AUXILIARY RESERVOIR AND BRAKE CYLINDER.

Q. 51. How many kinds of quick-acting triple valves? Name them?
A. Four—H, K, F, P.

Q. 52. What functions does the K triple valve possess in addition to the old style quick-action triple valve?
A. Quick service and retarded release.

Q. 53. How many working parts in the quick action triple valve? Can you name them?
A. Six—Triple piston, slide valve, graduating valve, emergency piston, emergency valve and check valve.

Q. 54. What is the duty of the triple valve?
A. To charge the auxiliary reservoir. Apply and release the brake.

Q. 55. With the triple valve in release position and a constant pressure of 70 pounds in the brake pipe, how long will it take to charge an auxiliary reservoir to 70 pounds?
A. One minute and a half to two minutes.

Q. 56. Why does it take so long to charge the auxiliary reservoir?
A. On account of feed groove being so small.

Q. 57. Could the auxiliary on four or five cars be charged as quickly as one?
A. Yes.
Q. 58. Could 50 cars be charged with air as quickly as four or five?

A. No.

Q. 59. Who is held responsible for leaks in the brake pipe?

A. Trainmen and car inspectors.

Q. 60. Give some of the causes for undesired quick action of the air brake?

A. Defective triple valve, leak or air from brake pipe close to triple valve, a light application of brakes on long trains.

Q. 61. Name the operating parts of the brake cylinder?

A. Release spring, piston head, follower plate, packing leather, expander ring.

Q. 62. Why is the leakage groove placed in the brake cylinder?

A. To get rid of any small amount of air that will get to the brake cylinder at undesired times.

Q. 63. What causes the brake cylinder piston to return to release position?

A. Release spring.

Q. 64. Name the defects in the quick-action triple valve that will cause a blow at the exhaust port?

A. Leaky side valve, emergency valve, body gasket, check case gasket or induction supply pipe.

Q. 65. How can it be determined whether air escaping at the triple valve exhaust port is coming from auxiliary reservoir or brake pipe?

A. Close cut-out cock in branch pipe, if brake applies, leak is from brake pipe. If brake does not apply, leak is from auxiliary reservoir.

Q. 66. If emergency valve remains off its seat and a strong blow escapes at the triple valve exhaust how could you get the valve seated?
A. By closing cut-out cock, drain auxiliary reservoir, open cut-out cock suddenly, or by using the emergency application.

TRAIN AIR SIGNAL AND HIGH SPEED BRAKE

Q. 67. What other line of pipe is found on a passenger equipment car that is not on a freight car?
   A. Signal pipe.

Q. 68. What pressure is carried in the signal pipe?
   A. Forty-five pounds.

Q. 69. From where is this pressure obtained?
   A. Main reservoir.

Q. 70. Has the signal line any connections with the brake pipe?
   A. No.

Q. 71. What kind of stop cocks do we find on the main signal pipe?
   A. Plug cocks, one at each end of pipe.

Q. 72. In what position do the handles stand when these cocks are open? Closed?
   A. Handles are crosswise of pipe when open. In line with pipe when closed.

Q. 73. How many branch pipes lead off from the main signal pipe?
   A. One to two.

Q. 74. To what are these branch pipes connected?
   A. Car discharge valve.

Q. 75. Is there a cut-out cock in this pipe? Where located?
A. Yes. Located in toilet.

Q. 76. How must the car discharge valve be operated to make a reduction in the signal pipe?
A. Should be opened suddenly.

Q. 77. How long should the car discharge valve be held open to give the proper blast of the signal whistle on engine?
A. One to two seconds.

Q. 78. What period should intervene between each blast?
A. Two to three seconds.

Q. 79. If the car discharge valve is opened and a very weak blast of air comes from the valve and the engineman does not answer the signal, what could be wrong if the car discharge valve operates properly on other cars in the train?
A. Defective car discharge valve, cut-out cock partly closed, or strainer in main pipe dirty.

Q. 80. If no air comes out of the car discharge valve on one car and operates on cars ahead of or in the rear of this car, what could be wrong?
A. Cut-out cock closed.

Q. 81. What additional equipment is necessary on passenger equipment cars when using the high speed brake?
A. High speed reducing valve.

Q. 82. What other air reservoirs do we charge on some passenger equipment cars besides auxiliary reservoirs?
A. Reservoirs for carburetor light or water raising system.

Q. 83. From where does the carburetor and water raising system receive its air?
A. From the auxiliary reservoir.
Q. 84. How much pressure do we carry in the carburetor tank?
A. 110 pounds.

Q. 85. How much pressure do we carry in the water raising system storage tank?
A. 110 pounds.

Q. 86. With broken brake rigging with car equipped with carburetor and water raising system, how would you get air to operate these systems?
A. By removing plug from high speed reducing valve or unconnect pipe between brake cylinder and reducing valve.

Q. 87. How long does it take to charge the reservoirs on a passenger car with the carburetor system?
A. Eight to ten minutes.

Q. 88. To what pressure is the high speed reducing valve connected?
A. Brake cylinder pressure.

Q. 89. To what pressure is this valve adjusted?
A. Sixty pounds.

Q. 90. What pressure is carried in the brake pipe and auxiliary reservoir, when using the high speed brake?
A. 110 pounds.

Q. 91. Is a higher brake cylinder pressure obtained when an emergency application is made than when the brake is applied with a full service application?
A. Yes.

Q. 92. Does the high pressure obtained in the brake cylinder in emergency application remain constant until completion of stop?
A. No.
Q. 93. About how long will it take to reduce this high pressure to 60 pounds?
A. Eighteen to twenty-six seconds.
Q. 94. Would it be advisable to use the emergency application at slow speed?
A. No.
Q. 95. If we want to attach a car after leaving terminal not equipped with high speed reducing valve or safety valve to a train using a high speed brake, what should be done?
A. High speed brake to be operated after notifying the engineer.
Q. 96. Give the standard code of air whistle signals?
A. When standing—Two blasts of signal whistle, signal to start; three while standing, back train; four while standing, to apply or release brakes; five while standing, to call flagman. When running—Two blasts, to stop at once; three blasts, stop at next station; four blasts, reduce speed; five blasts, increase speed. One blast while running, to be answered by the engineer with two short blasts of the steam whistle; signal whistle blowing once after being answered by engineer would indicate that brakes are sticking on train.

RETAINING VALVES.

Q. 97. What are retaining valves used for?
A. To retain a pressure in brake cylinder with triple valve in release position.
Q. 98. To what are they piped?
A. Piped to triple exhaust.
Q. 99. How many kinds of retaining valves are used?
A. Two.

Q. 100. How many positions do the old style retaining valves have?
A. Two.

Q. 101. What pressure do they retain?
A. Fifteen pounds.

Q. 102. How should retaining valves be tested?
A. By turning the handles up and applying and releasing brake.

Q. 103. What is the rule in regard to the use of the pressure retaining valves?
A. To be used in descending grades or where stops are likely to be made.

Q. 104. When, where and how should retaining valves be used?
A. Descending grades—The three-position retaining valve only to be used in 50-pound position on car with load descending grades exceeding 2%.

Q. 105. What pressure does the three-position retaining valve hold in brake cylinder when the handle is at an angle of 45 degrees? At right angle to the pipe?
A. 45 degrees, 50 pounds. At right angle to pipe, 25 pounds.

INSTRUCTIONS—MAKING UP TRAINS AND TESTING BRAKES.

Q. 106. In making up trains, how many cars in consecutive order may have the brake cut out?
A. One.
Q. 107. If the brake on a car is cut out, with no cut-out card on it, and no visible defect found, what should be done?
A. Brake to be cut in and tested.

Q. 108. In making up trains, should the air hose be coupled before turning in the air pressure from the locomotive or air plant?
A. Yes.

Q. 109. Why should this be done?
A. For a saving of time and air.

Q. 110. When train is all coupled up, and before turning in the air pressure, what should be done?
A. Engine moved ahead and train stretched.

Q. 111. In turning in the air pressure, how should angle cock be opened?
A. Open slow.

Q. 112. Which one should be opened first?
A. The one next to the engine.

Q. 113. After air has been turned into the brake pipe. What should the trainmen do?
A. Examine the train for leaks and other defects.

Q. 114. When train is ready for terminal or road test, how should the engineer be notified in freight service? In passenger service?
A. By a signal to apply the brakes, in freight service. Passenger—Signal given with signal whistle or inspectors.

Q. 115. How much brake pipe reduction should engineman make in testing brakes?
A. Twenty-five pounds.

Q. 116. What is the duty of trainmen or car inspectors after brakes are applied for test?
A. To go over train to see that brakes have applied.
Q. 117. After having passed over the train and noted its condition, what signal should be given to release the brakes in freight service? In passenger service?

A. Freight service—Hand, flag or lamp, held at arm’s length above the head. Passenger service—Four blasts of signal whistle.

Q. 118. After brakes are examined and signal given to release, what is required of trainmen or inspectors before a test of the brakes is complete?

A. To inspect all brakes to know that they have properly released.

Q. 119. If additional applications of the brakes are required, what signal should be given in freight service? Passenger service?

A. Freight service—Hand, flag or lamp, swung horizontally above the head. Passenger service—Four blasts of signal whistle.

Q. 120. What is the required percentage of brakes in operative condition to comply with the instructions now in force?

A. 85% for all air brake cars associated together.

Q. 121. If you have less than the required number of air brakes in the train in operative condition, what action must be taken?

A. By order from Superintendent.

Q. 122. What kind of a test must be made when the make-up of a train has been changed or engine cut loose after leaving a terminal?

A. A road test.

Q. 123. In case of train parting, what is the duty of the trainmen?

A. If train parts where there is no air, signal to engineman and stop rear portion of train. If
train parts in air, to protect all tracks until they are known not to be obstructed.

