

The "AB-4-12"
FREIGHT CAR BRAKE
EQUIPMENT



INSTRUCTION PAMPHLET

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"AB-4-12" FREIGHT BRAKE EQUIPMENT

The A.A.R. recommendations for freight equipment specify 60% braking ratio on the empty car weight and a maximum leverage ratio of 9 to 1. Under these limits the standard "AB" equipment with 10" brake cylinder is applicable to cars with a light weight of 58,000 pounds or less. Heavier cars require an increased brake cylinder force. The "AB-4-12" equipment is designed for use on cars having an empty weight exceeding 58,000 pounds, and produces a higher braking effort from a 12" brake cylinder with the same air consumption as the standard 10" "AB" equipment.

The "AB-4-12" freight brake equipment is the same as the standard "AB" equipment covered in Instruction Pamphlet No. 5062, with the following exceptions:

(a) The standard 10" brake cylinder is replaced by a double cylinder, Fig. 6, one 4" in diameter and the other 12". The small cylinder acts to take up the brake rigging slack and adjust the piston travel for the large cylinder, previous to the development of pressure in the large cylinder. This combination provides a higher braking force than a single 12" cylinder and the volume of air required is no greater than that used by the standard 10" brake cylinder of the "AB" equipment. The force value of the 4-12 duplex brake cylinder at 50 pounds pressure is approximately 6350 pounds.

(b) The standard "AB" valve is replaced by the "AB-4-12" valve, which includes the standard service and emergency portions but has a special pipe bracket

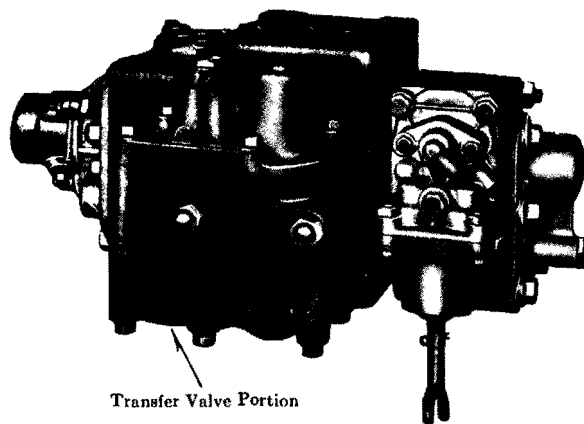


Fig. 1. AB-4-12 Valve, Showing the Transfer Valve Portion Location on Pipe Bracket

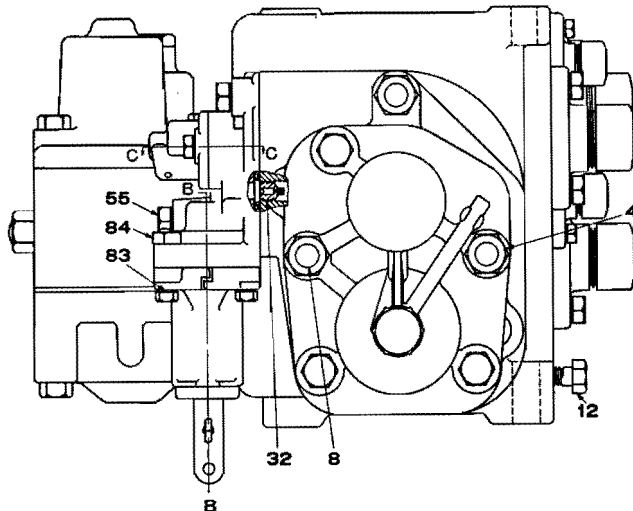


Fig. 2. End View of AB-4-12 Valve, Showing Location of Transfer Valve Portion on Pipe Bracket

to which a Transfer Valve Portion is attached, as shown in Fig. 1. This portion controls the flow of air to and between the 4" take-up cylinder and the 12" brake cylinder, during brake application and release. In application it permits development of a predetermined take-up cylinder pressure to take-up brake rigging slack before pressure is admitted to the 12" brake cylinder. In release it releases the brake cylinder pressure previous to take-up cylinder release in order to relieve the latch mechanism of the take-up cylinder from brake rigging stress.

Description of the Parts

As previously noted, with the exception of the brake cylinder and "AB" valve, the parts of the "AB-4-12" equipment, including the reservoirs, are the same as those used for the standard "AB" freight brake equipment, and fully described in Instruction Pamphlet No. 5062. One additional pipe is used, this being a $\frac{3}{8}$ " Take-Up Cylinder Pipe as shown on the piping diagram, Fig. 8.

"AB-4-12" Valve

As shown in Figs. 1-4, the "AB"-4-12 valve consists of four portions: Service Portion, Emergency Portion, Pipe Bracket, and Transfer Valve Portion. The Service and Emergency portions are the standard "AB" Portions.

The pipe bracket is special, having its back face finished to accommodate the transfer valve portion. As indicated in the piping diagram Fig. 8, this bracket has an additional $\frac{3}{8}$ " pipe connection 16 which connects to the Take-Up Cylinder.

