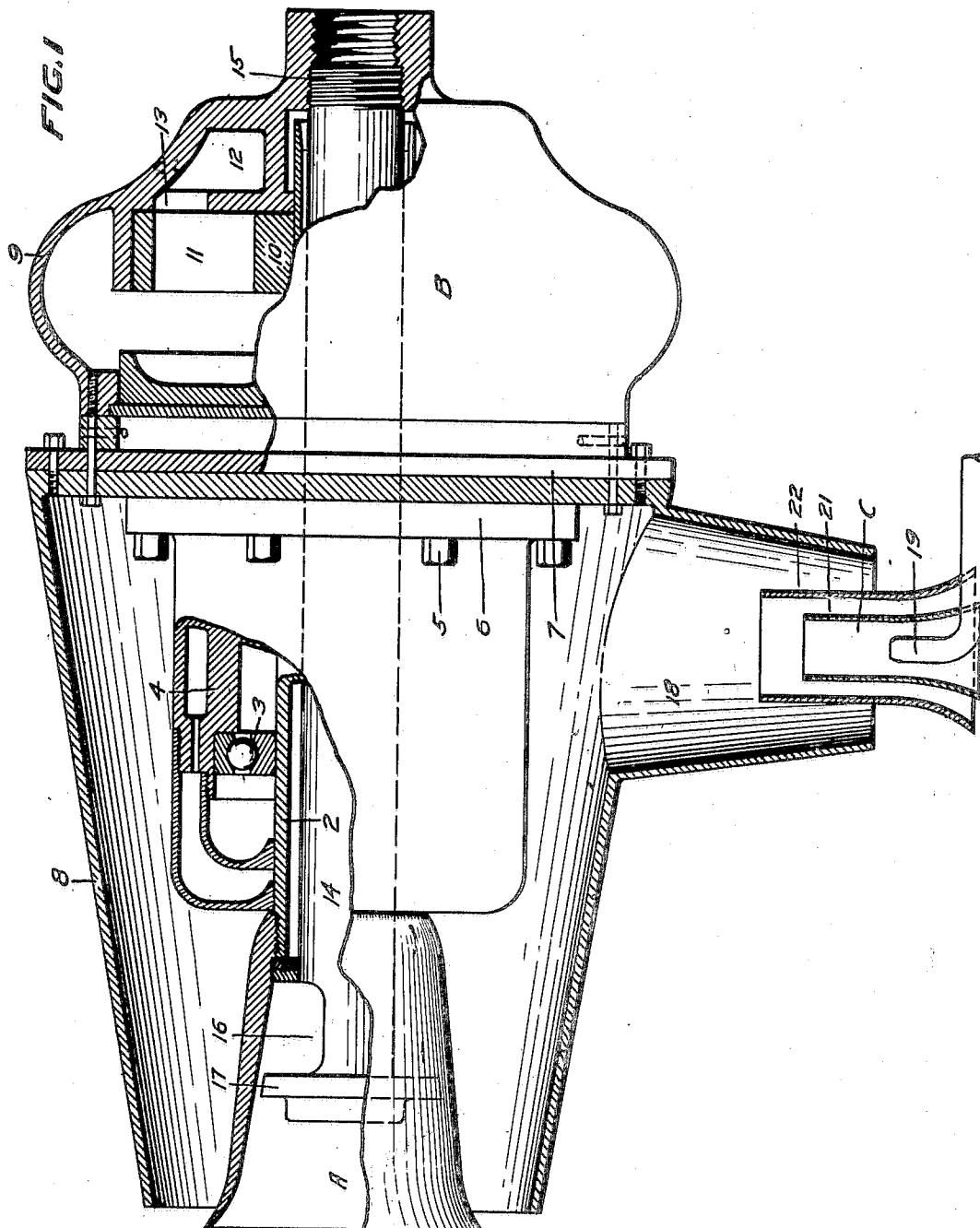


Jan. 9, 1923.

W. R. RAY,
OIL BURNER.
FILED APR. 1, 1919.

1,441,630.

2 SHEETS—SHEET 1.



INVENTOR
WILLIAM R. RAY.

