Oct. 3, 1933. I. M. HAYWARD 1,928,688

OIL BURNER

Filed Oct. 8, 1931 3 Sheets-Sheet 1

Fig. 1.

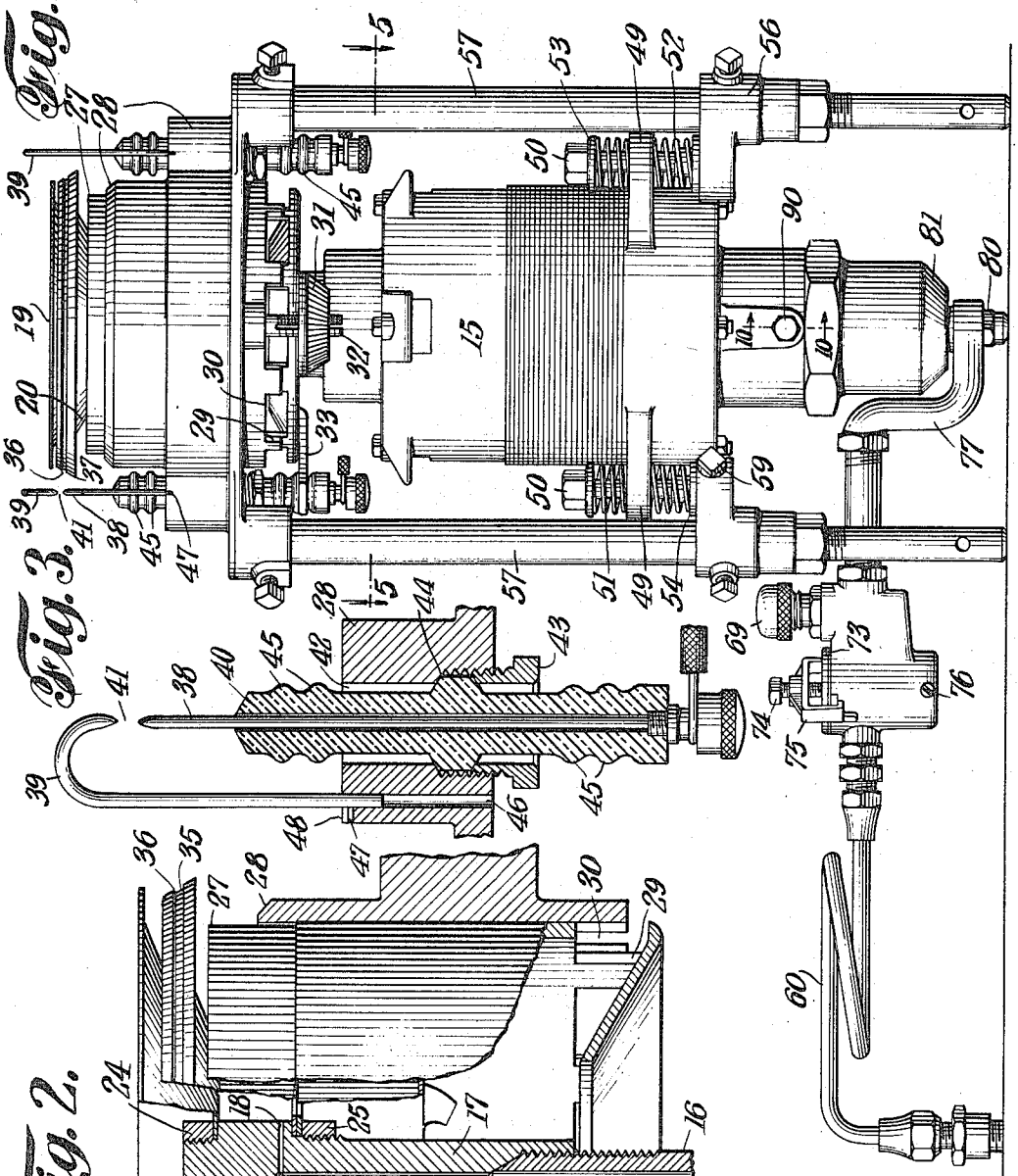

Fig. 3.

Fig. 2.

