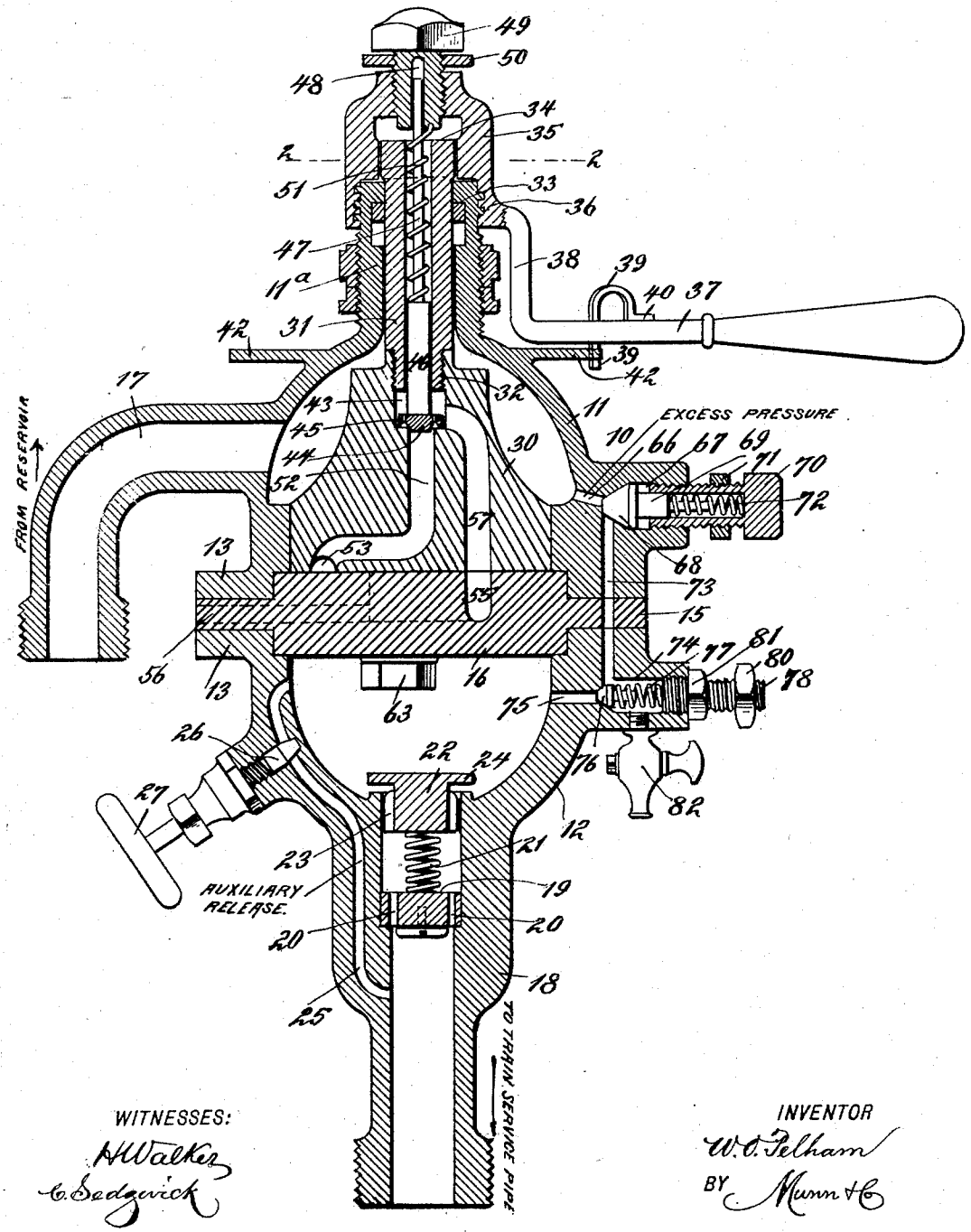
(No Model.) 2 Sheets—Sheet 1.

W. O. PELHAM.

ENGINEER'S GRADUATING VALVE.

No. 503,551. Patented Aug. 15, 1893.

Fig. 1.



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(No Model.) 2 Sheets—Sheet 2.

