(No Model.) 2 Sheets—Sheet 1.

J. H. BULLARD.

HYDROCARBON BURNER.

No. 404,955. Patented June 11, 1889.

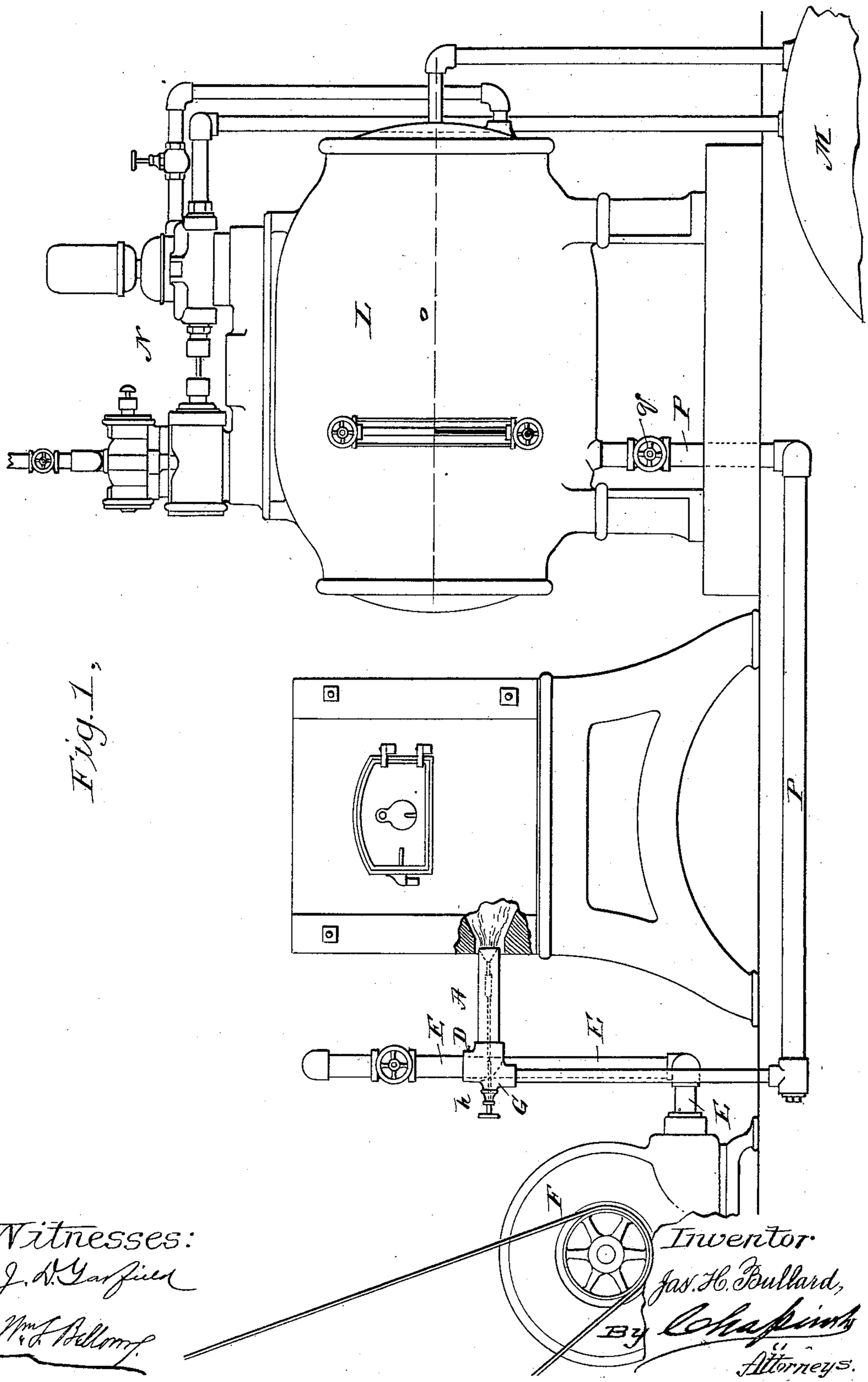


Fig. 1.

Witnesses:
J. V. Garfield
Wm. F. Bellamy

Inventor.
Jas. H. Bullard,
By Chapin & Co
Attorneys.

(No Model.) 2 Sheets—Sheet 2

J. H. BULLARD.

HYDROCARBON BURNER.

