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W. FERGUSON
FLAME RETENTION NOZZLE
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2,365,945

Fig. 1.

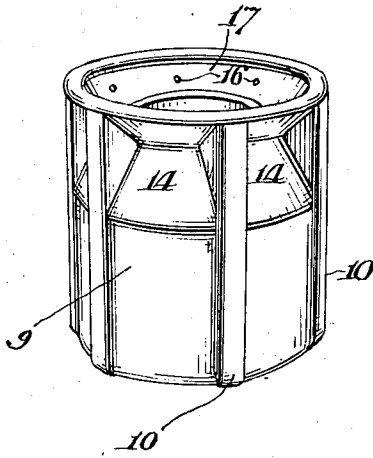


Fig. 2.

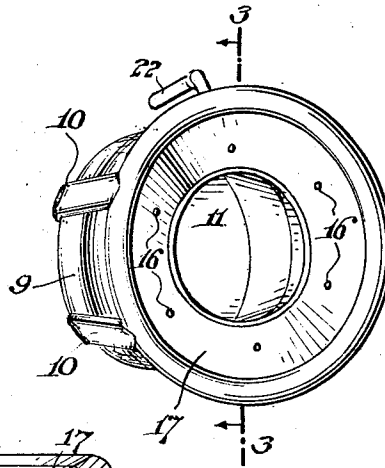


Fig. 5.

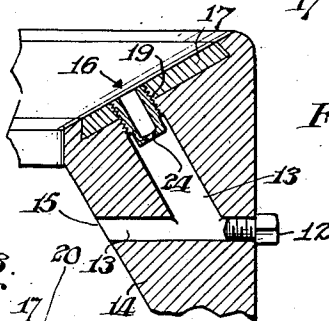
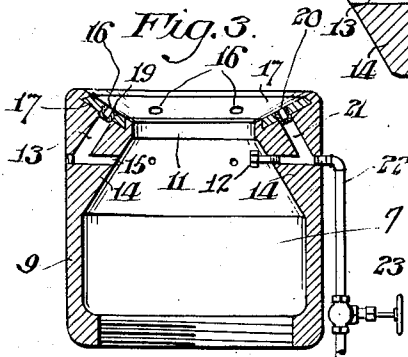
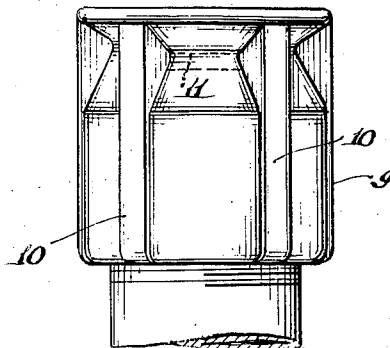


Fig. 4.



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UNITED STATES PATENT OFFICE

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FLAME RETENTION NOZZLE

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3 Claims. (Cl. 158—109)

The invention relates to improvements in flame retention nozzles, especially of the common and well known type, such as is shown in my pending application Serial No. 424,961 filed Dec. 30, 1941, which matured into Patent No. 2,333,531; dated November 2, 1943.

The object is to provide an air-cooled nozzle. Because of its construction and operation it does not require the use of heat resisting alloy, which is expensive and difficult to procure at the present time.

An object therefore is to provide a flame retention nozzle which permits the use of cast iron in its construction and yet insures a relatively long life.

The device comprises novel and useful features as hereinafter to be described.

Referring to the drawing which illustrates, merely by way of example, suitable means for the embodiment of my invention:

Fig. 1 is a view partly in elevation and in part perspective, of the device in accordance with my invention.

Fig. 2 is a perspective view of the same, looking into the discharge end.

Fig. 3 is a section on the line 3—3 of Fig. 2.

Fig. 4 is a simple elevation.

Fig. 5 is a sectional detail on an enlarged scale.

Similar numerals refer to similar parts throughout the several views.

As shown, especially in Figs. 1, 3 and 4, this nozzle has a cylindrical formation 9. It is provided with spaced apart parallel reinforcing ribs 10. The parts of the cylindrical formation between the ribs and between the middle part of the cylinder and its outer end, are formed to extend inwardly to provide a tapered or contracted discharge passage 11. The four wall sections 14 forming depressions (looking toward the outside) are all inclined to each other, with the result that the discharge passage through the nozzle is first contracted as shown at 11, and then with a flaring outermost part 17 for the discharge of air-gas mixture.