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Fig 2

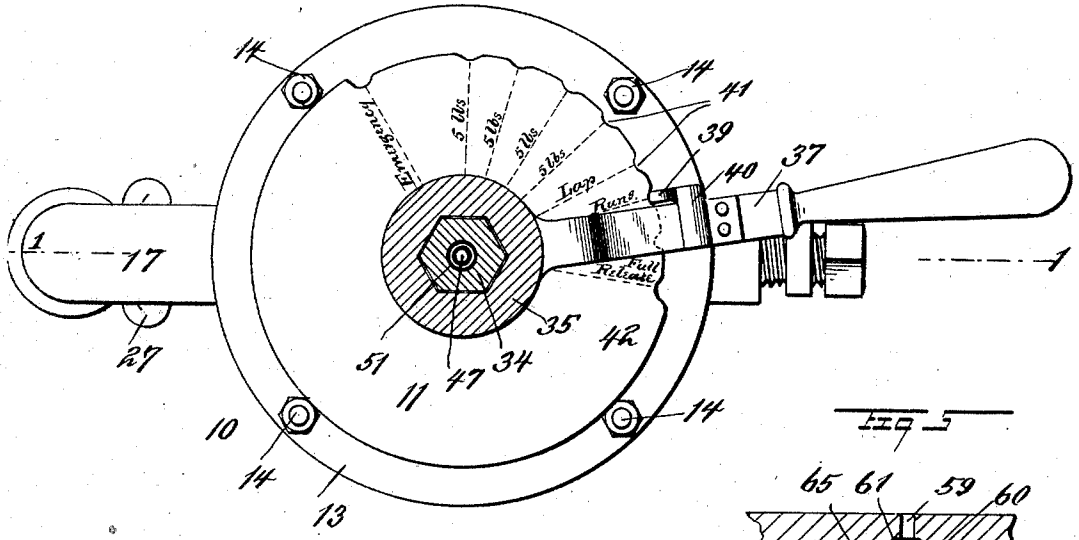


Fig 5

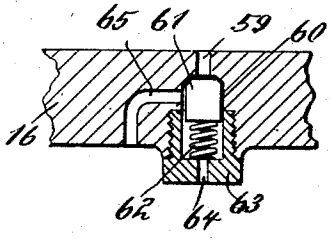


Fig 3

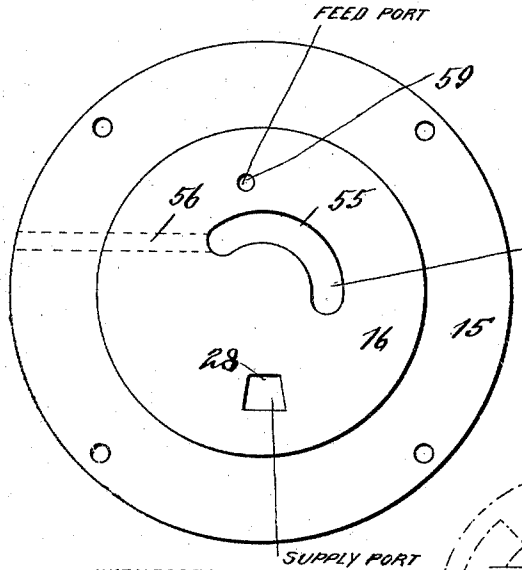


Fig 4

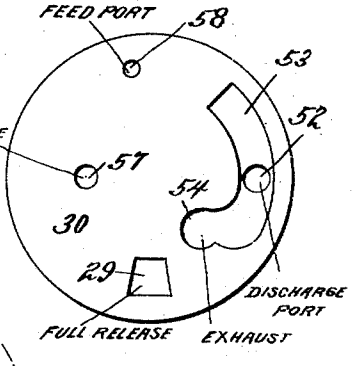
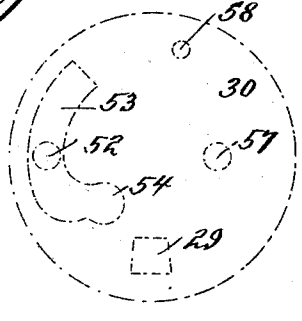


Fig 6



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UNITED STATES PATENT OFFICE.

WALTER O. PELHAM, OF DENISON, TEXAS.