No. 404,955. Patented June 11, 1889.

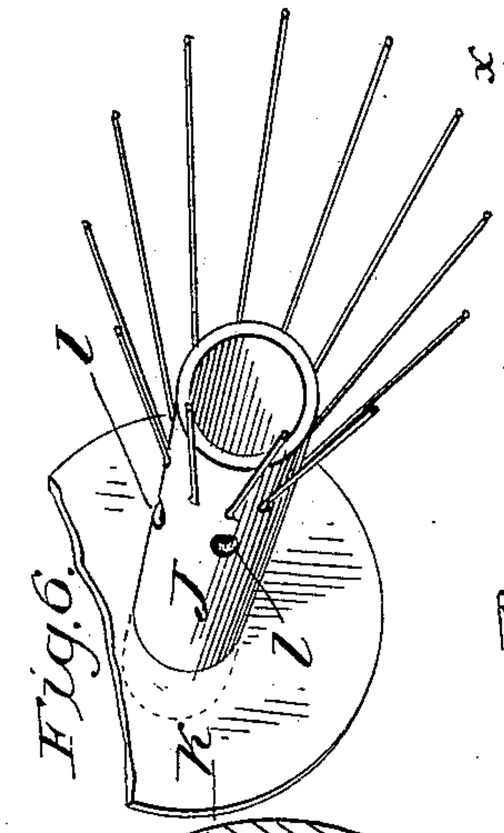


Fig. 6.

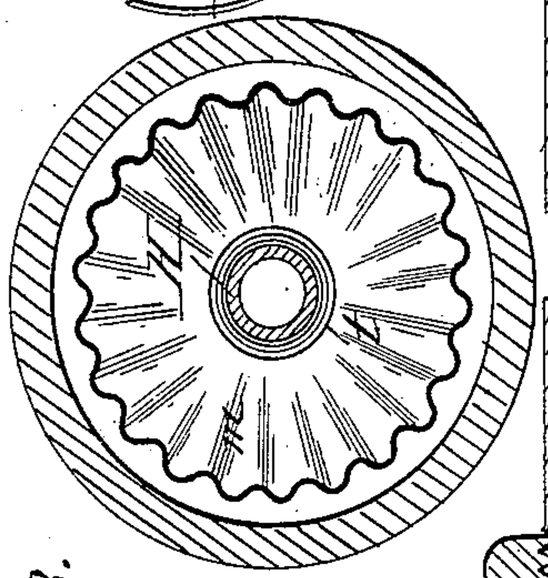
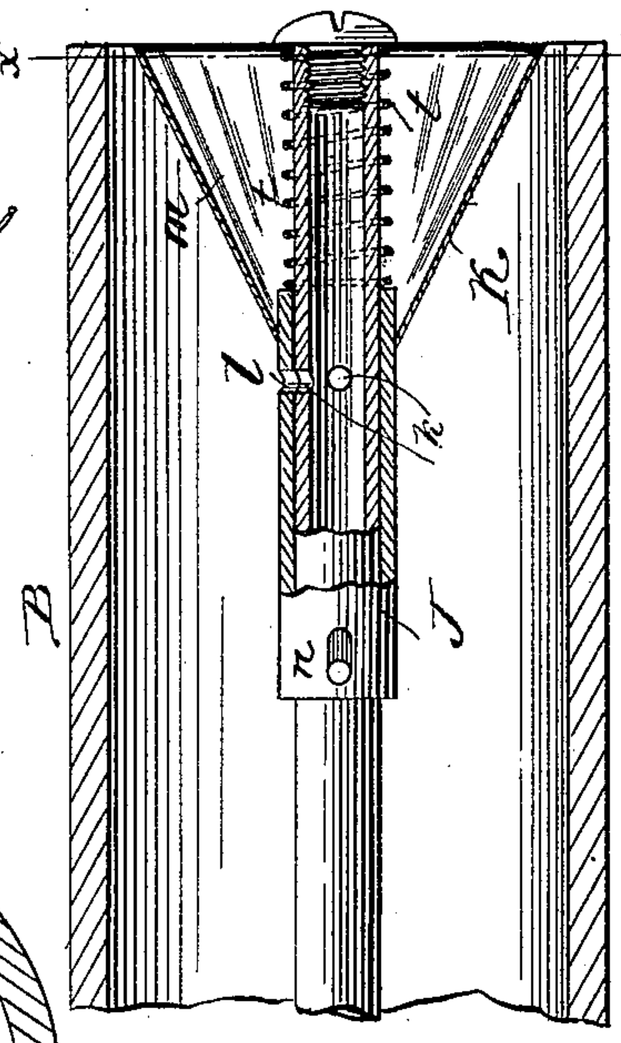


Fig. 3.



