

1,297,138.

2 SHEETS--SHEET 1.



*H. Davis*

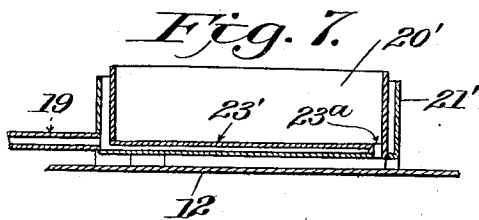
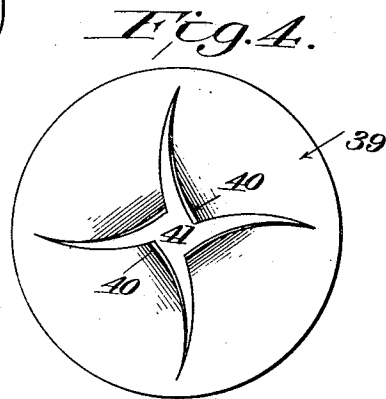
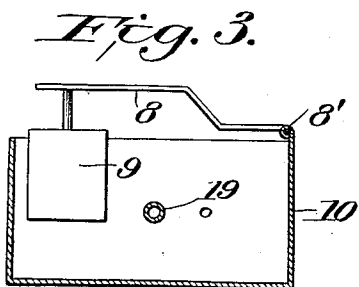
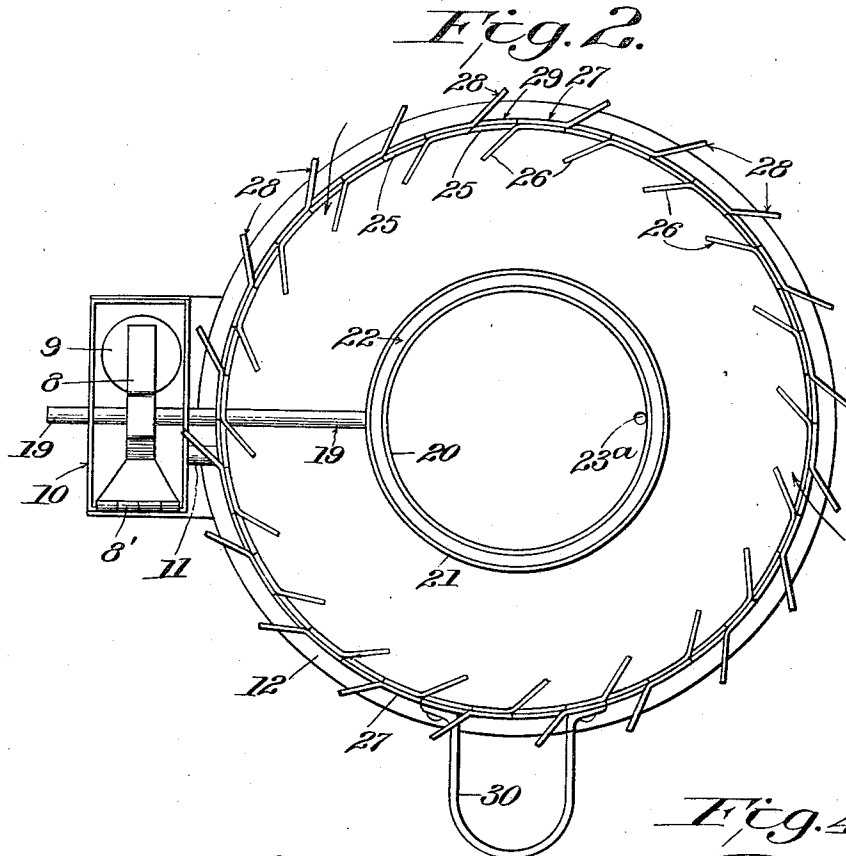
Attorney

L. GARDNER.  
LIQUID FUEL BURNER.  
APPLICATION FILED JUNE 6, 1917.

1,297,138.

Patented Mar. 11, 1919.

2 SHEETS—SHEET 2.



Inventor,  
*Lee Gardner.*

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Attorney

# UNITED STATES PATENT OFFICE.

LEE GARDNER, OF CONCORD, NORTH CAROLINA, ASSIGNOR OF FORTY-FIVE ONE-HUNDREDTHS TO JOSEPH F. CANNON, GOWAN DUSENBERY, AND MORRISON H. CALDWELL, ALL OF CONCORD, NORTH CAROLINA; JOSEPH F. CANNON EXECUTOR OF SAID LEE GARDNER, DECEASED.