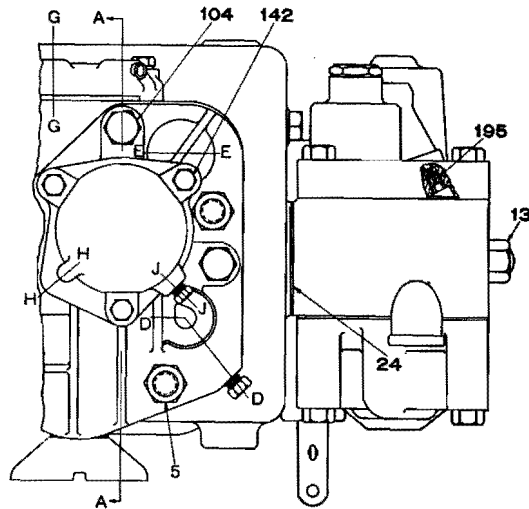


Fig. 3. Outline View of AB-4-12 Valve, Showing Transfer Valve Portion Location on the Pipe Bracket

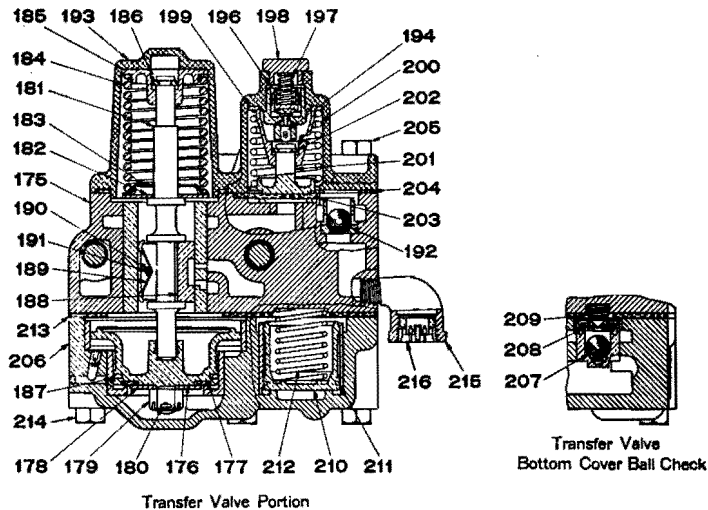


Fig. 4. Sectional View of Transfer Valve Portion of the AB-4-12 Valve

The transfer valve portion, shown in Figs. 1-4, is attached by two studs and nuts to the pipe bracket. It consists of a body 175 with a bottom cover 206 and a top cover 193.

Transfer piston 176, Fig. 4, is contained between the top and bottom covers and controls the position of its slide valve 188. The piston has two heads, the lower being fitted in its cylinder by piston ring 187 and the upper being sliding fitted in its cylinder. It has two seals, lower seal 177 on which the piston seats in brake application position, and an upper bead which seals on gasket 213 in release position. Spring 184 moves the piston to its lower position when a predetermined differential between auxiliary reservoir pressure and take-up cylinder pressure is developed during brake application.

Slide Valve 188 has two positions as controlled by piston movement. In its upper (release) position it connects the brake cylinder directly to the service slide valve exhaust; in its lower (applied) position it connects auxiliary reservoir air from the service port to the brake cylinder. It also controls the position of cut-off valve 210, opening this valve in release position, and closing it in brake application position.

Cut-off valve 210 is ring fitted in its cylinder with one piston ring 211. In release position of slide valve 188 the cut-off valve is held in its lower position by spring 212, opening the brake cylinder to the transfer valve exhaust fitting 215. When the slide valve moves to its lower (applied) position it admits pressure to the chamber beneath the cut-off valve, moving it upward to seal on gasket 213, which closes off the exhaust. The

cut-off valve therefore insures that the brake cylinder is open to atmosphere, preventing build-up of pressure therein until the take-up cylinder pressure is sufficient to take up slack, as evidenced by movement of the slide valve to its lower position.

Exhaust valve 196 controls the exhaust of the Take-Up Cylinder. Its position is controlled by diaphragm 203 which is subject to combined spring pressure and brake cylinder pressure on its upper face, opposing air pressure on its lower face. The latter pressure is controlled by the service slide valve which supplies auxiliary reservoir air when the slide valve is in release position. When auxiliary reservoir air pressure exceeds the combined spring and take-up cylinder pressures it deflects diaphragm 203 upward, moving follower 201 and pusher pin 194 which unseats exhaust valve 194, opening the take-up cylinder passage to the service slide valve exhaust. When brakes are applied, the chamber beneath the diaphragm is connected to the service slide valve exhaust. Spring pressure then deflects the diaphragm spring retainer and pusher down, relieving pressure on the exhaust valve which is then seated by its spring 197, closing the take-up cylinder exhaust.

There are three ball checks 192, (two not shown), Fig. 4. One prevents development of brake cylinder pressure prior to development of Take-Up Cylinder pressure. The second prevents back flow from the Take-Up Cylinder to the brake cylinder, if the latter should be lower. The third prevents release of Take-Up Cylinder air through the brake cylinder exhaust when the transfer valve is in its upper position.

Ball check 207 and flat check 208 in the bottom cover permit release of the brake cylinder and take-up cylinders by means of the duplex release valve when the service port is closed on a standing car, when normal release can not otherwise be obtained. Spring 209 normally seats the flat check valve, so that the two check valves in series provide double protection against undesired reverse flow of auxiliary reservoir air to the large face of the transfer piston.

Choke 195 is located in the take-up cylinder exhaust passage where it retards release flow of take-up cylinder pressure until brake cylinder pressure is released.

Exhaust elbow 215 is equipped with excluder 216 to prevent entry of insects.

4-12 "UE" Brake Cylinder (Figs. 5, 6 and 7)

The 4-12 "UE" Brake Cylinder, Figs. 5-7, consists of a body 2, containing the 12" piston 4. The piston rod is a hollow sleeve in which notched push rod 10 moves. The non-pressure head 13 is cast integral with the take-up cylinder, the latter having a 4" piston 55 with hollow sleeve in which rod 72 freely moves.

