

June 26, 1923.

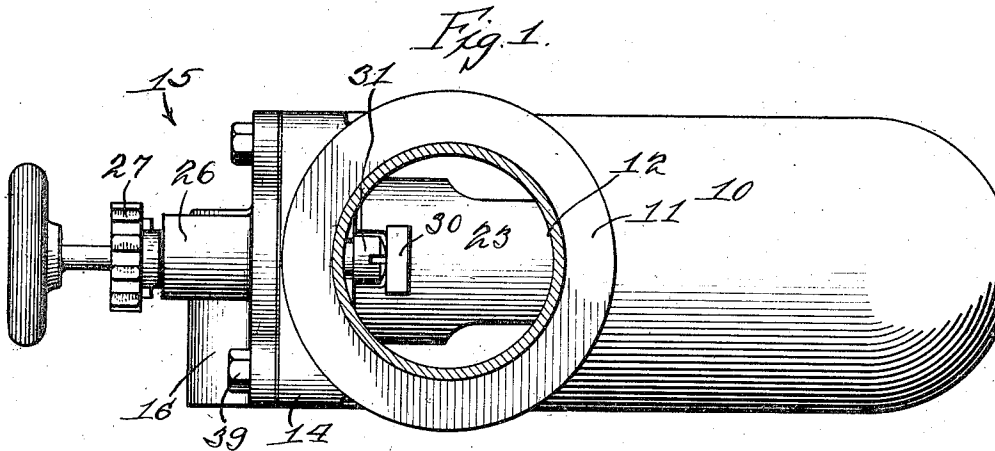
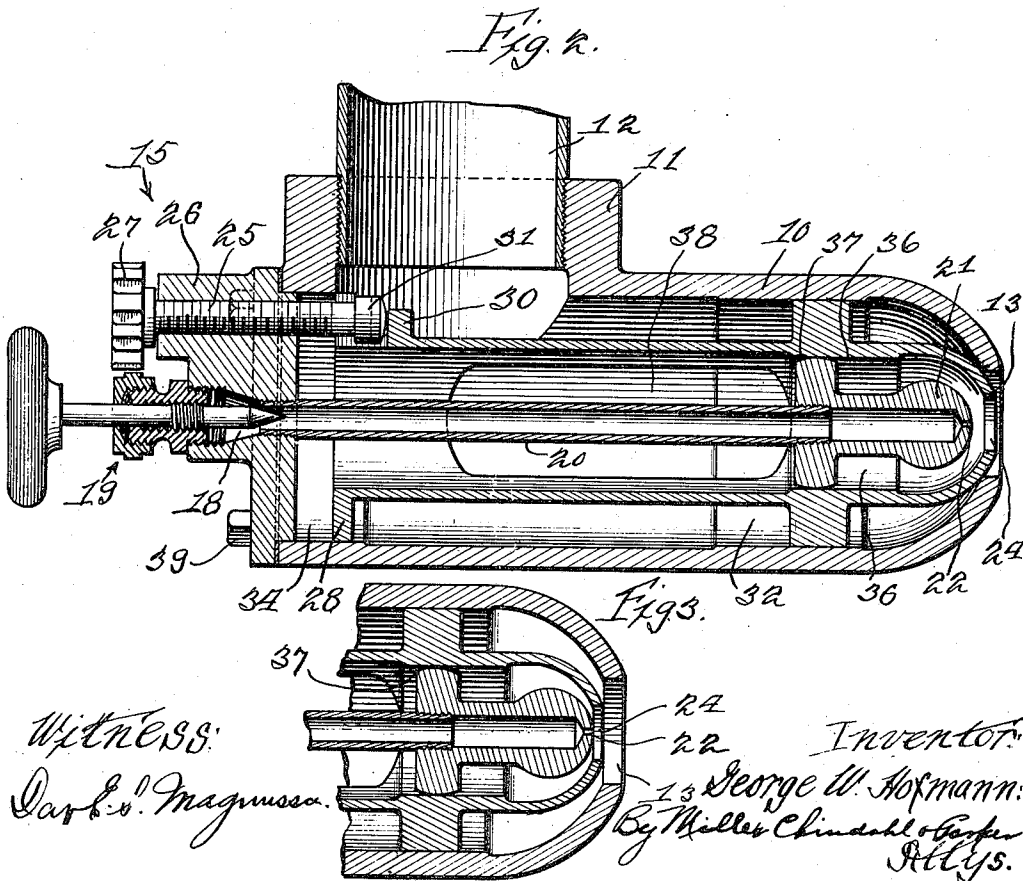
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G. W. HOFMANN

