Jan. 10, 1928. 1,655,810

D. J. CARTWRIGHT

FUEL ATOMIZING AND VAPORIZING APPARATUS

Filed April 24, 1924

FIG 1

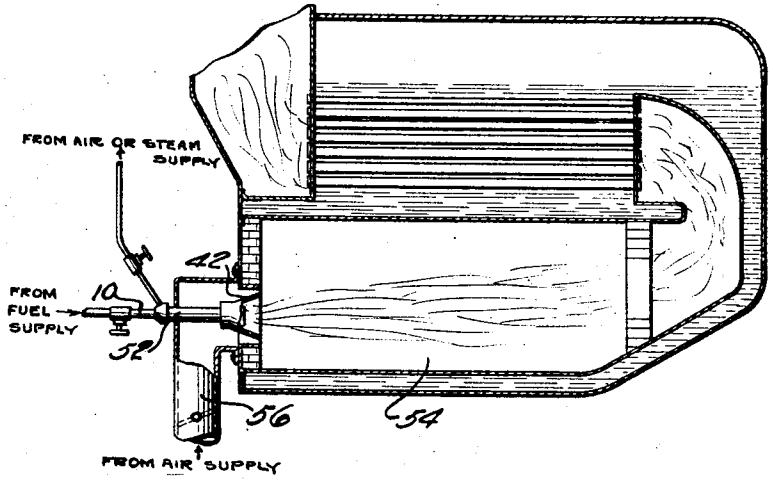


FIG 2

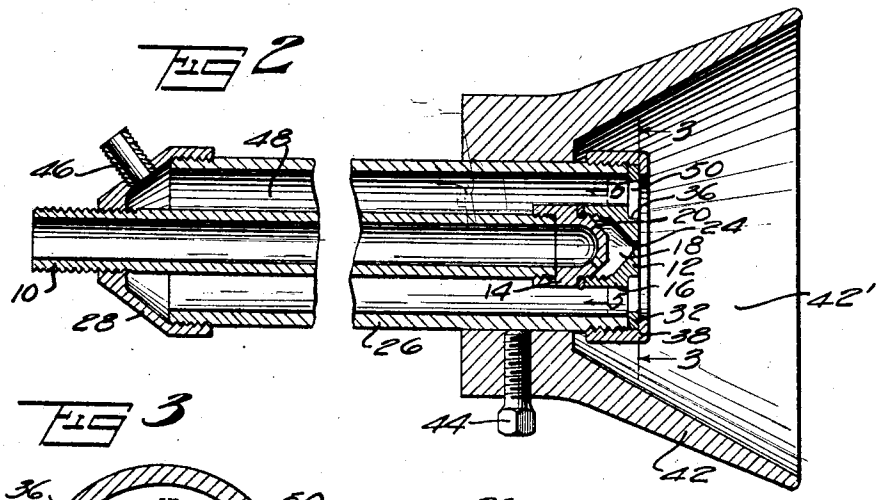


FIG 3

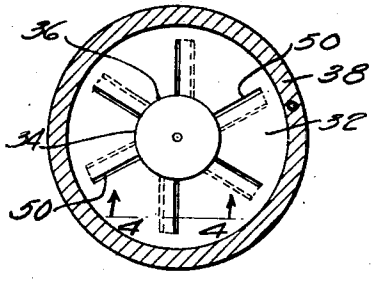


FIG 5

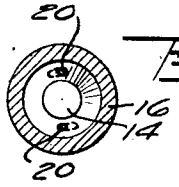
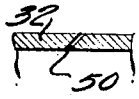


FIG. 4.



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UNITED STATES PATENT OFFICE.

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FUEL ATOMIZING AND VAPORIZING APPARATUS.

Application filed April 24, 1924. Serial No. 708,741.

My invention relates to fuel atomizing and vaporizing devices for liquid fuel adapted for the efficient atomization and vaporization of liquid fuels, such as fuel oil, and the like, and may be made use of in burners of various sorts, as, for example, for heating boilers and in other connections where liquid fuel is used.

One object of the invention is to provide a device which will bring about a more perfect atomization of the fuel and a more complete vaporization of the fuel.

Another object of the invention is to provide a device which will completely eliminate the deposit of carbon on the fuel atomizer tip and within the firebox and eliminate smoke in the stack, which are results of poor vaporization and poor combustion. The elimination of these evils is brought about by a more perfect vaporization, resulting in all the fuel being consumed within the firebox and combustion chamber, with a consequent substantial saving in oil consumption.

According to the present invention, the fuel is atomized or broken up into fine spray by being forced under pressure through a spray nozzle adapted for giving the atomized fuel a swirling or circular motion, and the spray of atomized fuel is vaporized and intimately mixed by and with primary air or steam supplied through a series of orifices surrounding the fuel jet and angularly arranged to produce a whirling motion taking place at a different angle and different rate of speed from that of the fuel spray, and outside and encircling the primary air supply and flame cone there is a secondary source of air supply to the flame, this air coming in in its turn at still different angles and velocities. Thus a thorough atomizing of the fuel and an intimate mixing or vaporization of the fuel with the primary air or steam is secured within the flame cone prior to the combustion, and a fuel mixture obtained having a high degree of combustibility, with resultant substantially complete absence of carbon deposits.

