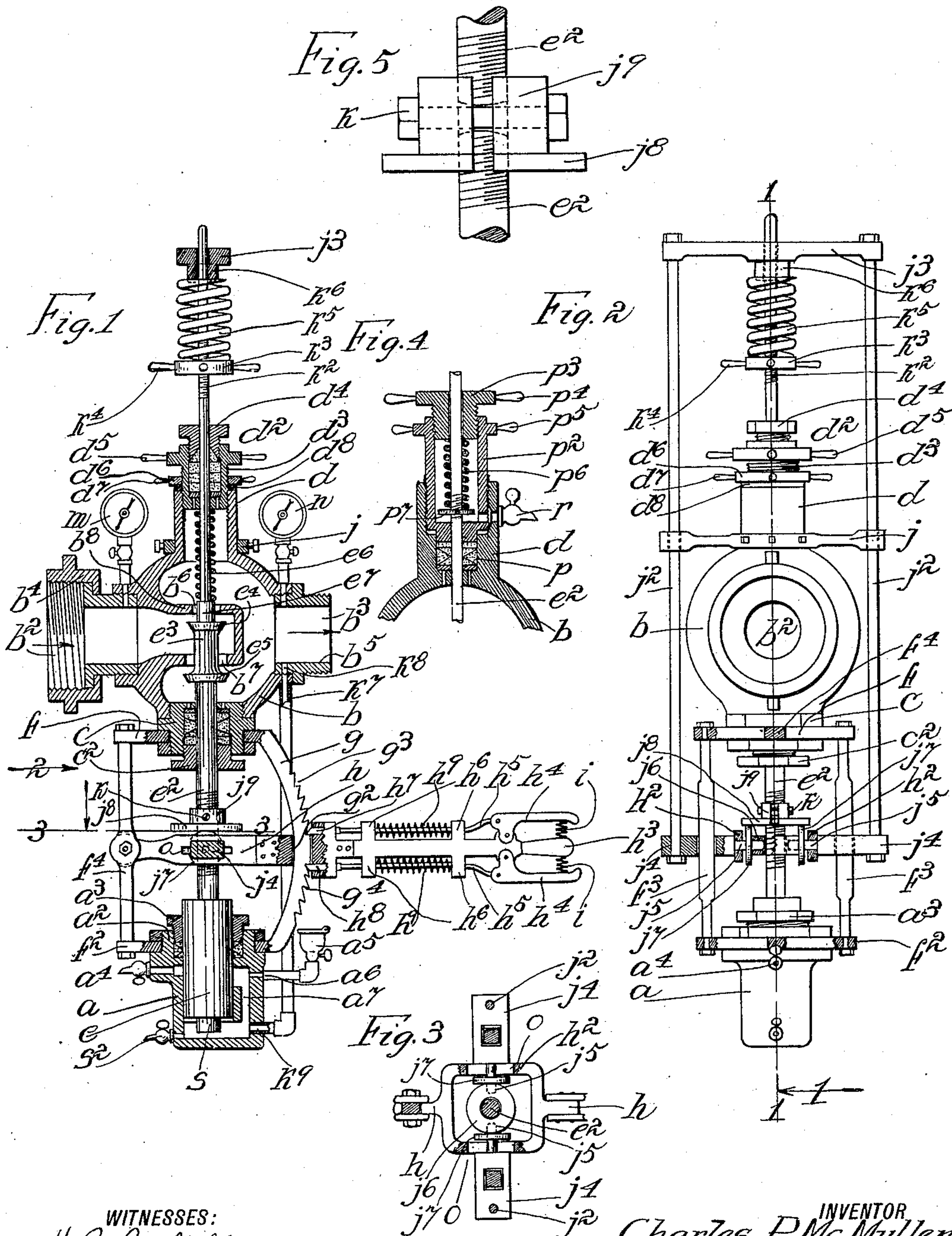


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STEAM AND LIQUID PRESSURE REGULATING DEVICE.
APPLICATION FILED APR. 9, 1909.

944,689.

Patented Dec. 28, 1909.



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STEAM AND LIQUID PRESSURE REGULATING DEVICE.

944,689.

Specification of Letters Patent.

