

C. D. MILLER.
 AUTOMATIC SHUT-OFF VALVE AND FIRE ALARM COMBINED.
 APPLICATION FILED JAN. 25, 1910.

996,110.

Patented June 27, 1911.

2 SHEETS—SHEET 1.

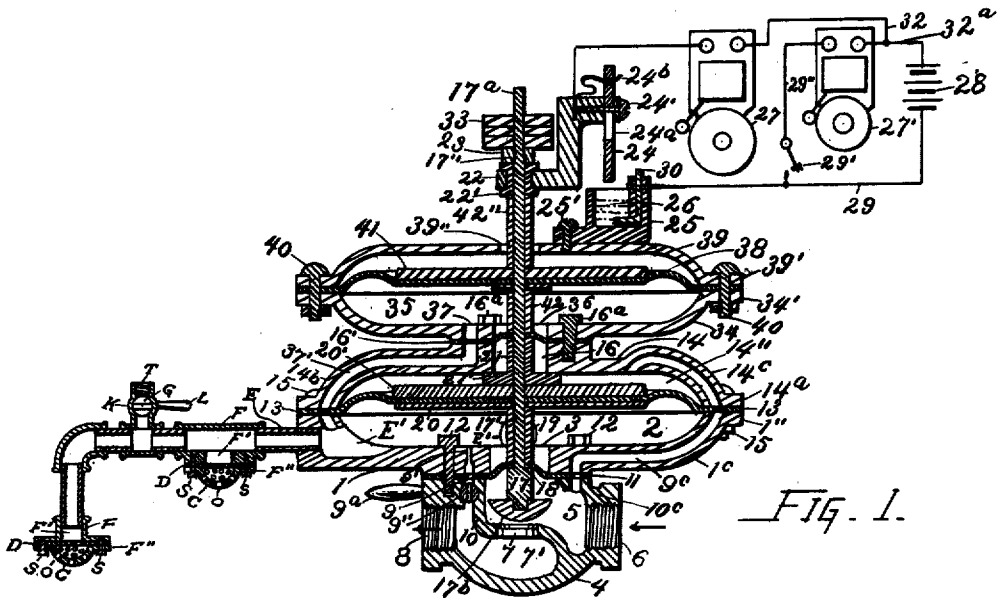


FIG. 1.

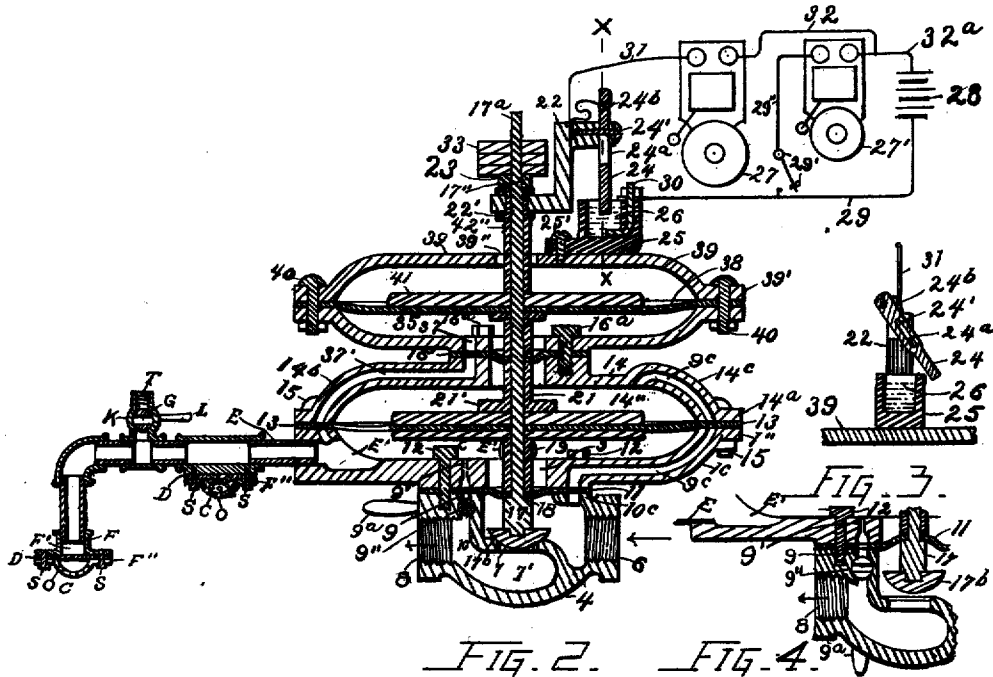


FIG. 2.

