

DESCRIPTIVE LEAFLET

No. 2432

JULY, 1928

(SUPERSEDES ISSUE OF FEBRUARY, 1927)

M-3 AND M-3-A
FEED VALVES

WESTINGHOUSE AIR BRAKE CO.
PITTSBURGH, PA., U. S. A.

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The
"M" FEED VALVE

WESTINGHOUSE AIR BRAKE CO.
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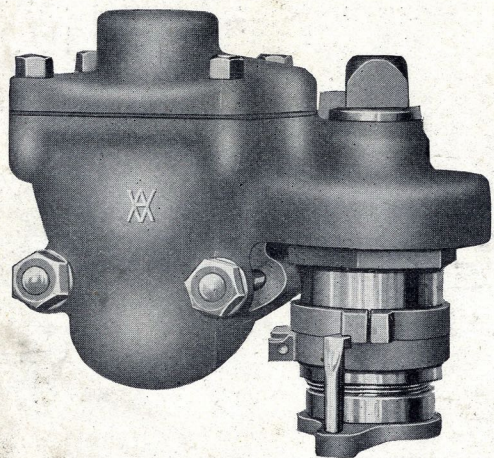


Fig. 1. Front View of M-3-A Feed Valve

M-3 and M-3-A FEED VALVES

The demand for feed valves of greater capacity than the standard valves, heretofore employed, has resulted in the development of a new valve, known as the "M" type in which certain additional features have been incorporated, looking toward increased stability of action, reduction in maintenance expense, etc.

This valve is designed to perform the same general functions as the former standard B-6 and C-6 feed valves but differs from the latter in mechanical construction and manner of operation.

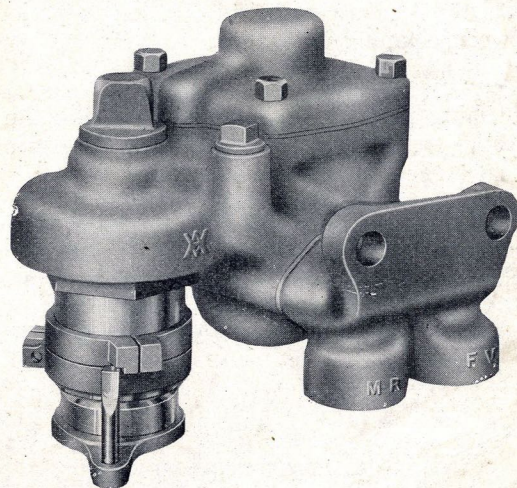


Fig. 2. Rear View of the M-3-A Feed Valve, Showing Pipe Bracket

A detail examination of the design will show that the bushings are of the "slip" type, the piston and slide valve bushings being in one piece; also, that the supply piston is fitted with a packing ring, a by-pass choke being incorporated to provide a fixed relationship between pressures on the two sides of the piston. A venturi tube principle is also employed as described later.

Characteristics

The relative characteristics of this feed valve are as follows:

1. Consistent and uniform operation.

The ring fitted piston tends to keep the bush free from dirt and gumming action while the double piston spring affords sufficient power to overcome reasonable resistance offered to piston movement by such accumulation of dirt.

2. Low operation cost because of longer periods between cleaning dates.
3. Low maintenance cost because of easy, cheap bushing renewal. All parts, including the bush (37), are easily replaced without the use of special tools.
4. Sustained air delivery flow up to the point of closure by virtue of the venturi tube control; the regulating valve is held open longer and sustained flow thus continues more nearly to the point of the regulating spring setting.
5. Increased capacity.

Valve Operation

The diagrammatic view, Fig. 3, pictures the valve with all parts in one plane in order to facilitate description. Main reservoir pressure is on both sides of piston (20) in passage (p), through by-pass choke (25), in chamber (m) above the supply piston (20) and through passage (n) above regulating valve (7). Feed valve pipe pressure is in the diaphragm chamber and in passage (o), leading to it.

Opening

As the feed valve pipe pressure is reduced the pressure is also reduced on diaphragm (11) by way of passage (o), causing its force on the diaphragm (11) to be less than that of the regulating spring (15). The regulating spring, therefore, forces the diaphragm against, and opens, the regulating valve (7). Main reservoir pressure now has a very restricted passage to the feed valve pipe by way of passage (p), choke (25), passage (n), past regulating valve (7), and passage (o). Also, chamber (m) on the spring side of piston (20) is opened to the feed valve pipe through passage (n), regulating valve (7) and passage (o). Consequently, the main reservoir air pressure in chamber (k) forces the piston against the spring and reduced air pressure in chamber (m) and moves the slide valve (22) towards its open position. One set of slide valve ports opens first and gives a direct connection of limited size between main reservoir air pressure and the feed valve pipe. If the supply of main reservoir air is not now sufficient to immediately raise the pressure in the feed valve pipe to the pressure for which the regulating spring is adjusted, the pressure differential on piston (20) will be sufficient to move it farther and open the second port in slide valve (22), thus increasing the air flow to the feed valve pipe.