ENGINEER'S GRADUATING-VALVE.

SPECIFICATION forming part of Letters Patent No. 503,551, dated August 15, 1893.

Application filed October 17, 1892. Serial No. 449,134. (No model.)

To all whom it may concern:

Be it known that I, WALTER O. PELHAM, of Denison, in the county of Grayson and State of Texas, have invented a new and Improved Engineer's Graduating-Valve, of which the following is a full, clear, and exact description.

My invention relates to improvements in engineers' graduating valves such as are used in connection with air brake systems; and the object of my invention is to produce a comparatively simple valve which is constructed in such a way that it is not likely to clog or get out of order, which is arranged so that successive regular reductions may be easily made in the pressure of air in the train service pipe, which is adapted to automatically act on the governor of the air pipe from pressure either above or below the main valve, which is constructed in such a way that if the train parts the pressure in the main reservoir will not be reduced, which generates excess pressure when the brake handle is in running position and acts through said excess pressure on the governor of the pump, which is not likely to leak, and which in general may be easily controlled and places the train brakes under the complete control of the engineer.

To these ends my invention consists in certain features of construction and combination of parts, as will be hereinafter described and claimed.

Reference is to be had to the accompanying drawings, forming a part of this specification, in which similar figures of reference indicate corresponding parts in all the views.

Figure 1 is a central vertical section of the valve embodying my invention, on the line 1—1 in Fig. 2. Fig. 2 is a sectional plan on the line 2—2 in Fig. 1. Fig. 3 is a detail plan view of the main valve seat. Fig. 4 is an inverted plan of the main valve. Fig. 5 is an enlarged detail sectional view of an excess pressure valve which is arranged in the main valve seat; and Fig. 6 is a diagram of the main valve ports.

The valve is provided with an elongated two-part casing 10, the upper part 11 and lower part 12 forming respectively the upper and lower chambers of the valve, and these parts 11 and 12 have flanges 13 which are held together by bolts 14, as shown in Fig. 2. A plate 15 is held between the two parts of the valve casing and this plate is thickened in the middle to form the seat 16 of the main valve, and the seat is perfectly flat so that the valve may rotate smoothly upon it. The upper part of the casing has an inlet 17 which is adapted to connect with the main reservoir, and the lower part of the casing has an outlet pipe 18 which is coupled to the train service pipe. In this outlet pipe 18 is seated a plug 19 which is provided with air passages 20, and the plug supports a spiral spring 21 which presses upward upon a valve 22 which is arranged in the mouth of the pipe 18, the valve having side channels or passages 23 for air and a top flange 24 which is adapted to be seated upon the mouth of the pipe so as to close the latter. When the valve is raised, however, the air may pass freely through the channels or passages 23 and 20. The valve 22 under ordinary circumstances floats above the mouth of the pipe 18, as the tension of its spring 21 is reinforced by the back pressure from the train pipe, but in case the train pipe should be broken and the pressure reduced in the service pipe, the pressure in the valve casing immediately seats the valve 22 and thus prevents leakage without regard to the position of the main valve. A bore or duct 25 leads from the lower chamber of the main valve casing through the wall of the casing and into the pipe 18, and this bore is controlled by an angle cock 26 which is provided with a suitable handle 27, and by this means when the train has parted and the train service pipe has broken, the angle cock may be turned so as to release the brakes without bleeding the train.

The main valve seat 16 is provided with a a vertical port 28 which extends through it and which registers with a port 29 in the main valve 30, which valve is of a bell shape and is fitted snugly upon the top of the seat 16, and the port 29 extends through the valve and consequently, when the ports 28 and 29 register, there is a clear passage from the main reservoir through the inlet 17 and through the valve and port to the train pipe. The valve 30 is provided with an upwardly extending hollow stem 31 which is preferably connected with the valve by a screw joint, as

