Feb. 25, 1936. C. C. FARMER 2,032,121

VALVE TESTING DEVICE

Filed May 6, 1933

Fig. 1

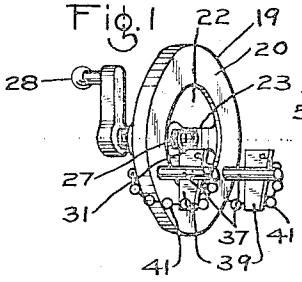


Fig. 2

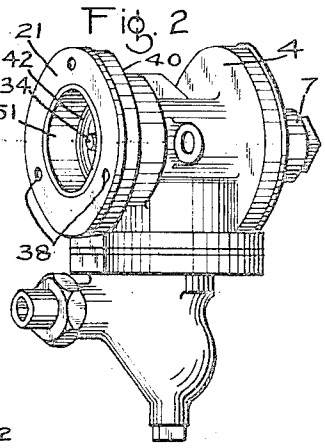


Fig. 3

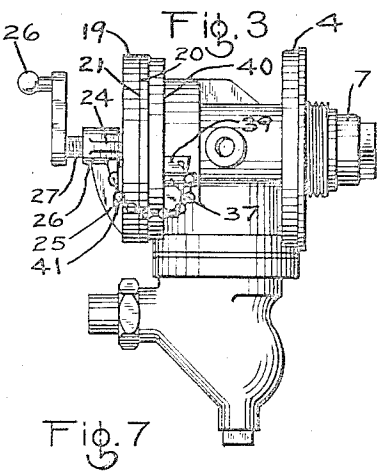


Fig. 4

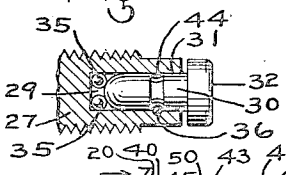


Fig. 7

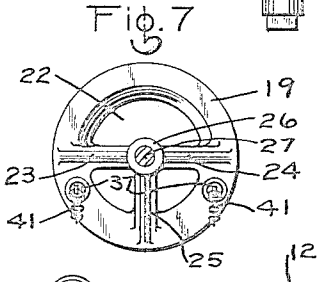
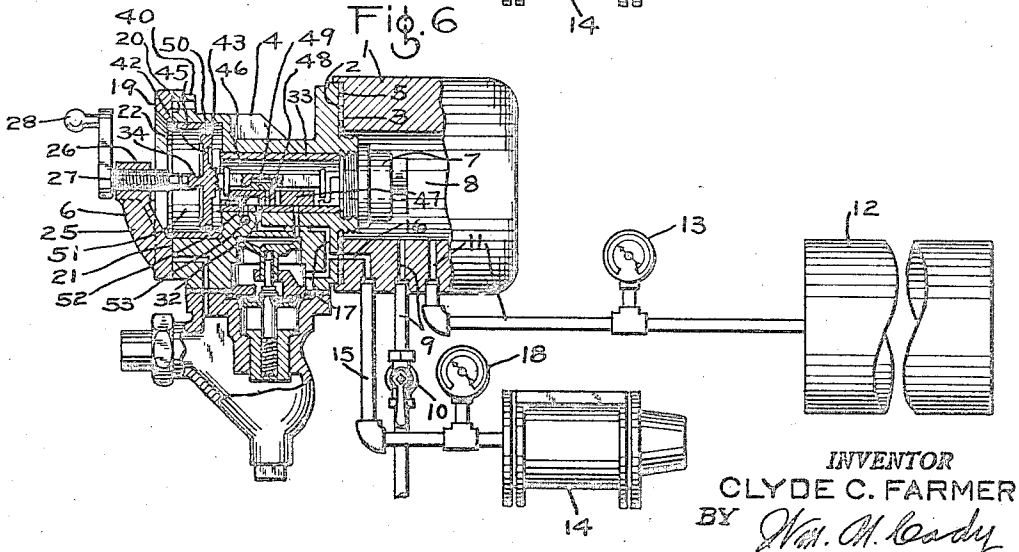


Fig. 5

Fig. 6



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VALVE TESTING DEVICE

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11 Claims. (Cl. 73—51)

This invention relates to a testing device and has for its principal object to provide a device for determining whether the feed groove in the main piston bushing in the usual triple valve device and the connection from the brake cylinder passage to the atmospheric exhaust passage are opened in the proper sequence.

