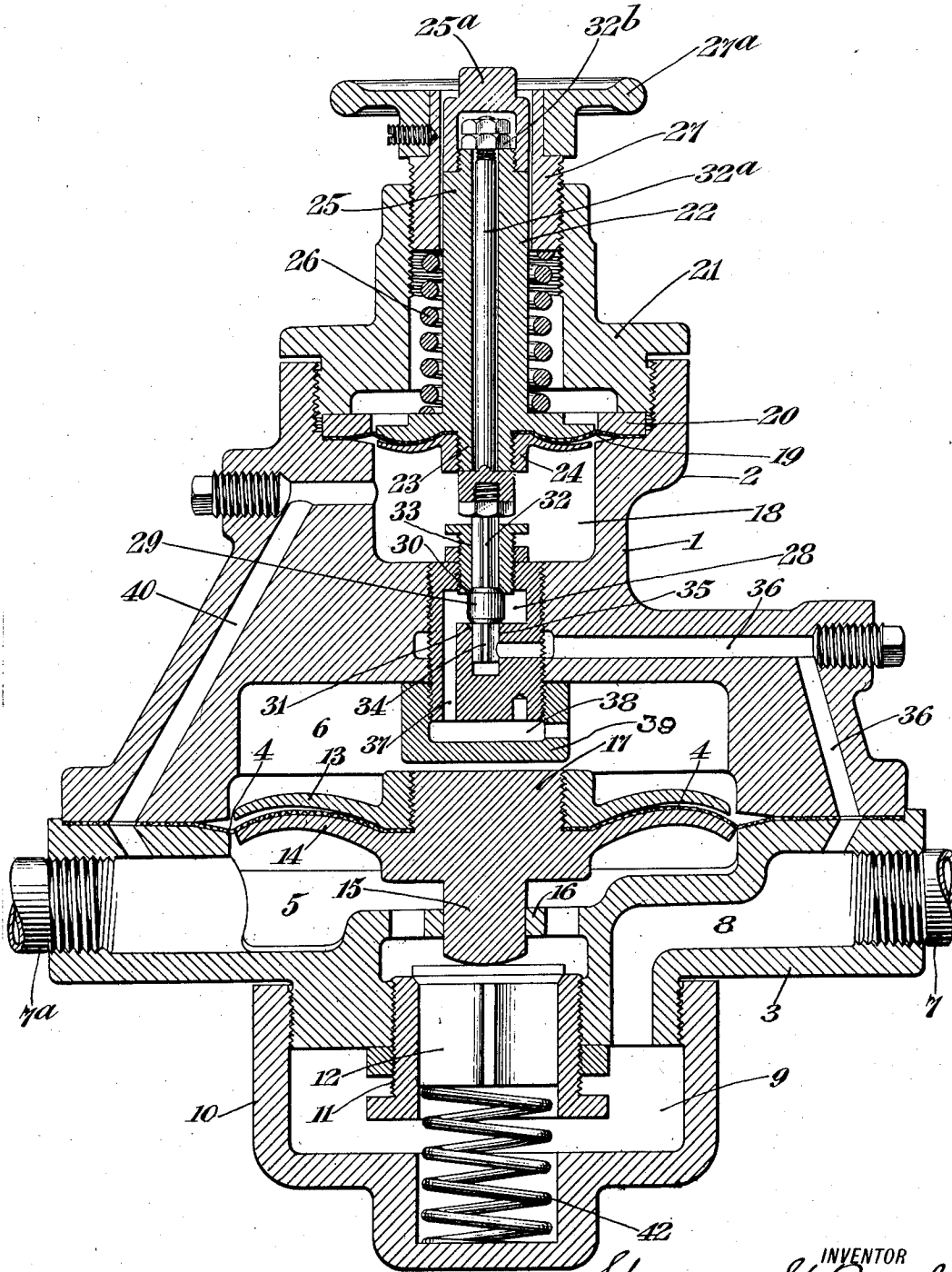


S. G. NEAL.
 FEED VALVE FOR AIR BRAKE APPARATUS.
 APPLICATION FILED DEC. 15, 1916.

1,361,278.

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UNITED STATES PATENT OFFICE.

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AUTOMATIC STRAIGHT AIR BRAKE COMPANY, OF WILMINGTON, DELAWARE,
A CORPORATION OF DELAWARE.

FEED-VALVE FOR AIR-BRAKE APPARATUS.

1,361,278.

Specification of Letters Patent.

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To all whom it may concern:

Be it known that I, SPENCER G. NEAL, a citizen of the United States, and resident of the borough of Manhattan, city, county, and State of New York, have invented certain new and useful Improvements in Feed-Valves for Air-Brake Apparatus, of which the following is a specification.

One of the principal objects of this invention is to provide an automatically operating feed valve by means of which a predetermined pressure may be maintained in the train pipe, said feed valve being adapted for use with the usual engineer's brake valve.

