

994,564.

2 SHEETS--SHEET 1.



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Fig. 2.

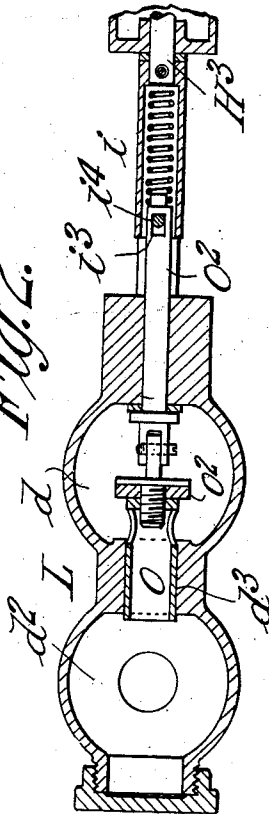
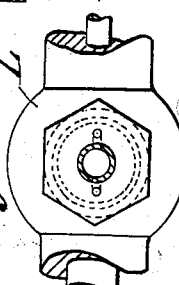


Fig. 3.



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VALVE APPARATUS.
APPLICATION FILED JUNE 1, 1910.

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Patented June 6, 1911.

2 SHEETS—SHEET 2.

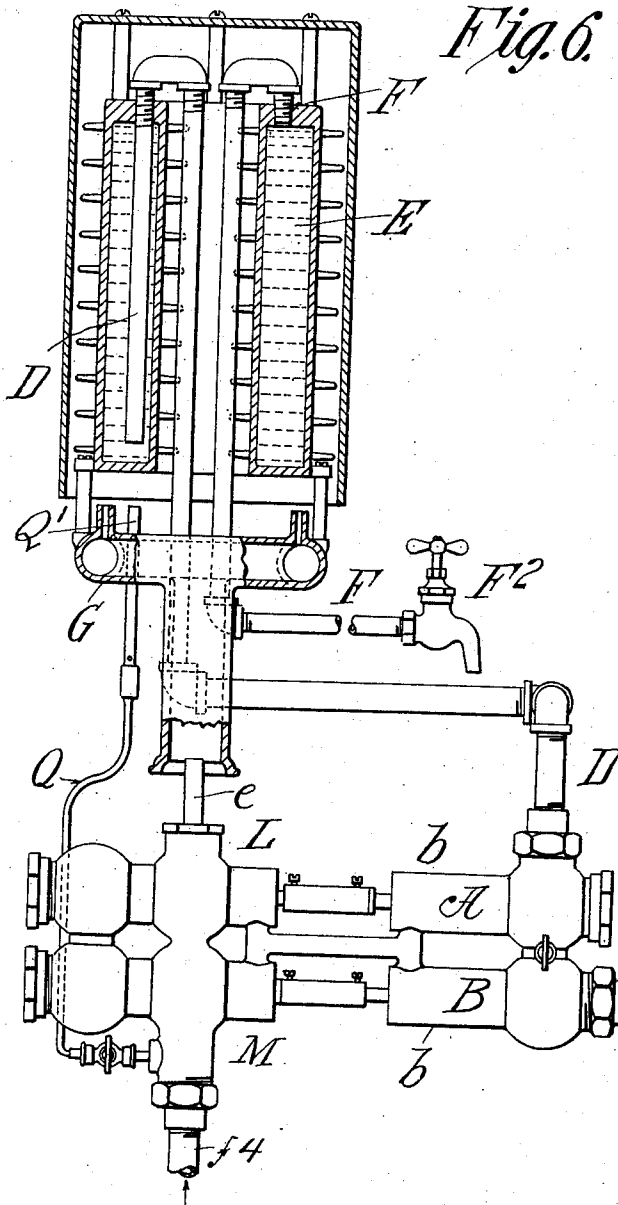


Fig. 6.