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To all whom it may concern:

Be it known that I, CHARLES P. McMULLEN, a citizen of the United States, and residing at New York, in the county of New York and State of New York, have invented certain new and useful Improvements in Steam and Liquid Pressure Regulating Devices, of which the following is a specification, such as will enable those skilled in the art to which it appertains to make and use the same.

This invention relates to pressure regulating devices adapted for use in fire extinguishing apparatus, steam pumps, and other forms of apparatus of the same class; and the object thereof is to provide an improved device or apparatus of this class which is automatic in operation and which may be used under high or low pressure conditions, and which is simple in construction and operation; and with these and other objects in view the invention consists in a device or apparatus of the class specified constructed as hereinafter described and claimed.

The invention is fully disclosed in the following specification, of which the accompanying drawing forms a part, in which the separate parts of my improvement are designated by suitable reference characters in each of the views, and in which:—

Figure 1 is a sectional side view of my improved pressure regulating device or apparatus, the section being taken on the line 1—1 of Fig. 2, Fig. 2 is a side view at right angles to that of Fig. 1 and looking in the direction of the arrow 2 of said figure, with part of the construction broken away, Fig. 3 is a partial section on the line 3—3 of Fig. 1, Fig. 4 is a view similar to Fig. 1, but showing a modification of a part of the construction shown therein, and;—Fig. 5 is a view of a detail of the construction shown in Figs. 1 and 2, but showing said detail on an enlarged scale.

The invention described and claimed herein is particularly adapted for use in connection with the high pressure fire extinguishing apparatus described and claimed in an application for Letters Patent of the United States filed by me Oct. 15, 1908, Ser. No. 457,797, and one of the particular objects of the improvement which forms the basis of this application is to adapt the said device

for use in connection with hydrants or water plugs where there is but little space for the attachment thereof; but this invention is, however, adapted for use as a pump governor and for similar purposes, and in this respect is similar to, and an improvement on, the invention described and claimed in U. S. Letters Patent granted to me Nov. 8, 1904, Ser. No. 774,266 and reissued Jan. 10, 1905, No. 12,302; also in Letters Patent of the United States granted to me Jan. 23, 1906, Ser. No. 810,666; July 9, 1907, No. 859,327, and July 9, 1907, Ser. No. 859,407; and said invention in this use thereof is more particularly an improvement on that described and claimed in an application for Letters Patent of the United States filed by me June 30, 1908, Ser. No. 441,186, and in an application for Letters Patent of the United States filed by me Nov. 28, 1908, Ser. No. 464,905.

In the drawing forming part of this specification, I have shown at *a* the cylinder of a pressure regulator or governor of the class specified and above which is placed a valve casing *b* having an inlet side *b*² and outlet side *b*³, the inlet side *b*² being provided with a coupling *b*⁴ with which, in practice, a water supply, steam supply or other pipe is connected, and the outlet side *b*³ with a coupling *b*⁵ with which, in practice, a pipe for conveying water to a fire hose, or steam to a steam pump or other device may be connected.

The valve casing *b* is provided at the bottom thereof with a packing box *c* having a gland *c*² and the cylinder *a* is closed at the bottom and open at the top and provided with a packing box *a*² having a gland *a*³, and said cylinder is provided at one side of the top portion thereof with a vent *a*⁴ and at the opposite side with an oil supply device *a*⁵ which is in communication with the top portion of the cylinder at *a*⁶, and said cylinder is provided with a by-pass *a*⁷ which communicates with the top and bottom portion of said cylinder and by means of which the interior of said cylinder may be thoroughly lubricated at all times, this feature of the construction being substantially the same as that shown and described in the patents and applications hereinbefore referred to.

The top portion of the valve casing *b* is

provided with a tubular casing d which communicates with the outlet side b^3 of said valve casing, and said tubular casing d is provided with a packing box d^2 formed by a tube d^3 which is screwed thereto and a gland d^4 which is screwed into the tube d^3 , and said tube d^3 is provided with handles d^5 by which it may be turned in either direction, and mounted on the tube d^3 is a threaded band or collar d^6 which operates as a set nut and is provided with handles d^7 and between which and the end of the tubular casing d is placed a packing ring d^8 .