## LIQUID-FUEL BURNER.

1,297,138.

Specification of Letters Patent.

Patented Mar. 11, 1919.

Application filed June 6, 1917. Serial No. 173,187.

*To all whom it may concern:*

Be it known that I, LEE GARDNER, a citizen of the United States, residing at Concord, in the county of Cabarrus and State of North Carolina, have invented certain new and useful Improvements in Liquid-Fuel Burners, of which the following is a specification.

This invention relates to liquid fuel burners, and more particularly to burners of the general type shown in my prior application, Serial No. 68,558, filed December 24, 1915. In this type of burner, means are provided for simultaneously vaporizing water and liquid hydrocarbon and causing the vapors to mingle as they pass into a combustion chamber.

In the present invention are embodied certain novel features of construction not covered by the above mentioned application, which novel features result in increased efficiency in operation and control. Among these novel features may be mentioned the provision of a gas generating chamber partially or wholly submerged in water, and in improved means for supplying air to the burning fuel and for determining the character of the flame.

In order that the invention may be clearly understood, reference is had to the accompanying drawings, forming a part of this specification, and in which,

Figure 1 is a central vertical section through my improved burner complete, showing means for supplying water and oil thereto;

Fig. 1<sup>a</sup> is a fragmentary view of the burner, similar to Fig. 1, but showing the water level at a different height;

Fig. 2 is a plan view of the burner with the cover and chimney removed;

Fig. 3 is a side elevation of the float controlled valve, parts being shown in section;

Fig. 4 is a plan view of an improved baffle plate or flame controlling device which I may employ;

Fig. 5 is a fragmentary horizontal section through the lower part of the chimney shown in Fig. 1;

Fig. 6 is a fragmentary side elevation of the control ring or damper which surrounds the lower part of the chimney; and,

Fig. 7 is a fragmentary sectional view,

similar to Fig. 1, showing a modified construction of burner.

Referring to the drawings in detail, Fig. 1 illustrates a convenient arrangement of oil reservoir 1, mounted inside of a water reservoir or container 2, supported on suitable legs 3. From the side of the water reservoir 2 extends a discharge pipe 4, having a downwardly turned end. The flow of water through the pipe 4 may be controlled by means of a stop cock or valve 5, preferably carrying a pointer 6, movable over a scale or dial 7.

The flow of water from the end of pipe 4 is controlled by means of a valve member 8, pivoted at 8' to a waterbox 10 and actuated by means of a float 9, located in such box. When the water in the box 10 has reached a predetermined level, the valve member 8 is pressed against the end of the pipe 4 and thus shuts off the supply of water.

The waterbox 10 is connected by means of a short pipe 11 with a relatively large water pan 12, preferably circular in plan, as shown in Fig. 2. This water pan has a flat bottom and an upstanding wall 24, the pan being supported on suitable legs 13.

A supply pipe 14 extends from the bottom of the oil tank 1 and is controlled by means of a stop cock or valve 15, preferably carrying a pointer 16, movable over a scale or dial 17, suitably graduated to indicate the amount of oil being supplied. The end of pipe 14 is connected by means of a coupling 18 with a pipe 19, which extends through the waterbox 10 and through the wall 24 of the water pan 12 and connects at its inner end with the burner proper. This burner consists of inner and outer nested pans or cups 20 and 21, respectively, concentrically mounted and spaced apart to form between them an annular oil trough 22. The bottoms of the cups 20 and 21 are also spaced apart a distance approximately equal to the width of the trough 22, so that the fuel oil is spread out in a thin sheet between the bottoms of the cups. This space between the bottoms of the cups also constitutes a gas generating chamber, as will be hereinafter described. The bottoms of the cups are preferably conical in shape, as shown in Fig. 1, the apex or highest points of the cones being in the center, as indicated at 23. A short tube or nipple 23<sup>a</sup>

passes through the cup bottoms at their lowest point and serves to establish communication between the inside of the cup 20 and the pan 12, so that water will stand at the same level in the cup and in the pan. As shown in Fig. 1, this water level may be so high as to come above the apex 23 of the cones, and in this case, the generating chamber formed between the cup bottoms is entirely surrounded by water on all sides. Under certain circumstances, however, it may be desirable to lower the water level to some such extent as indicated in Fig. 1<sup>a</sup>, in which case the generating chamber formed between the cup bottoms is only partly immersed in water and projects partly above the same.

