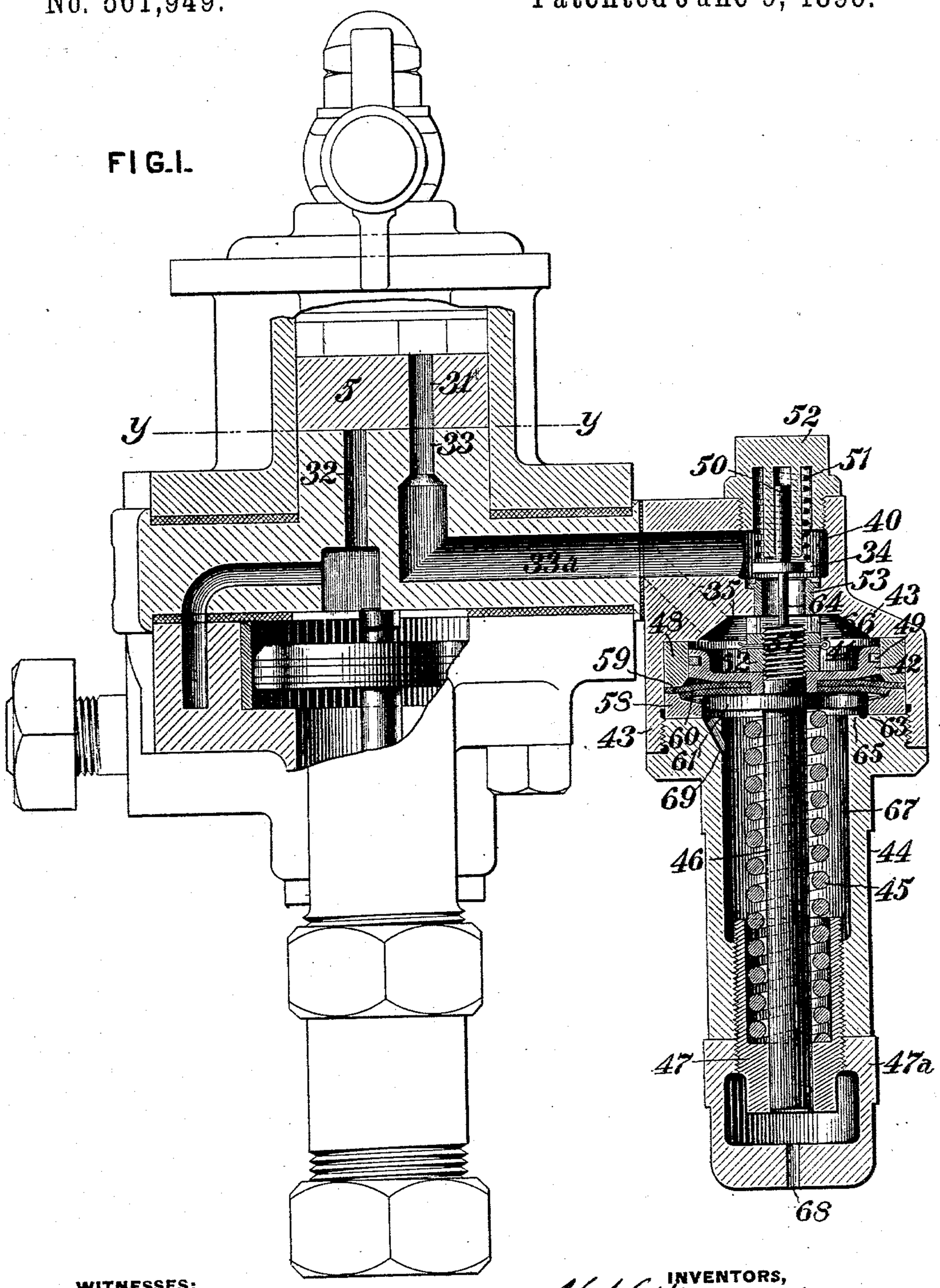
(No Model.) 2 Sheets—Sheet 1.