In the triple valve device in common use, the feed groove and the brake cylinder port in the slide valve bushing, which connects with the brake cylinder passage in the triple valve casing, are so positioned relative to each other that when effecting a release of the brakes, the brake cylinder port is opened to the atmospheric exhaust passage through a cavity in the slide valve in advance of the opening of the feed groove around the main piston ring, and it is highly important that this sequence of opening exist. When the triple valve piston is moved toward release position sufficiently to effect the opening of the feed groove and the pressure of the brake pipe fluid in the piston chamber is increased slowly, as in the rear portion of a long train, there may not be sufficient differential created on the piston to move it and the associated slide valve beyond the feed groove opening position. Now, if the brake cyinder port were still closed, the brakes on the car equipped with this particular triple valve device would remain applied, thereby causing delay, annoyance and probably damaged wheels.

It will thus be seen that a vital relationship exists between the relative time of opening of the feed groove and the brake cylinder port, and it is important that this relationship be maintained when the triple valve is reconditioned by renewing the piston bushing, the slide valve bushing, the slide valve, or the piston, or by regrooving the piston. A piston bushing and a slide valve bushing which have the feed groove and the brake cylinder port, respectively, improperly positioned with respect to each other, a slide valve in which the brake cylinder exhaust cavity is not properly positioned, or a new or regrooved piston in which the piston ring is improperly positioned, may result in the feed groove being opened in advance of the opening of the brake cylinder port. It can readily and accurately be determined, by means of the device disclosed herein, in conjunction with certain additional commonly used test apparatus, whether the correct sequence exists in the opening of the feed groove and the brake cylinder port.

In the accompanying drawing; Fig. 1 is an isometric view of a testing device constructed in accordance with my invention; Fig. 2 is an isometric view of a triple valve device, of the well known K type, with the piston chamber cap removed, to permit application of my test device; Fig. 3 is a side elevational view of the triple valve device shown in Fig. 2, with my test device applied thereto in place of the piston chamber cap; Fig. 4 is a fragmentary enlarged sectional view of the screw-threaded stem included in the testing device; Fig. 5 is a diagrammatic view, partly in section, of a triple valve device having my test device thereto and of the additional apparatus employed in conjunction therewith, with said test device adjusted so as to maintain the triple valve piston and associated slide valve in service position against the pressure of the fluid in the slide valve chamber; Fig. 6 is a diagrammatic view similar to Fig. 5, except that the testing device has been operated so as to move the piston and slide valve from service position toward release position for the purpose of determining the sequence of opening of the brake cylinder port and the feed groove; and Fig. 7 is a view of the testing device taken on the line 7—7 of Fig. 5.

Although the testing device is shown in the drawing as applied to a triple valve device of the K type, it should be understood that said device may also be used in conjunction with any type of triple valve device in which the means for releasing fluid under pressure from the brake cylinder consists of a cavity in the slide valve adapted to connect the usual brake cylinder passage to the atmospheric exhaust passage, and in which the means for supplying fluid under pressure from the brake pipe to the slide valve chamber and connected auxiliary reservoir consists of the usual feed groove, or its equivalent.

As shown in Fig. 5, the testing apparatus employed in conjunction with my invention may comprise a bracket 1 having a clamping face 2 against which the gasket face 3 of the triple valve device 4 to be connected is clamped, there being a gasket 5 interposed between said faces. A testing device 6, constructed in accordance with my invention, is applied to the face 21 of the triple valve device from which the piston chamber cover has been removed.

The retarded release device 7 of the triple valve device 4 extends into a chamber 8 formed in the bracket 1, said chamber being therefore in communication with the slide valve chamber 46 through said retarded release device. The chamber 8 is connected by a passage and pipe 9 with a source of fluid pressure supply (not shown), said pipe being provided with a cut-out cock 10. The chamber 8 is also connected by a passage

and pipe 11 with a reservoir 12, a pressure gage 13 being connected to said pipe.

The testing apparatus may also comprise a brake cylinder 14, which is connected by a pipe 15 with a passage 16 in the bracket 1 which leads to the face 2 of said bracket, where it registers with the brake cylinder passage 17 in the triple valve device 4 which leads to the brake cylinder port 32 in the slide valve seat in the slide valve bushing 33. A pressure gage 18 is connected to the pipe 15.

