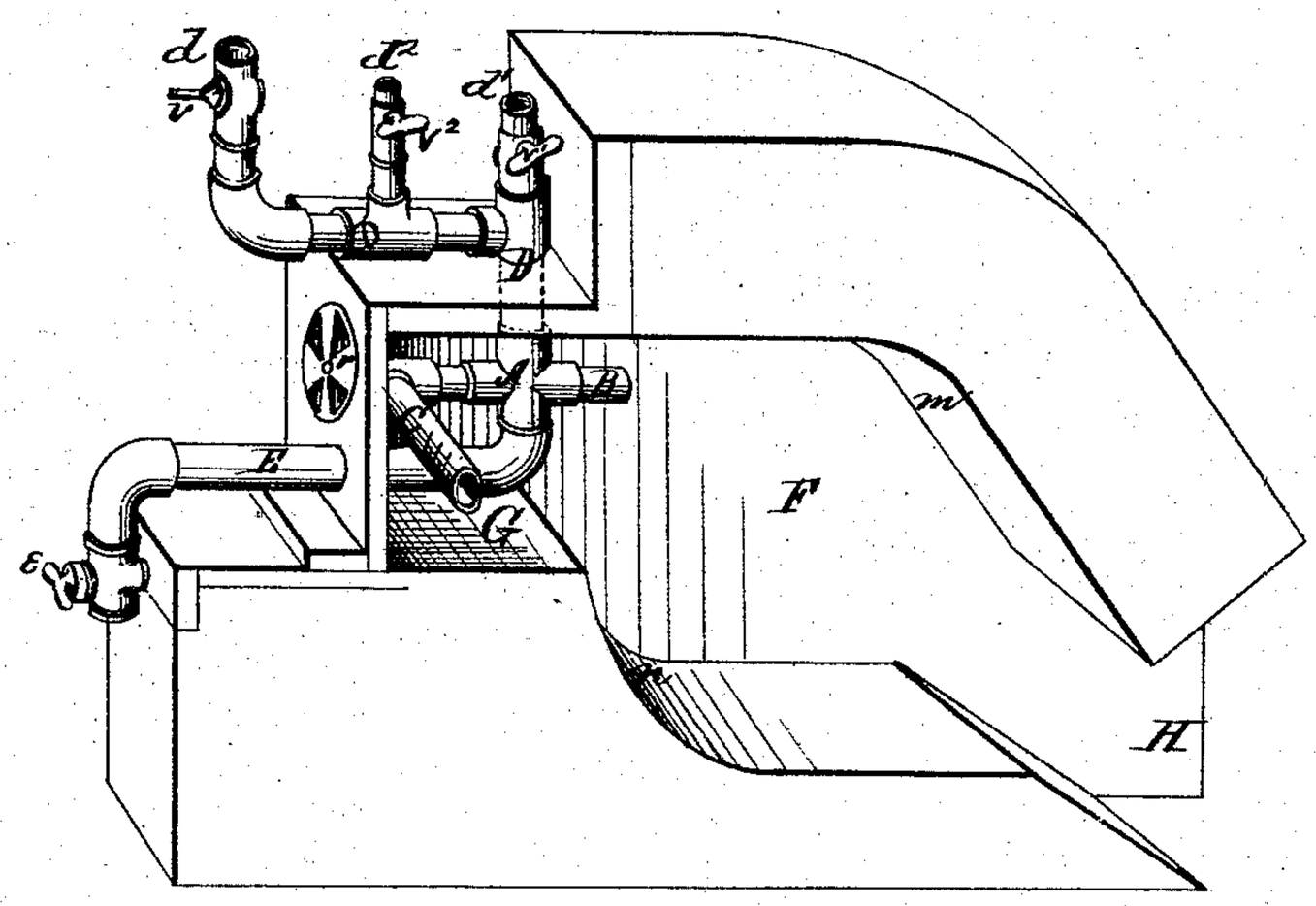
L. STEVENS.

Hydrocarbon-Burners for Furnaces.

No. 156,956. Patented Nov. 17, 1874.



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UNITED STATES PATENT OFFICE.

LEVI STEVENS, OF WASHINGTON, DISTRICT OF COLUMBIA.

IMPROVEMENT IN HYDROCARBON-BURNERS FOR FURNACES.

Specification forming part of Letters Patent No. **156,956**, dated November 17, 1874; application filed July 18, 1874.

To all whom it may concern:

Be it known that I, LEVI STEVENS, of the city and county of Washington and District of Columbia, have invented an Improved Hydrocarbon-Burner for Furnaces; and I do hereby declare the following to be a full and exact description of the same, reference being had to the accompanying drawings, forming part of this specification, in which my invention is represented by a perspective view.

Similar letters of reference in the accompanying drawings denote the same parts.

This invention relates to that class of furnaces in which liquid hydrocarbons are vaporized and applied as fuel, in connection with steam and air.

The whole apparatus consists of two parts, viz., first, the device adapted to mix the liquid hydrocarbons with steam and air, vaporize the mixture, effect a chemical decomposition of the vapor, and the proper recombination of its elements, and project the recombined vapors into the combustion-chamber in a condition for instant and intense combustion; and, secondly, a combustion-chamber completely adapted to receive said apparatus, co-operate with it in volatilizing the hydrocarbon, and effecting the chemical actions and reactions, and to hold and circulate the gases during the the continuance of their ignition.