BY
Strong Townsend
ATTORNEY

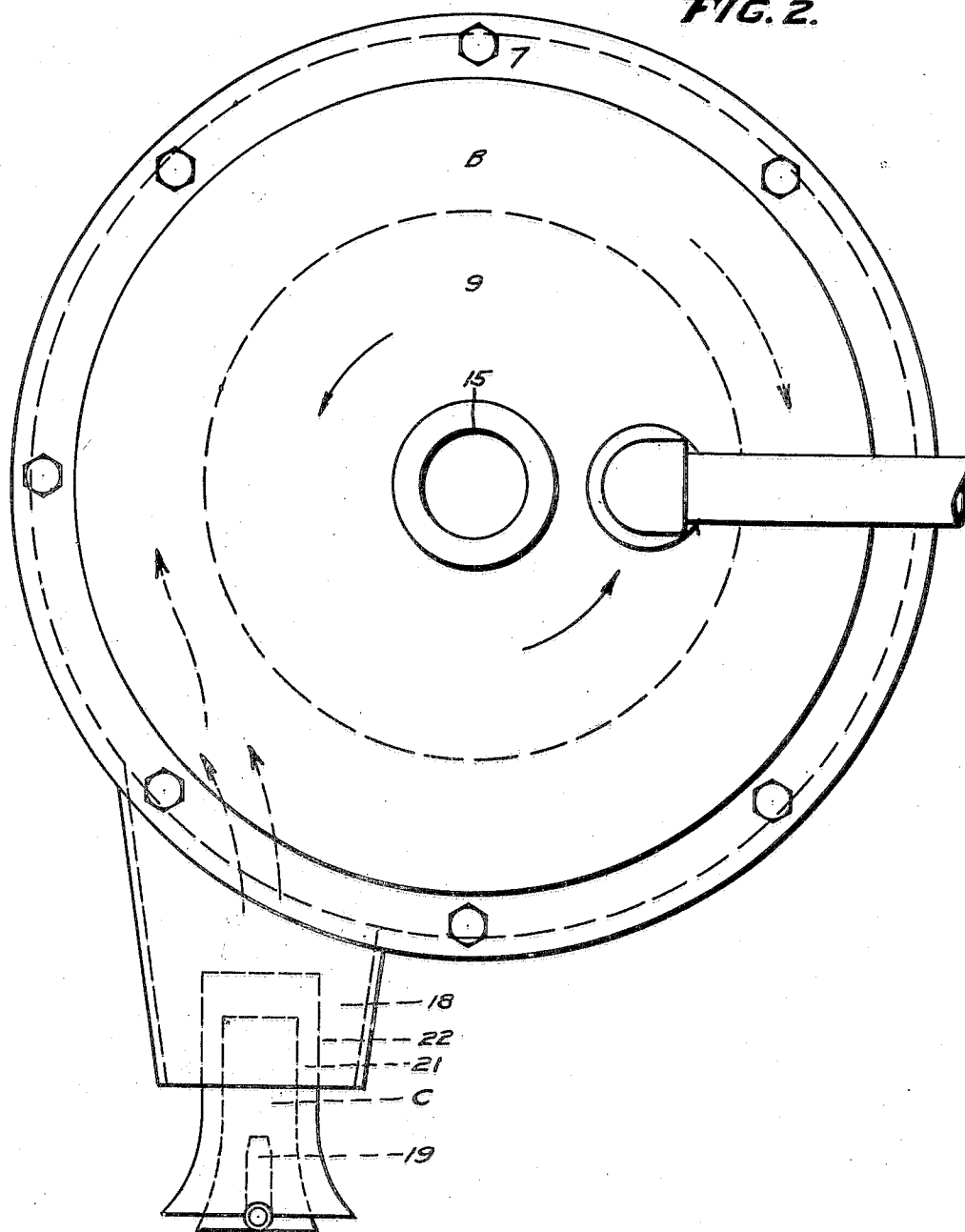
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FIG. 2.



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UNITED STATES PATENT OFFICE.

WILLIAM R. RAY, OF SAN FRANCISCO, CALIFORNIA.

OIL BURNER.

Application filed April 1, 1919. Serial No. 286,755.

To all whom it may concern:

Be it known that I, WILLIAM R. RAY, a citizen of the United States, residing at San Francisco, in the county of San Francisco and State of California, have invented new and useful Improvements in Oil Burners, of which the following is a specification.

This invention relates to oil burners, and particularly to improvements on the structure shown in my copending application entitled "Oil burner", filed January 15, 1919, Serial No. 271,287.

One of the objects of the present invention is to provide an oil burner of the rotary type from which the oil is ejected and atomized by the combined action of centrifugal force, steam and air, and particularly a novel structure whereby the atomizing air employed is induced by an induction nozzle which also serves the function of imparting a swirling movement to the air in a direction opposite to the rotation of the centrifugal fuel atomizer.