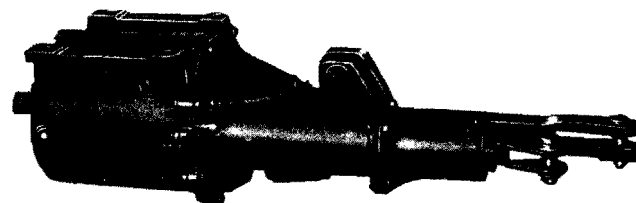


Fig. 5. Exterior View of 4-12 "UE" Brake Cylinder

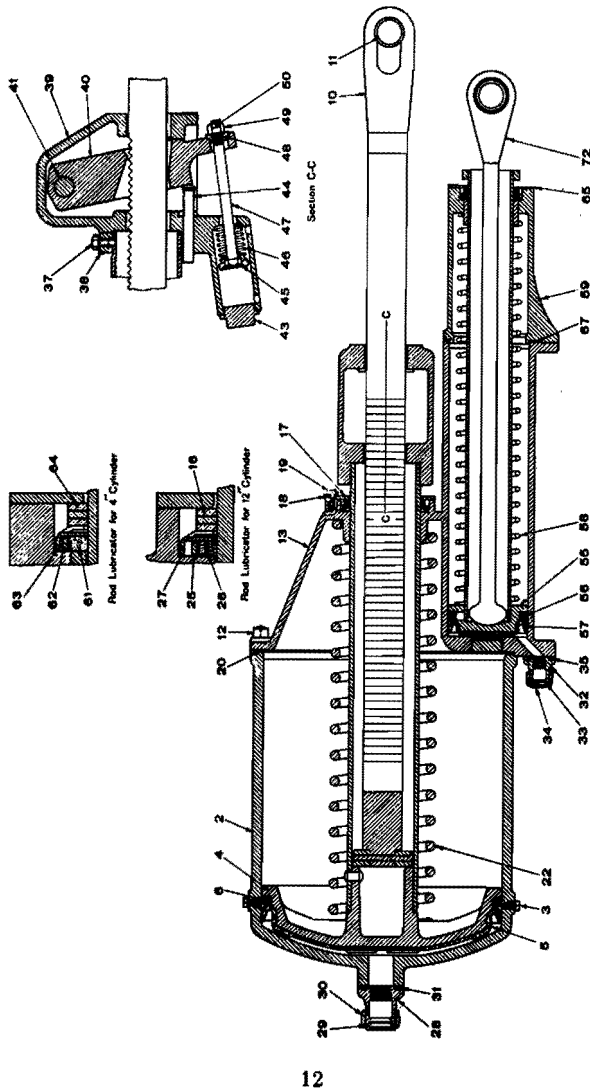


Fig. 6. Sectional View of 4-12 "UE" Brake Cylinder

A latching mechanism is attached to the end of the hollow rod of the 12" piston. It consists of a latch box 39, Fig. 6, which houses a latch 40 pivoted on pin 41. In release position release pin 44 engages the non-pressure head forcing latch 40 clear of the rod. When the brake is applied, pressure is initially admitted to the take-up cylinder and its piston moves out. The ends of both the brake cylinder and take-up cylinder rods are pinned to the live cylinder lever so that the brake cylinder rod initially moves out with the take-up cylinder rod. As pressure builds up in the take-up cylinder, the latter takes up the brake rigging slack, after which pressure build-up starts in the brake cylinder whose piston then moves out, carrying with it the latch mechanism. This moves release pin 44 from engagement with the non-pressure head whereupon spring 46 exerts its force to pull the latch 40 into engagement with the rod, the wedge surface of the latch engaging and locking in the notches of the rod, so that the rod now moves with the piston as pressure develops in the brake cylinder.

Both pistons are equipped with the "AB" type packing cup 4 and 57 which are lubricated from tapped openings that are normally plugged. As shown on Fig. 6, both rods are fitted with lubricators consisting of a felt swab 26 and 61 which are lubricated from tapped openings. The brake cylinders and rods should be lubricated and maintained in accordance with the practice established for standard "AB" cylinders as outlined in maintenance pamphlet No. 2391.

The spring chambers of the 4" and 12" cylinders are connected so that curled hair strainer 14, Fig. 7, acts as a breather for both.

The pipe connections are provided with reinforced unions, 1" for the 12" cylinder and $\frac{3}{8}$ " for the 4" cylinder.

Operation of the Equipment

The operation of the service and emergency portions is described in Instruction Pamphlet No. 5062, the following description being concerned only with the transfer function of the equipment. Fig. 10, at the back of the pamphlet, shows the equipment in a purely diagrammatic way, the actual proportions and construction of the parts being disregarded where necessary to make the connections and operation more easily understood.

Full Release and Charging Position

Brake pipe air passes through the combined branch pipe cut-out cock and dirt collector into passage b and thence through curled hair strainer 6 to the face of service piston 33, moving the piston and attached slide valve to release position. Passing through two feed grooves V in the service piston, brake pipe air flows to the chamber back of the piston, thence through passage a to the auxiliary reservoir which is thus charged to brake pipe pressure. With the service slide valve in release position cavity F registers with port r in the seat, permitting auxiliary reservoir air to flow through passage m to the transfer valve portion where it builds up in chamber S beneath diaphragm 203. The pressure of spring 200 is overcome and the diaphragm is deflected upward so that pusher pin 194 unseats exhaust valve 196. Slide valve chamber F is thus open through seat

