May 17, 1938. B. G. WOOLLEY 2,117,388

OIL BURNER

Filed April 30, 1935 2 Sheets-Sheet 1

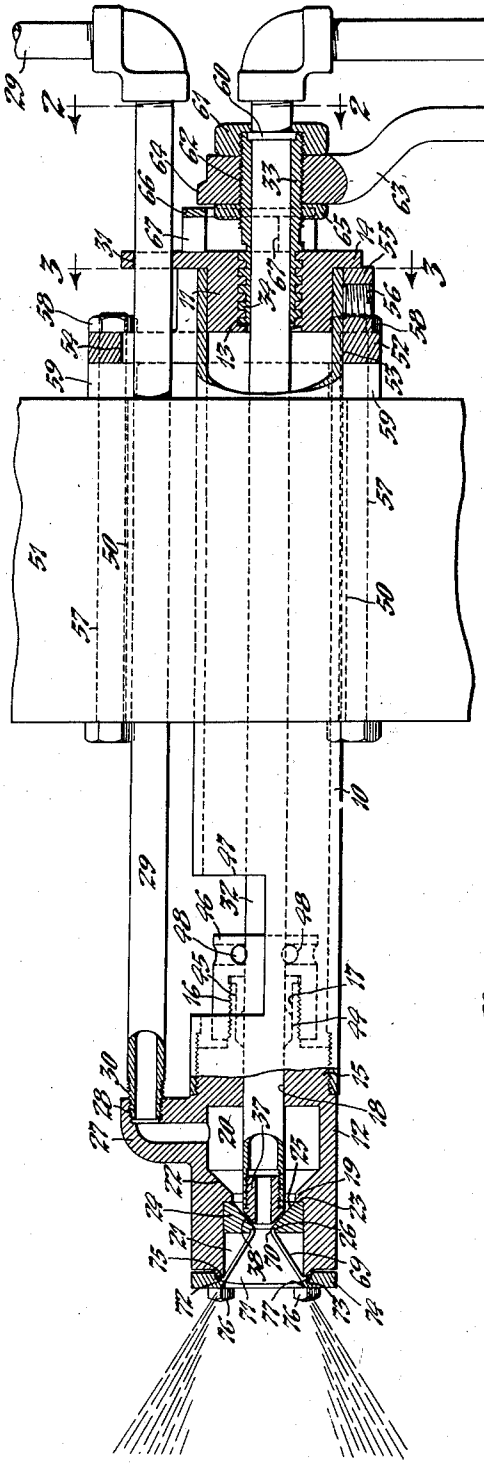

Fig. 1.

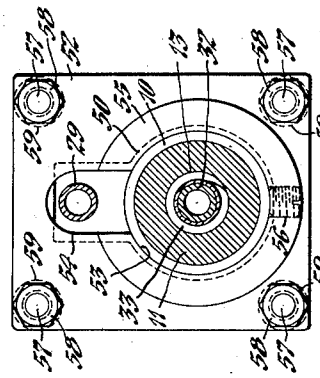

Fig. 3.

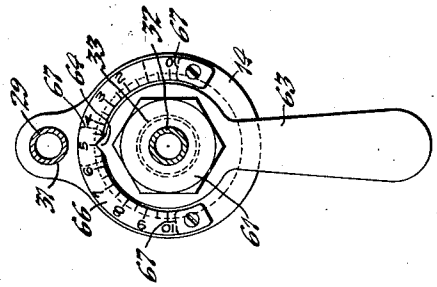

Fig. 2.

