(No Model.)

L. W. LOMBARD.

HYDROCARBON HEATER.

No. 405,423. Patented June 18, 1889.

Fig. 1.

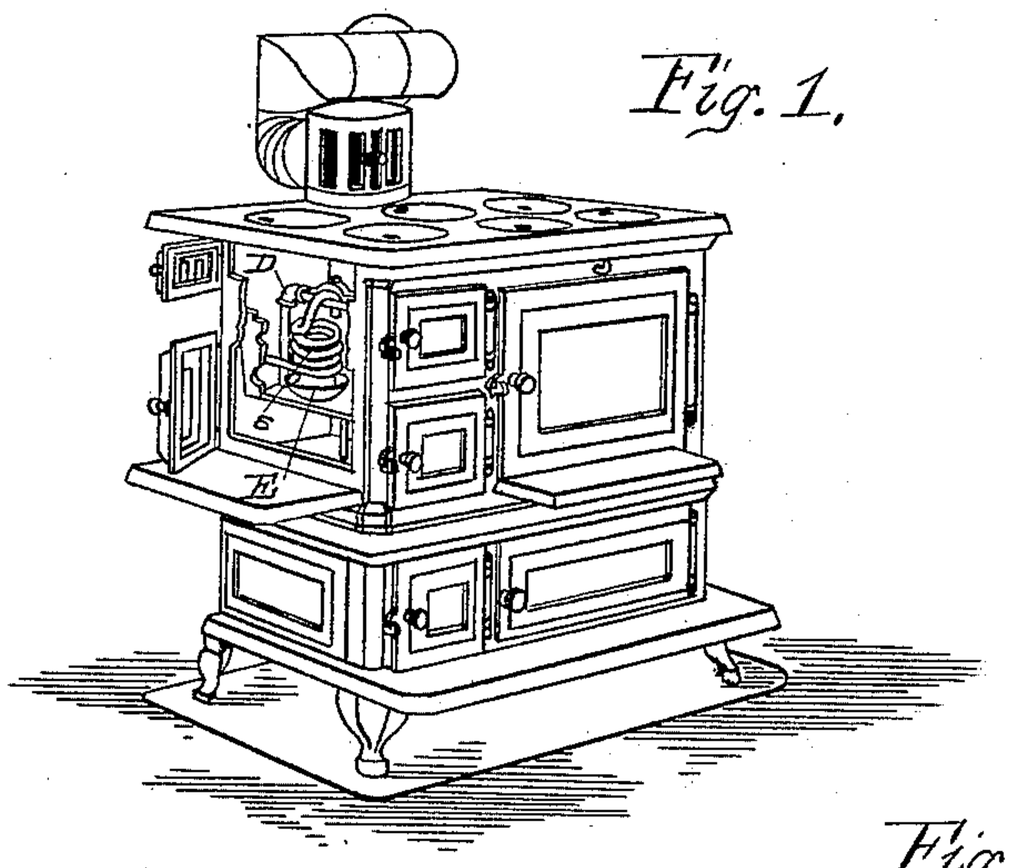


Fig. 2.