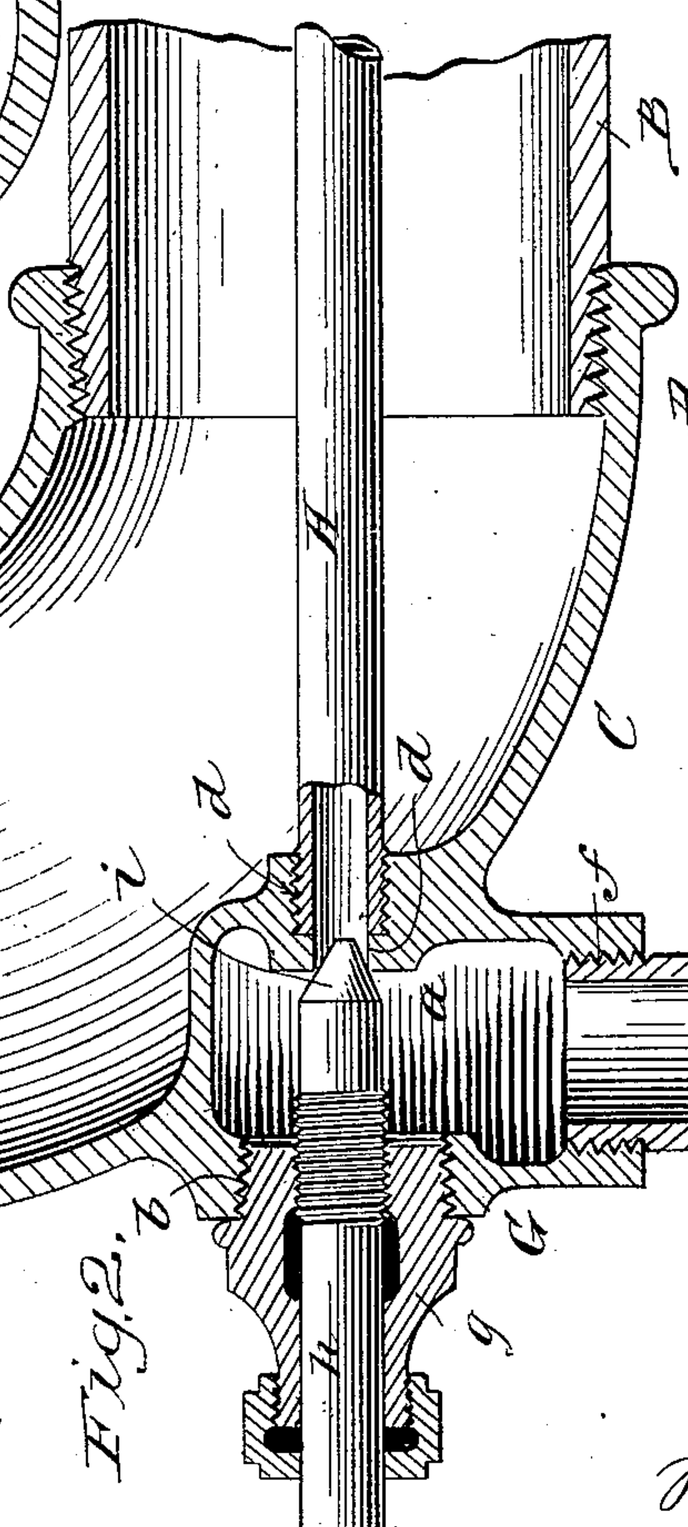


Fig. 2.