The wall 24 of the water pan 12 is provided, at a point well above the water level, with an annular series of openings or windows 25. These openings are preferably formed by cutting the material on three sides and then bending it to form wings or vanes 26. As shown in Fig. 2, these vanes 26 project inwardly at an acute angle to the radius of the circular pan. A band 27 of sheet metal or the like surrounds the wall 24 of the water pan and is provided with a series of ports or windows 29, similar in size and spacing to the ports 25. The openings 29 are likewise formed by cutting the metal on three sides and bending it outwardly to form wings or vanes 28. Each of these wings extends substantially parallel with an adjacent wing 26, so that when the windows 25 and 29 are brought into registry the opening thus formed is flanked on both the inside and outside by the parallel wings 26 and 28. Air currents entering the opening between these wings are directed in a substantially tangential direction and therefore have a decided whirling tendency. A handle 30 is secured to the ring 27 by means of which the ring may be circularly adjusted on the water pan, so as to bring the openings 25 and 29 more or less into registry. As shown in Fig. 2, these ports are fully open, and it will be obvious that by shifting the ring slightly they may be wholly or partially closed. In this way, the amount of air entering the combustion chamber formed within the pan can be regulated, as desired.

On the upper edge of the water pan rests a top or cover plate 31, which, as clearly shown in Fig. 1, is of inverted conical shape, and is provided at its lowermost point with a central opening 32 of relatively small diameter compared with that of the cups 20 and 21. Resting upon the top of this cover plate is a chimney 33, the function of which is to generate the necessary draft. The lower part of this chimney is provided with an annular series of windows or openings 34, which are of more or less rhombic shape. That is to say, the side edges are inclined to

the horizontal at an angle, preferably 45°. These openings are formed in a manner similar to the openings in the water pan, by cutting the material on three sides and bending it in to form tongues or wings 35. A ring or damper 36 surrounds the chimney 33, adjacent the openings 34, and is itself provided with a series of openings 38, formed in a manner similar to the openings in the ring 27 by cutting out the material on three sides and bending it out to form tongues or wings 37. The tongues or wings 35 and 37 extend substantially parallel with each other and are inclined, as shown in Figs. 5 and 6. The ring 36 is circularly adjustable on the chimney 33, so that the ports or openings 34 and 38 may be brought more or less into registry to control the admission of air to the chimney, as will be obvious. It will, of course, be understood that the wings 35 and 37 are set in the same direction as wings 26 and 28, so as to increase the whirling tendency of the rising column of gas and flame.

In order to still further augment this whirling action and also to produce a more intimate mixture of the gas and air, I may employ the novel baffle plate shown in Fig. 4. This consists of a disk 39, preferably formed of sheet metal, which is cut on a plurality of curved radial lines to form tongues 40, one edge of each of which is bent up so as to provide a central opening 41, with radiating warped slots, through which the flame passes. This baffle plate is supported, as by means of suitable legs 42, immediately above the opening 32, and at a point substantially on a level with the windows 34 in the chimney.

The operation of my improved burner is as follows: The pan 12, having been filled with water to the proper level, as shown, the valve 15 is opened to admit oil to the trough 22 and space between the cup bottoms. This oil is then ignited and the cover 31 and associated parts placed in position. If a light hydrocarbon, such as gasoline, is employed, it can, of course, be readily ignited, but if a heavier liquid such as kerosene or crude oil be used, then it becomes necessary to prime the burner by means of a few drops of gasoline, or the like, in order to warm it up to the vaporizing point of the heavier liquid. It will be observed that the upper edge of the cup 20 projects slightly above the edge of the cup 21, so that there is a tendency for the oil in the trough 22 to overflow at starting into the water pan 12, where it floats on the surface of the water. After the oil is ignited, the heated air currents pass upwardly through the opening 32 and chimney 33, while fresh air enters through the ports 25. The passage of the air currents through the ports 25 at the outer edge of the water pan to and through