Q. 124. Under what conditions should the angle cock be used to stop a train?

A. In cases of emergency, to prevent an accident or loss of life.

Q. 125. Should hand brakes be applied when the air brakes are being used?

A. No—Unless special instructions otherwise.

Q. 126. With self-closing conductor's emergency valve, how should the valve be opened for an emergency application?

A. Should be opened suddenly and held open until stop is completed.

Q. 127. What is the proper piston travel on a freight car?

A. Six inches.

Q. 128. What is the proper piston travel on a passenger equipment car?

A. Six inches for steel wheels, seven for cast iron.

Q. 129. What is the objection of a three-inch piston travel?

A. Leakage groove would not be closed, brake cylinder would retain no air.

Q. 130. What would be the objection to a brake having 12-inch piston travel?

A. Piston would travel out to end of brake cylinder, and possibly not have shoes up to wheels.

Q. 131. How and when should a road test be made?

A. By making a service application and noting that brake applies on rear car of train, also that it releases. Test to be made every time there is any change in the make-up of the train.
Q. 132. When brakes are applied for test, and you find a brake that did not apply, what should be done with the brake? If defective, how should it be carded?

A. Examine cut-out cock to know if it is open, examine bleed cock on auxiliary to see if it is closed, see if there is a hand brake on car working against the air, then open bleed cock to see if there is air in auxiliary reservoir. If there is air found in the auxiliary reservoir, signal for an application and watch brake to see if it applies. If brake applies and it is found that piston moves back in the brake cylinder, would indicate leak in brake cylinder. Brake should be carded for defective brake cylinder but not cut out.

Q. 133. In going over a train after brakes are released, and you find a brake that did not release, what should be done to determine the cause? If defective, how carded?

A. Examine retaining valve. Hand brake working with air brake. If brake cannot be released from engine it should be cut out and carded for whatever defect found.

Q. 134. What should be done with defective air brake hose after removing from car; also, new hose before applying to car?

A. Remove cut-out figures on badge plate, representing the year and the month.

Q. 135. When necessary to secure a new hose from the locomotive for application to a car, what information should be given the engineman?

A. Engineman should be given a form showing the number and initial of car the hose is to be used on.

Q. 136. When should a running test be made?

A. When authorized by special instructions.
GENERAL QUESTIONS ON THE AIR BRAKE SUBJECT.

Q. 1. What is an air brake?
A. Mechanical device used to stop the rotating wheels on vehicles.

Q. 2. What are the essential parts of the automatic brake as applied to a freight locomotive, passenger locomotive and tenders?
A. Freight locomotives—Air pump, main reservoirs, brake valves, triple or distributing valve, brake cylinders, air gauges, reducing valves, with the necessary pipes and cocks. Passenger locomotive—Same as freight, with the addition of high speed reducing valve. Tenders—Triple valve, auxiliary reservoirs, brake cylinder and the necessary pipes and cocks.

Q. 3. How is compressed air obtained and where is it stored?
A. Obtained by use of air pumps, stored in main reservoir.

Q. 4. What are the standard main reservoir, auxiliary reservoir and brake pipe pressure for locomotives in passenger and freight service?
A. Passenger locomotive—Main reservoir, 130 to 140 pounds; brake pipe, 110; auxiliary reservoir, 110. Freight service—Main reservoir, 100; brake pipe, 70; auxiliary reservoir, 70.
AIR PUMPS.

Q. 5. How many different types of air pump have we in service?
A. Three.

Q. 6. How should air pump be started?
A. Pump should be started slow. Lubricated after starting.

Q. 7. Is the air pump a single or double acting pump?
A. Double acting.

Q. 8. Name the working parts of the steam end of the nine and one-half inch air pump? Cross Compound?
A. Differential piston, steam valve, reversing valve, reversing valve rod, main steam piston, 9½" pump. 8½" C. Compound same as 9½" with the addition of another steam piston.

Q. 9. What causes the pump to reverse at half stroke?
A. Bent reversing valve rod.

Q. 10. When should the drain cocks on steam cylinder be opened?
A. Should be opened when pump is shut off.

Q. 11. If steam is turned into an air pump and it does not start, how could it be determined whether the trouble was in the pump, governor or exhaust pipe?
A. To determine if trouble was in the governor, cut steam pipe between governor and pump. To determine if trouble was in exhaust pipe or air pump, cut exhaust pipe at pump.

Q. 12. Name the working parts of the air end of the 9½" pump? Cross Compound?
A. 9½" pump—Main air piston, two receiving valves, two discharge valves. 8½" C. C.—Two air pistons, four receiving valves, four intermediate valves and two discharge valves.

Q. 13. Name the duties of different working parts of the air end of 9½" pump? Cross Compound?

A. 9½ pump—Air piston to compress the air to the main reservoir, receiving valves, to retain air after it has entered pump, discharge valves to retain air after it has entered the main reservoirs. 8½ C. C. pump—Same as 9½" pump.

Q. 14. Name the location and the proper lift of the receiving, discharge and intermediate valves?

A. Receiving valves on air inlet side of pump. Discharge valves on discharge side of pump. Intermediate valves between the two air cylinders. The proper lift for these valves 3-32 of an inch.

Q. 15. Trace the steam through the steam end of 9½" pump? C. C.?

A. 9½" pump—Steam enters the pump through the governor into a chamber where the main steam valve and differential piston are located. The steam having more force on large end will force the differential piston and main steam valve to the right, opening a port which admits steam to the bottom end of steam cylinder, forcing the main steam piston up, the main steam piston will move the reversing rod which in turn moves the reversing valve to admit steam to the chamber on the outside of the large end of differential piston; the steam pressure on the inside of smaller piston then forces the differential piston and main valve to the left, admitting steam to top end of steam cylinder, also exhausting steam from bottom end of steam cylinder. 8½" C. C. pump—Is practically the same as the 9½" pump except the steam is exhausted from the high pressure.
steam cylinder to the low pressure steam cylinder, then to the atmosphere.

Q. 16. Trace the air through the air end of the 9½" pump?  C. C.?

A. The pump making the upstroke, air is admitted at bottom end of air cylinder through air inlet and bottom receiving valve. The air in top end of cylinder being compressed and forced through the discharge valve to the main reservoir. 8½" C. C. pump—The air that is compressed in the low pressure air cylinder will be discharged to the high pressure air cylinder, then to the main reservoir.

Q. 17. Why is it important to keep the air inlet strainer clean?

A. So as not to interfere with air entering the pump.

Q. 18. What are the instructions regarding the maximum speed of air pump, 9½"?  C. C.?

A. 9½"—Not to exceed 140 single strokes per minute. 8½" C. C. pump—Not to exceed 132 single strokes per minute.

Q. 19. If pump is running at normal speed and no pressure is delivered to the main reservoir, how would you locate the defect?

A. Air inlet, receiving or discharge valve, packing rings on air piston.

Q. 20. How and when should the steam and air cylinders be lubricated, 9½"?  C. C.?

A. After pump has been started, with the necessary oilers.

Q. 21. What are the instructions relative to the kind of oil to be used?

A. Valve oil.

Q. 22. What are the instructions relative to lubricating the piston rod?

A. By using a swab.
Q. 23. What are the bad results of too free lubrication of the air cylinder of the pump?

A. Will cause the closing up of air passages, gum up valves of air pump, also air valves on engine.

Q. 24. Describe in detail how the proper test of an air pump should be made?

A. 9½"—Boiler pressure not less than 100 pounds; speed of pump, single strokes per minute, 120; air pressure to be maintained in main reservoir, 59 pounds; diameter orifice, 3-16". 8½" C. C. pump—130 pounds steam pressure; 100 strokes; 53 pounds in main reservoirs; 5-16" diameter of orifice.

Q. 25. What should be the minimum capacity of the air pump for road service, 9½"? C. C.?

A. 9½"—Maintain 59 pounds against a leak of 3-16"; not to exceed 120 single strokes per minute. 8½" C. C. pump—Maintain 53 pounds against a leak of 5-16"; not to exceed 100 single strokes per minute.

Q. 26. How can the condition of cylinder packing rings in air and steam cylinder be determined, and what is the limit of wear before re-boring?

A. Can be determined by number of strokes per minute the pump will make (steam cylinder). Condition of packing rings in air cylinder can be determined by placing your hand on the air inlet and noting the suction of air. Limit of wear for the steam cylinder not to exceed 1-32". Air end, the same.

Q. 27. At what point in the air cylinder of the pump does the greatest wear take place?

A. At the two ends.

Q. 28. Give some of the causes for air pump pounding? For heating?

A. Cause for pounding—Too much oil, loose on bracket, too much lift of air valves, or nuts loose in
pump. Cause for heating—Racing pump, restricted air ports, bad packing rings on pistons.

Q. 29. What kind of material should be used for the air pump gasket?
A. Composition gasket.

Q. 30. What care should be taken in renewing the top head gasket of the steam cylinder?
A. When gaskets and pump are well cleaned and ports in gasket register with ports of pump.

GOVERNORS.

Q. 31. What is the duty of the air pump governor?
A. Shut the steam off from pump when the required pressure has been obtained in the main reservoir.

Q. 32. What air pressure operates the pump governor?
A. Main reservoir pressure.

Q. 33. Name the working parts of the air pump governor?
A. Cap nut, adjusting nut, tension spring, diaphragm and ring, pin valve, governor piston and steam valve.

Q. 34. Trace the air through the governor and explain how the steam is shut off from the pump?
A. Air from the main reservoir first enters the governor under the diaphragm, unseating the pin valve and permits air to pass to governor piston forcing it downward and seating the steam valve, shutting off steam from pump. The reduction of main reservoir pressure caused by leakage while the pump is shut off will cause a reduction of air under the dia-

70
phragm when spring pressure will seat the pin valve. The air that would be between pin valve and piston will be vented to the atmosphere, the spring under main piston, assisted by steam will unseat the steam valve and again admit steam to the pump.

Q. 35. What holds the pin valve closed and steam valve open with the governor in normal position?
A. Springs in governor.

Q. 36. Explain the duties of the waste and vent ports in the governor?
A. To vent any steam or air to the atmosphere that may leak by the working parts in governor.

