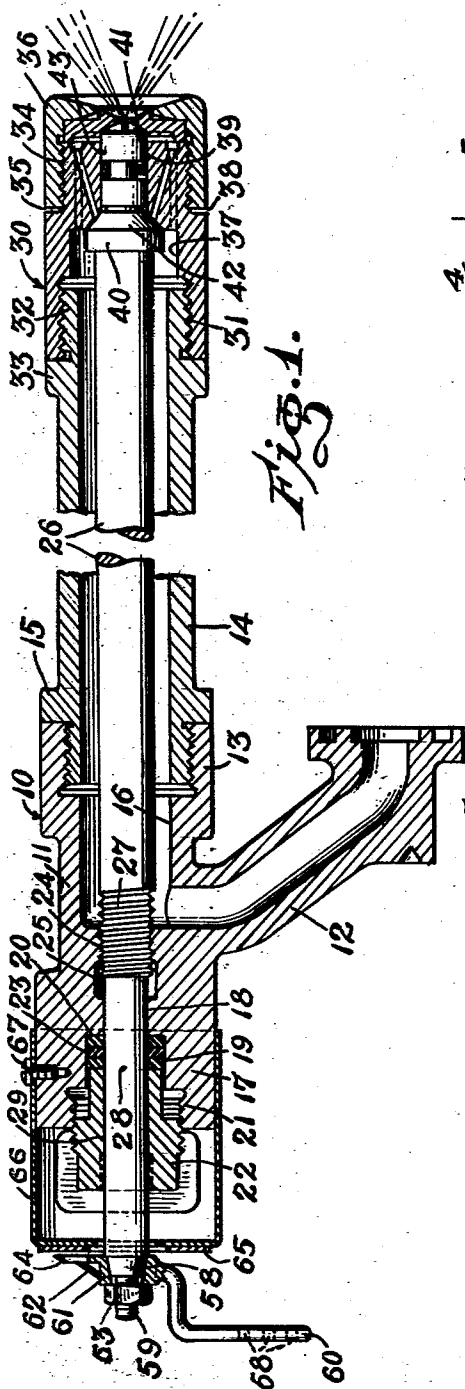
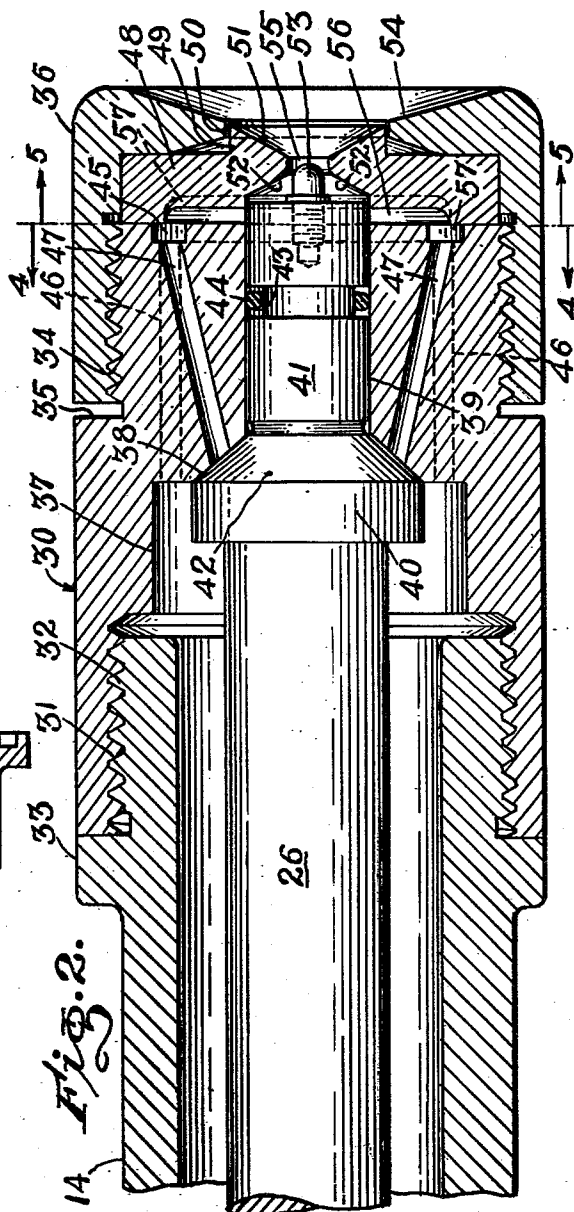


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OIL BURNER

2 Sheets-Sheet 1



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OIL BURNER

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Fig. 3.