shown at 32, and this stem is held in a stuffing box 33 at the top of the upper reduced end of the main valve casing. The top portion 34 of the valve stem is hexagonal, as shown best in Fig. 2, although it may be of other shape so long as it has squared or faceted sides. This faceted portion of the valve stem fits in a corresponding bore of the cap 35 which is seated upon the main valve casing and connects with the reduced top 11^a thereof by a large quick thread 36, so that by turning the cap it may be forced quickly up and down. The cap is provided with a handle 37 which extends horizontally outward from the valve, the handle being bent upward at its inner end, as shown at 38, so as to form a convenient connection with the cap. This handle 37 is provided with a spring catch 39 which is bent outward and downward from the handle, and has a plate 40 which is firmly attached to the handle. The spring catch 39 is adapted to engage in the notches 41 of the graduating plate 42, see Fig. 2, which plate is formed preferably integral with the valve casing, and the notches 41 therein are arranged opposite the several positions in which the handle or lever is placed in controlling the valve and the train pipe. The spring catch 39 engages the notches with sufficient force to prevent the accidental displacement of the lever, but when the lever is grasped and swung either to the right or left, the spring catch slips from notch to notch. This graduating plate is marked off in substantially the usual manner, it being marked "Full release," "Running position," "Laps," "Service" and "Emergency," but between the lap mark and the emergency mark are a succession of five pounds marks and these marks are useful in connection with the valve, as by using the valve a positive and accurate reduction of five pounds in the pressure of the train pipe may be made at each movement of the handle or lever from one notch to another. This will be hereinafter described.

In the upper end of the valve 30 is a chamber 43 in which is held a pop valve 44, which has an annular groove 45 in the bottom and is adapted to be seated on the discharge port 52 of the valve. The valve 44 has a stem 46 which slides in the bore of the valve stem 31, and the stem 46 is reduced at its upper end, as shown at 47, and slides in a slot or bore 48 in the set screw 49, which set screw is provided with a washer 50 and turns in the top of the cap 35.

Between the set screw and the stem 46 is a spiral spring 51 which presses the valve 44 to its seat, and the tension of the spring may be adjusted by the set screw 49. This spring is made to have a certain tension in practice, about twenty pounds, and by turning the lever 37 one notch, the cap 35 may be raised so as to reduce the tension of the spring five pounds, and it may be again reduced five pounds by turning the handle another notch, and so on through the four notches indicated on the graduating plate, and if necessary, the valve may be made to have still other similar reductions. This is an important feature of the invention, as by this means the exact pressure required may be maintained in the train pipes.

Leading downward from the chamber 43 in the valve 30 and then outward to a point on the bottom and near one edge of the valve, is a discharge port 52, which terminates in a face port or groove 53, see Figs. 1 and 4, and the lower end of the port 52 and the port 53 are arranged so as to register with the port 28 in the main valve, and the port or groove 53 has at one end an offset 54 which, when the valve is turned, is adapted to register with a port 55 in the main valve seat and this port communicates with the outer air, as shown at 56. The port 56 is a discharge for all, that is, for all air which is extracted from the train service or brake pipe, and this arrangement adapts the valve for use in an emergency, and when the pressure is to be immediately removed from the train pipe. By turning the handle 37 to "emergency" the groove or port 53 registers with the port 28 in the main valve seat, and the offset 54 in the port 53 registers with the curved and elongated port 55 in the valve seat, so that the air may rush from beneath the valve seat up through the port 28 and out through the ports 54, 53 and 55 without having to overcome the pressure on the pop valve 44.

The valve 30 has a port 57 which leads downward through it from the chamber 43, and this port is adapted to register with the port 55 in the valve seat. This port 57 serves as the ordinary service discharge and the air to escape through the ports 57 and 55 passes upward through the port 28 into the port 53, then up through the port 52, lifts the valve 44, and then passes out through the ports 57 and 55. It will be noticed that the port 55, being a long one, is in engagement for some time with the port 57, and the amount of pressure in the train pipe, when these ports are in connection, depends on the position of the handle 37 and cap 35, as by changing the position of the cap, the tension of the spring 51 is changed and consequently the pressure on the valve 44.