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OIL BURNER

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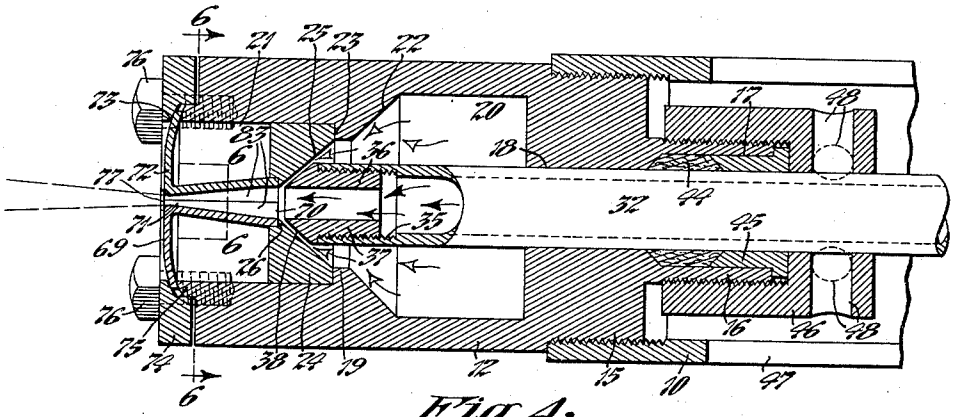

Fig. 4.

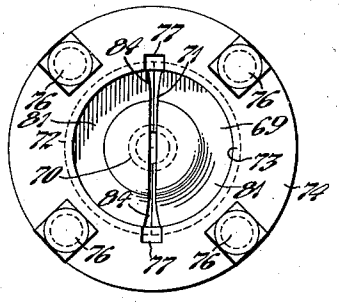

Fig. 5.

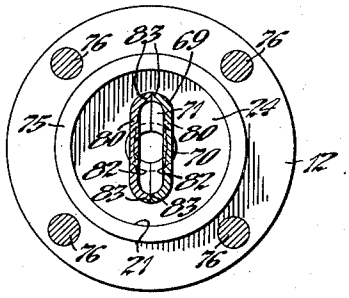

Fig. 6.

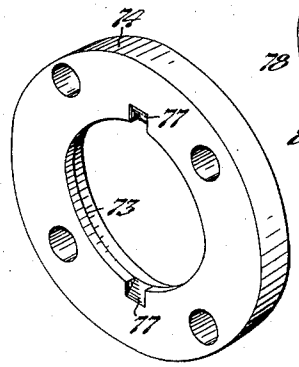

Fig. 7.

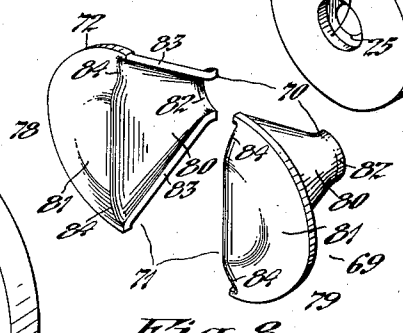

Fig. 8

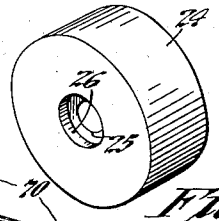

Fig. 9.

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UNITED STATES PATENT OFFICE

2,117,388

OIL BURNER

Bradford G. Woolley, Providence, R. I., assignor to Hammel Oil Burning Equipment Company, Inc., Providence, R. I., a corporation of Rhode Island

Application April 30, 1935, Serial No. 19,070

5 Claims. (Cl. 299—140)

This invention relates to oil-burners and more particularly to oil-burners of the type in which the oil is sprayed through a dispensing nozzle with an atomizing medium.

One of the objects of the present invention is to provide an oil-burner of the type indicated having a casing and means for clamping a detachable spraying tip to the casing.

Another object of the present invention is to provide an oil-burner of the type indicated which is designed to facilitate the cleaning and removal of carbon deposits.

Another object of the present invention is to provide a spraying tip for an oil-burner having correspondingly-shaped members assembled and clamped in reverse relationship to form a dispensing nozzle.

Still another object of the present invention is to provide a two-part spraying tip of the type indicated which may be quickly attached to and removed from the burner casing to facilitate repair or replacement.

Still another object of the present invention is to provide an oil-burner of the type indicated which is of simple construction, economical to manufacture and assemble and one which is efficient in performing its intended function.

