

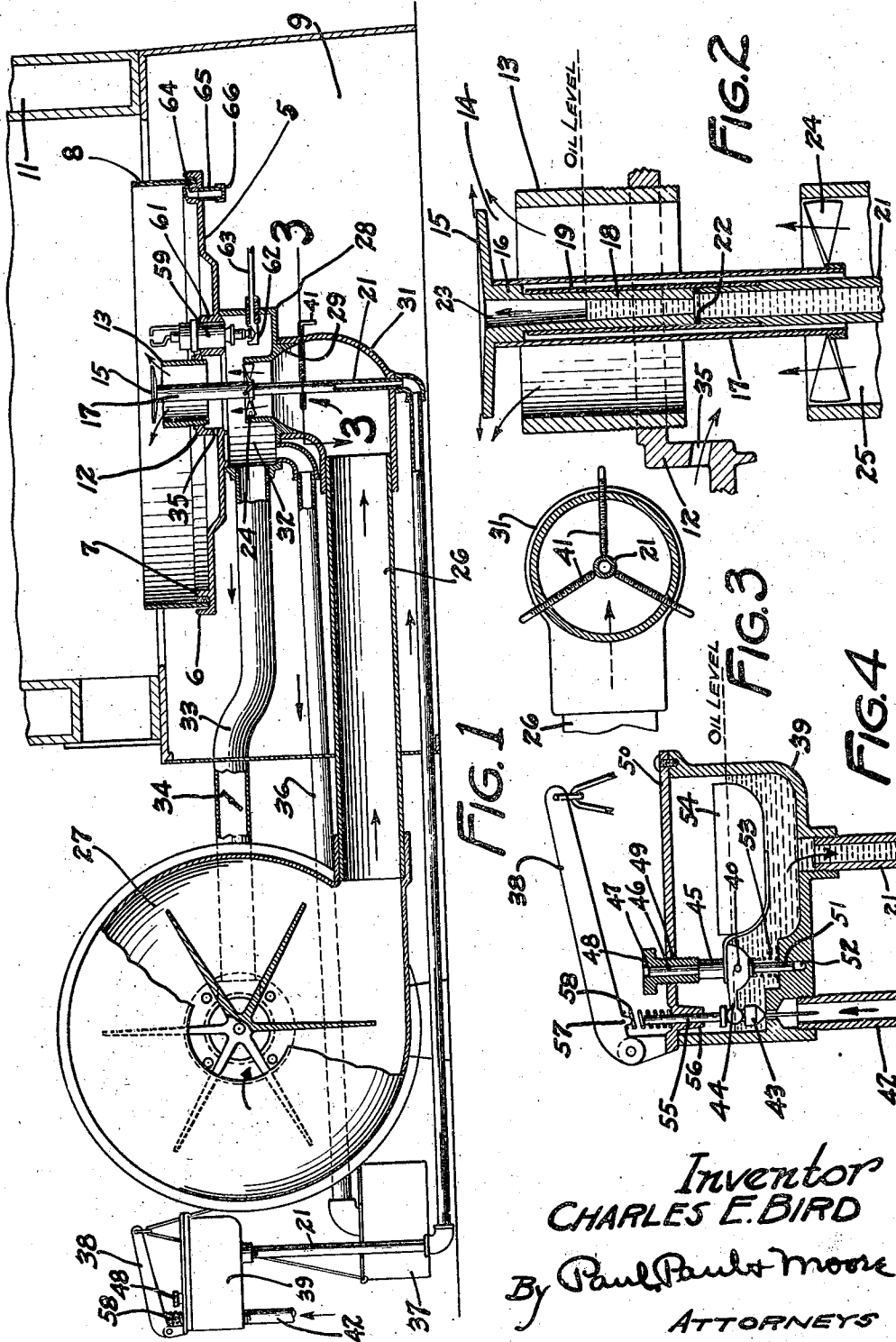
May 29, 1928.