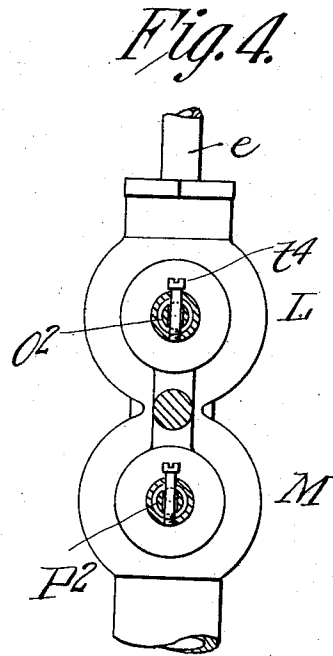


Fig. 4.

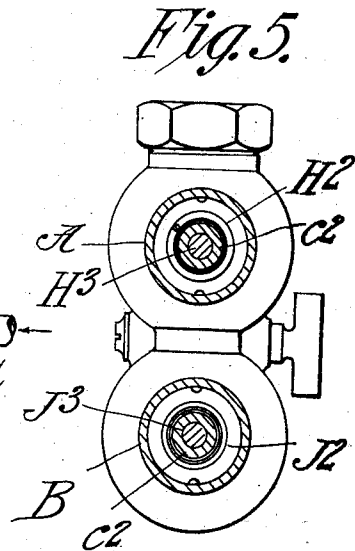


Fig. 5.

WITNESSES:

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VALVE APPARATUS.

994,564.

Specification of Letters Patent.

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To all whom it may concern:

Be it known that I, JOHN B. BEAUVAIS, a citizen of the United States of America, and a resident of Holyoke, in the county of Hampden and State of Massachusetts, have invented certain new and useful Improvements in Valve Apparatuses, of which the following is a full, clear, and exact description.

This invention relates to improvements in a valve apparatus of the kind in which a gas valve is controlled by a diaphragm or piston which is subject to a water pressure; and pressure controlled valve appliances of a kind to which this invention relates being applicable in conjunction with an apparatus for the heating of water wherein the gas valve is automatically opened and held open only when water is being withdrawn through the delivery pipe from the heater, causing a lowering of the water pressure in the heater and any portions of the valve appliances which are pipe connected with the heater; although at this time it may be stated the valve appliances in which the present improvements are embodied are applicable for uses otherwise than in conjunction with those for heating water by gas.

A leading object of the present invention is to provide in a gas conduit,—which, for instance, may be connected with a gas burner which is in coöperative relation to a water heater,—a normally closed gas valve and means subject to control by the water pressure in a casing or conduit, which, for instance, may also be connected with the heater,—so that when the water pressure is lowered, as insured by the drawing of water away from the heater, the gas valve will be opened to permit the flow of gas to the burner, and to further provide a normally open gas valve in a gas conduit between the normally closed gas valve and the gas supply with means subject to a water pressure, (whether the same be of maximum pressure or of considerably reduced pressure) for maintaining the second named gas valve in its opened condition, but operative, on a cessation of the water pressure of any degree on such means for controlling the normally open gas valve to cause an automatic closing of such valve as an important safeguarding expedient. That is to say, that inasmuch as the valve appliances are such that when the water pressure is reduced the normally closed gas valve will be opened, it is of

great importance that on the absolute termination of the water pressure, as would be accomplished by the shutting off of the water from the city main, resulting in an automatic opening of the normally closed gas valve, to then, under the last stated conditions, insure such a closing of the gas supply conduit that no gas can be delivered at and through the burner to cause waste and greatly endanger the premises.

A further object is to so construct the valve appliances and hydraulic means for controlling them that without the necessity of any stuffing boxes, or analogous equipments, leakages of both gas and water are prevented at all times and under all conditions; and an object is generally to simplify, cheapen and render efficient and reliable the mechanical appliances for the carrying out of the leading objects of this invention.

The invention is described in conjunction with the accompanying drawings and is defined in the claims.

