May 15, 1951 C. H. NEIMAN, JR., ET AL 2,553,520

BURNER NOZZLE PIPE ASSEMBLY

Filed April 15, 1947

Fig. 1.

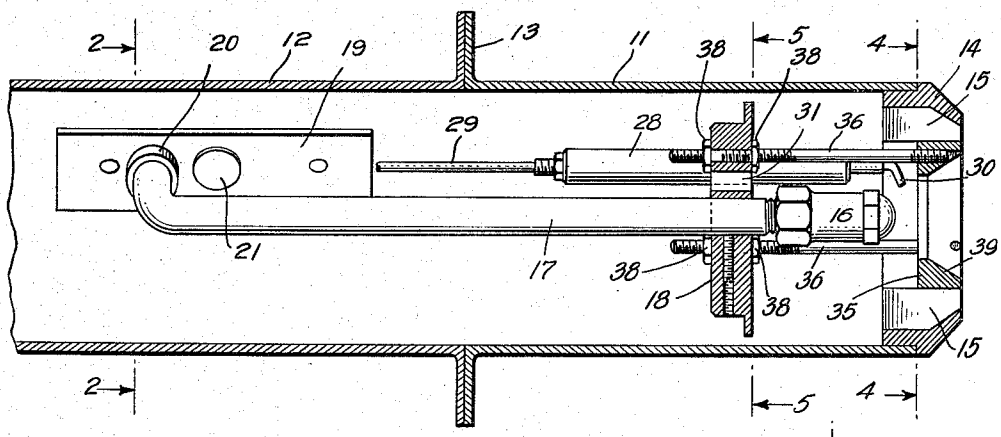


Fig. 2.

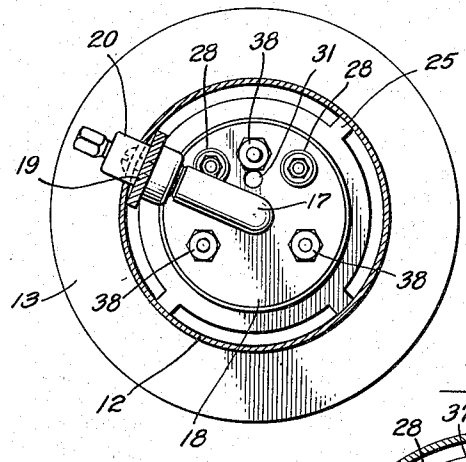


Fig. 4.

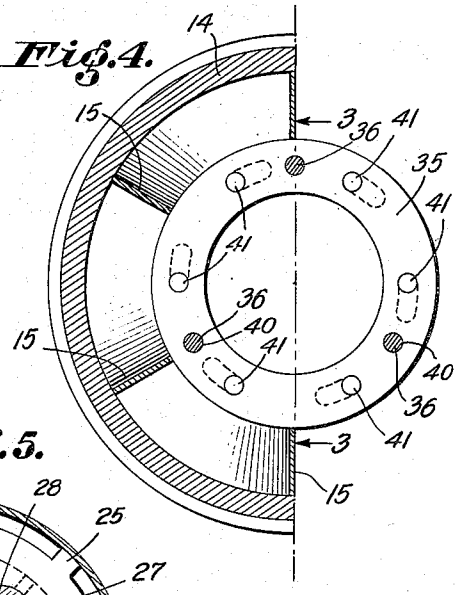


Fig. 5.

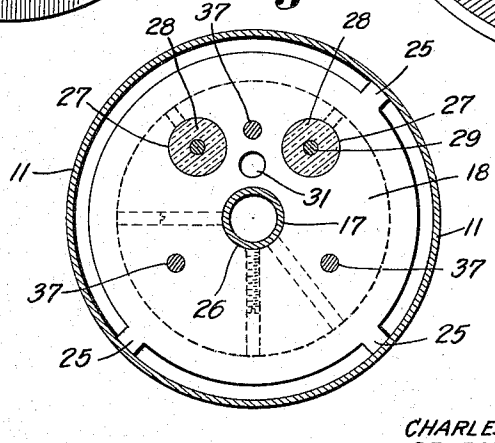
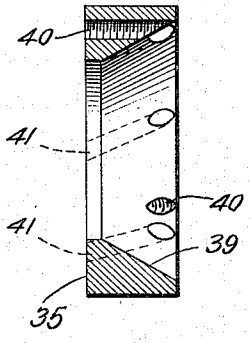


Fig. 3.