Q. 37. If pipe connections between the main reservoir and governor was stopped, what effect would it have on the pump?
A. Will render governor inoperative.

Q. 38. What defects in the air pump governor will render it inoperative?
A. Pipe from main reservoir to governor stopped up, leaking pin valve, with vent port closed. Leak by diaphragm with vent ports closed. Leak by steam valve with vent ports closed.

Q. 39. What is the object of the duplex pump governor?
A. To obtain a high main reservoir pressure, at time the brake is released.

Q. 40. Explain how the high and low pressure heads of duplex pump governor should be adjusted?
A. Low pressure head of governor adjusted for 100 pounds. High pressure head adjusted for 130 pounds.

Q. 41. What defect in the governor causes an excessive leak of steam at the waste port when governor steam valve is open?
A. Leak of steam by upper seat of steam valve.
MAIN RESERVOIRS.

Q. 42. What is the advantage of cooling the air before it leaves the main reservoir?
A. To drain the moisture from the air.
Q. 43. Where do we carry what is known as excess pressure?
A. In the main reservoir.
Q. 44. Where does the main reservoir pressure begin and end?
A. At the air pump and ends at the brake valve.
Q. 45. How does water in the main reservoir affect the operation of the brake?
A. Will affect the releasing of the brakes.
Q. 46. How often should the main reservoir be drained?
A. At the end of each trip.

BRAKE VALVES.

Q. 47. Name the different types of automatic brake valves on locomotives?
A. G-6, H-6.
Q. 48. Name the positions of the handle of the different types of automatic brake valves?
A. G-6 brake valve—Release, running, lap, service and emergency. H-6 brake valve—Release, running, holding, lap, service and emergency.
Q. 49. Name the valves in the different types in automatic brake valves?
A. Rotary valve, equalizing discharge valve, feed valve.
Q. 50. What are the duties of the different valves in the automatic brake valve?
A. Duties of rotary valve—To register the various ports in brake valve. Equalizing discharge valve—To vent air from the brake pipe to the at-
mosphere with brake valve in service position. Feed valve—To maintain a pre-determined pressure in the brake pipe with the brake valve in running position.

Q. 51. Trace the air through the brake valve in its different positions?

A. G-6 brake valve: Release position—Air is passed from the main reservoir to the brake pipe, direct; to chamber (D) through two ports, thence to black pointer on air gauge, to atmosphere through warning port. Running position—From main reservoir to brake pipe by way of feed valve, to chamber (D) through one port, to black pointer on air gauge. Lap position—All ports closed. Service position—From chamber (D) to atmosphere, from brake pipe to atmosphere, by way of equalizing discharge valve. Emergency position—From chamber (D) to atmosphere, from brake pipe to atmosphere, by way of rotary valve. H-6 brake valve: Release position—From main reservoir to brake pipe, by way of rotary valve, to chamber (D), thence to black pointer on gauge, to atmosphere through warning port. Running position—Main reservoir to brake pipe, by way of feed valve, to chamber (D), to black pointer on air gauge, from application cylinder to atmosphere. Holding position—From main reservoir to brake pipe by way of feed valve, to chamber (D), to black pointer on air gauge. Lap position—All ports closed. Service position—Chamber (D) to atmosphere, brake pipe to atmosphere, by way of equalizing discharge valve. Emergency position—Chamber (D) to atmosphere, brake pipe to atmosphere, by way of rotary valve, from main reservoir to application cylinder.

Q. 52. For what purpose is the small reservoir connected to the volume of air above the equalizing piston?

A. To increase the volume of air to chamber (D).
Q. 53. What is the purpose of the choke, and where is it located in the equalizing pipe?
A. To hold equalizing discharge valve seated when charging brake pipe. At T connection.

Q. 54. What is the proper size of the equalizing reservoir?
A. 10x14½".

Q. 55. In making a service application of the brakes, where does the first discharge of air escape and through what port?
A. From chamber (D) to atmosphere through preliminary exhaust.

Q. 56. What is the size of the preliminary exhaust port?
A. 5-64" or 1-16".

Q. 57. If preliminary exhaust port is of proper size, how long will it take to reduce the equalizing reservoir pressure from 70 to 50 pounds, with the handle of the brake valve in service position?
A. 5-64" port—6 to 7 seconds. 1-16" port—9 to 10 seconds.

Q. 58. When re-facing or grinding the rotary valve, what is the minimum distance allowable from the top of rotary valve to the body gasket seat.
A. 1⅞".

Q. 59. What kind of gasket is used for rotary valve key?
A. Leather.

Q. 60. What is the duty of the feed valve?
A. To maintain a pre-determined pressure in brake pipe, with brake valve in running position.

Q. 61. Name the different types of feed valve that are in use?
A. B-6, C-6.

Q. 62. Name the working parts of the feed valve?
A. Supply valve, supply piston, regulating valve, diaphragm and ring, and springs.
Q. 63. Describe the operation of the feed valve?
   A. Air from the main reservoir acting on the supply piston will force piston against spring, opening supply valve and allow the air to flow from main reservoir to the brake pipe, supply piston not being air tight permits air to leak by piston which flows to brake pipe by way of regulating valve until pressure in brake pipe exceeds the pressure of spring acting against diaphragm which will force diaphragm back and allow regulating valve to be seated. This will allow the pressure to equalize on the two sides of supply piston when a spring will force piston back and close supply valve.

Q. 64. What precautions must be used in grinding in the regulating valve?
   A. That the stem must be ground off to an equal amount of what was ground off from seat of valve.

Q. 65. When testing the feed valve, what is the allowable variation?
   A. Should not exceed two pounds.

Q. 66. With handle of brake valve in running position and full main reservoir pressure, what defects in the feed valve will prevent air passing to the brake pipe?
   A. Defective feed valve.

Q. 67. If brake pipe and main reservoir pressure become equal, where would you look for trouble?
   A. Leak of air through rotary valve, feed valve, body gasket or P. R. R. cut-out cock.

Q. 68. How would you test to determine whether trouble was with the rotary valve, feed valve, body gasket, or double-heading cock?
   A. To test for leak in feed valve, lap the brake valve. To test double-heading cock, make reduction of brake pipe pressure and close cut-out cock, put brake valve in running position. To test for leak in
rotary valve or body gasket, note the difference of increase of pressure in chamber (D) with brake valve in running and lap position.

Q. 69. Explain the purpose of the double-heading cock?
A. To cut main reservoir pressure away from brake valve on second engine.

Q. 70. What line of pipe is this cock placed in?
A. Main reservoir pipe.

Q. 71. When this cock is turned to cut-out position, what ports are open and what closed?
A. Cut-out position, ports will open from brake pipe to brake valve, ports closed from main reservoir to brake valve, from brake pipe exhaust to atmosphere.

Q. 72. Name the different positions of the straight air valve?
A. Release, lap and application.

Q. 73. Name the valves in the straight-air brake valve?
A. Release valve, application valve.

Q. 74. What additional parts are required when using this brake valve?
A. Reducing valve and double-seated check valve.

Q. 75. Trace the air through the straight-air brake valve in its different positions?
A. Release position—Brake cylinders to atmosphere. Application position—Main reservoirs to brake cylinder. Lap position—Ports are closed.

Q. 76. What type of valve is used to reduce the pressure between the main reservoir and the straight-air brake valve, and to what pressure is it adjusted?
A. Feed valve type. Adjusted to 45 pounds.

Q. 77. Where is a safety valve used in connection with the straight-air brake, and at what pressure should it be adjusted?
A. Connected to brake cylinders. Adjusted to 53 pounds.

Q. 78. Describe the operation of the double check valve.

A. In an automatic application the air from triple valve strikes on automatic side of double check valve, forcing it to the straight air side and allowing the air to flow to the brake cylinder. When brake is applied with straight air brake valve, the acting on opposite side of valve, forces it to the automatic side and allows the air to flow to brake cylinder.

Q. 79. What kind of seats have the valves in a straight-air brake valve and double check valve?

A. Leather.

Q. 80. Name the pipe connections to the straight-air brake valve?

A. Main reservoir pipe, brake cylinder pipe, exhaust pipe.

Q. 81. If the straight-air brake is applied and air blows out of the exhaust port of the triple valve, where would you look for the trouble?

A. Double seated check valve.

Q. 82. If the automatic brake valve is applied and air blows out of exhaust port of straight-air brake valve where would you look for the defect?

A. Double seated check valve.

Q. 83. If air blows out of the exhaust port of the straight-air brake valve with the handle in application position, what is the defect?

A. Exhaust valve in brake valve.

Q. 84. If air blows out of the exhaust port with handle of brake valve in release position, what is the defect?

A. Application valve.
Q. 85. With handle of straight-air brake valve in application position, and safety valve blows continuously, what will cause this trouble?
   A. Reducing valve or safety valve not set properly.

Q. 86. What will cause a continuous blow at the brake pipe exhaust, with the handle of the automatic brake valve in release, running, or lap position?
   A. Defective equalizing discharge valve.

Q. 87. What will cause an intermittent blow at the brake pipe exhaust, with handle in lap position?
   A. Leak of air from chamber (D).

Q. 88. With handle of brake valve placed in service position and no brake pipe exhaust can be obtained, where is the defect?
   A. Brake pipe exhaust plugged up, preliminary exhaust port plugged up or leak of air into chamber (D).

Q. 89. What would be the effect of the equalizing reservoir being partly filled with water?
   A. Preliminary reduction would be made too quick.

Q. 90. Name the positions of the independent brake valve, used in connection with the E. T. equipment?
   A. Release, running, lap, slow and quick application.

Q. 91. To what pressure should the reducing valve used in connection with the independent brake valve be adjusted?
   A. Forty-five pounds.

Q. 92. After this reducing valve is cleaned, how should it be lubricated?
   A. Slide valve and bushing should be lubricated with dry graphite.
Q. 93. What are the important features of the E. T. locomotive brake equipment?