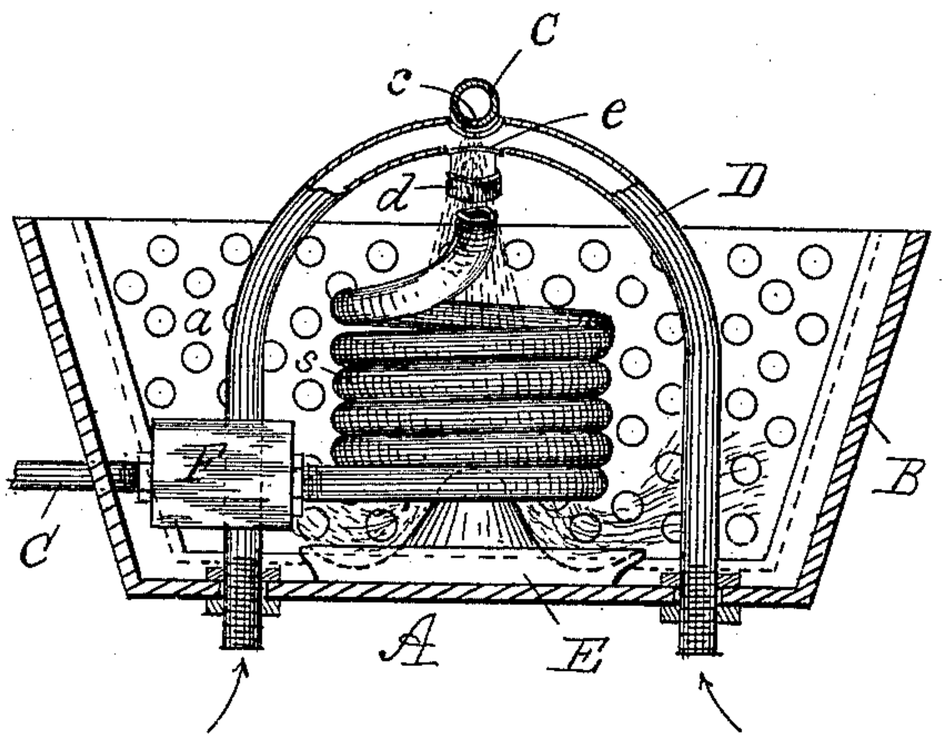
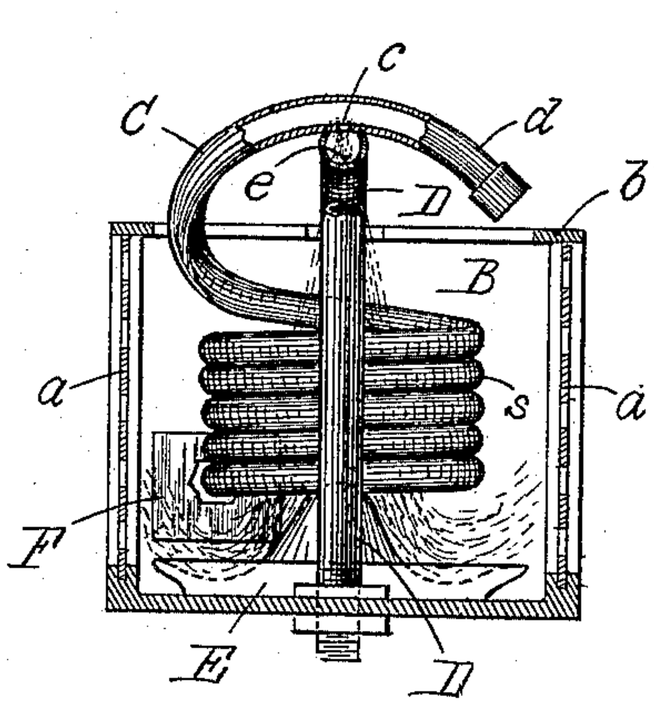


Fig. 3.



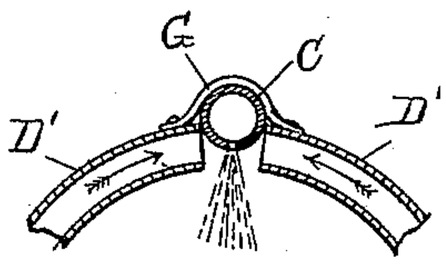


Fig. 5.

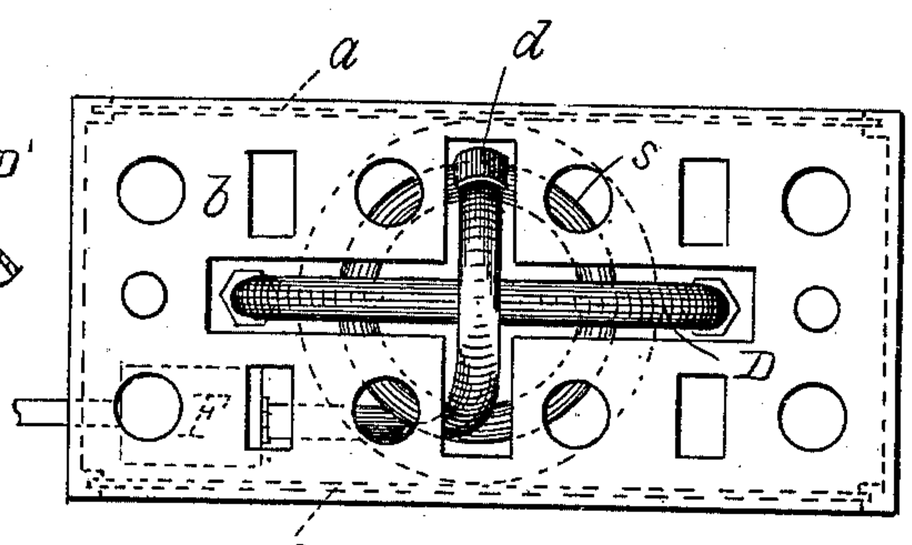


Fig. 4.