The valve 30 is provided with still another port 58 which leads downward through it, and this is adapted to register with the port 59 in the valve seat 16, which port is governed in a measure by the excess pressure valve 61 which is held in a recess 60 in the under side of the seat 16, and the valve is pressed upward, so as to close the port 59, by a spiral spring 62 which is held in a screw cap 63 which is screwed into the recess 60. The cap 63 is perforated in the center, as shown at 64, so that the air pressure from beneath also acts to hold the valve 61 to its seat. A port 65 leads directly from the recess 60 to the under side of the valve seat and to the chamber beneath the valve seat. When the ports 58 and 59 register, the valve is in "running position," and the press-

ure from above the valve passes downward and depresses the valve 61 thus permitting the air from above to pass downward through the ports 59 and 65, and thence to the train pipe. When excessive pressure is generated above the valve, the air passes outward through the port 66 in the valve casing, pushes back the valve 68 and passes on to the governor with which the valve connects, and this action will be more fully described hereinafter. The port 66 leads from the upper portion of the valve casing and connects with the chamber 67 in which is held a valve 68 which has an outwardly extending stem 69, and this is held in a screw cap 70 which is provided with a suitable jam nut 71, and the valve 68 is pressed to its seat, so as to close the port 66, by a spiral spring 72, which is arranged behind the valve and held in a hollow screw cap. A port 73 leads downward from the chamber 67 through the plate 15 and the wall of the valve casing, and delivers into a second chamber 74 which is arranged opposite the lower chamber of the main valve casing with which it connects by a port 75. The port 75 is normally closed by a valve 76 which is pressed to its seat by a spring 77 and the latter is adjusted by a nipple 78 which is threaded to turn in the outer portion of the chamber 74 and is provided with adjusting nuts 80 and 81. A cock 82 opens from the chamber 74, and this cock may be used to bleed the port 73 which is controlled by the valve 68, as described above, and connects with the upper chamber of the main valve casing.

The operation of the valve is as follows:—When the handle 37 is turned to the extreme left to the point marked "Full release," the ports 28 and 29 in the main valve seat and valve register, and the air passes downward through the ports and out through the pipe 18 to the train pipe. When the handle is moved to the service notch, as shown in the drawings, the air passes up through ports 28 and 52, raises the valve 44, and then passes to the atmosphere through the ports 57, 55 and 56. When the handle is moved to the next stop marked "Running position," the ports 58 and 59 register and the air pressure overcomes the resistance of the spring 62, and the air passes downward through the ports 59 and 65 to the train pipe. When excessive air pressure is generated above the valve, the excess pressure pushes back the valve 68, and the air passes downward through the ports 76 and 73, and out and through the nipple 78 to the governor of the air pump with which the said nipple connects in the usual way. When the handle is moved one more notch to the right, it is opposite the "lap" mark on the graduated plate 42 and all the ports of the main valve and its seat lap, none of them being open. When the handle is moved one more notch to the right, the cap 35 is turned up so as to lessen by five pounds the tension of the spring 51, and the port 53 is brought opposite the port 28 in the valve seat and the port 57 opposite the port 55 in the valve seat, so that the air from beneath passes through the ports 28, 53 and 52, lifts the valve 44, and then passes out through the ports 57 and 55; as soon as the pressure is reduced five pounds the pop valve 44 is again returned to its seat. Upon turning the handle another notch this action is repeated and the pressure on the train pipe lessened five pounds more and so on until the last of the five pounds notches is reached, each movement of the handle from one notch to the other as described, reducing the pressure in the train pipe by permitting some of the air to escape, and the spring 51 returning the valve 44 to its seat after each operation. The next turn of the handle 37 is to the "emergency" mark and this brings the offset 54 and the port 53 into register with the port 55 in the valve seat, while the port 53 registers with the port 28 in the valve seat. The pressure will thus be wholly released and the air from beneath the valve seat will rush outward through the ports 28, 53 and 55 without having to overcome the pressure on the pop valve 44. As the connection with the governor is through the nipple 78 and as this nipple connects through valve controlled ports with both the upper and lower chambers in the main valve casing, it will be seen that this gives an automatic double control of the governor, as the excess pressure in either part of the casing will cause the governor to be acted upon.

When the brake handle 37 is at lap position, the air is pumped from the main pump through the main reservoir and through the inlet pipe 17 to the top portion of the main valve casing, and as all ports are closed, the pressure overcomes the tension of the spring 71, the latter being set at a stated pressure, say of one hundred and ten pounds, and the air then passes down through the port 73 entering behind the valve 76, closing the port 75, and then passing out through the stem 78 to the governor of the air pump, and as the governor is set at, say seventy pounds, it will stop the pump until the pressure is reduced in the top of the valve and then the valve 67 closes.