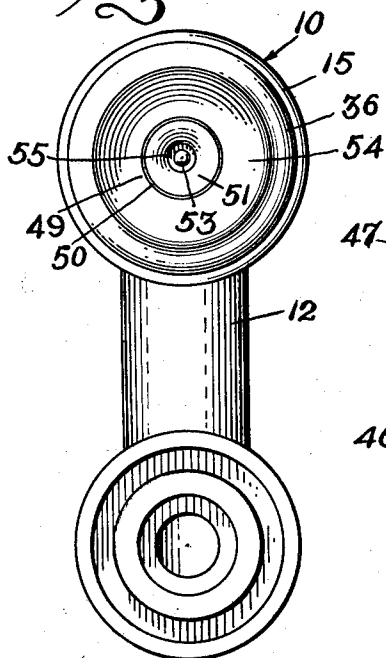


Fig. 4.

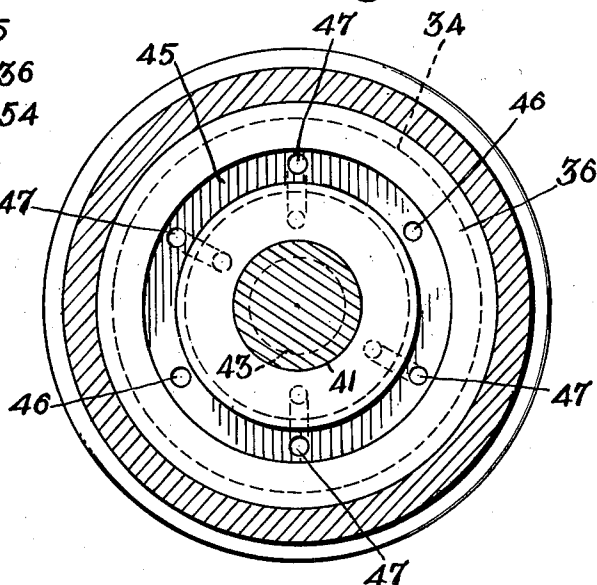


Fig. 5.

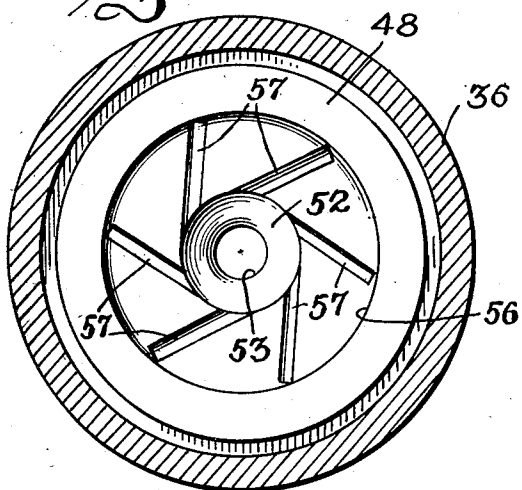
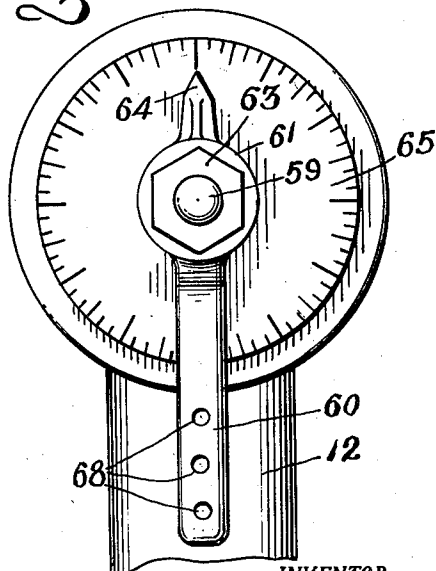


Fig. 6.



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OIL BURNER

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9 Claims. (Cl. 299—118)

This invention relates to fuel burners for oil furnaces and particularly to such burners designed for atomization of the fuel oil at several different rates.

The burning range of straight mechanical atomizers is about 1.7 to 1. This range is far too low because it requires a large number of small burners as well as the cutting in and cutting out by hand of these burners to cover the operating range, both of which are objectionable features. The range of the return flow type atomizer for oil burners is about three or four to one, which is not enough for the operating range and consequently burners must be cut in and out by hand. Furthermore, the characteristics of this type are not suitable for automatic control, and are quite critical and sensitive, frequently resulting in poor combustion. In general, the service performance of the return flow type atomizer for oil burners has been unsatisfactory.

To meet modern requirements particularly on ships, oil burners should operate with a range of at least 10 to 1 and the burners should operate efficiently at the minimum boiler capacity in part which is about three percent.

