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SAFETY PILOT FOR FURNACES

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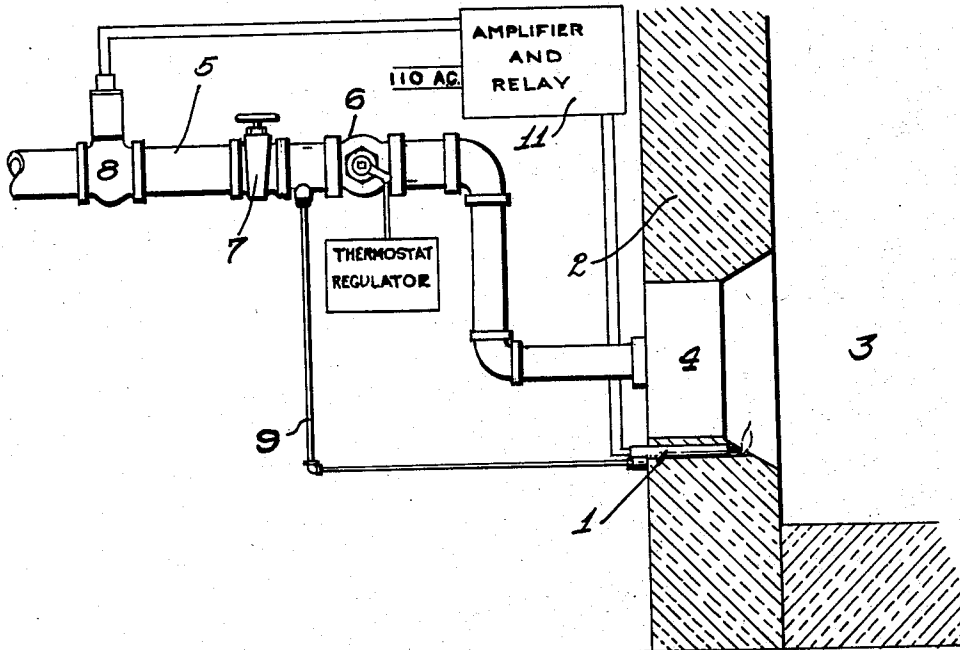


FIG. 1

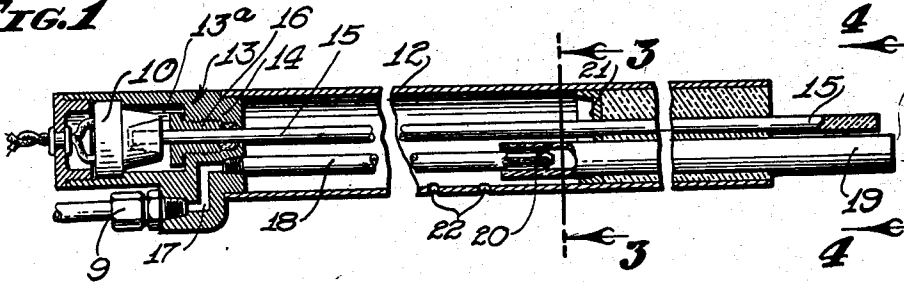


FIG. 2

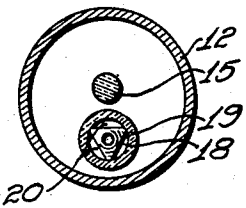


FIG. 3

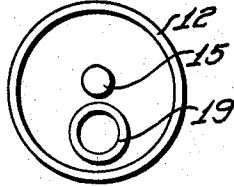


FIG. 4

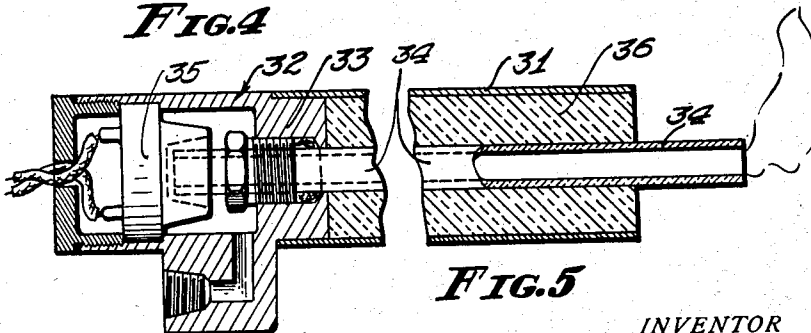


FIG. 5

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SAFETY PILOT FOR FURNACES

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7 Claims. (Cl. 158—117.1)

My invention relates to safety pilots for furnaces and among the objects of my invention are:

First, to provide a safety pilot which is particularly designed for gas burning furnaces and which control the main supply line to the burner, whereby, should the pilot flame become extinguished the main supply line is closed preventing further operation of the main burner or the pilot until the pilot is reignited, thereby insuring against the accumulation of unburned explosive gases in the furnace.

