July 5, 1932. J. J. DONOHUE 1,866,253

GAS SHUT-OFF SYSTEM AND APPARATUS

Filed Dec. 20, 1927

Fig. 1.

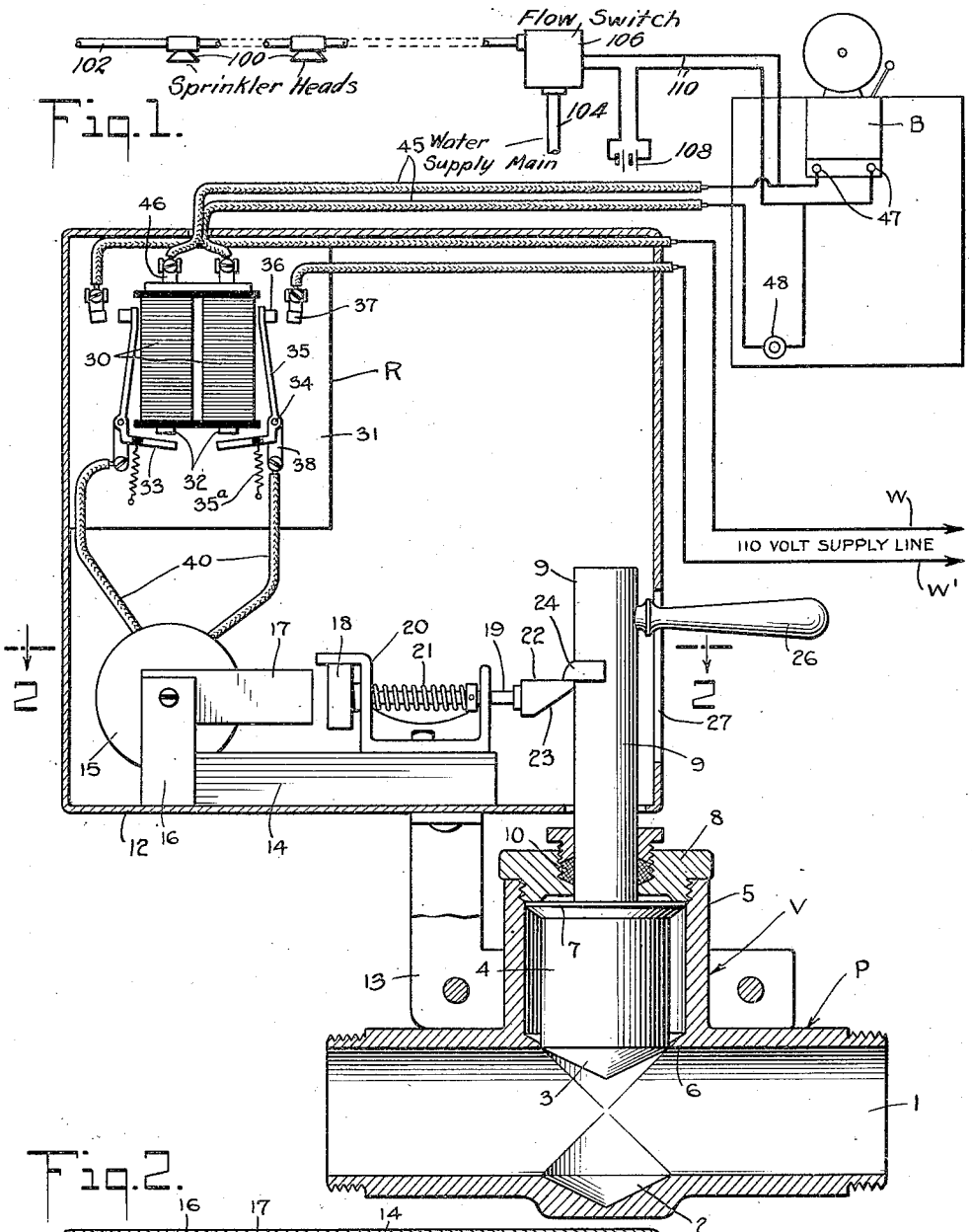
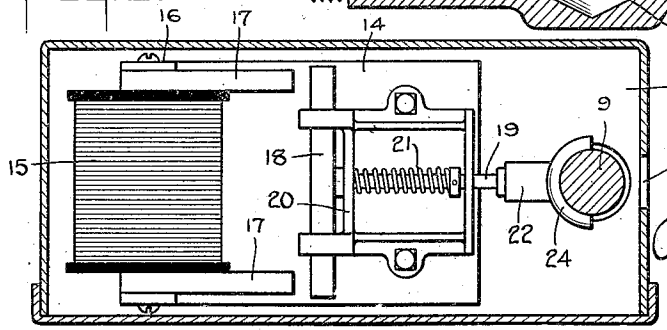


Fig. 2.



