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A. DUCHARME
FUEL OIL BURNER

3,090,422

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2 Sheets-Sheet 1

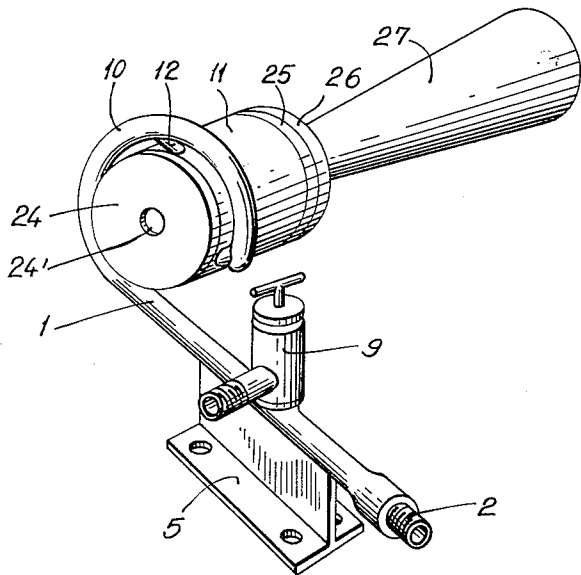


Fig. 1

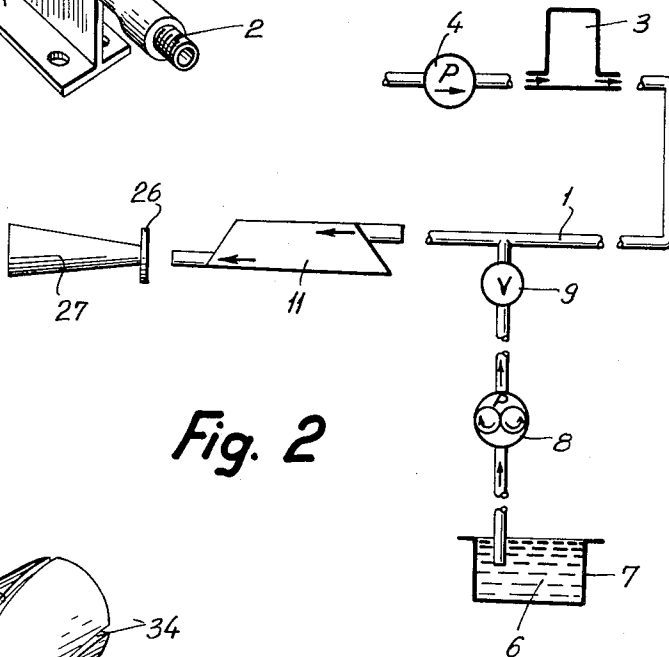


Fig. 2

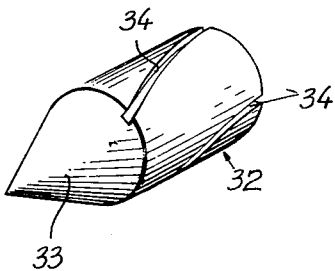


Fig. 6

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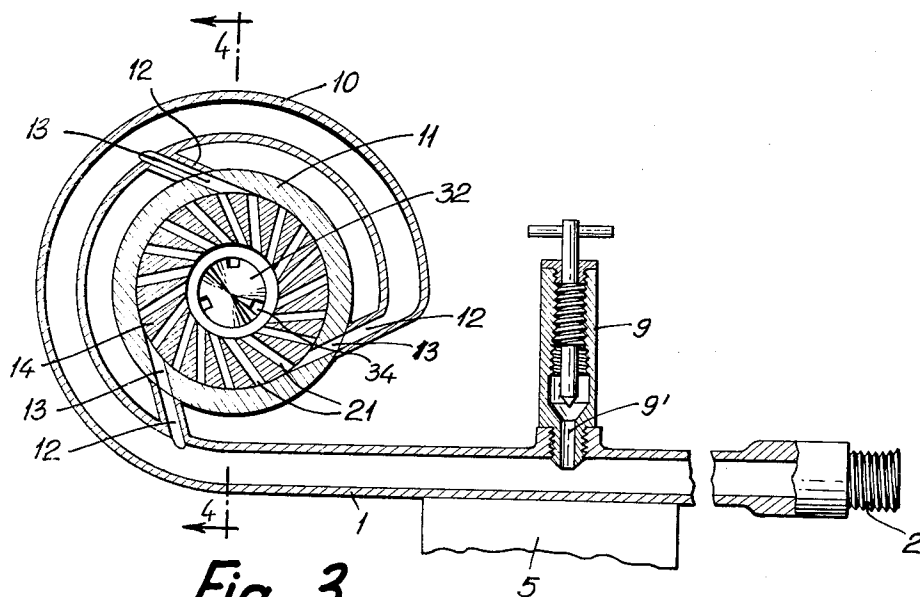


Fig. 3

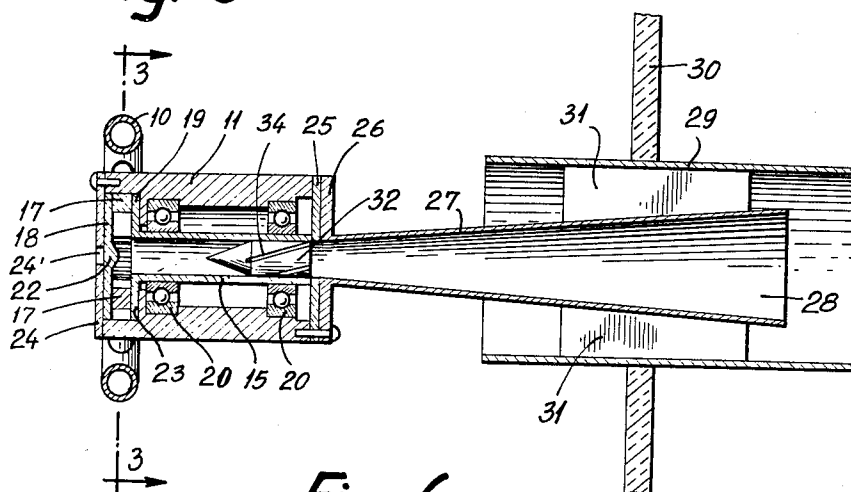


Fig. 4

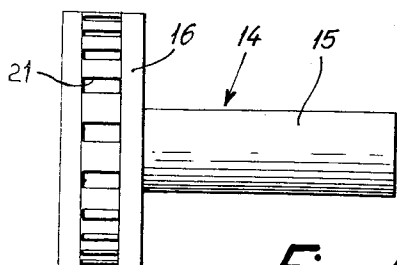


Fig. 5

PATENT AGENT

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3,090,422

FUEL OIL BURNER

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The present invention relates to oil burners and more particularly to the type adapted for burning high viscosity oils such as the oil grades known in the trade under the names of Bunker No. 3 and Bunker No. 4.

It is known that such oils are very difficult to vaporize even when preheated, proper atomizing being essential for obtaining a fine spray necessary for proper combustion of the oil. The most common type of oil burner adapted to burn high viscosity oil is known under the name of Rotary Cup oil burner in which the oil is fed to a horizontally disposed slightly conical cup which rotates to eject the oil under centrifugal force and air is fed directly into the resulting oil spray. However, these burners are very complicated in construction and expensive to manufacture and are difficult to adjust for proper combustion efficiency.

It is the general object of the present invention to provide an oil burner for heavy oil which is simple to build, having a minimum number of elements and which has a high atomizing efficiency and a high combustion efficiency.

Another important object of the present invention resides in the provision of an oil burner of the character described which can produce a flame exceeding a temperature of 4000° F. suitable for melting ores such as titanium bearing magnetite and ilmenite.

Another important object of the present invention resides in the provision of an oil burner of the character described having new and improved means for breaking up the oil into very fine particles.