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BURNER NOZZLE PIPE ASSEMBLY

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6 Claims. (Cl. 158—76)

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This invention relates to liquid fuel burners and more particularly to new and useful improvements in nozzle pipe assemblies for use in gun type burners.

In gun type oil burners, the liquid fuel is usually atomized by being pumped through a relatively fine opening or openings in a fuel nozzle and combustion air is delivered by an air tube around the outside of the fuel spray which issues from the nozzle. The nozzle and the surrounding air tube are directed into a combustion chamber in which combustion of the atomized fuel takes place. Suitable vanes may be provided in the nose or forward end of the air tube to whirl or agitate the flow of combustion air in order to assure proper mixing of the air with the fuel spray and in order to assist in controlling the shape of the combustion flame. Various adjustments of the fuel nozzle and its relation to the air tube are often necessary to provide for efficient combustion at the desired rate of fuel feed.

It is an object of this invention to provide an improved nozzle pipe assembly for liquid fuel burners which may be adjusted as a unit before insertion into an air tube and which will be firmly supported in proper alignment within the air tube when inserted therein.

It is another object of this invention to provide a nozzle pipe assembly including a fuel pipe, a fuel nozzle, a fuel igniter, and a flame stabilizer connected together to form a rigid single unit for insertion in or removal from the air or blast tube of a liquid fuel burner.

It is another object of this invention to provide an improved nozzle pipe assembly having a novel flame stabilizer carried thereby for controlling the shape and burning efficiency of the combustion flame.

It is still another object of this invention to provide a nozzle pipe assembly including a novel flame stabilizer which prevents the fuel nozzle from becoming overheated thereby preventing the cracking of liquid fuels therein and preventing clogging of the nozzle passages.

It is a still further object of this invention to provide a novel nozzle pipe assembly including a flame stabilizer which when inserted in an air or blast tube will position the fuel nozzle and stabilizer in correct alignment in said tube.

Another object of this invention is the provision of a nozzle pipe assembly supporting a flame stabilizer so that adjustment of the nozzle in an air tube also positions the flame stabilizer in correct relation to the nozzle and air tube.

Still other objects and advantages of this invention will be readily apparent to those skilled in the art from the following description of the embodiment of the invention illustrated in the accompanying drawings wherein:

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Figure 1 is an elevational view, partly in section, of a nozzle pipe assembly positioned in the air or blast tube of a liquid fuel burner.

Figure 2 is a sectional view of the outer end of the assembly taken on line 2—2 of Figure 1.

Figure 3 is an enlarged vertical sectional view of the flame stabilizer removed from the forward end of the nozzle pipe assembly and taken on line 3—3 of Figure 4.

Figure 4 is an enlarged sectional view, partly cut away, taken on line 4—4 of Figure 1, and showing the flame stabilizer positioned centrally of the tip of the air tube.

Figure 5 is an enlarged elevation view, partly in section, of the assembly supporting member taken on line 5—5 of Figure 1.

Referring particularly to Figure 1 of the drawings, the air or blast tube of a liquid fuel burner is indicated by the numeral 11. The air tube 11 may be connected to the air conduit 12, leading from a conventional air blower (not shown), by a connecting flange 13. The forward end of the air tube 11 is provided with a tapering tip 14 which may be a casting with inwardly extending vanes 15. The vanes 15 may be inclined or canted with respect to the axis of the air tube 11 to cause the air blast from tip 14 to have a whirling motion. The air tube 11 may be supported in a suitable opening in a furnace wall with the air tube tip 14 directed into a combustion chamber.

The nozzle pipe assembly includes a nozzle assembly 16 secured on the forward end of the fuel supply conduit 17, the conduit passing through a central opening 26 in the assembly supporting member 18. The fuel conduit 17 extends outward from the center of the air conduit 12 to a supply coupling 20 carried by a plate 19 and adapted to be connected to a source of liquid fuel under pump pressure. The coupling 20 may extend through a longitudinal slot in the air conduit 12 which permits the fitting 20, the fuel conduit 17 and the fuel nozzle 16 to be adjusted longitudinally in the air conduit and tube for control of the combustion flame. A knockout opening 21 may be provided in plate 19 to receive an electrical plug for use with electronic combustion controls. The fuel nozzle assembly 16 may be of conventional construction including a nozzle holder and a nozzle tip designed to project fuel oil in finely-divided or atomized form.

