(No Model.)

C. M. HOLLINGSWORTH.

VAPOR STOVE.

No. 448,652. Patented Mar. 24, 1891.

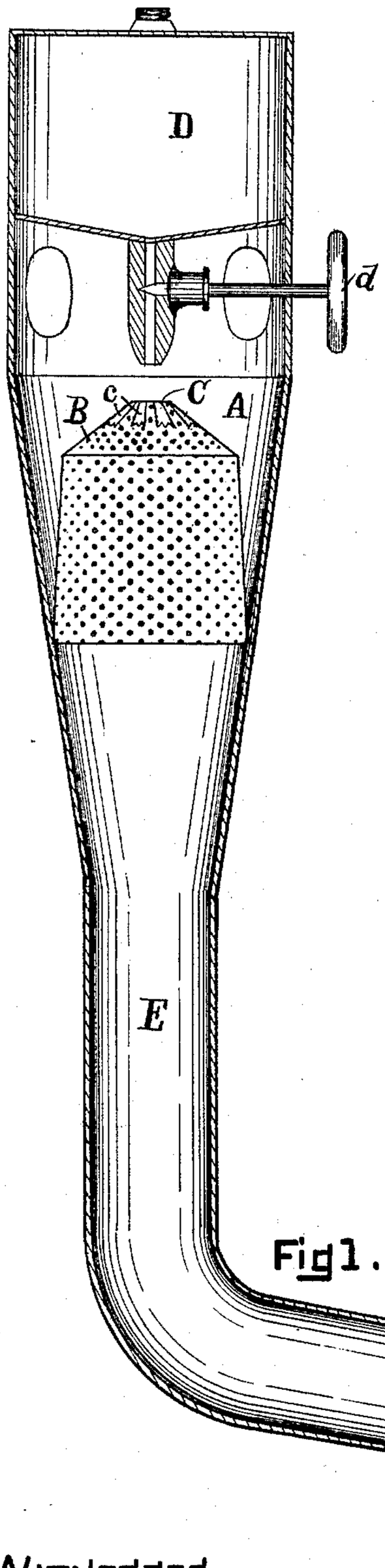

Fig 1.

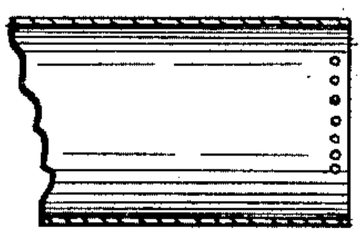

Fig 2.

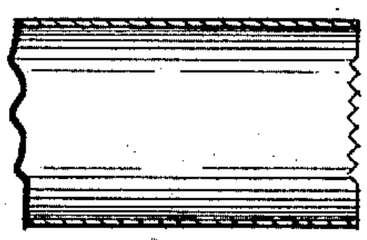

Fig 3.

WITNESSES:

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CHARLES M. HOLLINGSWORTH, OF CLEVELAND, OHIO.

VAPOR-STOVE.

SPECIFICATION forming part of Letters Patent No. 448,652, dated March 24, 1891.

Application filed June 16, 1890. Serial No. 355,643. (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, reference being had to the accompanying drawings.

As vapor-stoves consisting of a gravity carburetor combined with a suitable burner were operated prior to my invention of the process patented in Letters Patent No. 420,797, dated February 4, 1890, the control and regulation of the burner-flame depended upon a regulated delivery from the carburetor to the conducting-pipes of the combustible mixture of air and hydrocarbon vapor, and no liquid hydrocarbon was allowed to escape into the conducting-pipes leading to the burner; but in the process above mentioned, patented by me, the proper regulation and control of the burner-flame depends, primarily, upon a regulated delivery into a separate vaporizing-chamber of the liquid hydrocarbon which flows indefinitely downward over suitable evaporating-surfaces until it is completely vaporized, the conducting-pipe for the mingled vapor and air being merely a downward continuation of the vaporizing-chamber and itself affording supplementary evaporating-surfaces.

