April 10, 1934. J. E. HISTED 1,954,173

BURNER

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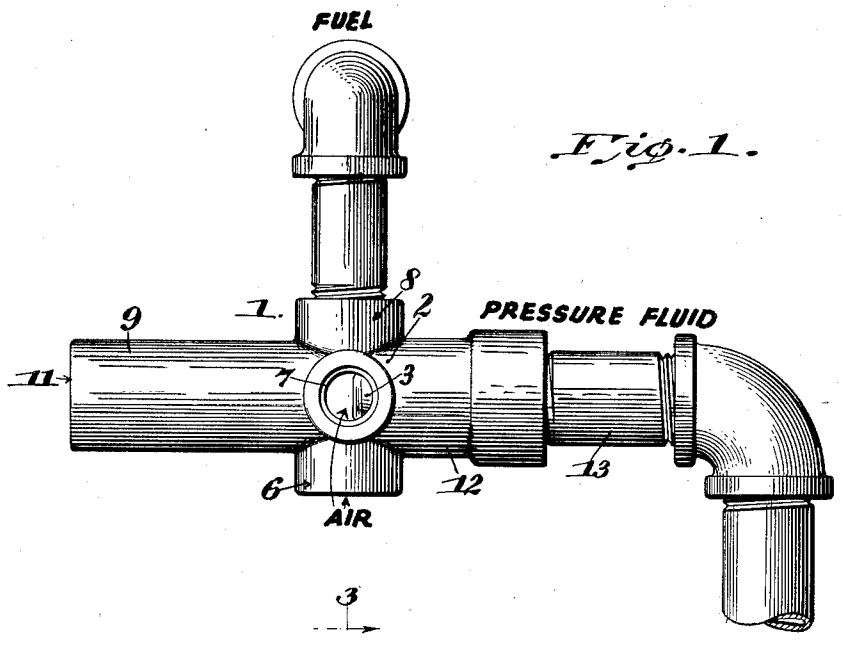


Fig. 1.

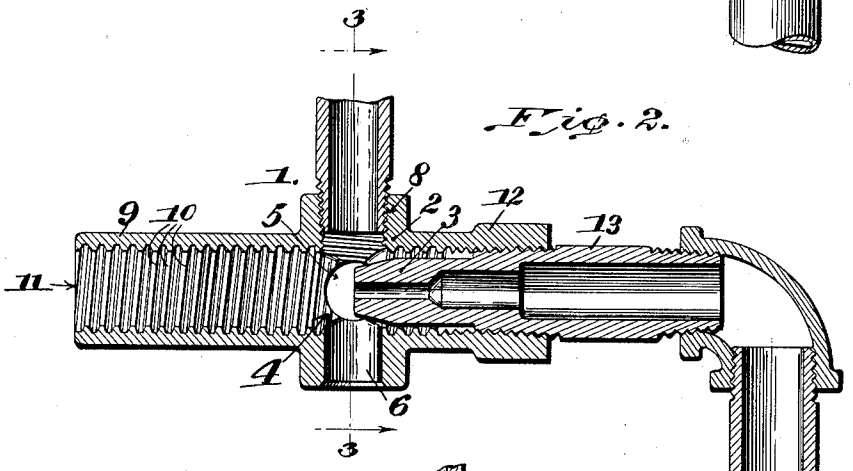


Fig. 2.

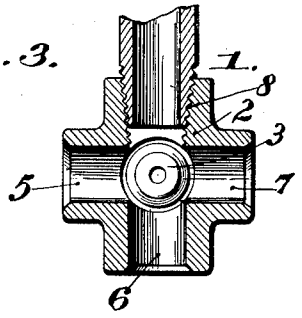


Fig. 3.

WITNESSES

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BURNER

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3 Claims. (Cl. 158—74)

This invention relates to improvements in burners, and its objects are as follows:—

First, to provide a burner having a central mixing chamber from which plural air ports and a liquid fuel port radiate in a substantially common axial plane, the pressure fluid nozzle projecting into said chamber in a medial position with respect to said ports and at right angles to said plane so as to compel a uniform inflow at all of the ports and produce a balanced mixture of fluids in the chamber adjacent to the point of the nozzle.

Second, to provide an internally circumferentially corrugated outlet pipe immediately in advance of the nozzle and in communication with the central chamber, said outlet pipe receiving the mixture of fluids and producing such a turbulence in the resulting stream by virtue of disturbing all sides of the stream that the various constituents are thoroughly mixed and reduced to a combustible mist.

Third, to utilize the bottom one of said plural air ports as a fuel drip when the burner is shut down, thereby draining the burner of any fuel which would become baked or carbonized by the residual heat of the furnace.

Fourth, to make said outlet pipe of uninterruptedly cylindrical form from the central chamber to its end to prevent back-pressure in said chamber and consequent choking of the liquid fuel.

Fifth, to provide a cruciform port arrangement for the central mixing chamber, one of the ports alternating as an air and drain port when the burner is in operation or when shut down.

Other objects and advantages will appear in the following specification, reference being had to the accompanying drawing in which

Figure 1 is a side elevation of the improved burner.

Figure 2 is a longitudinal section thereof.

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

The burner, generally denoted 1, comprises a body 2 and a nozzle 3. These are the only units of the burner, the remaining pipe fittings being taken from any ordinary source of supply. The burner is therefore a two-piece burner, and one of the advantages of it is its simplicity.