Closing

As the feed valve pipe pressure increases and approaches the setting of the regulating spring, it gradually forces the diaphragm (11) to compress the regulating spring (15) and thus allows the regulating valve (7) to close. Main reservoir air flowing from chamber (K) through choke (25) into chamber (m) on the spring side of the supply piston balances the pressures on the two sides of piston (20), allowing springs (28) and (31) to move the piston and slide valve to their inward position and close the supply ports (a) and (a').

Venturi Tube Action

The function of venturi tube (z) is to obtain a sustained air delivery flow from the main reservoir to the feed valve pipe up to the pressure for which the feed valve is adjusted. Its operation is on the same principle as a steam injector. The main reservoir air in the feed valve pipe develops an increased velocity at the small section of the venturi tube with a corresponding decrease in pressure at this point. Passage (o) leads into the venturi tube at this small section, or reduced pressure area, which causes the pressure to be reduced in the diaphragm chamber below the feed valve pipe pressure and permits the regulating spring (15) to open the regulating valve (7) more fully, thus allowing a greater flow of air with consequently greater reduction of pressure on the face of supply piston (20).

As the feed valve pipe pressure approaches the pressure for which the feed valve is adjusted, the velocity of flow through the venturi tube diminishes. Therefore, its effect of reducing the pressure in the diaphragm chamber becomes proportionately less, thus permitting accumulation of pressure in the diaphragm chamber, which tends to close the regulating valve at its true setting.

Conversion

The M-3 feed valve is quickly convertible into the M-3-A, the double pressure valve, by the application of the two adjustable stops, Ref., 18, two cap screws, Ref., 19 and stop pin, Fig. 4. Necessary holes are drilled in the regulating nut, Ref., 17, and the barrel of the spring box, Ref., 16 is turned to proper size for the application of the adjustable stops. Likewise, the M-3-A may be converted to the M-3 by the omission of these parts.