I have found that in an apparatus for carrying out this process to the best advantage peculiar features of construction not required in the prior devices are desirable in order that the vaporization of the hydrocarbon and the delivery of the commingled vapor and air to the burner shall be gradual, regular, and continuous.

The object of my invention is to produce at the burner a flame of substantially even and unvarying quality, and I aim to secure this result by compelling a continuous and regular downflow of the liquid hydrocarbon without accumulation thereof at the laps or edges of connected evaporating-surfaces, or in any depressions in the conducting-pipes, and without leakage at the joints until said liquid is either completely vaporized or the final residue is delivered in a gradual and regular manner on a heated surface, preferably within the burner-shell, the residue being thus vaporized without impairing to any appreciable degree the quality of the flame. The several features of construction which, in combination, as set forth in the claims, contribute to secure this result are: (*a*) a continuously-downward inclination of the conducting-pipe to a point in or contiguous to the burner, where the unvaporized residue of the hydrocarbon liquid is vaporized by heat; (*b*) the construction and mode of joining two evaporating-surfaces, which consists in serrating the delivery edge of the upper surface and placing said serrated edge in contact with the lower surface; (*c*) providing the outer of two lapping pipe-sections with an outwardly-turned annular bead set back from its edge and in the lapping part thereof; (*d*) carrying the lower part of the conducting-pipe into the burner-shell and providing it with a downwardly-turned lip adapted to gradually discharge the unvaporized residue onto a heated evaporating-surface within the burner-shell; (*e*) providing the bottom of the burner-shell with a depression or pocket into which the residue of the unvaporized hydrocarbon is discharged from the lip on the conducting-pipe.

Referring to the drawings, Figure 1 is a vertical central sectional view of the following parts of a vapor-stove, viz: the carburetor, the burner, and the connections between them. Figs. 2 and 3 are detached sectional views of the delivery edge of the inner of two connected pipe-sections.

I will now proceed to describe in detail the constructions illustrated in the drawings.

The vaporizing-chamber A, of substantially the form shown in my prior patents, contains an evaporator B, made of perforated metal and of any approved form. The liquid hydrocarbon is fed drop by drop from the reservoir D into the vaporizing-chamber and onto the imperforate cap C, which crowns the evaporator, the rapidity of the flow being regulated by a suitable valve *d*. The parts of this cap which extend down over and in contact with the perforated sides of the evaporator are in the form of separate arms *c*, whereby the liquid hydrocarbon is more evenly distributed over the evaporator, and the lower or delivery edges of these arms are serrated,

whereby accumulation of the liquid at these edges is prevented, as and for the purpose hereinafter pointed out.

E represents the conducting-pipe which connects the vaporizing-chamber A with the burner F, which pipe is, as a matter of fact, an open continuation of the vaporizing-chamber.

The operation of the device is theoretically perfect when all of the liquid hydrocarbon is vaporized in the vaporizing-chamber; but, practically, this mode of operation cannot be attained at all times, and the liquid flows in a thin shallow stream down the non-absorbent evaporating-surfaces of the evaporator, the vaporizing-chamber, and of the conducting-pipe, and in some cases into the burner before complete vaporization takes place. It is therefore necessary that the vaporizing-surfaces in the vaporizing-chamber and of the conducting-pipe have a continually-downward inclination to the point where the unvaporized residue flows onto a heated surface, where complete vaporization takes place, and this, it will be seen, is the construction shown in the drawings.