FIG. 3.

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BY

George W. Hinton.
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WITNESSES:

Luke E. Hinton
 Thomas J. Smallwood.

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2 SHEETS—SHEET 2.

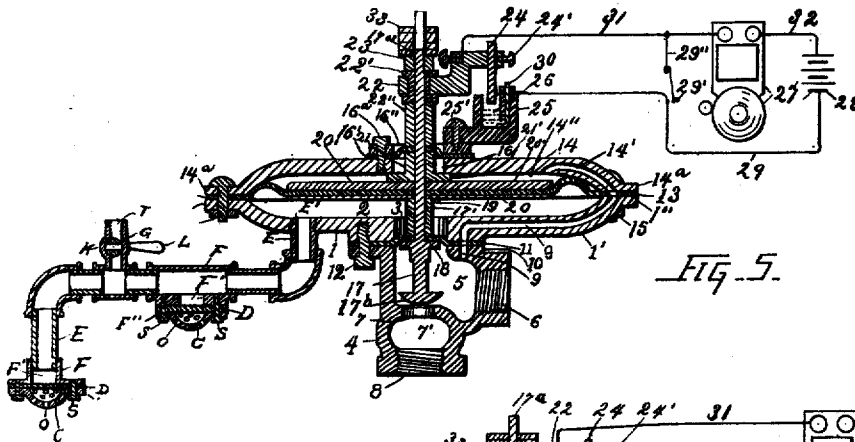


FIG. 5.

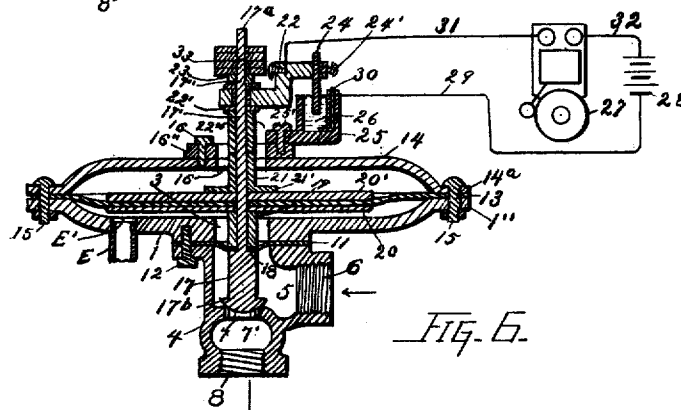


FIG. 6.

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UNITED STATES PATENT OFFICE.

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AUTOMATIC SHUT-OFF VALVE AND FIRE-ALARM COMBINED.

996,110.

Specification of Letters Patent. Patented June 27, 1911.

Application filed January 25, 1910. Serial No. 540,099.

To all whom it may concern:

Be it known that I, COSBY D. MILLER, a citizen of the United States, residing at St. Joseph, in the county of Buchanan and State of Missouri, have invented certain new and useful Improvements in Automatic Shut-Off Valves and Fire-Alarms Combined, of which the following is a specification, reference being had therein to the accompanying drawing.

My invention relates to improvements in automatic shut-off valves and fire alarms combined, the objects of which, are, first; to provide a mechanism of this class, which, either in case of fire, or of low pressure of gas, will automatically close said valve, and shut off a supply of gas, admitted there-through, and at the same time close an electric circuit and thereby ring an alarm bell, and continue to keep said supply of gas shut off until said valve is manually opened, and also continue to keep said bell ringing until said electric circuit is manually opened, second; to provide means, whereby the user of said valve will be notified, should said electric circuit become dead, third; to so construct and arrange the parts of said valve, that at the option of the user, the opening and retention of valve in open position, are caused, either by pressure of said gas, or by pressure of air, manually pumped into certain parts of said valve; fourth; to so construct a shut-off valve and fire alarm combined, that the same shall be positive and extremely sensitive in action, neat in appearance, substantial, durable and not at all liable to get out of order, and be cheap in cost of manufacture. I attain these objects by the mechanism illustrated in the accompanying drawing, in which:—

Figure 1 is a longitudinal section, cut vertically through the center of all the parts, showing the valve and the electric circuit open. Fig. 2 is a section, similar to Fig. 1, but showing the valve and electric circuit closed. Fig. 3 is a transverse section of the alarm bell circuit closer, on the line X X seen in Fig 2, but with the circuit manually opened. Fig. 4 is a section in detail of the port cock in closed position. Figs. 5 and 6 are sections similar to Fig. 1, showing two of the various forms in which the valve and the circuit closer may be con-

structed, and the electric circuits may be arranged.