LIQUID FUEL BURNER

Filed Oct. 10, 1919

2 Sheets-Sheet 1



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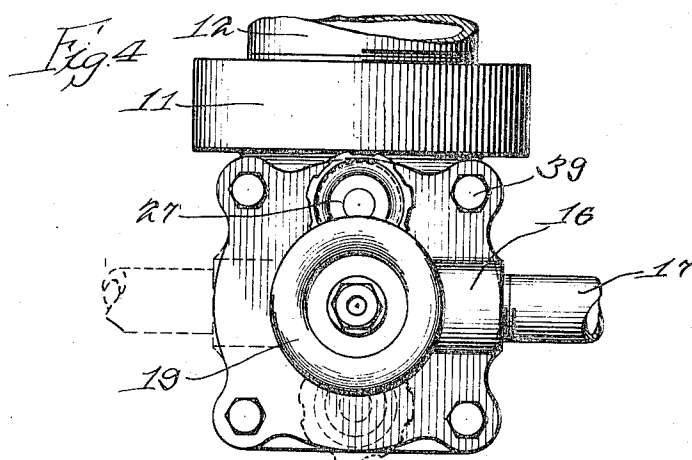
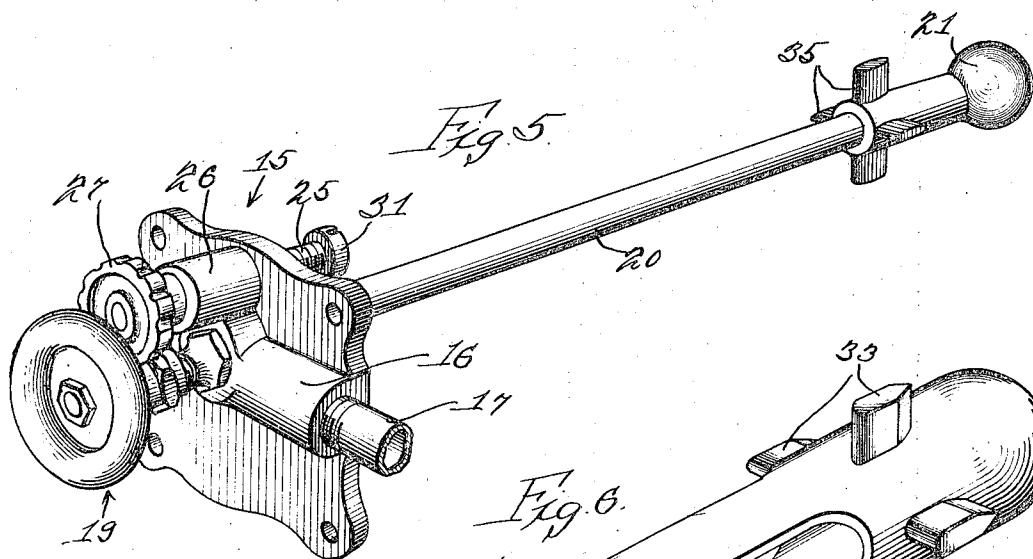
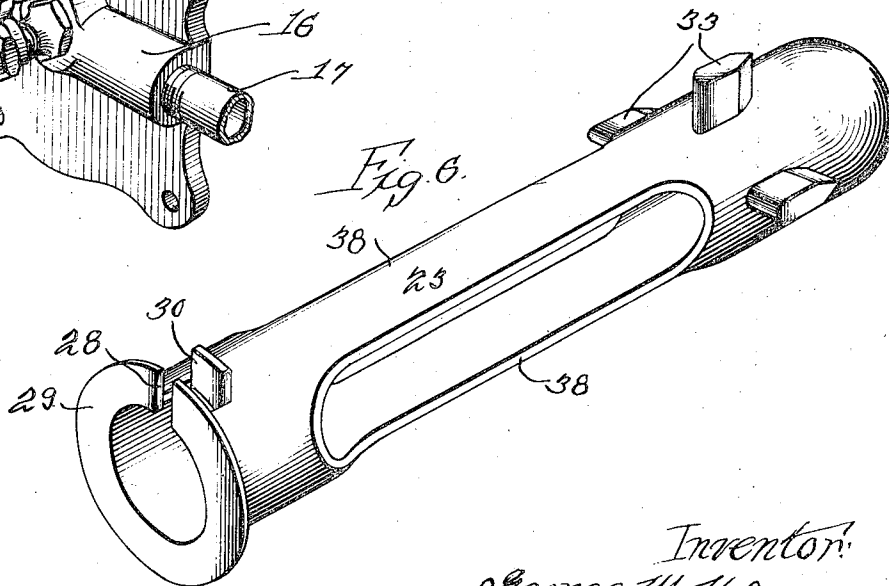
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2 Sheets-Sheet 2



