A. W. THOMPSON.

BURNER FOR FUEL OILS.

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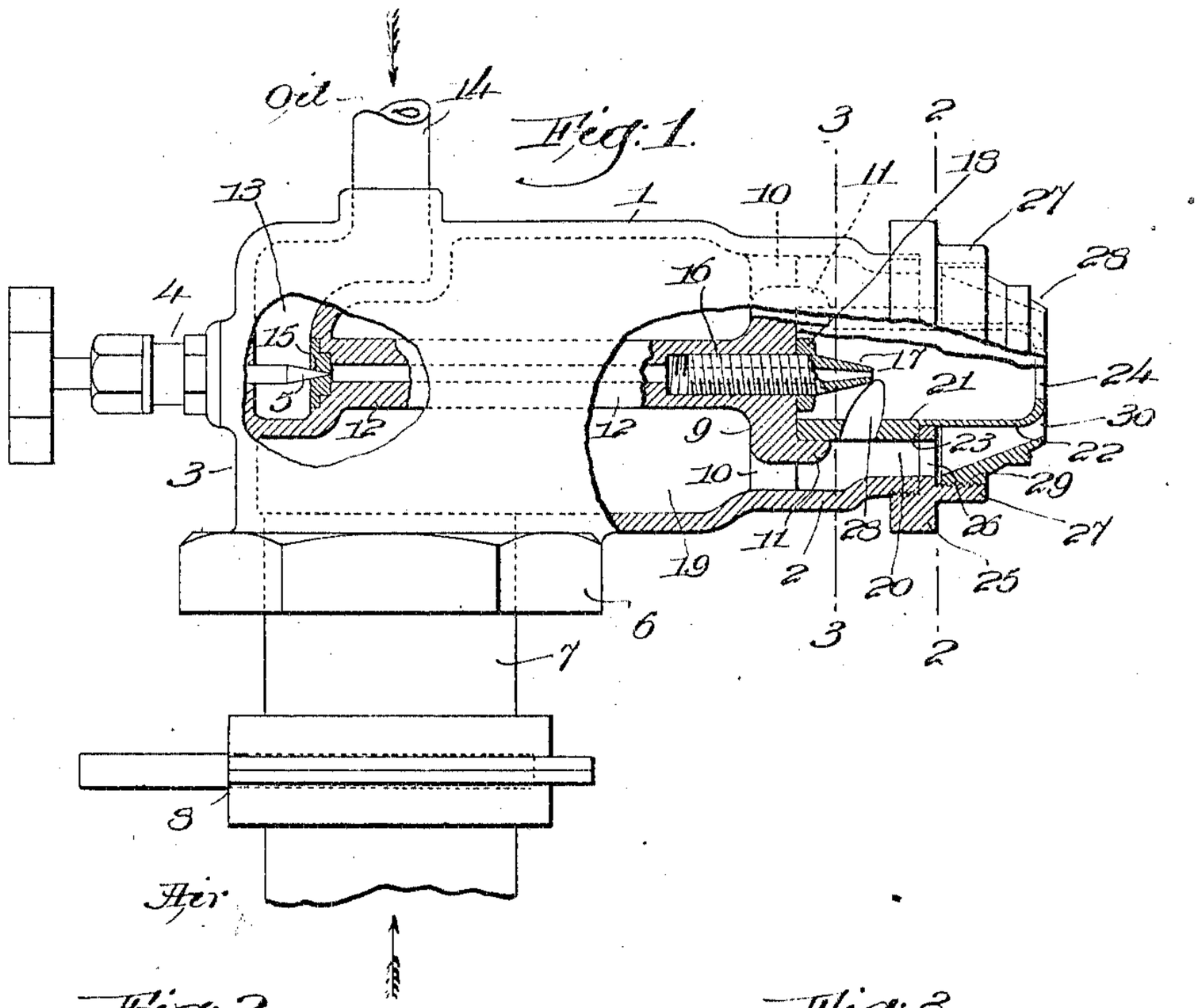


Fig: 1.

Fig: 2.