1,671,340

C. E. BIRD

LIQUID FUEL BURNER

Filed May 2, 1925



Inventor
CHARLES E. BIRD
By Paul Paul Moore
ATTORNEYS

Patented May 29, 1928.

1,671,340

UNITED STATES PATENT OFFICE.

CHARLES E. BIRD, OF MINNEAPOLIS, MINNESOTA.

LIQUID-FUEL BURNER.

Application filed May 2, 1925. Serial No. 27,543.

This invention relates to improvements in liquid fuel burners particularly adapted for use in connection with steam or hot water boilers or hot air furnaces, such as are commonly employed for heating homes and other buildings, and more particularly relates to such an apparatus which may readily be employed in conjunction with the usual coal burning type of heating plants to convert such a furnace into a liquid fuel burning furnace.

Broadly, this novel burner comprises a revolving oil distributing head which functions to centrifugally and circumferentially distribute the oil into the path of the in-rushing air currents, thereby effecting a thorough atomization of the liquid fuel and mixing with air to provide a highly combustible mixture which will readily lend itself to ignition. The revolving oil distributing head is adjustably mounted in the air discharge opening through which air is supplied to the burner, and is driven by means of a rotary fan, secured thereto and arranged in said opening.

The object of the invention therefore is to provide an improved oil burner.

Other objects of the invention will appear from the following description and the accompanying drawings and will be pointed out in the annexed claims.

In the drawings there has been disclosed a structure designed to carry out the various objects of the invention, but it is to be understood that the invention is not confined to the exact features shown as various changes may be made within the scope of the claims which follow.

In the drawings:

Figure 1 is a vertical sectional view of the improved burner showing the general construction thereof;

Figure 2 is an enlarged detail sectional view of the revolving oil distributing head and also showing the means for adjusting the annular air gap beneath the head;

Figure 3 is a horizontal sectional view on the line 3—3 of Figure 1, showing the means provided for adjusting the position of the oil distributing head within the discharge end of the air supply trunk; and

Figure 4 is an enlarged detail sectional view through the float chamber which functions to control the level of the oil in the distributing head.

The novel oil burner shown in the accom-

panying drawings comprises a circular plate or priming pan 5 having a pair of upwardly extending spaced parallel flanges 6 and 7 provided thereon to form an annular recess to receive an annular ring or deflector wall 8 against which the liquid fuel is thrown from the revolving fuel distributing head of the burner.

As shown in Figure 1, the burner is preferably mounted in the usual ash-pit 9 of the furnace in such a manner as to have the flames or heat from the burner strike the water jacket 11 of the furnace adjacent its lower portion.

An important feature of this invention resides in the novel means provided for centrifugally distributing the oil or liquid fuel at the point of combustion and at which point it is also mixed with air flowing through an annular air gap beneath the distributing head. Referring to Figures 1 and 2, it will be noted that the priming pan 5 is provided with a central boss 12 which is threaded to adjustably receive an enlarged nipple 13 whereby the annular air gap 14, beneath the revolving head or disc 15 of the burner, may be varied to increase or decrease the flow of air therethrough. Also by varying the width of the air gap 14, the outward flow or direction of the flames from the burner head may be varied to provide the most efficient arrangement for the particular type of furnace with which the burner is being used.

The revolving fuel distributing head preferably comprises the revolving member or disc 15 which has a downwardly extending hub 16 centrally provided thereon to receive a sleeve 17 which is suitably secured thereto so as to rotate synchronously therewith. An extension 18 is provided on the hub 16 which is of sufficient length to provide a suitable bearing for the distributing head 15. A bearing sleeve 19 is terminally mounted and secured to the upper end of the oil feed pipe 21 and is adapted to receive the extension 18 of the hub 16 to provide a bearing therefor. A suitable thrust collar or ring 22 is seated upon the upper end of the oil pipe 21 to carry the weight of the revolving head 15 which has the lower end of the extension 18 bearing thereagainst.

