Aug. 11, 1931. J. L. POOLE ET AL 1,818,865

BURNER

Filed April 18, 1928

Fig. 1.

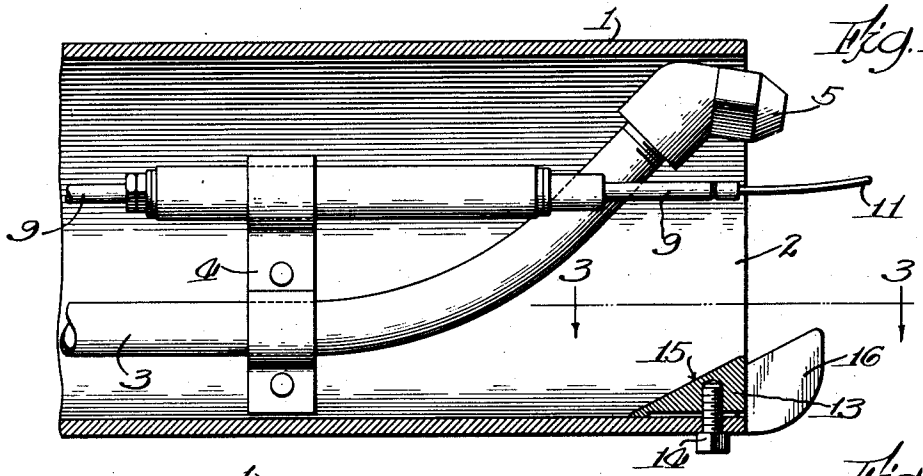


Fig. 2.

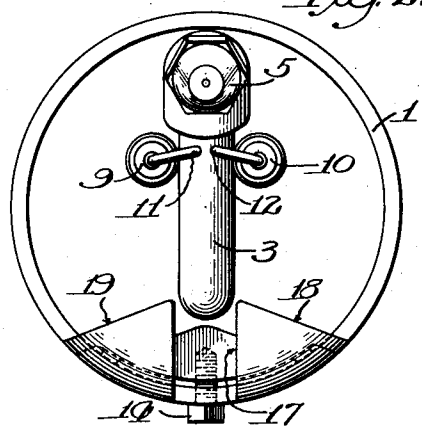
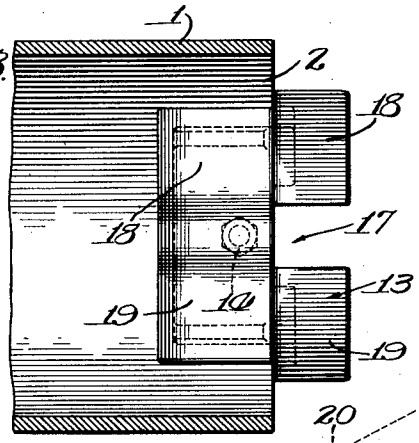


Fig. 3.



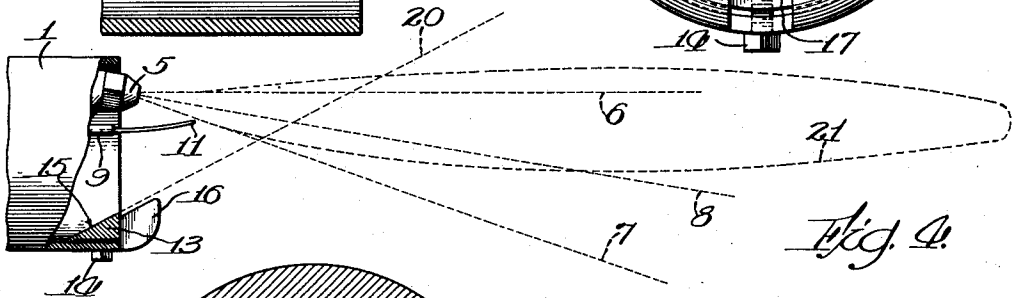


Fig. 4.

