431-42

SEARCH ROOM

Jan. 7, 1941. R. J. HAGEMAN 2,227,901

BURNER

Filed April 14, 1937

Fig. 1

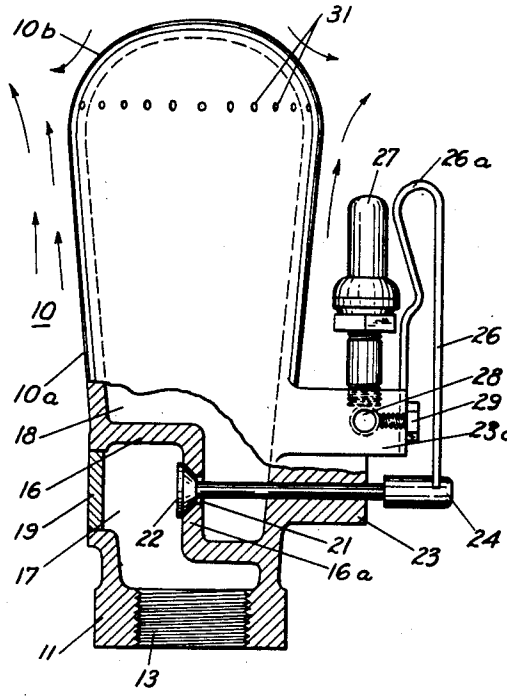


Fig. 2

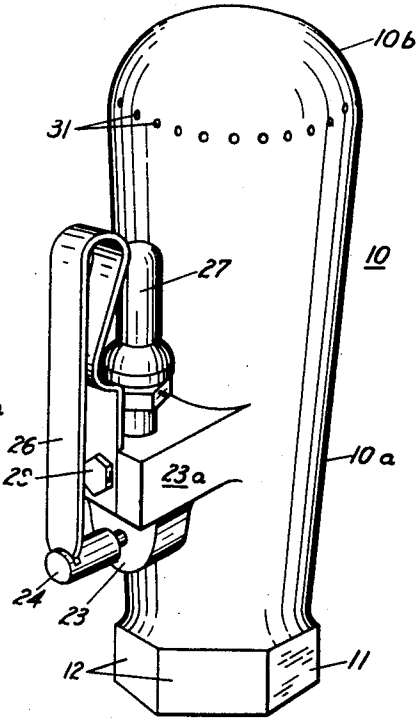


Fig. 3

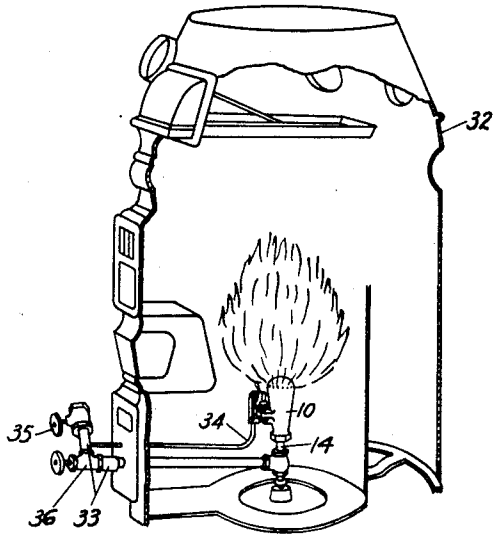


Fig. 4

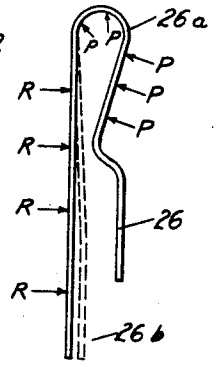
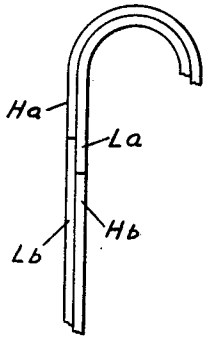


Fig. 5



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SEARCH ROOM

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2,227,901

UNITED STATES PATENT OFFICE

2,227,901

BURNER

Ralph J. Hageman, Cedar Rapids, Iowa, assignor to Johnson Gas Appliance Company, Cedar Rapids, Iowa, a corporation of Delaware

Application April 14, 1937, Serial No. 136,829

1 Claim. (Cl. 158—117.1)

This invention relates to burners and has particular relation to burner heads and control mechanisms for such burners.

