No. 669,303. Patented Mar. 5, 1901.

# F. P. GLAZIER.

## HYDROCARBON BURNER.

(Application filed Feb. 10, 1899.)

(No Model.)

Fig. 1.

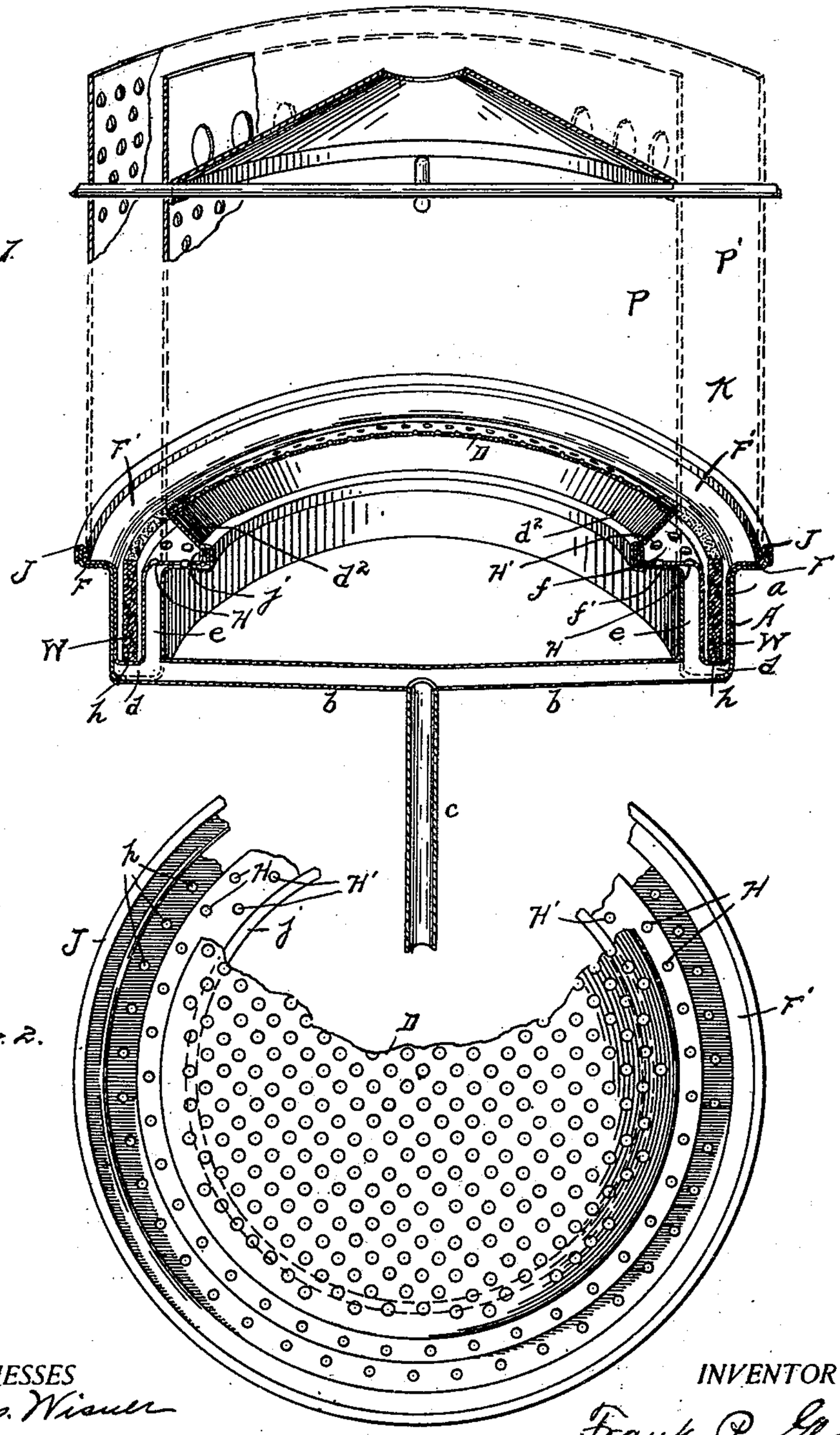


Fig. 2.




WITNESSES

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# UNITED STATES PATENT OFFICE.

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## HYDROCARBON-BURNER.

SPECIFICATION forming part of Letters Patent No. 669,303, dated March 5, 1901.

Application filed February 10, 1899. Serial No. 705,146. (No model.)