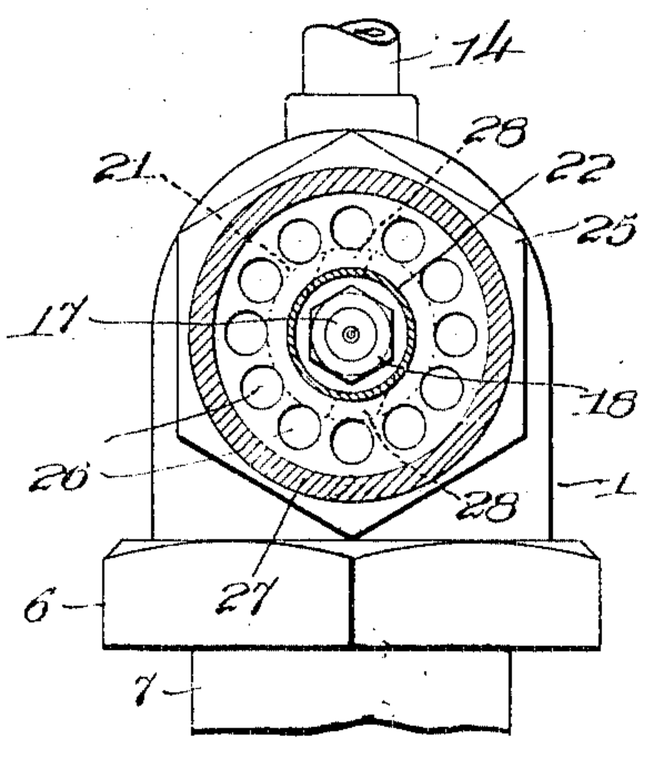
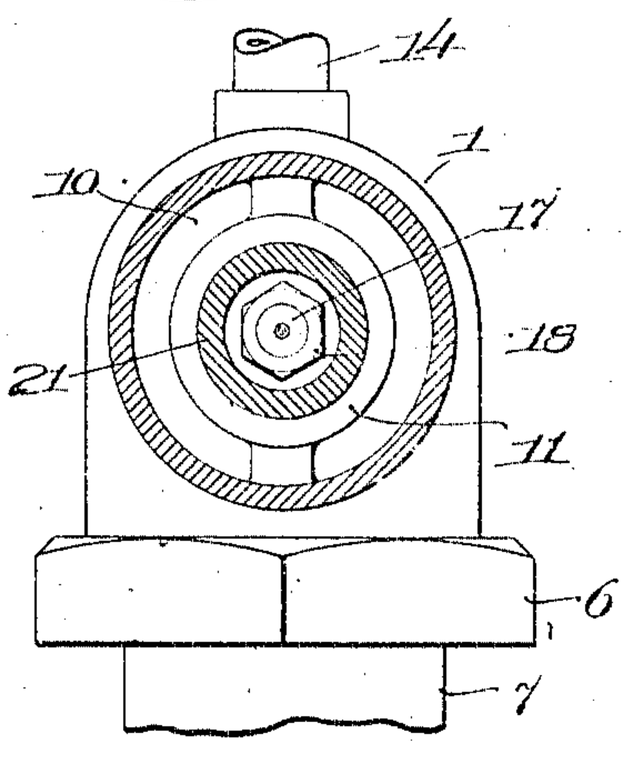


Fig: 3.



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UNITED STATES PATENT OFFICE.

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BURNER FOR FUEL-OILS.

965,963. Specification of Letters Patent. Patented Aug. 2, 1910.

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To all whom it may concern:

Be it known that I, ALBERT W. THOMPSON, a citizen of the United States, and resident of Manchester, county of Hillsboro, State of New Hampshire, have invented an Improvement in Burners for Fuel-Oils, of which the following description, in connection with the accompanying drawing, is a specification, like characters on the drawing representing like parts.

This invention has for its object the production of a simple, novel and efficient burner for fuel oils, so constructed and arranged that perfect atomization of the oil is effected without the use of high pressures, either on the oil or on the air employed to atomize the oil and discharge the same in jet form.