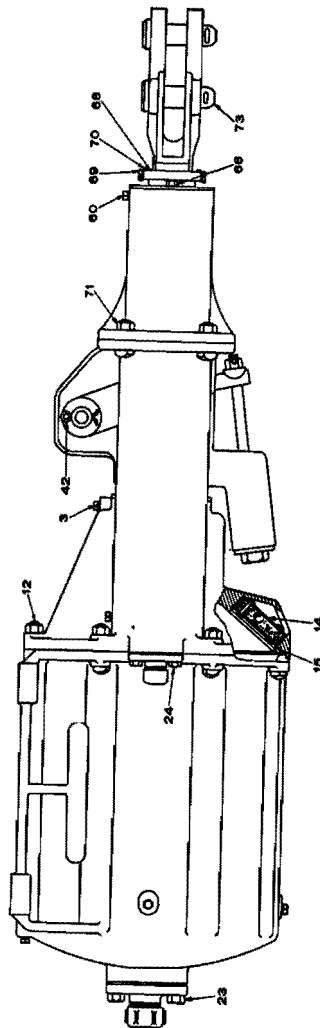


Fig. 7. Outline View of 4-12 "UE" Brake Cylinder

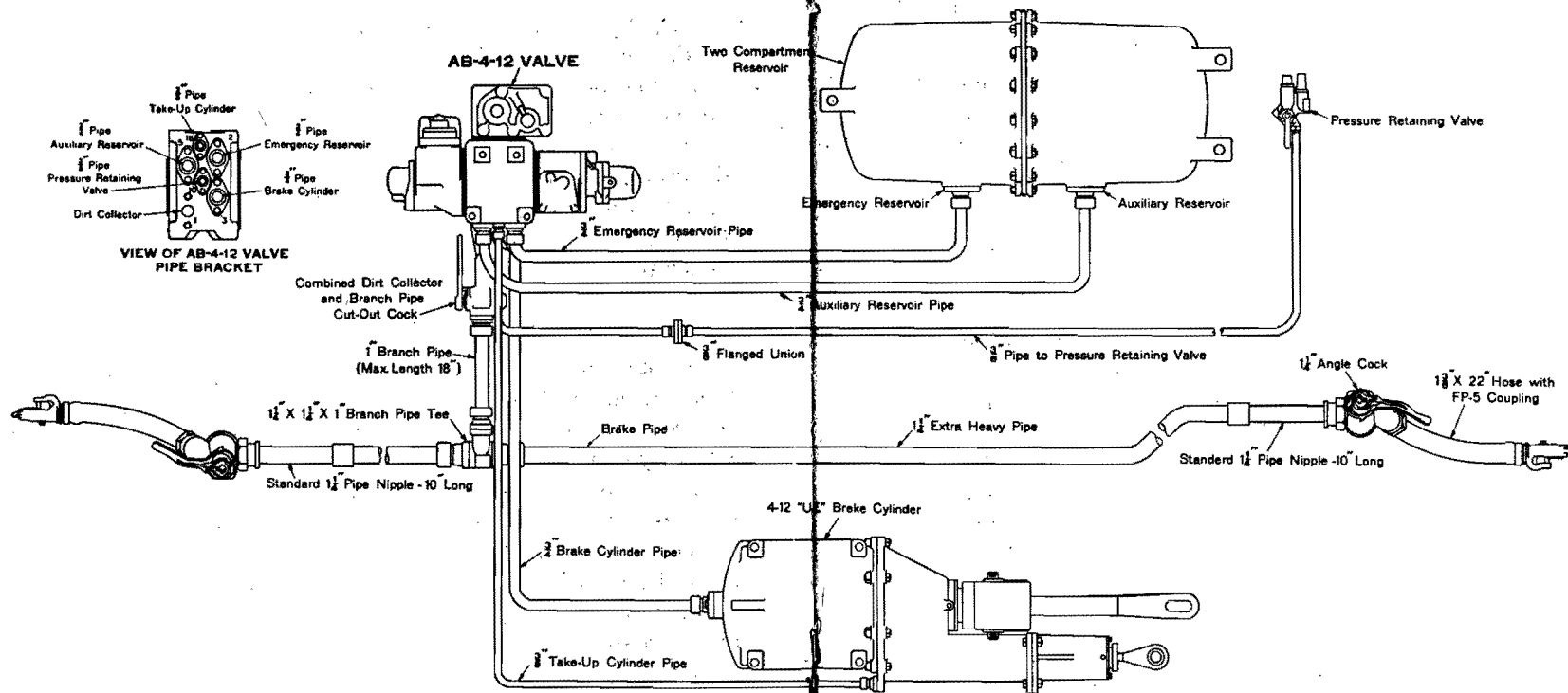


Fig. 8. Piping Diagram of AB-4-12 Freight Brake Equipment

port 16a, ball check 192b, choke 195, passage 16f and exhaust valve 196, to the spring chamber, thence through passages 9c, 9 and c3, and service slide valve cavity B to passage 10 and the retaining valve exhaust. The take-up cylinder is likewise open to the retaining valve exhaust through passages 16, 16b, choke 195, passage 16f, past exhaust valve 196, thence as above.

The 12" brake cylinder is connected through passage c, past inshot valve 126, passages c2, 9a and 9b, past ball check 192 to passages 9c, 9 and c3 to the service slide valve cavity B and the retaining valve exhaust.

Air from the auxiliary reservoir flows through passage a1 in the pipe bracket to the transfer valve portion, thence past check valve 208 and through passage a2 to chamber R on the face of transfer piston 176. With chamber F above the piston open to atmosphere at the service slide valve exhaust, auxiliary reservoir pressure in chamber R exceeds the force of spring 184 and, therefore, moves the piston and attached slide valve 188 to their upper position, bead n on the upper face of the piston sealing on gasket 213. As the piston moves from its lower seal, auxiliary reservoir air in chamber R flows through passage a4 and choke K to chamber E. With the piston sealed on bead n, pressure in chamber E is cut-off from chamber F on the opposite face.