In heating buildings by means of gas burners it has been the practice to utilize burners employing both a primary and secondary air supply, that is, air is mixed with gas in the conduit leading to the burner head and this is called the primary air supply and then, as the gas leaves the burner head, it mixes further with secondary air during the combustion process.

Burners of this character, termed atmospheric or primary type burners, require elaborate control mechanisms, such as motor-actuated dampers and the like, thus making the cost of such burner installations relatively high.

It is well known that burners will operate if primary mixing of air is omitted and only secondary air used. This type of burner is termed the luminous type burner and it is adapted to burn raw gas.

The luminous type burner, however, has not found favor in the house heating field, because, although it is usually a less expensive burner to manufacture and install than the primary type burner, it has been less efficient than the primary type burner and consequently more expensive to operate over a period of years.

Another disadvantage of the luminous type of burner has been the difficulty of shutting off the flow of gas to the burner in the event of failure of the pilot light.

It has been an object of my invention to improve the efficiency of the luminous type burner to a point where it is at least as efficient as the primary type burner and preferably more efficient.

A main object of my invention is to provide a low priced, high efficiency luminous type burner incorporating all of the safety features found in high priced burners.

Another object of my invention is to provide a burner in which is incorporated means for controlling and directing the air flow to cause better entrainment of secondary air and a better mixture of air and gas than in devices known to the art.

Another object of my invention is to provide an improved means for controlling the valve of a luminous burner to shut off the burner if the pilot light fails.

Another object of my invention is to speed up the operation of closing or opening the valve of the burner.

Another object of my invention is to provide an improved thermostat control for burners.

Another object of my invention is to provide a luminous type burner in which the air supply to the burner is caused to flow smoothly into the gas stream issuing from the burner.

Another object of my invention is to provide means for utilizing both the radiant heat from the walls of the furnace and the cooling of the bi-metal strips to actuate the valve of the burner.

Another object of my invention is to provide a new and improved control system, including a thermostatic strip adapted to make use of both a cooling and heating effect for actuating the strip.

Another object of my invention is to provide a new and improved bi-metallic element and a new and improved method of making use of a bi-metallic element to secure faster operation thereof.

Another object of my invention is to provide a bi-metallic element so arranged and constructed as to be exposed to heat sources at two portions of the element and to provide an element such that on failure or inoperativeness of one source of heat, the consequent cooling of the strip at one portion and continued heating of the strip at another portion will cause it to operate with increased speed.

Other and further features and objects of the invention will be more apparent to those skilled in the art upon a consideration of the accompanying drawing and following specification, wherein is disclosed a single exemplary embodiment of the invention, with the understanding, however, that such changes may be made therein as fall within the scope of the appended claim, without departing from the spirit of the invention.

In said drawing:

Figure 1 is a view, partly in section and partly in elevation, of a burner in which a "streamlined" head, constructed according to an embodiment of my invention, has been incorporated.

Figure 2 is a view in perspective of the burner shown in Figure 1.

Figure 3 is a view in perspective illustrating how a burner constructed according to my invention appears when incorporated in a furnace. A portion of the wall of the furnace has been broken away to permit illustration of the burner.

Figure 4 is a diagrammatic view illustrating how heat is applied to a thermostatic element constructed according to an embodiment of my

invention, and illustrating also the action of the element under heat, and

Figure 5 is an enlarged fragmentary view illustrating the arrangement of the strips which make up the bi-metal element and how they are joined.