Referring to Fig. 1, my invention comprises the annular diaphragm holder 1, having chamber 2 formed therein, and valve stem aperture 3 through the center of the bottom thereof.

In valve body 4 is formed the valve chamber 5, provided with screw threaded inlet opening 6, leading into said valve chamber and with valve opening 7, outlet chamber 7' and screw threaded outlet opening 8 leading from said valve chamber. Port 9 is formed through wall 10 of valve body 4 and through the edge portion of small annular diaphragm 11, in register with small port opening 9' formed through the bottom of holder 1. Said port is provided with cock gate 9'', rotatable by handle 9^a, for opening and closing port 9; thereby providing closable communicating means, whereby outlet chamber 7' is placed in communication with diaphragm chamber 2. Port 9^c is formed through wall 10^c of valve body 4 and through the edge portion of diaphragm 11, and is extended therefrom, through wall 1^c of holder 1; thence through the edge portion of diaphragm 13 and through wall 14^a, of annular diaphragm cover 14, into chamber 14'', formed in said cover, above diaphragm 13; thereby placing chamber 14'' in communication with valve chamber 5.

The edge portion of diaphragm 11 is secured between valve body 4 and diaphragm holder 1 by cap-screws 12, passed through apertures in the bottom of holder 1 and through said diaphragm and screwed into valve body 4. Said diaphragm forms flexible closing means, whereby aperture 3 in holder 1 is at all times closed.

The edge portion of diaphragm 13 is secured between flange 14^a, (formed with cover, 14,) and flange 1'', (formed with holder 1,) by bolts and nuts; thereby forming a gas tight flexible partition between chambers 2 and 14''. Said diaphragm has apertured annular weight 20' resting thereon.

Stem aperture 16, formed through the center of cover 14, is provided with diaphragm 16', the annular edge portion of which is secured between cover 14 and upper annular diaphragm holder 34, secured thereon by cap-screws 16^a, passed through aper-

tures in said holder and diaphragm 16', and screwed into cover 14, thereby forming gas tight, flexible closing means, whereby aperture 16 in cover 14 is at all times closed.

5 Annular diaphragm holder 34, (provided with flange 34') has chamber 35 formed therein, and valve stem aperture 36 and port opening 37 through the bottom thereof.

Apertured annular diaphragm 38 has the 10 edge portion thereof secured between flange 39', (formed with annular cover 39,) and flange 34', by bolts and nuts 40; thereby forming a gas tight cover for chamber 35. Cover 39 has stem aperture 39'' formed 15 through the center thereof. Apertured annular weight 41 rests on diaphragm 38.

Valve stem 17 has semispherical valve 17^b 20 secured on the lower end thereof, adapted to close valve opening 7. Said valve stem is provided with shoulder 18, formed thereon, and above said shoulder said stem is extended and forms the upper portion 17', provided with the screw threaded portion 17'', 25 and with the upper end portion 17^a, adapted to have apertured annular weights 33 placed thereon. Said upper portions of stem 17 are passed upward through the centers of diaphragm 11, sleeve 19, through aperture 3, 30 annular metal plate 20, (beneath diaphragm 13,) and through weight 20', (adapted to depress said diaphragm,) and stop sleeve 21, provided with flange 21', adapted to be 35 stopped against cover 14, for limiting the upward movement of stem 17 and its attached parts. Said upper portions of stem 17 are also passed upward through aperture 16 in cover 14, and through diaphragm 16', 40 also through sleeve 42, through aperture 36 in holder 34, diaphragm 38, weight 41, sleeve 42'', through aperture 39'' in cover 39, insulation 22', through an end portion of arm 22, and nut 23, screwed on threaded 45 portion 17''; thereby securing said parts on said upper portion of said stem, and firmly pressing the same downward against shoulder 18.