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UNITED STATES PATENT OFFICE.

GEORGE W. HOFMANN, OF CHICAGO, ILLINOIS.

LIQUID-FUEL BURNER.

Application filed October 10, 1919. Serial No. 329,808.

To all whom it may concern:

Be it known that I, GEORGE W. HOFMANN, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Liquid-Fuel Burners, of which the following is a specification.

My invention relates to devices for burning liquid fuel by mixing it with a jet of compressed air or steam.

One of the objects of my invention is to provide a liquid fuel burner in which the rates of discharge of air and of oil and the size of the flame may be conveniently regulated.

Another object is to design a burner which will throw a flame of the proper and most efficient shape.

Another object is to secure the proper shape of flame throughout the range of adjustment of the device.

Another object is to secure alinement of the parts of the device and uniformity in production as it has been found that lack of alinement distorts the flame thrown by the burner.

Another object is to provide simple means in the burner itself for preheating the liquid when a supply of steam or heated air is used.

Another object is to provide an adjustable head receiving the fuel pipe, for convenience in connecting the device to the gas and fuel pipes.

Special objects are to provide a simple gas tight connection in the head for the operation of a movable sleeve within the burner, and to cut down unnecessary resistance in the passages within the burner through which the gas flows.

In the accompanying drawings, Fig. 1 is a plan view of a device embodying my invention. Fig. 2 is a central section of the parts shown in Fig. 1. Fig. 3 is a fragmentary section of the discharge end showing the intermediate sleeve partly drawn back. Fig. 4 is an end view of the parts shown in Fig. 1. Fig. 5 is a perspective view of the head and the oil tube carried thereby and Fig. 6 is a perspective view of the intermediate sleeve.

In the embodiment of my invention selected for illustration, 10 designates the main casing of my improved liquid fuel burner having an inlet at 11 for connection with a suitable air supply pipe 12. The casing

10 is cylindrical and at its front or discharge end tapers in to a central opening 13 the walls having the curvature shown in Fig. 2. The rear end of the casing 10 is enlarged at the corners as indicated at 14 and the opening is closed by a head designated as a whole by character 15 having four bolt holes drilled at the corners and equally spaced. The head carries an enlargement 16 drilled out to receive a laterally projecting fuel supply pipe 17. The enlargement 16 extends to the center of the head and the fuel passageway connects with an axial opening 18. A hand operated needle valve 19 of any common or preferred construction controls the rate of flow of fuel into the bore of the tube 20, which tube is adapted to carry the fuel to a point adjacent to the discharge end of the burner. The fuel is discharged at this end from the head 21 drilled out as indicated in Figs. 2 and 3 and threaded on to the axial tube 20. A small central opening 22 allows the fuel to be discharged along the axial line of the burner.

