June 19, 1928. 1,674,283

G. V. FLETCHER

OIL BURNER

Filed March 21, 1927 2 Sheets-Sheet 1

Fig. 1

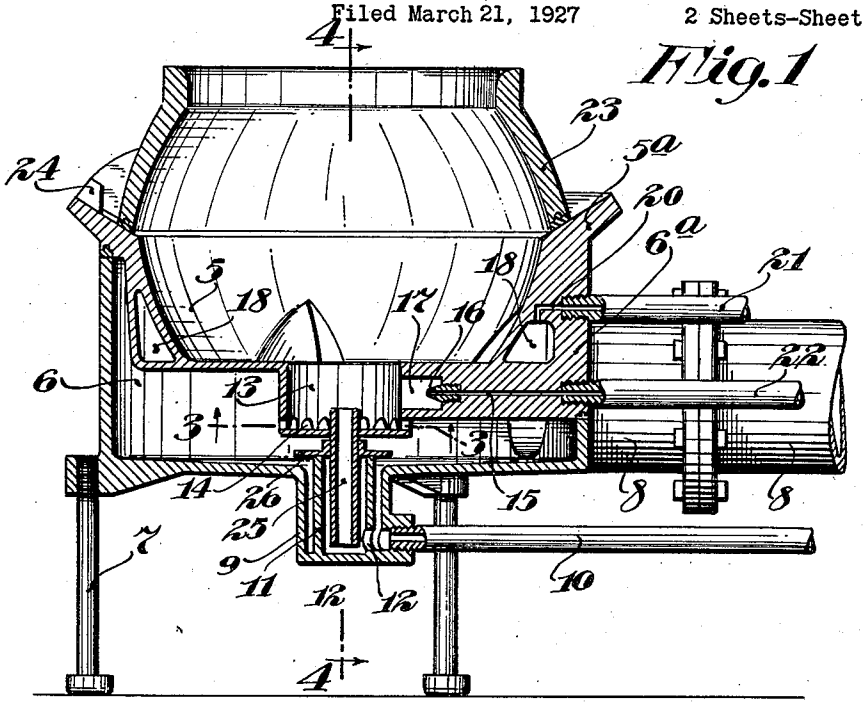
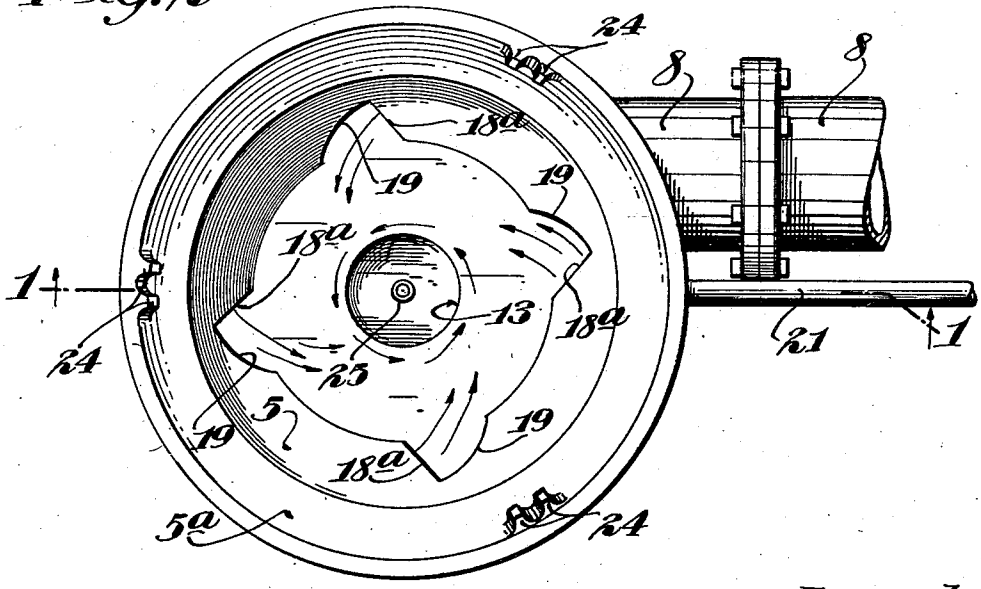


Fig. 2



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Filed March 21, 1927 2 Sheets-Sheet 2