The valve casing b is of what is known as a double valve type and is provided with two ports b^6 and b^7 , the top port b^6 being preferably smaller than the bottom port b^7 , and placed in the cylinder a is a vertically movable piston e provided with a rod e^2 which passes upwardly through the packing box c , the valve casing b , through the ports or passages b^6 and b^7 in said valve casing, through the tubular casing d at the top of said valve casing and through the packing box d^2 , and said valve rod is provided with a double valve e^3 the upper part e^4 of which is adapted to close the port or passage b^6 , and the lower part e^5 to close the port or passage b^7 , and mounted on said valve rod between the partition b^8 in the valve casing b in which the port or passage b^6 is formed and the bottom of the packing box d^2 is a low pressure spiral spring e^6 , and said spring bears on an annular shoulder or similar device e^7 with which the valve rod e^2 is provided.

Secured to the packing box c and to the cylinder a are top and bottom yoke-shaped frame bars f and f^2 connected by vertically arranged frame rods or bars f^3 two of which are shown, and this frame construction forms a rigid connection for the valve casing b and cylinder a . The frame bars f and f^2 are also connected by a vertically arranged bar f^4 as clearly shown in Fig. 1 and opposite to which is a vertically arranged outwardly curved or segmental rack bar g which is also connected with the frame bars f and f^2 and forming part of said frame, and these parts f^4 and g also form part of the frame of the device which connects the valve casing b and the cylinder a . Pivoted to the part f^4 of said frame is a lever h having a yoke-shaped member h^2 through which the piston rod e^2 passes, and the rack bar g passes loosely through said lever at g^2 , and said rack bar is provided above the middle thereof with teeth g^3 and below the middle thereof with teeth g^4 .

The lever h is provided at its outer end with a handle h^3 at the inner end of which are pivoted bell cranks h^4 with which are connected rods h^5 which range parallel with said lever h and pass through keepers h^6

connected therewith, and said rods are provided with dogs h^7 and h^8 adapted to engage, respectively, the upper teeth g^3 and the lower teeth g^4 on the rack bar g , and mounted on the rods h^5 between the keepers h^6 are springs h^9 which normally force the dogs h^7 and h^8 inwardly so as to engage said teeth, and placed between the outer ends of the bell cranks h^4 and the handle h^3 are springs i which normally hold said dogs in said engagement.

Secured to the tubular casing d above the valve casing b is a yoke bar j through the opposite ends of which are loosely passed vertically arranged rods j^2 , the upper ends of which are connected by a cross bar j^3 , and the lower ends of which are connected with a divided cross head j^4 vertically movable on the side bars j^5 of the frame which connects the valve casing b and the cylinder a .

The separate parts of the cross head j^4 are rigidly connected with the sides of the yoke-shaped member h^2 of the lever h as clearly shown in Fig. 3 by means of pins j^5 which are also secured in a central ring j^6 through which the piston rod e^2 passes, and mounted between said ring and the sides of the yoke-shaped member h^2 are wheels or rollers j^7 adapted to bear on the under side of a disk j^8 having a hub j^9 and rigidly secured to the rod e^2 . The rod e^2 is composed of two parts, and the disk j^8 and its hub j^9 form a nut for connecting these parts as clearly shown in Fig. 5 and the adjacent ends of said rod are threaded and the said nut is correspondingly threaded, and the separate parts of said nut are secured together by a bolt k which passes between the adjacent ends of the rod as clearly shown in said figure, the object of this construction being to facilitate the taking apart of the separate parts of the apparatus when necessary in making repairs.

The upper end of the piston rod e^2 passes loosely through the cross bar j^3 at the top of the rods j^2 , and part of said rod above the packing box d^2 is threaded as shown at k^2 , and mounted thereon is a head or collar k^3 provided with handles k^4 , and between said head or collar and the cross bar or head j^3 is placed a high pressure spiral spring k^5 , and said cross bar or head j^3 is provided with a stud k^6 adapted to enter the upper end of the spring k^5 but shown above said spring in Fig. 1 and said stud is designed to hold it in proper position.

With the above construction, it will be seen, that the frame composed of the divided cross head j^4 , the rods j^2 and the top cross head or bar j^3 is vertically movable with the lever h when said lever is swung in a vertical plane, and this movement will result, as will be understood, in throwing the spring k^5 into or out of operation according to the direction in which the lever h is moved.