In the drawings:—Figure 1 is a vertical longitudinally sectional view through the improved valve appliances which comprise a normally closed gas valve and a normally open gas valve in the gas supply conduit, and means for automatically controlling the positions of said valves which are subject to water pressure conditions. Fig. 2 is a partial longitudinal horizontal sectional view as taken on line 2—2, Fig. 1; Fig. 3 is a partial plan view as seen below the plane indicated by line 3—3, Fig. 1; Fig. 4 is a cross sectional view as seen on line 4—4, Fig. 1; Fig. 5 is a cross sectional view as seen on line 5—5, Fig. 1; Fig. 6 is a side elevation of the improved valve apparatus shown as having a manner of connection with a gas supply pipe and burner and with a water supply pipe and a heater,—such being one of various uses to which the pressure controlled valve may be put.

Similar characters of reference indicate corresponding parts in all of the views.

In the drawings, A and B represent two piston cases, the one B having a water inlet with which a water supply pipe C is connected while the piston casing A has an outlet opening with which a pipe D is connected,—the inlet pipe being understood as leading from a water main and supplying water under city pressure into the casing B and because of the passage *a* connecting the chambers in both casings also supplying

water under the same pressure in the casing L.

The pipe D is in Fig. 6 represented as extending to and connecting into the interior of a water heater E for which F is the draw off pipe provided with a faucet F²,—G representing the gas burner under and for supplying a flame for the heater.

The casings A and B, united by the short duct or conduit *a* have cylindrical portions *b b*, arranged axially parallel, in which pistons H and J are closely fitted, yet freely movable, both to one side of the general line or course of flow of the water through the globe-like portions of the connected casings. Each piston casing has a passage *c* which opens through its end, and the passage provided portion of each casing is constructed with an elongated hub *c*² which affords ample length of bearing for the piston rod which is guided therethrough and also serves as a retainer for the piston spring which is in compression for reaction between the end walls of the piston casing and the piston.

The water pressure normally in the piston casing forces the pistons H and J outwardly against the stress of the springs H² and J² respectively appurtenant to such pistons and causes a seating of the circular valve forming members *h* and *j* for closing the inner orifices of the aforementioned passages *c*² through which the piston rods H³ and J³ play, to the end that the normal maximum, or high, water pressure will be ineffective to cause a leakage through the bearings for the piston rods.

A conduit or valved way for gas is formed by a pair of gas valve casings L and M which are here represented as united and the passages and chambers therein are as follows:—The casing L comprises enlarged chambers *d* and *d*² united by a cylindrical passage *d*³ of reduced diameter, and in which is the normally closed gas valve O. From the chamber *d* the gas pipe *e*, for delivery to the gas burner or otherwise, leads. The casing M comprises enlarged chambers *f* and *f*², the one *f*² being in open communication with the aforementioned chamber *d*², while an inlet opening *f*³ leads to the chamber *f* and receives connection thereat of the gas pipe *f*¹ understood as leading from a source of gas supply; and the chambers *f* and *f*² are connected by a cylindrical passage *f*⁴, of reduced diameter and relatively to which is the normally open gas valve P. The ends or portions of the gas valve casings L and M, which are toward, and in axial alinement with, the piston casings, have through passages *d*⁶ and *f*⁶ for the valve stems O² and P².

The approached ends of the piston rod H³ and valve stem O² are connected, or shackled by means which permit, however, of a slight degree of lost motion; and the said rod and stem have a spring so applied in relation

thereto that an endwise separating force is exerted thereby, it being moreover noticed that the valve stem o² is provided at its portion which is interiorly of the chamber *d* with a valve constituting member *g* which, when the normally closed gas valve O is moved open, seats itself at the inner orifice of the valve stem passage or bearing *d*⁶ and prevents the leakage of gas therethrough.