The hub 16 and extension 18 are provided with a tapered socket or bore 23 in which a constant oil level is maintained, as indicated by the dotted line in Figure 2. The taper

of the bore 23 is such that when the head or disc 15 is rotated, the centrifugal action of such rotation will cause the oil to upwardly creep along the walls of the bore to the enlarged discharge end thereof after which it will be outwardly thrown therefrom, over the surface of the disc 15 and into the path of the inrushing air flowing through the annular gap 14 beneath the disc. Such discharging and distributing of the oil from the feed pipe over the surface of the disc 15 and into the path of the air will effect a thorough atomization of the fuel particles before being discharged into the path of the air after which it will be thoroughly mixed therewith to provide an efficient mixture which will readily lend itself to instant combustion. By this novel arrangement and mounting of the oil distributing head, the liquid fuel will provide a means for automatically lubricating the vertical bearing provided by the extension 18 of the hub 16 and the bearing sleeve 19. No care or attention need therefore be exercised with regard to the proper lubrication of the revolving head 15.

The means provided for rotating the head 15 when the burner is in operation, preferably consists of mounting a plurality of vanes 24 upon the lower end of the sleeve 17 and securing them thereto so that the air draft will strike the vanes and rotate the sleeve 17 and therefore revolve the fuel distributing head 15. As shown in Figures 1 and 2, the vanes 24 are preferably mounted in the air discharge opening 25 of the air trunk 26 which has its opposite end connected to a suitable blower or fan 27, of ordinary construction. The air discharge opening 25 is preferably encased within a housing 28, the upper end of which provides a supporting means for the priming pan 5 seated thereon. The housing 28 is preferably provided with a downwardly extending flange 29 adapted to be received within the upright end of an elbow 31 which is suitably secured to the trunk 26. By means of the housing 28, it will be noted that a chamber 32 will be provided around the vanes and beneath the revolving head 15. This chamber functions as an expansion chamber for the air discharged through the discharge opening 25 of the trunk 26. From the expansion chamber 32, a suitable amount of air will be discharged through the annular gap 14 beneath the disc or head 15 to provide an efficient combustible mixture. The flow of air through the gap 14 may be varied by adjustment of the nipple 13 or may be controlled by increasing or decreasing the pressure in the expansion chamber 32.

The means provided for regulating the pressure in the expansion chamber 32 to control the effective supply of air to the burner preferably resides in the provision

of an air pipe 33 having one end in communication with the air chamber 32 and its other end preferably connected to the intake portion of the housing of the fan 27. A valve 34 is interposed in the air pipe 33 to regulate the flow of air therethrough and therefore from the expansion chamber 32. When the valve 34 is closed, the flow of air through the gap 14 beneath the oil distributing head 15 will be increased in volume and when the valve 34 is partially opened, or opened, air circulation will be established therethrough from the expansion chamber 32, thereby decreasing the pressure in the expansion chamber with a resultant decrease in the flow of air through the annular gap 14. The air returned to the fan 27 by the return pipe 33 will be heated during the operation of the burner and, when again forced to the chamber 32, will aid in the atomization of the oil beyond the air gap.

Referring to Figures 1 and 2, it will be noted that the central boss 12 of the priming pan 5 preferably has provided, in the lower portion thereof, a series of apertures which function as a means for draining the liquid fuel from the priming pan into the expansion chamber arranged therebeneath, and which chamber also functions as a catch basin therefor. An overflow pipe 36 leads from the chamber 32 to a suitable bucket 37 which is suspended from an arm 38 carried by the float chamber 39. The overflow oil discharged from the chamber 32 into the bucket 37 will cause the arm 38 to be downwardly moved to interrupt the supply of fuel to the float chamber as will be hereafter described.