The testing device may comprise an annular flange portion 19 having a face 20 adapted to engage the face 21 of the triple valve device 4. Extending inwardly from the flange portion and preferably integral therewith are spaced webs 23, 24 and 25, which support a boss 26 disposed concentrically with the inner edge of the flange 20. In the present instance, there are three of these webs, two of which, 23 and 24, are disposed diametrically opposite to each other in a horizontal direction, and the other of which, 25, extends downwardly, midway between said other two webs. Since there is no upwardly extending web, the space 22 above the webs 23 and 24 and above the boss 26 is relatively large and is free from obstruction, for a purpose which will appear in the description hereinafter. It will be understood that instead of arranging the webs as just described, they may be arranged in any other desired manner, keeping in mind that it is desirable to provide a relatively large unobstructed opening above the webs and the boss.

In screw-threaded engagement with said boss is a stem 27 having at one end a handle 28 for turning said stem and at the other end an axial bore 29 for the reception of the stem 30 of a rotatable member 31 having a head 32 which is adapted to engage the piston 42 of the triple valve device 4, in the present instance the engagement being with the boss 34 on said piston.

Contained in the bore 29 of the stem 27 and interposed between the inner end of the stem 30 of the member 31 and the inner end wall of said bore are balls 35 which constitute a thrust bearing for the member 31, for preventing rotation of said member when the head 32 engages the boss 34, the inner end of said member being shaped to maintain the balls in their circular arrangement.

For maintaining the member 31 within the bore 29, a pin 36 carried by the stem 27 loosely engages said member within a peripheral groove 44 provided on the stem portion 30 of said member.

For securing the testing device 6 to the face 21 of the triple valve device 4, spaced pins 37 are provided which may be carried by the flange 19 of said device and which extend therefrom in a direction toward the right hand, as viewed in Fig. 1, said pins being adapted to be received, in the present instance, within the openings 38 regularly provided for the bolts for securing the piston chamber cap to the triple valve device. The pins and the openings in the triple valve device for receiving them are preferably so located that when the test device is applied to the triple valve device, the relatively large opening 22 in said test device will provide easy access to the feed groove. In the present embodiment, the feed groove 43 is shown at the top of the piston bushing 45 and the pins 37 and the openings 38 are so located that the opening 22 is uppermost.

At the outer end of each pin is a longitudinally slotted opening adapted to receive a tapered key 39, which is adapted to engage a shoulder 40 on the triple valve device for clamping the testing device to said triple valve device when the tapered key is forced down into said slot. To prevent loss of the keys, chains 41 are provided which are attached at one end to the respective keys and which are attached at the other end to a fixed portion of the test device.

In operation, the triple valve device 4 to be tested having been mounted on the bracket 1, with the piston chamber cap removed from the face 21 of the triple valve device, and the cut-out cock 10 closed, the test device 6, with the keys 39 removed from the slotted openings in the pins 37, is applied to said face in such a manner that said pins extend through the openings 38 in the triple valve device, after which said keys are replaced and forced down in said slotted openings, so as to clamp the test device to the triple valve device.

The cut-out cock 10 is now opened, which permits fluid under pressure to flow from the source of supply (not shown) through the pipe and passage 9 into the chamber 8 in the bracket 1 and from thence through the passage and pipe 11 into the reservoir 12. From chamber 8, fluid under pressure also flows through the retarded release device 7 into the slide valve chamber 46 of the triple valve device 4, where it acts upon the piston 42 to move said piston and the slide valve 47 outwardly, against the pressure of the atmosphere acting on the outer face of said piston, until the boss 34 on the piston engages the head 32 of the member 31 of the test device.

The stem 27 is then turned, by means of the handle 28, in a counter-clockwise direction, causing the member 31 to move outwardly, which will permit fluid under pressure in the slide valve chamber 46 to move the piston 42 outwardly, with the boss 34 maintained in engagement with the member 31. As the movement of the piston 42 continues, due to the continued turning of the member 27, the graduating valve 49 will be shifted by said piston relative to the slide valve 47 so as to uncover the service port 48 in said slide valve and then the slide valve will be shifted to service position, in which said service port registers with the brake cylinder port 32 in the slide valve bushing 33.

The registration of the ports 48 and 32 permits fluid under pressure to flow from the slide valve chamber 46 to the brake cylinder 14 through said ports and the passages 17 and 16 and the pipe 15, the pressure gage 18 indicating when said port registration is effected. At this point, further turning of the stem 27 is discontinued.

When the pressure of the fluid in the reservoir 12 and in the brake cylinder 14 has been built up to, say, 10 pounds, as indicated by the gages 13 and 18, the cock 10 is closed. The gages are then observed and assuming, for the present, that there is no leakage of fluid under pressure from the slide valve chamber 46 past the piston ring 50 to the chamber 51 at the outer side of the piston, said gages will show a substantially constant pressure, in which event the procedure is as follows:

The stem 27 is turned clockwise, by means of the handle 28, causing the piston 42, and thereby the graduating valve 49 and the slide valve 47, to be moved inwardly toward release position, against the pressure of the fluid in the slide valve chamber 46.