Second, to provide a safety pilot of this character which incorporates a novel means of transmitting illumination produced by the pilot flame to a remote point for actuating a photo-electric cell, said means being effected only by the pilot flame even though the furnace may be in operation so that, should the pilot flame be extinguished during operation of the furnace or during a period in which the pilot light only is in operation, the master control is caused to shut off all supply of fuel to the furnace and the pilot light.

Third, to provide a safety pilot which is unaffected by the extreme temperature conditions to which devices of this character are necessarily subject, so that continued functioning of the safety pilot for long periods of time without attention is assured.

Fourth, to provide a safety pilot of this character which incorporates a novel pilot burner tip which is particularly heat resistant.

With the above and other objects in view as may appear hereinafter, reference is directed to the accompanying drawing, in which:

Figure 1 is a diagrammatical view illustrating an installation of my safety pilot in gas furnaces;

Figure 2 is a longitudinal sectional view through my novel safety pilot;

Figures 3 and 4 are transverse sectional views of my safety pilot taken through 3—3 and 4—4 respectively of Fig. 2; and,

Figure 5 is a longitudinal sectional view of a modified form of my safety pilot.

Reference is first directed to Fig. 1. My safety pilot, indicated generally by 1, is mounted in the wall 2 of a furnace 3 in proximity to a conventional gas burner 4 or the like in such a manner that flame from the pilot will ignite the main burner when its supply is turned on. The main gas burner is supplied from a gas line 5 in which is provided a regulating valve 6 which is conventionally associated with a control means such as a thermostat for turning the main burner off and on. Also in the supply line 5 is a manually operated valve 7 and a motor or solenoid operated valve 8, the latter being controlled by the safety pilot. Between the manually oper-

ated valve 7 and regulating valve 6 is a pilot supply line 9.

The safety pilot, described in more detail hereinafter, includes a photo-electric cell 10 which controls the valve 8 through a suitable amplifier unit 11.

Reference is now directed particularly to Figs. 2, 3, 4. The safety pilot is encased in a shell 12 at the outer end of which is fitted a housing 13 having a wall 14 closing the outer end of the shell 12 and a chamber 13a outwardly thereof adapted to receive the photo-electric cell 10. The wall 14 is provided with an opening there-through which receives an end of a light transmitting rod 15 formed of fused quartz or analogous material adapted to transmit light axially. A packing gland 16 may be provided to seal the opening around the rod 15.

The housing 13 is also provided with a passage way 17 connected to the pilot supply line 9. A gas supply pipe 18 connects with the passage way 17 and extends forwardly through the shell 12 to a point near its inner end. Here the pipe 18 extends into a pilot burner tube 19. The pipe 18 is preferably polygonal at its inner end fitting the tube 19 to form therewith air passages 20. Inwardly of the pipe 18, the shell 12 is provided with a partition 21 for supporting the rod 15 and tube 19. Between the partition 21 and housing 13 the shell is provided with air intake openings 22.

The tube 19 and rod 15 project inwardly from the shell 12, the tube a slightly greater distance than the rod and below, so that a flame burning at the end of the tube 12 is directly in front of the end of the rod 15. The shell inwardly from the partition 21 is preferably filled with insulating material 23 such as asbestos fiber.

The tube 19 as well as the rod 15 is formed of fused quartz or similar material adapted to withstand tremendous heat without deterioration.

Reference is now directed to Fig. 5 in which a modified form of safety pilot is illustrated, differing principally from the above described structure in that the pilot tube and light transmitting element are combined. A tubular shell 31 is provided at its outer end with a housing 32 having a wall 33 through which extends a combined pilot and light transmitting element comprising a hollow rod or tube 34. The rear end of the tube 34 fits into a photo-electric cell 35. Gas is introduced from the supply line 9 into the chamber formed between the wall 33 and photo-electric cell 35. The shell 31 is filled with insulating material 36 around the tube 34 inwardly of the wall 33.

Operation of the safety pilot is as follows:

The fused quartz rod 14 or the tube 34 is practically unaffected by light unless the light is directly in front or coaxially located, and inas-

much as light intensity varies inversely as the square of the distance between light source and object, it follows by reason of the extremely close relationship between the rod or tube and the pilot flame, that energizing of the photo-electric cell is dependent upon the pilot flame whether the furnace burner is in operation or not.