H. H. WESTINGHOUSE & T. W. WELSH.

PRESSURE REGULATING DEVICE.

No. 561,949. Patented June 9, 1896.

FIG. 1.



WITNESSES:

F. J. Hogan.

F. E. Gaither.

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H. H. Westinghouse

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(No Model.) 2 Sheets—Sheet 2.

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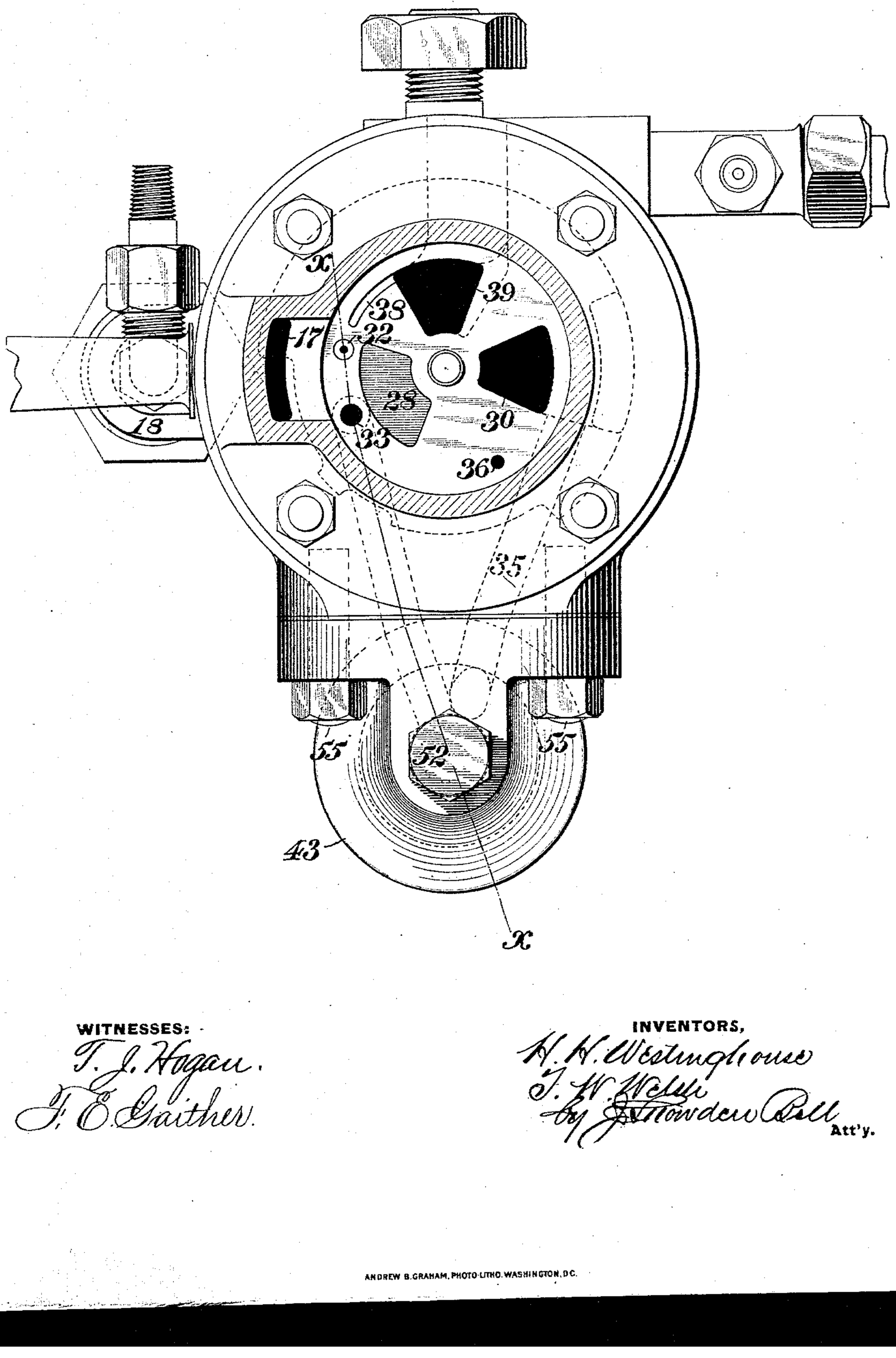
FIG. 2.