The outlet side b^3 of the valve casing b is placed in communication with the bottom of the cylinder a by means of a pipe k^7 as shown at k^8 and k^9 , and the opposite sides of said valve casing or the inlet and outlet sides thereof are provided with pressure gages m and n as shown in Fig. 1.

In the accompanying drawing the communication between the gages m and n and the corresponding sides of the valve casing are formed in said sides and in the coupling with which they are provided, and the connection of the pipe k^7 with the outlet side of the valve casing is similarly formed, but this connection may be made in any desired manner.

It will be understood that the valve rod e^2 is free to move vertically through the yoke h^2 of the lever h , and when said lever is in the position shown in Fig. 1, water, steam or other fluid or liquid under pressure enters the inlet side of the valve casing b and passes out at the outlet side thereof and the pressure in the outlet side is the pressure that is delivered to a fire hose when the device is used in connection with a fire extinguishing apparatus, and the pressure delivered to the pump when the device is used as a pump governor, and this pressure is transmitted to the bottom of the cylinder a , and if at any time this pressure becomes too great, the piston e will be raised and the valve e^3 will be operated automatically to cut off or regulate the passage of water or steam through the valve casing as will be readily understood.

This movement of the piston rod e^2 is, as will be understood, against the operation of the spring e^6 , and this spring normally serves to hold the valve e^3 open at all times and an increase of pressure in the outlet side of the valve casing or the pipes communicating therewith beyond a predetermined point will, as will be readily understood, operate to raise the valve e^3 as described and cut off the flow of water, steam or other fluid or liquid through the valve casing.

The tube d^3 of the packing box d^2 is threaded into the casing d of the valve casing b as hereinbefore described, and the position thereof in said casing may be adjusted at any time so as to increase or decrease the tension of the spring e^6 and the force at the bottom of the piston e necessary to raise the piston rod e^2 and to close the valve e^3 may thus be regulated as desired.

The spring e^6 is intended to regulate the operation of the device under low pressure conditions, as for instance when a pressure of from twenty to forty pounds is required, and when the parts are in the position shown in Fig. 1, the high pressure spring k^5 is not in operation, but whenever it is de-

sired to use the device under high pressure, or when a pressure of from forty to one hundred and fifty pounds or higher still is desired, the lever h is moved downwardly, and this operation draws down the frame composed of the cross head j^4 , the vertically arranged rod j^2 and the cross head or bar j^3 and pressure is applied to the high pressure spring k^5 which is exerted on the piston rod e^2 and piston e and a much greater pressure is obtained in the outlet side of the valve casing b or the pipes connected therewith to raise the piston e and close the valve e^3 .

By manipulating the bell cranks h^4 , as will be readily understood, the lever h may be raised or lowered as desired and locked in either position above or below the horizontal or normal position shown in Fig. 1, and as hereinbefore stated the downward movement of said lever will bring the high pressure spring k^5 into action whenever desired, and the upward movement of said lever will close the valve e^3 and hold it in a closed position, and said lever may be locked in its raised position for this purpose by means of the dog h^7 , the corresponding bell crank h^4 and spring h^9 , and the pressure gages m and n will also serve to disclose at any time the pressure in the opposite sides of the valve casing.

The packing boxes a^2 , c and d^2 are similar to those described and claimed in U. S. Letters Patent, No. 859,327 and No. 859,407 granted to me July 9, 1907 and form no part of the invention described and claimed herein, and are therefore not described in detail.

In the accompanying drawing the lower end portion of the piston rod e^2 is made larger than the upper end portion thereof in order to give strength thereto and to facilitate the operation thereof, and said rod may be made of one or two or more parts as may be desired, or may be constructed in any preferred manner.

The sides of the yoke h^2 of the lever h are slotted horizontally as shown at o , and the pins j^5 on which the wheels or rollers j^7 are mounted are movable in these slots in order to accommodate the vertical movement of the lever h .

The lower end of the piston e is provided with a projection s which is intended to prevent said piston from descending low enough to strike the bottom of the cylinder a , in which event the water or steam passing through the pipe k^7 could not pass below said cylinder, and thus operate to raise it and the rod e^2 , and the bottom portion of the cylinder a is provided with a drain spigot s^2 whereby the cylinder may be drained whenever desired.