A. A locomotive equipped with this brake may be used in any kind of service, such as high speed passenger, double pressure control, ordinary passenger or freight, or any kind of switching service, without change of special adjustment of the brake apparatus thus simplyfying locomotive brake apparatus, not only from an operative standpoint, but in the matter of maintenance as well. All valves are so designed that they may be removed for repairs and replacement without disturbing the pipe joint.

Q. 94. Name the essential parts of the E. T. equipment?

A. The air pump, main reservoir, pump governor, distributing valve, two brake valves, feed valve, reducing valve, two duplex air gauges, driver, tender, and truck brake cylinders, with necessary pipes and cocks, hose couplings and fittings.

Q. 95. Explain the difference between the G-6 and H-6 automatic brake valve?

A. G-6 brake valve has five positions. H-6 brake valve having six positions and will perform certain functions not possessed by the G-6 brake valve.

Q. 96. In removing the H-5 or S-6 brake valve, is it necessary to disconnect any pipe joints?

A. No.

Q. 97. Name the pipe connections to the distributing valve?

A. Reservoir supply pipe, application cylinder pipe, distributing valve exhaust pipe, brake cylinder pipe, brake pipe branch pipe.
Q. 98. To remove the distributing valve for repairs, is it necessary to disconnect any pipe joints?
A. No.

Q. 99. How many portions in the distributing valve? Name them?
A. Two. Application portion and equalizing portion.

Q. 100. Are both portions used in the automatic application of the brake? Independent?
A. Automatic application—Both portions. Independent application—Application portion.

Q. 101. From where do the engine brake cylinders receive their supply of air?
A. From main reservoir.

Q. 102. How many operative parts are there in the distributing valve?
A. Eight.

Q. 103. What are the duties of the operative parts of the distributing valve?
A. Application piston—Operates the application and exhaust valve. Application valve—Opens and closes the port from main reservoir to brake cylinder. Exhaust valve—Opens and closes port from brake cylinder to atmosphere. Equalizing piston—Opens and closes feed groove from brake pipe to pressure chamber and operates equalizing slide and graduating valve. Equalizing slide valve—Registers the ports from pressure chamber to application chamber and cylinder, also from application chamber and cylinder to atmosphere. Graduating valve—Measures the air from pressure chamber to application chamber and cylinder in service application. Emergency valve—Permits brake pipe pressure to enter the brake cylinder in the emergency application. Check valve—Prevents the brake cylinder pressure
from returning to brake pipe when pressure in brake cylinder exceeds pressure in brake pipe.

Q. 104. How many air gauges are used on locomotives having the E. T. brake equipment, and what does each pointer indicate?

A. Two. Red pointer on large gauge, main reservoir pressure. Black pointer on large gauge, chamber (D) pressure. Black pointer on small gauge, brake pipe pressure. Red pointer on small gauge, brake cylinder pressure.

Q. 105. Will excessive brake cylinder leakage affect the successful operation of this brake?

A. Yes.

Q. 106. What is the rule for removing the distributing valve for cleaning and testing?

A. Once each month.

Q. 107. Explain how the distributing valve must be cleaned and oiled?

A. Distributing valve should be removed and after taken apart should be well cleaned; feed groove to equalizing piston examined to know that it is clean. All parts of distributing valve should be examined to know that they are in good condition before assembling; slide valves and bushings should be lubricated with dry graphite. Equalizing piston and application piston should be lubricated with Dixon’s triple valve grease.

Q. 108. Describe the test for the distributing valve after being cleaned and repaired?

A. The test for a distributing valve should be made with 70 pounds brake pipe pressure; a 5-pound reduction should be made and note that distributing valve operates to apply brakes. Should then note by air gauges that there is no leak affecting the brake. Brake should then be released and applied with a full service application, noting what
pressure is developed in brake cylinder, that there was no indication of undesired quick action with either the light or heavy application, also that brake can be graduated off of engine with either the automatic or independent brake valves.

Q. 109. Are all distributing valves equipped with quick action caps?

A. Yes.

Q. 110. Is it important to maintain the standard piston travel on locomotives equipped with the E. T. brake equipment?

A. Yes.

Q. 111. What will cause brake cylinder pressure to increase after a light service application is made and the brake valve handle placed on lap?

A. A brake pipe leak or leak of air into application cylinder of distributing valve.

Q. 112. What will cause brake cylinder pressure to decrease when the brake valve handle is placed on lap after a service application?

A. A leak of air from application cylinder.

Q. 113. What will cause a blow at the exhaust port of the automatic brake valve with both brake valve handles in running position?

A. Leaky rotary valve in brake valve or leak in equalizing slide or graduating valve.

Q. 114. How can it be determined whether the air is coming from the main reservoir or pressure chamber?

A. By lapping the independent brake valve and noting that leak at brake valve has stopped.

Q. 115. How can it be determined if the application valve is leaking?

A. By a blow of air at distributing valve exhaust, while brake is released.
Q. 116. How would you tell if the exhaust valve was leaking?

A. By a blow of air at distributing valve exhaust, while brake is applied.

Q. 117. If brake releases after service application, with handle of automatic brake valve on lap, where would you look for the trouble?

A. Leak of air from application cylinder or application cylinder pipe.

Q. 118. If brake released after an independent application, what will be the probable defect?

A. A leak of air from application cylinder, application cylinder pipe, distributing valve release pipe, or safety valve.

Q. 119. If the cut-out cock in the main reservoir pipe is partly closed, or bushing turned, what will be the result when a service application is made?

A. Will affect the application of the engine brakes.

Q. 120. If an excessive heavy brake application is made and the brake released with the independent brake valve, why does it re-apply when the automatic brake valve is placed in running position?

A. Caused by an equalizing of the air between the application chamber and cylinder.

Q. 121. If the graduating valve on the equalizing slide valve leaks, what effect will it have on the brake of the second engine of a double-header?

A. Will cause engine brake to release.

Q. 122. How would you tell the difference between a leak through the application valve, and one through the emergency valve of the quick-action cap of the equalizing piston?
A. By closing cut-out cock in distributing valve supply pipe, and noting that leak at distributing valve exhaust has stopped.

Q. 123. Explain how the air brake equipment should be tested on locomotives equipped with the E. T. brake?

A. After the standard pressures have been obtained make a 5-pound brake pipe reduction, and with brake valve on lap, note what pressure was developed in brake cylinders, also note by air gauges that brake cylinder pressure is not affected by leaks or that there is any leak affecting the brake pipe pressure, after which place brake valve on holding position to note that engine brakes remain applied, after which place brake valve on running position and note what pressure the feed valve closes at, also that engine brakes release. After being charged up, make a full service application and note the time required to make a 20-pound chamber (D) reduction. Also that equalizing discharge valve responds promptly, that there is no indication of undesired quick action; also how much brake cylinder pressure was obtained, after which place brake valve on release position and allow the brake pipe to charge a few pounds higher than feed valve closes at, then return to running position and note what pressure the feed valve opens at. The brake should then be applied in full with the independent valve and note how much brake cylinder pressure is obtained and that there is no leak affecting the brake cylinder pressure and that this valve will release engine brakes in running position if the automatic valve is on running position or will release engine brakes in release position if automatic brake is applied.
Q. 124. How many cocks on the main brake pipe and where are they located?
A. Two. One at each end.

Q. 125. How does the handle of an angle cock stand when it is open?
A. In line with pipe.

Q. 126. How does the handle of a stop cock stand when it is open?
A. Cross wise with pipe.

Q. 127. If the handle of either of these cocks are gone, how can it be told if they are open?
A. By a port mark on top of the cock.

Q. 128. How many branch pipes lead from the main brake pipe on a locomotive? On a tender?
A. Two on locomotive. One on tender.

Q. 129. Do any of these pipes have a cut-out cock in them?
A. Pipes leading to triple valve have cut-out cocks.

Q. 130. How does the handle of this cock stand when open?
A. Handle crosswise of pipe.

Q. 131. What is the pipe called that connects the brake pipe with the triple valve?
A. Branch pipe.

Q. 132. How many strainers must the air pass through from the brake pipe to the triple valve?
A. Two.

Q. 133. What are the instructions regarding the hose that is removed from locomotives and tenders?
A. Figures cut out on badge plate to show date when hose was applied and removed.
TRIPLE VALVES, AUXILIARY RESERVOIRS AND BRAKE CYLINDERS.

Q. 134. Where is the plain triple valve used?
A. On locomotives.

Q. 135. Where is the cut-out cock located to cut out the plain triple valve on locomotives?
A. In triple valve or branch pipe.

Q. 136. What is the position of this handle when open?
A. Old plain triple valve, handle in line with branch pipe. Improved plain triple, handle crosswise with pipe.

Q. 137. With the triple valve in the release position and a constant pressure of 70 pounds in the brake pipe, how long should it take to charge the auxiliary reservoir from zero to 70 pounds?
A. Minute and a half to two minutes.

Q. 138. Name the working parts of the plain triple valve?
A. Triple piston, slide valve and graduating valve.

Q. 139. Name the additional working parts of the quick-action triple valve?
A. Emergency piston, emergency valve and check valve.

Q. 140. Name the different gaskets used in the quick-action triple valve, giving material of which each is composed?

Q. 141. How many positions has the triple valve?
A. Four.
Q. 142. Through what port does the air pass in going from the brake pipe to the auxiliary reservoir?

A. Feed groove.

Q. 143. Why is this port made so small?

A. To make the brake uniform.

Q. 144. What is the duty of the main triple piston? Slide valve? Graduating valve?

A. Triple piston—Opens and closes the feed groove, and moves the slide and graduating valve. Slide valve—Registers the ports from auxiliary reservoir to brake cylinder and from brake cylinder to atmosphere. Graduating valve—Measures the air from auxiliary reservoir to brake cylinder in service application of brake.