Further objects of the invention are set forth in the following specification which describes a preferred form of construction of the invention, by way of example, as illustrated by the accompanying drawings. In the drawings:

Fig. 1 is a side elevational view of an oil-burner shown partly in section and incorporating the novel features of the present invention;

Fig. 2 is a transverse sectional view taken on line 2—2 of Fig. 1 and showing the means for adjusting the flow of the atomizing medium to the spraying tip;

Fig. 3 is a transverse sectional view taken on line 3—3 of Fig. 1 and showing the means for supporting the oil-burner in operative position;

Fig. 4 is an enlarged plan view in section of the oil-burner head shown in Fig. 1;

Fig. 5 is an end elevational view of the burner head showing the outlet end of the spraying tip;

Fig. 6 is a transverse sectional view taken on line 6—6 of Fig. 4 and showing the contour of the spraying tip in end elevation;

Fig. 7 is a detailed perspective view of the retaining ring for the spraying tip;

Fig. 8 is a detailed perspective view of the cooperating members forming the spraying tip; and

Fig. 9 is a detailed perspective view of the septum plate to which the spraying tip is clamped.

The oil-burner in general comprises a casing adapted to be mounted in the fire door or wall of a furnace and having a hollow spraying tip at its forward end for spraying the oil. The atomizer tip is formed by a pair of correspondingly-shaped members that are clamped in cooperative reverse relationship in an open ended chamber at the forward end of the casing. Liquid fuel is fed to the tip through a supply-pipe which extends through the casing and terminates at the rearward end of the tip; and surrounding the end of the feed-pipe is a mixing chamber to which an atomizing medium is supplied. Means are also provided for adjusting the oil feed-pipe with respect to the casing to vary the rate of flow of the atomizing medium between the end of the pipe and the end wall of the mixing chamber.

Referring now to Fig. 1 of the drawings, the oil-burner casing is herein shown as comprising a tubular shell 10 having a closure plug 11 at its rearward end and a head 12 at its forward end. The plug 11 is forced into or otherwise secured to the end of the shell 10 and has a screw-threaded bore 13 axially positioned with respect to the shell and a radially-extending flange 14 at the rearward end of the shell. The head 12 is connected with the forward end of the shell 10 by a threaded portion 15 screwed into engagement with the interiorly threaded forward end of the shell to form a closure therefor. The head 12 has a reduced rearwardly-extending sleeve 16 formed with an axial bore 17 to provide a stuffing box. The head 12 has an axial bore 18 enlarged at its forward end with an intermediate inwardly directed annular rib 19 forming a rearwardly-positioned mixing chamber 20 and a forwardly-positioned dispensing chamber 21. The rearward face of the rib 19 is beveled to provide a conical wall 22, while the forward face of the rib forms an annular shoulder 23.

A septum plate 24 is seated against the shoulder 23 in the chamber 21 of the head 12 and has a rearwardly-extending conical aperture 25 and an annular recess 26 in its forward face forming a seat surrounding the aperture 25. A radially-projecting and rearwardly-extending conduit 27, formed integrally with the head 12, communicates with the mixing chamber 20 at its inward end and has screw-threads 28 at its outward end. A supply-pipe 29 for an atomizing medium, such as air or steam, has a screw-threaded end 30 connected with the outer end of the conduit 27. The pipe 29 extends rearwardly through an aperture 31 in the flange 14, being thereby supported at the rearward end of the burner.

An oil supply- or feed-pipe 32 extends through the bores 13 and 18 in the plug 11 and head 12, respectively. At the rearward end of the burner the supply-pipe 32 is embraced by a sleeve 33 having an exterior screw-threaded portion 34 in engagement with the screw-threads in the aperture 13 of the plug 11. At its forward end the interior of the supply-pipe 32 is screw-threaded at 35 for receiving the threaded shank 36 of a measuring nozzle 37. The forward end of the nozzle 37 has a conical periphery 38 cooperating with the conical aperture 25 in the septum 24 to form an annular passageway therebetween for the atomizing medium.