The initial movement of the piston 42 causes the graduating valve 49 to be shifted relative to

the slide valve 47 to lap position, cutting off the service port 48 from the chamber 46. As the movement of the piston 42 is continued, said slide valve is engaged by said piston and moved toward release position. Meanwhile both pressure gages 13 and 18 are observed to determine which gage is the first to show a reduction in pressure.

If the pressure gage 18 is the first to show a reduction in pressure, it indicates that the slide valve 47 has been moved to release position, in which the exhaust cavity 52 in said slide valve connects the brake cylinder port 32 with the atmospheric passage 53, as shown in Fig. 6, thereby permitting fluid under pressure to be vented from the brake cylinder 14 through the pipe 15, the passages 16 and 17, the port 32, the cavity 52, and the atmospheric passage 53. Inasmuch as the pressure gage 13 meanwhile shows a substantially constant pressure, it indicates that the venting of fluid under pressure from the brake cylinder occurs in advance of the opening of the feed groove 43 by the piston ring 50, which is the correct sequence.

If, however, during the above mentioned movement of the triple valve parts toward release position, the pressure gage 13 is the first to show a reduction in pressure, it indicates that the feed groove 43 is open around the piston ring 50, permitting a flow of fluid under pressure from the slide valve chamber 46 through said feed groove to the chamber 51, in advance of the opening of the brake cylinder port 32 to the atmospheric passage 53 through the exhaust cavity 52. This sequence of opening is incorrect and may be caused by a feed groove which is too long, an exhaust cavity 52 or a brake cylinder port 32 which is incorrectly located, or a piston which does not have the ring properly located.

If, after the cock 10 is closed, both pressure gages 13 and 18 show a slow reduction in pressure and then, during the initial movement of the piston 42 toward release position, the pressure gage 18 shows a substantially constant pressure while the gage 13 shows a reduction in pressure, it indicates leakage from the slide valve chamber 46 to the chamber 51 past the piston ring 50, and the gage 13 cannot, therefore, be relied on to indicate when the feed groove 43 is open. In this event, as the piston is moved inwardly toward release position, the operator, by inserting one of his fingers through the opening 22 in the test device 6 into the piston chamber 51 and causing said finger to closely follow the piston, in the present instance in a path along the top of the piston chamber where the feed groove is located, he can ascertain when the feed groove 43 is opened, which will be indicated by the "feel" of the fluid under pressure being vented through said groove against his finger. By proceeding in this manner and observing the gage 18, the operator can determine whether the brake cylinder port 32 or the feed groove 43 opens first.

It will thus be seen that I have provided a test device by means of which the relationship between the opening of the brake cylinder port to the atmospheric exhaust passage and the opening of the feed groove around the triple valve piston may readily be determined.

While one illustrative embodiment of the invention has been described in detail, it is not my intention to limit its scope to that embodiment or otherwise than by the terms of the appended claims.

Having now described my invention, what I claim as new and desire to secure by Letters Patent, is:

1. A testing device for testing a valve device having valve means and a piston responsive to differences in the pressure of fluid on opposite sides thereof for actuating said valve means, the testing device comprising a base member adapted to be removably attached to said valve device, and an operating stem having screw-threaded engagement with said base member and adapted to engage said piston, said stem being movable back and forth in the direction of its length to vary the position of said piston and valve means.

2. In a testing device for testing a valve device having valve means and a piston for actuating said valve means, a base member adapted to be removably attached to said valve device, an operating stem movably mounted in said base member and adapted to control the operation of said piston, a thrust member carried by said movably mounted member and adapted to engage said piston, and a roller bearing interposed between the thrust member and the movably mounted member.

3. Testing apparatus for testing a valve device having a casing, valve means and a piston for actuating said valve means to their several controlling positions, said apparatus comprising means for subjecting one side of said piston to fluid under pressure, a base member adapted to be secured to said casing, an operating stem having screw-threaded engagement with said base member and adapted to engage said piston for controlling the movement of said piston and said valve means to their control positions, means for indicating when fluid passes around said piston, and means for indicating when said piston and valve means reach certain control positions.