Q. 145. What is the duty of the emergency piston? Emergency valve? Check valve?

A. Emergency piston unseats the emergency valve. The emergency valve admits air from the brake pipe to the brake cylinder in the emergency application of the brakes. The check valve prevents the brake cylinder air from returning to brake pipe when brake cylinder pressure is greater than brake pipe pressure.

Q. 146. What causes the triple valve to move from release to application position?

A. A reduction of brake pipe pressure.

Q. 147. What causes the triple piston to move from lap to release position?

A. An increase of brake pipe pressure or reduction of auxiliary pressure.

Q. 148. What causes the triple valve to assume lap position?

A. Not a sufficient difference, in brake pipe and auxiliary pressure to cause triple to move to release.
Q. 149. Are feed ports in different triple valves of different size? Why?
A. No. Brake would not be uniform.

Q. 150. Give some of the causes of undesired quick action?
A. A dirty triple valve; weak or broken graduating spring; broken graduating pin; a brake pipe leak close to triple valve; restricted air ports in triple valve; triple used on wrong equipment, a light reduction of air on a long train.

Q. 151. Name the defects in a quick-action triple valve that will cause a blow at the exhaust port?
A. Slide valve leaking, emergency valve leaking, a leak through a body gasket, check case gasket or induction pipe.

Q. 152. How can it be determined whether the air is coming from the auxiliary reservoir or brake pipe?
A. By closing cut-out cock on branch pipe. If brake applies leak is from brake pipe.

Q. 153. If the emergency valve remained off its seat and a strong blow of air was escaping at the triple valve exhaust, how would you proceed to get the valve seated and stop the blow?
A. By closing cut-out cock and bleeding auxiliary reservoir, then open cut-out cock quick, or by using the brake in the emergency.

Q. 154. When does a leaky brake pipe check valve affect the holding power of the brake?
A. At any time the brake pipe pressure has been reduced below brake cylinder pressure.

Q. 155. What is the effect of a leaky graduating valve?
A. To release brakes on light application.
Q. 156. What is the effect of an auxiliary reservoir leak to the atmosphere?
A. To release brakes.

Q. 157. If the brakes release without any escape of air from the triple valve exhaust, what is the defect?
A. Leak from brake cylinder.

Q. 158. How often should a triple valve be cleaned, lubricated and tested?
A. On engine once a month.

Q. 159. If the air escapes from the exhaust port of the triple valve when the brake is applied, where is the defect?
A. Slide valve leaking.

Q. 160. What type of triple valve should be used on tenders having 10" cylinder? 12" cylinder? 14" cylinder?
A. 10" cylinder—P-1 triple valve. 12" or 14" cylinders—P-2 triple valves.

Q. 161. What size auxiliary reservoir should be used with a 10" cylinder? 12" cylinder? 14" cylinder?
A. 10" cylinder—12x33. 12" cylinder—14x33. 14" cylinder—16x33.

Q. 162. Should a type K triple valve be used on tenders?
A. No.

Q. 163. How can you distinguish the different types of triple valves?
A. Plain triple valves, by cut-out cocks; freight and passenger triple valves, by exhaust ports; K triple valves, by fin on body of triple. Different sizes of triple valves designated by reservoir flange hole or by stencil marks on triple valve.
Q. 164. Will a leaky graduating valve cause a blow at the triple valve exhaust?
A. No.
Q. 165. What will be the result if the triple piston does not make a good joint against the cylinder cap gasket when an emergency application of the brake is made?
A. Cause brake to release.
Q. 166. Name the operating parts in the brake cylinder?
A. Release spring, piston head, follower plate, packing leather, expander ring.
Q. 167. Have all brake cylinders a leakage groove?
A. No.
Q. 168. What causes the brake cylinder piston to return to the release position?
A. Release spring.

TRAIN AIR SIGNAL AND HIGH SPEED BRAKE.

Q. 169. What are the essential parts necessary to equip a locomotive with the train air signal system?
A. Reducing valve, signal valve and necessary pipes and cocks.
Q. 170. What is the purpose of the air signal equipment?
A. To transmit signals from train to engineer.
Q. 171. How many pounds pressure do we carry in the signal pipe?
A. Forty-five pounds.
Q. 172. Where do we obtain this pressure?
A. Main reservoir.
Q. 173. What style cocks are used on the signal pipe on a locomotive and tender?
A. Stop cocks.

Q. 174. How do these cocks stand in relation to the pipe when they are open?
A. Handle crosswise of pipe.

Q. 175. Explain in detail how a test of the signal apparatus should be made?
A. Test should be made from front and rear of locomotive with a test device.

Q. 176. Is there a cut-out cock in the old type signal reducing valve?
A. Yes.

Q. 177. What type of reducing valve is used to reduce the pressure with the E. T. equipment?
A. Feed valve type.

Q. 178. Through what must this air pass to reach the signal line?
A. Through strainer and choke fitting.

Q. 179. Why is there a choke fitting between the reducing valve and the signal line?
A. So as not to interfere with the reductions made in signal line.

Q. 180. What additional apparatus must be applied to a locomotive to equip it for the high speed brake?
A. High speed reducing valves.

Q. 181. What is the object of the high speed brake?
A. To give a more efficient brake for trains running at high speed.

Q. 182. To what pressure is the high speed reducing valve adjusted?
A. Sixty pounds.
Q. 183. To what part of the air brake system is the high speed reducing valve connected?
A. To brake cylinders.

Q. 184. What are the instructions relative to cleaning the high speed reducing valve?
A. The same as to triple valves.

Q. 185. Should the brake pipe and main reservoir pressure be increased, when a freight engine takes charge of a passenger train?
A. Yes.

Q. 186. What would be the effect if the opening in the cap at the bottom of the reducing valve was stopped with a plug, or frozen shut?
A. To cause valve to become inoperative.

Q. 187. How is the high speed reducing valve adjusted?
A. By an adjusting nut in bottom of valve.

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EXAMINATION ON INSTRUCTIONS FOR INSPECTORS.

Q. 188. How much pressure should be obtained in the main reservoir before increasing the speed of the pump to its maximum?
A. Thirty to forty pounds.

Q. 189. How often should the air gauges be tested?
A. Once a month.

Q. 190. How much variation should be allowed between the gauges on a locomotive and the test gauge before the gauge is removed?
A. Not to exceed three pounds.
Q. 191. How would you test for leaky or defective packing ring in equalizing piston in the automatic brake valve?
   A. By lapping automatic brake valve, draining the air from the brake pipe, then note black pointer on air gauge.

Q. 192. What is the proper piston travel on driving wheel brakes of the equalized type?
   A. Four inches.

Q. 193. What is the proper piston travel for the engine truck brake cylinder?
   A. Five inches.

Q. 194. What is the proper piston travel on the tender?
   A. Six inches.

Q. 195. How should a defective brake be cut out on a tender having a triple valve and auxiliary reservoir?
   A. Close cut-out cock in branch pipe and drain auxiliary reservoir.

Q. 196. How would you cut the brake out if the tender was equipped with a triple valve and the engine was fitted with the E. T. equipment?
   A. By closing cock in brake cylinder pipe from distributing valve; also close cut-out cock in branch pipe and drain auxiliary reservoir.

Q. 197. On a tender equipped with a triple valve and auxiliary reservoir running behind an engine fitted with the E. T. equipment, do we use a double check valve?
   A. Yes.

Q. 198. What should be done to the badge plate of all hose when applied and removed?
   A. Dates removed showing time when hose was applied and removed.
Q. 199. What is the proper method of adjusting the tender brake?
A. By adjusting lever on both trucks.

Q. 200. How is the date marked on a locomotive to show the last date of cleaning of triple valve and brake cylinders?
A. By using tags.

Q. 201. How should the triple valve gaskets be applied?
A. Cylinder cap gasket—Smooth side of leather to triple piston. Body gasket—Rib side of gasket to triple valve; and check case gasket—Rib side of gasket to check case.

Q. 202. Explain in detail how a brake cylinder should be cleaned and lubricated?
A. Piston should be clamped to non-pressure head, and piston then removed from cylinder. Cylinder to be washed out with carbon oil until all hard grease is removed. Examine leakage groove and if found dirty, dirt to be removed with some soft tool. After cylinder has been cleaned a small amount of Marbin's compound to be used in cylinder. Follower plate to be removed and packing leather examined, if leather is found in good condition, to be well cleaned and replaced. The expander ring to be examined to know that it fits cylinder properly. Before replacing the piston, Marbin's compound should be used freely between follower plate and leather.

Q. 203. What kind of grease should be used?
A. Marbin's compound.

Q. 204. At what point in the cylinder should the opening in the expander ring be placed when the piston is put in place?
A. To the top, one-quarter of a turn away from leakage groove.
Q. 205. How much opening should the expander ring have?
A. The minimum one-fourth inch; the maximum five-eighth inch.

Q. 206. After the piston is in the cylinder how can it be ascertained whether the expander ring is in position or not?
A. After piston is in cylinder move piston rod or sleeve in circle to indicate about eight inches.

Q. 207. What are the instructions regarding the use of sharp tools in entering the brake piston leather into the cylinder?
A. Not to be used.

Q. 208. How would you test the brake cylinder for leakage on an engine having the G-6 valve? With the E. T. equipment?
A. By using gauge in triple valve exhaust for G-6 brake valve. E. T. equipment—Using gauge indicating brake cylinder pressure on engine.

Q. 209. How often should the air brake and signal apparatus be tested?
A. At the end of each trip.

Q. 210. What is the maximum allowable brake cylinder leakage, at the time the cylinder is cleaned and lubricated?
A. Not to exceed five pounds per minute.

Q. 211. What attention should be given the flexible connections between engine and tender?
A. To know they are in good condition and not leaking.
GENERAL QUESTIONS AND ANSWERS ON THE AIR BRAKE SUBJECT.

Q. 1. What do you understand by the term automatic brake?
   A. Self-acting or a brake that will work within itself.

Q. 2. What are the essential parts of the automatic quick-action brake as applied to a car?
   A. Triple valve, auxiliary reservoir, brake cylinder, necessary piping and cocks.