The invention will become clearer by referring to the following description and to the annexed drawings, in which:

FIGURE 1 is a perspective view of the essential parts of the oil burner of the invention;

FIGURE 2 is a schematic plan view of the oil burner proper and its auxiliaries;

FIGURE 3 shows a longitudinal section of the feeding scroll and feeding pipe and a cross section of the turbine said section being taken along line 3-3 of FIGURE 4;

FIGURE 4 is a longitudinal section of the turbine casing, rotor, outlet tube and air feeding duct, said section being taken along line 4-4 of FIGURE 3;

FIGURE 5 is a side elevation of the turbine rotor; and
FIGURE 6 is a perspective view of an insert for the rotor.

Referring now more particularly to the drawings in which like reference characters indicate like elements throughout, reference numeral 1 indicates a feeding pipe having a threaded inlet end 2 for connection to a supply of air under pressure for instance a compressed air reservoir 3 fed by an air compressor 4 of conventional design. The pipe 1 is secured in horizontal position by means such as bracket 5 to a proper base adjacent the furnace.

High viscosity preheated oil 6 contained in a suitable reservoir 7 is fed under pressure by gear pump 8 to an adjustable needle valve 9 secured to and in communication with pipe 1 such that oil is fed into the pipe 1 at a regulated rate. The portion of the feeding pipe opposite its end 2 is curved into an arc of a circle in a vertical plane to form a scroll 10 surrounding and supporting a turbine casing 11 being in communication with the interior thereof by means of angularly equally spaced discharge nipples

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12 and passages or ports 13 made in the casing wall. The axes of the nipples 12 and aligned passages 13 are inclined with respect to the radii of the turbine casing intersecting the passages 13.

A turbine rotor 14 is rotatably mounted within the casing 11. The rotor comprises a tube 15 having at its inlet end an enlarged part 16 constituted by a cylindrical block 17 interposed between an end disc 18 and an annular flange 19, secured to the inlet end of tube 15. Elements 15, 16, 17, 18 and 19 form a rigid unitary assembly mounted for rotation within the casing 11 by means of the spaced bearings 20. The block 17 is provided with a plurality of inclined through bores 21 angularly equally spaced and having a rectangular section as clearly shown in FIGURE 5, said bores opening at the periphery of the block 17 and also in the interior chamber of part 16 communicating with tube 15. As shown in FIGURE 3, the bores 21 are less inclined than passages 13 with respect to the radii of the rotor intersecting said bores whereby the change of direction of the fluid entering bores 21 will produce an impulse rotating rotor 14.

The inside face of the disc 18 is provided with a central axially directed conical boss 22 disposed adjacent the outlet ends of the bores 21. The enlarged part 16 of the rotor 14 is positioned in cavity 23 of the casing 11, said cavity being closed by an end cover disc 24 having a hole 24' at its center. The outer peripheral wall of the block 17 is in close proximity to the inner peripheral surface of the cavity 23.

The other end of the turbine casing 11 is closed by an annular disc 25 and by the flange 26 of a frusto-conical tube 27 which is rigidly secured to the turbine casing 11 at its smaller end. The outer bigger end 28 of frusto-conical tube 27 is disposed within an air feeding duct 29 surrounding and coaxial with tube 27 and passing through the furnace wall 30. The tube 27 is located centrally of duct 29 by means of longitudinal radially extending support flanges 31.

An insert 32 is tightly fitted within the tube 15 of rotor 14 in the outlet end portion of said tube 15. The insert 32 consists of a cylindrical block having a tapered inner end 33, and provided with equally angularly disposed helical grooves 34 extending longitudinally of the peripheral surface thereof.

The oil burner of the invention operates as follows: Air under pressure is fed to pipe 1 by means of compressor 4 and air reservoir 3 at approximately 200 pounds per square inch pressure; preheated Bunker oil Number 3 or 4 from reservoir 7 is fed by gear pump 8 under higher pressure than the air pressure and the amount of oil fed to tube 1 is adjusted by the needle valve 9 so as to have a proportion in volume of about 92% of air and 8% of oil. The needle valve 9 does not constitute a jet as its outlet 9' has about 1/8 of an inch in diameter.