With the slide valve 188 in its upper position chamber H beneath cut-off piston 210 is connected through passage 16c, cavity U in the slide valve and passage 9h to chamber M above the cut-off piston. Chamber M is also connected through passage 9f to the exhaust fitting 215. With atmospheric pressure on both faces of the cut-off

valve, spring 212 holds the valve away from its upper seal. Cavity U in the slide valve also connects passage 9h to passage 9a, which leads to the 12" brake cylinder; therefore, the latter is connected to the transfer valve exhaust 215, as well as to the retaining valve exhaust as previously explained.

Brake Application

When a brake pipe reduction is made to apply the brakes, the service slide valve moves to service position, as described in Instruction Pamphlet 5062. Cavity F is cut-off from seat port r, closing off the auxiliary reservoir connection to passage m, and cavity B connects port r to the retaining valve exhaust 10. The air in chamber S of the transfer valve is therefore vented through passage m, port r, and cavity B in the service slide valve to the retaining valve exhaust. Spring 200 then moves pusher pin 194 down, after which spring 197 seats exhaust valve 196. At the service slide valve, auxiliary reservoir air flows through port c5 to service port c3 in the seat, thence through passage 9 to slide valve chamber F of the transfer valve, and from chamber F through passage 16a, past ball check 192b, through passages 16b and 16 to the take-up cylinder. Ball check 192 prevents auxiliary reservoir air flow from passage 9c to 9b and thence to the brake cylinder, previous to development of take-up cylinder pressure. Meanwhile the cut-off valve 210 remains down, opening the brake cylinder to the transfer valve exhaust, thereby insuring that there is sufficient pressure in the take-up cylinder to take up brake rigging slack before pressure is admitted to the brake cylinder.

Auxiliary reservoir pressure in chamber F, which is acting downward on the large area of transfer piston 176, is increasing while auxiliary reservoir pressure in chambers E and R, acting upward on the piston, is decreasing, through passages a2 and a4. When the air pressures acting on this piston thus reach a predetermined differential, spring 184 will move the piston downward from the upper seal n. Breaking of this seal permits pressure in chamber E to equalize with the pressure in chamber F, so that the pressure acting to keep the piston in its upper position is immediately less than before the seal was broken. Choke K restricts auxiliary reservoir air supply to chamber E to permit rapid equalization between chambers E and F.

Auxiliary reservoir pressure is now acting only on the lower face of the small piston. As spring force assisted by the air pressure in chamber F was sufficient to move the piston downward when opposed by auxiliary reservoir pressure acting under the area of the large piston, this same force, opposed by auxiliary reservoir pressure acting only on the smaller area of the small piston will result in an increased differential of force downward which will cause the piston and its slide valve to move down with a snap action. The transfer valve is so designed that this action takes place when there is approximately 50 lbs. developed in slide valve chamber F and the take-up cylinder, after which auxiliary reservoir air flows to the 12" brake cylinder.

With transfer slide valve 188 in its lower position passage 9, connecting to the service slide valve service port c3, is cut-off from chamber F and the take-up cylinder, and connected by cavity U in the transfer

slide valve 188 to passages 9a and c2, past the inshot valve 126 to passage c and the 12" brake cylinder. In its lower position the slide valve also opens passage 16c to the slide valve chamber F and air from the latter flows to chamber H beneath cut-off valve 210. A low pressure in chamber H is sufficient to overcome spring 212 so that cut-off valve 210 is promptly moved to its upper position, seating on the gasket and closing off exhaust 215 when the transfer valve moves to its lower position.

If take-up cylinder pressure at any time should be lower than 12" brake cylinder pressure, these pressures will equalize by flow of air from the 12" brake cylinder, passage c, past inshot valve 126, passages c2, 9a, 9b and 9d, past ball check 192a to passages 16d and 16c to chamber F and passage 16 to the take-up cylinder. Ball check 192a prevents take-up cylinder air flowing in the reverse direction to the 12" brake cylinder, when the latter pressure is lower than that in the take-up cylinder, as when the brake is partially applied.

As pressure is initially built up in the take-up cylinder, its piston moves out and, as pressure increases on its piston, takes up the slack in the brake rigging. The piston push rods of both brake cylinders are connected to the same cylinder live lever; consequently, the notched push rod 10 of the 12" brake cylinder moves out with the take-up cylinder push rod 72. When the transfer piston and slide valve move down, the piston of the 12" brake cylinder moves out, carrying with it the latch mechanism. This movement of the 12" brake cylinder piston takes release pin 44 from contact with the cylinder head and allows latch spring 46 to act on spring guide

47 and pull the upper end of latch 40 to the left. As latch 40 pivots on pin 41 through its lower end, a wedge shape portion of the latch engages a notch in push rod 10, firmly locking the push rod to the cylinder piston rod so that the notched rod moves out with the cylinder piston as air pressure is developed in the cylinder. As the take-up cylinder takes up slack in the brake rigging, compensation is made for brake shoe wear and a fixed travel of the 12" brake cylinder is obtained. The slot in the live lever connection of the 12" brake cylinder push rod is to increase the piston travel and, therefore, the volume of this cylinder an amount which will provide the same brake cylinder pressure for any given brake pipe reduction that is obtained with the standard AB equipment.

The take-up cylinder, therefore, takes up the slack in the brake rigging and adjusts the position of the brake cylinder push rod so that the slotted pin hole will allow a predetermined brake cylinder piston travel when pressure is introduced into the brake cylinder. In other words, there is always a fixed volume relation between the auxiliary reservoir and the brake cylinder. Therefore, the extent of the braking effort obtained depends upon the extent of equalization of pressures between the auxiliary reservoir and the brake cylinder, and the latter in turn is controlled by the amount of brake pipe reduction. This relation is such that the standard 50 pounds equalization is obtained from a full service reduction from 70 pounds brake pipe pressure. Any less brake pipe reduction will, therefore, produce the same ratio of brake cylinder pressure as obtained with the standard 10" "AB" equipment.

