(No Model.) 2 Sheets—Sheet 1.

A. T. GIFFORD.

HYDROCARBON BURNER AND CONNECTION THEREFOR.

No. 562,819. Patented June 30, 1896.

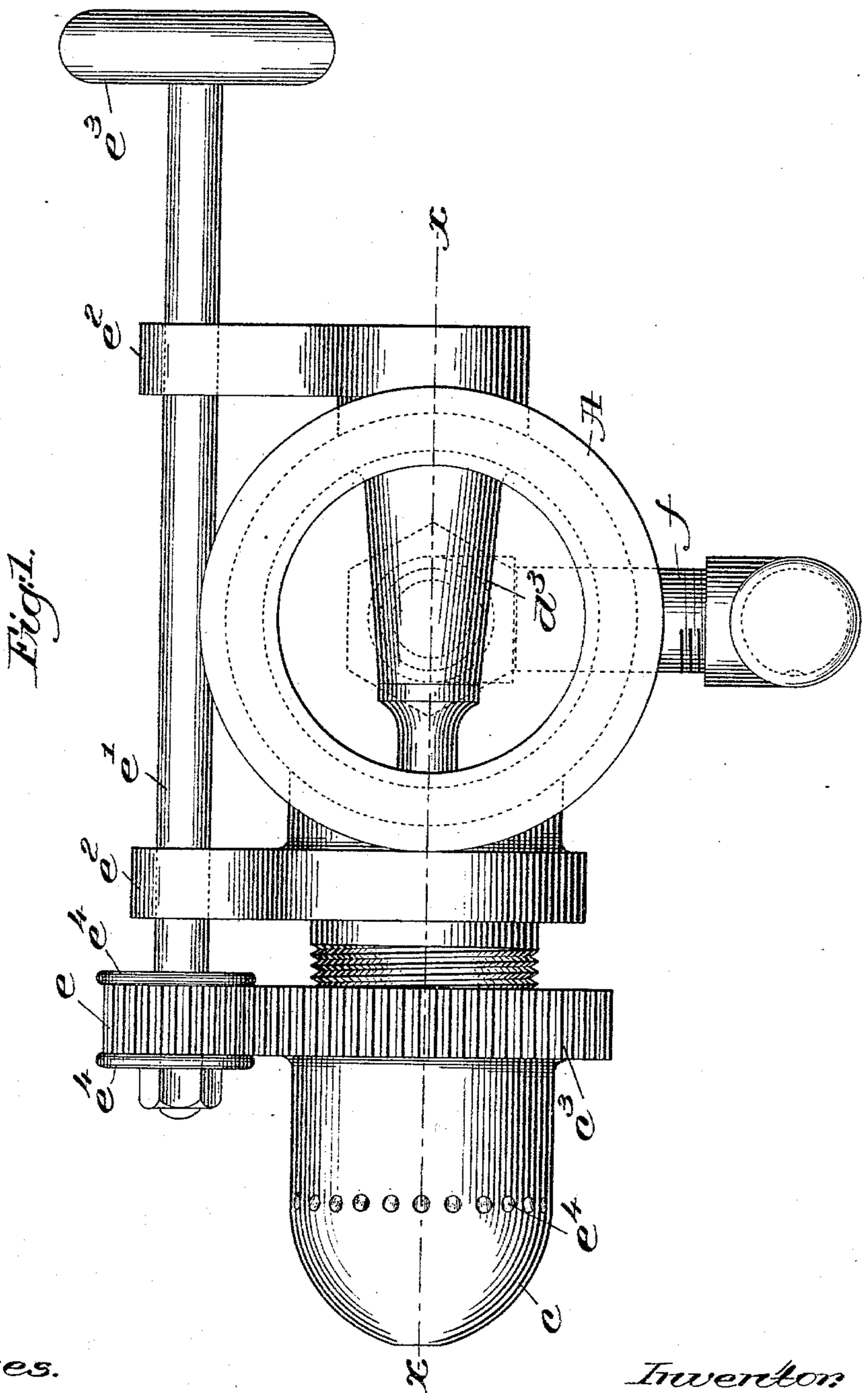

Fig. 1.