the central opening 32, causes the flame to curl downwardly over the edge of the cup 20 and impinge upon or dip into the water in such cup so that this water is soon heated to the boiling point. This downwardly curling action is accentuated by reason of the relatively high upper edge of the inner cup, as the incoming air currents strike the flame directly at such edge, and cause it to dip over the same. After the burner has been in operation for a few minutes, the oil in the water pan on the outside of the cup 21 ignites, and this water also is heated to the boiling point. The oil in the space between the cup bottoms and in the trough 22 is therefore subjected on all sides to the heat of boiling water, and vaporization of the fuel oil takes place in the space between the cups, such space being only partially filled with liquid. The water in the pan appears to become covered with oil, either as a result of the initial overflow from the fuel trough, or as a result of the condensation of oil vapors, or both. The entire water pan then becomes filled with flame, which rises from the surface of the water both inside and outside of the fuel trough. Both oil and water are rapidly and simultaneously vaporized, by the heat, and the mingled vapors rise and unite in the combustion chamber formed in the water pan between the water level and the cover. As the flame passes up into the chimney, additional air is supplied through the ports 34, and an intense heat is produced. By properly adjusting the damper rings or bands 27 and 36, it is possible to regulate and control the character of the flame, as desired.

By adjusting the valves 5 and 15, the relative proportion of oil and water may be determined, and this is facilitated by means of the scales 7 and 17. Under certain conditions, I have found that one part of oil is used to three parts of water.

If the water level is maintained below the apex 23 of the conical cup bottoms, as shown in Fig. 1<sup>a</sup>, the oil in the upper part of the conical sheet, where it projects above the water, is subjected directly to the heat of the flame which curls down into the cup 20. Vapor is thus rapidly generated.

Instead of the conical bottoms shown in Fig. 1, I may employ cups 20' and 21', having flat bottoms 23', as shown in Fig. 7.

What I claim is:

1. A liquid fuel burner comprising a pair of nested cups having their sides and bottoms spaced apart to provide a fuel chamber, a water pan in which said cups are immersed, and a tube or nipple passing through the cup bottoms, whereby water is admitted to the inside of the inner cup.

2. A liquid fuel burner comprising a pair of nested cups having vertical side walls and conical bottoms, said walls and bottoms be-

ing spaced apart to provide a fuel chamber, and means for causing the flame to impinge upon the conical bottom of the inner cup, so as to vaporize the fuel in such chamber.

3. A liquid fuel burner comprising a pair of nested cups having their sides and bottoms spaced apart to provide a fuel chamber, a water pan in which said cups are seated, and means for supplying fuel oil to the chamber between the cups, the edge of the outer cup being slightly lower than that of the inner, whereby the oil tends to overflow into the water pan.

4. A liquid fuel burner comprising a water pan, an annular fuel trough centrally disposed in said pan, and an inverted conical cover plate for said pan, said plate having a central opening of a diameter less than that of the fuel trough and located over the same.

5. A liquid fuel burner comprising a water pan, an annular fuel trough centrally disposed in said pan, a cover plate of inverted conical form supported on said pan and having a central opening at its lowest point, such opening being smaller than the fuel trough, and located above the same, means for admitting air around the sides of the pan, and a chimney mounted on said plate around said opening for creating a draft therethrough.

6. A liquid fuel burner comprising a water pan, an independent annular fuel trough centrally mounted therein and spaced from the walls thereof, said pan being provided with air ports in its walls and constituting a combustion chamber, a cover plate resting upon the edge of the pan and having a central opening, and means for causing the flame generated in said chamber to pass inwardly from said trough and upwardly through said opening.

7. A liquid fuel burner comprising a circular water pan, a relatively small annular fuel trough centrally located therein, a cover plate for said pan, having a central opening disposed above said fuel trough, and means for creating a draft up through said opening, the side walls of said pan, above the water level, having a series of air inlet ports, and means for giving a substantially tangential direction to the air currents entering such ports.

8. In a liquid fuel burner, a fuel trough, a cylindrical drum or casing associated therewith, and means for controlling and directing the supply of air to the flame within said cylindrical casing, such means comprising a circularly movable band snugly fitting said casing and having a series of openings, a set of angularly disposed wings extending outwardly from said openings, the cylindrical casing also having a similar series of openings with which the openings in the band are adapted to register, and a

set of angularly disposed wings extending inwardly from the openings in the casing, corresponding wings of each set adjacent each pair of registered openings being substantially parallel, and serving as guides to  
5 give to the air currents entering between them a substantially tangential direction.

9. In a liquid fuel burner, the combination with a water pan having a series of air  
10 inlet ports in its wall, a fuel trough located centrally in said pan, a cover plate for said

pan having a central opening, a chimney mounted on said plate around said opening, said chimney having near its bottom a series of air inlet ports, and means for causing the  
15 air currents entering the ports in both the water pan and chimney to take a substantially tangential course in the same direction.

In testimony whereof I have affixed my signature.

LEE GARDNER.