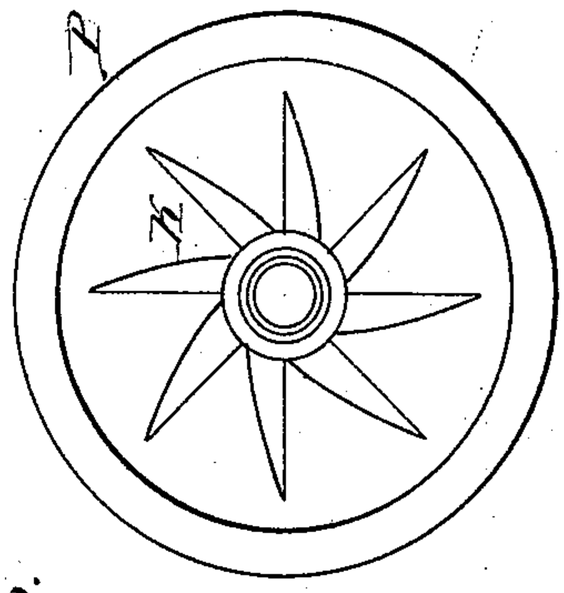


Fig. 5.

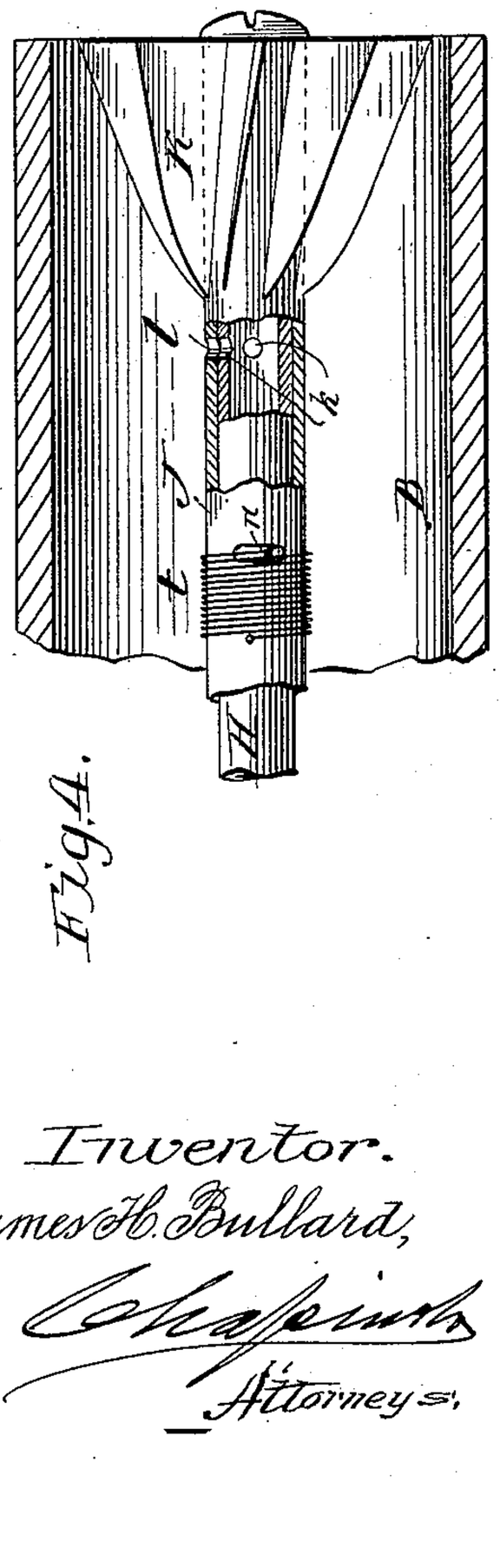


Fig. 4.

Witnesses:
J. D. Garfield
Wm. F. Bellamy

Inventor.
James H. Bullard,
By Coburn & Smith
Attorneys.

UNITED STATES PATENT OFFICE.

JAMES H. BULLARD, OF SPRINGFIELD, MASSACHUSETTS.

HYDROCARBON-BURNER.

SPECIFICATION forming part of Letters Patent No. 404,955, dated June 11, 1889.

Application filed February 14, 1889. Serial No. 299,848. (No model.)

To all whom it may concern:

Be it known that I, JAMES H. BULLARD, a citizen of the United States, residing at Springfield, in the county of Hampden and State of Massachusetts, have invented new and useful Improvements in Hydrocarbon-Burners, of which the following is a specification.

This invention relates to burners for hydrocarbon fuel and such as are adapted to secure the combustion of oil in conjunction with air under pressure, the purpose of which invention being to provide a burner which will be automatically operative to deliver the hydrocarbon in quantities proportionate to the pressure and quantity of the air also forced through and discharged from said burner; and the invention consists in the construction and combination of parts, all substantially as will hereinafter more fully appear, and be set forth in the claims.