With reference to Figs. 1 and 2, it is to be noted that as regards the piston rod H³ and gas valve stem O², the one has the end portion of a sleeve *i* rigidly connected thereto as by the screw *i*², such sleeve extending to and loosely embracing the end portion of the other rod like member which has an elongated slot *i*³, through which a pin or stud *i*⁴ carried by the sleeve is passed; and the spiral spring *k* is in compression between the ends of the piston rod and valve stem exerting a separating reaction on such parts and so that the one may be forced toward the other against a yielding resistance. The last described provision insures that when the valve like portion *h* appurtenant to the piston H is seated to prevent water leakage through the piston rod passage *c*, the annular flange like seating portion o² of the valve O will also be firmly seated at the orifice of the gas passage *d*³ which is at the end of such passage next to the chamber *d*; and so the seating or limitation of the valve like part of the piston will not prevent the absolute seating of the gas valve O or vice versa. When the water pressure in the piston casing A becomes lowered, for instance, as a result of the opening of the faucet F² which relieves the pressure in the heater and causes a flow of water through the piston casings to the heater, the spring H², which had been overpowered by the maximum water pressure, now reacts to move the piston inwardly in its chamber, and against the reduced water pressure, causing an opening of the gas valve O, and a seating of the secondary valve *g* at the inner orifice of the valve stem passage *d*⁶ preventing gas leakage thereat. And it will be understood that so long as the faucet F² remains open, during which time only the reduced pressure is maintained in the piston casings, gas will flow from the gas supply pipe *f*¹ through the chamber *f*, through passage *f*⁴, relatively to the left hand orifice of which the gas valve C has open relation,—to and through the connected chambers *f*² and *d*² through the open gas passage *d*³ to chamber *d* and thence through the gas delivery pipe *e* to the burner.

It is to be here particularly stated that the spiral spring J² effective on the piston J is one of very light character and low power as compared with the spring H² appurtenant to the piston H, for the particular reason that the normally open gas valve

P shall not be closed even when the pressure in the piston casings A and B is very much reduced from the maximum, as such a result would defeat a leading object of the invention and the general operativeness of the apparatus; but in case the water should be shut off from the main so that there would be a cessation of all pressure in the piston casings, the normally closed gas valve O would, as may incidentally be stated, automatically open, but, at the same time, the normally opened gas valve P, which is back of the valve O, that is between it and the source of gas supply, will become automatically closed, its light spring under the latter named conditions being now effective for moving the piston J into the piston casing, to the rightward, as represented in Fig. 1, of the drawing, through its connection with the valve P, such valve to its closed position, absolutely shutting off the flow of gas through the pair of valve gas casings L and M.

The stem P^2 of the normally open gas valve P has within the chamber f a secondary valve member s which when the valve P is closed seats against the inner orifice of the valve stem passage f^6 and prevents gas leakage to the exterior of the casing M; and the said valve stem P^2 also has outside of the casing M a member s^2 constituting an auxiliary valve which has a seating position at the right hand or outer orifice of the valve stem passage f^6 during all the time the valve P is in its normal, open, position; and for the purposes of perfecting the seating conditions so that when the valve constituting member j appurtenant to the piston J is seated as shown in Fig. 1, the valve constituting member s^2 appurtenant to the valve stem P^2 will be also seated as shown in said Fig. 1, the lost motion connection between the parts P^2 and J^3 will have associated therewith a spiral spring t which, similar to the spring k in the other situation, exerts a force for separating the valve stem P^2 and piston rod slightly relatively to each other, as limited by the pin and slot engagement applied in relation to the piston rod J^3 and the sleeve T^2 which is fixedly connected with the right hand end of the valve stem P^2 .

Q^1 is a pilot light, the gas feed for which is through a pipe Q, connected into the gas conduit at any suitable place behind the normally closed gas valve O which constantly burning serves as a means for igniting the gas automatically delivered to the burner adjacent which the pilot light is located by the automatic action of the valve apparatus described and shown.

Q^2 represents a shut-off cock for the pilot burner.

By providing a straight way plug valve R in the passage a connecting the chambers of

the two piston casings A and B, a means is thereby established for restricting the freedom of the passage of the water into the piston casing A, and serves as a regulator so that the reduced pressure of the water when flowing through the piston casing A, for instance to a heater, may be rendered proportionate to and lower than the potentiality of the piston spring H^2 , and conducing to delicacy and certainty of action of this portion of the apparatus; and said means for variably restricting the passage of water through the piston casings permits that the amount of water delivered into the heater may be proportionate to the heating capability of the burner, and insures that the water in the heater may be but slightly warmed or heated to a high temperature.