Witnesses.
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(No Model.) 2 Sheets—Sheet 2.

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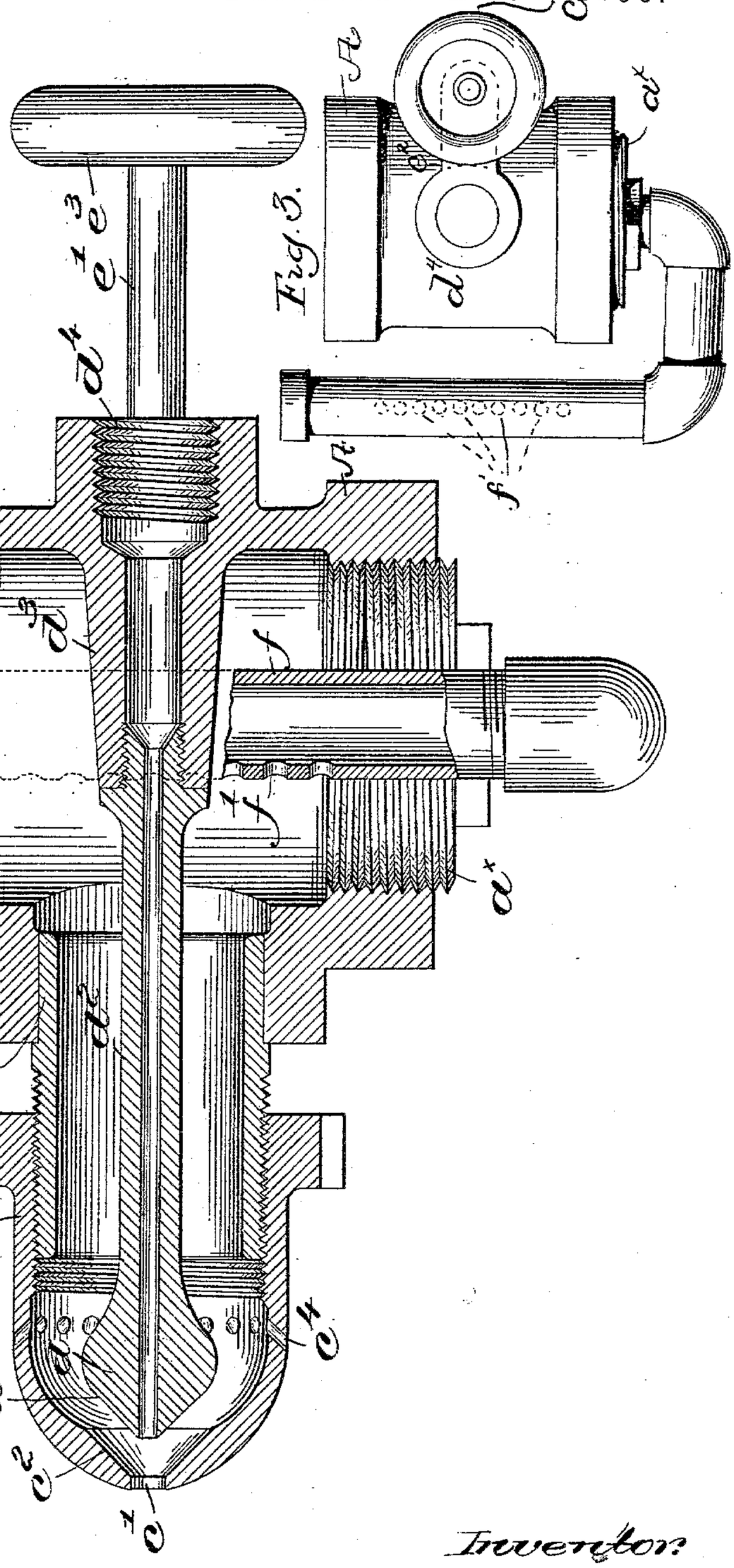
Fig. 3.