Fig. 3

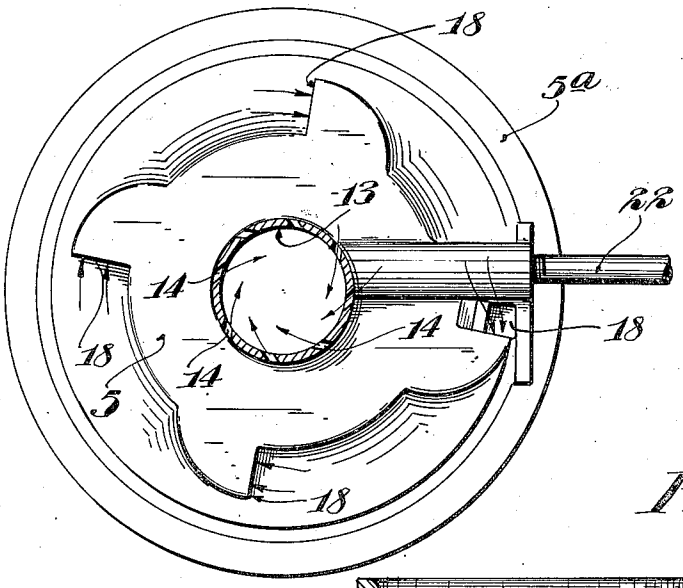
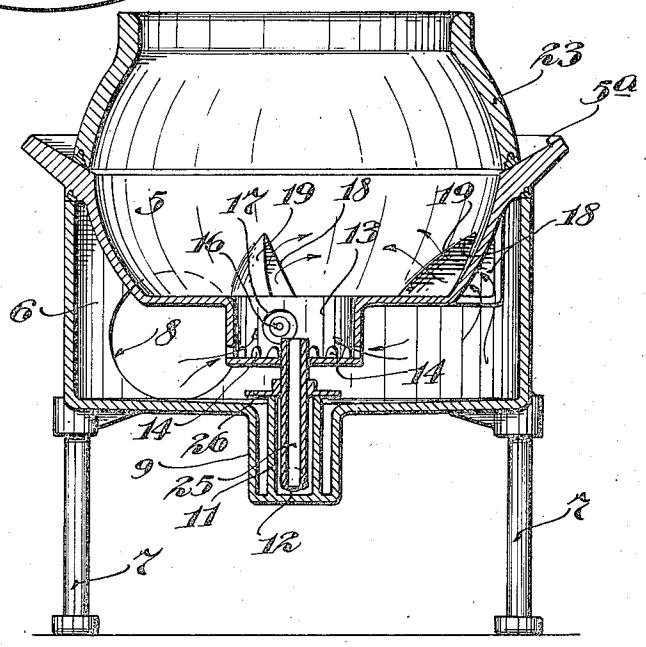


Fig. 4



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Patented June 19, 1928. 1,674,283

UNITED STATES PATENT OFFICE.

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OIL BURNER.

Application filed March 21, 1927. Serial No. 176,927.

My present invention relates to oil burners of the type wherein the vaporization of the oil is produced by a violently whirling air current which sweeps up and evaporates the oil and rapidly forms a mixture suitable for complete combustion, and the invention is directed to highly important features which insure complete combustion by proper distribution of oil and the oil vapor and prevent carbon deposits. Also the invention comprises other important features, all as will hereinafter more fully appear.

A commercial form of burner is illustrated in the accompanying drawings wherein like characters indicate like parts throughout the several views.

Referring to the drawings:

Fig. 1 is a vertical section of the burner, some parts being broken away, some parts being shown in full and some parts being sectioned on the line 1—1 of Fig. 2;

Fig. 2 is a plan view of the burner shown in Fig. 1, the rim section of the bowl being removed;

Fig. 3 is a bottom plan view of the parts shown in Fig. 2, some parts being sectioned on the line 3—3 of Fig. 1; and

Fig. 4 is a transverse vertical section taken on the line 4—4 of Fig. 1.