Insulated arm 22 carries the preferably carbon electrode 24, provided with slot 24^a, 50 formed therethrough slidably and pivotally secured to the extended end of said arm by screw 24', which passes through said slot and is screwed into said extended end of said arm. Said electrode is firmly pressed in 55 contact with said screw by the free end of spring 24^b, which passes through an aperture through the upper end of said electrode. The opposite end of spring 24^b is secured in an aperture in arm 22 by screw 24'.

60 The preferably hard rubber cup 25, provided with binding post 30, is secured on diaphragm holder 34 by screws 25'. Said cup is partially filled with mercury electrode 26, into which the lower extremity of said carbon electrode is adapted to be submerged, 65 for closing the following described electric

alarm circuit, through alarm bell 27. Said circuit starts from battery 28 and extends therefrom through conductor 29, binding post 30, (to which said conductor is secured,) 70 mercury electrode 26, (connected with the lower extremity of said binding post,) carbon electrode 24, arm 22, conductor 31, (one end of which is secured in said arm by screw 24') thence through alarm bell 27, conductor 32, past ordinary door bell 27' and 75 through conductor 32^a, to battery 28.

Port 37' is formed through the wall 14^b of cover 14, and is extended upward therefrom through the edge portion of diaphragm 16', in register with port opening 37, in diaphragm holder 34. Said port is extended 80 downward from cover 14, through the edge portion of diaphragm 13, thence through a wall of diaphragm holder 1, into opening E', formed through the bottom of said holder; thereby placing diaphragm chamber 2 in communication with diaphragm chamber 35. Diaphragm holder 1 has a plurality of said openings E', formed through the 85 bottom thereof, and in said openings and communicating with chamber 2 are secured the pipes E. Said pipes E extend throughout the apartments or premises (not shown,) served by said shut-off valve and alarm bell, 90 and since said pipes E and the parts attached thereto, are identically alike in their construction and operation, a detailed description of one of said pipes and parts attached thereto, is sufficient. 95

At desirable points along pipe E, fuse 100 holders F are connected therewith as seen. Said fuse holders each have an exhaust opening F', covered by a fusible diaphragm D, covered by cover C, to protect said diaphragm from mechanical injury. Said 105 cover has openings O formed therethrough, to permit free circulation of air over the outside surface of diaphragm D which is made of fusible metal that will become fused or melted at a predetermined degree of heat. 110 Cover C has flange F'' formed on the outer edge thereof. Diaphragm D and cover C are secured to fuse holder F, by cap-screws S, which pass through said flange and diaphragm and are screwed into said fuse holder. 115

Connected with pipe E, at any desired point thereon, is the cock K, provided with gate G, rotatable by lever L, for manually opening and closing said cock. Said cock 120 is provided with screw threaded opening T, adapted to have an ordinary air pump (not shown,) attached thereto, for pumping air into pipe E. It will be understood that but one of said cocks would be sufficient, and that for convenience, any number of the same could be connected with said pipes as desired. It will also be understood, that the cross section area of exhaust openings F', 125 of pipe E, and of openings E', are each of 13'

them greater than the same of small port opening 9', and that gas would exhaust, (as hereafter described,) more rapidly through said pipe and openings than through the small port opening 9'.

Door bell 27' is provided with the door bell circuit, commencing at battery 28 and extending therefrom through conductor 29 manual circuit closer 29', (when the same is closed,) conductor 29'', door bell 27', and conductor 32^a, to said battery.

In installation, the described shut-off valve, with parts in position seen in Fig. 2, is preferably placed beyond the reach of fire, pipes E and their connected parts are extended and connected with chamber 2 as described. The ordinary supply pipe (not shown,) for supplying gas through said valve, is connected with opening 6; admitting gas into valve chamber 5 and thence through port 9^c into chamber 14'', thereby pressing diaphragm 13 and its connected parts, including valve 17^b, downward, and stopped on valve opening 7. Such system of pipes as is desired for the distribution of said gas is extended throughout said apartments or premises and connected with outlet opening 8.

Alarm bell 27, door bell 27' and battery 28 are placed in any desired locations and connected with the circuit closers, as seen; after which valve 17^b is lifted by either of the two following described operations.