For the purpose of varying the opening for the discharge of the air an axially slidable intermediate sleeve 23 is provided. In the position shown in Fig. 2 this sleeve has been advanced so that its outer wall closes the aperture 13 in the main casing 10 and the air is discharged from the smaller aperture 24 in the end of the intermediate sleeve. The sleeve may be withdrawn to the position shown in Fig. 3 and further until the inner wall of the sleeve lies against the surface of the fuel discharge head 21. In this position the nozzle opening and the discharge of air are at a maximum.

Means to adjust the axial position of the sleeve 23 are provided in the form of a simple machine screw 25 passing through a rather long bushing 26 formed integrally on the head 15. The screw 25 carries a small wheel 27 for convenient rotation thereof and passes through a slot 28 in the base flange 29 of the intermediate sleeve. An upwardly projecting lug 30 opposite the slot confines the head 31 of the screw between the flange and the lug. It will be seen that rotation of the screw 25 will move the sleeve axially in the casing 10. The bearing 26 through which the screw is threaded is made fairly long and is practically gas-tight.

To maintain exact alinement of the casing 10, the intermediate sleeve 23, and the

fuel discharge head 21, I provide a machined surface at 32 on the interior of the main casing and four radially projecting lugs 33 on the intermediate sleeve turned to the same diameter as the finished surface and machined to a sliding fit therein. The flange 29 at the rear end of the intermediate sleeve is also turned to an exact diameter and is a sliding fit in the circular opening 34 at the rear end of the main casing. The fuel discharge head 21 is similarly supported in exact alinement in the center of the intermediate sleeve 23 by four radially projecting arms 35 engaging the interior of the machined cylindrical surface 36 of the intermediate sleeve. In inserting the head and fuel discharge parts in the intermediate sleeve, it is necessary to swing them slightly out of alinement to pass the head 31 of the screw 25 over the base flange 29. To make this possible the projecting arms are slightly rounded as indicated at 37 in Figs. 2 and 3.

Preheating of the liquid fuel flowing down the tube 20 is accomplished by contact of the air supply entering through the pipe 12 with the walls of the tube. The intermediate sleeve is cut away through nearly half its periphery as indicated at 38 to form apertures extending a substantial part of the length of said sleeve. When the parts are in the position illustrated in Fig. 2, all the air discharge enters the intermediate sleeve through these apertures and is discharged through the small orifice of the intermediate sleeve, the space between the intermediate sleeve and the outer casing being closed. As the sleeve is drawn back to allow air to be discharged through the larger orifice 13 the amount of air flowing outside of the intermediate sleeve increases until when the sleeve has been drawn back against the oil discharge head all the discharge travels around the outside of the intermediate sleeve. This is the condition corresponding to a maximum discharge of air and the velocity of the air entering through the pipe 12 will result in a turbulence that will drive currents of heated air against a substantial part of the fuel tube 20 through the apertures 38. As illustrated in Figs. 5 and 6, the radially projecting lugs 33 and the arms 35 on the intermediate sleeve and fuel discharge member respectively, are tapered or slightly streamlined to cut down the resistance they offer to the flow of air through the burner.

The equal spacing of the fastening bolts 39 for the head 15 make it possible with the main casing in any position to fasten the head on in any one of four different positions with the fuel supply pipe opening up or down or at either side. This has been found to very convenient in installing burners of this type in various positions where the location makes it necessary or de-

sirable to extend the fuel supply pipe and the air supply pipe in certain directions.