4. A testing device for testing valve devices comprising a casing having a chamber, a piston contained in said chamber, valve means actuated by said piston, and a cap adapted to be removably mounted on said casing for closing the open end of said chamber, said chamber having a feed groove adapted to be controlled by said piston, said testing device comprising a base member adapted to be removably secured to said casing in place of said cap and having formed therein an opening through which said feed groove is accessible from the exterior of the member when said member is secured to said casing, and an operating stem carried by said base member and adapted to engage said piston, said stem being movable back and forth in the direction of its length to vary the position of said piston and valve means.

5. A testing device for testing valve devices comprising a casing having a chamber, a piston contained in said chamber, valve means actuated by said piston, and a cap adapted to be removably mounted on said casing for closing the open end of said chamber, said testing device comprising a base member adapted to be removably mounted on said casing in place of said cap, a pin carried by said base member and adapted to extend through an opening provided in said casing, and a key adapted to extend through an opening in said pin and to engage said pin within said opening and also to engage said casing for securing said test device to said casing.

6. A testing device for testing valve devices comprising a casing having a chamber, a piston contained in said chamber, valve means actuated by said piston, and a cap adapted to be removably

mounted on said casing for closing the open end of said chamber, said testing device comprising a base member adapted to be removably mounted on said casing in place of said cap, a pin carried by said base member and adapted to extend through an opening provided in said casing, a key adapted to extend through an opening in said pin and to engage said pin within said opening and also to engage said casing for securing said test device to said casing, and means for securing said key to said test device.

7. Testing apparatus for testing a valve device comprising a casing having a chamber, valve means, and a piston contained in said chamber for actuating said valve means to their several controlling positions, said chamber having a passage adapted to be controlled by said piston for controlling communication from one side of said piston to the other side of said piston, said apparatus comprising means for subjecting one side of said piston to fluid under pressure, means adapted to be placed in fixed relation with said casing and operative to engage and control the movement of said piston and thereby said valve means to their control positions, means for indicating when fluid under pressure flows through said passage from one side of said piston to the other side of the piston, and means for indicating when said valve means reach certain control positions.

8. Testing apparatus for testing a valve device comprising a casing having a chamber, valve means, and a piston contained in said chamber for actuating said valve means to their several controlling positions, said chamber having a passage adapted to be controlled by said piston for controlling communication from one side of said piston to the other side of said piston, said apparatus comprising means for subjecting one side of said piston to fluid under pressure, screw means adapted to be placed in fixed relation with said casing and operative to engage and control the movement of said piston and thereby said valve means to their control positions, and means for indicating the sequence in which said piston reaches a position permitting flow of fluid under pressure through said passage from one side of said piston to the other side of the piston and in which said valve means reaches certain control positions.

9. Testing apparatus for testing a triple valve device to determine whether the triple valve slide valve establishes the exhaust communication from the brake cylinder to the atmosphere and the triple valve piston opens the feed groove in the proper sequence, said apparatus comprising a reservoir analogous to an auxiliary reservoir for supplying fluid under pressure to the triple valve slide valve chamber, another reservoir analogous to a brake cylinder and connected to the brake cylinder connection of the triple valve device, means adapted to be placed in fixed relation to the triple valve device and adapted to extend through the end of the triple valve piston chamber opened by the removal of the chamber cap and to engage the triple valve piston for positioning the piston and triple valve slide valves in service position for permitting flow of fluid under pressure from the auxiliary reservoir to the brake cylinder, said means being also adapted to engage the triple valve piston for moving said piston and slide valves inwardly toward release position against the opposing pressure of the auxiliary reservoir, and means for indicating whether the brake cylinder pressure drops in advance of auxiliary reservoir pressure during such movement.

10. Testing apparatus for testing a valve device having valve means and a piston for actuating said valve means, said apparatus comprising means for subjecting one side of said piston to fluid under pressure, a base member adapted to be secured to said valve device, and an operating stem having screw-threaded engagement with said base member and adapted to engage the opposite side of said piston for moving said piston in one direction against said opposing fluid under pressure and for controlling the movement of said piston in the opposite direction by said opposing fluid under pressure.

11. A testing device for testing valve devices comprising a casing having a chamber, a piston contained in said chamber, valve means actuated by said piston, and a cap adapted to be removably mounted on said casing for closing the open end of said chamber, said chamber having a feed groove adapted to be controlled by said piston, said testing device comprising a base member adapted to be removably secured to said casing in place of said cap and having formed therein an opening through which an operator's finger may be inserted to ascertain whether or not fluid under pressure is flowing through said feed groove, and an operating stem carried by said base member and adapted to engage said piston, said stem being movable back and forth in the direction of its length to vary the position of said piston and valve means.

CLYDE C. FARMER.