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Oct. 3, 1933. I. M. HAYWARD 1,928,688

OIL BURNER

Filed Oct. 8, 1931 3 Sheets-Sheet 2

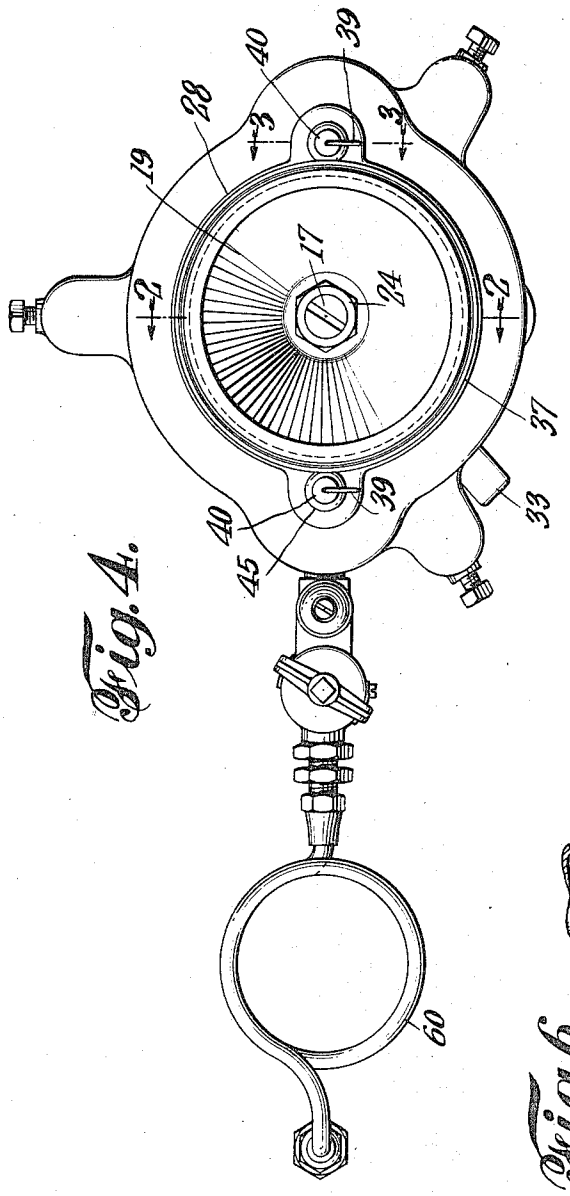

Fig. 4.

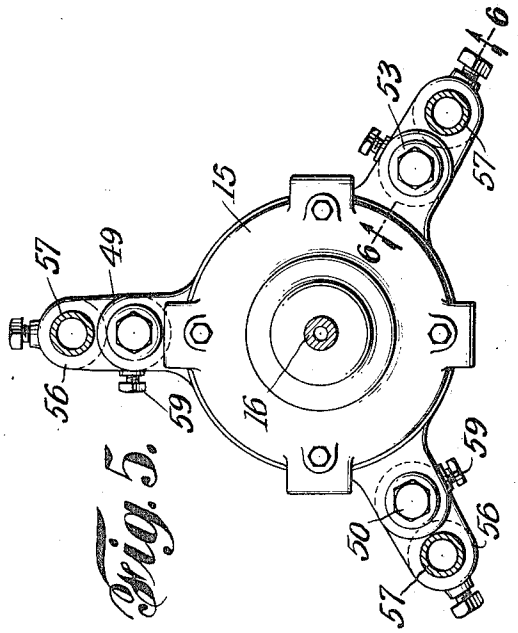

Fig. 5.

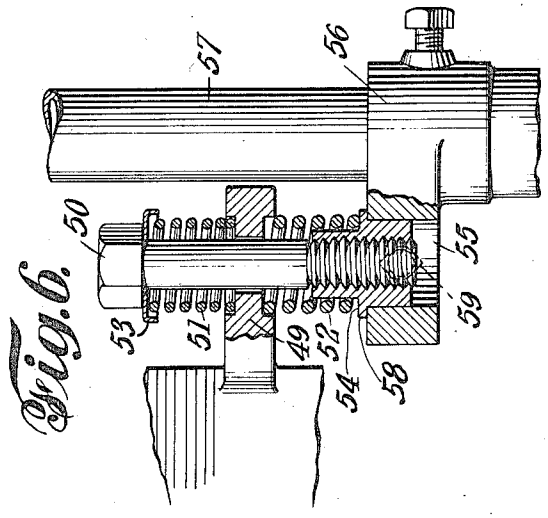

Fig. 6.