The mixture in the feeding pipe 1 downstream from the needle valve 9 consists of oil drops suspended in the air.

This mixture is fed to the turbine rotor 14 through the scroll 10 and causes high speed rotation of the rotor 14. As the oil drops leave the passages or ports 13, they are cut into very fine particles by the straight outer edges of the bores 21 made in the block 17. The resultant mixture of oil and air is directed inwardly of the rotor part 16 and deflected axially along tube 15 by means of boss 22. The mixture then engages the helical grooves 34 of the insert 32 whereby a rotary motion is imparted thereto and the mixture is discharged into and is expanded within the conical tube 27. The high speed stream discharged from tube 27 is mixed with secondary air sucked through outer duct 29.

The oil air mixture discharged from conical tube 27

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is ignited by conventional means such as by an electrode (not shown) disposed near the outer end of tube 27.

Due to the high vaporising efficiency obtained, the oil burns completely and the combustion gases attain a very high temperature of over 4000° F.

The high degree of vaporising of the oil is obtained by the high speed rotation of turbine rotor 14 and by the pressure of the bores 21 or rectangular cross-section providing straight cutting edges moving past the outlet ends or ports of the passages 14 at very high speed. In accordance with the invention it has been found that the vaporising efficiency is considerably decreased if the bores 21 are made circular instead of square or rectangular as shown in the drawings.

The speed of rotation of the rotor is so high that it is necessary to provide the cover disk 24 with the central hole 24' in order to prevent friction between the cover 24 and the enlarged part 16 of rotor 14 due to the vacuum created by the centrifugal force on the air exerted by the fast rotating rotor.

While a preferred embodiment in accordance with the present invention has been illustrated and described, it is understood that various modifications may be resorted to without departing from the spirit and scope of the appended claims.

What I claim is:

1. An oil burner comprising a turbine casing, a turbine rotor freely rotatably mounted within said casing, said rotor consisting of a tube and of an end enlarged cylindrical hollow part having a central chamber coaxial with and in communication with said tube and angularly equally spaced bores opening at the periphery of said part and in said chamber, said bores being inclined with respect to the radii of said rotor intersecting said bores, the peripheral face of said part being in close proximity to an internal cylindrical face of said casing, and means to feed a mixture of oil drops and air under pressure to angularly spaced passages made in said casing and opening in said cylindrical face opposite said bores, whereby the rotor is caused to rotate at high speed under the impulse of said pressurized mixture and the outer ends of said bores separate said oil drops into smaller particles upon moving across the openings of said passages.

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2. A burner as claimed in claim 1, wherein said passages made through the casing wall are inclined with respect to the radii of said rotor intersecting said passages to a greater extent than the inclination of the bores of said rotor.

3. A burner as claimed in claim 2, wherein said feeding means include a pipe having a portion bent around said turbine casing and in communication with said passages through nipples connected to the same and secured to said turbine casing and to said pipe, said pipe supporting said casing.

4. A burner as claimed in claim 3, wherein said feeding means further include an adjustable valve having its outlet end in communication with said pipe and its inlet end in communication with a supply of oil under pressure.

5. A burner as claimed in claim 1, further including a cylindrical block tightly inserted within the tube of said rotor and having grooves at the periphery thereof for the passage of the mixture issuing from said chamber.

6. A burner as claimed in claim 5, wherein said grooves are helical.

7. A burner as claimed in claim 1, further including a frusto-conical tube secured at its smaller end to said casing and in communication with the tube of said rotor, for receiving and expanding the gaseous mixture issuing from the rotor.

8. A burner as claimed in claim 7, further including an external duct surrounding the outer portion of said frusto-conical tube and projecting beyond the outer end of said frusto-conical tube, said duct being opened at both ends for the admission of secondary air.

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