The accompanying drawings illustrate an embodiment of the invention, but it is to be understood that same is only for the purpose of affording an understanding of the invention and not for limitation of its scope.

In said drawings, Fig. 1 is a cross-section of a boiler showing an apparatus embodying the present invention installed therein. Fig. 2 is a cross-sectional view of the atomizing and vaporizing apparatus. Fig. 3 is a cross-section on the line 3—3, Fig. 2. Fig. 4 is a cross-section on the line 4—4, Fig. 3, and Fig. 5 is a cross-section on the line 5—5, Fig. 2.

The fuel entering fuel pipe 10 is forced under pressure through a spray nozzle or burner tip 12 screw-threaded on the end of fuel pipe 10. The spray nozzle 12 shown in Fig. 2 comprises a male member 14 and a female member 16 screwed thereon, with a chamber 18 therebetween. Male member 14 has a plurality of apertures 20 therein communicating with chamber 18 and set at an angle to produce a swirling or rotation of the fuel, and female member 16 has spray aperture 24 in its center. The fuel passing through the spray aperture 24 is broken up and discharged in a fine substantially conical spray and the atomized particles in the spray cone retain to some extent the swirling or rotation imparted by passing through the angularly disposed openings 20.

Fuel pipe 10 and spray nozzle 12 extend axially through the cylinder 26 and are held in place therein at the inner end by reducer 28 and at the outer end by the air or steam jet plate 32 having a central aperture 34 therein adapted to fit over the shoulder 36 of female spray nozzle member 16, plate 32 being clamped to the cylinder 26 by the screw-threaded cap ring 38. A flame cone 42 is adjustably secured on cylinder 26, as by set screw 44, with its conical chamber 42′ surrounding the jet plate 32, which in turn surrounds the spray nozzle 12.

A pipe 46 is connected to an air or steam supply and communicates with the chamber 48 surrounding the fuel pipe 10, as by being screwed into the reducer 28. Steam or air entering chamber 48 through pipe 46 passes out through the slots 50 in plate 32 surrounding jet 12. Said radial slots 50 are set at an angle, preferably an angle of 45 degrees, with respect to the plane of the plate, and air or steam passing therethrough is given a whirling motion while being admixed with the atomized fuel which is also given a circular motion in leaving the spray nozzle. The whirling spray of finely atomized oil and the whirling column of steam or air from the inclined outlets 50 coming together at differing angles and speeds re-

sults in a thorough vaporization of the fuel and the production of highly combustible mixture.

Fig. 1 shows the fuel atomizer 52 of my invention installed in the firebox 54 of a conventional steam boiler. The secondary supply of air from the air supply pipe 56 enters the firebox 54 around the sides of the flame cone 42 and aids in the combustion of the vaporized fuel mixture emerging from the flame cone 42. This hollow column of air may come straight in, if desired, without having a whirling movement imparted thereto, but it nevertheless comes into contact and admixture with the fuel spray and primary air or steam whirling at different angles and velocities so that the fuel when burned is in a finely divided highly vaporized state and thoroughly admixed with the primary air or steam prior to leaving the flame cone and with the secondary air after passing beyond the flame cone.

The advantages of the device of my invention are numerous. A saving in fuel consumption is effected with resulting increase in efficiency, a practically smokeless flame can be secured, and because of the absence of carbon deposits it is unnecessary to resort to frequent dismantling of the apparatus for cleaning, adjustment or replacement.

While I have described the application of my atomizing and vaporizing device more especially in connection with fuel burners, I do not desire to be limited to such application, but I desire it to be understood that the apparatus may be used wherever occasion exists for putting liquids into highly atomized and vaporized condition and producing what may be termed substantially a fog of the liquid material.

I claim:

Apparatus for efficient vaporization and burning of liquid fuel, comprising a fuel spray nozzle adapted to supply substantially a conical spray of atomized fuel, means in said fuel nozzle for setting the fuel spray into swirling movement, said means comprising a chamber within said fuel nozzle, openings in the rear wall of said fuel nozzle in communication with said chamber, said openings being directed outwardly and in angular relation to the flow of fuel into said nozzle chamber, and a constricted opening centrally disposed in the front wall of said fuel nozzle through which the fuel atomized within the nozzle chamber leaves said nozzle in a substantially swirling movement prior to being admixed with steam or air, a nozzle for steam or air provided with radially arranged outlet means surrounding the fuel nozzle and arranged at an angle to give a swirling motion, said last named nozzle discharging in the same general direction as the fuel nozzle, an outwardly flaring flame cone into and through the base of which both said nozzles extend, and means for supplying air for combustion around the outside of the cone, whereby the swirling conical fuel spray, upon leaving the fuel nozzle, is intimately admixed with the swirling steam or air stream issuing from the nozzle surrounding the fuel nozzle.

In testimony whereof, I have signed my name hereto.

DAVID J. CARTWRIGHT.