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Filed Oct. 8, 1931 3 Sheets-Sheet 3

Fig. 8.

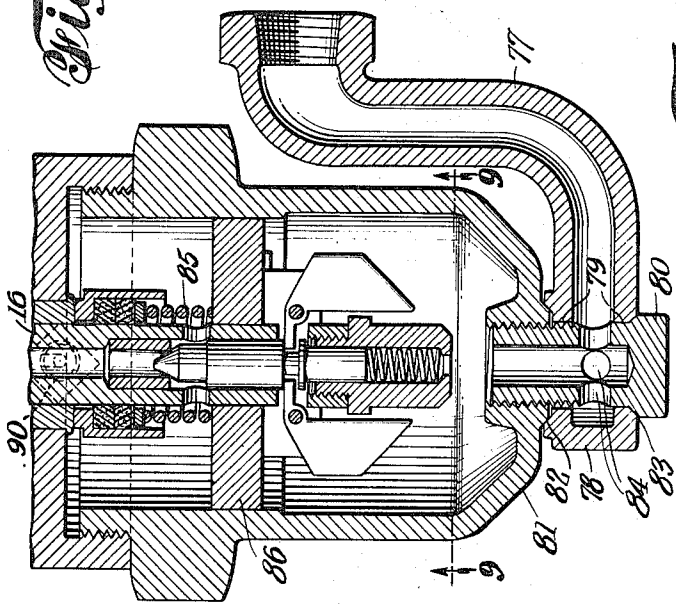


Fig. 9.

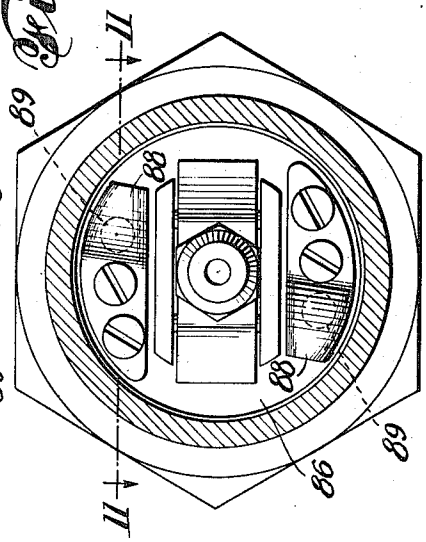


Fig. 10.

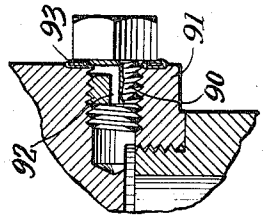


Fig. 7.

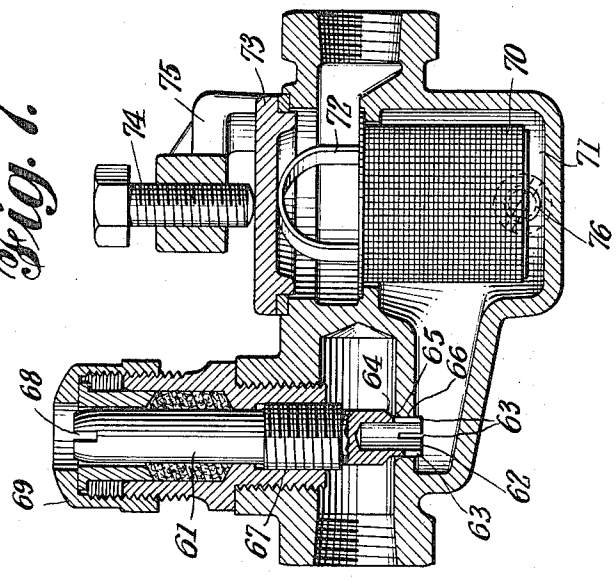
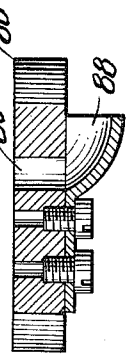


Fig. 11.



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UNITED STATES PATENT OFFICE

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OIL BURNER

Irving M. Hayward, Brooklyn, N. Y.