The oil feed pipe 21 upwardly extending through the elbow 31 of the air trunk 26, is preferably centrally aligned in the air discharge opening 25 by means of a plurality of adjusting screws 41 mounted in the wall of the elbow 31, as particularly shown in Figure 3. By means of these adjusting screws, it will be readily seen that the vanes 24 may readily and conveniently be adjusted within the opening 25 regardless of the position of the burner. The opposite end of the feed pipe 21 is connected to the float chamber 39 as shown in Figures 1 and 4.

Another important feature of this invention resides in the novel means provided for maintaining a constant level of oil in the tapered bore 23 of the revolving distributing head 15 as shown in Figure 2. Such means preferably consists in the provision of the float chamber 39 which is mounted at the proper height to maintain the desired oil level. Oil is supplied to the float chamber through a pipe 42 having one end connected to a suitable source of supply. A needle valve 43 is mounted in the float chamber above the discharge opening of the supply pipe 42 and the opening and closing of this

valve controls the height of the oil level in the float chamber 39, and therefore the level of the oil in the tapered bore 23 of the distributing head. A forked arm 44 has one end connected to the needle valve 43 and has its other end pivotally connected to a shouldered stud 45 by means of a pivot pin 40. The upper reduced end-portion 46 of the stud 45 is seated in a bore 47 of an adjusting nut 48 which is adjustably mounted in a threaded socket 49 in the cover 50 of the float chamber. The lower end-portion 51 of the stud 45 is mounted in a guide 52. A coiled spring 53 is preferably coiled about the lower end-portion 51 to exert an upward force against the stud 45, the upper shoulder thereof being thereby held in constant contact with the lower face of the adjusting nut 46 so that when the latter is adjusted in its threaded socket, the horizontal position of the pivotal connection between the forked arm 34 and the stud 45, or the pivot pin 40, will be relatively adjusted. By thus raising and lowering the stud 45 and therefore the pivot pin 40, the position of the float 54, secured to the forked arm 44, will be relatively adjusted within the float chamber thereby raising or lowering the oil level therein and therefore the oil level in the tapered bore 23 of the fuel distributing head 15 of the burner.

The needle 43 has an upwardly extending end-portion 55 which is slidably mounted in a guide 56 provided in the cover 50 of the float chamber. The end-portion 55 upwardly extends through the cover and is adapted to be engaged by a lug 57 provided on the arm 38. A coiled spring 58 is interposed between the cover and the arm 38 to yieldably retain the arm in its inoperative position with the lug 57 out of contact with the upper end of the end-portion 55 of the needle valve. When oil is discharged into the bucket 37 and the arm 38 is downwardly moved by the weight of such oil, the lug 57 will engage the upper end of the needle valve and will downwardly move it into closing position, thereby cutting off the supply of fuel to the float chamber and therefore to the burner. Before the burner can again be started, the bucket 37 must be emptied of its contents so as to allow the spring 58 to upwardly move the arm 38 out of contact with the needle valve so that the needle will again be opened by the movement of the float 54 within the float chamber. By thus being able to adjust the position of the adjusting nut 48 to raise and lower the pivot pin 40, the level of the oil in the float chamber, and therefore in the tapered bore 23 of the fuel distributing head, may readily and conveniently be varied to supply the proper quantity of oil to the burner head for proper combustion.

The means provided for igniting the fuel

when the burner is initially started, may be of any standard and well-known construction. In the drawings, such means is shown as consisting of a spark-plug 59 removably mounted in a socket 61 provided in the plate or priming pan 5. This spark-plug as will be noted, is preferably inverted so that it may readily be removed for cleaning or replacement at any time without the use of tools. When mounted in the socket 61 as shown, the central electrode or contact thereof is preferably seated in a stationary contact 62 which is connected to a suitable source of electrical energy by means of a conductor 63. The other electrode or contact will be grounded to the burner as is customary in devices of this kind. In order to facilitate ignition of the atomized mixture, discharged from the revolving distributing head 15, a suitable porous material or wicking 64 is provided in the annular recess in which the deflector ring or wall 8 is mounted. This wicking functions to absorb the unignited fuel thrown against the ring 8, and will thereby prevent the usual puff or small explosion of the mixture when ignition takes place. A nipple 65 is also provided adjacent the annular recess 7 to provide means for connecting a gas pipe thereto should it be desired to use gas for igniting the fuel instead of spark-plug ignition. This nipple is preferably closed by means of a cap 66 when the spark-plug type of ignition is employed.