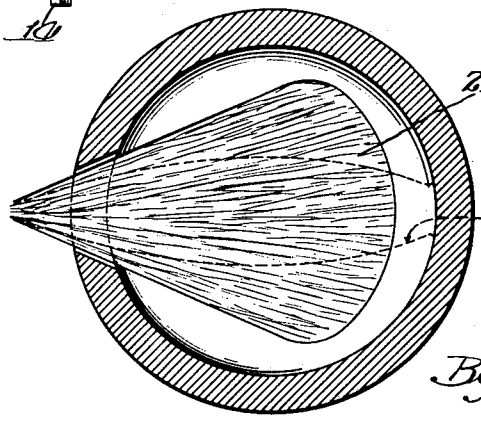


Fig. 5.

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UNITED STATES PATENT OFFICE

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BURNER

Application filed April 18, 1928. Serial No. 270,827.

The present invention relates to burners, such as those known as domestic burners for use with boilers and the like for heating dwellings and the like, but this is merely illustrative and the invention is applicable to other types of burners in this and other uses.

Among the objects of the invention is to provide a novel burner and a novel method of combustion wherein a flame is produced of a form or shape as to be better suited to boilers and the like than heretofore possible; to have a better heat transfer range for any given burner; to have greater stability, and to have increased efficiency.

In oil burners of the type having a large air tube or duct for conducting a stream of air or other supporter of combustion from a blower or the like to an oil spraying or atomized means or the like, it has been usual to include vanes in the air duct to cause a whirling of the air upon the theory of thoroughly mixing the air with the oil spray. The result is a rather thick beam of air and oil mixed with lean and rich spots or areas and very little mushrooming of the flame. The flame is usually too elongated and narrow, and by reason of its thickness, complete and efficient combustion is impossible and considerable deposit of carbon, soot or the like is effected.

Hence, it is an object of this invention not to whirl or turbulently disturb the air stream but to so direct the stream into the atomized oil or other fuel to effect a resultant relatively flat and wide flame with a substantially even distribution of the air and fuel particles whereby lean and rich spots or areas are minimized or eliminated and complete and efficient combustion is obtained with no deposit of soot, carbon or the like.

In a specific illustrative embodiment, this is arrived at by blowing a stream of air substantially linearly through a duct or tube and directing an atomized spray of oil or the like downwardly across the discharge outlet or the air duct and deflecting, preferably upwardly, a part of said air stream at the outlet of the duct. The intersection of the two streams produces a resultant flame which is substantially horizontal, flat, and wide. The oil spray is preferably effected by forcing under pressure, the oil through a mechanical atomizer to project the atomized particles at an angle to the axis of the air tube or duct and in a more or less hollow cone form. A deflector having an upwardly inclined surface, is preferably located at the duct outlet to upwardly deflect the lower part of the air stream, thus, to a certain extent, flattening the same by directing the issuing stream at an angle or more or less transversely to the general direction of the fuel spray. The deflector is preferably inclined at its sides so that the lateral sections of the air stream may be increased in cross-sectional areas for even distribution of those portions of air intersecting the segmental cross sectional areas of the fuel spray having the larger number of fuel particles. In this way a more uniform distribution and mixture is effected so that all parts of the mixed volume will be correct for perfect and complete combustion.

The flame will not travel backward, and exists from the first point of intersection of the two streams to the other side of the combustion chamber. It is also widened by reason of its flattening and hence combustion is complete for substantially the whole horizontal area of the chamber, thus eliminating cold side currents of air and the like. The nozzle or atomizer is preferably located at the air duct outlet and a little in advance of the same, and the deflector similarly placed and provided with a notch or slot vertically beneath the nozzle to permit passing of drippage without any dropping of oil on the hot surface of the deflector and the forming of carbon or the like.

Other objects, capabilities, advantages, features and process steps are comprehended by the invention as will later appear and are inherently possessed thereby.

Referring to the drawings,

Fig. 1 is a view partly in vertical longitudinal section and partly in side elevation of a construction following the invention;

Fig. 2 is a view in end elevation of the same;

Fig. 3 is a horizontal fragmentary sectional view taken in a plane represented by line 3—3 shown in Fig. 1 of the drawings;

Fig. 4 is a view of an end of the burner with parts broken away and a schematic showing of the action of the streams and flame; and

Fig. 5 is a transverse sectional view of a furnace showing the position of the flame.

