

Aug. 30, 1927.

E. I. STAPLES
LIQUID FUEL BURNER
Filed March 30, 1923

1,641,017

Fig. 1.

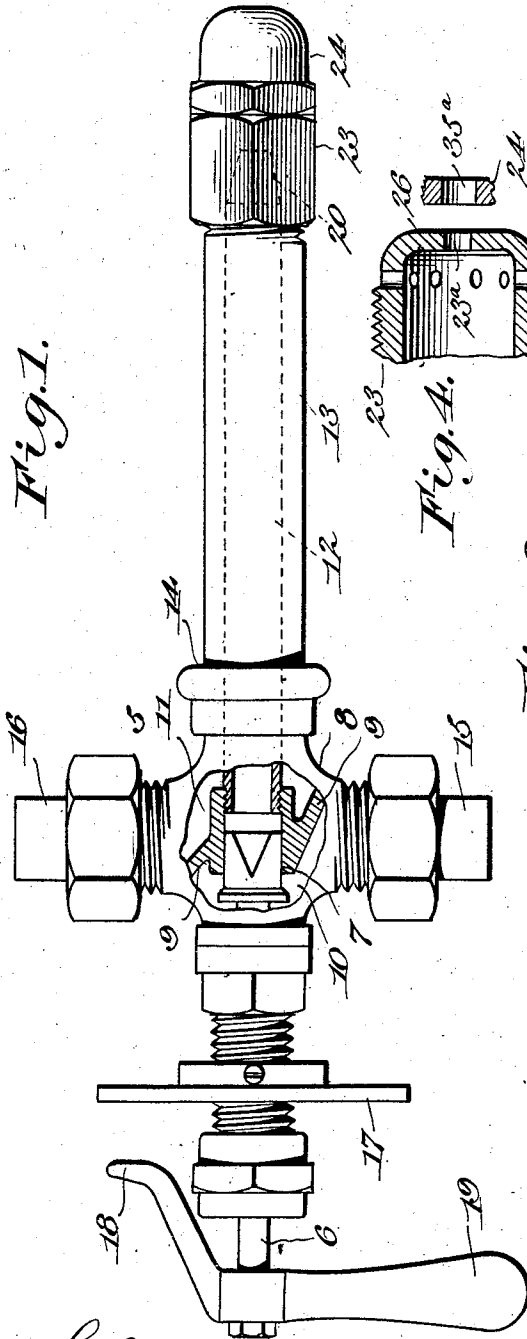


Fig. 4.

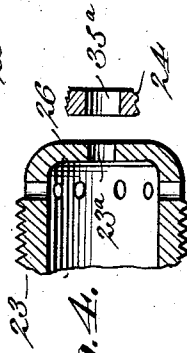


Fig. 2.

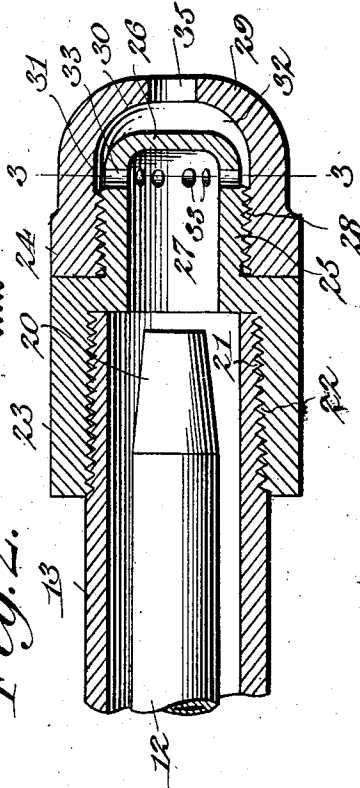
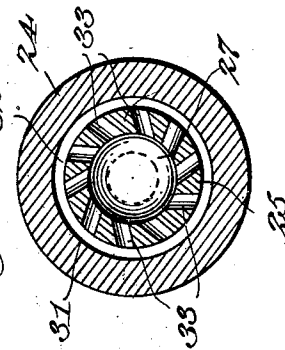


Fig. 3.



WITNESS:

Swick

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LIQUID-FUEL BURNER.

Application filed March 30, 1923. Serial No. 628,828.

This invention relates to liquid fuel burners and particularly to tip structures therefor.

Heretofore, burners of this type have been so formed and designed that a long penetrating flame is produced. With many types of furnace and boiler structures a long penetrating flame is highly objectionable in that its impingement against the back and side walls of the furnace or boiler is injurious to said walls and results in carbonation thereof.

It is an object of my invention to provide a tip structure wherein the fuel will be subjected to an effective atomizing process before it leaves the orifice of the tip and which said fuel will be placed in centrifugal motion and delivered in the form of a cone shaped finely atomized mist, and whereby through the creation of this centrifugal motion of the fuel, a velocity will be created which causes the fuel to rotate in the flame and thereby bring about perfect combustion, while producing an oval shaped flame axially of the burner of relatively short length or proportion.

A further object of the invention is to provide a burner having means for causing perfect atomization of the fuel by centrifugal action, creating a whirling motion of the fuel at the mixing chamber of the tip and causing the fuel to expand on leaving the orifice of the tip and to take the form of a relatively short length, soft clean flame of high intensity whose length is calculated with respect to the length of the furnace so as to prevent the heretofore serious objectionable impingement of the flame against the back and side walls of the furnace.