In the operation of this novel oil burning apparatus, the liquid fuel is delivered to the float chamber 39 through the pipe 42. When the float chamber 39 is empty, the float 54 will obviously be in its lowermost position thereby causing the valve 43 to be opened to permit the entrance of oil into the float chamber. From the float chamber, the oil will flow into the oil feed pipe 21, and into the tapered bore 23 in the oil distributing head. As soon as the oil level in the tapered bore 23 reaches the proper level, or that indicated by the dotted lines in Figures 2 and 3, the float 54 will cause the valve 43 to be moved into closing position thereby preventing the oil in the tapered bore to rise above a predetermined level. As soon as the blower is started, the flow of air through the trunk 26 and through the discharge opening 25 thereof, will cause the vanes 24 to rotate the distributing head 15 so that the liquid fuel in the tapered bore will upwardly creep along the walls of the bore by centrifugal force. As the oil reaches the discharge end of the tapered bore 23, it will be outwardly and circumferentially thrown therefrom over the surface of the head 15 and into the path of the air current flowing through the annular gap 14 provided beneath the head 15. Such action of the oil and air will cause the former to be thoroughly atomized and

- mixed with the air, resulting in the production of a highly combustible and efficient mixture which may be readily ignited by either spark-plug or gas pilot ignition.
- 5 After the burner has thus been started, the proper proportion of oil and air may be obtained by regulating the oil level in the tapered bore 23 and also by regulating the air pressure in the expansion chamber 32 by manipulation of the valve 34. Also by varying the width of the air gap 14 beneath the burner head, the divergency or spread of the flames from the burner head may be varied from substantially a horizontal plane to any inclination desired to provide the proper contact with the furnace walls for efficient operation.
- In operation, the adjustable feature of the float chamber may be dispensed with and an ordinary type of nonadjustable float chamber be used in place thereof. When such a float chamber is used, however, means must be provided whereby the float chamber may be bodily raised or lowered with reference to the tapered bore 23 thereby to raise or lower the oil level in the tapered bore 23 of the burner head. It is to be understood that such changes may be made without departing from the scope of the invention.
- 30 Having thus described my invention what I claim as new and desire to secure by Letters-Patent, is:
1. In a device of the class described, a vertical fuel supply pipe having a socket at its upper end, a spreader disk having a tubular extension rotatable within the socket above said fuel supply pipe, and a thrust-receiving element interposed between and abutting the end faces of said pipe and extension.
 2. In a device of the class described, a vertical fuel supply pipe having a socket at its upper end, a spreader disk having a tubular extension rotatable within the socket above said fuel supply pipe, and a thrust-receiving element interposed between and abutting the end faces of said pipe and extension, the bore of said extension increasing in calibre from the bottom upwardly to the upper side of the disk.
 3. In a device of the class described, a vertical fuel supply pipe having a socket at its upper end, a spreader disk having a tubular extension rotatable within the socket above said fuel supply pipe, and a sleeve dependently secured to said spreader disk and loosely encircling said extension and supply pipe, and having radially disposed fan blades below said spreader disk.
 4. In a device of the class described, a rotatable spreader disk, having a depending sleeve and fan blades exteriorly of the sleeve, an oil pipe as a bearing for said disk leading into said sleeve from beneath, an air delivery conduit leading upwardly to deliver against the lower side of the disk, and encircling said blades for pneumatic rotation of the disk, said conduit having an expansion chamber between said fan blades and disk, and a fan as a pump, having its pressure side leading into said air conduit, and having its suction side communicating with said expansion chamber through a valve-controlled pipe.
 5. In a device of the class described, a rotatable spreader disk, having a depending sleeve and fan blades exteriorly of the sleeve, an oil pipe as a bearing for said disk leading into said sleeve from beneath, an air delivery conduit leading upwardly to deliver against the lower side of the disk, and encircling said blades for pneumatic rotation of the disk, and a fan as an air pump, having its pressure side leading into said air conduit and having its suction side communicating with said air delivery conduit between said fan blades and spreader disk through a valve-controlled pipe.
 6. A device of the class described, comprising a priming pan having a central air intake nipple, a casing secured beneath said pan as an expansion chamber, an air intake conduit having its discharge end within said chamber, a fan as a pump, having its pressure side leading into said conduit, an oil supply pipe leading vertically through said air conduit and having thereon a spreader disk disposed adjacent said nipple and forming therewith an annular air spreader orifice, and having a hollow stem rotatable with relation to said oil pipe, a sleeve carried by said disk and having fan blades thereon disposed in said air conduit, and a valve-controlled pipe connecting the expansion chamber with the suction side of the fan.
 7. In a liquid fuel burner comprising in combination, a fuel distributing head, means providing an air gap beneath the head, said means movable for adjusting the width of said gap to vary the outward spread of the flames, an air expansion chamber in communication with said gap, and means for increasing or decreasing the air pressure in the air expansion chamber to control the effective supply of air to the gap.
 8. In a liquid fuel burner comprising in combination a rotary fuel distributing head having a fuel feed pipe in communication therewith, said fuel distributing head including a circular disk having an extension centrally provided thereon, a tapered bore in said disk and said extension leading to the upper surface of said disk, a socket terminally provided upon said fuel feed pipe and adapted to rotatably receive said extension to provide a bearing therefor and for said head, and whereby said head will be supported entirely upon said feed pipe.
 9. In a liquid fuel burner comprising in