The main casing and intermediate sleeve may be formed of any suitable material but I prefer cast or malleable iron. The head and fuel carrying parts are preferably of a suitable brass or bronze but may obviously be of any desired material.

It should be noted that the contour of the inner surface of the intermediate sleeve adjacent to the nozzle is very similar to that of the main casing so that the jets of air discharged from the two orifices will be similar in shape and in the intermediate positions of the sleeve will mingle with each other to form a single jet of approximate constant shape throughout the range of adjustment of the sleeve.

The inner walls of both the casing and the sleeve adjacent the nozzle are surfaces of revolution, generated by revolving approximately circular arcs around the axis of the burner. The two nozzles are substantially similar with an orifice diameter between 30 and 50 per cent of the diameter of the tube. I have found that the shape of the flame thrown varies greatly with variation in the shape of the nozzle and that the nozzles shown throw a much better shape of flame than nozzles of other shapes.

It will be seen that I have provided an improved burner for liquid fuel composed of few parts, cheap to manufacture, easy to assemble and durable in service. The device shown is very efficient in regulating the flow of air, steam or other gaseous substance to suit varying conditions and in securing efficient preheating of the fuel in all positions of adjustment.

While I have shown and described in detail one illustrative embodiment of my invention, it is apparent that many modifications and variations will naturally occur to those skilled in the art. I aim in the subjoined claims to cover all legitimate variations and modifications.

I claim as my invention:—

1. In a liquid fuel burner, in combination, a large nozzle, a small nozzle inside said large nozzle slidable along the axis of said large nozzle, an axially located head adapted to discharge a liquid, means for sliding said small nozzle into a position closing said large nozzle or into a position adjacent said discharge head whereby said small nozzle is closed by said head and said large nozzle is opened.

2. In a liquid fuel burner, in combination, a main casing terminating in a large nozzle, a sleeve axially slidable in said main casing terminating in a small nozzle, an axially extending passageway adapted to conduct a liquid to a point adjacent said nozzles, means for sliding said sleeve forward to close said large nozzle and backward into

proximity to the end of said passageway to open said large nozzle.

3. In a liquid fuel burner, a main casing terminating in a nozzle, a sleeve concentric with said main casing and axially slidable therein said sleeve terminating in a nozzle, an axially extending tube terminating in an oil discharge head adjacent said last-mentioned nozzle, the walls of said sleeve being cut away whereby the air in said casing may make contact with said tube.

4. A device of the class described having, in combination, an outer casing having an outlet in one end and a head closing the opposite end, a fuel conducting tube located within said casing and having one end mounted in said head in communication with a supply passage, an intermediate sleeve located within said casing and surrounding said tube and slidable longitudinally with reference to both, said sleeve and tube having outlets adjacent to the outlet in said casing, and means for sliding said sleeve to vary the outlet therein by cooperation with a part carried by said tube or to vary the outlet in said casing by cooperation with the latter.

5. In a device of the class described, a source of air supply, an oil pipe having a

head, and two concentrically mounted tubes exterior to the oil pipe and connected with the air supply and having nozzles lying adjacent to the head on the oil pipe, one of said tubes being longitudinally slidable to cooperate with the head of the oil pipe or the walls of the other tube, thereby closing or restricting the nozzle of either tube.

6. In a device of the class described, a fixed outer tube connected with a source of fluid supply and having a nozzle at one extremity; a centrally disposed oil supply pipe having a head adjacent to the nozzle of the outer tube; and an intermediate tube concentrically mounted within said outer tube and having lateral openings to said outer tube and the common source of fluid supply and having also a nozzle adjacent to the nozzle of said outer tube, said intermediate tube being capable of longitudinal adjustment partially or wholly to close the nozzle of the outer tube by contact with its walls and partially or wholly to close the nozzle of the intermediate tube by contact with the head of the oil supply pipe.

In testimony whereof, I have hereunto set my hand.

GEORGE W. HOFMANN.