Q. 3. Name the different air pressures necessary to maintain and operate the automatic brake?
   A. Atmosphere, main reservoir, brake pipe, auxiliary reservoir and brake cylinder.

Q. 4. From where is the compressed air obtained?
   A. From the atmosphere.

Q. 5. Why is there more pressure carried in the main reservoir than in the brake pipe?
   A. So as to get a prompt recharging of the brake pipe.

Q. 6. Where does the brake pipe pressure begin and end?
   A. Begins at brake valve and ends at triple valve.

Q. 7. What is the brake pipe pressure used for?
A. For charging the auxiliary reservoirs and operating triple valves.

Q. 8. How many pounds pressure is carried in brake pipe, freight and passenger?

Q. 9. From brake pipe where does the air go and what pressure is it then called?
A. To auxiliary reservoir and it is then called auxiliary reservoir pressure.

Q. 10. How many pounds pressure is carried in auxiliary reservoir?

Q. 11. What is auxiliary reservoir pressure used for?
A. Used to apply the brake.

Q. 12. When air leaves the auxiliary reservoir, where does it go to apply the brakes?
A. To the brake cylinders.

Q. 13. Where does the brake cylinder pressure go when brakes are released?
A. To the atmosphere.

Q. 14. What are the duties of the triple valve?
A. To charge the auxiliary reservoir; to apply and release the brake.

Q. 15. How is the service application made? Emergency?
A. Service application made by reducing the brake pipe pressure slowly. Emergency application made by reducing the brake pipe pressure suddenly.

Q. 16. With cars standing on grades, should the hand brakes or air brakes be used to hold the cars?
A. The hand brakes.
BRAKE PIPE AND CONNECTIONS.

Q. 17. What is the correct location and position of the angle cocks at the end of the car?
A. Thirteen inches from center of car to center of angle cock at an angle of 45 degrees for wooden cars; fifteen degrees for steel cars, pointing to center of track.

Q. 18. How many branch pipes lead away from the main brake pipe on freight cars? On passenger cars?
A. Freight cars—One. Passenger cars—Two to four pipes.

Q. 19. Are there any cocks in this branch line, and what are they called?
A. Yes; called the cut-out cocks.

Q. 20. What kind of handles do these cocks have, and how do they stand?
A. Straight handles; crosswise of pipe when open.

Q. 21. If there is no handle on angle cock or cut-out cock, how can you tell whether cock is open or closed?
A. By a port mark on top of cocks.

Q. 22. How many strainers does the air pass through in the brake pipe? Where located?
A. Two. One at triple valve and one at T connection at main pipe.

Q. 23. On some cars, what takes the place of the brake pipe strainer?
A. Centrifugal dirt collector.

Q. 24. What particular attention should be given to the centrifugal dirt collector?
A. To be examined to know that it is not filled with dirt or water.
Q. 25. What particular attention should be given to the brake pipe and branches in reference to clamping?

A. To know that pipes are properly clamped.

Q. 26. What kind of gaskets should be used in union or T connections where old style unions or T’s are used?

A. Leather gaskets.

Q. 27. In case of a broken branch pipe between the main brake pipe and cut-out cock on a perishable loaded car, how could temporary repairs be made so main brake pipe could be used?

A. By reversing the broken pipe.

Q. 28. In making up a passenger or freight train, what particular attention should be given to the rear car of the train?

A. To know that hand brake is in good condition on a freight train, and air brake is working on last car of passenger train.

Q. 29. If necessary to place a car on the rear of a train with a defective brake pipe, how should the hose couplings and angle cocks be arranged between the two rear cars?

A. Air hose should be coupled, angle cock closed on car with broken pipe, and open on car ahead.

Q. 30. Should a passenger train leave a terminal station with a defective brake pipe, branch pipe, or conductor’s valve on the rear of a train?

A. No.

Q. 31. Is there a cut-out cock in the branch pipe to the conductor’s valve?

A. No.

Q. 32. Do Pullman and private cars have more than one conductor’s valve? Where are they located?

A. Yes. Usually in toilet of car.
DEFECT CARD M. P. 276.

Q. 33. For what kind of a defect should the red or M. P. 276 card be used?
A. For all air-brake defects on freight cars.
Q. 34. For what kind of equipment is an M. P. 217 card used?
A. Passenger equipment.
Q. 35. Where should M. P. 276 cards be placed?
A. Should be placed one at each angle cock for defects in main brake pipe; for other defects, should be placed on branch pipe to triple valve.
Q. 36. What disposition should be made of M. P. 276 cards when removed?
A. Should be sent to the Superintendent of Motive Power.

TRIPLE VALVES, AUXILIARY RESERVOIRS, BRAKE CYLINDERS AND RETAINING VALVES.

Q. 37. Name the types of triple valves used on freight cars? On passenger cars?
A. Freight cars—H and K. Passenger cars—P and L.
Q. 38. What function does the K triple valve possess in addition to the old style, or H type of quick-action triple valve?
A. Quick service and retarded release.
Q. 39. How should release valve on auxiliary reservoir be operated to release a brake?
A. Should be held open until air starts to escape from brake cylinder.
Q. 40. Name the working parts in the quick-action triple valve?
   A. Triple piston, slide valve, graduating valve, emergency piston, emergency valve and check valve.

Q. 41. Name the operating parts in the K type triple valve?
   A. The same as quick-acting triple with the addition of retarding stem and spring.

Q. 42. Name the different operating positions of the standard quick action triple valve? The K type triple valve?
   A. Quick-acting triple—Release, service, lap and emergency. K triple valve—Full release, retarded release, full service, quick service, lap and the emergency.

Q. 43. How can you tell a freight triple valve from a passenger triple valve?
   A. By the exhaust ports.

Q. 44. How can you tell an H type of triple valve from a K type triple valve?
   A. By a fin on body of a K triple valve.

Q. 45. Trace the air through the quick-action and K triple valves in their different positions, and describe the duties of all working parts?
   A. Quick-action triple valve: In release position—Air is passing from brake pipe to auxiliary reservoir, and from brake cylinder to atmosphere. In service position—Air is passing from auxiliary reservoir to brake cylinder. Lap position—All ports are closed. Emergency position—Air is passing from auxiliary reservoir to brake cylinder, also from brake pipe to brake cylinder. K triple valve is practically the same as quick-acting triple, except in quick service position, when it vents air from the brake pipe to the brake cylinder. Triple piston—opens and...
closes the feed groove, moves the slide and gradu-
ating valve. Slide valve—Registers the ports from auxiliary to the brake cylinder, and from the brake cylinder to atmosphere. Graduating valve—Meas-
ures the air from the auxiliary reservoir to the brake cylinder in service application. Emergency piston—Unseats the emergency valve. Emergency valve—Permits brake cylinder pressure to enter the brake cylinder in the emergency position. Check valve—Prevents brake cylinder pressure from returning to brake pipe when brake cylinder pressure is higher than brake pipe pressure.

Q. What are the duties of the retarding stem and spring in the K type triple valve.

A. To prevent triple valve from going to retarded release position.

Q. 46. With triple valve in release position and a pressure of 70 pounds in the brake pipe, how long will it take to charge up an auxiliary reservoir to 70 pounds?

A. A minute and a half to two minutes.

Q. 47. Why does it take so long to charge the auxiliary reservoir?

A. On account of feed groove being so small.

Q. 48. Can you charge four or five cars as quickly as one? Can fifty cars be charged as quickly as four or five?

A. Four or five cars—Yes. Fifty cars—No.

Q. 49. Name some of the defects that will cause undesired quick action in a triple valve?

A. Dirty triple valve, broken graduating spring or pin, restricted air ports in triple valve, triple used on wrong equipment, bad leak of air from brake pipe close to triple valve, light reduction on long trains.

Q. 50. What are the instructions for locating triple valves which go into undesired quick action?
A. For long trains—To section the train. For a few cars—By making a light application.

Q. 51. What defects will cause a blow at the exhaust port of the triple valve in release position?
A. Slide valve or emergency valve leaking, check-case gasket or body gasket leaking, induction pipe leaking.

Q. 52. How can you tell whether the air escaping at the triple valve exhaust port is coming from the auxiliary reservoir or the brake pipe?
A. By closing cut-out cock in branch pipe, and brake applies, indicates that leak is from brake pipe.

Q. 53. If the emergency valve remains off its seat and a strong blow escapes at the triple valve exhaust, how would you reseat valve and release brakes?
A. By closing cut-out cock, draining auxiliary reservoir, then open cut-out cock quick, or by using the brake in the emergency.

Q. 54. How does a leaking brake pipe check valve affect the brake and at what time? Leaking graduating valve?
A. Will leak brake off, when brake pipe pressure is below brake cylinder pressure. Graduating valve will leak brake off on light application.

Q. 55. How does one triple valve going to quick action affect the rest of the triple valves in the train?
A. Will cause all triple valves to go to the emergency.

Q. 56. Can an H-1 or K-1 triple valve be put on the same bracket as a P-1 triple valve on passenger equipment cars, and what would be the effect?
A. Yes. Likely undesired quick action.

Q. 57. How often should triple valves in freight service be cleaned, lubricated and tested? On passenger equipment?
A. Freight service—At least every twelve months. Passenger equipment—Once every six months.

Q. 58. How should triple valve be cleaned, lubricated and tested?

A. Triple valve should be taken off car and taken apart, all parts of triple well cleaned and examined to know they are in good condition. Slide valve and bushing should be lubricated with dry graphite. Triple piston and bushing to be lubricated with Dixon’s triple valve grease, and tested on a suitable rack.

Q. 59. When replacing a triple valve, how should the gaskets be applied?

A. Cylinder cap gasket—Smooth side of leather to piston. Body gasket—With ribs next to triple valve.

Q. 60. When putting on check valve case gasket, should the rib side be placed next to triple valve body or check valve case?