combination, an oil feed pipe centrally mounted in a closed air delivery conduit; a liquid fuel distributing head rotatably mounted upon said feed pipe and carried thereby, above the air conduit, means providing an annular air gap beneath and leading upwardly around said distributing head, an air expansion chamber in said air conduit also beneath said rotary distributing head, and means for removing some of the air from the expansion chamber thereby to control the flow of air to the air gap.

10. In a centrifugal oil burner, the combination of a rotatable burner head, means to supply oil to the head, means to force air past the head to atomize the oil, means to rotate the head by the forced air, and means to return a portion of said forced air to the intake of the air-forcing means whereby such re-forced air will be warmed during the operation of the burner.

11. A device of the class described, including a priming pan having a central cylindrical air intake nipple vertically adjustable, a spreader disk above said nipple rotatably mounted, and having a concave upper side and an oil duct leading centrally there-through from beneath for delivery of oil to its upper side, the bore of said duct being upwardly flared, a sleeve carried by the disk having fan blades, an air pump as a fan, an

air pipe leading from the pressure side of the fan and surrounding said fan blades and having its discharge end disposed for vertical delivery of air through said nipple, an expansion chamber encircling said pipe and gap between air pipe and nipple, a valve-controlled auxiliary air pipe leading from said chamber to the suction side of the fan.

12. A device of the class described comprising a priming pan, having a marginal groove, an annular member resting in the groove, a piece of absorbent material arranged within the groove at the inner side of the annular member, a rotatable burner head adapted to deliver oil horizontally and against the upright wall of the annular member.

13. A device of the class described comprising a priming pan, having a marginal groove, an annular member resting in the groove, a piece of absorbent material arranged within the groove at the inner side of the annular member, a rotatable burner head adapted to deliver oil horizontally and against the upright wall of the annular member, said priming pan having a passage leading to the groove on the inner side of the annular member.

In witness whereof, I have hereunto set my hand this 29th day of April, 1925.

CHARLES E. BIRD.