The joint between the oil supply-pipe 32 and head 12 is sealed by a packing 44 in the counterbore 17 of the sleeve 16, see Fig. 4. The packing 44 is compressed by a gland 45 forced thereagainst by a nut 46 having a screw-threaded engagement with the periphery of the sleeve 16. The tubular casing 10 adjacent the nut 46 is cut away at 47 to provide an extended arcuate opening for the insertion of a spanner wrench or similar tool suitably shaped to engage with sockets 48 in the nut 46 to adjust the latter.

The oil-burner assembly extends through an opening 50 in the door or wall 51 of a furnace and is mounted thereon by means of a bracket or plate 52. As shown in Fig. 3 the plate 52 has openings 53 and 54 through which the casing 10 and pipe 29 extend and a projecting annular flange 55 which closely embraces the rearward end of the shell 10. The casing shell 10 is secured in position in the flange 55 by suitable means such as a set-screw 56 extending through the flange with its end impinging against the shell. The plate 52, in turn, is mounted on the wall 51 by means of a plurality of bolts 57 extending through the wall and plate with nuts 58 at their ends; bosses 59 being provided on the rearward face of the plate 52 to space the plate from the wall.

As shown in Figs. 1 and 2, the oil supply-pipe 32 is longitudinally adjustable with respect to the casing 10 to regulate the flow of the atomizing medium by varying the width of the annular passageway between the conical wall of the aperture 25 in the septum 24 and the conical periphery 38 of the pipe. To this end an annular flange 60 formed on the rearward end of the pipe 32 is seated in a counterbore or recess in the end of the sleeve 33 and engaged on its side by a nut 61 having internal screw-threads engaging screw-threads 62 on the periphery of the sleeve. The engagement of the flange 60 between the sleeve 33 and nut 61 allows rotary movement of the sleeve with respect to the feed-pipe 32 while providing for longitudinal movement of the pipe by and with the sleeve. A handle 63 has its nut-like hub screwed onto the exteriorly threaded portion 62 of the sleeve 33 and formed integrally therewith is a pointer 64 on the opposite side from the handle, see Fig. 2. The handle 63 is secured fast on the sleeve 33 between the nut 61 and a lock-nut 65 screwed onto the threaded portion 62 of the sleeve. Thus, by rotary movement of the handle 63 the assembly of handle, sleeve 33 and nut 61 may be rotated and due to the engagement of the screw-threads 34 on the forward end of the sleeve 33 with the interior screw-threads 13 in the block 11 the complete assembly will be moved longitudinally as a unit. Further, due to the engagement of the flange 60 on the pipe 32 between the end of the sleeve 33 and the nut 61 the pipe 32 will be moved longitudinally with respect to the casing 10 to adjust the width of the space between the conical periphery 38 of the measuring nozzle 37 and the conical wall of the aperture 25 in the septum 24. An indicating dial 66 is mounted on the flange 14 by brackets 67 in position to cooperate with the pointer 64 to indicate the degree of adjustment in the width of the passageway for the atomizing medium.

A spraying tip 69 is mounted in the dispensing chamber 21 of the head 12 and, as herein illustrated, the tip is generally of flaring contour or fan-shaped with a reduced annular wall surrounding its inlet end 70 and adapted to fit within the annular seat 26 on the forward face of the septum 24. The fan-shaped portion of the tip 69 provides a relatively narrow flaring slot or outlet 71 and at its end is a slightly convexed circular flange 72 surrounding the outlet. The button-like flange 72 serves as the means for clamping the tip 69 in place at the end of the burner head 12, the circular overhanging rim of the flange being engaged by an inwardly-directed shoulder 73 on a retaining ring 74 to clamp the inlet end 70 against the annular seat 26 in the septum 24. The retaining ring 74, shown in detail in Fig. 7, is mounted on an annular shoulder 75 at the end of the head 12 and the outer face of the shoulder has a contour corresponding with the cupped contour of the flange 72. The ring 74 is attached to the end of the head 12 by bolts 76 to clamp the tip 69 in its operative position. Oppositely disposed slots 77 are provided on the ring 74 which aline with the slot-shaped outlet 71 and form a continuation of the fan-shaped contour thereof.

