(No Model.) 2 Sheets—Sheet 1.

C. M. HOLLINGSWORTH.

VAPOR STOVE.

No. 470,756. Patented Mar. 15, 1892.

Fig. 1

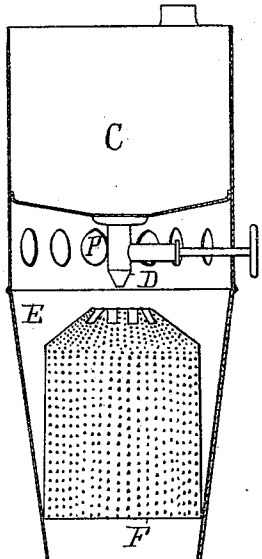


Fig. 9.

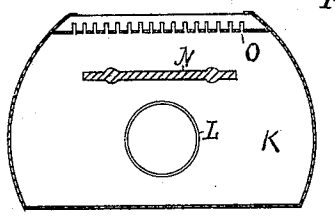


Fig 8

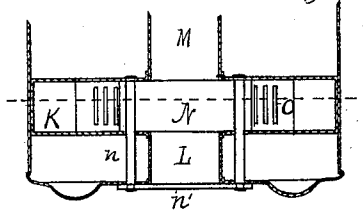
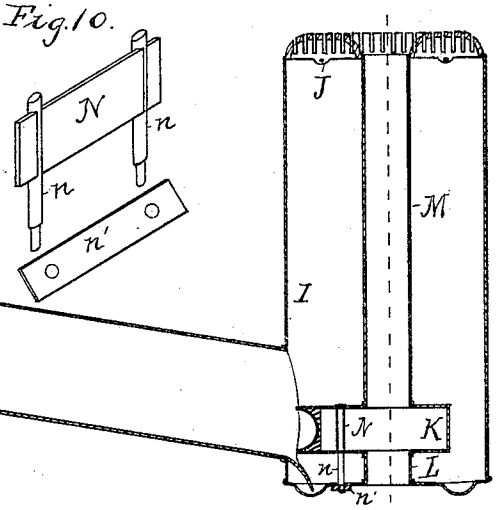


Fig. 10.



WITNESSES

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(No Model.) 2 Sheets—Sheet 2.

C. M. HOLLINGSWORTH.

VAPOR STOVE.

No. 470,756. Patented Mar. 15, 1892.

Fig 2

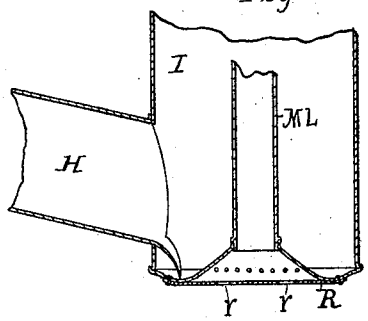


Fig 3

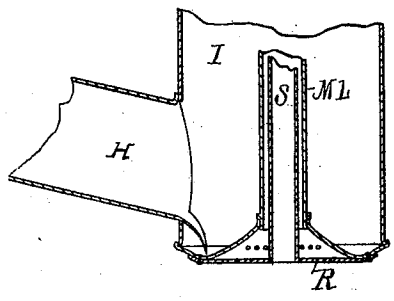


Fig. 4

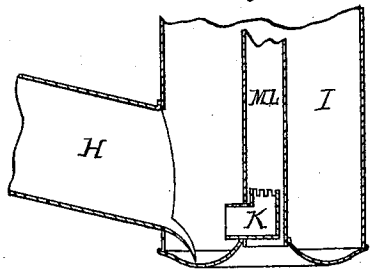


Fig 5

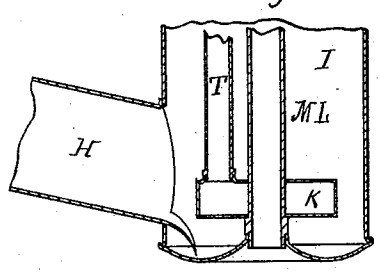


Fig. 6

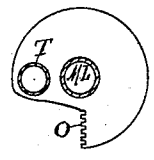
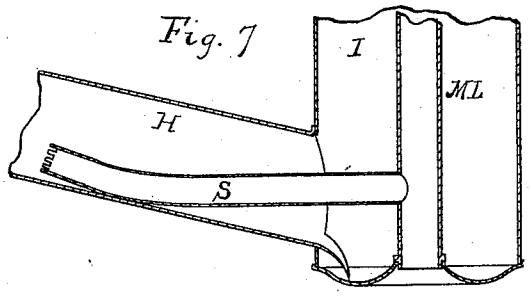


Fig. 7



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UNITED STATES PATENT OFFICE.