A. Rib side next to check valve case.

Q. 61. Name the operating parts of a brake cylinder?

A. Release spring, piston head, follower plate, packing leather, expander ring.

Q. 62. Why is a leakage groove placed in brake cylinder?

A. To get rid of any small amount of air that gets to the brake cylinder at an undesired time.

Q. 63. How often should brake cylinders be cleaned, lubricated and tested on freight cars? On passenger cars?

A. Same as triple valve.

Q. 64. Why is it necessary that cylinder and reservoirs be properly tightened up and all pipes properly clamped?
A. So as not to create leaks in pipe or fall off of car?

Q. 65. What should be done with the old stencil marks and how should car be stenciled?

A. Remove old stencil marks and re-stencil car.

Q. 66. In putting in a new packing leather, should the flesh or skin side be placed next to the walls of the cylinder?

A. Flesh side next to walls of cylinder.

Q. 67. How should the brake cylinder be cleaned and lubricated?

A. Piston should be clamped to non-pressure head and piston then removed from cylinder. Cylinder to be washed out with carbon oil until all hard grease is removed. Examine leakage groove and if found dirty, dirt to be removed with some soft tool. After cylinder has been cleaned a small amount of Marbin’s compound to be used in cylinder. Follower plate to be removed and packing leather examined; if leather is found in good condition, to be well cleaned and replaced. The expander ring to be examined to know that it fits cylinder properly. Before replacing the piston Marbin’s compound should be used freely between follower plate and leather.

Q. 68. In entering the piston in the brake cylinder what precautions must be taken to prevent injury to the packing leather?

A. Not to use any sharp tool.

Q. 69. What test will you make to determine if expander ring is in proper place?

A. By moving piston rod or sleeve in circle to indicate about eight inches.

Q. 70. In case studs came out of piston head when renewing the cylinder packing leather, what must be done to prevent cylinder leaking?

A. Studs should be renewed.
Q. 71. After all parts of the cylinder have been replaced, what kind of a test should be made?

A. A test to determine the amount of cylinder leak.

Q. 72. What is the maximum allowable leakage per minute when testing brake cylinders?

A. Not to exceed five pounds per minute.

Q. 73. Give list of standard tools for air-brake repairmen as shown on plate one of the Air Brake Train Air Signal Instructions No. 99.

A. Piston sleeve clamp, emergency valve seat lifter and puller, two 8" S wrenches, a socket wrench, cleaning tool for feed and leakage groove, grease pail, crow-foot wrench, one pair 8" pipe tongs, two No. 3, one No. 4, and one No. 4½ alligator wrenches, one 24" trimo, one 8" and one 14" pipe wrenches, one 16" screw wrench, six assorted cold chisels, six assorted files, one coupling tool cleaning groove, suitable box for tools and old cylinder to form up packing leathers.

Q. 74. What apparatus is used for testing air brakes on cars?

A. Authorized test device.

Q. 75. What are retaining valves used for?

A. To retain the air in the brake cylinder with triple valve on release position.

Q. 76. To what are they piped?

A. To triple valves.

Q. 77. How many kinds of retaining valves are in use?

A. Two.

Q. 78. How many positions has the old style retaining valve? What pressure do they retain?

A. Old style has two. Fifteen pounds.

Q. 79. How should they be tested?
A. By turning handle up on retaining valve and applying and releasing the brake.

Q. 80. What pressure does the three-position retaining valve hold in brake cylinder when the handle is at an angle of 45 degrees? At right angle?

A. Angle of 45 degrees—Fifty pounds. At right angle—Twenty-five pounds.

Q. 81. What kind of cars are equipped with the three-position retaining valve?

A. Steel cars.

Q. 82. Describe the action of the three-position retaining valve?

A. With handle of retaining valve turned down, air is vented to the atmosphere through bottom port of retaining valve; with handle of retaining valve at 45 degrees, air port in bottom of retaining valve is closed. The air must then lift two weights in valve so as to escape to the atmosphere. With handle of retaining valve at right angle, one weight in valve is lifted by the handle, the air need only lift the one weight to escape.

HIGH SPEED BRAKE, AUXILIARY RESERVOIR AND TRAIN AIR SIGNAL.

Q. 83. What additional equipment is necessary on passenger equipment cars when using the high speed brake?

A. High speed reducing valves.

Q. 84. To what is the high speed reducing valve connected?

A. To the brake cylinder.

Q. 85. To what pressure is this valve adjusted?

A. Sixty pounds.
Q. 86. What pressure is carried in brake pipe and auxiliary reservoir when using the high speed brake?
A. One hundred and ten (110) pounds.

Q. 87. Name the operating parts of the high speed reducing valve?
A. Slide valve, piston, spring abutment, tension spring, regulating nut and cap nut.

Q. 88. How is this valve adjusted?
A. By the adjusting nut.

Q. 89. When should this valve be cleaned and lubricated?
A. At the same time the triple valve and brake cylinders are cleaned.

Q. 90. Are all passenger equipment cars equipped with the high speed reducing valves?
A. Yes.

Q. 91. To what pressure is the safety valve set?
A. Sixty pounds.

Q. 92. If a car is placed in a passenger train carrying 110 pounds brake pipe pressure that has no safety valve or high speed reducing valve, what must be done?
A. Notify the engineer and use the high speed brake.

Q. 93. What is the proper size auxiliary reservoirs on passenger equipment cars equipped with a 10", 12", 14", 16" and 18" cylinder?
A. 10"—12x33. 12"—14x33. 14"—16x33. 16"—16x42. 18"—16x48.

Q. 94. What size triple valves of the P or L type is used on 10", 12", 14", 16" and 18" cylinders?
A. 10"—P-1. 12", 14", 16"—P-2. 18"—L-3.
Q. 95. What other reservoirs do we have on some passenger equipment cars other than auxiliary reservoirs?
   A. Reservoirs for carburetor lights and water raising system.

Q. 96. How are the water raising system storage and carburetor tanks charged with air?
   A. The reservoir for carburetor light is charged from the auxiliary reservoir through a check valve. The reservoir for water raising system is charged from the auxiliary reservoir through a governor.

Q. 97. How much pressure is carried in water raising system and carburetor storage tanks?
   A. 110 pounds.

Q. 98. How should a test for a leaky dust-guard and check valve on carburetor cars be made?
   A. By having the car charged up and bleeding the auxiliary reservoir, then note the leak of air from storage tank to the auxiliary reservoir.

Q. 99. With a broken brake rigging on a car with the carburetor lighting system or with the water raising system, how could you get air to operate the system?
   A. By removing the plug in high speed reducing valve or unconnecting pipe to high speed reducing valve.

Q. 100. Does it take longer to charge the reservoir on a car having the carburetor or water raising system?
   A. Yes.

Q. 101. What other air pipe is used on passenger equipment cars?
   A. Signal pipe.

Q. 102. What kind of cocks are on the main signal pipe?
   A. Stop cocks.
Q. 103. In what position does the handle of cut-out cock stand when open?
   A. Crosswise of pipe.

Q. 104. How many branch pipes lead from the signal pipe?
   A. One to two.

Q. 105. Where does it lead to?
   A. To the car discharge valve.

Q. 106. Where are the cut-out cocks in the branch pipe located and what kind of handles do they have?
   A. Usually in toilet. Handles straight.

Q. 107. From where does the signal pipe receive its supply of air?
   A. From main reservoir.

Q. 108. What pressure is carried in the signal line?
   A. Forty-five pounds.

Q. 109. Is there a strainer in the signal line? Where located?
   A. Strainer located at T connections in main pipe.

Q. 110. How must a car discharge valve be operated?
   A. Should be opened quick.

Q. 111. If a car discharge valve is open and a very weak blast of air comes out of it and whistle does not blow on engine, what could be wrong if car discharge valves operate properly on other cars in train?
   A. Defective car discharge valve; or cut-out cock in branch pipe partly closed.

Q. 112. If no air comes out of the car discharge valve on one car and operates on cars ahead or in rear of this car, what could be wrong?
A. Cut-out cock closed in branch pipe.

Q. 113. Will signal hose coupling couple freely with air brake hose coupling?
A. No.

Q. 114. In case you find a train coming into terminal station with the signal hose coupled to the brake hose coupling on a car having a defective brake pipe, what should be done with the signal hose coupling after repairs are made to brake pipe on this car?
A. Hose should be removed and new hose applied.

Q. 115. What passenger equipment cars if any, have more than one complete air brake equipment?
A. Steel Pullman cars.

Q. 116. How would you proceed to cut out one of these brakes on account of defects?
A. The same as cutting out brake on other cars.

Q. 117. On cars having two independent air brake equipments, is the hand brake arrangement connected to both trucks?
A. Yes.

Q. 118. Have you noticed there is a new passenger brake equipment in service on a number of the steel passenger equipment cars?
A. Yes.

Q. 119. What is the object of this new air brake equipment?
A. To provide a brake of greater efficiency in passenger service.

Q. 120. What is the name of this equipment when complete?
A. The Westinghouse Universal Common Standard Electro-pneumatic (Type U. C.).
Q. 121. Will this brake operate in harmony with other air brake equipment in the same train?
A. Yes.

Q. 122. What are the essential parts of this equipment?
A. Universal valve, auxiliary, service and emergency reservoirs, cut-off valve in emergency reservoir pipe, brake cylinder, cut-out cock in brake cylinder pipe, slack adjuster, electric attachments when complete, and with necessary piping and cocks.

Q. 123. How many parts compose the complete Universal Valve?
A. Five.

Q. 124. What part of this equipment is being applied at this time?
A. All except the electric portion in steam service. The electric portion is applied to the electric trains.

Q. 125. Is the bracket to which the Universal Valve is secured used for any other purpose?
A. Yes, for all pipe connections.

Q. 126. What are the duties of the equalizing portions?
A. It controls the charging of the reservoirs, the application and release of brakes in service, and through the medium of quick action portion, the application and release of brakes in emergency.