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UNITED STATES PATENT OFFICE

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GAS SHUT-OFF SYSTEM AND APPARATUS

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My invention relates to a system and apparatus for shutting off a gas supply, which may be operated arbitrarily, or in a preferred embodiment is combined with such apparatus as an automatic sprinkler system so that the gas shut-off is automatically operated upon the outbreak of a fire.

A well known sprinkler system includes a plurality of heat-fusible elements which effect the operation of the sprinklers and the energizing of an electric circuit leading to an alarm bell. I combine with such a system, a valve located in the main gas-supply pipe of the building, means normally retaining the valve in open position, and electro-magnetic means interconnected with the electric circuit of the sprinkler system or with the alarm bell to cause the automatic closing of the valve by gravity of spring action upon the outbreak of fire.

While the shut-off mechanism proper is in many cases associated with a sprinkler system, it may also be used independently thereof, and operated in any of various ways, as, for example, by means of a suitable circuit including one or more switches or push buttons which may be operated at convenient points to cause the shut-off action, and at the same time sound the alarm if desired.

This improved system or mechanism is obviously useful in any building where gas is employed for lighting or heating and especially in factories using gas in large quantities as fuel, and where the flow of gas during a fire would immensely increase the destruction of property and difficulty of extinguishment.

The characteristics and advantages of the invention are further sufficiently explained in connection with the following detail description of the accompanying drawing, which illustrates one representative embodiment. After considering this example, skilled persons will understand that many variations may be made without departing from the principles involved, and we contemplate the employment of any structures that are properly within the scope of the appended claims.

In the drawing:

Fig. 1 is a sectional elevation taken through a preferred embodiment of my invention; and

Fig. 2 is a horizontal section taken in the plane of the line 2—2 in Fig. 1.

Referring to the drawing, and more particularly to Fig. 1 thereof, sprinkler heads 100 of conventional type are connected to piping 102 which leads to a water supply main 104. The sprinkler heads are arranged to be automatically operated upon a substantial increase in temperature indicative of fire, and to accomplish this they may be provided with fusible links or similar means well known in the sprinkler art. A flow switch 106 is connected in the water supply to the sprinkler system, and this switch is arranged in conventional manner to change the state of energization of a low voltage alarm circuit, here exemplified by closing the circuit including the battery 108 and conductors 110, and thereby ringing the alarm bell B. Obviously any number and type of sprinkler heads and alarm means may be employed.

The shut-off mechanism proper includes a valve V arranged as a part of a T pipe-fitting P interposed in the gas-main. The fitting has in its main portion 1 a conical valve seat 2 to cooperate with the complementally shaped lower end 3 of a valve 4 located in the angle or branch 5. For proper guidance and free action of the valve the fitting P is provided with a flange 6 in which the cylindrical valve body 4 has a sliding fit, and at the upper end the valve is provided with a flange 7 which has a free sliding fit in the cylindrical branch 5. The latter is closed by a nut 8, and a stem 9 connected to the valve body passes through the nut and a suitable packing 10. As shown, the valve is preferably of substantial size and weight to provide for gravity closing.

A box 12 is supported on the fitting P by a bracket 13. On the box bottom is a base 14 carrying a solenoid 15 having a core 16 and poles 17, confronting an armature 18 mounted on a stem 19, which is arranged to reciprocate in a bracket 20, and is urged to the position shown in the drawing by a spring 21. On the end of the plunger remote from the armature is a detent or pawl 22

having a beveled under face 23. The end of the pawl cooperates with a lug 24 on valve stem 9. The valve stem also has a handle 26 projecting through a slot 27 in the side wall of the box to permit ready re-opening, or resetting of the valve in open position.

The detent or trip mechanism just described is actuated by a relay R also located in the box. The relay is desirably arranged as a two-pole switch, and will be so described, with the understanding that when conditions permit, a single-pole switch may be employed, with corresponding simplification of the apparatus. The relay comprises solenoids 30 mounted on a base 31. The cores 32 of the solenoids confront armatures 33 pivoted at 34 and provided with arms 35 carrying contacts 36 to cooperate with fixed contacts 37. The latter are connected respectively to the high voltage supply line wires W, W'. Terminals 38 are in electrical contact with respective contacts 35 and the armatures 33 may be insulated from the contact arms and terminals as shown. Springs 35ª urge the movable contacts to "open" position. Conductors 40 go from the terminals 38 to the ends of solenoid 15.

The solenoids 30 of the relay are usually connected in series, and conductors 45 run from the solenoid terminals 36 to the bell terminals 47; and a switch or push button 48 may also be interposed in this circuit for arbitrary control, if desired.