CHARLES M. HOLLINGSWORTH, OF CLEVELAND, OHIO.

VAPOR-STOVE.

SPECIFICATION forming part of Letters Patent No. 470,756, dated March 15, 1892.

Application filed June 16, 1890. Serial No. 355,642. (No model.)

To all whom it may concern.

Be it known that I, CHARLES M. HOLLINGSWORTH, a citizen of the United States, residing at Cleveland, in the county of Cuyahoga and State of Ohio, have invented certain new and useful Improvements in Vapor-Stoves, of which the following is a full, clear, and exact description.

My invention relates to vapor-stoves which contain a gravity-carburetor and a burner suitably connected therewith, whereby the volatile hydrocarbon is vaporized and the combustible vapor fed as fast as formed to the burner, where it is consumed.

The form of gravity-carburetor which is illustrated in the drawings is substantially that which is shown in my prior patents, No. 420,797, dated February 4, 1890, and No. 421,834, dated February 18, 1890, although my invention may be advantageously employed with any other form of carburetor when the same is so combined with a burner that the combustible vapor is fed as fast as formed to said burner by gravity. In the carburetor apparatus shown the difference in specific gravity between the external air and the combustible mixture of air and vapor formed in said carburetor is slight, and even under most favorable circumstances—as, for example, when the downwardly-extended conducting-tube which connects the carburetor with the burner is as long and straight as is practicable—the effective pressure or head at the burner-cap where the vapor is burned is not great. The exigencies of adaptation to practical use of a gravity-carburetor combined with a burner in a vapor-stove still further reduce the effective pressure or head, because it is desirable to have the burner raised to such a height that the user can readily and conveniently handle cooking-vessels above said burner, while the tank containing the volatile hydrocarbon should not be too high to be reached conveniently.

My invention is designed to remedy this practical difficulty; and it consists, broadly, in the combination, with a gravity-carburetor and a burner connected therewith in the described manner, of a device for heating the current of mingled vapor and air when the same is at or near the lowest point in the path it travels in passing from the carburetor to the burner-cap or point of combustion, whereby the rapidity of the current due to gravity is supplemented by a forced upward draft toward the burner-cap due to the expansion of the vapor by heat.

It also consists in the construction and combination of parts hereinafter described, and pointed out definitely in the claims.

Referring to the drawings, Figure 1 is a central vertical sectional view of what I believe to be the best form of apparatus embodying my invention. Figs. 2, 3, 4, 5, and 7 are central sectional views through the lower part of the burner-shell and a supplemental heating device combined therewith, illustrating some of the forms in which the invention may be embodied. The devices shown in said figures are devices which I have tried with satisfactory results, which results differ in degree only from the result obtained by the preferred construction. Fig. 6 is a top plan view of the heating-chamber K, which is shown in Fig. 5. Fig. 8 is a vertical sectional view of the lower part of the burner-shell and heating-chamber K, which is shown in Fig. 1, said section being in a plane at right angles to the section shown in Fig. 1. Fig. 9 is a horizontal sectional view of the heating-chamber shown in Fig. 1; and Fig. 10 is a detached view of certain details of construction present in the form of device shown in Fig. 1, as will be hereinafter more fully described.

I will now proceed to describe in detail the apparatus shown in Fig. 1.

C represents a reservoir for containing the volatile hydrocarbon, which reservoir is provided with a valve-controlled outlet-pipe D, and it is suitably supported above the vaporizing-chamber E, which chamber is provided with suitable infeed-apertures P for free admission of air thereto.

F represents an evaporator within the chamber E, substantially like those which are described in my prior patents above referred to; but it may be of any other suitable form, so placed as to receive the drip or flow of oil from the reservoir C.

H represents a pipe, which connects the lower end of the chamber E with the lower end of the burner-shell I, which shell is pro

vided with a suitable bottom and with a burner-cap J, which cap is provided with suitable perforations or slits, through which the mixture of air and vapor passes to be consumed.