Another object of the invention is to provide a valve adapted to feed air from the main reservoir into the train pipe to maintain a predetermined pressure therein, the air from the main reservoir opening the inlet valve when the train pipe air is below the desired pressure; and wherein the main reservoir air will close the inlet valve when the train pipe air is at the desired pressure.

This feed valve may be used in other apparatus than air brakes, and while I have described it as being particularly adapted for use in air brake apparatus I desire it understood that I am not to be in any way limited in the use of the device.

The drawing represents a vertical central sectional view of the valve, showing the inlet valve closed.

Referring to the various parts by numerals, 1 designates the main body of the valve which consists of two sections, an upper section 2 and a lower section 3, the lower section 3 carrying the valve which controls communication between the main reservoir and the train pipe chamber within the valve casing. The two sections of the valve may be connected together in any suitable manner, and said sections clamp between them the valve operating diaphragm 4, said diaphragm forming the upper wall of a train pipe chamber 5 and the lower wall of a valve closing chamber 6. The chamber 6 is formed in the lower part of the section 2, and the train pipe chamber 5 is formed in the upper part of section 3. That part of the diaphragm 4 which separates the chambers 5 and 6 from each other is circular and is so constructed that it vibrates to a limited extent in response to variations in pres-

ures in the train pipe chamber and in the valve closing chamber.

The main reservoir supply pipe 7 is connected to the section 3 of the casing below the diaphragm 4 and is in communication through a passage 8 with a main reservoir supply chamber 9 formed by cap 10 secured to the bottom of the casing. The section 3 is provided at its lower end with a bushing 11 whose upper end forms a seat for a downwardly seating inlet valve 12. The diaphragm 4 is clamped between two plates or disks 13 and 14, the lower one 14 being provided with a depending stem 15 which passes through a spider wall 16 and engages the upper surface of the valve 12. The plate 14 is also formed with an upwardly extending central stud 17 on which is threaded the upper clamping plate 13. The upper end of the stud 17 is adapted to contact with a fixed stop to limit the upward movement of the diaphragm, as will be more fully hereinafter described.

In the upper end of section 2 of the valve casing is formed a controlling chamber 18, the upper wall of said chamber being formed by a controlling diaphragm 19, said diaphragm being held in place by a clamping ring 20. This ring is forced downwardly and held in place by the base portion of an upwardly extending cup 21 secured to the top of the casing section 2. A plunger 22 rests on the upper side of the controlling diaphragm and said plunger is formed with a depending, central, threaded stud 23 on which is screwed a lower clamping plate 24, which forms a support for the under side of the controlling diaphragm. In the cup 21 and surrounding the upwardly extending stem 25 of the plunger 22 is a controlling spring 26, the pressure of said spring on the plunger being regulated by an adjustable sleeve 27 which is threaded in the upper end of the cup 21. It is manifest that by adjusting this sleeve in the cup the pressure of the spring 26 on the plunger 22 may be varied as desired.

In the section 2 of the valve casing between the controlling chamber 18 and the valve closing chamber 6 is formed a pilot valve chamber 28, and in this chamber is mounted a double pilot valve 29, the upper end of which is adapted to rest on valve seat 30, the lower end being adapted to come to

rest on valve seat 31. This pilot valve is formed with an angular stem 32 which extends upwardly through a port 33. The upper end of this angular stem is screwed into the lower end of a headed rod 32^a which passes upwardly through the plunger 22 and its stem 25. Lock nuts 32^b are screwed on to the upper end of the said rod and clamp it to the plunger. A cap 25^a is secured to the upper end of the stem 25 and incloses the lock nuts 32^b. On the upper end of the adjustable sleeve 27 is secured a hand wheel 27^a by means of which the said sleeve may be readily turned. By rigidly securing the pilot valve to the controlling diaphragm 19 it is manifest that the said valve will be positively reciprocated and will follow the movements of the said diaphragm. The pilot valve is also formed with a depending angular stem 34 which fits within a downwardly extending port 35. Port 33 opens into the controlling chamber and is closed when the pilot valve rests on valve seat 30. Port 35 communicates through passage 36 with the main reservoir supply pipe 7. Pilot valve chamber 28 is in communication with the valve closing chamber 6, through passage 37 and port 38 formed in a cap 39 located within the valve closing chamber, said cap forming a stop to limit the upward movement of the valve closing diaphragm 4. The controlling chamber 18 is in communication with the train pipe chamber through passage 40 so that train pipe pressure will be almost instantly registered in the controlling chamber.

While air pressure from the main reservoir supply will unseat valve 12 I prefer to employ a light spring to insure the positive opening of said valve.