Referring now more in detail to the drawings, the embodiment selected to illustrate the invention is shown as comprising an air tube or duct 1 which may be connected at its inlet end to a suitable motor driven blower for transmitting or conveying a stream of air through the tube 1 toward the outlet 2 thereof. Within this tube 1 may be located an oil duct or pipe 3 supported by a bracket 4, the forward end of the pipe 3 being suitably bent to extend upwardly to carry a mechanical atomizer 5, the nozzle part of which may be directed at an angle or inclined downwardly so as to be able to project an atomized stream of fuel particles into the form of a hollow cone represented by the dotted lines 6 and 7 in Fig. 4 of the drawings, the dotted line 8 being of utility to indicate the axis or center line of such nozzle and cone.

The bracket 4 may also support a pair of conductors 9 and 10 leading to spark terminals 11 and 12 between which a spark gap may be provided. These terminals and the gap are preferably located at the edge of or just within the surface of the flame area as clearly shown in Fig. 4 of the drawings.

In the lower part of the tube 1 and at the outlet thereof is located a deflector member 13 preferably of refractory material and held in position by any suitable securing means such as the bolt 14. This deflector has an inclined surface portion 15 extending upwardly toward the outlet of the tube and has also an outwardly projecting portion 16 provided with a slot 17 located vertically below the outlet of the nozzle 5 so that any drippage of oil from the nozzle will pass through this slot and below the burner without danger of any of the drops falling upon the surface of the member and thus carbonizing or coking upon the hot surface of the member. The surface 15 is preferably inclined laterally downwardly or, in other words, to form the surface portions 18 and 19 as shown in Fig. 2 of the drawings.

It will be seen by inclining the surface 15 upwardly, that a portion, such as the lower portion of the stream of air passing through the tube 1 will be deflected upwardly substantially along the dotted line 20 shown in Figure 4 of the drawings. The result is that when the air stream thus upwardly deflected intersects with the oil stream downwardly deflected, that there is a resultant projection of the flame as shown by the dotted line 21 in Fig. 4 of the drawings. This causes a flattening of the flame as well as a widening of the same so that it will have substantially the form shown in Fig. 5 of the drawings. In the previous structures, where the stream of air issues as a beam, the resultant flame is thicker, longer or more elongated and narrower as indicated by the dotted line 22 in Fig. 5 of the drawings. This leaves a considerable air space on both sides of the flames, thus aiding in cooling the flame at the sides and causing deposit of carbon, soot, or the like. By the present invention, the flame is made to extend over a much greater area of the combustion space of the combustion chamber, and thus eliminating the disadvantages of the narrower, deeper and longer flame. Moreover, the flame 21 will extend substantially across the combustion chamber without impinging upon the oppoiste face or wall of the chamber as in the case of the flame 22.

Inasmuch as the fuel stream projected from the nozzle 5 will take the form of a hollow cone or the like, it will be seen that given sections of air stream at the sides of the air stream issuing from the tube 1, would come in contact with a larger number of oil particles in the segmental area at the sides of the oil stream, and a central or like section of the air stream would come in contact with smaller areas and hence a smaller number of particles in the central part of the oil stream whereby too much air might be present for the particles in such areas whereas the side portions of the air stream might have too little air for the total number of oil particles in the side portions of the oil stream.

In order to provide a more even distribution of the air to the particles in the oil stream, the inclined surface of the member 13 is made with laterally and downwardly inclined portions or faces 18 and 19 on both sides of the slot 17 in order that the side portions of the air stream passing through the tube 1 and issuing therefrom will be increased in area, and thus furnish a larger amount of air to the side portions of the oil stream, and by having a central portion of the member 13 high or having a crest, the central section of the air stream will be accordingly decreased or made to be nearer to the proper size for mixing with the smaller areas at the central portions of the oil stream. Thus, this invention comprehends the idea of effecting as nearly as possible an even distribution of the air among the particles of oil projected from the nozzle whereby there will be no rich or lean parts or areas causing the formation of carbon, soot and the like. This results in a complete

combustion throughout the whole mass of the flame.

The angle of the nozzle may be varied to suit conditions and the shape of the deflector may be modified for use with oils of various viscosities and fire boxes of different dimensions. The deflector is preferably located to extend somewhat beyond the end of the air duct to permit a better projection or deflection of the air stream into the oil stream. This advantage may be secured without dripping of oil from the nozzle upon the deflector by reason of having a slot in the deflector for the passage of such dripping.