In the body 2 there is a central mixing chamber 4 (Fig. 2) from which a plurality of air ports 5, 6, 7 and a single fuel port 8 radiate in a substantially common axial plane. The nozzle 3 projects into the chamber 4 in a medial position (Fig. 3), that is to say, the nozzle 3 is so centralized with respect to the radial ports that when pressure fluid, comprising the atomizing medium, is discharged from the nozzle said discharge compels a uniform inflow of air at each of the three ports 5, 6, 7 and fuel at the single port 8. This produces a balanced mixture of the fluids in the chamber 4. The foregoing ports are arranged in a plurality of pairs the axes of which intersect in the mixing chamber substantially at the tip of the nozzle 3.

It is to be observed that the nozzle 3 stands at right angles to the axial plane of the air and fuel ports. The discharge of the pressure fluid occurs at right angles to said axial plane, and it is readily seen that fluid will be drawn in at each of the ports in a uniform manner even though air is admitted at three of the ports and fuel at the other.

The outlet pipe 9 of the body 2 is internally circumferentially corrugated at 10. The corrugations, in this instance illustrated as a coarse thread, are continuous from the mixing chamber 4 to the discharge end 11. The corrugations are not necessarily confined to a coarse thread but may comprise any type of baffles projecting circumferentially of the internal walls of the outlet and lying in planes substantially transverse to the axis of the outlet pipe. The mixture of fluid continues in the outlet pipe 9, and the corrugations 10 produce such a turbulence in the stream as to thoroughly commingle the pressure fluid, air and fuel. The latter is thoroughly broken up so that the result is a combustible mist which emerges from the discharge end 11 under pressure.

The stream passing through the outlet pipe 9 will be of a substantially cylindrical form. The thing meant by this is that the interior of the outlet pipe 9 is of a substantially uniform diameter. There is no diminution in size as in case of a tapering bore. Such bores are not uncommon in burner outlets, and the bad effect of them is that they produce a back-pressure in the burner.

The cylindrical form of the riffled outlet lets the stream through without producing a back-pressure in the chamber 4. Consequently there is no possibility of choking the liquid fuel entering at the port 8. It is easy to visualize a cylindrical stream passing through the outlet 9. The sides of this stream will be disturbed, and the disturbance will prevail throughout the entire volume of the stream while in the outlet 9. It is this disturbance of the stream that produces the turbulence of its constituents.

In addition to serving as an air port, the port

6 also serves as a fuel drip. This port is the bottom one of the cruciform arrangement (Fig. 3). It is directly opposite the fuel port 8, and when the burner is shut down any dripping oil will drain from the burner at the port 6. This prevents the settlement of oil in the burner, and it likewise prevents the baking or carbonizing of the oil by the heat from the furnace. Thus it will be apparent that the port 6 alternates as an air and drain port.

A mount 12, which is nothing more than a continuation of the outlet 9 on the opposite side of the mixing chamber 4, provides a place into which to screw the nipple portion 13 of the nozzle 3. This nipple portion is connected to a source of pressure fluid by any arrangement of piping. Similarily, the port 8 is connected with a source of fuel by any necessary arrangement of piping.

The operation is readily understood. The pressure fluid herein contemplated is steam. The fuel is heavy oil. The steam jet is directed across the central mixing chamber 4 (Fig. 2) by the nozzle 3, and as it enters the outlet pipe 9 it draws in fuel from the port 8 and air from the three ports 5, 6, 7. The mixture of fluids results in a stream in the outlet pipe 9.

As has been brought out before the corrugations 10 disturb the sides of the stream and produce such a turbulence therein that all of the constituents are thoroughly commingled, the oil especially, being so broken up that the resulting mixture is a combustible mist.

It has been determined conclusively from actual experimentation with the herein described burner that a very heavy oil is capable of being disintegrated so thoroughly that ignition will take place within four inches of the discharge end 11 of the outlet 9. The flame is short and intensely hot, in fact so hot that it has reduced fire brick supposedly capable of withstanding heat at a temperature between 3000° F. to 3500° F. to a molten puddle. Moreover, it has actually been demonstrated that the combustion of the fuel is so complete that no smoke appears at the stack.

As a consequence the boiler flues stay clean much longer. It has been found further, that flues which require cleaning every night could go from four to six weeks without cleaning after the installation of the improved burner. These effects are attributed to the perfect atomization of the fuel, and the siphonic effect of the pressure fluid stream which draws in air at three sides to commingle with the steam in producing a highly efficient supporter of combustion.

In cases where this burner, or atomizer as it may be called, is used to fire a bolt or flue furnace using compressed air for atomization, it should be pointed out that the induced air through ports 5, 6 and 7 with twenty-five pounds of compressed air is more than equal to the air that would be supplied by fifty pounds of compressed air with ports 5, 6 and 7 closed. This is a great consideration in plants where there are many small furnaces using compressed air for atomization, approximately a saving of one-half in compressed air.

I claim:—

1. A burner comprising a body having a mixing chamber, means communicating with said body for feeding oil, air and a gaseous atomizing medium to said mixing chamber, an outlet pipe also in communication with the body and leading therefrom, and corrugations along the internal wall of said pipe, said corrugations lying in planes substantially transverse to the axis of said outlet pipe.

2. A burner comprising a body having a mixing chamber and an outlet pipe, fuel atomizing means projecting into the mixing chamber and directed toward the outlet pipe, said body having a top fuel port and a bottom air port, said ports being in substantially vertical alinement to enable fuel drippings to escape at the air port and prevent accumulation of fuel in said mixing chamber or outlet pipe.

3. A burner comprising a body having a mixing chamber, an outlet pipe in communication with the mixing chamber, the internal wall of the outlet pipe being corrugated, a nozzle carried by the body, said nozzle projecting into the mixing chamber and being directed toward the outlet pipe, and a plurality of pairs of ports communicating with the mixing chamber, the axes of said ports intersecting in the mixing chamber substantially at the tip of the nozzle.

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