Further objects will hereinafter appear.

The invention consists of the parts and the construction, combination and arrangement of parts as hereinafter more fully described and claimed, having reference to the accompanying drawings, in which—

Fig. 1 is a side elevation of the burner, partly in section.

Fig. 2 is an end view of the burner.

Referring to the drawings in detail, A indicates an atomizing cup supported by a hollow shaft 2 which is journaled in ball bearings 3 supported by a centrifugal bearing member 4 which is secured by means of bolts 5 and an annular flange 6 to an end plate 7. Surrounding the atomizing cup A and the bearing member supporting the shaft 2, is a tapered nozzle 8. This nozzle is secured and supported by the end plate 7 or may be cast integral therewith, as shown. Also supported by the plate member 7 is a fluid actuating turbine generally indicated at B. This turbine consists of a housing 9 in which is mounted a rotor 10 provided with turbine blades 11. Any suitable form of fluid or steam under pressure is admitted to a steam chest 12 formed within the housing 9 and it escapes from said chest through a series of nozzle openings 13 mounted ad-

jacent the blades of the rotor. Rotary movement is thus imparted and the steam after escaping into the housing 9 may be removed by means of an exhaust pipe or similar means not here shown. The rotor 10 is secured to the hollow shaft 2 and therefore serves the function of transmitting rotary movement to the shaft and the atomizing nozzle A carried thereby. The fuel to be atomized, preferably a low grade crude oil, is delivered to the atomizing cup by means of a stationary pipe 14. This pipe is secured at one end as at 15, in the forward end of the housing 9 and extends through the hollow shaft and enters the atomizing cup, as shown. The portion entering the cup is cut away, as at 16, to permit the crude oil to freely escape into the cup and it is otherwise provided with an end cap 17 which restricts the escape of oil and furthermore serves the function of evenly distributing the same within the cup, as has previously been described in my co-pending application referred to hereinabove.

The oil to be atomized and burned, may be delivered to the stationary pipe 14 under a slight pressure or merely by gravity flow. It escapes through the opening 16 formed in the forward end of the pipe and is thus delivered to the atomizer or cup A. The high speed of revolution of the cup, which in actual practice often exceeds three or four thousand revolutions per minute, produces a centrifugal force which is so great that the oil forms a thin film on the interior surface of the cup. It is at the same time forced outwardly, due to the flare or taper of the cup, and therefore discharges at right angles to the longitudinal axis of the cup when it leaves the outer annular lip of the cup. In fact, an annular sheet of oil is ejected which is so highly atomized that it appears more like a mist or fog than the viscous oil originally delivered to the cup. While the oil thus centrifugally projected, is highly atomized, it is one of the objects of the present invention to further atomize the oil and to thoroughly mix it with steam and air. The oil discharged by the cup is therefore subjected to a secondary atomizing action and it is also projected directly forward into the furnace. This is accom-

plished by providing the tapering nozzle 8 and a secondary nozzle 18. This nozzle is arranged at the rear end of the main nozzle 8 and at one side thereof, see particularly 5 Fig. 2.

Projecting into the lower end of the nozzle 18 is a compound induction nozzle C, consisting of a steam nozzle 19 and a pair of superimposed nozzles 20 and 21. Steam 10 or other fluid under pressure delivered to the nozzle 19 and passing through the nozzle 21, induces a flow of air therethrough. The air and steam escaping from the mouth of nozzle 21 and passing through the mouth 15 of the exterior nozzle 22, induces a secondary flow of air through the nozzle 22 and the air and steam finally discharging from the exterior nozzle 22 and entering the main nozzle 8 through the lower extension 18, 20 induces an additional flow of air through the extension 18. A great quantity of air is thus induced by the action of the single fluid actuated nozzle 19 and as the combined mixture of steam and air induced thereby 25 through the nozzles 21, 22 and the extension 18, is delivered to one side of the main nozzle 18, it can readily be seen that a swirling movement will be imparted to the mixture before it is permitted to escape through the 30 forward end of the main nozzle 8. The swirling movement thus imparted is in a direction opposite to the rotation of the atomizing cup A and the velocity imparted by the steam nozzle 19 is so great that the 35 mixture, when discharging from the main nozzle 8, will instantly pass through the atomized oil ejected by the cup A, thus carrying it forward into the furnace. It will, at the same time, produce a secondary 40 atomizing action by further breaking up the oil particles and it also produces a homogeneous mixture of air, steam and oil which is highly combustible and instantly ignited when entering the furnace.