A burner, constructed according to one embodiment of my invention, has a body, indicated generally at 10, consisting of a cylindrical barrel 10*a*, the diameter of which increases from bottom to top in what may be termed as the frustum of an inverted cone, and this barrel is surmounted by a hemispherical cap 10*b*. Of course, the inverted cone frustum and hemispherical cap are preferably one casting.

The base of the head 10 is provided with a flange 11 having flattened outer faces 12 and a threaded opening 13 within the flange leading into the interior of the head 10 to permit the device to be threaded on to a gas pipe as illustrated at 14 in Figure 3. The interior of the head 10 is divided by means of a partition 16 into two chambers 17 and 18. Access to the chamber 17 may be had through a plug 19.

The partition 16 has a vertical portion 16*a* through which an opening 21 is drilled. This opening 21 is adapted to be closed by means of the valve 22, the stem of which extends through the wall of the barrel 10*a* and through a boss 23 on the outside of the barrel 10*a*. The outer end of the stem is covered by a notched cap 24. The boss 23 is enlarged, as indicated at 23*a*, and this enlarged portion serves not only as a means for mounting the thermostatic element 26 thereon but also as a means for mounting the pilot burner 27. The pilot burner may be of any usual type but in the present instance is a porous ceramic tip which permits gas to pass therethrough to burn with a relatively wide-spread flame. Gas is let into the pilot burner by means of the channel 28 in the side of the boss 23.

A bi-metallic strip is provided, formed as a roughly U-shaped member, one leg of which is secured to the side of a boss 23 by means of a bolt 29.

The curved portion 26*a* of the thermostatic element is preferably positioned quite close to the pilot burner 27 so that the curved portion is not only heated by the flame but also by the radiant heat from the ceramic tip.

Openings 31 are provided in the lower portion of the hemispherical cap 10*b* through the walls thereof and these openings are preferably perpendicular to the surface of the cap, so that the gas issues therefrom at slight upward angle with reference to the horizontal.

I term the form of the head 10, consisting of the inverted frusto-conical barrel 10*a* and hemispherical cap 10*b*, a "streamlined" head, and it has been found that the stream of air rising upwardly, by reason of the convection currents over the outer wall of the barrel 10, flows smoothly over the surface of the barrel without the whirls and eddies which characterize the flow of the air supply of burners not so formed. It has been found that causing the air supply to flow smoothly into the streams of gas issuing from the jets results in an increase of efficiency of from 6 to 7 per cent over other burners known to the art. I have illustrated the flow of the air by means of arrows.

In use the luminous burner 10 is placed within the usual hot air furnace 32, and gas is fed to the head by means of a supply pipe 33. A small supply line 34 leading off the main conduit 33 carries gas to the pilot burner 27.

In operation the valves 35 and 36 are opened and gas is permitted to enter the supply line 33. Gas then issues from the pilot burner 27 but cannot issue from the openings 31 in the burner head because the thermostatic strip 26, being "cold," causes the valve 22 to close the opening 21 leading through the partition 16 within the head. The gas issuing from the pilot burner is then ignited and the flame heats the bent portion 26*a* of the thermostatic strip 26 causing it to contract, as illustrated in Figure 4, to raise the valve 22 from its seat to permit gas to flow into the chamber 18 and issue from the openings 31. The gas issuing from the openings 31 is ignited by the pilot flame and the burner heats the interior of the furnace 32. If the demand for heat is satisfied the valve 36 is closed, but since gas still continues to flow to the pilot burner, the flame of the pilot burner maintains the thermostatic element 26 in contracted condition so that the valve 22 is raised from its seat and, if there is a demand for heat and the valve 26 is opened, gas will pass immediately into the burner head chamber 18 and issue therefrom to be ignited.

