April 25, 1933. E. J. LEACH 1,905,414

PILOT LIGHT CONTROLLED SAFETY VALVE

Filed Feb. 20, 1928

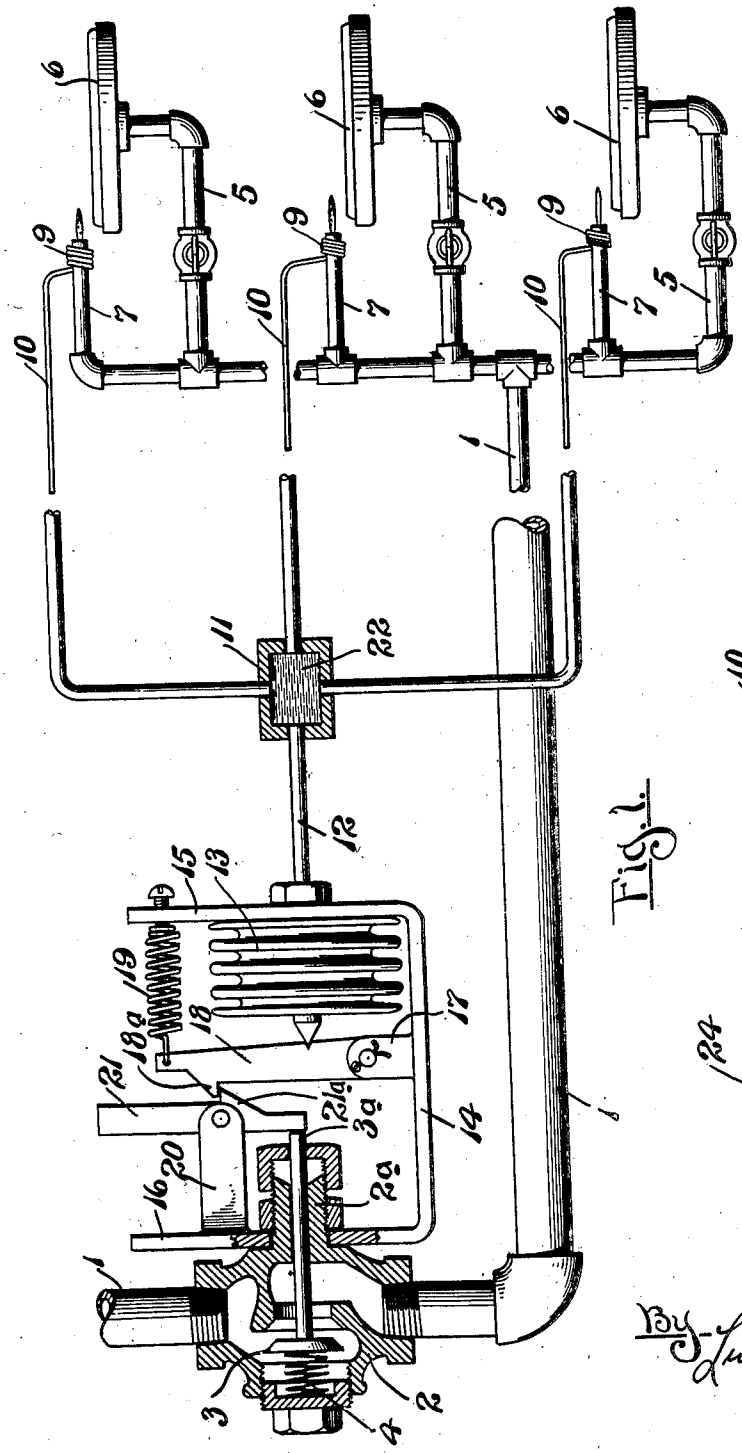


Fig. 1.

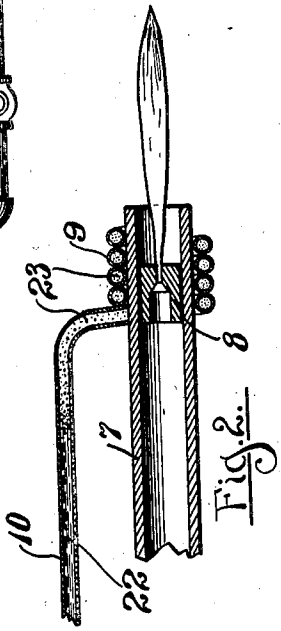


Fig. 2.