By valve stem 17 valve 17^b is manually lifted, thereby moving said stem and the parts thereto attached from the position seen in Fig. 2 to the position seen in Fig. 1; thereby opening valve opening 7. Said parts are manually retained in this position until pressure of gas in valve chamber 5 has extended therefrom, through said opening, outlet chamber 7', cock gate 9'' port 9 and small port opening 9', into chamber 2, beneath diaphragm 13, and equals or balances the previously described pressure of gas in chamber 14''. Said parts are still manually held upward until pressure of gas in chamber 2 extends therefrom through opening E' into pipe E and its attached parts, and also extends from opening E' through port 37' and port opening 37 into chamber 35, under diaphragm 38, which pressure of gas retains said parts in the position seen in Fig. 1; after which said manual retention is removed and said pressure of gas in chamber 35 normally keeps said valve and said electric alarm circuit open, all of the time that the same are in use. Valve 17^b may also be lifted by opening cock K and attaching thereto, an ordinary air pump (not shown) and pumping air through pipe E, opening E', port 37' and port opening 37, into diaphragm chamber 35, under diaphragm 38, until said pressure of air lifts said diaphragm and its attached parts, in-

cluding valve 17^b from the position seen in Fig. 2, to the position seen in Fig. 1 after which said cock K is closed. Gas in valve chamber 5 will slowly commingle with said air throughout the described ports, pipes and chambers, and normally retain said parts in the position seen in Fig. 1, all of the time the same are in use.

When heat from fire, (not shown,) melts any one of the fusible diaphragms D, (as seen in Fig. 2,) the described pressure of gas is exhausted from chambers 2 and 35, through pipe E and opening F', opened by the said melting of said fusible diaphragm. When said gas is thus exhausted from said chambers 2 and 35, pressure of gas in chamber 14'', supplemented by the gravity of the described weights, moves diaphragm 13 and the thereto attached parts, including valve 17^b, from the position seen in Fig. 1, to the position seen in Fig. 2, and continues to press said valve downward on opening 7'; thereby shutting off said pressure of gas from entering outlet chamber 8, and from said gas distributing system of pipes, until said valve is again manually opened. At the same time the upper portion of stem 17 carries carbon electrode 24 downward, into contact with mercury electrode 26, thereby closing the previously described alarm circuit through alarm bell 27, and thus ringing said bell. When desired the user stops the continuous and annoying ringing of said bell in the following manner. Said user lifts carbon electrode 24 from the position seen in Fig. 2, deflects the lower end thereof to one side of cup 25 and allows said electrode to be moved by the gravity thereof, from the position described to the position seen in Fig. 3 thus opening said alarm circuit. Said movement is assisted by spring 24^b. After replacing said melted diaphragm D with a new one, stem 17 carrying valve 17^b, is again raised from the position seen in Fig. 2 to the position seen in Fig. 1, by either of the two described operations, and lifts electrode 24, which by the reasons of the gravity thereof and the lateral pressure of spring 24^b thereon, rotates on screw 24', from the deflected position seen in Fig. 3, to the position seen in Fig. 1. Should pressure of gas, in valve chamber 5, become lower than is safe for use in any ordinary gas burner, said reduced pressure is communicated to chambers 2, 14'', and 35, through their previously described communicating means, as seen in Fig. 1. After such reduction of pressure, weights 20' and 41, together with such number of weights 33, as are required to adjust the closing of said valve at said low pressure, gravitate and close said valve, to the position seen in Fig. 2. The gravity of said weights will thereafter continue to press valve 17^b, (in closed position,) on opening 7. The return

of pressure of gas to normal or higher pressure in chamber 5, will be extended therefrom through port 9^c to chamber 14'', above diaphragm 20' and will press downward thereon, and thus augment the said pressure of valve 19^b on opening 7, and said valve will be thus retained until lifted by either of the two previously described manual operations.