Application October 8, 1931. Serial No. 567,553

8 Claims. (Cl. 158—77)

This invention relates to oil burners of the type for which application for patent was filed September 23, 1930, Ser. No. 483,779.

The objects of the present invention are to simplify the construction; reduce the cost of production; facilitate assemblage of parts; improve the atomizer by making the same lighter and at the same time stronger; to increase the efficiency of the atomizer by better controlling the oil and the supply of air; to improve the ignition apparatus; to combine with the motor the adjustable mounting means for the same; to provide an inexpensive and practical air release for quickly freeing any air trapped in the system; to provide simple and effective valve means for controlling the oil flow and to facilitate the mounting of the apparatus to meet particular situations or requirements.

The foregoing and other desirable objects of the invention have been attained by the novel features of construction, combinations and relations of parts hereinafter disclosed and broadly covered in the claims.

The drawings accompanying and forming part of the following specification illustrate the embodiment of the invention in one practical commercial form. It will be appreciated however, that the structure may be modified and changed as regards the present disclosure without departure from the true spirit and broad scope of the invention.

Fig. 1 is a front elevation of the burner;

Fig. 2 is an enlarged broken sectional detail of the atomizer head;

Fig. 3 is a broken sectional detail of one of the igniters;

Fig. 4 is a plan view of the device shown in Fig. 1;

Fig. 5 is a horizontal sectional view as on substantially the plane of line 5—5 of Fig. 1;

Fig. 6 is a broken sectional detail of the motor mount as taken generally on the plane of line 6—6 of Fig. 5;

Fig. 7 is a longitudinal sectional view of the oil adjusting valve and strainer;

Fig. 8 is a vertical sectional view illustrating the swivel coupling for the oil supply line;

Fig. 9 is a cross sectional view as on line 9—9 of Fig. 8 showing the scoop construction of the impeller;

Fig. 10 is a broken sectional detail of the air release plug;

Fig. 11 is a sectional detail of the lift impeller as taken on line 11—11 of Fig. 9.

In the form of the apparatus shown, there is provided an electric motor 15 arranged with its armature shaft vertical and carrying at the top a fuel atomizer of the whirl type. In Fig. 2 the upper end of the motor shaft is indicated at 16, of tubular form to act as a conduit for carrying the oil up to the atomizer head.

The atomizer comprises a tubular head piece 17 screwed on the upper end of the motor shaft and having a series of radially extending oil outlets 18, in the enlarged or head portion of the same and carrying spaced discs or flange-like members 19, 20 above and below the same.

The lower disc 20 is cupped in its central portion 21 opposite the oil outlets and extends from such cupped portion substantially parallel and in closely spaced relation with the upwardly and outwardly flared top plate 19, forming therewith an annular outwardly flaring throat.

Air for atomization and combustion is furnished by a fan 22 below the lower disc or atomizing plate and this fan is shown as an inverted cup 23 arranged in back-to-back engagement with the atomizer plate cup, with the fan structure in the form of blades projecting outwardly from the lower end of such cup formation. This cupped structure locates the fan blades at a proper distance below the atomizer disc and provides an annular boundary defining an uprising current or air beneath the atomizing disc and a second uprising current of air between the two discs, as indicated by the arrows in Fig. 2.

For securing the top disc in place, there is shown a nut 24 secured over the screw threaded upper end of the shaft extension and fastening said disc against the upper side of the flange or head portion of said shaft extension. The lower disc is secured in like fashion by a nut 25 on a screw threaded portion of the shaft below the flange or head and in the illustration the back-to-back relation of the two cup members enables both being secured against the underside of the flange by the one nut, 25.

The cupped portions of the atomizer disc and fan are indicated as perforated at 26 for passage of air up into the discharge throat. It will be evident that by adjusting these two members angularly to carry the perforations therein more or less into and out of complete registry the volume of air which will be passed up into the throat may be accurately regulated. This adjustment is easily made by loosening nut 25, relatively turning the two cup-like members and then tightening nut 25 to clamp said members in the desired adjusted relation.

The fan operates within an annular valve sleeve

27, extending up beneath the atomizer disc and vertically and circularly adjustable within a stationary annular burner head 28 for purposes of controlling cooperating air ports 29, 30, in the lower ends of the sleeve and burner head. The vertical adjustment of the valve sleeve is shown as effected by a hand nut 31, engaging the lower end of the sleeve and frictionally held in set relation on a split screw stem 32, Fig. 1, while angular adjustment of the sleeve is shown as effected by means of an outstanding handle 33 on the lower end of the sleeve.