Release

When the brake is released and recharged the service piston and slide valve move to release position, where cavity B in the service slide valve connects port c3 to the retaining valve exhaust and cavity F again connects auxiliary reservoir air to port r and passage m. Brake cylinder air thus flows through passage c, past inshot valve 126, passage c2, passage 9a, cavity U in the transfer slide valve, passages 9 and c3, cavity B in the service slide valve to pipe 10 and the retaining valve exhaust. If, for any reason, the transfer slide valve is in its upper position at this time, brake cylinder air can flow through passages 9a, and 9b, past ball check 192, to passages 9c and 9 to the retaining valve exhaust.

The brake cylinder piston spring 22 then moves the piston 4, notched rod 10 and latch 40 back until release pin 44 contacts with the non-pressure head, which forces the release pin back, disengaging latch 40 from the notched rod, and permitting the latter to move in its hollow piston sleeve to release position.

Meanwhile, auxiliary reservoir air from passage m builds up in chamber S in the transfer portion. Brake cylinder air from passage 9c is present in the spring chamber above diaphragm 203. Auxiliary reservoir is increasing while brake cylinder pressure is decreasing. When auxiliary reservoir pressure in chamber S becomes 35 pounds higher than brake cylinder pressure above the diaphragm, spring 200 is compressed and the diaphragm, follower 201, and pusher 194 move up, unseating exhaust valve 196. Take-up cylinder air then flows through passages 16 and 16b, choke 195 and passage 16f past

exhaust valve 196 to the spring chamber, thence through passages 9c and 9 to the service slide valve exhaust cavity B and the retaining valve exhaust. The interval required to obtain the 35 pound differential to open exhaust valve 196, and the restricted flow of take-up cylinder air through choke 195 retards the exhaust of take-up cylinder air to insure that the brake cylinder piston returns to release and disengages the latch before take-up cylinder pressure is materially reduced.

Chamber F pressure also reduces with take-up cylinder pressure, through passage 16a, past ball check 192b, passage 16f, and unseated exhaust valve 196 to the retaining valve exhaust. Chamber F pressure thus decreases as auxiliary reservoir pressure in chamber R beneath the piston is increasing and the pressure differential moves the piston and slide valve up before all pressure is exhausted from chamber F. In its upper position the slide valve uncovers port 9, connecting chamber F directly to the retaining valve exhaust through service slide valve cavity B. Ball check 192b prevents take-up cylinder air flowing into chamber F and thence to the exhaust, thereby imposing the delayed release of take-up cylinder air through choke 195 with the transfer valve in its upper position.

In its upper position the slide valve 188 connects ports 16c and 9h, thereby connecting chamber M and H and equalizing the pressures above and below cut-off valve 210. Spring 212 moves the valve from its upper seal and connects brake cylinder passage 9a through cavity U in the slide valve, passage 9h and past the cut-off valve to passage 9f and exhaust fitting 215.

Releasing with Duplex Release Valve

The brake may be released by means of the duplex release valve in the event of the brake pipe being depleted at the time the brake is applied, as when a car is set out, or when the locomotive is detached from the train. Under this condition the service slide valve is in application position and its exhaust port is closed. Auxiliary reservoir pressure is exhausted from chamber S under diaphragm 203 of the transfer valve through passage m, cavity B in the service slide valve and the retaining valve exhaust. Therefore, spring 200 returns pusher pin 194 to its lower position, permitting spring 197 to seat exhaust valve 196. Take-up cylinder pressure and chamber F pressure thus can not release past the exhaust valve in the normal manner.

By opening the duplex release valve, air from the 12" brake cylinder is vented with auxiliary reservoir air so long as the service port c5 in the service slide valve is open permitting back flow from the brake cylinder to the auxiliary reservoir; however, the service piston tail spring 39 may move the graduating valve 34 to close the service port c5 before the brake cylinder is entirely released in this manner.

Under this condition complete release of take-up cylinder and brake cylinder pressures is effected by ball check 207 and flat check 208. Piston spring 184 moves the transfer piston 176 and its slide valve 188 to their lower position when auxiliary reservoir air in chamber R is depleted by opening the duplex release valve. Take-up cylinder air then flows through passage 16 to chamber F, past the large piston to chamber E thence through

passage a3, choke Y and past check valves 208 and 209, through passages a1 and a, past the auxiliary reservoir release valve 69 to atmosphere. As take-up cylinder pressure is thus reduced below the low pressure that may be trapped in the brake cylinder, the higher brake cylinder pressure in passage 9d will unseat ball check 192a and flow through passages 16d and 16c to chamber F and thence past the large piston to the duplex release valve exhaust as described in the preceding sentence. At other times ball check 207 and flat check 208 are held seated by spring 209 to prevent flow of auxiliary reservoir air to piston chamber E where it otherwise might prevent piston movement to its lower position when unintended.

Piston Travel

The minimum travel of the 4" take-up cylinder piston should be adjusted to 7" with 40 pounds pressure in the cylinder. A maximum piston travel of 12" is permissible since the small diameter of the take-up cylinder makes it possible to exceed the maximum 9" travel prescribed by the A.A.R. for 10" equipment, without materially affecting the brake cylinder pressure.

A range of piston travel from 7" to 12" for the take-up cylinder provides for greatly increased brake shoe wear with the 4-12 freight brake, as compared with the standard 10" "AB" equipment, without readjustment of piston travel.