I claim:—

1. In a valve apparatus, a gas-valve and a casing having a water way leading thereto, and having a movable diaphragm, subject to a water pressure in said casing, and co-acting with the gas valve to open and close it, a gas conduit, with which said gas valve has a connection, a second gas valve, in said conduit, and a piston subject to a water pressure for normally maintaining the second gas valve open and operable upon a decrease of such water pressure below a predetermined limit to automatically close the open gas valve.

2. In a valve apparatus, a piston-casing having a water inlet and a water outlet, and a gas valve-casing having a gas inlet and an outlet, a piston in the first casing subject to the water pressure therein, and a normally closed valve in the gas valve-casing operated by the piston, a conduit connected with said gas valve casing having a valve therein, and a piston subject to a water pressure for normally maintaining the second gas valve open and operable upon a decrease of such water pressure below a predetermined limit to automatically close the open gas valve.

3. In a valve apparatus, a piston-casing having a water inlet and a water outlet, and a valve casing having a gas inlet and an outlet, a piston in the first casing subject to the water pressure therein, and a valve in the gas valve casing operated by the piston, a conduit connected with said gas valve casing having a normally open valve therein, a second piston casing in communication with the first named piston casing, having a water inlet leading thereto and having a piston therein, connected with said normally open gas valve, and subject to the pressure of water in its casing for holding such gas valve in its normally open position, and means for exerting a comparatively light closing force to the normally open gas valve, operable on a cessation of water pressure in said second piston casing.

4. In a valve apparatus, a piston-casing

having a water inlet and a water outlet, and a valve casing having a gas inlet and an outlet, a piston in the first casing subject to the water pressure therein, and a valve in the gas valve casing operated by the piston, a conduit connected with said gas valve casing having a normally open valve therein, a second piston casing and a conduit connecting it with the first piston casing having means for variably restricting the passage thereof, said second named piston casing having a water inlet leading thereto, and having a piston therein, connected with said normally open gas valve, and subject to the pressure of water in its casing for holding such gas valve in its normally open position, and means for exerting a comparatively light closing force to the normally open gas valve, operable on a cessation of water pressure in said second piston casing.

5. A valve apparatus comprising two piston casings having pistons therein, piston rods leading through the ends of the casings, a water inlet leading to one of the casings, a water outlet leading from the other, and a water passage connecting the two casings, springs of unequal powers exerting pressures on the pistons in a direction against that exerted by the pressure of water in said piston casings, a conduit having connected therein two gas valve casings, a normally closed gas valve in one casing having a stem connected with the rod of one of the pistons and a normally open gas valve in the other casing having a stem connected with the rod of the other piston.

6. Two piston casings having pistons therein, piston rods leading through the ends of the casings, a water inlet leading to one of the casings, a water outlet leading from the other, and a water passage connecting the two casings, springs of unequal powers exerting pressures on the pistons in a direction against that exerted by the pressure of water in said piston casings, a conduit having connected therein two gas valve casings, a normally closed gas valve in one casing provided with a stem having a lost motion connection with the rod of one of the pistons and a spring exerting a stress on said piston rod and valve stem for forcing them longitudinally apart, and a normally open gas valve in the other casing having a stem connected with the rod of the other piston.

7. Two piston casings having pistons therein, piston rods leading through the ends of the casings, a water inlet leading to one of the casings, a water outlet leading from the other, and a water passage connecting the two casings, springs of unequal powers exerting pressures on the pistons in a direction against that exerted by the pressure of water in said piston casings, a conduit having connected therein two gas valve casings,

a normally closed gas valve in one casing having a stem connected with the rod of one of the pistons and a normally open gas valve in the other casing provided with a stem having a lost motion connection with the rod of the other piston, and a spring applied in relation to the last named piston rod, and the stem of the normally open gas valve stem for exerting a force to cause separating relations thereof.