From the foregoing description, it will be

seen, that the construction and operation of the lever h in connection with the piston rod e^2 , piston e and valve e^3 is substantially the same as in applications No. 441,186 and No. 464,905 hereinbefore referred to, the novel features of the construction described and claimed herein being found in the location and operation of the low pressure spring e^6 , the high pressure spring h^5 , the vertically movable frame by which said high pressure spring is thrown into and out of operation, and the combination of said frame with the lever h by which it is operated and in the gages m and n and other features of construction pointed out in the appended claims.

In Fig. 4, I have shown a modification of the construction shown in Fig. 1 in which the tubular casing d at the upper side of the valve casing b is closed at its lower end and provided with a packing box p . In this form of construction the tube p^2 is threaded into the tube of the tubular casing d which is enlarged to receive it, and the lower end of the tube p^2 is closed and forms a part of the packing box p , and said tube is provided at its upper end with a threaded plug p^3 having handles p^4 , and the upper end of the tube p^2 is also provided with handles p^5 , and the piston rod e^2 passes through these parts and through the threaded plug p^3 and is provided within the tube p^2 with a low pressure spring p^6 the upper end of which bears on the plug p^3 and the lower end on a plug p^7 secured to the piston rod e^2 , and in this form of construction the spring p^6 is the low pressure spring and takes the place of the spring e^6 shown in Fig. 1 and the high pressure spring h^5 , and the parts j^3 , j^2 and j^4 may be used in connection with this form of construction the same as with that shown in Fig. 1.

The tension of the spring p^6 may be regulated at any time by means of the threaded plug p^3 , and the operation with this form of construction will be the same as with that shown in Fig. 1. The tube p^2 is also provided with a drain spigot r in order to drain off any liquid substance that may collect therein in the operation of the apparatus as hereinbefore described.

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

1. In a device of the class described, a valve casing having high and low pressure inlet and outlet sides, a cylinder below said valve casing and the lower end of which is in communication with the low pressure side thereof, a frame work rigidly connecting said cylinder with said valve casing, a piston mounted in said cylinder and provided with a rod which passes through said valve casing, a valve connected with said rod within said valve casing and adapted

to control the communication between the high and low pressure sides thereof, a spring at the top of said valve casing and operating in connection with said rod to force the same downwardly and open said valve, and means for locking said rod in position to close said valve.

2. In a device of the class described, a valve casing having high and low pressure inlet and outlet sides, a cylinder below said valve casing and the lower end of which is in communication with the low pressure side thereof, a frame work rigidly connecting said cylinder with said valve casing, a piston mounted in said cylinder and provided with a rod which passes through said valve casing, a valve connected with said rod within said valve casing and adapted to control the communication between the high and low pressure sides thereof, a spring at the top of said valve casing and operating in connection with said rod to force the same downwardly and open said valve, and means for locking said rod in position to close said valve, the opposite sides of the valve casing being also provided with gages.

3. In a device of the class described, a valve casing having high and low pressure inlet and outlet sides, a cylinder below said valve casing and the lower end of which is in communication with the low pressure or outlet side thereof, a frame work rigidly connecting said cylinder and valve casing, a piston mounted in said cylinder and provided with a rod which passes through said valve casing, said rod being provided with a valve adapted to open and close the communication between the opposite sides of said casing, a spring at the top portion of said valve casing and operating in connection with said rod to force it and the piston downwardly and to open said valve, a lever pivoted in the frame work which connects the valve casing and the cylinder and ranging transversely thereof and adapted to swing in a vertical plane, and means whereby the upward movement of said lever will lock said rod in position to close said valve.

4. In a device of the class described, a valve casing having high and low pressure inlet and outlet sides, a cylinder below said valve casing and the lower end of which is in communication with the low pressure or outlet side thereof, a frame work rigidly connecting said cylinder and valve casing, a piston mounted in said cylinder and provided with a rod which passes through said valve casing, said rod being provided with a valve adapted to open and close the communication between the opposite sides of said casing, a spring at the top portion of said valve casing and operating in connection with said rod to force it and the piston downwardly and to open said valve, a lever

pivoted in the frame work which connects the valve casing and the cylinder and ranging transversely thereof and adapted to swing in a vertical plane, and means whereby the upward movement of said lever will lock said rod in position to close said valve, said device being also provided with a vertically movable frame operated by said lever and through the top portion of which the piston rod passes, and a spring mounted on said rod and on which the top portion of said frame is adapted to bear, the lower end of said spring being provided with a bearing secured to said rod.