The operation of the valve is as follows:

The sleeve 27 is adjusted to bring the required controlling pressure on the plunger 22 and diaphragm 19, this pressure being the desired train pipe pressure. Before air pressure is admitted into the valve the spring 26 holds valve 29 on valve seat 31 to close port 35. The spring 42 holds the valve 12 open and the diaphragm 4 in its upper position with the central portion thereof against the cap 39. As main reservoir pressure is admitted to the valve it flows into the main reservoir supply chamber 9 by way of passage 8, and to the train pipe, past valve 12 and train pipe chamber 5. The increasing train pipe pressure caused by the flow of main reservoir air as described, will be registered in the regulating or controlling chamber 18, said air flowing through passage 40. From the controlling chamber 18 the train pipe air will flow to the valve closing chamber 6 through port 33, around valve 29 and through passage 37 and port 38, thereby equalizing pressure on both sides of the diaphragm 4. This per-

mits spring 42 and main reservoir pressure to maintain valve 12 in its open position.

The parts will remain in the position just described until sufficient pressure has been built up in the controlling or regulating chamber 18 to overcome the tension of the controlling spring 26. When this pressure has been attained the controlling diaphragm 19 is moved upwardly against the tension of the spring 26, and will raise pilot valve 29 to open port 35 and close port 33, thus cutting off communication between the train pipe and valve closing chamber 6 and opening communication between the main reservoir and the said valve closing chamber through passage 36, port 35, passage 37 and port 38. The high main reservoir pressure thus admitted to chamber 6 will force diaphragm 4 downwardly against train pipe pressure in chamber 5 and close valve 12 against main reservoir pressure. It will be readily seen that if the pressure in the train pipe be now reduced by train pipe leaks, the pressure in chamber 18 will be likewise reduced, thereby permitting spring 26 to overcome the train pipe pressure on the controlling diaphragm 19 and force said diaphragm downwardly to again place the pilot valve in its lowermost position to close port 35. This will cut off the main reservoir pressure from the valve closing chamber 6, and admit train pipe pressure to said chamber thereby again bringing about an equalization of pressures on both sides of the diaphragm 4. The high main reservoir pressure from pipe 7, assisted by the tension of the spring 42, will then force the diaphragm 4 and valve 12 upwardly, thereby admitting main reservoir pressure to the train pipe chamber and to the train pipe and controlling chamber as hereinbefore described, until the required pressure is again built up in the controlling chamber.

From the foregoing it is manifest that I provide a feed valve wherein the inlet valve is opened by main reservoir pressure, and is closed by main reservoir pressure when the train pipe air has reached the desired pressure. A valve operating as described will be very positive both in its opening and closing movements. It is also of great advantage to utilize train pipe air in the controlling chamber to insure the proper pressure in the train pipe before the inlet valve is closed. I also consider it of great advantage to employ a pilot valve under the control the train pipe pressure and serving to admit main reservoir air to the valve closing chamber for the purpose of closing the inlet valve. By this means the inlet valve is positively and instantly closed the moment the train pipe air in the controlling chamber is at the desired pressure. There are other advantages resulting from the construction and operation of the valve as

described herein but I do not deem it necessary to further state these advantages herein.

While I have described my valve as especially applicable for use in connection with air brake apparatus it will, of course, be understood that it may be used for other purposes and in other apparatus where a valve for feeding fluid under pressure is desired. It will also be understood that the chamber 9 is an inlet chamber connected with a source of supply through the pipe 7; and that the train pipe chamber is an outlet chamber connected to the controlling chamber through the passage 40. The train pipe 7^a may lead the reduced pressure to any desired place and for any purpose. I desire it also understood that while I have shown and described the movable abutments 4 and 19 as diaphragms they may be in any desired or suitable form and construction. I am, therefore, not to be limited in the use of the valve or in the details of construction thereof.

The valve closing diaphragm is of larger diameter than the inlet valve so that the said two parts have differential pressure areas. By this means the pressure from the source of supply may be utilized to close the inlet valve against the supply pressure because of the larger area of the diaphragm 4.

What I claim is:

A fluid feeding valve comprising a casing

formed with an inlet chamber, an outlet chamber, a valve closing chamber, a movable abutment between the outlet chamber and the valve closing chamber, an inlet valve between the inlet chamber and the outlet chamber, said valve moving toward the outlet chamber in response to pressure in the inlet chamber, said valve being smaller in area than the movable abutment, a spring under said valve and tending to open it, a depending stem formed on the movable abutment and adapted to contact with the upper surface of the inlet valve to force said valve to its seat, a controlling chamber in communication with the outlet chamber, a controlling abutment in said controlling chamber, a double pilot valve controlling two ports and formed with an upwardly extending stem rigidly connected to the controlling abutment, said valve vibrating between two seats whereby said pilot valve will be positively moved from one seat to another by said abutment, said seats serving as positive stops for the controlling diaphragm, said pilot valve controlling communication between the inlet chamber and the valve closing chamber and between the valve closing chamber and the controlling chamber, and a variable pressure device bearing on the controlling abutment.

In testimony whereof I hereunto affix my signature.

SPENCER G. NEAL.