*To all whom it may concern:*

Be it known that I, FRANK P. GLAZIER, a citizen of the United States, residing at Chelsea, county of Washtenaw, State of Michigan, have invented a certain new and useful Improvement in Hydrocarbon-Burners; and I 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 pertains to make and use the same, reference being had to the accompanying drawings, which form a part of this specification.

This invention relates to hydrocarbon-burners, and has for its object improvements in that class of burners in which the liquid hydrocarbon is delivered at the bottom of a vaporizing-chamber, wherein it is vaporized or gasified and from which it is delivered into a mixing and combustion chamber, where the process of chemical union of the hydrocarbon with oxygen is carried on and the perfect combustion effected.

The object of the combustion which is effected by the burner of this invention is the production of heat rather than the production of light, and consequently the purpose of the invention is to produce such a combination of oxygen and hydrocarbon that a maximum of heat shall be produced without references to the production of light, and, indeed, generally when oxygen and hydrocarbon are united chemically in such a way as to produce a maximum of heat the flame produced is only slightly visible, and where visible at all has a blue tinge or green tinge, showing a yellow or reddish cast only in those places where for some reason there is imperfect mixture of the chemical constituents, and consequently a combustion that is imperfect, although at a later period (higher up in the flame) there may be a complete combination of gases which at first were not completely chemically united.

The process of chemical action in the burner which forms the object of this invention is, first, the production of a gaseous hydrocarbon vapor; second, the gradual mixing and combining of the vapor with air or oxygen, so that in the first part of the mixing and combining there is a partial combustion with production of some heat, which serves not only to more completely vaporize or gasify the hydrocarbon, but acts also by the liberation of nitrogen from one part of the air and by the production of carbon monoxid from the combination of oxygen and a part of vapor to dilute the remaining part of the vapor and to dilute the carbon monoxid itself, so that as the mingled mass of gases rises higher in the combustion-chamber there is always a more intimate mixing of the gases that are in condition to chemically unite, as well as a constant dilution or spreading and scattering of those gases by the incombustible gases which are mixed with the combustible.

Perfect combustion depends always on the proper proportioning of the parts which constitute the burner, the size of the chambers, the size and number of the air-openings, and the size or extent of surface on which the liquid hydrocarbon is spread and primarily vaporized.

With a hydrocarbon that vaporizes at a comparatively high temperature it is generally found necessary to prepare the initial lighting or first lighting of the fire by mechanically breaking up the liquid into a condition suitable to be ignited. By the comparatively low temperature of a match such mechanical preparation is usually made by allowing the liquid to rise through a wick, and in the burner which is the object of this invention I have used a wick for primary lighting purposes and made arrangements for the regular access of hydrocarbon to the wick; but I have also made provision whereby the wick is not submerged or dipped to any great depth in the hydrocarbon and whereby as soon as the combustion is fairly started and the vaporizing-chamber is heated the hydrocarbon is vaporized before reaching the wick and the vapor finds an easier passage-way to the combustion-chamber than it would have were it compelled to traverse the interstices of the wick.

In the drawings, Figure 1 is a sectional elevation of the burner, the position of the combustion-tubes being indicated by dotted lines. Fig. 2 is a plan view of the burner.

The burner consists of a trough A, preferably of sheet metal stamped or spun into shape. Inlet-pipes *b b*, branching from a stand-pipe *c*, lead into the trough at two places, though there may be more than two

branches leading into the trough, if desired. The stand-pipe *c* is adapted to be connected to any suitable hydrocarbon-receptacle. Within the trough A is a wick-trough *a*, and beneath the wick-trough *a* and above the bottom of the vaporizing-trough A is a chamber *d*, and connected with the chamber *d*, extending up beside the trough *a* and between the trough *a* and the wall of the trough A, is an annular chamber *e*. The chamber *d* and the chamber *e* connect or, in fact, form two portions of a single chamber which extends entirely around the burner and extends vertically from the bottom of the trough A to the flange *f*, which is turned from the walls of the wick-trough *a* at the top line thereof. The trough A also has a flange *f'* turned from the top line of its inner wall, and the flange *f'* engages closely under the flange *f*. The two flanges—one lying above the other—extend a short distance inward and are seamed together at their inner edges. External flanges F F' at the upper edges, respectively, of the troughs A and *a* are also seamed together at their external edges. Through the bottom of the wick-trough are a number of small holes *h*, through which liquid hydrocarbon is admitted to the wick W, and through the upper wall, that bounds the chamber *e*, are a number of small perforations H for the escape of the vapor. A diaphragm D, preferably somewhat conical in shape, is stretched across the opening.