Q. 127. What does the equalizing portion consist of?
A. Equalizing piston, slide and graduating valve, graduated release piston, reduction limiting valve, release piston and slide valve, service reservoir charging valve, service port check valve, emergency reservoir charging port check valve and graduated release cap.
Q. 128. What is the duty of the equalizing piston?
A. It opens and closes the auxiliary reservoir feed groove and emergency reservoir charging port and actuates the movements of the equalizing slide and graduating valve.

Q. 129. What is the duty of the equalizing slide valve?
A. In release position it separates the service reservoir from the auxiliary reservoir; connects the release end of the release piston to atmosphere by way of the graduating valve; blanks the port leading to application end of release piston, and closes the service port. In application position it connects the service reservoir to the auxiliary reservoir; blanks the port leading to release end of release piston; connects the port leading to application end of release piston to atmosphere, and opens the service port to brake cylinder.

Q. 130. What is the duty of the graduating valve?
A. In release position it closes the service port in the slide valve; connects the release end of the release piston, through the slide valve to the atmosphere, and connects the auxiliary reservoir pressure to the resistance increasing cavities in the slide valve. In application position it opens the service port in the equalizing slide valve; connects the application end of release piston to the atmosphere; closes the communication from the release end of release piston to the atmosphere, and connects the resistance increasing cavities to the atmosphere.

Q. 131. What is the duty of the reduction limiting valve?
A. To limit the brake pipe reduction to that necessary for equalization when operating electrically.
Q. 132. What is the duty of the release piston and its slide valve?

A. Release piston operates the release slide valve. Release slide valve opens the emergency reservoir charging port, service reservoir charging port, graduated release port, high pressure valve port and brake cylinder exhaust port. In application position it closes these same ports.

Q. 133. What is the duty of the service reservoir charging valve?

A. To prevent the charging of service reservoir until auxiliary reservoir has been charged to within five pounds of the emergency reservoir.

Q. 134. What is the duty of the service port check valve?

A. To permit air to flow from auxiliary and service reservoirs to brake cylinder and to prevent it from flowing back from the brake cylinder into these reservoirs.

Q. 135. Why is this check valve necessary?

A. The service port check valve prevents the air in the brake cylinder from flowing back into the auxiliary and service reservoirs through the service port.

Q. 136. What is the duty of the emergency charging port check valve?

A. To prevent emergency reservoir pressure from passing back to equalizing piston chamber and brake pipe.

Q. 137. What is the duty of the graduated release piston?

A. To stop equalizing piston and slide valve in graduated release position.

Q. 138. What is the purpose of the graduated release cap?
A. To change the valve from direct to graduated release or vice versa.

Q. 139. Of what does the quick action portion and high pressure cap consist?

A. Emergency piston, graduating valve, slide valve, protection valve, high pressure valve, intercepting valve, cut-out valve, safety valve, quick action piston and valve, quick action chamber and quick action closing chamber.

Q. 140. What is the duty of the emergency piston and its slide valve?

A. The emergency piston opens and closes the quick action chamber feed groove, and operates the graduating valve and slide valve. The duties of the slide valve in release position are to open the quick action closing chamber port and connect the face of the high pressure valve and cut-out valve to the atmosphere. In application position it first connects the quick action chamber to the quick action piston and emergency switch piston then closes these ports and opens a connection from the quick action closing chamber to the quick action piston and emergency switch piston; closes the quick action closing chamber ports, connects the back of the high pressure valve to the atmosphere through the cavity in the release slide valve, and connects the quick action chamber to the brake cylinder.

Q. 141. What is the duty of the emergency graduating valve?

A. To open and close the communication between the quick action chamber and the quick action piston and emergency switch piston.

Q. 142. What is the duty of the protection valve?

A. To cause automatic emergency application of the brakes when the brake pipe pressure is from any cause reduced below a predetermined point, namely, 35 pounds.
Q. 143. What is the duty of the high pressure valve?
A. The high pressure valve controls the operation of the intercepting valve and it opens and closes the large port to the brake cylinder in emergency application.

Q. 144. What is the duty of the intercepting valve?
A. To allow auxiliary and service reservoirs to equalize into brake cylinder quickly in advance of emergency reservoir; then cut off the auxiliary and service reservoirs and allow emergency reservoir to equalize with brake cylinder.

Q. 145. What is the duty of the safety valve cut-out valve?
A. The duty of cut-out valve in service application is to allow the brake cylinder pressure to pass to the safety valve. In emergency application it admits auxiliary service and emergency reservoir pressure to brake cylinder and cuts out and unseats safety valve.

Q. 146. What is the duty of the safety valve?
A. To prevent high brake cylinder pressure in service application.

Q. 147. To what pressure is the safety valve adjusted?
A. Sixty pounds.

Q. 148. Name the air storage reservoirs that are used with this equipment on each car?
A. Auxiliary, service and emergency reservoirs.

Q. 149. What is the object of using a service reservoir in addition to the auxiliary reservoirs?
A. To give more prompt release of brakes also permits of a very flexible graduated release with a minimum emergency reservoir volume.
Q. 150. What is the object of the emergency reservoirs?

A. To operate the graduated release pneumatically and to assist in re-charging service reservoir and to give a high brake cylinder pressure in an emergency application.

Q. 151. What is the reason for having two emergency reservoirs with cut-off valves in the pipe to the large emergency reservoir?

A. To furnish the large volume of air necessary for quick recharge of the service reservoir and the graduated release feature, but at the same time, by the operation of the cut-off valve to cut off the large emergency reservoir when an emergency application is made.

Q. 152. How many cut-out cocks are there to this equipment and where located?

A. Two: one in branch pipe and one in brake cylinder pipe.

Q. 153. Is each reservoir equipped with a drain cock?

A. Yes.

Q. 154. Should the air brake become defective on the car and it is necessary to cut it out of service, what must be done?

A. If the defect is in the brake rigging, the cut-out cock should be closed in the brake cylinder pipe. If defect is in valve itself, the cut-out cock in branch pipe should be closed and all reservoirs drained, except the large emergency reservoir.

Q. 155. If the reservoirs are fully charged and the air brake fails to apply in service, where would you look for the trouble?

A. In the equalizing portion.
Q. 156. With all reservoirs fully charged and the air brake fails to apply in quick action when making an emergency application, where would you look for the trouble?

A. In the quick action portion.

Q. 157. When making a service application and the brake applies in quick action, where would you look for the trouble?

A. In the quick action portion.

Q. 158. When making a service or an emergency application and a brake fails to release, where would you look for the trouble?

A. In the quick action portion.

Q. 159. If undesired quick action occurs on a car equipped with either the old or new brake equipment, will it cause the other brakes to go into quick action?

A. Yes.

Q. 160. Will any defects in the equalizing portion cause undesired quick action?

A. No.

Q. 161. If the brake pipe pressure is reduced to 35 pounds in making service application and the brakes set in quick action, is the equipment defective?

A. No.

Q. 162. What brake pipe pressure is necessary to release the brakes after an emergency application?

A. Approximately 90 pounds.

Q. 163. Why is it important in making up trains or shifting cars that the brake pipe pressure should not be reduced sufficiently to cause the protection valve to apply the brake in the emergency?

A. To avoid causing an emergency application of the brakes which would cause a delay due to the
time which would be required to restore brake pipe pressure to 90 pounds.

Q. 164. Will less than a 5-pound service reduction apply this brake?
A. No.

Q. 165. What is the proper position for the pointer of the graduated release cap?
A. Direct release position.

Q. 166. Why should it not be placed in graduated release position?
A. Because it is not intended that the graduated release feature should be used until a sufficient number of cars are equipped to warrant its use.

Q. 167. What may cause a blow at the equalizing slide valve exhaust in release position?
A. A leaky equalizing slide valve or graduating valve, or the seal at the release end of the release piston.

Q. 168. What may cause a blow at the equalizing slide valve exhaust in the application piston?
A. A leaky slide valve or graduating valve, or the seal at the application end of the release piston.

Q. 169. What may cause a blow at the release slide valve exhaust in release position?
A. A leaky release slide valve.

Q. 170. What may cause a blow at release slide valve exhaust in application position?
A. It may be caused by a leaky release slide valve, or equalizing slide valve.

Q. 171. What may cause a blow at the emergency slide valve exhaust in release position?
A. A leaky emergency slide valve or high pressure valve.
Q. 172. What may cause a blow at emergency slide valve exhaust in emergency position?
   A. A leaky emergency slide valve, release slide valve or outside seal of the high pressure valve.

Q. 173. What may cause a blow at the quick action exhaust when the valve is in release position?
   A. A leaky quick action valve or emergency graduating or slide valve.

Q. 174. What may cause a blow at the protection valve exhaust with the brake release?
   A. Leaky atmospheric seal.

Q. 175. What may cause a blow at the protection valve exhaust when the brake is applied in emergency?
   A. A leaky emergency piston gasket combined with a leaky emergency piston ring.

Q. 176. What may cause a blow at the brake cylinder exhaust in release position?
   A. A leaky release slide valve.

Q. 177. What may cause a blow at the brake cylinder exhaust in application position?
   A. A leaky release slide valve or equalizing slide valve.

Q. 178. Why is it important to examine the gaskets when changing any of the portions?
   A. To see that all ports are open; that gasket is in good condition and properly applied.

Q. 179. Is it the intention to use the electric features of this brake at some future time?
   A. Yes. It is in use on Philadelphia Division.

Q. 180. Why was a cut-out cock located in the brake cylinder pipe?
   A. For convenience of inspectors when necessary to make repairs.
Q. 181. When making repairs to any part of the brake rigging, in what position should this cut-out be placed?
A. In closed position.

PISTON TRAVEL.

Q. 182. What is the proper piston travel on freight cars? On passenger cars?
A. Freight cars, six inches. Passenger cars, six or seven inches, depending on wheels.

Q. 183. What is the objection to a 3-inch piston travel. 12-inch piston travel?
A. 3-inch piston travel, the piston would not be out past leakage groove; 12-inch piston travel, piston would be to end of cylinder.