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UNITED STATES PATENT OFFICE.

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HYDROCARBON-BURNER AND CONNECTION THEREFOR.

SPECIFICATION forming part of Letters Patent No. 562,819, dated June 30, 1896.

Application filed May 31, 1894. Serial No. 512,958. (No model.)

To all whom it may concern:

Be it known that I, ALENZA T. GIFFORD, of Fitchburg, county of Worcester, State of Massachusetts, have invented an Improvement in Hydrocarbon-Burners and Connections Therefor, of which the following description, in connection with the accompanying drawings, is a specification, like letters on the drawings representing like parts.

This invention relates to hydrocarbon-burners, more particularly of that class known as "low-pressure" burners, the object of the invention being, first, to improve the construction and means for adjustment of the burners to obtain finer and more accurate regulation and from the exterior of the furnace while the burner is in use, and, second, to provide suitable means for preventing the flame from a burner drawing back out from the furnace. Low-pressure burners require a large outlet-opening in the air-nozzle, while high-pressure burners require a small outlet-opening in the air-nozzle.

Prior to my invention it has been the common practice to construct low-pressure burners with large unadjustable outlet-openings in the air-nozzle, the quantity of air permitted to pass through the burner being regulated by throttling, that is, by more or less closing the air-supply at some point remote from the burner.

It is evident that with a large unadjustable outlet-opening in the nozzle, air at varying pressures would not always be projected therethrough with sufficient force and effect to vaporize the oil, and that therefore any method of regulating a low-pressure burner which depends upon the throttling of the air-supply at some point more or less remote from the burner is necessarily defective in that it cannot at all times properly spray or atomize the oil.

In accordance with this present invention I provide a low-pressure hydrocarbon-burner in which different air-nozzles having outlet-openings of varying diameters may be employed, according to the general class of work for which the furnace is to be used, the supply of air being regulated, not by throttling, as is now customary, but by varying the conical delivery-opening between the air-nozzle and the oil-tube, whereby the air is maintained always at a substantially-constant pressure, but permitted to flow through the burner in greater or less quantities, according to the size of the opening at the nozzle. In order that large openings may be employed and openings of varying diameter, according to the various classes of work, I employ an oil-tube having an enlarged, preferably conical or tapering head, capable of coöperating with outlet-openings having a great range in diameter, and so fitted with relation to the coöperating inner face of the air-nozzle as to preserve at all times, whatever be the size of the opening, a uniformity in the plane of projection of the air and thereby the focal point of the flame.

My invention also comprehends means for adjusting or varying the air supply at the nozzle, such that adjustment may be effected while the burner is in use or heated.

My invention further comprehends suitable means for projecting a blast of air from back of the outlet of the burner toward the furnace-wall to keep the flame from drawing back upon the burner. One simple method of accomplishing this is to provide the air-nozzle with circumferentially-arranged angular perforations through which the air is projected to act upon and blow the flame forward away from the air-nozzle. In some instances, however, this is not sufficient, and my invention also comprehends an air-tube, which may or may not be independent of the burner, arranged at one side the latter and perforated to project air toward and to keep the flame always in substantially its proper position.

In the drawings, Figure 1 represents in side view the preferred construction of burner embodying my invention; Fig. 2, a horizontal section of the same on the dotted line $x\,x$, the plug $a^{\times}$ and part of the pipe f being in elevation; and Fig. 3, a detail end view, on small scale, showing the baffle-pipe f.

Referring to the drawings, in the particular burner there shown to illustrate my invention, A is the shell, shown as tapped at opposite sides at $a\,a$. The threaded end of the air-supply pipe (not shown) is screwed into one of these threaded openings a, and to the other may be connected an air-supply pipe leading to the next burner of a series, where a series is employed, or in case a single burner only

is employed said other opening may be closed by a screw-plug $a^{\times}$, as shown in the drawings.