It is accordingly a principal object of the present invention to provide a wide range burner which will provide burning ranges up to 20 to 1 and which will operate efficiently for the minimum boiler capacity.

It is another object of the present invention to provide a wide range type mechanical oil burner atomizer which will operate in accordance with known principles of atomization.

It is still another object of the present invention to provide a wide range mechanical atomizer for oil burners which will provide better control of the burning range.

It is still another object of the present invention to provide a burner capable of efficient operation at several rates and obviating the necessity for frequent changing of burners with changes in the load on the furnaces.

Other objects of the present invention are to provide a fuel oil burner bearing the above objects in mind which is of simple construction, inexpensive to manufacture, has a minimum number of parts, is easy to use and efficient in operation.

For other objects and a better understanding of the invention, reference may be had to the following detailed description taken in connection with the accompanying drawing, in which:

Figure 1 is a longitudinal sectional view of a preferred embodiment of the invention and shown adjusted for low capacity burning;

Fig. 2 is a detail of a portion of Fig. 1, namely the nozzle body;

Fig. 3 is a front elevational view thereof looking from the right of Fig. 1;

Fig. 4 is a transverse sectional view taken along the line 4—4 of Fig. 2;

Fig. 5 is a transverse sectional view taken along the line 5—5 of Fig. 2; and

Fig. 6 is a rear elevational view thereof taken from the left of Fig. 1.

Referring now more in detail to the drawing, the burner

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includes an atomizer body indicated generally at 10 integrally formed at its central section 11 with a depending inlet 12, substantially as illustrated. The inlet 12 is adapted to be placed in communication with the fuel oil 5 pressure system, the improved burner being substituted for present ones.

The central section 11 is integrally formed at its forward end with an enlarged internally threaded portion 13 into which is screwed the externally threaded end of the atomizer barrel 14, the barrel 14 being integrally formed with a shoulder or flange 15 adapted to abut the forward end of the enlarged portion 13 when the parts are in operative assembly. The enlarged portion 13 and central section 11 are provided with a central bore 16 which connects the 10 inlet 12 with the barrel 14.

The rear end of the central section 11 is integrally formed with the enlarged portion 17 having a smooth central bore 18 and an enlarged smooth bore 19 forming with bore 18 a shoulder 20. The enlarged rear end 17 is also provided with an enlarged internally threaded bore 21 communicating with bore 19 and into which is screwed a stuffing gland indicated generally at 22, the inner end of the gland 22 abutting the packing 23.

The central section 11 is provided with an internally 25 threaded bore 24 which connects the bore 16 with an enlarged cylindrical bore 25 provided in the enlarged portion 17, which latter connects with the central bore 18 (Fig. 1).

An operating shaft is provided and includes an elongated cylindrical portion 26 which extends through the atomizer body 10 and the barrel 14, an externally threaded portion 27 adjustable within the internally threaded bore 24 and received within the enlarged bore 25 and a reduced cylindrical extension 28 which extends through 30 a smooth central bore 29 provided in the gland 22, substantially as illustrated. Thus, upon rotation of the operating shaft in a manner to be hereinafter described, the shaft will move longitudinally relative to the atomizer body 10 and barrel 14.

A nozzle body indicated generally at 30 is provided at its rear end with an internally threaded bore 31 and is screwed onto the externally threaded extension 32 of barrel 14, the barrel being integrally formed with a shoulder or flange 33 adapted to abut the rear end of the nozzle body 30. The forward end of the nozzle body 30 45 is integrally formed with a reduced externally threaded portion 34 providing a shoulder 35 and onto which is screwed an atomizer cap 36.

The nozzle body 30 is provided with a smooth reduced bore 37 (Fig. 2) which communicates at one end with the internally threaded bore 31 and at the other end with a conical bore 38. The externally threaded portion 34 of the nozzle body 30 is provided with a smooth reduced bore 39 which communicates with the conical bore 38.

The forward end of the operating rod 26 is integrally 55 formed with an enlarged cylindrical portion 40 which connects with a reduced cylindrical portion or extension 41 by means of a frusto-conical portion 42, the cylindrical extension 41 being slidably received within the bore 39 while the frusto-conical portion 42 is seated within the frusto-conical bore 38. It will be noted from Fig. 2 that when the frusto-conical portion 42 is seated within the conical bore 38 the forward end of the extension 41 extends slightly beyond the forward end of the externally threaded portion 34. The cylindrical extension 41 is provided with an annular groove 43 within which is positioned an O ring seal 44 whereby to prevent the passage of oil through bore 39, as will be obvious.