The burner proper will of course be suitably connected within a furnace, preferably with its bowl centrally located in the plane usually occupied by the grate. In the device illustrated, the bowl 5 is set partly into the casing 6 that constitutes an air trunk and is supported by suitable legs 7. As an important feature of the invention, this casing 6 is provided with a large air intake pipe 8 which, in practice, will usually be connected to the discharge pipe of the fan or blower. At its central portion the casing 6 has a depressed cup 9, from the bottom of which an oil drain pipe 10 is extended. The cup 9 is formed with a sleeve 11 that extends upward from its bottom, is spaced from the walls of the cup to form an intervening oil chamber, and is terminated at its upper edge slightly above the bottom of said casing. The sleeve 11 is formed near its bottom with a port 12 for a purpose which will presently appear.

The bowl 5, at its bottom, is formed with a central cup-like depression or auxiliary bowl 13 provided close to its bottom with a multiplicity of circumferentially spaced tangential air ports 14 (as best shown in Figs. 1 and 3) which perform a function presently to be noted. The bowl 5 sets on the rim of the casing 6 but at one side is formed with a heavy lug-like portion 6^a that is fitted closely into a notch formed in the adjacent portion of the rim of said casing 6. This lug 6^a, at its lower portion, is formed with a radial gas tip conduit 15 that leads to a gas burner tip 16 projected slightly into a pocket 17 formed in the inner portion of the lug portion 6^a and opening directly into the auxiliary bowl 13. This cup performs an important function and will be noted in the description of the operation.

The bowl 5, near its bottom and in its side wall, is formed with a plurality of tangential air intake ports 18, the outer extremities of which open from the air trunk afforded by the casing 6 and the inner extremities of which open into the bowl in position to tangentially deliver a plurality of blasts of air into the bowl and cause air to take up a violent whirling motion over and just above the bottom of the bowl. By reference particularly to Fig. 2 it will be noted that the inner faces 18^a of the air ports 18 are oblique in respect to radial lines drawn from the axis of the bowl and that they deliver the air against curved deflecting surfaces 19 which deflect the air toward the axis of the bowl and to the rim of the auxiliary bowl. One of the ports 18 is formed at least partly in the lug 6^a, and into the top of which port opens a small oil duct 20. The oil supply pipe 21, which is screwed into the lug 6^a, delivers the oil into the duct 20; and a pilot gas supply pipe 22, which is also screwed into said lug 6^a, delivers to the gas conduit 15.

The body proper of the bowl 5 has an upward flare but it is desirable that the extreme upper portion of the bowl be contracted. Moreover, the extreme upper portion of the bowl will be subjected to very intense head and will in service be given greater expansion and contraction than the bottom of the bowl. Hence, this extreme upper portion of the bowl is made as a separate element indicated at 23 and may even be of a different material than the bowl. For example, the bowl proper may be of cast iron while the detachable rim or upper portion

23 may be of carborundum or the like. Perfect freedom for expansion and contraction on the upper or rim section 23 of the bowl is required, and hence the bowl is provided with a converging ring flange 5^a on which the detachable rim or upper portion is loosely seated. The ring flange 5^a, as shown, is provided with circumferentially spaced retaining lugs 24 that prevent the rim section 23 from getting completely out of place. The pipes 10, 21 and 22 all lead straight toward the axis of the bowl so that they may be, without removal, readily cleaned out in case any carbon deposit should accumulate therein.

Operation.

When air under pressure from the fan or blower is delivered into the air trunk 6 it will be discharged through the ports 18 of the main bowl 5 and a lesser amount through the ports 14 of the auxiliary bowl 13. The delivery through the ports 18 and 14 will be tangential and hence the air will be caused to take up rapid rotary motions within the respective bowls 5 and 13. The pilot light from the burner tip 16 will cause ignition of the vapor within the auxiliary bowl 13 and the flame discharged from the top thereof will be delivered through the bottom of the main bowl 5 and to the interior thereof under a rapid rotation and of course with a tendency to expand under the action of centrifugal force. These burning gases will be commingled with the vapors in the main bowl and the main combustion will take place within the main bowl wherein there will be a violent and rapid rotation of the burning vapors.

It is now important to note that the air blasts delivered from the ports 18 of the main bowl are directed slightly somewhat inward and toward the rim of the auxiliary bowl so that there will be a commingling of the two blasts, that is, whirling blasts from the auxiliary bowl will have to cut their way into each of the four streams of air from the ports 18 and all of the blasts from the ports 18 will be directed against a whirling blast from the auxiliary bowl.