A still further object of the invention is to provide a tip structure for liquid fuel burners which will be simple, effective for its intended purpose and embodying relatively separable parts which can be quickly separated and removed from or applied to the burner structure as the occasion necessitates.

Figure 1 is a side view of a liquid fuel burner showing my improved tip associated therewith.

Figure 2 is a vertical longitudinal section through a portion of the burner and the tip with parts in elevation.

Figure 3 is a section taken on line 3—3 of Figure 2.

Figure 4 is a view similar to Figure 2

illustrating a slightly modified form of my invention.

My invention is essentially directed to the construction of a novel form of tip which may be used in conjunction with various forms of liquid fuel burners. For this reason I will not discuss in detail unnecessary parts or adjuncts of a burner but will merely describe such desirable features and parts that might be most advantageously used in conjunction with my invention.

The burner structure includes a regulating valve 5 whose stem 6 co-acts with a seat 7 in the casing 8. The casing is sub-divided by diaphragms or parting walls 9 into a fuel space 10 and an air or steam space 11, the former leading to the valve seat and to a discharge nozzle 12. Extending around the nozzle in spaced relation thereto is a cylindrical body 13 joined at 14 to the valve casing so that the inner end of the body opens directly to the air or steam space 11. The valve casing is provided at one side with a union 15 adapted to operatively join a liquid fuel supply pipe with the space 10. A similar union 16 on the casing 8 is adapted to join a steam or air pipe with the aforesaid space 11.

The burner structure is preferably provided with a dial 17 which co-acts with an indicating pointer 18 on the handle 19 of the valve stem 6 so that one can visually determine the quantity of liquid fuel entering the burner.

The fuel nozzle 12 has its discharge end terminating within the body 13 and same is disposed axially thereof. The aforesaid body 13 is threaded exteriorly at 21 to accommodate an internal thread 22 on the member 23 of my improved burner tip 24. This burner tip is provided with a reduced extension or neck 25 closed at its forward end by a baffle 26 and provided with a mixing chamber 27 axially positioned with respect to the body 13 and in open communication therewith and with the discharge end of the fuel nozzle 12. The purpose of this construction is to cause fuel as it leaves the nozzle 12 to be directly discharging into the chamber 27 and a corresponding discharge into said chamber of air or steam which passes from the space between the nozzle 12 and said body 13.

The restricted end 25 of the tip member 23 receives the internal thread 28 of a mat-

ing tip member 29 having a crown wall 30 and an annular wall or surface 31, the latter spaced from the walls of the forward end of the extension 25 and the former spaced
5 from the crown wall 26. This provides a second chamber 32 and same is in open communication with the chamber 27 by means of an annular set of orifices 33 in the forward extension on the member 23. These
10 orifices are each disposed on a tangent to the longitudinal axis of the chamber 27 and when fuel and air are admitted under pressure to said chamber 27 it is scattered laterally thereof by way of said orifices and dis-
15 charged into the chamber 32, coming into impingement with the annular wall or surface 31 of the member 24. This sets up centrifugal motion of the fuel in the chamber 32 and brings about a perfect mixture of the
20 fuel with the air or steam which is employed as a mixture therewith. The fuel is thereby finely atomized before it leaves the tip. The chamber 27 co-acts with the chamber 32 to further induce atomization of the fuel and
25 the combination of the two chambers is quite desirable.

The member 24 is provided with an axially disposed orifice 35 by means of which the atomized fuel is permitted to emerge from
30 the tip. The relation of the orifice 35 to the chamber 32 coupled with the fact that the fuel is made to take a centrifugal motion in the chamber 32, causes the fuel to initially assume the shape of a cone in which the
35 atoms of fuel are in constant twirling motion. The fuel is permitted to expand as it leaves the orifice 35 and when the flame is in operation it takes an oval shape axially of the burner and is of relatively short
40 length. In this manner a flame is produced in calculated proportion to the length of the furnace or boiler with which it is associated. The flame, incident to the process of perfect atomization of the fuel is of high heat in-

tensity and its full efficiency can be satis- 45
factorily spent without its injurious direct impingement with the rear and side walls of the furnace. In this manner perfect combustion of the fuel is effected. However, and as stated I am particularly consistent in 50
the construction of the tip per se and merely make reference to a suitable means for delivering oxygen to the burner that is conducive to best results.

In the modified form of my invention 55
shown in Figure 4 the member 23 has its wall 26 provided with an orifice 23^a disposed in alignment with the orifice 35^a in the member 24. In this form a long flame may be produced. The tip structure is otherwise 60
identical with that described in the preferred embodiment of the invention.

While I have described what I deem to be the most desirable embodiment of my invention, it is obvious that many of the de- 65
tails may be varied without in any way departing from the spirit of my invention, and I therefore do not limit myself to the exact details of construction herein set forth nor to anything less than the whole of my in- 70
vention limited only by the appended claim.

What is claimed as new is:—

In a liquid fuel burner, a cylindrical body with a fuel nozzle arranged therein and having one end disposed adjacent to said 75
cylindrical body, a sleeve detachably secured thereto and having a tubular nipple projecting therefrom, said nipple having a closed end, a plurality of tangentially disposed openings formed therein and project- 80
ing through the side wall of said nipple, said openings being in the same plane and a cap removably arranged on the nipple, said cap having its wall spaced therefrom and provided with a central outlet opening. 85

In testimony whereof I have affixed my signature.

EARLE I. STAPLES.