The perforated diaphragm D is of greater diameter than the opening bounded by the seam and is supported and held in place by a return-flange $d^2$, which holds it with its edge lifted above the floor or flat part of the flange *f*, and in practice the return-flange $d^2$ is bent or seamed around, engages under the under side of the flange *f*, and the extreme outer periphery engages against the inside of the inner perforated chimney P and prevents the chimney from shifting on its support underneath the flange $d^2$. Through both the flanges *f f'*, which here lie contiguous, are a number of holes H', the row of holes extending entirely around the burner. These holes H' are air-passages which furnish the first supply of air just at the point where the wick rises above the wick-trough *a*.

A wick, preferably of some incombustible fibrous material, is laid in the wick-trough. It is better that the wick does not fill the trough entirely, though it should extend entirely around the burner.

Above the burner are located two perforated concentric tubes or chimneys P P', and between them and above the wick is an annular chamber. Into this chamber rises gas or vapor from the chamber *e*. Air also enters this chamber through the perforated walls of the chimney.

At the bottom of the combustion-chamber the vapor is in excess, and in accordance with a well-known law of combustion of this class of fuel where the vapor is in excess there is produced that union of gases which results in carbon monoxid, with very little carbon dioxid, but with a large mixture of free vaporized hydrocarbon, and this mixture carries with it all the nitrogen of the air. As the mixture rises it meets fresh supplies of air, which come in through the perforations in the walls of the chimney. The mixture is not only hot, but it is dispersed and diluted, and the access of fresh air to it produces perfect combustion, leaving neither free hydrocarbon vapor nor carbon monoxid.

Below the combustion-chamber and annularly inside of and below the wick is a vaporizing and vapor chamber arranged to be quickly heated when the combustion is first started and to have its heat constantly kept up by the fire in the combustion-chamber, and it is arranged to deliver the vapor generated in it directly into the combustion-chamber, where the rising vapor meets and rapidly mingles with air flowing into the combustion-chamber through the perforations in the side wall. The vapor formed in the vaporizing-chamber does not have free egress into the vaporizing-chamber, but only a limited egress therein, and this may be proportioned to the size and number of holes through the side walls, so as to produce that perfect proportioning of gaseous material necessary to perfect combustion, the perfect proportioning of these openings and of the height of the perforated walls and of the size and number of the openings through the perforated walls being interdependent and not determinable by any fixed rule, but only by experiment. I have found also that the action of the burner is modified materially by the diaphragm D and that the introduction of the first supply of air low down with respect to the wick or the vapor-chamber produces a low initial combustion, which is of use in quickly heating and in properly maintaining the heat of the vaporizing-chamber.

In the vapor-chambers *d* and *e* the vapor is produced and disseminated, so that it rises in an even and uniform volume around the entire burner, rising with equal velocity and mass through the holes H, and as each stream of gas emerges from the chamber *e* it emerges into a mass of surrounding air, of which a fresh supply is constantly coming in through the various passages provided for that purpose.

What I claim is—

1. In a hydrocarbon-burner, the combination of a wick-trough and a vapor-disseminating trough adjacent thereto, the wick-trough being provided with a flange which extends over and beyond the vapor-trough, and is perforated above the vapor-trough, and a pair of perforated chimneys having an annular combustion-chamber between them, and the inner perforated chimney being seated on said flange inside the circle of perforations, substantially as described.

2. In a hydrocarbon-burner, the combina-

tion of a wick-trough and a vapor-disseminating trough adjacent thereto, the wick-trough being provided with a flange which extends over and beyond the vapor-trough, and is perforated in the part above the trough and on the extension beyond the trough, and a pair of perforated chimneys arranged concentrically, the inner chimney being seated on said flange between the circles of perforations, substantially as described.

3. In a hydrocarbon-burner, the combination of an annular vapor-disseminating chamber, the inner wall of said chamber being provided with a perforated flange which extends toward the center of the annular chamber, and a perforated diaphragm, arranged to be supported above the flange, perforated concentric chimneys, the inner one of which is seated on said flange and engages against the edge of said diaphragm, substantially as described.

In testimony whereof I sign this specification in the presence of two witnesses.

FRANK P. GLAZIER.

Witnesses:
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