Whirling vapors within the main bowl will of course move quite rapidy upward but their discharge will be somewhat retarded by the rim section 23. This will cause all or nearly all of the gases to be ignited within the bowl and be to a large extent consumed in the bowl before the unconsumed vapors in the nature of flame will be discharged from the rim of the bowl under a whirling and expanding action, and the combustion will be completed close to the rim of the bowl and of course within the fire box of the furnace.

In experiments with burners of this general type but without the auxiliary bowl at the bottom of the main bowl, it has been found practically impossible to produce complete combustion or complete ignition of gases at the center of the bowl. This was probably due to the formation of vacuum or dead air space at the axis of the bowl. In the operation of the device described, the auxiliary or preliminary whirling action of the gases within the auxiliary bowl was discharged into the main bowl at the axis thereof at the very place where hitherto there had been incomplete combustion, due to partial vacuum or dead air space, and thereby it is found that the combustion will be rendered complete and the accumulation of carbon entirely eliminated.

It has also been found that the pilot was more reliable when applied for action on the vapors within the relatively small box-like bowl for at this place there was found to be less tendency to blow out the pilot light. Moreover, this blowing of the pilot light was further guarded against by placing the pilot tip within a small pocket opening into but offset from the auxiliary bowl.

In the arrangement illustrated, the oil from the pipe 21 is delivered through only one of the ports 18 and will be swept into the bowl only by the one blast but it will be instantly commingled with the other blasts and rapidly vaporized.

The numeral 25 indicates the overflow tube secured to the bottom of the auxiliary bowl 13, and extended from a point above said bottom down into the sleeve 11 where it is terminated above the bottom of the cup 9. The numeral 26 indicates a washer-like valve slidably mounted on the tube 25 and resting loosely on the upper edge of the sleeve 11. This valve does not form a very tight joint with the sleeve 11 but will prevent too great a flow of air from the trunk 6 upward through the tube 25. In practice it has been found a slight flow of air from the trunk 6 up through the tube 25 such as can find its way through port 12 will not stop the flow of accumulated oil from the auxiliary bowl 13 and out through the safety overflow pipe 10, but when too free a flow of air is permitted, such flow of accumulated oil will be stopped by the pressure of air, hence, the use of said valve 26. If the pilot light should go out and the supply of oil through pipe 21 and the supply of air through pipe 8 should be continued it was found that the accumulated oil in bowl 13 would not flow under the action of gravity against the air blast out through the ports 14 and hence that the oil would accumulate in the bowl 13 and bowl 5 and finally overflow from the latter. The introduction of the tube 26, however, prevented this accumulation and provided the safe overflow for the accumulated oil which, running from the tube 25 out through pipe 10 to the customary valve cut-off mechanism,

would cut off the supply of oil to supply pipe 21 and usually at the same time stop the motor and the fan.

What I claim is:

1. In an oil burner, a main bowl having air ports opening tangentially thereinto, a relatively small auxiliary bowl opening centrally through the bottom of said main bowl and having tangential air ports, and means for supplying fluid fuel to said burner, said main bowl, inward of its tangential ports, having deflecting surfaces for directing the air for combustion toward the rim of said auxiliary bowl.

2. In an oil burner, a main bowl having air ports opening tangentially thereinto, a relatively small auxiliary bowl depending from and opening centrally through the bottom of said main bowl and having tangential air ports, means for supplying fluid fuel to said burner, an air trunk supplying air to the tangential air ports of said main and auxiliary bowls, and means for delivering air under pressure into said air trunk.

3. In an oil burner, a main bowl having air ports opening tangentially thereinto, of a relatively small auxiliary bowl depending from and opening centrally through the bottom of said main bowl and having tangential air ports, means for supplying fluid fuel to said burner, an air trunk delivering air to the tangential air ports of said main and auxiliary bowls, said air trunk having a depending cup formed with an internally spaced upstanding sleeve having a port near its bottom, an overflow tube extending through the bottom of said auxiliary bowl and into said sleeve, a valve mounted on said overflow tube and resting on the upper end of said sleeve, an oil pipe extending to said cup, and means for delivering air under pressure into said air trunk.

In testimony whereof I affix my signature.

GEORGE V. FLETCHER.