The atomizer disc, 20 in the illustration, has a downturned flange or lip 34 about the rim of the same forming a baffle overstanding the edge of the air valve sleeve to confine and direct the flow of air radially outwardly to aid combustion.

To predetermine the point at which the oil will leave the atomizer disc, a groove 35 is formed in the outer surface of the downwardly angled flange or lip 34, which at its upper edge forms an inwardly angled shoulder 36, providing a definite "parting line", for the oil, while it will creep outwardly under centrifugal action, will not flow inwardly, contrary to centrifugal force. The lower under edge of the downwardly angled flange or lip is shown as outwardly bevelled to a sharp edge at 37, to drain off any liquid particles that may have been under way at a time when the burner is shut down.

This atomizer construction, while particularly efficient is relatively inexpensive, can be produced in light sheet metal and at the same time, it is strong because of the way in which the inverted cup of the fan braces the central cup portion of the disc and the way in which these perforated cup portions brace one another.

The igniter comprises in the illustration two electrodes 38, 39, the first in the form of a straight rod carried by an insulator 40 and the second being a grounded conductor hooked over the end of the first to locate a spark gap 41, substantially in line with the oil parting circle 36 of the atomizer, Fig. 1. The insulated electrode is shown as set up through an opening 42 in the upper ring member 28 and as removably held in such location by a hollow surrounding nut 43 engaging the shouldered portion 44 of the electrode to hold it in such seated relation. The insulator 40 of the electrode 38 is of novel structure, in that it is provided at both ends, that is, above and below the supporting member 28 with annular outstanding ribs or flanges 45 providing cooling and increase in insulating surface without lengthening the insulator. Thus, a comparatively short-length insulating tube is made to accomplish the same results and have the same insulating effect as an appreciably longer tube. These heat dissipating and surface lengthening ribs being located both above and below the support serve to insulate the electrode equally well at both ends and as the insulator is held only at the enlarged or shouldered intermediate portion of the same, it can freely expand and contract under varying heat conditions.

The grounded electrode is shown as removably set in a socket or hole 46 in the base ring 28 and as located angularly to align with the other electrode by means of a small outstanding pin 47, entering a positioning notch 48 in the top of the base. Either one or both the electrodes are thus readily removable or replaceable and when mounted on the base become automatically positioned to establish the spark gap in the proper relation. One or any number of the igniters may be used. In the illustration, Figs. 1 and 4, two such igniters are indicated.

The motor may be cushioned by mounting it on spring supports and a special feature of the present invention is the attachment of said spring supports to the motor in such way, that these spring supports will remain attached to and come away with the motor when the latter is removed from the tripod or mounting stand. This special novel feature will be clear from Figs. 1 and 6, which show the motor casing as having mounting lugs 49 through which freely pass bolts 50, surrounded by springs 51, 52, the upper springs 51 being interposed between the mounting lugs and the abutment caps 53 beneath the heads of the bolts and the lower springs 52 being interposed between the lugs and the abutment bushings 54, screwed on the lower ends of the bolts. The upper cushioning springs 51 may be lighter than the lower springs 52, since they are only required to hold the motor lugs firmly down on the lower springs, which carry the weight of the motor. Adjustment of the bolts 50 in the bushings 54, determines the degree of compression on the springs and hence the cushioning effect. The spring abutment bushings 54, as shown in Fig. 6, seat in the sockets 55, in the collars 56 on the posts of columns 57 of the burner stand, the outstanding flanges 58 on such bushings serving both as abutment shoulders for the springs and as rests engaging with the ends of the socket 55. Set screws 59 are shown provided for securing the bushings or spring rests in their sockets in the stand and for securing the same against turning when the bolts 50 are rotated for adjusting the springs and positioning the motor and hence the atomizer head. It will be evident, that upon release of these set screws, the entire motor assembly with its spring mounts can be lifted out of the supporting frame. Thus, the springs need not be again disturbed after they have once been properly mounted or adjusted with respect to the motor.