It will generally be necessary, practically, in constructing a vaporizing-chamber and conducting-pipe to join together two or more pipe-sections, and in order that the laps or transitions from the evaporating-surface of one section to that of the other shall not in any way impede the continued downflow of the liquid hydrocarbon the sections are preferably constructed and joined together in the following manner: The upper section is inserted into the lower section a sufficient distance, and the edge of that part of the inner section over which the liquid will flow—that is, the delivery edge—is serrated or perforated, substantially as shown in Figs. 2 and 3. The serrated edge, in which the distance between the points is about one-eighth of an inch and the depth of the notches between the teeth is about one-eighth of an inch, is the best construction; but these proportions are not essential to the invention. Moreover, I find that small perforations close to the delivery edge result in substantially the same mode of operation, although in a less satisfactory degree, and I regard the perforations as the equivalents of the serrations, as herein described and claimed. This serration of the delivery edge of the upper evaporating-surface causes a regular and even downflow of the thin stream of liquid, and it is believed that this regularity in the flow is due to a capilliary action, which does not take place unless said edge is constructed substantially as described. Without such construction accumulation of the liquid at the delivery edge of the upper section would occur, and this accumulation would be due, it is believed, to the fact that a liquid flowing in a very shallow and continuous stream over an inclined or vertical non-absorbent surface will not readily pass in the same manner over any break in the continuity of said surface or where an abrupt edge is presented, but will tend to heap itself up above the edge until the weight of the accumulated mass is sufficient to carry it over said edge in a flood, after which the flow would again be checked until there was another similar accumulation. This intermittent flow or delivery of the liquid causes some irregularity in the rate of its vaporization, and this irregularity has an injurious effect upon the quality of the flame at the burner. Where the liquid hydrocarbon flows down the pipe past any joint therein, capillary attraction will tend to cause said liquid to enter between the two pipe-sections, and unless this capillary action is in some way broken a small quantity of the liquid will flow between the sections to the outside surface of the pipe, causing some waste of the liquid, creating a bad odor, and making it disagreeable to handle said pipe. I prevent this action by forming in the lapping part of the outer pipe-section and back from its edge an outwardly-turned annular bead G, as shown in the drawings, and when the liquid hydrocarbon reaches this point capillary attraction ceases to act and the liquid goes no farther.

The burners which are found best adapted for use with this sort of carburetor are cylindrical in form and have a perforated or slitted top, through which the combustible vapor escapes. The pipe conducting the vapor from the vaporizing-chamber connects with this burner near the bottom thereof, as shown in the drawings. In the bottom of the burner F is formed an annular pocket II for the purpose of spreading any liquid delivered thereon. The lower part of the conducting-pipe E enters the burner F, and a lip I on the end of the pipe E is bent downward over the pocket H in the bottom of the burner. After the burner has been used a short time the burner-shell becomes heated by conduction by the flame. If any of the liquid hydrocarbon which is permitted to enter the vaporizing-chamber is not sooner vaporized, it flows from the lip I onto the bottom of the burner-shell, where it is quickly vaporized by the heat thereof. In the best construction this lip I is in contact with the heated surface within the burner-shell, although accumulation of the liquid at the lower edge of said lip may be avoided, even where the lip is not in direct contact with said heated surface, by making said lip pointed, as shown. The pointing of this lip or its contact with the bottom of the burner-shell causes the flow of liquid therefrom (when there is such a flow) to be regular and continuous, so that the vaporization of this residue by the heated surface of the burner-shell is also regular and continuous and does not appreciably affect the quality of the flame.

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

1. In a vapor-stove, the combination of a vaporizing-chamber and means for admitting air and a regulated supply of liquid hydrocarbon thereto with a burner formed with a depression in its bottom and a conducting-pipe connecting said chamber and burner, having a continuously-downward inclination, the lower end of said pipe entering the burner-shell and being provided with a downwardly-turned lip, substantially as and for the purpose specified.

2. In a vapor-stove, in combination, a vaporizing-chamber and means for admitting air and a regulated supply of liquid hydrocarbon thereto, a burner, and a conducting-pipe connected therewith, having a continuously-downward inclination, the sections forming said conducting-pipe being constructed and connected in the following manner, to wit: the upper section is inserted in the lower section, and the lower section is provided with an externally-turned annular bead in the lapping part and back from its edge, substantially as and for the purpose specified.

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Witnesses:
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