As one feature of the present invention the spraying tip 69 is preferably constructed in two sections comprising a pair of separable correspondingly-shaped members 78 and 79 assembled in reversed relationship and cooperating to form a hollow nozzle of a contour to give the flame pattern desired. As shown most clearly in Fig. 8, each of the members 78 and 79 has a generally triangular-shaped wall 80 merging into a semicircular portion 81 which is bent at right-angles to provide a concavo-convex flange at its outer end. At the inner end the wall 80 is shaped to form a semicircular rim or flange 82 for engagement with the seat 26. Between the rim 82 and the flange 81 the two opposite marginal portions 83 of the flaring wall 80 project at substantially right-angles to the flat plane of the wall with the width of the portions or inclined walls 83 decreasing in a direction toward the semicircular flange 81, as shown in Fig. 4. The marginal portions 83 are preferably bent or folded over with respect to the flat plane of the wall but it is to be understood that the marginal portions may be formed in any suitable manner such as by casting or cutting a blank. When the two members 78 and 79 are reversed in position with respect to each other and assembled with the edges of the inclined walls 83 in abutting engagement the two sections cooperate to form the fan-shaped tip 69 with the circular flange 72 surrounding the outlet end 71 of the tip. Preferably, the side walls 80 are bowed inwardly slightly at the flanged end of the tip so that the slot-shaped outlet 71 is wider at its outer extremities 84 than at its center to provide for equal distribution of the oil as it is sprayed from the tip 69. Because of the slightly convexed rim on the flange 72 which is engaged by the inwardly-directed shoulder 73 on the retaining ring 74 the

elements are clamped and held in close-fitting abutting engagement. Having now described a preferred form of construction of the invention the mode of operation of the burner will be next explained.

The burner assembly comprising the casing 10, plug 11, and head 12 is mounted in the opening 50 in the door or wall 51 of the furnace and attached thereto by the plate 52. The rearward ends of the steam or air supply-pipe 29 and oil feed-pipe 32 are then connected with a source of supply of an atomizing medium and fuel, respectively, by suitable couplings not herein shown in detail. By means of valves or the like an atomizing medium such as steam or air and oil are supplied to the mixing chamber 20 of the burner in controlled quantities. To properly proportion the amount of atomizing medium with respect to the oil supplied the position of the end of the feed-pipe 32 is varied with respect to the conical wall of the aperture 25 in the septum 24. This adjustment is made by rotating the handle 63 and connected sleeve 33 which, due to the engagement of its threaded end 34 with the screw-threads 13 in the plug 11, causes the supply-pipe 32 to be moved longitudinally with respect to the casing 10 and head 12. The handle may be moved to any desired position with the degree of adjustment indicated by the position of the pointer 64 on the dial 66. The spraying tip 69 having been mounted in the dispensing chamber 21 and clamped in its operative position with the tubular inlet end 70 engaging the annular seat 26 surrounding the aperture 25 in the septum 24, the oil will be injected through the tip together with the atomizing medium and discharged in a fan-shaped spray.

The burner may be continuously operated until such time as its tip becomes clogged or fouled with carbon or the like. The burner may then be cleaned by closing the oil supply valve leading to the pipe 32 and passing steam through the mixing chamber 20, conical aperture 25 in the septum 24 and spraying tip 69. During this cleaning process the conical end 38 of the pipe 32 is preferably moved rearwardly with respect to the conical aperture 25 by means of the handle 63 to increase the area of the annular passage therebetween and the amount of steam passing therethrough. Due to the velocity and scouring action of the steam the carbon, sludge or other foreign matter is blown out through the tip. If necessary the steam connection may be applied to the inlet end of the oil pipe 32 to effectively remove any accumulation of foreign matter therefrom.