45 The important feature of the present invention is the provision of a single induction nozzle which is adapted to induce a sufficient quantity of air to produce a homogeneous combustible mixture of air and oil 50 and which will also impart sufficient velocity to the air to permit this to act as a secondary atomizing agent.

The second important feature of the invention is the positioning of said nozzle at 55 one side of the main nozzle 8 so that a swirling movement may be imparted to the air in a direction opposite to the rotation of the atomizing cup. This is of great importance as it further increases the atomizing and 60 mixing action desired.

While a more or less specific form of induction nozzle is here shown, I wish it understood that any type of injector may be employed; similarly, that the materials and 65 finish of the several parts forming the burner

may be varied to suit different installments and applications.

Having thus described my invention, what I claim and desire to secure by Letters Patent is—

70 1. The combination with a centrifugal atomizer and means for delivering fuel thereto, of a main nozzle surrounding the atomizer, said main nozzle being open at one end and closed at the opposite end, an 75 air inlet extension formed on the nozzle adjacent the closed end and positioned approximately at right angles to the longitudinal axis of the nozzle and atomizer and an induction nozzle mounted in the air inlet ex- 80 tension to induce a flow of air therethrough.

2. The combination with a centrifugal atomizer and means for delivering fuel thereto, of a main nozzle surrounding the atomizer, an induction nozzle connected with 85 the main nozzle, and means for passing a fluid under pressure through the induction nozzle to induce the flow of air through the main nozzle, said induction nozzle hav- 90 ing its axis transverse to and at one side of the main nozzle axis so that a swirling movement in the direction opposite to the rotation of the atomizing cup will be imparted to the air induced.

3. In an oil burner, a centrifugal atomiz- 95 ing cup, a hollow shaft supporting the cup, a nozzle surrounding the cup and shaft and enclosing the same, said nozzle being open at one end and closed at the opposite end, a bearing member supported by the nozzle 100 in which the shaft is journaled, an air inlet extension formed on the nozzle adjacent the closed end, said air inlet extension being arranged at one side of the nozzle and at ap- 105 proximate right angles to the longitudinal axis thereof, an induction nozzle positioned in said air inlet extension to induce a flow of air therethrough, means for rotating the hollow shaft and atomizer supported there- 110 by, and means for delivering oil to the atomizing cup through the hollow shaft.

4. The combination with a centrifugal atomizer, and means for delivering fuel thereto, of a main nozzle surrounding the atomizer, said main nozzle being open at 115 one end and closed at the opposite end, said atomizer projecting through the open end of the main nozzle, an induction nozzle mounted adjacent the closed end of the main, nozzle, and means for passing a fluid under 120 pressure through the induction nozzle to induce a flow of air through the main nozzle.

5. The combination with a centrifugal atomizer, and means for delivering fuel thereto, of a main nozzle surrounding the 125 atomizer, said main nozzle being open at one end and closed at the opposite end, an induction nozzle mounted adjacent the closed end of the main nozzle, and means for pass- 130 ing a fluid under pressure through the in-

duction nozzle to induce a flow of air through the main nozzle, said induction nozzle being positioned at one side of the main nozzle to impart a swirling movement to the air induced in a direction opposite to the rotation of the centrifugal atomizer.

6. In a burner of the character described, a centrifugal atomizer, means for delivering fuel thereto, a nozzle surrounding the atomizer, said nozzle being open at one end and closed at the other end, and means connected with the nozzle for delivering a current of air, said means being disposed between the ends of the nozzle to impart a swirling movement to the air as it discharges through the nozzle and in a direction opposite to the rotation of the atomizer.

7. In a burner of the character described, a centrifugal atomizer, means for delivering fuel thereto, a nozzle surrounding the atomizer, said nozzle being opened at one end and closed at the other end, and means connected to the side of the nozzle for-

wardly of the closed end thereof for delivering a fluid under pressure to the nozzle to induce the flow of air through the nozzle.

8. In a burner of the character described, a centrifugal atomizer, means for delivering fuel thereto, a nozzle surrounding the atomizer, said nozzle being opened at one end and closed at the other end, and means connected with the nozzle at one side thereof adjacent to the closed end thereof for delivering a current of air in a direction at right angles to the longitudinal axis of the nozzle to impart a swirling movement to the air as it discharges through the nozzle and at a direction opposite to the rotation of the atomizer.

In testimony whereof I have hereunto set my hand in the presence of two subscribing witnesses.

WILLIAM R. RAY.

Witnesses:

JOHN H. HERRING,
W. W. HEALEY.