Increasing the range of piston travel, from 7-9" to 7-12", provides for a degree of brake shoe wear, making possible the replacement of one or more brake shoes

before hand readjustment of the travel must be made and, therefore, the power value of the 4-12 equipment will remain substantially constant without readjustment of piston travel. Stated differently, the functioning of the take-up cylinder is equivalent to the employment of an automatic slack adjuster but without the necessity of adjusting the travel each time a brake shoe is replaced.

Instructions for Application of Reinforced Flanged Union Fittings

The purpose of the reinforced flanged union fittings is to produce pipe joints which can be made and maintained permanently air tight and at the same time avoid costly failures in road service due to the breakage of pipe or fittings. The fitting is designed to clamp the pipe back of the threaded end so as to relieve the thread of tension stresses, and is arranged so that removals and re-applications can be made conveniently.

Unless these fittings are installed correctly, the protection against pipe failures at the point of the exposed threads may be lost. To accomplish fully the purpose of these fittings, the piping assembly should be made up as follows:

After slipping the clamping nut and anchor ring over the threaded end of the pipe, the flanged fitting must be screwed on the pipe so as to make a rigid and air tight joint at the threads when the bolt holes are in line with the tapped holes in the face to which it will be bolted. The anchor ring and clamping nut must then be moved into place and the nut firmly tightened so as to solidly close the anchor ring on the pipe.

To insure that the anchor ring will have a full supporting bearing on the pipe, the thread must be straight, that is, cut substantially parallel with the axis of the pipe. This will occur automatically if the pipe threading tools are in proper condition.

The pipe must be so formed and fitted that when it is in place, the face of the flanged fitting, with the gasket removed, will contact squarely with the surface to which it will be clamped, and the bolt holes will be in line to permit application of the cap screws without springing the pipe. The gasket can then be applied and the fitting clamped in place with the cap screw bolts which should be tightened solidly.

The design of the pipe runs between clamping points must be such that the pipe can have sufficient flexibility in itself to take up any small deflections that may be caused by movements in the car body. This flexibility is best secured by designing the pipe run to have one or more easy bends of not less than six inch radius. Where the form of the pipe and the installation of the flanged union is made as described, there will be adequate mechanical strength in the flange union assembly to cause the pipes to deflect sufficiently to compensate for normal maximum car body movements without the production of excessive stresses within the fittings.

When the assembly is made in accordance with the above instructions the pipe and flange fittings will be

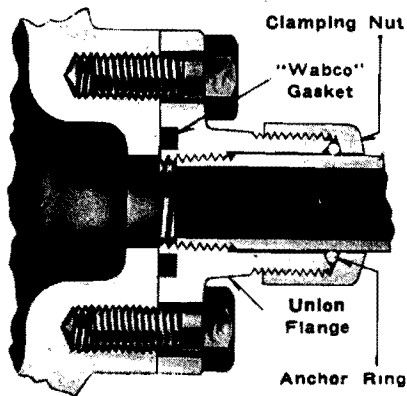


Fig. 9. Flanged Union Connection as used on the Valves, Brake Cylinders, Reservoirs, Dirt Collector and Branch Pipe Tee

free from initial tension. The flange fitting will be drawn solidly metal to metal and, therefore, be free of any motion, and the pipe will have a solid metal support outside of the threaded joint which, acting as a fulcrum, changes any stresses at the exposed pipe threads from tension on a small area to a shear force on the whole diameter of the pipe. This shear force may be many times as great as the tension force cited without causing failure.