As shown in Fig. 2, the forward end of the externally threaded portion 34 of the nozzle body 30 is formed with an annular groove 45 which communicates with a pair of oppositely disposed bores 46 provided in the 70

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internally threaded portion 34 and which extend rearwardly to the bore 37 (see also Fig. 4). The externally threaded portion 34 of the nozzle body 30 is also provided with four radially spaced bores 47 which extend from the annular groove 45 to the conical bore 38 and are adapted to be sealed off by the frusto-conical portion 42 of the operating stem 26.

A circular sprayer plate 48 is mounted on the forward end of the nozzle body 30 by means of cap 36. The outer face of the sprayer plate 48 is integrally formed with a cylindrical extension 49 which extends outwardly within an orifice 50 provided in the cap 36. The extension 49 is provided with a frusto-conical bore 51 which communicates with a reversed inner frusto-conical bore 52 through the reduced central bore 53, the outer conical bore 51 being in registry with an enlarged frusto-conical bore 54 provided in the cap 36.

An orifice tip 55 is suitably mounted in the end of the extension 41 and is normally disposed within the central bore 53 or orifice opening when the operating rod is in the position of Figs. 1 and 2.

The rear face of the sprayer plate 48 is provided with a circular recessed portion 56 which connects the annular groove 45 with the conical bore 52 when the extension 41 of rod 26 is displaced to the left of Figs. 1 and 2 in a manner to be hereinafter described, the recessed portion or whirling chamber 56 being provided with a plurality of tangential grooves 57 as shown in Fig. 5 and which communicate with the circumferential groove 45 with the conical bore 52 regardless of the position of the operating rod. Said bores 46 permit a minimum supply of fuel into the recess 56 for normal charging purposes prior to extra supply through the grooves 57.

As a means of effecting the desired adjustment of the operating rod, the rear end thereof is integrally formed with the frusto-conical extension 58 (Fig. 1) which terminates in the reduced externally threaded portion 59. An operating handle 60 is integrally formed with the hub or mounting portion 61 having a frusto-conical internal bore 62 which receives therethrough the frusto-conical portion 58, the hub 61 being retained thereon by the nut 63. Thus, upon rotation of the operating handle 60, the operating rod will be rotated. The hub 61 is integrally formed with an indicating finger 64 which cooperates with a circular scale 65 mounted on the outer end of a hollow cap or sleeve 66 which is secured on the rear end of the atomizer body by means of the screws 67. When the frusto-conical plunger 42 is positioned or seated within the frusto-conical bore 38 (Figs. 1 and 2) the position of handle 60 will be as indicated in Fig. 6 with the indicator finger 64 pointing to the zero of the scale 65.

The handle 60 is provided with a plurality of longitudinally spaced openings 68 for automatic control of the handle. The details of such control mechanisms are well known to those skilled in the art and will not, therefore, be discussed in detail.

In operation, oil enters the inlet 12 of the atomizer body 10 at pressures ranging from 75 to 300 pounds per square inch, passing through the barrel 14 around the operating rod 26 where it enters the nozzle body 30. The oil then enters the two longitudinal bores 46 in the nozzle body 30 and passes into the circumferential groove 45 into whirling chamber or recess 56 and into the two tangential slots 57 in the sprayer plate 48. The oil then enters into the whirling chamber of the sprayer plate 48 in a whirling motion and leaves through the orifice 53 restricted by the orifice tip 55. This condition of burning requires no setting of the plunger shaft and is used for low capacities.

To increase the burning capacity through the two bores 46 and slots 57 previously mentioned, the operating handle 60 is rotated counter-clockwise which causes the plunger 42 to move horizontally away from the frusto-conical bore or seat 38 by means of the thread 27 on the operating rod. This movement uncovers the openings of

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the tangential slots 57 in the sprayer plate 48, allowing more oil to enter the whirling chamber 52. This motion also increases the area of the whirling chamber and simultaneously increases the area of the orifice 53 by means of the movement of the tip piece 55. With further rotation of the handle 60 in a counter-clockwise direction, the plunger will continue to move horizontally to open the four bores 47 in the nozzle body and the four additional slots 57 in the sprayer plate 48. It will be noted that for each change in position of the plunger 42 the areas of the whirling chamber and outlet orifice will also change proportionately to provide the required ratios of the areas of the slots 57, whirling chamber 52 and orifice 53. In a given furnace, best results for burning the oil efficiently will be found when the cone of atomized oil includes an angle varying only within very small limits. Since this angle in the burners described is largely determined by the relation between the total cross sectional areas of the tangential passages into the whirling chamber and the area of the orifice, no substantial changes in these factors may be allowed. An ordinary ratio between the area of the tangential passages and the area of the orifice is 1.0, approximately.