Witnesses.
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UNITED STATES PATENT OFFICE.

LEVI W. LOMBARD, OF BOSTON, MASSACHUSETTS, ASSIGNOR TO THE PETROLEUM FUEL COMPANY, OF MAINE.

HYDROCARBON-HEATER.

SPECIFICATION forming part of Letters Patent No. 405,423, dated June 18, 1889.

Application filed March 12, 1889. Serial No. 303,007. (No model.)

To all whom it may concern:

Be it known that I, LEVI W. LOMBARD, a citizen of the United States, residing at Boston, in the county of Suffolk and State of Massachusetts, have invented certain new and useful Improvements in Hydrocarbon-Heaters; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to letters or figures of reference marked thereon, which form a part of this specification.

This invention relates to hydrocarbon-heaters, more particularly that class adapted to be employed in stoves, ranges, or steam-generators, whereby liquid fuel may be substituted and used in the place of wood or coal.

In the use of such heaters the attendant advantages are many. A fire can be started very quickly and the range put in readiness for cooking immediately. Further, the fire can be as readily extinguished, while the amount of fuel heretofore consumed, but now saved, will be large, as is easily understood. Again, there are no ashes or cinders to be removed, and rooms, particularly where air-tight stoves are employed for heating purposes solely, can be kept clean much more easily than where ordinary fuel is consumed.

My present invention consists, primarily, in the improvement in the liquid-fuel feed-pipe and in the manner of discharging the oil therefrom to prevent its filling up; secondly, in the construction of the combustion-chamber; thirdly, in the conjunction with the liquid-fuel feed-pipe of an air-supply pipe; and, lastly, in the disposal of a superheater therein, all which features will be more fully and particularly hereinafter set forth and described.

In the drawings accompanying this specification, Figure 1 represents a heater embodying my invention as applied to a cooking-range. Fig. 2 is a vertical sectional elevation longitudinally of the heater, showing one of the foraminated removable sides taken out. Fig. 3 is a transverse section of the same. Fig. 4 is a plan. Fig. 5 is a modification of air-supply pipe.

In the said drawings, A represents the heater as an entirety, composed of a metallic box B, termed the "combustion-chamber," since within the same the liquid fuel and air are mixed and then burned to produce the requisite heat. Said chamber may be of any desirable shape or size, preferably rectangular, with perforated sides *a a* and top *b*, all of which are to be removable. The side plates are especially for the purpose of directing the flames upon a water back or front, not shown, but located, as usual, within the range. Thus if one of said sides *a* is taken out the free inrush of air drives the flame toward the opposite side and directs heat as it may be desired.

The liquid-fuel feed-pipe is shown at C as located within the combustion-chamber and formed into a coil or helix *s*, which terminates above said coil in a bent or curved portion which passes preferably diametrically thereacross.

The feed-aperture or delivery-orifice at *c* is shown as located in the under part of said terminal portion, but in the highest portion or crown thereof. Thus it will be seen that the extreme end of said feed-pipe C is in a plane somewhat below that in which the orifice *c* is situated. This arrangement is to prevent the speedy filling up and clogging which now occurs in feed-pipes of this class where a liquid fuel has been ejected through a contracted opening axially with the bore and at the extremity of the pipe through which the liquid fuel passes. Moreover, it will be seen that in my invention any small particles—non-combustible or resinous gummy compounds—now find their way to the extremity of said pipe marked *d*, whence they may be removed by taking off the cap. By means of this trap or reservoir the discharge-orifice *c* is maintained free from obstructions.

To afford the required supply of air, as well as to heat the same and to thoroughly mix it with the liquid fuel prior to the act of combustion, I have disposed a bent hollow pipe D, which passes preferably diametrically

across the top of the coil *s* just beneath the bent curved end portion *d*, and thence down on either side of the coiled portion of the liquid-fuel supply-pipe C. The two ends of this pipe pass through the bottom of the combustion-chamber and are firmly secured by fastening-nuts, or otherwise. These ends being open allow a free passage of air from beneath the combustion-chamber upward. Furthermore, the air-pipe D is pierced with an aperture *e*, extending through both walls of the pipe and centrally adjusted of the liquid-fuel delivery-orifice *c*. Moreover, as the liquid fuel enters the feed-pipe C under pressure and escapes forcibly from the delivery-orifice, passing through the aperture *e*, an inrush of air upward through both ends of the pipe D is produced, the air being carried down and drawn from the aperture *e* with the liquid fuel after the manner of an injector. In this way a thorough commingling of the air and fuel is effected, and as both are heated prior to their union thorough combustion is a consequent result.