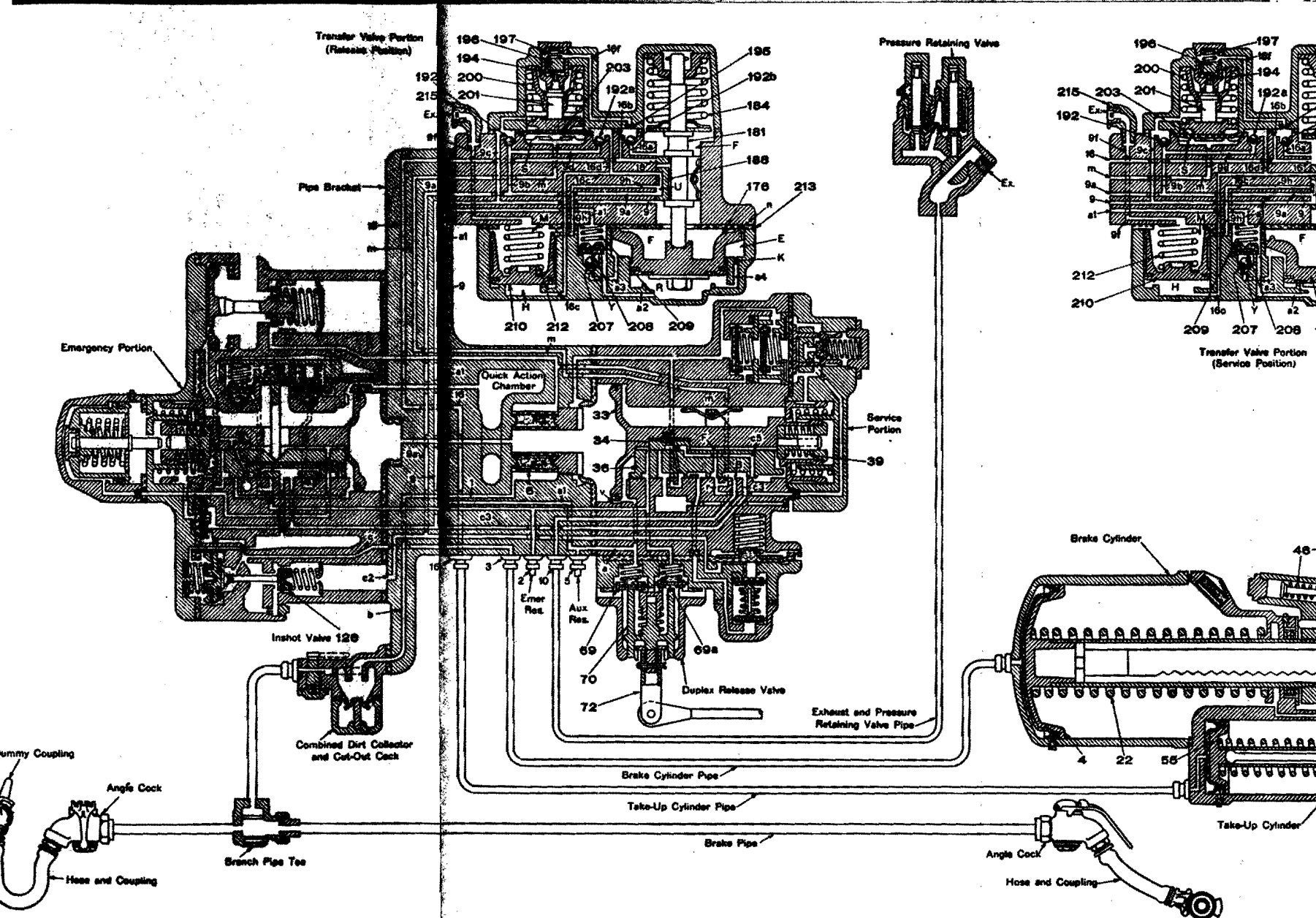


Fig. 10. AB-4-12 Freight Car Brake Equipment—Diagrammatic

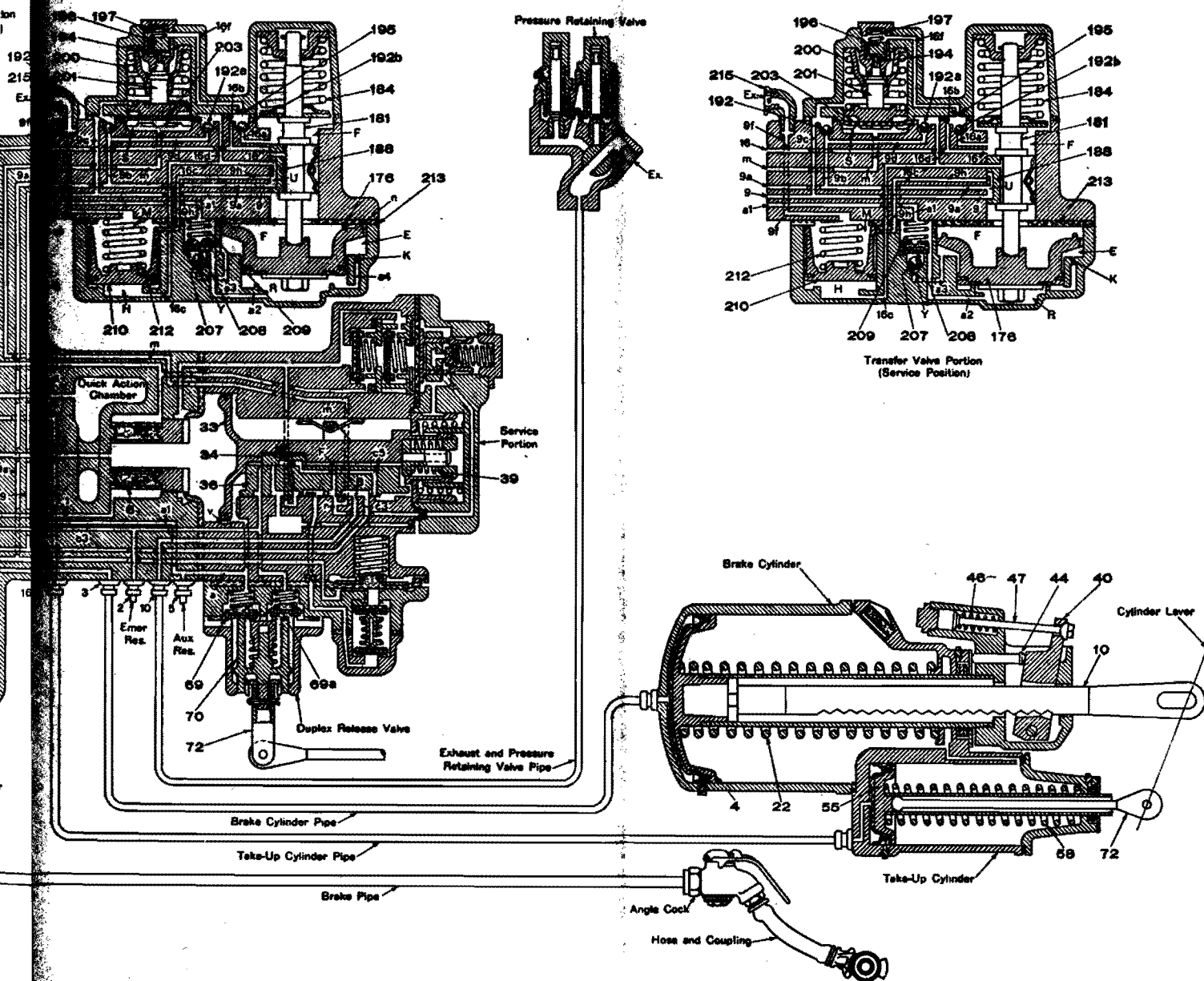


Fig. 16. AB-4-12 Freight Car Brake Equipment—Diagrammatic