In the accompanying drawings the burner constructed according to this invention and the manner of its use are illustrated.

Figure 1 is a view in side elevation of a forge-furnace to which aerated hydrocarbon is supplied for consumption therein through the burner, which is shown in connection with said furnace. Said figure also comprises, in elevation, oil storage and service tanks and oil-conduits therefor between same and said burner, an air compressor or blower, and an air-conduit leading therefrom to the burner. The side of the forge-furnace is shown as partly broken away and in section for clearer illustration. Fig. 2 is a central vertical longitudinal section of the burner on an enlarged scale. Fig. 3 is a cross-sectional view of the same on the line *x x*. Figs. 4, 5, and 6 are detail views of modifications to be hereinafter referred to.

The burner A consists of a main longitudinal tube B, at one end of which is a coupling C of peculiar construction. The said coupling comprises a main elbow-shaped member D (to one end of which said main burner-tube B is attached, and at the other is entered the pipe E from the air-compressor F) and the supplemental coupling member G, which is located on the back or outer side of the elbow, and which in turn in itself comprises a central chamber *a*, having at each side thereof openings *b d* through its walls in the line of the axis of said main burner-tube B, and also having through its wall another opening *f*, leading to any suitable part of said chamber. A gland *g* is screwed into said opening *b*, through which is entered a spindle *h*, having intermediate of its length a screw engagement with the axial opening in said gland, and said spindle is provided at its outer end with a handle, knob, or disk for conveniently turning it, and by its inner end portion extends across the said chamber *a*, its extremity being tapered, as at *i*, to fit within said opening *d*, and to partially close its orifice to a greater or less degree as the said spindle is screwed inward or outward. A tube H, for oil, of much smaller diameter than the one B, is screwed into the said opening *d*, and extends with its axis coincident with the axis of the tube B to or about to the outer end of said main tube, said outer end being closed, and a short sleeve-section J surrounds said tube a short distance from its outer end, said sleeve-section being capable of a movement on said oil-tube, whereby the one or more apertures *l* therein may register with the one or more apertures *k* which are formed in the oil-tube. The movements of the sleeve-section J to permit its apertures to register or non-register with the oil-pipe apertures is caused by the pressure of air in and through the pipe B acting on wings or more or less lateral projections K, formed on said sleeve. In Fig. 2 the wings are comprised in the funnel-shaped casing *m*, formed on or attached to the outer end of the sleeve, which acts as a spreader or distributer for the oil when ejected.

In Figs. 2 and 3 the lateral wing projection on the sleeve is constructed to impart to said sleeve a longitudinal movement on the oil-tube, and such movement is guided and limited by the engaging pin and slot seen at *n*. The forward or outward movement of the sleeve under the pressure of air passing through the tube B is against the spiral spring *t*, coiled around the tube H, and bearing against and between the overlying head of the screw, which is secured at the end of the oil-tube and the end of the sleeve J. The normal position of the sleeve under its spring

is such as to place the perforations thereof out of register with the perforations of the oil-tube.

In the use of the present burner the oil-level in the service-tank may be at any desired height above that of the burner, being supplied to the burner by gravity or hydrostatic pressure, and in Fig. 1 is illustrated an approved method of practically using the burner.

Oil maintained in the service-tank L to the height, for instance, indicated by the dotted line *o*, being pumped to said service-tank from a storage-tank M by the pump N, passes from said tank L through the pipe P, which is connected to the opening *f* of the supplemental coupling G to the burner. Air from the air-blower F through the pipe E, being forced under any desired degree of compression into the tube, in its passage through said tube impinges against the lateral projection or wing on the sleeve, moving same more or less against its spring, according to the air-pressure, and causing the apertures *k l* to register by the whole or a part of their areas. Therefore, by adjusting the burner for the entrance of a certain maximum quantity of oil thereinto, by turning the stem *h*, if the air-pressure is a maximum one, the whole area of the apertures will be open, permitting a large amount of oil to commingle with the air for delivery at the mouth of the burner. The air-pressure in and through the burner-tube B being decreased, the apertures *k* will be uncovered to a less extent, and correspondingly less oil will be delivered with the decreased amount of air.