While we have herein described and upon the drawings shown an illustrative embodiment of the invention, and the method of producing this novel combustion, it is to be understood that the invention is not limited thereto but may comprehend other constructions, arrangements of parts, details, features, and process steps, without departing from the spirit thereof.

Having thus disclosed the invention,

We claim:

1. A burner comprising an air duct having an outlet, a nozzle at said outlet inclined downwardly and forwardly with respect to the axis of said duct to project particles of fuel in a downward and forward direction, the outlet of said nozzle being beyond the plane of the outlet of said duct, and a deflector at said outlet having a deflecting surface inclined upwardly and forwardly with respect to the axis of said duct for deflecting a part of the air stream upwardly and forwardly to produce a combustible mixture with said particles and form a relatively flat and wide flame, said deflector having a portion within and a portion without said duct outlet, and having a slot vertically beneath said nozzle outlet to permit passage of drippage.

2. A burner comprising an air duct having an outlet, a nozzle at said outlet inclined downwardly and forwardly with respect to the axis of said duct to project particles of fuel in a downward and forward direction, and a deflector at said outlet having a deflecting surface inclined upwardly and forwardly with respect to the axis of said duct for deflecting a part of the air stream upwardly and forwardly to produce a combustible mixture with said particles and form a relatively flat and wide flame, the upper surface of the deflector having laterally inclined side portions whereby larger segmental cross-sectional area portions of the air stream may act on the larger segmental cross-sectional area portions of the fuel particle stream for more even distribution of the air and particles.

3. A burner of the character described comprising an air duct having a delivery end, a liquid fuel conduit having a pressure oil-spray nozzle located adjacent said delivery end and positioned to direct liquid fuel spray in a predetermined direction, and a deflector member located partly within the delivery end of said duct and projecting therebeyond, said deflector member being shaped to cause a portion of the air discharged by said duct and impinging upon the deflector to travel across the direction of discharge from said nozzle, so as to form a combustible mixture and to effect a resultant relatively flat and wide flame upon ignition of said mixture, said deflector member having a slot formed in the projecting portion thereof and located in a position vertically beneath the nozzle orifice, so that drippage from the nozzle will drop through the slot.

4. A burner of the character described comprising an air duct having a delivery end, a liquid fuel conduit having a pressure oil-spraying nozzle located adjacent said delivery end positioned to direct liquid fuel spray in a predetermined direction, and a deflector member located partly within the delivery end of said duct and projecting therebeyond, the top surface of said deflector member being inclined upwardly and forwardly with respect to the axis of the duct so as to cause a portion of the air discharged by said duct and impinging upon said surface to travel across the direction of discharge from said nozzle to form a combustible mixture and to effect a resultant relatively flat and wide flame upon ignition of said mixture, said deflector member having a slot formed in the projecting portion thereof and located in a position vertically beneath the nozzle orifice, so that drippage from the nozzel will drop through the slot, said deflector member also having its top surface extending laterally outward and downward on both sides of the slot.

5. A burner comprising a nozzle for projecting liquid fuel under pressure in the form of a spray of particles in a given path, a duct for conducting a supporter of combustion to said sprayed particles, and a deflecting member in said duct, said nozzle and said deflecting member each extending a given distance beyond the outlet of said duct, said deflecting member having a slot for the passage of drippage from said nozzle, and having its deflecting surface sloping upwardly and forwardly with respect to the spray path, said member being adapted to deflect a part of the supporter to cause the supporter to move in a direction transverse to said path and to mix with said particles to form a combustible mixture and to effect a resultant relatively flat and wide flame.

6. A burner comprising an air duct having an outlet, an oil conduit extending longitudinally through said duct and having an upturned discharge end, a nozzle secured

to said discharge end adjacent the outlet of said air duct and inclined downwardly and forwardly with respect to the axis of the duct so as to project particles of fuel in a downward and forward direction, and a deflector member having one end located within said duct and its other end projected beyond said outlet, said deflector member having a deflecting surface inclined upwardly and forwardly with respect to the axis of said duct so as to deflect a part of the air stream upwardly and forwardly to produce a combustible mixture and to form a relatively flat and wide flame.

In witness whereof, we hereunto subscribe our names to this specification.

JOHN L. POOLE.
HENRY J. G. RUDOLF.