Upon the outbreak of fire the sprinkler system goes into action in the manner sufficiently explained above; the low voltage line L, L' leading from the flow switch is thus energized, causing the alarm bell to ring, and thereby the solenoids are energized, operating the contacts 36 which close the main line circuit W, W' through the detent solenoid 15, and the pawl 22 is thus thereupon retracted, releasing the valve stem and valve 4, which thereupon drops by gravity and shuts off the gas supply. After normal conditions have been restored, the control circuit L, L' is de-energized, and contacts 36 are retracted as by their springs 35ª. The line supply to the detent solenoid is thus broken, and the end of the pawl reengages valve stem 9. The valve is then reset in open position by pulling up handle 26, whereupon the detent reengages the lug 24 in the manner shown in the drawing, and gas service is restored.

Evidently the shut-off mechanism including the valve, detent and relay may be used apart from a sprinkler system, and in such cases may be operated in any convenient manner as, for example, by a switch or push button in a pilot or control line leading to the relay solenoids.

What I claim is:

1. The combination with a sprinkler system including an electric control circuit which is energized when the sprinkler system is active, of automatic gas shut-off mechanism comprising a gas-main, a valve, means normally retaining the valve in open position, and means actuated by the energizing of said electric circuit to cause the valve to close.

2. The combination with a sprinkler system including an electric control circuit which is energized when the sprinkler system is active, of automatic gas shut-off mechanism comprising a gas-main, a valve normally tending to move to closed position, a detent normally retaining the valve in open position, a solenoid arranged to withdraw the detent, and a relay for connecting the solenoid with a power line, the relay being interposed in said control circuit.

3. The combination with a sprinkler system including an electric control circuit which is energized when the sprinkler system is active, and an alarm bell in said control circuit, of automatic gas shut-off mechanism comprising a gas-main, a valve, means normally retaining the valve in open position, and means actuated by the energizing of said electric circuit to cause the valve to close.

4. The combination with a sprinkler system including an electric control circuit which is energized when the sprinkler system is active, of gas shut-off mechanism including a gas main, a weighted valve mounted in said gas main, a stem connected to the valve and provided with a lug, a detent cooperating with the lug to retain the valve in open position, an armature connected to the detent, and magnetic means arranged to operate the armature in response to energization of said control circuit.

5. In apparatus of the class described, a shut-off valve including a pipe fitting having a straight flow portion and a valve housing branch, the straight portion of which is provided with a valve seat, a valve located in the fitting, the valve having a flange slidably engaging the bore of the branch, the fitting also having a flange slidably engaging the valve whereby to guide the valve for free movement to closed position.

6. In apparatus of the class described, a gas-main, a valve therein having an enclosed valve stem provided with a reset handle projecting out of the enclosure, detent mechanism including a pawl engaging a lug on the valve stem, an armature connected to the pawl, a solenoid arranged to retract the armature, and a relay having contacts electrically connected to the solenoid.

7. In apparatus of the class described, a pipe fitting, a valve therein, a box supported on the fitting, a valve having a stem extending into the box and also having a reset handle projecting through a slot in a wall of the box, detent mechanism in the box including a pawl engaging a lug on the valve stem, an armature connected to the pawl, a solenoid arranged to retract the armature, and a relay mounted

in the box having contacts electrically connected to the solenoid.

8. In an apparatus of the class described, a water system, a gas main, a valve controlling the flow of gas through the main, means for normally holding the valve out of operative position to permit the unobstructed flow of gas through the main, a fusible element adapted to control the flow of water in the water system, and electrical devices, controlling the valve and operable upon the melting of the fusible element to permit the valve to close and shut off the flow of gas through the main.

9. The combination with a sprinkler system including an electric control circuit the state of energization of which is changed when the sprinkler system is active, of automatic gas shut-off mechanism comprising a gas main, a valve, means normally retaining the valve in open position, and means actuated by the change in energization of said control circuit for causing the valve to close.

10. The combination with a sprinkler system including an electric control circuit which is energized when the sprinkler system is active, of automatic gas shut-off mechanism comprising a gas main, a valve normally tending to move to closed position, a detent normally retaining the valve in open position, and means responsive to energization of the control circuit for withdrawing the detent.

11. The combination with a sprinkler system including an alarm and an electric control circuit for operating said alarm when the sprinkler system is active, of automatic gas shut-off mechanism comprising a gas main, a valve normally tending to move to closed position, a detent normally retaining the valve in open position, and means operated in response to energization of said control circuit for withdrawing the detent and permitting the valve to close.

12. The combination with a sprinkler system including an electrically operated alarm, a hydraulically operated flow switch, and an electric circuit controlled by said flow switch for operating said alarm when the sprinkler system is active, of automatic gas shut-off mechanism comprising a gas main, a valve, means normally retaining the valve in open position, and electrically operated means responsive to the aforesaid electric circuit for causing the valve to close when the sprinkler system is active.

Signed at New York, in the county of New York and State of New York, this 5th day of December, A. D. 1927.

JAMES J. DONOHUE.