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T. J. Hogan.
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H. H. Westinghouse
T. W. Welsh
by Howard & Bell
Att'y.

UNITED STATES PATENT OFFICE.

HENRY HERMAN WESTINGHOUSE, OF EDGEWOOD, AND THOMAS W. WELSH, OF WILMERDING, PENNSYLVANIA, ASSIGNORS TO THE WESTINGHOUSE AIR BRAKE COMPANY, OF WILMERDING, PENNSYLVANIA.

PRESSURE-REGULATING DEVICE.

SPECIFICATION forming part of Letters Patent No. 561,949, dated June 9, 1896.

Application filed April 19, 1893. Serial No. 470,963. (No model.)

To all whom it may concern:

Be it known that we, HENRY HERMAN WESTINGHOUSE, residing at Edgewood, and THOMAS W. WELSH, residing at Wilmerding, in the county of Allegheny, State of Pennsylvania, citizens of the United States, have invented or discovered a certain new and useful Improvement in Pressure-Regulating Devices, of which improvement the following is a specification.

The object of our invention is to provide a new and improved regulating device for automatic fluid-pressure brake apparatus; and to this end it consists of a device by means of which the admission of fluid under pressure from the main reservoir to the train-pipe is regulated according to the pressure in the train-pipe.

Although our invention is specially adapted for employment with a fluid-pressure brake apparatus, it is equally applicable in other situations as a pressure-regulator or reducing-valve, and embodies features of construction which are not limited in their application to any particular form of pressure-regulator.

In the accompanying drawings, Figure 1 is a vertical section on the line *x x* of Fig. 2 through an engineer's brake-valve and through our improved regulating device as applied thereto; and Fig. 2, a horizontal section on the line *y y* of Fig. 1, showing the pressure-regulator and part of the engineer's valve in plan view.

Our improvement is shown in the drawings in combination with an engineer's brake-valve, which forms part of the present Westinghouse quick-action automatic brake system; but its application is not limited to any particular form of engineer's brake-valve. The port 39, which is formed in the seat of the main valve 5 and which opens to the atmosphere, the port 32, which is connected in service applications with the groove 38 and with the port 39, the equalizing-port 36, which is connected with the port 30 when the main valve is in running position, and the cavity 28 in the seat of the main valve are substantially the same as in the well-known Westinghouse engineer's brake-valve.

The casing of the regulating device, as shown in the drawings, is made in two parts or sections 43 and 44, which are joined together by means of a screw-thread connection. The section 43 is shown connected to the casing of the engineer's valve by means of bolts 55 in such a position that the chamber 40 of the section 43 is always in open communication with the passage 33^a in the casing of the engineer's valve.

When the main valve 5 is in running position, fluid under pressure from the main reservoir is admitted through the passage 17 to the space above the main valve 5 and flows through the passage 31 in the main valve and through the passages 33 and 33^a in the casing into the chamber 40 of the regulating device. The chamber 40 is connected by means of a passage 53 with a chamber 41, which is at all times in open communication with the train-pipe through the passages 35 and 30.

The chamber 41 is provided with a bushing 48, and between this bushing and a ring 58 is clamped a flexible diaphragm 59. A stem 46, surrounded by a spring 45 and inclosed by the section 44 of the casing, is provided with a disk or broad flange 61 near one end and an extension 57, extending beyond the disk and passing through a piston 42, which fits in the bushing 48 and is provided with a friction-ring 49. A diaphragm 60 is fitted in place against the back of the diaphragm 59, and the two diaphragms 59 and 60 are clamped between the disk 61 and the piston 42, the piston and two diaphragms being held in place against the disk 61 by means of the nut 62, which is screwed on the extension 57.