Referring to the first part—namely, the device for preparing the fuel and projecting it into the combustion-chamber—A represents a combining chamber or passage, in which air, steam, and liquid hydrocarbon meet under a temperature sufficient to rapidly vaporize the hydrocarbon, viz., from 600° to 1000° Fahrenheit, more or less, according to the kind of hydrocarbon employed. B represents a nozzle, from which the decomposed and recombined elements of hydrocarbon vapor, steam, and air are blown with great force into the combustion-chamber. C represents a steam-pipe, which enters the passage A behind and directly in line with the nozzle B, said steam-pipe itself being provided with a suitable nozzle, from which the steam is blown through the passage A into and through the nozzle B. D represents a bent pipe, which extends downward, and connects with the chamber or passage A directly over the center thereof—that is to say, behind the nozzle B, and in front of the steam-nozzle above referred to—so that whatever enters the chamber A from the pipe D will be projected into the combustion-chamber by the force of the steam-jet. d d^1 are two short open branches of the pipe D, having cocks v v^1, for the purpose of admitting and regulating air-currents both behind and in front of the oil-supply. d^2 is the oil-supply pipe, having a cock, v^2, to control the flow of oil, and arranged to join the pipe D at a point between the branches d d^1, so as to insure a thorough intermingling of the air and hydrocarbon liquid before they enter the furnace and become subject to the vaporizing heat thereof; and E is an air-pipe, entering the combining chamber or passage directly under the mouth of pipe D, for the purpose of preventing the deposition of carbon in the bottom of the passage A at that point. This pipe E is also provided with a cock, e, by which the quantity of air admitted through it may be regulated at will.

The extension G of the combustion-chamber forms a hot-air compartment, adapted to accommodate the parts A C D E, and to maintain a suitable temperature for their purpose, which temperature may be varied somewhat by means of air-register r.

Only a single section of pipes is shown in the drawing, as the latter is intended merely to illustrate the principle. Any number of such sections may be arranged in the extension G, when the furnace is constructed for practical use.

The practical operation of the apparatus is substantially as follows: The reservoir of hydrocarbon having been suitably supplied, steam is let on by means of a suitable valve, and the cocks v v^1 v^2 e are opened. The blowing of the steam through the nozzle B creates a strong air-current through each of the pipes d d^1 E toward the chamber or passage A, and also facilitates the induction of the hydrocarbon from the pipe d^2. The air, steam, and hydrocarbon, all heated in the course of their movements to the combining-chamber A, are, while in such highly-heated condition and still subject to a high surrounding heat, thoroughly intermingled in said combining-chamber. During their brief passage through that chamber

the hydrocarbon is instantly decomposed, and its elements recombined with the other elements present, and this having taken place the gases thus liberated or prepared are projected from the nozzle horizontally into the combustion-chamber with great force, and are there burned, giving off an intense heat. The cocks v^1 v v^2 e are to be adjusted so as to produce the best results, which the operator can determine in any case by observing the combustion in progress in the chamber F through openings or windows provided for that purpose. The pipe E being open at its lower end, and somewhat inclined from the chamber A, will always serve to indicate when the hydrocarbon is supplied too freely, since so much of the oil as does not evaporate nor combine with the steam will work down through the pipe and drip from the lower end thereof. Whenever liquid oil is observed at the lower end of the pipe E, the cocks should be readjusted to prevent it. In devices heretofore employed for evaporating hydrocarbon in a pipe or pipes, difficulty has been experienced from the deposition of solid carbon upon the bottom of the pipe immediately beneath the oil-inlet and the gradual filling up of the main pipe thereby until the whole apparatus becomes practically inoperative. In my improved device this difficulty no longer exists, first, because the solid carbon has no surface to drop upon and adhere to at that point; and, secondly, because any over-supply of oil is at once detected by means of the pipe E, as above described. The pipe E also helps to mingle air thoroughly with the vaporized hydrocarbon and the steam. Indeed, the intermixing of the substances referred to, in the course of their progress through the pipes, is as perfect as can be practically attained, the hydrocarbon first striking an air-current on one side, at the lower end of pipe d^2, and commingling therewith, the commingling substances then striking another air-current on the other side at the lower end of pipe d^1, and becoming further intermixed, and the whole, thus intermixed, dropping directly into the line of the air-current from E, moving in the opposite direction, and at the same instant receiving the impact of the steam in a lateral direction. Under these circumstances it is almost impossible that each atom of heated hydrocarbon in the passage A should not have, as its neighbors, an atom of heated air and an atom of heated steam in a condition for instant chemical action with each other, as the result abundantly proves.

I claim as my invention—

1. The pipe E, in combination with the chamber A and the pipe D, beneath which latter and said chamber it is located to act as an indicator, and also to prevent the deposition of solid carbon in said chamber, substantially as described.

2. The bent pipe D, provided with air-tubes d d^1, and hydrocarbon-tube d^2, in combination with the steam pipe C, chamber A, and air-pipe E, substantially as described, and for the purposes set forth.

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Witnesses:
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