One side the shell or fitting A is provided with an opening to receive the end of the nipple b, threaded at its outer end to receive the interiorly-threaded end of the air-nozzle c, shown as rounded at its outer end and provided with a suitable air-outlet c', adjacent which the inner face of the said nozzle is made conical or tapering, as shown at c^2, Fig. 2. Coöperating with the tapering inner face c^2 is the tapering outer face d' of the enlarged head d of the oil-tube d^2, formed by reducing the tube-body d^2 to an attenuated form. Tube d^2 is threaded at its rear end and screwed into the hollow boss d^3, the opening in which extends through the back of the shell A and is threaded at d^4 to receive the end of the oil-supply tube, (not herein shown,) the openings or passages in the boss d^3, oil-tube d^2, and the air-nozzle being preferably axially in line, as shown.

Referring now particularly to Fig. 1, as a means for adjusting the air-nozzle, I have connected to the latter a toothed wheel c^3, which may be, and preferably is, formed integral with the nozzle itself, the said wheel meshing with the spur-pinion e, fast on the regulating-shaft e', journaled in the lugs e^2 e^2, fast on one side of the shell A, and provided at its outer end with a suitable hand operating-wheel e^3, by which to effect rotation of the shaft and also rotation of the air-nozzle c.

Rotation of the air-nozzle, threaded upon the nipple b, causes the said nozzle to be moved axially toward and from the enlarged head d of the oil-tube, and in order to keep the pinion e in mesh with the wheel c^3 on the nozzle without making the former equal to the length of the entire longitudinal travel of the nozzle, I have herein provided the pinion e with side flanges e^4, which lap over the gear c^3 and cause the said pinion with its shaft e to move longitudinally with the air-nozzle as the latter is adjusted.

The operating-shaft e' is made of sufficient length to extend rearward beyond the burner through and to the exterior or front of the furnace, where the hand-wheel e^3 is at all times accessible for adjustment. This is an important feature, for in many lines of business, particularly such, for instance, as the tempering of saw-blades, it becomes necessary to vary the flames of the burners every few moments, according to the particular condition of the blades.

The enlarged head d of the oil-tube is of sufficient size to coöperate with any diameter of air-outlet c', so that when the fires are to be started any desired air-nozzle may be applied to the shell, according to the particular character of the fire desired during the day, and the said nozzle be thereafter moved with relation to the said head to vary the fire according to the particular condition of the work. The tapering faces c^2 and d' of the mixing-chamber are parallel, or substantially so, so that the plane of projection of the air and the focal point of the flame may be preserved substantially uniform whatever the quantity of air passing through the burner. With the oil-tube d^2 carried straight out to the air-nozzle, and its point tapered, as ordinarily, without the enlarged head, the range of opening c' would be much more limited.

The adjustment of the device is entirely through the air-nozzle, and all the adjusting mechanism is upon the exterior of the burner, thereby avoiding packing-boxes and complicated construction.

Burners of this class, when in use, are usually arranged outside the furnace at the front of the latter, with the air-nozzles directly in front of or projecting slightly into suitable openings in the wall of the furnace, so that the flame from the nozzle is projected through said opening or openings into the interior of the furnace. When these furnaces are tight, that is, without any draft-outlet, it frequently occurs that the flame doubles back upon itself, that is, creeps back over the outside of the nozzle and between the latter and the wall of the opening in the furnace-wall in which the nozzle is inserted. The flame also has a tendency to turn back upon itself and seek an outlet through the hole in the furnace-front through which the work is inserted, the flame at such times heating the work outside the furnace to such an extent as to render it impossible to hold the same, except by the use of tongs, which render it extremely difficult to properly handle the work. To obviate these difficulties, I have herein shown the nozzle c as provided with a continuous series of angular perforations c^4, through which air is projected in such a manner as to blow the flame always toward the front in the direction in which it is projected. I have also shown the plug $a^{\times}$ as tapped to receive the air-pipe f, which is curved over at the side of the burner and provided with perforations f', facing the furnace-front, through which air is projected to beat back the flame and hold the latter within the furnace-walls.