The friction-ring 49 is a split ring which permits the passage of fluid under pressure from one side of the piston to the other, so that the pressure on the diaphragm 59 is always the same as the pressure in the chamber 41.

The spring 45 bears at one end against the disk 61 and at the other end against the screw-plug 47, by means of which its tension is adjusted.

The passage 53 is controlled by a feed-valve 34, which has a guide-stem 50, extending up into the screw-plug 52. A spring 51 bears at

one end against the screw-plug 52 and at the other end against the valve 34 and tends to hold the valve to its seat. A stem 64 extends from the valve 34 into or through the passage 53 and is of such a length that when the piston 42 and diaphragm 59 are moved toward the valve 34 by the spring 45 the extension 57 may come in contact with the stem 64 and unseat the valve 34. The movement of the piston and diaphragm in the opposite direction is great enough to move the extension 57 entirely out of contact with the stem 64 and to permit the valve 34 to be seated by the pressure of the spring 51 and the fluid-pressure in the chamber 40.

As the chamber 41 is always in open communication with the train-pipe the pressure in the chamber 41 acts in opposition to the pressure of the spring 45 and tends to move the piston and diaphragms and extension 57 so as to permit the seating of the valve 34 and the closing of communication between the main reservoir and the train-pipe. The tension of the spring 45 is so adjusted and the effective area of the diaphragm is so proportioned that the pressure in the chamber 41 moves the diaphragm and piston so as to withdraw the extension 57 from contact with the stem 64 and permit the valve 34 to be seated when the train-pipe pressure is equal to or greater than the normal pressure which it is desirable to maintain in the train-pipe. When the train-pipe pressure is above the normal, the valve 34 will always be seated and the diaphragm and piston may be moved far enough to cause the disk 61 to be seated on the shoulder 65, which is formed by the end of the section 44 of the casing and which limits the movement of the disk, diaphragms, and piston in one direction. The movement in the opposite direction is limited by the stops 66, formed on the nut 62, which come in contact with the casing 43 when the piston and diaphragms are at the other extremity of their strokes.

When the train-pipe pressure falls below the normal amount, the pressure of the spring 45 overcomes the pressure acting against it on the diaphragm 59 and moves the extension 57 into contact with the stem 64 of the feed-valve 34, unseats the feed-valve, and permits fluid under pressure to flow from the main reservoir into the chamber 41 and through the passages 35 and 30 into the train-pipe. This flow continues until the train-pipe pressure becomes high enough to move the piston and diaphragms against the pressure of the spring 45 far enough to permit the seating of the feed-valve 34.

The chamber 67 of the section 44 of the casing is in open communication with the outer atmosphere, and in case there should be any leakage from the chamber 41 into the space 67 the fluid so escaping will pass out through the opening formed for the stem 46 in the screw-plug 47 and through the opening 68 in the screw-cap 47ª. In order to permit of the free escape of any fluid which may leak by the diaphragm when the disk 61 is in contact with the shoulder 65, a groove 63 is formed on the shoulder 65 and is provided with openings 69, which lead into the chamber 67.

As the chamber 41 is normally filled with fluid under a high pressure and the chamber 67 is in open communication with the atmosphere it is difficult to prevent leakage from the chamber 41 into the chamber 67 when any usual form of piston is employed by itself, and for that reason we employ a diaphragm 59, of rubber or other flexible material, which may be so secured in place as to prevent leakage. When a diaphragm alone is used and the pressure in the chamber 41 and the pressure of the spring 45 nearly balance one another, very slight variations of pressure in the train-pipe and in the chamber 41 will cause rapid vibrations of the diaphragm and of the valve 34, by which the valve would continually be seated and unseated. This not only causes rapid wear of the valve, but also of the diaphragm, and in order to prevent this over-sensitiveness we employ a friction device in connection with the diaphragm, by means of which a more regular and gradual movement of the diaphragm is obtained when the pressures on opposite sides of the diaphragm are nearly in equilibrium.