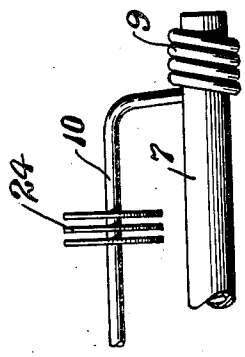


Fig. 3.

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UNITED STATES PATENT OFFICE

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PILOT LIGHT CONTROLLED SAFETY VALVE

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This invention relates to an automatic control adapted for application to a gas line carrying gaseous fuel to a burner or burners and is concerned primarily with a means to automatically shut off the gas supply should the pilot light used to light any burner become extinguished. Gaseous fuel burners are equipped each with a pilot light ordinarily, which is located closely to the burner to light the same when fuel is supplied to the burner; and as long as the pilot light is lit there is no danger from escaping gas as the gas passing from the burner will always be lighted if the pilot is properly burning.

Pilot lights, however, at times become extinguished due to various causes. In such cases fuel supplied to and passing from a burner is wasted and escapes into the room in which the burner is located. The room soon becomes filled with gaseous fuel with a resultant great danger, not only to persons entering the room who are liable to be overcome by the gas and asphyxiated but also on account of the explosive nature of the mixture made by mixing the fuel with the air of the room so that if a match is lighted in the room a severe explosion is very likely to occur.

It is an object and purpose of the present invention to provide an automatic control for a valve interposed in the main gas line supplying a house or other building with gaseous fuel, which will effect the release of the valve in said gas line to close the same and positively shut off the supply of gas to a burner or all of the burners in a house or building should the pilot light of any burner be extinguished. When the valve is thus closed the supply of fuel passing to a burner is cut off in a very short time after the pilot light is extinguished and before gas escaping into a room becomes in any measure dangerous. The invention in the present case is directed to a very simple and practical means for automatically controlling the supply of fuel to a burner, or to several burners which may be used in a building, with the provision of a sensitive construction automatically controlled through heat coming from a pilot light whereby a latching means for holding a valve in a gas main supplying a building is maintained in operative position while the pilot lights are lighted and supplying the necessary heat for such control, but which becomes inoperative and releases the valve should any one of the pilot lights associated with any of the burners, whether a single burner or a multiplicity of burners in a building, become extinguished. A further object of the invention is to provide a device which is simple in construction, easily installed, durable and efficient in operation and sure and positive in service, not liable to get out of order so as to become ineffective for the purposes for which it is designed.

An understanding of the invention and the constructions embodying the same for the attainment of the above ends may be had from the following description taken in connection with the accompanying drawing, in which,

Fig. 1 is an elevation of the apparatus of my invention with certain parts shown in section for a better disclosure of the operative structure.

Fig. 2 is a fragmentary longitudinal section through a pilot light made in accordance with my invention, and

Fig. 3 is an elevation thereof.

Like reference characters refer to like parts in the different figures of the drawing.

As illustrated, the supply of gaseous fuel entering a building is through a pipe 1 in which a valve casing 2 is located having a valve 3 therein which normally would be held in a closed position by a spring 4. The valve casing 2 in the structure shown has a threaded stem 2*a* extending from one side through which a valve rod 3*a* attached to the valve 3 freely passes, as shown in Fig. 1.

The gaseous fuel may be supplied from the pipe 1 to one or more burners, branch pipes 5 leading from the main supply pipe 1 to the burners 6. While three burners 6 are shown it is to be understood that the illustration is diagrammatic and the invention is applicable to any number of burners, one or more.

Each burner is provided with a pilot light. In practice gaseous fuel is led through a small pipe 7 which, at its free end lies closely

adjacent a side of the burner. Within the free end a plug 8 is fixed which has a very small opening therethrough for the passage of fuel. The outer end of the plug is located a distance, in practice approximately one half inch, back of the open free end of the pipe 7. The fuel passing through the plug 8 when lighted gives a long pencil flame and because of the position of the plug the extended open end of the pipe 7 is heated by the pilot light flame.