The spraying tip 69 may be quickly dismantled to repair or replace the same by removing the bolts 76 and ring 74 from the end of the casing. The separable parts 78 and 79 of the spraying tip may then be withdrawn from the chamber 21. In some installations the oil-burner is withdrawn as a unit from the furnace wall or door 51 before the spraying tip is dismantled but in other installations the dismantling may be done through a suitable opening in the door. After the separable members 78 and 79 or the septum 24 have been repaired or new parts substituted they are again assembled with the edges of their inclined walls 83 in abutting engagement and the annular wall 82 at the inlet end inserted in the annular seat 26 in the septum 24 and the retaining ring 74 applied over the circular flange 72 and attached to the end of the casing by the bolts 76. The annular shoulder 73 on the ring 74 engages the flanged rim 72 and applies pressure thereto which clamps the two parts 78 and 79 in abutting engagement with each other and in the seat 26 in the septum 24. The oil-burner is then ready for subsequent operation.

The invention and its mode of operation having now been described it will be apparent that a novel construction and arrangement of elements is provided in an oil-burner which is simple, compact and efficient for performing its intended function. Further, it will be apparent that a novel form of spraying tip is provided as constructed in separable correspondingly-shaped members that are clamped in their operative position by a quickly detachable ring at the forward end of the casing. The two-part burner construction provides for economical manufacture of the same in a structure which may be quickly assembled and disassembled.

While the device is herein described and illustrated as embodied in a preferred form of construction it is to be understood that various modifications may be made in the form and arrangement of its parts without departing from the spirit or scope of the invention. Therefore, without limiting myself in this respect, I claim:

1. An oil-burner comprising a casing having a chamber with a recessed seat in its rearward wall, a spraying tip in said chamber comprising a pair of identically-shaped complementary members arranged with one member inverted with respect to the other to form a fan-shaped orifice, one end of said tip being of tubular form and engaging the seat in the wall of the chamber, clamping means at the opposite end of the tip, means for attaching the clamping means to the casing to secure the tip thereto, and a conduit for supplying fuel to the tip.

2. A burner-tip comprising a pair of identically-shaped complementary members arranged with one member inverted with respect to the other member, each of said members having a triangular wall terminating in a semicircular end extending outwardly to form a flange and inwardly-extending marginal walls at the opposite sides of the triangular wall, the edges of the inwardly-directed marginal walls of one member abutting the edges of the marginal walls of the opposite member, said members cooperating to provide a fan-shaped spraying orifice for the fuel.

3. A burner-tip comprising a pair of identically shaped complementary members arranged with one member inverted with respect to the other member, each of said members having a triangular wall with a semicircular end extending outwardly to form a flange and shaped at its opposite end to form a half annulus, said members having substantially right-angular inwardly-extending marginal walls decreasing in width from the half annular end toward the opposite end, said members cooperating to form a fan-shaped orifice having a tubular inlet and slot-shaped outlet.

4. A burner-tip comprising a pair of identically-shaped complementary members arranged with one member inverted with respect to the other member, each of said members comprising a wall having a flanged end portion extending outwardly at right-angles thereto and right-angular marginal walls extending inwardly and merged into a half annular end, the edges of the marginal walls of the two members abutting to form a fan-shaped orifice having a tubular inlet and a slot-shaped outlet, said outwardly-directed

flanged end portions being adapted to hold the pair of members in cooperative relationship.

5. A burner-tip comprising a pair of identically-shaped sheet-metal members arranged with one member inverted with respect to the other member, each of said sheet-metal members being formed to provide a side wall with marginal edges extending inwardly and a semicircular flanged end extending outwardly therefrom, said marginal edges of the cooperating parts abutting to form a fan-shaped orifice and said flanges surrounding the outlet end of the orifice.

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