By reason of the low air pressure required I am enabled to use a blower of the rotary fan type for the air supply, instead of employing compressed air or steam as an atomizing agent.

The above-mentioned advantages secured by my novel burner manifestly lead to simplicity of construction and operation and economy of power and fuel.

In the matter of oil pressure I find in practice that highly satisfactory results are obtained with a pressure of from 4 to 5 pounds per square inch, and with a pressure of from 6 to 8 ounces per square inch for the air.

The various novel features of my invention will be fully described in the subjoined specification and particularly pointed out in the following claims.

Figure 1 is a side elevation and partial longitudinal section of a fuel-oil burner embodying one form of my invention, the wall of the main air chamber being broken out; Fig. 2 is a transverse section on the line 2—2, Fig. 1, looking toward the left; Fig. 3 is a transverse section on the line 3—3, Fig. 1, looking toward the left, but showing the oil-inlet nozzle in elevation.

In the present embodiment of my invention the burner comprises an elongated, tubular casing 1, conveniently made as a casting, reduced somewhat in diameter at its open end, at 2, and at its opposite closed end 3 having a suitable gland or stuffing box 4, Fig. 1, for the stem of an oil-controlling valve 5 of any suitable construction. By a nipple 6 the bottom of the casing is herein shown as connected with a pipe or conduit 7 communicating with a suitable supply of air under low pressure, about from 6 to 8 or 10 ounces per square inch, a suitable air controlling valve or damper 8 being shown in Fig. 1. A transverse diaphragm 9 is formed in the reduced part 2 of the casing, provided with peripheral ports 10, and having on its outer face an annular rib or seat 11, concentric with an elongated tubular extension 12 extended centrally from the inner face of said diaphragm, as shown in Fig. 1, and communicating at its left-hand end with a chambered portion 13 of the casing and having no communication therewith except through the said extension. Said chambered portion communicates by a pipe 14 with a supply of fuel oil at a pressure of about 4 to 5 pounds per square inch, and a suitable valve-seat 15 in the end of the extension 12 coöperates with the valve 5, as clearly shown in Fig. 1. The diaphragm 9 and adjacent part of the extension are bored and tapped at 16 to receive the threaded shank of an oil-inlet nozzle 17 which is held fixedly in position by a check-nut 18.

The main interior part of the casing 1 between its closed end 3 and the diaphragm 9 constitutes an air chamber 19, Fig. 1, from which the air passes through the ports 10 into the annular passage 20 between the reduced end 2 of the casing and a cylindrical atomizing chamber. For convenience in construction I make this chamber as a tube 21, reduced in thickness at its outer portion 22 to leave an external annular shoulder 23 and having at its outer end a central outlet 24 of less diameter. The inner, thicker end of the chamber fits tightly into the annular seat 11 and abuts against the diaphragm as clearly shown in Fig. 1, so that said diaphragm forms a closed inner end for such atomizing chamber, the oil-inlet nozzle 17 communicating axially therewith and projecting thereinto. A retaining ring 25 screwed onto the reduced part 22 of the casing engages the shoulder 23 and holds the atomizing chamber securely in position, said ring having a circularly arranged series of

apertures 26 which communicate with the annular passage 20 surrounding the inner end of the atomizing chamber. The ring is provided with an internally threaded annular flange 27 on its outer face, for a purpose to be described. Near its inner end the atomizing chamber is provided with one or more substantially tangential inlets 28, shown in dotted lines Fig. 2, for the admission of air from the passage 20 to the said chamber.

Owing to the tangential arrangement of the inlets the air under pressure when admitted to the atomizing chamber assumes a rotary or whirling motion therein, of relatively high velocity, breaking up or pulverizing and thoroughly atomizing the particles of oil admitted through the nozzle 17 and discharging the completely atomized oil from the chamber through its outlet 24. The atomization is thus affected and completed within the burner, so that the discharge from the atomizing chamber is a jet of perfectly and thoroughly atomized oil, absolutely obviating any dripping of the burner or the building up of carbonized oil in the interior of the fire-box or furnace.