A tubular coil 9 is wound around the free end portion of each pilot tube 7 and thence extends, as indicated by tubes 10, to a junction box 11. The tubes 10 with the coils 9 integral therewith are small copper tubes the outer ends of which are closed and sealed. Where there are a plurality of burners and a plurality of pilot lights in a building, all of the tubes 10 lead to a single junction box 11 from which a tube 12 extends to and is connected with a longitudinally expansible and contractable bellows 13 in the form of a deeply corrugated thin metal tube equipped with closed ends. If there is but one burner and one pilot light, the tube 10 leads directly to the bellows 13.

The bellows 13 is carried by a supporting fixture which includes a base 14 and legs 15 and 16 extending from the ends thereof, the bellows 13 being mounted on the leg 15 as shown. The leg 16 is connected with the stem 2*a* of the valve casing 2 previously described. A post 17 projects from the base 14 to which one end of lever 18 is pivotally connected being located substantially parallel to the leg 15 and connected at its free end therewith by a coiled tension spring 19. The bellows 13 is located between the lever 18 and the leg 15 on which it is carried. On longitudinal expansion of the bellows the lever 18 is moved about its pivot with a consequent stretching of the spring 19; and on contraction of the bellows the spring 19 moves the lever toward the leg 15.

A post 20 extends from the leg 16 on which a lever 21 is pivotally mounted between its ends. The lower end comes directly in front of the valve rod 3*a* which bears against it. The two levers 18 and 21 have cooperating dogs 18*a* and 21*a* thereon adapted to operatively connect and hold the valve 3 in open position when bellows 13 is expanded to the position shown in Fig. 1, but on contraction of the bellows spring 19 draws the lever 18 to the right releasing it from the lever 21 whereupon the spring 4 acts to move valve 3 to closed position.

The bellows 13, tube 12, junction box 11 and the various tubes 10 extended therefrom are filled with a volatile liquid 22 in practice preferably ethyl chloride. This liquid extends to the ends of the coils 9 at ordinary atmospheric temperatures. The heat from the pilot lights heats the ends of the tubes 7 and also the coils 9, vaporizing the volatile fluid 22 and converting it into a gas, indicated at 23, and thus forces the liquid back into the junction box 11 and thence through the tube 12 and into the bellows 13, with a consequent expansion and elongation of the bellows, maintaining the latching lever 18 in the operative position shown in Fig. 1.

Should a pilot light become extinguished the cooling of the coil 9 around the same condenses the gas 23 and the volatile liquid 22 passes from the bellows 13 to fill the space previously occupied by the gas 23. When this occurs the bellows 13 contracts in length and lever 18 is moved so as to disengage dogs 18*a* and 21*a* with a consequent closure of the valve 3.

This construction of gas supply control governed by a pilot light associated with a gaseous fuel burner or any one of the several pilot lights associated with several gaseous fuel burners is very sensitive yet practical and sure in operation. Extinguishing a pilot light results in an automatic closing off of fuel to all the burners within a very short time, in practice approximately one minute, and by adjustment of the parts this time can be in a measure controlled. It is not important whether the fuel supplied to the pilot lights comes from the pipes 5 as diagrammatically shown or comes from a separate pipe leading to the main pipe 1 above the valve 3. In practice it is better to have the fuel continuously supplied to the pilot lights and not have it cut off when valve 3 closes for the reason that the pilot lights can always be immediately lighted and do not have to await opening the valve at 3. The escape of gas by the pilot light is very small and of little or no consequence.

I have found that the volatile liquid 22 vaporizes in a coil 9 and part way back in the connected tube 10 only a short distance back of the coil. If necessary radiating vanes 24 may be connected to the pipe 10 a short distance from each coil 9 in order that not too great a portion of the volatile fluid shall be converted into a gas. This, however, is a minor feature of the present invention. Changes in atmospheric temperature have little or no effect on this system of gaseous fuel control for the reason that the pilot light raises the temperature of the coils 9 and the liquid or gas therein to a substantial uniform point irrespective of the surrounding atmospheric temperature. Should a pilot light become extinguished with a consequent closure of the valve 3 it is necessary merely, in order to reconnect the levers 18 and 21, to light the extinguished pilot light and hold the lever 21 in operative position as shown in Fig. 1 manually until the bellows 13 has expanded sufficiently to move the dog 18*a* into engaging position over the dog 21*a*.

This construction shown and described has

been very thoroughly tested and tried out and is very practical for the purposes for which it is designed with an assurance against detrimental escape of quantities of gaseous fuel in connection with gaseous fuel burners.