5. In a device of the class described, a valve casing having high and low pressure inlet and outlet sides, a valve rod passing therethrough and provided with a valve adapted to open and close the communication between the high and low pressure sides, a tension device operating in connection with said valve rod to hold said valve open, automatic devices operating in connection with said rod to move the same against said tension device and close said valve, pressure gages connected with the opposite side portions of said valve casing, and means for locking said rod in position to close said valve.

6. In a device of the class described, a valve casing provided with high and low pressure inlet and outlet sides, a cylinder below said valve casing and connected therewith and the lower end of which is in communication with the outlet side of said valve casing, a piston mounted in said cylinder and provided with a rod which passes vertically through the valve casing and is provided with a valve adapted to open and close the communication between the inlet and outlet sides thereof, a low pressure spring at the top portion of said valve casing and operating in connection with said rod to force it and the piston downwardly and to open the valve, a high pressure spring placed on said valve rod above said valve casing and normally out of operation, means for throwing said high pressure spring into operation, and means for locking said valve rod in position to close the valve in the valve casing.

7. In a device of the class described, a valve casing having high pressure inlet and outlet sides, a rod passing vertically therethrough and provided with a valve adapted to open and close the communication between the sides thereof, means for automatically forcing the rod in position to close said valve, a low pressure tension device at the top portion of said casing and operating in connection with said rod to hold said valve in an open position, a high pressure tension device above the top of said casing and adapted to operate in connection with said rod to hold said valve open, said high pres-

sure tension device being normally out of operation, and means for throwing said high pressure tension device into operation.

8. In a device of the class described, a valve casing having high pressure inlet and outlet sides, a rod passing vertically therethrough and provided with a valve adapted to open and close the communication between the sides thereof, means for automatically forcing the rod in position to close said valve, a low pressure tension device at the top portion of said casing and operating in connection with said rod to hold said valve in an open position, a high pressure tension device above the top of said casing and adapted to operate in connection with said rod to hold said valve open, said high pressure tension device being normally out of operation, and means for throwing said high pressure tension device into operation, and means for locking said valve in a closed position.

9. In a device of the class described, a valve casing having high and low pressure inlet and outlet sides, a cylinder below said valve casing and the lower end of which is in communication with the low pressure side thereof, a frame-work rigidly connecting said cylinder and said valve casing, a piston mounted in said cylinder and provided with a rod which passes through said valve casing, said valve casing being provided at its upper side with a tubular extension having an adjustable packing box mounted therein and through which said rod passes, and a spring mounted on said rod below said packing box and on which said box bears, said spring being adapted to depress said rod and the tension thereof being adjusted by adjusting the position of the packing box, and said rod being provided with a valve adapted to control the passage through said valve casing.

10. In a device of the class described, a valve casing having high and low pressure inlet and outlet sides, a rod passing therethrough and provided with a valve adapted to control the passage through said casing, said valve casing being also provided on its upper side with a tubular extension and an adjustable packing box through which said rod passes, and said rod being also provided below said box with a spring by which said rod is depressed and the valve held open and the tension of which is adjusted by adjusting the position of the packing box, and means for moving said rod in the opposite direction so as to close the valve.

11. In a device of the class described, a valve casing, a rod passing therethrough and provided with a valve adapted to control the passage therethrough, said valve casing being provided at the top thereof with a tubular extension, an adjustable

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packing box mounted therein and through which said rod passes, a spring mounted on said rod below the packing box and adapted to hold the valve open and the tension of which is adjusted by adjusting the position of the packing box, and means for moving the rod in the opposite direction to close said valve.

In testimony that I claim the foregoing as my invention I have signed my name in presence of the subscribing witnesses this 7th day of April 1909.

CHARLES P. McMULLEN.

Witnesses:

C. E. MULREANY,
H. R. CANFIELD.