It will be seen and understood that diaphragm 11 forms elastic packing between the contacting surfaces of valve body 4 and diaphragm holder 1, also that diaphragm 13 does the same between flanges 1'' and 14'', and that diaphragm 16' acts in the same manner between the contacting surfaces of cover 14 and diaphragm holder 34, and that diaphragm 38 acts similarly between flanges 34' and 39', thereby rendering unnecessary the machining of said surfaces, thus cheapening the cost of manufacturing said parts. It will also be seen and understood that said diaphragms being flexible, allow stem 17 and the valve 17^b, carried thereby, to be sensitive to every impulse and move with perfect freedom. It will also be understood, that should said valve be out of exact alinement with opening 7, the semispherical form thereof will cause the same to be self seating when pressed upon said opening, and that the flexibility of said diaphragms, allow lateral movement of said valve, for said self seating.

When it is desired to use air exclusively, in pipes E and the ports and chambers connected therewith as seen in Fig. 2, said valve is not operated upon reduction of gas pressure, as previously described, but is closed only upon the melting of one of the fusible diaphragms D. In this case port cock 9'' is rotated to the position seen in Fig. 4, and thereafter valve stem 17 and the thereto attached parts are manually lifted exclusively by the previously described air pumping operation. Where such is permanently desired, port opening 9', port 9 and cock gate 9'' are eliminated, as seen in Fig. 5, and said pressure of air is pumped as described into chamber 2, under diaphragm 13, to a higher pressure, than the previously described pressure of gas in chamber 14''. Said higher pressure of air overcomes said pressure of gas in chamber 14'', and by diaphragm 13 lifts said valve 17^b. Where such exclusive use of air in pipes E, is permanently desired, diaphragm 38, its cover 39, and holder 34, and port 37', in cover 14 may be eliminated, as seen in Fig. 5. In this case diaphragm ring 16'', supports cup 25 and holds diaphragm 16' in the same manner as cover 39 and holder 34, respectively.

Where it is desired to use the ordinary door bell 27' as a door bell and also as an alarm bell, alarm bell 27 is eliminated as

seen in Fig. 5. Conductors 31 and 32^a are connected with said door bell and conductor 32 is eliminated. One of the various forms of carbon electrodes 24 which may be used is adjustably secured in the end of arm 22 by screw 24'.

Referring to Fig. 6, weight 20' may be made of sufficient weight to move valve stem 17 and the thereto attached parts downward by the gravity thereof; thereby rendering superfluous the pressure of gas in chamber 14'', for moving said stem. In this case port 9^c and diaphragm 16' are also eliminated. The alarm bell 27 is used exclusively for alarm purposes, and has conductors 31 and 32^a connected therewith. The door bell 27', conductor 29'' and manual circuit closer 29' are eliminated.

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

1. In a diaphragm operated shut-off valve, a valve casing provided with an inlet chamber, a valve opening and an outlet chamber therein, adapted to permit passage of gas therethrough; a valve adapted to close said valve opening, said valve having a stem therefor and a plurality of diaphragms for operating said stem; a plurality of diaphragm holders, one for each of said diaphragms, said holders each having a holder chamber therein said holder chamber being provided with communicating means, whereby the same are placed in communication; closable communicating means whereby one of said holder chambers is placed in communication with said outlet chamber; a cover for one of said diaphragms, having a cover chamber therein, and communicating means, whereby said cover chamber is placed in communication with said inlet chamber.

2. In a diaphragm operated shut-off valve, having a valve casing, provided with a valve chamber, a valve opening and an outlet chamber therein, adapted to permit passage of gas under pressure therethrough, and provided with a valve adapted to close said valve opening, said valve having a stem therefor and an operating diaphragm, adapted to operate said stem, of a diaphragm holder adapted to hold said diaphragm thereon, said holder having a holder chamber, therein beneath said diaphragm, and having a plurality of openings through the bottom thereof, said openings being adapted to have air conducting means connected therewith; communicating means whereby said outlet chamber is placed in communication with said holder chamber, closing means in said communicating means, whereby the same is opened and closed; a cover for said diaphragm, said cover having a cover chamber therein above said dia-

phragm, and communicating means, whereby said cover chamber is placed in communication with said valve chamber.