The invention is defined in the appended claims and is to be considered comprehensive of all forms of structure coming within their scope.

I claim:

1. In an apparatus of the character described, a plurality of burners, an automatically closing valve controlling the flow of fuel to all of said burners, a plurality of tubes, one for each burner, each having a sealed free end closely associated with a burner, a closed junction box to which all of the tubes are connected, an expansible and contractible vessel, means establishing communication between said vessel and said junction box, said vessel, junction box and tubes connected therewith being filled with a volatile fluid, and means associated with said vessel and said valve for holding the valve in open position when the vessel is expanded in response to the heat of all of said burners and permitting the automatic closing of said valve when any one of said burners is extinguished.

2. In an apparatus of the character described, a pilot burner consisting of a tube having an open end, a plug fitted within said tube a short distance back of its open end to provide a chamber in front of the plug, said plug having a restricted gas passage extending therethrough whereby to form a flame partially within the tube at its open end and thereby heat such end, an expansible and contractible vessel, and a second tube communicating at one end with the interior of said vessel and having its other end closed and coiled about the portion of the pilot tube at and about the chamber therein in front of the plug whereby said coiled end of said second tube is influenced by the heated portion of the pilot tube, said vessel, tube and coil being filled with a volatile liquid.

3. A multiple control for gas-fired ovens, including a plurality of oven burners, a valve to dispense gas to the oven burners, a pilot burner disposed between each pair of oven burners, means to lock the valve in the open position, a plurality of thermostats each including an expansible fluid adapted to be heated by a pilot burner, means common to all of said thermostats adapted to be rocked by the expansion of the fluid of all of said thermostats to move said locking means into locking position, said common means being operable in the opposite direction upon the contraction of said fluid of any one of said thermostats when the corresponding pilot burner becomes extinguished, to permit the valve to close automatically.

4. A multiple control for gas-fired, heat-generating ovens, having a plurality of oven burners, including a valve to dispense the gas to the oven burners, means to lock said valve in the open position, pilot burners disposed between adjacent oven burners to light the same, thermostats, each including an expansible fluid adapted to be heated by said pilot burners, a rockable member common to all of said thermostats actuated by means rendered operable by the simultaneous expansion of said fluid of all of said thermostats to move said locking means into locking position, said rocking member being released upon the contraction of the fluid in any one of said thermostats, in case the corresponding pilot burner becomes extinguished.

5. A multiple control for gas burners, including a plurality of gas burners, a valve to dispense gas to said burners, pilot burners for the gas burners, means to lock the valve in open position, a plurality of thermostats, one for each of the pilot burners, including an expansible fluid adapted to be heated by the pilot burners, means common to all of said thermostats adapted to be actuated by the expansion of the fluid of all of said thermostats to move said locking means into locking position, said common means being operable upon the contraction of said fluid of any one of said thermostats when the corresponding pilot burner becomes extinguished, to permit the valve to close automatically and shut off the supply of gas to the gas burners.

6. A multiple control for gas burners, including a plurality of gas burners, a valve to dispense gas to said burners, pilot burners for the gas burners, means to lock the valve in open position, a plurality of thermostats, one for each of the pilot burners, including an expansible fluid adapted to be heated by the pilot burners, and junction means for the thermostats and through which the expansion and contraction of the fluid takes place to move the locking means into locking position for holding the valve open upon the heating of the fluid by the pilot burners and to release the locking means so that the valve will close automatically upon the contraction of the fluid of any of said thermostats when the corresponding pilot burner becomes extinguished.

7. A multiple control for gas burners, including a plurality of gas burners, a valve to dispense gas to the burners, pilot burners for the gas burners, means to lock the valve in open position, thermostats for the pilot burners and each comprising a tube having one end closed and associated with a pilot burner to be heated thereby, a junction box to which the other ends of the tubes are connected, an expansible fluid confined in the tubes and junction box adapted to be heated by the pilot burners, means common to all of the thermostats and adapted to be actuated by the expansion of the fluid through

the junction box upon the heating of the fluid by the pilot burners to move the locking means in locking position, said common means being operable in the reverse direction upon the contraction of the fluid of any of said thermostats when the corresponding pilot burner becomes extinguished to permit the valve to close automatically to shut off the gas supply to all of the gas burners.

In testimony whereof I affix my signature.

EDGAR J. LEACH.