Passages or channels 13 are arranged in the projecting portions 14 (looking from within) of the side walls of the nozzle, as shown in Figs. 3 and 5. These passages have inlet openings 15 into the main chamber 7 for receiving the combustible mixture and discharge openings 16 in the face 17 of the flaring portion of the nozzle. These discharge openings or ignition ports 16 are preferably provided in spaced relationship around the inclined surface of said flaring face 17.

The said outer face of the nozzle, which is

exposed to the heat of combustion, is protected against heat deterioration by a facing 17, which is of a refractory insulating plastic. The said ignition ports 16 of this facing register with the channels or passages 13. These ports are provided with recessed gas tips 19, which are inserted at a suitable angle to direct the flame jets against the main volume of the combustible mixture passing through the nozzle. This design of the ignition jet formation prevents the over-heating and burning of the casting, which takes place with the customary retention nozzle. These recessed gas tips also allow of a greater turn-down without flash back.

A raw gas pilot 20, similar to any one of the discharge openings 16, delivering from an independent raw gas supply, is also made an integral part of the nozzle, not depending upon the flow of mixture through the main passage of the nozzle. It is safe, effective and an inexpensive device for quickly lighting the main gas burner.

This pilot port 20 is connected with a passage 21, (Fig. 3) similar to the other passages 13, except that the inlet 15 may be closed and an inlet provided for receiving raw gas from the outside of the nozzle through a pipe 22, having an independent control by means of the regulating valve 23.

For example—Fig. 5 shows a screw plug 12 inserted in a branch of passage 13 or 21, while inlet 15 is open to receive combustion mixture from the main chamber 7. In such case the pilot 20 functions as any of the other pilots.

When, on the other hand, it is desired to connect port 20 with a raw gas supply, the screw plug 12 is removed and replaced by the end of raw-gas supply pipe 22.

Any number of such pilots may be used.

Nozzles are used for delivering a mixture of primary air and gas to the furnace for burning without flash back or loss of ignition. They are designed to take the place of flame retention nozzles now in general use.

These nozzles are designed to and do reduce the cost of nozzle maintenance and replacements where a high furnace temperature, a plus furnace pressure, or preheated air is used. They have proved especially economical in replacements.

Unlike the ordinary flame retention nozzles for severe service, this nozzle is not made of a heat-resisting alloy that is so expensive at this time. The design of the nozzle, as above stated, permits use of cast-iron and yet insures a relatively long life.

As shown in Fig. 5, a special form of jet pro-

ducing body is provided for the ignition ports; this body cooperating with the refractory flaring face 17. It comprises an elongated cylindrical formation 19, open at the discharge end and provided with a jet orifice 24 at its inner or intake end. The outer or discharge end of 19 is preferably flush with the refractory face 17. The gas is projected through the small jet orifice 24, through the cylindrical chamber 19, so that the gas, or gas and air mixture will burn at the open end of said cylinder. It will thus be seen that the wall of the cylinder 19 and the refractory face 17 cooperate in protecting the orifice 24 from the heat of combustion. Such an arrangement has been found extremely effective in preventing overheating and clogging of said orifice 24.

The formation of the channels 13 has important advantages. It tends to retard the flow of combustible mixture, and contributes to the prevention of overheating the nozzle. It facilitates the forming of the channel in the burner body, and it provides simple and effective means for shifting the connection with the main chamber, to connection with a source of raw gas and vice versa.

In other words, the production of these channels 13 in an integral flame retention nozzle, as shown in Figs. 3 and 5, is believed to be a very distinct advance in the art.

What I claim is:

1. A flame retention nozzle comprising a cylindrical chambered body having one end formed to connect with a source of combustible mixture,

the other end being tapered to form a contracted discharge passage, a flaring formation for receiving the discharge from said passage, said chambered body also having channels in its wall leading from the tapered area of said chamber to said flaring formation, one at least of said channels having a port intermediate its two ends which may be connected with a source of raw gas.

2. A flame retention nozzle comprising a cylindrical chambered body having one end formed to connect with a source of combustible mixture, the other end being tapered to form a contracted discharge passage, a flaring formation for receiving the discharge from said passage, said body also having channels leading from the tapered area of said chamber to said flaring formation, said chambered body provided with parallel spaced apart reinforcing ribs positioned between the said converging and flaring walls and providing bodies for receiving the said channels.

3. A gas nozzle comprising a cylindrical chambered body having one end formed to connect with a source of combustible mixture, the other end being tapered to form a contracted discharge passage, and a flaring formation for receiving the discharge from said passage, the surface of said flaring formation being provided with an annular recess extending from near the inner and outer margins of said flaring formation and a refractory seated in said recess, providing a smooth continuous frusto-conical surface between said margins.

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