3. In a diaphragm operated shut-off valve, a valve casing provided with an inlet chamber, a valve opening and an outlet chamber therein, adapted to permit gas under pressure to pass therethrough, and provided with a valve stem having a valve secured on the lower end thereof, adapted to close said valve opening; a depressing diaphragm, the central portion of which is secured to said stem; conducting means, adapted to conduct gas under pressure, from said inlet chamber onto the upper surface of said depressing diaphragm for depressing the same and thereby depressing said valve for closing said valve opening; a lifting diaphragm, the central portion of which is secured to said stem; closable conducting means, adapted to conduct gas from said outlet chamber under pressure against the under surface of said depressing diaphragm; closing means in said closable conducting means, whereby the same is manually opened and closed; and other conducting means adapted to have gas under pressure extended therethrough from beneath said depressing diaphragm to, and against the under surface of said lifting diaphragm, for lifting said stem and valve.

4. In a diaphragm operated shut-off valve, a valve casing having an inlet chamber, a valve opening and an outlet chamber therein adapted to permit passage of gas therethrough; a valve stem having a valve secured on the lower end thereof, adapted to close said valve opening; a lower depressing diaphragm, provided with a lower diaphragm holder, having a holder chamber therein; a lower cover for covering said depressing diaphragm, said lower cover having a depressing chamber therein; securing means, whereby the outer edge portions of said cover said diaphragm and said holder are secured together; a lifting diaphragm, provided with a holder therefor, having a lifting chamber therein, and also provided with a cover therefor; securing means whereby said holder is secured on said lower cover; securing means whereby the edge portions of said lifting diaphragm and its holder and cover are secured together; said holders and covers, each being provided with a valve stem aperture therethrough, through which said valve stem is passed; a lower small diaphragm for closing the stem aperture through said lower diaphragm holder, and securing means whereby the outer edge portion of said small diaphragm is secured between said valve body and said lower diaphragm holder; an upper small diaphragm, having the edge portion secured between said lower cover and said lifting

diaphragm holder, adapted to close the stem aperture in said lower cover; spacing and securing means on said stem, whereby said diaphragms are spaced and secured thereon; stopping means on said stem, adapted to limit the upward movement thereof; conducting means, whereby gas is conducted from said inlet chamber, into said depressing chamber; closable gas conducting means whereby gas is conducted from said outlet chamber into said holder chamber, and other gas conducting means, whereby gas is conducted from said holder chamber into said lifting chamber.

5. In a shut-off valve and fire alarm combined, a valve stem, having a valve secured on the lower end thereof, and provided with a plurality of operating diaphragms, adapted to operate said stem; an extended arm provided with insulating and securing means whereby said arm is electrically insulated from said stem and secured thereon; an upper electrode, provided with slidable and pivotal securing means, whereby said upper electrode is slidably and pivotally secured to the extended end of said arm; a spring secured to said arm, the free end of said spring being adapted to press said upper electrode on said electrode securing means; an electric conductor provided with securing means, whereby said conductor is secured in said arm; a cup, provided with supporting means whereby said cup is supported beneath said electrode, said cup being adapted to have a mercury electrode placed therein, and being further provided with connecting means, adapted to connect another electric conductor with said mercury electrode.

6. A shut-off valve and fire alarm combined, comprising a valve casing, having an inlet chamber, a valve opening and an outlet chamber therein, adapted to permit passage of gas therethrough; a valve stem, provided with a valve on the lower end thereof adapted to close said valve opening; a plurality of weights, supported on said stem, and adapted by the gravity thereof, to move the same downward; a projecting arm, mounted on the upper portion of said stem; an electrode supported beneath the projecting end of said arm; another electrode, mounted on the extended end of said arm and adapted to thereby be carried into and from contact with the first mentioned electrode, for closing and opening an electric circuit through an electric alarm bell; a plurality of diaphragms for operating said stem; a plurality of holders, one for each of said diaphragms, said holders each having a chamber therein; closable communicating means, whereby said chambers are placed in communication with said outlet chamber; a cover for one of said diaphragms, having a

cover chamber therein, and communicating means whereby said cover chamber is placed in communication with said inlet chamber; a plurality of pipes communicatively connected with one of said holder chambers, said pipes being adapted to conduct gas therefrom; a plurality of fuse holders connected with said pipes, each of said fuse holders having an exhaust opening there-
10 through; fusible closing means secured on each of said fuse holders for closing said ex-
haust openings; a protecting cover for covering each of said fusible closing means, said covers having openings therethrough adapted to permit circulation of air over the out- 15 side surfaces of said fusible closing means.

In testimony whereof I affix my signature in the presence of two witnesses.

COSBY D. MILLER.

Witnesses:

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Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."