As a further aid to elimination of vibration and quieting the operation of the burner, the oil supply line where it comes up through the floor or other stationary structure may be formed with a flexible loop of tubing as indicated at 60 in Figs. 1 and 4. This loop may consist of one or more turns or a part-turn or part-turns of flexible copper tubing.

The oil control and strainer construction is illustrated in Figs. 1, 4 and 7, the latter in particular, showing the novel construction of the valve 61, having a hollow lower end 62, longitudinally slotted at 63, to different distances inward from the end toward a bevelled shoulder 64 opposed to a bevelled seat 65. This slotted tubular portion of the valve extends down through the bore 66 below the valve seat 65, so that vertical adjustment of the valve as by screwing it up or down in its guide 67 will open up or close off one or more of the control slots 63 to greater or less extent. The valve action is thus effected without "feathering" or drawing the flow to a fine edge, which latter is objectionable because of the greater possibility of stoppage of flow by dirt or solid particles in the oil. The flow through the valve is thus through the full width of a slot or slots of variable length. The upper end of the valve stem is shown as slotted at 68 for a screw driver or special adjusting tool and this adjustment end of the valve is shown as covered and protected by a surround-

ing bushing or cap 69. The strainer is illustrated in the form of a basket 70, set down in a well 71 of the valve casing and having at the top an arch or handle 72, forming an arched yielding spring element engaged by the removable cover 73, which is held down by a screw 74 in the removable yoke 75. By such construction, the strainer basket is held down firmly to its seat and any adjustment of bolt 74 necessary to seal the removable cover is automatically taken up by the yielding arched handle of the basket. The strainer well is shown equipped with a drain plug 76.

The flexible loop or coil in the oil line is of further advantage in facilitating proper location of the burner, permitting the complete burner unit to be adjusted one way or another, after the connections are made up.

The proper setting of the burner is further facilitated, in the illustration, by a swivel connection between the oil line and burner unit. This feature is illustrated in Figs. 1 and 8 in the form of an elbow 77 in the oil line closed at the end at 78 and having vertical openings 79 up through the same for the plug 80, which screws up into the bottom of a well or oil chamber 81, attached to the lower end of the motor. The upper face of the elbow is shown as having a bevelled swivelling valve engagement with the bottom of the oil chamber 82 and the hollow screw plug is shown as having a similar bevelled swivel valve engagement with the bottom of the elbow at 83. Thus when the plug is loosened, the elbow or swivel may be rotated on the bottom of the oil chamber one way or another to suit the particular position of the burner and the oil connection and then the screw plug be tightened to seal the swivel to the oil chamber in this particular position of adjustment. The hollow plug having openings 84 in the sides of the same communicating with the interior of the elbow then serves as part of the oil supply conduit.

The lower end of the hollow motor shaft is shown as equipped with a centrifugally opening valve 85, within the oil chamber for automatically cutting off flow up to the atomizer when the motor stops or loses speed and also as carrying an impeller 86 for positively forcing oil up through the shaft. As appears in Figs. 8, 9 and 11, this impeller is of special design, comprising a disc carrying on its under face forwardly facing scoops 88 for forcing oil up through passages 89 in the impeller disc.

At times, and particularly so at the time of connecting up the apparatus, a certain amount of air may be trapped in the oil chamber at the foot of the motor. This air should be vented out of the system. To enable such venting being readily accomplished, there is provided in the illustration, a small screw plug 90, Figs. 1 and 10, let into the top of the oil chamber, for instance, the dependent hub or sleeve portion 91 of the motor casing to which the oil chamber is screwed, said plug having a passage 92 extending from the inner end out through the side of the same, which will be sealed by the gasket 93, when the plug is set up tight in its seat.

After all oil connections are made, the plug 90 may be unscrewed far enough to open up the passage 92 therethrough, any trapped air then escaping out through this passage. The appearance of oil automatically indicates that all the air has been discharged, whereupon the plug may then be tightened to its seat. At any time after installation, the system may be tested for trapped air by simply loosening this part.