The oil issuing from the tube H at the rear of the outwardly-flaring funnel-shaped casing or spreader is, as the air forces it outwardly by said casing, distributed or spread for a more diffusive delivery at the mouth of the burner. By forming the spreader-casing with corrugated walls, as shown, it is made to impart greater divisibility to the issuing oil, any tendency of the particles of the same to combine being broken up.

The movement of the sleeve J on the oil-tube to cover or uncover the openings *k*, instead of being a longitudinal one, as described under the construction illustrated in Figs. 2 and 3, may as well be a rotary one, the wings being spirally arranged or in propeller form on the sleeve, said sleeve turning against or with the reaction of a spiral spring suitably applied, and having its motion limited by a pin on the tube H and a parti-circular slot in the sleeve.

The spiral wings just mentioned are to act as spreaders for the oil, although the conical form thereof is much preferred; and, again, as contemplated under the invention, the wing or wings for insuring the movement of the sleeve, instead of being located in advance of the oil-exit apertures, and serving, also, as the spreader, may, as seen in Fig. 6, be of disk form, located on the sleeve at the rear of the said apertures, and the spreader be independently formed; or by forming openings in the said disk, which would not, however, render the wing incapable of being forced forward by the air-pressure, a sufficient quantity of air would be allowed to pass through said openings to force the issuing oil from the burner. The spreader, instead of being formed as a continuous funnel-shaped casing, may be formed by separate diverging blades or rods, as shown in the views of modified constructions.

In addition to the means for regulating the amount of oil that may be delivered to the burner described as comprised in the supplemental coupling G, a regulating-cock *q* may be provided in the oil-pipe P.

What I claim as my invention is—

1. A hydrocarbon-burner consisting of a tube adapted at one end to be connected with an air-conduit and open at its other end, a tube of smaller diameter supported within said air-tube adapted by one end to be connected with an oil-conduit and provided near its outer end with an aperture, and a spreader having outwardly-flaring and corrugated walls, substantially as described.

2. A hydrocarbon-burner consisting of a tube adapted at one end to be connected with an air-conduit and open at its other end, a tube supported within said air-tube adapted by one end to be connected with an oil-conduit and provided near to its outer end with an aperture, a sleeve movable on said oil-tube having an aperture, and a spring for acting on said sleeve to normally maintain it in a position for a non-registration of its aperture with that of said oil-tube, and a spreader in advance of said aperture, substantially as described.

3. A hydrocarbon-burner consisting of a tube B, open at its forward end, and a coupling, to one end of which the inner end of said tube is connected, a supplemental coupling on said main coupling comprising the passage *d* and the passage *f*, and the oil-tube H, connected with said passage *d*, provided near its outer end with an aperture through its side and communicating with the interior of said tube B, and having in advance thereof an outwardly-flaring spreader, substantially as described.

4. A hydrocarbon-burner consisting of an air-tube B, open at its forward end, and an elbow-coupling on said tube comprising the passages *b* and *d* and the passage *f*, the oil-tube H, connected with said passage *d*, provided near its outer end with an aperture through its side, in advance of which it is provided with an outwardly-flaring spreader, a gland fitted in said passage *b*, and a spindle having a screw engagement with said gland and provided with a tapered end adapted on the movement of said spindle to vary the open area of the orifice of said passage *d*, substantially as and for the purpose described.

5. A hydrocarbon-burner consisting of a tube adapted at one end to be connected with

an air-conduit and open at its other end, an oil-tube supported within said air-tube adapted by one end to be connected with an oil-conduit and provided near its outer end with an aperture *k* through its side, and having a shouldered extremity, a sleeve longitudinally movable on said tube having a slot-and-pin engagement therewith and provided with an aperture to register with the oil-tube aperture and having the conical-shaped spreader, and the spring between the shouldered tube end and the sleeve, substantially as described.

6. In an apparatus for burning hydrocarbon, in combination, a burner comprising an air-tube open at its outer end, an air-compressor and a conduit leading therefrom and connected to said tube, a tube supported within said air-tube having at its forward end an aperture through its side, a sleeve movable on said oil-tube having an aperture and provided with a spring for acting on said sleeve, substantially as described, and a spreader in advance of said aperture, a service oil-tank, and a conduit leading therefrom to and connected with said burner oil-tube, substantially as described.

JAMES H. BULLARD.

Witnesses:
WM. S. BELLOWS,
G. M. CHAMBERLAIN.