It will be seen that the various columns of air projected through the perforations c^4 in the air-nozzle form a sort of umbrella, within the limits of which the flame is confined.

The air-pipe f may be directed to any side of the burner to beat back the flame at the side at which the workman wishes to stand and operate, or at any side at which the work-opening is located.

My invention is not limited to the particular construction of burner herein shown, for the same, as well as the disposition of the air pipes and perforations, may be varied without departing from the spirit and scope of my invention.

The flanges e^4, instead of being arranged upon the pinion e, may, with like effect, be arranged upon and in connection with the nozzle and the teeth thereupon.

I claim—

1. In a hydrocarbon-burner, a shell, a removable air-nozzle thereon, having an inner tapering front face, combined with an oil-tube within said shell, thereby forming a mixing-chamber between said shell and said tube, the latter being provided with an enlarged tapering head and an attenuated body, to coöperate with said tapering face, for varying the quantity of air permitted to pass through the burner, said head and body admitting of the application of air-nozzles having different-sized outlet-openings, substantially as described.

2. In a hydrocarbon-burner, a shell containing an oil-tube, combined with a rotatable air-nozzle surrounding said oil-tube and in longitudinally-adjustable engagement with said shell, adjusting devices arranged upon the exterior of said shell and connected with said nozzle, and an operating-handle for said adjusting devices extending to the rear of said burner and outside of the furnace or other connection of the burner, whereby the flame from said nozzle may be quickly and readily varied without danger from the heat and without interrupting the work, substantially as described.

3. In a hydrocarbon-burner, a shell containing an oil-tube, a coöperating air-nozzle surrounding said oil-tube to form a mixing-chamber therebetween and in threaded engagement with said shell, rotation of the said nozzle varying its longitudinal position with relation to said tube, mechanism for varying at will the flame from said nozzle by rotating and moving said shell longitudinally, without stopping or interrupting the said flame, and an operating-handle for said mechanism, said handle being extended from said burner, substantially as described.

4. In a hydrocarbon-burner, a shell containing an oil-tube, combined with a coöperating air-nozzle in threaded engagement with said shell and provided at its outer side with gear-teeth, an adjusting-shaft mounted in bearings at the side of the said shell, and a pinion fast thereon in mesh with the teeth on the said nozzle, whereby the latter is rotated and thereby adjusted by the said shaft, and flanges on the said pinion to cause the latter to follow the nozzle in its longitudinal movement, substantially as described.

5. In a hydrocarbon-burner, an oil-tube, an air-nozzle surrounding the same, and provided with a usual opening through which air and oil are projected and ignited into flame, said air-nozzle having one or more perforations back of said flame-opening through which an air blast or blasts are projected, said one or more perforations being arranged to be out of the normal range of the flame, but extending at an acute angle thereto, whereby to beat back the flame within its said normal range, substantially as described.

6. The combination with a hydrocarbon-burner, having an oil-tube, and a coöperating air-nozzle, to spray the oil issuing therefrom, of an air-conduit independent of said nozzle and provided with perforations directed at an angle to the line of projection of the oil-spray, through which air is projected without the furnace toward the furnace-front to beat back the flame and thereby shield the workman operating the burner, substantially as described.

7. In a hydrocarbon-burner, a shell containing an oil-tube, and a coöperating air-nozzle provided with a flame-opening, and one or more perforations formed at an angle to said flame-opening back of said opening, through which air is projected to beat back the flames, combined with a perforated air-conduit through which also air is projected to beat back the flames, whereby the flames are kept within the furnace and the workmen are protected, substantially as described.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

ALENZA T. GIFFORD.

Witnesses:
JOHN F. O'BRIEN,
LIZZIE G. HACKETT.