With either construction illustrated, the pilot burner tip and light transmitting rod being of fused quartz is capable of withstanding the high temperatures for practically an unlimited period; consequently, the safety pilot is inherently free from trouble.

While the foregoing description is directed to a safety pilot for a gas furnace, it is obvious that the safety-pilot is equally operative with other kinds of furnaces utilizing oil, powdered coal and the like. Furthermore, the photo-electric cell and light transmitting rod 15 or tube 34 may be responsive to the main burner as well as or in place of the pilot burner. Also, the invention herein disclosed may operate in conjunction with automatic stokers as a control therefore to regulate the feed thereof in accordance with the light intensity of the burning fuel. In every case operation of the control is similar to the foregoing description; that is, the rod or tube serves to conduct light from the source of heat or combustion to the photo-electric element located at a remote point.

Though I have shown and described certain embodiments of my invention, I do not wish to be limited thereto but desire to include in the scope of my invention the constructions, arrangements, and combinations as set forth in the appended claims.

I claim:

1. The combination with a main burner, fuel supply, and control valve therefor, of a safety pilot light comprising: a tubular shell; a pilot burner projecting through and beyond said shell terminating in a burner tip adjacent said main burner; a heat resistant element having the property of transmitting light axially, said element extending through said shell and positioned with one end in close proximity to said burner tip for illumination by a flame burning thereat; a photo-electric cell fitted in said shell at its end remote from said burner tip, the remaining end of said element terminating in proximity to said cell; and relay means operatively associated with said cell for operating said control valve.
2. A safety pilot for burners comprising: a combined pilot burner tube and light transmitting element formed of heat resistant material having the property of transmitting light axially; said tube terminating at one end in a burner nozzle; and a relay mechanism associated with said tube, said mechanism including a light sensitive element positioned in proximity to the other end of said tube remote from said burner nozzle.
3. The combination with a furnace having a main burner and a pilot burner located clear of the combustion region of said main burner but adapted to produce a flame reaching said combustion region for igniting said main burner, of a safety control comprising: a rod of quartz or analogous light transmitting material having a bare inner end exposed to the interior of the furnace, and terminating in close proximity to the flame from said pilot burner, the inner end of said rod being shaped to minimise its light gathering

power whereby only that light within a zone in close proximity to said rod and substantially equal to its diameter is transmitted by said rod, said light zone normally being filled by said pilot burner flame, said rod having an outer end remote from the interior of said furnace; a light sensitive element at the outer end of said rod; a control means including a relay circuit incorporating said element and adapted to close the fuel supply to said main burner in the event said pilot flame is extinguished.

4. In combustion apparatus having combustion control means responsive to light variations incident to the burning of combustible material in a combustion zone, the combination comprising: an elongated, light-transmitting element of quartz or the like, positioned with a relatively short portion thereof comprising its inner end exposed to the direct light emanations of the combustion zone and with a relatively long portion comprising its outer end remote from said zone, means to substantially insulate said outer end from the heat of combustion, the said element receiving the light emanations of combustion at its inner end only and transmitting the same axially therethrough, a light-sensitive device positioned at the outer and relatively cool end of said element to receive light transmitted through said element; and electro-responsive means operated by said device for regulating the combustion of said material in accordance with the variations of light emanating from the combustion zone.

5. The combination of claim 4 in which the said light transmitting element is of relatively small diameter compared to its length, and the extent of exposure of its inner end to the light of combustion is so limited that its light transmitting property is substantially confined to those light emanations which are directed axially of the element.

6. The combination of claim 4 in which the said light-transmitting element is of relatively small diameter as compared to its length and with that part of its length comprising the inner end that is exposed to the light of combustion constituting only a small fractional part of its over-all length, the said element being so directed with respect to the combustion flame and its exposed end being of such short length that the light to be transmitted thereby is substantially limited to those light emanations which impinge upon the exposed end and are directed axially thereof.

7. The combination with a furnace and burners therefor, of a control apparatus comprising: a heat-resistant, light-transmitting, element with its outer end positioned exteriorly of said furnace and its inner end exposed to and adapted to transmit light from a combustion zone substantially confined to the cross-sectional area approximating the diameter of said element, the inner end of said element being so positioned that said zone is confined to the combustion flame from only one of said burners; a light-sensitive element at the outer end of said element, and means including a relay circuit incorporating said element and operative to respond to the presence or absence of a flame issuing from said one burner irrespective of flame issuing from the remaining burners.

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