8. In a valve apparatus, a piston casing having a water inlet and a water outlet and having a passage opening to the end of such casing for a piston rod, and a piston in said casing having a piston rod extending through and outwardly beyond said passage and having a member operable as a valve for closing the inner orifice of said piston rod passage, and a spring operable to force the piston in a direction against that exerted by the water pressure in the piston casing, and a gas valve casing, having a gas inlet and a gas outlet and a normally closed valve therein, having a stem extending through and outwardly beyond said gas valve casing, having connection with said piston rod and having in its portion within the gas valve casing a circular member to serve as a valve for closing the inner orifice of the passage in the gas valve casing, through which the gas valve stem passes, upon the opening of said gas valve.

9. In a valve apparatus, a piston casing having a water inlet and a water outlet and having a passage opening to the end of such casing for a piston rod, and a piston in said casing having a piston rod extending through and outwardly beyond said passage and having a member operable as a valve for closing the inner orifice of said piston rod passage, and a spring operable to force the piston in a direction against that exerted by the water pressure in the piston casing; and a gas valve casing, having a gas inlet and a gas outlet and a normally closed valve therein, having a stem extending through and outwardly beyond said gas valve casing, having a lost motion connection with said piston rod and having in its portion within the gas valve casing a circular member to serve as a valve for closing the inner orifice of the passage in the gas valve casing, through which the gas valve stem passes, upon the opening of said gas valve, and a spring for exerting a reaction oppositely on the piston rod and gas valve stem.

10. In a valve apparatus, two piston casings having pistons therein, piston rods leading through the ends of the casing, a water inlet leading to one of the casings, a water outlet leading from the other and a water passage connecting the two casings, springs of unequal powers exerting pressures on the pistons in a direction against that exerted by the pressure of water in said piston casings,

a gas conduit having, connected therein, two gas valve casings, a normally closed gas valve in one casing having a stem connected with the rod of the piston to which the spring of higher power is applied, a normally open gas valve in the other casing provided with a stem having a lost motion connection with the rod of the other piston to which the spring of lower power is applied and having internally of said casing a member to serve as a valve for closing the inner orifice of the passage in such casing through which the normally open gas valve stem passes, upon the closing of such gas valve, and a spring applied in relation to the stem of the normally open gas valve and said piston rod for exerting a stress to force the gas valve stem and piston rod to separated relations.

11. In a valve apparatus, a piston casing having a water inlet and outlet and having a passage for a piston rod opening through its end and a gas valve casing having an inlet and an outlet and having a valve seat opening between the inlet and outlet, having through such casing a passage for a valve stem, a piston in the piston casing having a stem extending through said passage therefor, provided with a member to serve as a valve for closing the inner orifice of such passage and having a spring for exerting a force on the piston in a direction against that of the water pressure and a gas valve in the other casing for closing the valve

seat opening therein, having a stem provided at a portion thereof which is within such casing, and a member to serve as a valve for closing against the inner orifice of the valve stem passage, said piston rod and valve stem having a lost motion connection and a spring applied in relation to and for exerting a force endwise relatively to the piston rod and valve stem.

12. In combination, a water heater and a gas burner for heating the same, a valve apparatus comprising a piston casing having a water inlet for connection with the water supply, and a water outlet connected with the heater, a gas valve casing having a gas inlet for connection with the gas supply conduit and an outlet having connection with the gas burner, a piston in the first named casing subject to the water pressure therein, and a normally closed valve in the gas valve casing operated by said piston, another, but normally open, gas valve in said conduit between the normally closed gas valve and the gas supply, and means subject to a water pressure for maintaining the second gas valve open, and operable, on a cessation of such water pressure, to automatically close the normally open gas valve.

Signed by me at Springfield, Mass., in presence of two subscribing witnesses.

JOHN B. BEAUVAIS.

Witnesses:

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G. R. DRISCOLL.