M L represent an open-ended tube extending through the chamber inclosed by said burner-shell and tightly secured to the bottom and to the cap J thereof. K represents a chamber connected with said tube and forming an enlargement thereof. This chamber is made, preferably, of sheet metal, and it is placed adjacent to the infeed-opening to said shell, extending entirely across said shell in a direction at right angles to the infeed. That side of the chamber K which faces the infeed-opening is provided with perforations O in the form of vertical slits, through which a portion of the mixture of air and vapor entering through the infeed-opening E will pass into the chamber K. The outer face of this grated or slitted side is concave, as shown, to facilitate the entry of the vapor to said chamber. A partition N is inclosed within said chamber between the grated side and the point of connection with the tube L. Said partition serves to deflect the flame when it has been established at the grating, and thereby more effectually heats the entire chamber K. This partition is secured in position by means of the posts *n*, secured thereto, which pass through the bottom wall of said chamber, the bottom of the burner-shell, and the stiff bracing-strip *n'*, said posts being fastened by upsetting their ends or in any other suitable manner. These posts, moreover, serve to conduct the heat from the partition N to the bottom of the burner-shell. When the vapor and air are passed from the chamber E to the burner-cap J by gravity and there lighted, some vapor and air will also pass through the perforations O into the chamber K and into the pipe M, being drawn up said pipe to the flame at the burner (from which it is ignited) by the upward draft in said pipe induced by the main-burner flame, or, if the lighting of the vapor issuing from the main-burner cap is delayed, some of the escaping vapor will fall by gravity into the pipe M. When the main burner is lighted, this column of vapor in pipe M is also ignited, and the flame flashes back through pipe M and establishes itself within the chamber K, the supply of air to feed the flame being drawn through pipe L and the products of combustion passing off through pipe M. All of the joints of chamber K and pipes L and M are tight, so that the flame cannot be communicated from said chamber and pipes to the mixed vapor and air within the burner-shell I. The perforated side of the chamber K thus acts as a supplemental burner and also affords additional surface to be heated for the purpose of heating the current of vapor passing to the burner-cap J. As the chamber K and pipe M become heated through the operation of this supplemental burner they heat the mingled air and vapor contained in the burner-shell and near the lowest point traversed by the mixture of vapor and air, thus rarefying said mixture and creating a forced upward current through the burner-shell I and materially increasing the working pressure of the stove and giving a uniform, steady, and powerful flame at the burner, whereas without this reinforcement the pressure due to gravity and resulting from the comparatively small elevation of the vaporizing-chamber E above the level of the point of combustion at the burner-cap J would be comparatively small and inefficient.

In Fig. 2 the pipes M L are united to form a single central draft-tube, and the perforations which serve as supplemental burners are in the inverted-funnel-shaped bottom of the burner. A plate R extends across the bottom of the burner, thereby inclosing the chamber between it and the inverted funnel-shaped bottom of the burner-shell. The plate R is provided with perforations *r*, through which the air is admitted which escapes upward through the tube M L. This plate R thus protects the supplemental flame from the direct and undeflected draft from the column of air passing up the central draft-tube.

After a long series of experiments with many different forms of supplemental burners for vapor-stoves which have a gravity-feed I find that it is impossible to practically operate a supplemental burner which is formed by merely perforating the draft-tube, as shown, for example, in Letters Patent No. 401,783, granted April 23, 1889, to L. Kahn. A draft of air up the central tube, if allowed to come to this supplemental flame directly and without deflection, as it does in the Kahn burner, extinguishes the flame and renders the supplemental burner practically inoperative. Experimentally and under favorable conditions this supplemental flame may not be extinguished when such a burner is used in a stove having a gravity-feed; but in practical use it will be, and this action results from the strong direct draft up the tube and the very slight pressure with which the combustible mixture is fed to the supplemental burner. In order to make the burner operative for its intended purpose, it is necessary either to place the supplemental burner in a position which is out of the direct upward draft through the central tube or to employ a plate, substantially as shown in Fig. 2, whereby the strong draft up the central tube is deflected and prevented from coming directly in contact with the supplemental flame.

Fig. 3 shows substantially the same construction as Fig. 2, except that it contains an additional draft-tube S, passing centrally through the pipe L M, serving to increase the draft therein and to supply fresh oxygen to the center of the flame of the main burner. Moreover, the plate R contains no apertures *r* for the admission of fresh air, and I find by experiment that this construction is operative, because the mixed vapor and air which

passes through the perforations contains enough oxygen to support the combustion at the supplemental burner.

In Fig. 4 a box K is inserted into the pipe M L and has an open end facing the pipe H, while the part of said box within the pipe L M is slitted, as shown. The mixture of air and vapor passes into the open end of this box K, and through the slits above referred to into the pipe M L, where it is lighted, as above described, and the flame, flashing back, establishes itself at the slitted part of said box, with the same result as heretofore pointed out.

In Figs. 5 and 6 the supplemental burner consists of a shallow sheet-metal box, which surrounds the central draft-tube M L, but which does not communicate therewith. Fig. 8 is a top view of this box and shows the form in which it may be most advantageously constructed. At one side of the central tube are placed slits O, through which the combustible vapor enters the box. T represents a tube communicating with the box, as shown, and extending upward through the burner-cap. The mixture of vapor and air enters through the slits O and passes for most part around the tube M L and up through the tube T, where it is ignited from the burner-flame. As in the other examples, the flame flashes back and establishes itself at the perforations O. The heated products of the combustion at this point sweep around the tube M L and up the tube T, thereby heating the entire box K and tube M L for the same purpose as in the other examples of this invention. In this construction, as in the construction illustrated in Fig. 3, no means are provided for admitting a supply of air to support the flame at this supplemental burner, the oxygen contained in the mixture of vapor and air which enters this box through the slits O being relied upon wholly for this purpose.