For the highest burning capacities, the handle 60 is rotated counter-clockwise until the threaded end of the operating rod is seated in the bore 25 of the atomizer body 10, allowing free passage of oil through all bores 46, 47 and slots or grooves 57. Motion of the operating shaft will be transmitted to the indicating finger 64 relative to the scale 65, which latter is graduated to show the various burning rates. The stuffing box gland 22 and packing 23 are provided for oil sealing purposes. The nozzle body 30 is screwed onto the barrel 14 until it seats tightly. The nozzle cap 36 is screwed on the nozzle body 30 and secures the sprayer plate 48. It will be noted that the tangential slots 57 in the sprayer plate can be in any position since oil is fed through the circumferential groove 45 in the nozzle body 30. Therefore, no centering pins to match holes and slots are required.

It should now be apparent that there has been provided a wide range burner which will give burning ranges up to 20 to 1 and which will operate efficiently for the minimum boiler capacity. It should also be apparent that there has been provided a wide range mechanical atomizer which will embody the principles of atomization based on a thorough study and experimental research, covering these principles.

While various changes may be made in the detail construction, it shall be understood that such changes shall be within the spirit and scope of the present invention as defined by the appended claims.

What is claimed is:

1. A burner for oil furnaces comprising a tube means, nozzle means fixed to one end of said tube, said nozzle means including a whirling chamber, oil passages substantially tangential to said whirling chamber, and an orifice, said nozzle means having a first plurality of bores directly connecting said tube with said oil passages, said nozzle means further having a second plurality of bores connecting said tube with said oil passages, the inlets of said first plurality of bores being spaced from the inlets of said second plurality of bores, plunger means adapted to close off the inlets of said second plurality of bores, and slidably, rotatable means for moving said plunger means into operative position adjacent said nozzle means.

2. A burner according to claim 1, said nozzle means including a nozzle body secured to the end of said tube, and a sprayer plate on the end of said nozzle body.

3. A burner for oil furnaces comprising a tube, a nozzle body secured to one end of said tube, a sprayer plate secured to the end of said nozzle body, said sprayer plate having an orifice, and a whirling chamber extending into said orifice, said sprayer plate further having oil

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passages substantially tangential to said whirling chamber, said nozzle body having a first plurality of longitudinally extending bores therethrough directly connecting said tube with the inlets of said oil passages, said nozzle body having a central bore communicating with said whirling chamber, said nozzle body at the end thereof remote from said whirling chamber having an enlarged bore communicating with said central bore and providing a seat, a plunger adapted to fit within said seat, said plunger including an extension extending through said central bore and therebeyond whereby to partially seal off the outlets of said oil passages when said plunger is within said seat, said nozzle body having a second plurality of bores connecting said seat with the inlets of said oil passages having inlets adapted to be closed off by movement of said plunger into said seat, and rotatable means for moving said plunger into operative position within said seat.

4. A burner according to claim 3, including an orifice tip carried by said plunger extension and extending within said orifice whereby to increase the area of said orifice as said whirling chamber area is increased upon movement of said plunger away from said seat.

5. A burner according to claim 3, the inner face of said sprayer plate having a substantially circular recessed portion communicating with said whirling chamber when said plunger is displaced from said seat, the outer end of said nozzle body having an annular groove connecting the outlets of said first and second plurality of bores with each other and with the inlets of said oil passages and said circular recessed portion.

6. A burner according to claim 3, said slidable, rotatable means for moving said plunger means being operable from the opposite end of said tube.

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7. A burner according to claim 3, said slidable, rotatable means comprising a rotatable operating rod centrally located within the tube and arranged to be rotated only from the outer end of the tube, said operating rod having an externally threaded portion screw threaded to the other end of said tube, and manually operable means for rotating said operating rod.

8. A burner according to claim 7, said externally operable means for rotating said operating rod comprising a handle secured thereto, an indicating finger carried by said handle and cooperating scale means carried by the end of said tube whereby to indicate by a direct reading the fuel consumption.

9. A burner for oil furnaces comprising a tube, a nozzle fixed at one end of said tube, said nozzle having an annular groove, a sprayer plate forming a whirling chamber with the nozzle, an orifice for the nozzle said nozzle having oil passages longitudinally extending from the tube to the forward part of the nozzle into the chamber, and passages radially extending to the groove, oil passages substantially tangential to the whirling chamber and the orifice, operable plunger means extending through the tube and the nozzle to close off the radially extending passages, and the center of the nozzle.

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