If there has been a failure of the pilot flame, however, the thermostatic strip 26 expands and causes the valve 22 to seat itself in the partition 16*a* to close off the channel 21 leading into the chamber 18. Therefore, if the pilot burner is not ignited, no gas can issue from the jets 31 of the head 10. In this way the danger resulting from the collection of a large quantity of gas in and around the furnace, which may result in an explosion, is avoided. However, it has been found that if the usual bi-metal strip is employed for the thermostatic element 26, the heat from the furnace, and from the various parts of the device, and the residual heat of the thermostatic element, materially slows down the action of the thermostatic element, and the valve may be held open a much longer period than is consistent with safe practice.

After considerable thought and experimentation I have devised a means of making use of the radiant heat of the furnace to speed up the action of the thermostatic element 26. In practicing my invention I preferably employ a thermostatic element, a portion of which is illustrated in Figure 5. In this thermostatic element the relative position of the bi-metals, indicated as H*a* and L*a*, is reversed in one portion of the strip from the position they occupy in another portion of the strip. That is, for instance, the metal having the low co-efficient of expansion, indicated at L*a*, may be on the inside and the metal with the high co-efficient of expansion on the outside as indicated at H*a*. The positions of these metals is then reversed as indicated at L*b* and H*b* so that the metal having the high co-efficient of expansion is on the inside and the metal having the low co-efficient is on the outside.

In use the curved portion of the thermostatic strip 26 is exposed to the pilot flame and radiant heat from the pilot burner as indicated by the arrows P, while another portion 26*b*, constituting the long leg of the thermostatic strip 26 in the present instance, is exposed to the radiant heat from the walls of the furnace, as indicated by arrows at R. A thermostatic element of this kind, when subjected to heat, will take the position illustrated in dotted lines in Figure 4, with the

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curved portion exposed to the heat from the pilot burner contracted, thus causing the valve 22 to be opened. If the furnace is heated for any appreciable time, radiant heat from the walls of the furnace strikes the leg 26*b* of the element 26 and, by reason of the position of the bi-metals, the leg is caused to assume the concave bowed position indicated by the dotted lines.

The relative lengths of the legs and the arrangement of the metals of the element are so chosen that when the leg 26*b* is in the bowed position shown and the portion 26*a* heated the valve 22 is still held open. Now, if the pilot burner 27 fails, the portion 26*a* of the strip expands. The portion 26*b* is in the initially bowed or flexed position indicated by dotted lines and is maintained in this condition by the radiant heat from the walls of the furnace 32. When the pilot burner fails and the portion 26*a* begins to expand only a very limited movement of the curved portion 26*a* is required to cause the leg 26*b* to close off the valve 22. It has been found, from many experiments, from tests, and from actual installations, that the time of closing the valve is very materially shortened and, whereas the time of closing under certain conditions in devices known to the art might be as high as 20 minutes, the closing time of a control constructed according to my invention is only about one to one and a half minutes, which is well within the limits acceptable for safe operation of the burner.

The problem of reversing the position of the bi-metals and preventing them from being pulled apart and providing a smooth joint at first seemed extremely difficult, if not insurmountable, but I have found that by overlapping the bi-metals as indicated in Figure 5 and welding them in this overlapped position a smooth joint is secured which will not pull apart.

It is apparent that a thermostatic element constructed according to my invention may be utilized in many different ways, particularly when there are two sources of heat, one of which may become operative or inoperative at different times than the other. Furthermore, it is apparent that the element does not necessarily have to be formed in the curved form shown but may be straight or curved as desired.

Although modifications of my invention may be made by those skilled in the art, such modifications may be made without departing from the spirit and scope of my invention as set forth in the appended claim.

I claim as my invention:

In a burner having a valve associated therewith for controlling the flow of fuel into the burner, a continuous U-shaped bi-metallic element for controlling the valve, a pilot burner adjacent to one leg of the bi-metallic element and the other leg being exposed to radiant heat from the wall of the furnace, with the leg of the bi-metallic element adjacent the pilot burner arranged with the bi-metal in a certain given relation and with the leg exposed to the wall of the furnace arranged with the bi-metals in reversed order whereby double action of the bi-metallic element is secured.

RALPH J. HAGEMAN.