The air which effects the atomization of the oil is usually not sufficient in volume to furnish a proper amount of oxygen for combustion, and the rotative effect upon the issuing jet of atomized oil is so pronounced that such jet tends to expand in conical form with a very wide angle of divergence, which is objectionable. I have, accordingly, provided a tapered or conical nozzle 28, Fig. 1, externally threaded at 29 to screw into the flange 27, said nozzle surrounding the outer end of the atomizing chamber concentric therewith, and providing an annular discharge orifice 30 adjacent the outlet 24.

Air from the interior of casing 1 traverses the passage 20 and passes through the apertures or ports 26 into the nozzle, from which it is discharged through the orifice 30 in the form of an annular jet completely surrounding the jet of atomized oil discharged from the outlet 24. Such enveloping air jet serves the double purpose of concentrating the jet of atomized oil into a cylindrical, instead of a conical, form, and also provides an additional amount of air sufficient to properly support combustion. The completely atomized particles of oil thus move in substantially parallel lines within and constitute a species of core for the enveloping jet of air. The area of the annular orifice 30 can be varied within the required limits of adjustment by rotating the nozzle 28 to move it longitudinally in or out with reference to the threaded flange 27, thereby decreasing or increasing, respectively, the amount of air supplied in the annular enveloping air jet.

From the foregoing description it will be apparent that perfect atomization of the oil is effected within the burner itself by or through the action of air at low pressure, the air also supplying the necessary amount of oxygen for combustion.

While it is neither practical nor desirable to use oil fed by gravity only, it is necessary in my invention to use only enough pressure to get the oil to the tip of the inlet nozzle 17, say from 4 to 5 pounds per square inch. The oil aperture in said nozzle is relatively large and hence is less likely to cause trouble by clogging than would be the case with a small outlet aperture, and as the tip of the said nozzle is completely within the burner casing it is not exposed to the heat, and has no tendency to clog from carbonized oil in the tip. Some pressure on the oil is a practical necessity, as it permits of regulation of the amount of oil by the valve 5, the whirling or rotary movement in the atomizing chamber being requisite to cause the separation and breaking up of the oil particles in order to effect atomization and partial distribution.

In many oil burners the oil is supplied at sufficient pressure to impart a very considerable linear velocity to the jet, and baffle bricks or tiles are generally relied upon to break up and distribute the flame. With the burner embodying my invention, however, the pressure is only required to cause flow of the oil sufficient to permit regulation by the valve, the rotary action in the atomizing chamber being wholly relied upon for atomization, while the air blast provides sufficient linear velocity for proper distribution. By using low pressure on the oil, with only a single inlet nozzle, a relatively large aperture in the nozzle can be used, with consequent diminished tendency to clog.

From an inspection of the drawing it will be manifest that the oil inlet nozzle 17, the outer nozzle 28, the retaining ring 25, and the atomizing chamber 21, 22 can be readily replaced, any or all of them, in case of breakage or injury, and hence nozzles or atomizing chambers of varying capacity or size may be substituted, without in any way disturbing the main oil and air connections with the burner. By the use of different rings, as 25, having openings or ports 26 of varying size, the quantity of air supplied to the outer nozzle can be adjusted or varied to suit widely different requirements.

While my burner is primarily designed for low pressures on both oil and air it will be manifest from the foregoing that if desired it can be used for higher pressures and smaller volumes of oil and air. The apparatus is herein described as a burner designed for the atomization of a fuel oil, but the apparatus as described and claimed is equally well adapted for the atomization of

other liquids for various purposes, as will be manifest.

My invention is not restricted to the precise construction and arrangement herein shown and described, as the same may be modified or rearranged in various details by those skilled in the art without departing from the spirit and scope of my invention as set forth in the claims annexed hereto.

Having fully described my invention, what I claim as new and desire to secure by Letters Patent is:—

1. In an oil burner, an atomizing chamber provided with a tangential inlet for the admission of air under pressure, and an axial outlet at one end of the chamber, an inlet member for oil under pressure, communicating axially with said chamber at its other end, and means to provide an annular jet of air concentric with and adjacent the outlet of the atomizing chamber.