Upon the bottom of the combustion-chamber and directly beneath the helix *s* is secured a dish-shaped metallic deflector E, with an upraised conical central portion, against which the flame is directed by the forcible contact of the air and fuel thereagainst, serving to spread the flames and produce a more general diffusion of the heat.

In order to heat the liquid fuel, that it may emerge from the feed-pipe in the best condition for ready combustion when intermingled with air, I have disposed a heater F, which is placed at one end of the combustion-chamber. Into this the feed-pipe C delivers the fuel, which soon becomes heated, as the apparatus F serves as a reservoir, wherein the fuel is temporarily stored prior to its delivery through and escape from the coiled part *s* of the feed-pipe C.

The operation is as follows: The liquid fuel enters the feed-pipe C under pressure, obtained by any suitable means, preferably a small air-pump, (not shown,) and passes to to the heater F, where it is temporarily held and heated to the point of vaporization. Thence it continues along the helix or coil *s* until it reaches the very highest part of said pipe, where it emerges from the delivery-orifice *c*, the flow of fuel passing directly across and through the air-supply pipe by way of the aperture *e* in the latter, causing an upward inrush of air through said pipe D. This mixture of air and liquid fuel emerges into the combustion-chamber and impinges against the deflector-plate E, which disperses and scatters the flames, causing a general and thorough diffusing of the heat which is imparted to the walls of the combustion-chamber, as likewise to the stove, cooking-range, or other suitable apparatus within which said heater A may be placed. The supply of fuel is regulated by means of a valve exteriorly of the cooking range or stove. It is evident that this heater is equally adapted for boilers and steam-generators of all descriptions where a continual fire is not to be maintained.

In lieu of making the air-pipe in one continuous length, with its aperture *e*, above which the end of the feed-pipe C is aligned, I may construct said pipe of two pieces D′, (see Fig. 5,) which are secured, as in Fig. 3, in the base of the combustion-chamber. Thence they extend upward and terminate at a point adjacent to the under side of the fuel feed-pipe C. Thus an aperture is formed, above which the said pipe C is placed, and through which the fuel is delivered, creating a suction and causing an inrush of air up through said pipes D′. This air is thoroughly commingled with the liquid fuel, as after the manner accomplished when the air-pipe D is made of one continuous piece. The ends of said pipes D′ adjacent to the pipe C are secured together by a semicircular strap G, bolted to them.

What I desire to claim is—

1. A hydrocarbon vaporizer and burner consisting of a combustion-chamber, a coiled vaporizing-pipe therein terminating in a curved end portion and provided with a delivery-orifice located some distance from the end of said pipe and in a plane above its termination, and an air-supply pipe, substantially as and for purposes herein specified.

2. A hydrocarbon vaporizer and burner consisting of a perforated combustion-chamber, a coiled vaporizing-pipe with a bent terminal having a fuel-orifice transversely of its bore and located at some distance from the extreme end of said pipe and in a plane above it, an air-supply pipe open at both ends, and with an aperture aligned with the fuel-orifice to permit fuel to pass directly across the bore of the air-pipe, all operating substantially as herein described.

3. In combination with a stove, a removable foraminated chamber B, a liquid-fuel feed-pipe C, terminating in a helix within said chamber, a heater F, and an air-supply pipe D, both within said chamber, said pipes C and D being provided with apertures *e c*, arranged in alignment and the aperture in the liquid-fuel pipe being above the end thereof, substantially as set forth.

4. In combination with a heating or cooking apparatus, a combustion chamber or box B, provided with foraminated removable sides and top, a heater F therein, a fuel-supply pipe C, connected with said heater, and the coil *s*, terminating in a bend, the supply-orifice *c* in the top of said bend, the air-supply pipe D, with its transverse aperture *e*, the orifice *c* being above the end of pipe C, substantially as described.

5. In combination with a heat or steam generating apparatus, a foraminated combustion-chamber B, a fuel feed-pipe C, terminating in a helix within said chamber, a heater

F, and air-supply pipes D, both within said chamber, said pipes terminating at their upper ends at a point adjacent to but to one side of the fuel-pipe C, and the delivery fuel-orifice *c*, transversely of the fuel-pipe and in alignment with the space between the ends of said air-pipes, substantially as herein described.

In testimony whereof I affix my signature in presence of two witnesses.

LEVI W. LOMBARD.

Witnesses:
H. E. LODGE,
JOHN A. DOUGHERTY.