The nozzle pipe supporting member 18 may be a casting of aluminum or other metal of the general shape illustrated in Figure 5. The outer periphery of member 18 is provided with projecting lugs 25 which engage the inner surface of air tube 11. Three lugs 25 are provided as shown to permit the member 18 and the fuel conduit and nozzle assembly to be freely inserted into and adjusted longitudinally within the air tube 11. Member 18 has a central opening 26 for the fuel conduit 17, one or two radial set screws being used to secure the member 18 to the conduit 17. The member 18 is also provided with spaced openings 27 to receive insulating tubes 28, which latter support electrical leads 29 for the ignition spark gap 30 of conventional form. Radial set screws may be provided to engage bushings which secure the insulators 28 to member 18. An aperture 31 may be provided in member 18 to admit a limited amount of air from the air conduit 12 to flow adjacent to the nozzle 16 and the spark gap 30. However, most of the combustion air flows through the annular space between the periphery of member 18 and the wall of the air tube 11.

An annular flame stabilizer 35 is rigidly supported from the member 18 by three threaded studs 36. The studs 36 are threaded to tapped openings in the stabilizer 35 and are adjustably secured in openings 37 of member 18 by means of lock nuts 38. The outer periphery of stabilizer 35 is preferably of cylindrical shape to be received between the longitudinal inner edges of the vanes 15 of tip 14. The inner periphery of stabilizer 35 is preferably of outwardly flaring shape having a frusto-conical inner surface 39, as shown in Figure 3. The stabilizer 35 is provided with three tapped openings 40 to receive the supporting studs 36. The stabilizer ring 35 is also provided with a plurality of passageways 41 extending from the rear face of the ring to the conical forward face 39 to permit air flow through the ring. The passageways 41 may be drilled at an angle to the central axis of the stabilizer in order to give the air passing therethrough a whirling motion.

During operation of the burner construction described above, the stabilizer 35 is effective to shield the nozzle 16 from the heat of the combustion flame. By maintaining the temperature of the nozzle 16 below oil cracking temperatures, the formation of carbon deposits within the nozzle and the clogging of the nozzle passages are prevented. Keeping the nozze temperature low also avoids undue expansion of the nozzle parts and hence assures a uniform fuel spray. Overheating of fuel nozzles has been a problem particularly with small firing rate burners and especially during shut down periods. The present construction provides for the flow of air at high velocity over the outside and through the inside of the stabilizer 35, and thus tends to keep the stabilizer at relatively low temperatures. If the nozzle 16 has any tendency to become warmer than the stabilizer 35, the nozzle will radiate its heat to the stabilizer and the heat may be carried away by the air flow over and through the stabilizer. The passages 41 in the stabilizer 35 provide for a constant film of air over the inner surface 39 of the stabilizer to prevent the building up of any carbon formations on the stabilizer. The air flow through the passages 41 also serves to cool the stabilizer more effectively. The passages 41 may be drilled at an angle as shown instead of parallel to the stabilizer axis in order to impart a whirling motion to that portion of the air which flows through said passages.

Proper adjustment of the nozzle pipe assembly is facilitated by the fact that the fuel supply conduit 17, support 18, nozzle 16, and stabilizer 35 may be removed as a unit from the air tube 11. The nozzle 16 may be then easily cleaned, adjusted or replaced and may be properly positioned on the supply conduit with respect to the support member 18. The ignition gap 30 may also be properly set. The stabilizer 35 may be adjusted with respect to the nozzle 16 by means of the lock nuts 38 on the supporting studs 36. The stabilizer 35 may be supported with its outwardly tapering surface 39 facing the fuel nozzle 16 for certain types of nozzles, fuel, and rates of fuel consumption. The adjusted assembly may then be inserted as a unit in the air tube 11 so that the outer periphery of stabilizer 35 rests on the inner edges of the vanes 15 of the air tip 14. The assembly may be adjusted longitudinally with respect to the air tip 14 by means of the sliding plate 19 in order that the relation of the stabilizer 35 to the air tip 14 will be such as to provide a combustion flame of the desired shape. The automatic centering of the stabilizer 35 within the air tip 14 assures that the fuel nozzle 16 will always be properly aligned with the air tip 14. The construction described is effective for the quiet burning of conventional fuel oils and fuel oils produced by catalytic cracking processes with high efficiency. Burner efficiency is promoted by the mixing of air and fuel at the proper places in the burner combustion head. The construction maintains high burner efficiency at both low and high rates of fuel consumption. The prevention of overheating of the burner nozzle and the cooling of the flame stabilizer results in better combustion and avoids the formation of carbon deposits in the nozzle or on the stabilizer. The provision of means to automatically center the nozzle and flame stabilizer in the air tube permits ease of adjustment and inspection of the burner construction. The construction shown is also adapted to be installed as a replacement for other types of burners now in use.