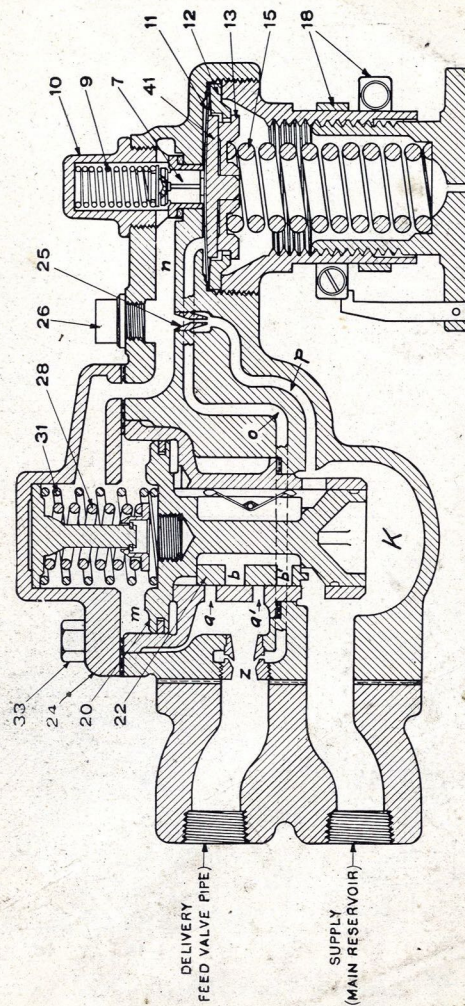


Fig. 3. Diagrammatic View of the M-3-A Feed Valve

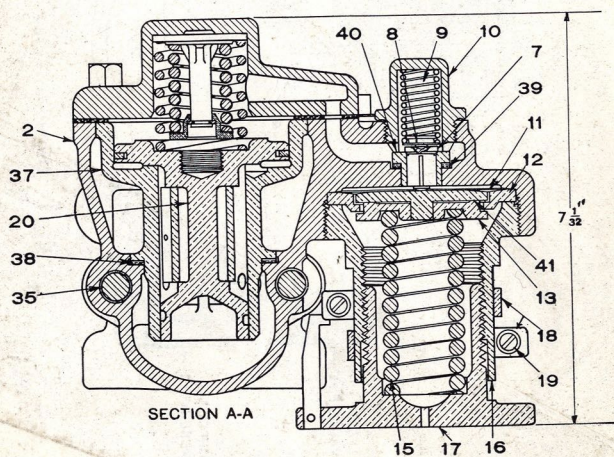
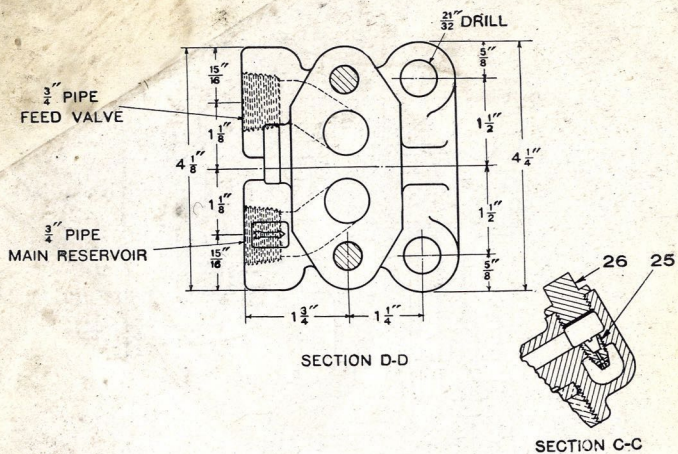


Fig. 4. Assembly Views of M-3-A Feed Valve

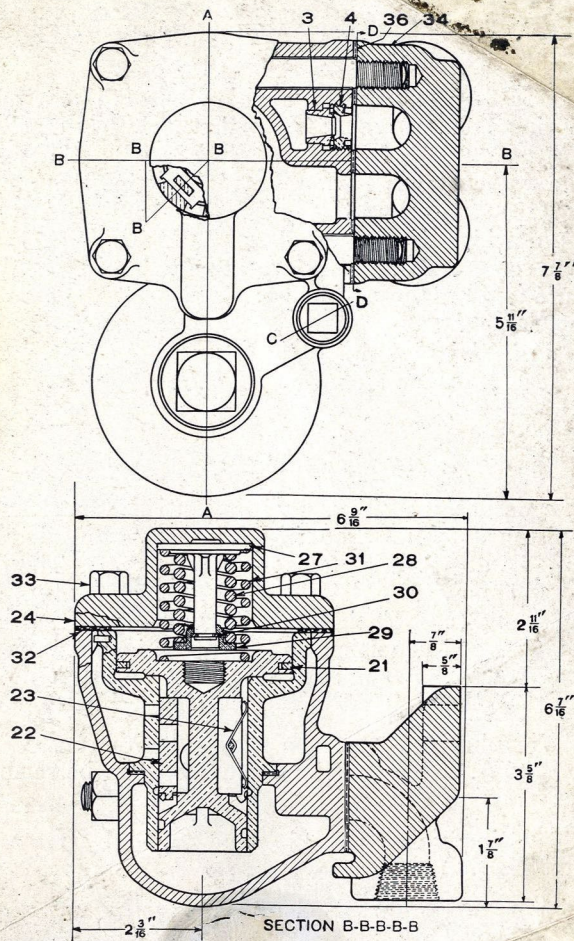


Fig. 5. Assembly Views of M-3-A Feed Valve

Adjustment

The M-3 is adjusted by turning up, or backing off, the regulating nut (17).

The M-3-A has two adjustable stops (18) encircling the spring box (16) split through the lugs and closed with a machine screw (19). When setting the valve, set the valve at the low brake pipe setting, loosen the screw (19) and move the lower stop (18) against the stop pin which is a part of regulating nut (17) and tighten screw (19). Then, set the valve at the high pressure and set the upper stop (18) to hit the stop pin in the same manner. Thereafter by turning the nut (17) until the pin hits either stop, the feed valve is regulated from high to low pressure.

Cleaning

The feed valve is easily dismantled for cleaning. The piston (20) may be withdrawn by removing the cover (24), attached by four cap screws (33). The cage bush (37) may also be removed and cleaned at the same time. In replacing the bush, be sure that seal (38) is in good condition and in place before inserting the bushing. The cage bush seal must be inserted with its bead up, that is, next to the bush. See Fig. 4.

Choke plug (25) may be removed after unscrewing cap nut (26). The choke is slotted and can be removed with a screw driver.

Regulating valve (7) can be cleaned by removing cap nut (10).

Diaphragms are cleaned or replaced by unscrewing the spring box (16).

All gaskets are of Wabco and provide excellent seals and give long service.