It is important that the diaphragm should not be exposed in such a manner as to permit the accumulation of grease or dirt thereon, which would affect its operation or tend to destroy it. By combining the piston 42 with the diaphragm 59 we provide means for protecting the diaphragm from grease and dirt, and by means of the friction device 49 we secure the desired regular movement of the diaphragm and prevent the irregular fluttering movement which would otherwise take place.

So far as the provision of a friction device in connection with a diaphragm is concerned our invention is not limited to the employment of a piston or a friction-ring, as it is obvious that other means may be employed to accomplish the same result. The application of a friction device is not limited to a diaphragm which is exposed on one side only to fluid-pressure, and a friction device may be employed on one or both sides of the diaphragm.

The diaphragm 60, which is secured against the back of the diaphragm 59, serves as a cushion between the ring 58 and the diaphragm 59 and also serves to prevent sharp bends in the diaphragm 59.

We claim as our invention and desire to secure by Letters Patent—

1. The combination, with a movable diaphragm adapted to be operated by fluid-pressure, of means for effecting frictional resistance, for the purpose of regulating the movements of the diaphragm, which is independent

of or additional to the usual incidental or unavoidable resistance of the part or parts which may be operated by the movement of the diaphragm, substantially as set forth.

2. The combination, with a movable diaphragm adapted to be operated by fluid-pressure, of a piston connected thereto and fitting in a chamber, and a friction device on the piston which bears against the wall of the chamber and regulates the movement of the diaphragm independently of the usual incidental or unavoidable resistance of the part or parts which may be operated by the movement of the diaphragm, substantially as set forth.

3. In a fluid-pressure regulator, the combination, with a casing having a chamber therein, of a movable diaphragm in the chamber, a piston connected to the diaphragm and provided with a friction device which is adapted to create a frictional resistance to the movement of the diaphragm independent of the usual incidental or unavoidable resistance of the other part or parts which are operated by the movement of the diaphragm, substantially as set forth.

4. The combination, with a movable diaphragm, of a valve adapted to be operated thereby, a piston connected to the diaphragm which is independent of the valve and which is provided with means for creating a frictional resistance to the movement of the diaphragm which is independent of or additional to the resistance of the valve, substantially as set forth.

5. The combination, with a movable diaphragm adapted to be operated by fluid-pressure, of a piston connected thereto and fitting in a chamber, and a friction device on the piston which bears against the wall of the chamber and regulates the movement of the diaphragm, substantially as set forth.

6. In a fluid-pressure regulator, the combination with a casing having a chamber therein, of a movable diaphragm in the chamber, a piston connected to the diaphragm and provided with a friction device, and a valve operated by the movement of the diaphragm, substantially as set forth.

7. In an automatic fluid-pressure brake apparatus, the combination with a feed-valve controlling communication between the main reservoir and the train-pipe, of a diaphragm by the movement of which the feed-valve is opened when the train-pipe pressure falls below the normal amount, a piston fitting in a chamber and connected to the diaphragm, a friction-ring secured to the piston, for regulating the movement of the diaphragm, substantially as set forth.

8. In an automatic fluid-pressure brake apparatus, the combination, with an engineer's valve of a feed-valve, a passage in the engineer's valve for the traverse of fluid from the main reservoir to the feed-valve, a diaphragm exposed to train-pipe pressure and operative on a reduction of train-pipe pressure to open the feed-valve, and a friction device connected to the diaphragm for regulating its movement, substantially as set forth.

9. In a fluid-pressure regulator, the combination of a movable diaphragm exposed on one side to fluid-pressure and on the other side to the pressure of a spring, and a friction device connected to the diaphragm for regulating its movement, substantially as set forth.

10. In a fluid-pressure mechanism, the combination of a diaphragm secured at its outer edge, a second diaphragm secured thereto but free at its outer edge, and a friction device connected to the diaphragms, substantially as set forth.

In testimony whereof we have hereunto set our hands.

HENRY HERMAN WESTINGHOUSE.
THOMAS W. WELSH.

Witnesses:
L. E. LOVE;
CHAS. P. LIVINGSTON.