2. In an oil burner, an atomizing chamber provided with a tangential inlet for the admission of air under pressure, and an outlet at one end, means to introduce oil under pressure to said chamber at its opposite end, and adjustable means to surround the jet of atomized oil discharged from the chamber with a jet of air adjacent the chamber outlet.

3. The combination with an atomizing chamber having an unobstructed outlet at one end and closed at its opposite end, and means to introduce air at low pressure to said chamber between its ends and effect rotary motion of the air within the chamber, of an inlet nozzle for a liquid under pressure, communicating axially with the closed end of said chamber opposite its outlet, the rotating air in the chamber atomizing the liquid introduced thereinto, and means concentrically surrounding the outlet of said chamber to surround the jet of atomized liquid discharged from the chamber with an annular, non-rotatable jet of air.

4. The combination with an atomizing chamber having at one end an axial inlet communicating with a supply of liquid under pressure, and an outlet at its opposite end, of means to introduce air at low pressure into said chamber and effect rotary motion of the air within the chamber, and an adjustable tubular nozzle concentrically surrounding said chamber and having its outlet adjacent the outlet of the chamber, to discharge a non-rotatable and annular jet of air at the outlet of said chamber and concentric with such outlet.

5. In an oil burner, a casing communicating with a supply of air under pressure and having a circularly arranged series of outlets at one end, a circular chamber within the casing and surrounded by said outlets, a tangential inlet for the admission of air from the casing to said chamber, and an axial outlet in the outer end of the chamber, means to introduce oil under pressure into said chamber at the inner end thereof, and a tapered nozzle at the outlet end of the casing concentric with the chamber, to deliver an annular jet of air surrounding the atomized oil discharged from the outlet of the chamber.

6. In an oil burner, an air chamber having a tubular outlet and communicating with a supply of air under pressure, a circular atomizing chamber supported within the air chamber and extended into the tubular outlet thereof, said atomizing chamber having an axial outlet at its outer end and a tangential inlet communicating with the air chamber, and an inlet for oil communicating axially with said atomizing chamber at its inner end.

7. In an oil burner, an elongated cylindrical chamber having an axial outlet at one end and a tangential inlet for the admission of air under pressure, an oil-inlet nozzle communicating with a supply of oil under pressure and extended axially into the end of said chamber opposite its outlet, and a conical, longitudinally adjustable nozzle concentric with said chamber and surrounding its outlet end, said nozzle communicating with the air supply.

8. In an oil burner, a tubular casing open at one end and adapted to be connected with an air supply at low pressure, a transverse diaphragm within the casing near its open end, having peripheral ports, and an annular seat on its outer face, an oil-inlet nozzle extended through the diaphragm at the center of the seat and communicating with a supply of oil, a tubular atomizing chamber supported at its inner end in said seat and closed thereat by the diaphragm, the oil-inlet nozzle extending axially into the chamber, the latter having an outlet at its outer end and a tangential inlet communicating with the casing, for the admission of air therefrom to the chamber, a perforated retaining ring on the open end of the casing, engaging said chamber and holding it fixedly in the annular seat, and a tapered nozzle longitudinally adjustable on said ring and surrounding the outlet end of the atomizing chamber.

9. In an oil burner, an elongated cylindrical chamber closed at one end and having a central outlet at its other end, and provided near its closed end with a tangential inlet for the admission of air under pressure, a nozzle for the admission of oil under pressure, extended axially into said chamber at its closed end, and manually adjustable means to discharge an annular jet of air at and surrounding the outlet of said chamber.

10. In an oil burner, an atomizing chamber having a central outlet and communicat-

ing at a distance from said outlet with a supply of oil under pressure, means to introduce air under pressure to said chamber and to effect rotary motion of the air within the chamber, to break up and atomize the particles of oil admitted thereto and discharge the atomized oil through the central outlet of the chamber, and means to discharge an annular jet of air at such outlet, to surround and concentrate the jet of atomized oil.

In testimony whereof, I have signed my name to this specification, in the presence of two subscribing witnesses.

ALBERT W. THOMPSON.

Witnesses:

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