The position of the parting groove in the lip of the atomizer disc determines the position of the flame vertically and the length of lip below the reentrant angle of the groove determines the distance of the flame from the edge of the disc. By properly controlling these factors, the so called "halo" of flame may be accurately controlled to obtain the desired results. The down turned lip of the atomizer by deflecting the air downwardly, serves to pull or hold the flame downward, preventing it being blown upwardly. This construction also improves the atomization. The scoop or scoops on the underside of the disc in the well or chamber at the foot of the motor provide a simple effective form of impeller for positively lifting the liquid and putting suction on the supply line. The atomizer head and the igniters are usually so related that the spark gaps between the electrodes are in horizontal alignment with the parting groove in the rim of the atomizer disc so that the oil is thrown outwardly through these gaps, instead of on the electrodes at the edges of the gaps. In addition to drawing the sparks across the stream of oil particles and hence facilitating ignition, by such relation, the oil is thrown through the spark gaps instead of on the electrodes at the edges of the spark gaps, preventing "fouling" and carbonizing of the electrodes.

The present disclosure illustrates a preferred embodiment of the invention but as many changes may be made within the true intent of the invention, it should be understood that the terms employed herein are used in a descriptive rather than in a limiting sense, except possibly for limitations as may be imposed by the state of the prior art.

What is claimed is:

1. In apparatus of the character disclosed, a rotary shaft and cupped members mounted on said shaft with the cupped portions of such members in back-to-back relation, one reinforcing the other, said back-to-back cupped portions being perforate and relatively adjustable on the shaft for effecting various degrees of registration of such perforations and means to feed liquid to one of said cupped members.

2. An atomizer comprising a tubular rotating vertical shaft, a cover disc carried by the shaft, an atomizer disc spaced below the cover disc and having a cupped annular portion about the shaft means to feed liquid through said tubular shaft to said atomizer disc, a fan member having a cupped portion in back-to-back engagement with the cupped portion of the atomizing disc and provided with fan blades extending outwardly from said cupped portion, said back-to-back cupped portions having openings therethrough for air passage and means for adjustably securing said perforate cupped portions on the shaft.

3. In a device of the character disclosed, a horizontally disposed rotating atomizer disc of upwardly divergent truncated conical form and provided at the rim of the same with a downwardly flaring flange forming with the other portion of the disc a sharp angle, said flange having a sharpened lower terminal edge and a cover plate spaced above said disc and extending out over said downwardly flaring flange at the rim of the same.

4. In a device of the character disclosed, a horizontally disposed rotating atomizer disc of upwardly divergent truncated conical form and provided at the rim of the same with a downwardly flaring flange forming with the other portion of the disc a sharp angle, said flange having a sharp-

ened lower terminal edge, a cover plate spaced above said disc and extending out over said downwardly flaring flange at the rim of the same and said disc having air passages therethrough in the intermediate portion of the same inside the dependent rim flange.

5. A device comprising a rotary sprayer having a liquid distributing surface and an annular periphery, means to rotate said sprayer and means to feed liquid to said surface to be distributed to said periphery, an annular flange at said periphery flaring rearwardly of said surface and having formed therein rearward of said periphery a groove, the edge thereof first in the path of liquid flow being sharp.

6. A device of the character disclosed, comprising a horizontally disposed rotary atomizer disc having a liquid distributing surface and an annular periphery, means to rotate said disc, means to feed liquid to said surface to be distributed to said periphery, a downwardly projecting annular flange at said periphery flaring downwardly from said distributing surface and having formed therein below the periphery a groove, the edge thereof first in the path of liquid flow being sharp.

7. In apparatus of the character disclosed, a tubular rotating vertical shaft, discs arranged in spaced relation on said shaft, means to feed liquid through said tubular shaft to the space between said discs, a fan member in back to back engagement with the lower of said discs and provided with outwardly extending fan blades, the back to back portions of said fan member and disc having openings therethrough for air passage and means for securing said fan member and perforate disc in relatively adjustable relation on the shaft.

8. In apparatus of the character disclosed, a tubular rotating vertical shaft, discs arranged in spaced relation on said shaft, means to feed liquid through said tubular shaft to the space between said discs, a fan member in back to back engagement with the lower of said discs and provided with outwardly extending fan blades, the back to back portions of said fan member and disc having openings therethrough for air passage and means for securing said fan member and perforate disc in relatively adjustable relation on the shaft, said shaft having liquid outlets opening from the tubular portion of the same to the aforementioned space between the discs above said air openings and that portion of the lower disc which is secured in back to back relation with the fan member being cupped in line with said oil outlets in the tubular shaft.

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