The train pipe is governed as follows: The plug 70 is set so as to hold the valve 68 to its seat with the necessary tension, and the valve has no action when the handle 37 and valve 30 are in running position; but when the handle and valve 30 are at lap, service, or emergency positions, pressure will increase in the main reservoir and the top of the valve casing until it pushes back the valve 68, and the air will then pass downward through the port 73, entering behind the valve 76, and then passing out to the governor, which, actuated by the air pressure, stops the air pump. To start the pump, bring the handle to full released position, thereby equalizing the press-

ure in the train pipe or brake pipe and in the main reservoir, and the valve 68 goes back to its seat and the pump starts.

Having thus described my invention, I claim as new and desire to secure by Letters Patent—

1. An engineer's graduating valve, comprising a casing having a stationary seat therein dividing the casing into two chambers, an inlet pipe connecting with the casing above the seat and adapted to connect with the main reservoir, an outlet below the seat to connect with a train pipe, a service port extending from chamber to chamber through the seat, a discharge port in the upper portion of the seat and opening into the outer air, a lower port opening downward through the seat and controlled by a spring pressed valve, a revoluble valve held to turn flat upon the seat, a port extending downward through the valve and adapted to register with the service port of the seat, a chamber in the top of the valve, a port leading downward from the chamber and adapted to register with the service and discharge ports of the seat, a pop valve held in the chamber and adapted to close the above named port therein, and another port opening from the side of the chamber and adapted to register with the discharge port in the seat, substantially as described.

2. An engineer's graduating valve, comprising a casing having one end portion arranged to connect with a compressed air supply and the other end connecting with the train pipes, a stationary seat arranged within the casing and dividing it into two chambers, a revoluble valve held to turn upon the seat and provided with a suitable handle, means for automatically closing the train or brake pipe discharge by the reduction of air pressure in said pipe and ports and a supplemental valve arranged in the main valve and seat, so that by turning the valve the compressed air may be permitted to flow downward through the seat, upward and outward through the seat and valve to the air and may be released in successive regular reductions, substantially as described.

3. In an engineer's valve, the combination of the casing having an inlet for compressed air at one end and an outlet at the other, a stationary valve seat extending transversely across the casing and dividing it into two chambers, a port extending downward through the seat, a spring-pressed valve held to normally close the port, a revoluble main valve held to turn on the seat and having a port therein to register with the seat port, and connected valve-controlled ports opening from above and below the seat and adapted to connect with the governor of an air pump, substantially as described.

4. In an engineer's graduating valve, the combination of the main casing having an inlet at one end and an outlet at the other, and the stationary seat extending across the casing, so as to form two chambers the seat having a service port opening through it between the two chambers and an outlet port opening from its upper side and leading to the outer air, of a revoluble valve held to turn on the seat and provided with a chamber, as described, a port arranged in the valve to register with the service port of the seat and connecting with the chamber of the valve, a discharge port opening from the side of the chamber in the valve and adapted to register with the outlet port in the seat, a spring-pressed pop valve held in the chamber of the main valve and adapted to normally close the service port, a handle arranged to turn the main valve, and a screw mechanism for adjusting the tension of the pop valve spring by the movement of the handle, substantially as described.

5. In an engineer's valve, the combination with the main casing having an inlet for compressed air at one end and an outlet at the other, a stationary flat seat extending centrally across the casing, so as to form two chambers a service port leading through the seat and an outlet port opening from the top of the seat and leading to the outer air, of a main valve held to turn on the valve seat, the valve having a chamber therein, a face port produced in the valve and adapted to register with the service port in the seat, a port leading from the face port to a chamber in the valve, a spring-pressed pop valve held to normally close the latter port, a discharge port opening from the side of the chamber and adapted to register with the outlet port of the valve seat, an upwardly extending hollow stem secured to the valve, a cap screwed to the valve casing and connected with the main valve stem so as to turn therewith, the cap serving also as an abutment for the spring of the pop valve, and a handle secured to the cap, substantially as described.

WALTER O. PELHAM.

Witnesses:
J. G. WEST,
JAS. F. HOGAN.