In Fig. 7 the supplemental burner is located within the lower end of the pipe H. A pipe S is connected with the pipe M L and extends into the pipe H, as shown. Its inner end is slitted, and the mixed air and vapor enter it through said slits. The flame is established in the manner above pointed out within said pipe contiguous to the slitted openings in its end. The supplemental burner is not in this case at the extreme lowest point traveled by the mixed air and vapor, and I find by experiment that it need not be. It must, however, be so near this lowest point that it will not create a back-current up the pipe H, but will begin to expand the combustible vapor at such a point that it will accelerate the rate at which said vapor travels to the burner-cap. It is of course impossible to designate the exact point in relation to the lowest point traversed by the vapor at which this heating thereof must begin. It must be near this lowest point and at such a point relative thereto that the current toward the burner-shell shall be accelerated by the heat.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. The combination of a gravity-carburetor, a main burner arranged below the level of said carburetor, a conducting-pipe connecting said carburetor and burner, through which the combustible mixture of air and vapor flows by gravity from the carburetor to the burner, and a device for heating the mixture of vapor and air at or near the lowest point which said mixture reaches in traveling from the carburetor to the point of combustion, for the purpose specified.

2. The combination of a gravity-carburetor, a main burner arranged below said carburetor, consisting of a shell having a suitably-perforated cap, and a conducting-pipe connecting said carburetor with the lower part of said burner-shell, said pipe and shell forming a closed conduit, through which the mixture of vapor and air flows by gravity from the carburetor to the point of combustion, with a supplemental burner receiving its combustible mixture of vapor and air in said conduit after it has entered the burner-shell, substantially as and for the purpose specified.

3. The combination of a gravity-carburetor, a main-burner shell arranged below said gravity-carburetor and having a suitably-perforated cap and a conducting-pipe, said pipe and burner-shell forming a closed conduit, through which the mixture of air and vapor flows by gravity from the carburetor to the point of combustion, with a supplemental burner receiving its combustible vapor from said conduit and arranged to heat the mixture of vapor and air at or near the lowest point which it reaches in traveling from the carburetor to the burner-cap, and a tube having its upper end adjacent to the main-burner flame, whereby the supplemental burner is automatically lighted, substantially as and for the purpose specified.

4. The combination of a gravity-carburetor, a main burner arranged below said carburetor, consisting of a shell having a suitably-perforated cap, and a conducting-pipe connecting said carbureter with the lower part of said burner-shell, said pipe and shell forming a closed conduit, through which the mixture of vapor and air flows by gravity from the carburetor to and through the burner-cap, a central draft-tube extending through said burner, a supplemental burner receiving its combustible vapor from said conduit, and means for protecting said supplemental-burner flame from the direct and undeflected action of the draft of air passing up through said central draft-tube, substantially as and for the purpose specified.

5. In a vapor-burner, in combination, a burner-shell having a perforated cap at its top and an infeed-opening near its lower end, a

tube open at both ends, passing vertically through the chamber inclosed by said shell, said tube being enlarged at a point opposite the infeed-opening, whereby a chamber K is formed, the wall of said chamber adjacent to the infeed-opening being perforated, substantially as and for the purpose specified.

6. In a vapor-burner, in combination, a burner-shell having a perforated cap at its upper end and an infeed-opening near its lower end, a tube open at both ends, passing upward through the chamber inclosed by said shell, and a chamber K, inclosed within said shell and communicating, as described, with said tube, that side of said chamber which faces the infeed-opening being in the form of a concave grating, substantially as and for the purpose specified.

7. In a vapor-burner, in combination, a burner-shell having a perforated cap at its top and an infeed-opening near its lower end, a tube open at both ends, passing upward through the chamber inclosed by said shell, a chamber K, inclosed within said shell and communicating, as described, with said tube, said chamber being provided on the side which faces the infeed-opening with perforations, and a partition N in said chamber K, substantially as and for the purpose specified.

8. In a vapor-burner, in combination, a burner-shell having a perforated cap at its top and an infeed-opening near its lower end, a tube open at both ends, passing through the chamber inclosed by said shell, a chamber K, inclosed within said shell and communicating, as described, with said tube, the side of said chamber K which faces the infeed-opening being perforated, and the metallic posts connecting the bottom of the chamber K with the bottom of the burner-shell, substantially as and for the purpose specified.

CHARLES M. HOLLINGSWORTH.

Witnesses:
E. L. THURSTON,
ALBERT H. BATES.