It will be apparent that many changes in minor details, proportions, and design may be carried out within the scope of this invention as defined in the following claims.

What we claim is:

1. A nozzle pipe assembly for use in a fluid fuel burner having an air tube having a forward end adapted to communicate with a combustion chamber, said assembly comprising in combination, a fuel pipe, a fuel nozzle secured on the forward end of said pipe, a circular member secured to said pipe rearward from said nozzle and having projecting lugs engageable with the inside of said air tube, and an annular flame stabilizer rigidly connected to said member and extending forward from said nozzle, said stabilizer comprising an annular body having a central bore aligned with the fuel discharge axis of said nozzle and having an annular forward surface facing the direction of fuel discharge and having a plurality of passageways extending through the body of said stabilizer for directing a flow of air from said air tube through said annular body to said forward surface of said stabilizer.

2. A nozzle pipe assembly for use in a fluid fuel burner having an air tube having a forward

end adapted to communicate with a combustion chamber, said assembly comprising in combination, a fuel pipe, a fuel nozzle secured on the forward end of said pipe, a circular member secured to said pipe rearward from said nozzle and spaced from the inside of said air tube, a plurality of studs secured to said member and extending forward of said nozzle, and an annular flame stabilizer secured to said studs and extending forward from said nozzle, said stabilizer comprising an annular body having a tapering central bore aligned with the fuel discharge axis of said nozzle and having an annular forward surface facing the direction of fuel discharge and having a plurality of passageways extending therethrough for directing a limited flow of air from said air tube through said body to the forward surface of said stabilizer.

3. In a burner construction having an air tube having a forward end adapted to communicate with a combustion chamber and having an annular row of inwardly projecting air vanes in the forward end of said air tube, a nozzle pipe assembly comprising in combination, a fuel pipe, a fuel nozzle secured on the forward end of said pipe, a member secured to said pipe rearward from said nozzle and engageable with the inside of said air tube, and an annular flame stabilizer rigidly connected to said member and extending forward from said nozzle, said stabilizer being axially slidable on the inner edges of said air vanes and comprising an annular body having a central bore aligned with the fuel discharge axis of said nozzle and having an annular forward surface facing the direction of fuel discharge and also having a plurality of passageways extending therethrough for directing a limited flow of air from said air tube through said body to the forward surface of said stabilizer, said assembly being axially adjustable as a unit within said air tube with respect to said air vanes.

4. In a burner construction as set forth in claim 3, said passageways extending through said stabilizer being canted at an angle to the axis of said air tube for imparting a whirling movement to the air passing therethrough.

5. In a burner construction as set forth in claim 3, said stabilizer having its central bore tapering outwardly in the direction of fuel discharge.

6. In a burner construction having an air tube having a forward end adapted to communicate with a combustion chamber and having an annular row of inwardly projecting spiral air vanes in the forward end of said air tube, a nozzle pipe assembly comprising in combination, a fuel pipe, a fuel nozzle secured on the forward end of said pipe, a circular member secured to said pipe rearward of said nozzle and having projecting lugs engageable with the inside of said air tube to center said member and fuel nozzle in said tube, an annular flame stabilizer, and a plurality of studs rigidly connecting said stabilizer to said member, said stabilizer being axially slidable on the inner edges of said spiral air vanes and having a central tapering bore aligned with the axis of said nozzle, said member having a passageway therethrough for directing a limited flow of air around said fuel nozzle, said stabilizer having a plurality of passageways therethrough canted at an angle to the axis of its central bore for directing a limited flow of air across the forward surfaces of said stabilizer.

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REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
1,965,411	Goodrich	July 3, 1934
1,981,248	Purcell	Nov. 20, 1934
2,056,561	Bork	Oct. 6, 1936
2,065,042	Berryman	Dec. 22, 1936
2,127,866	Haase	Aug. 23, 1938
2,156,121	Macrae	Apr. 25, 1939
2,163,915	Reif et al.	June 27, 1939
2,219,696	Mueller et al.	Oct. 29, 1940
2,221,519	Jones et al.	Nov. 12, 1940
2,222,031	Hammer	Nov. 19, 1940
2,233,529	Herr	Mar. 4, 1941
2,262,525	De Lancey	Nov. 11, 1941
2,393,897	Glendenning	Jan. 29, 1946
2,473,769	Schinman	June 21, 1949

FOREIGN PATENTS

Number	Country	Date
747,983	France	Apr. 10, 1933