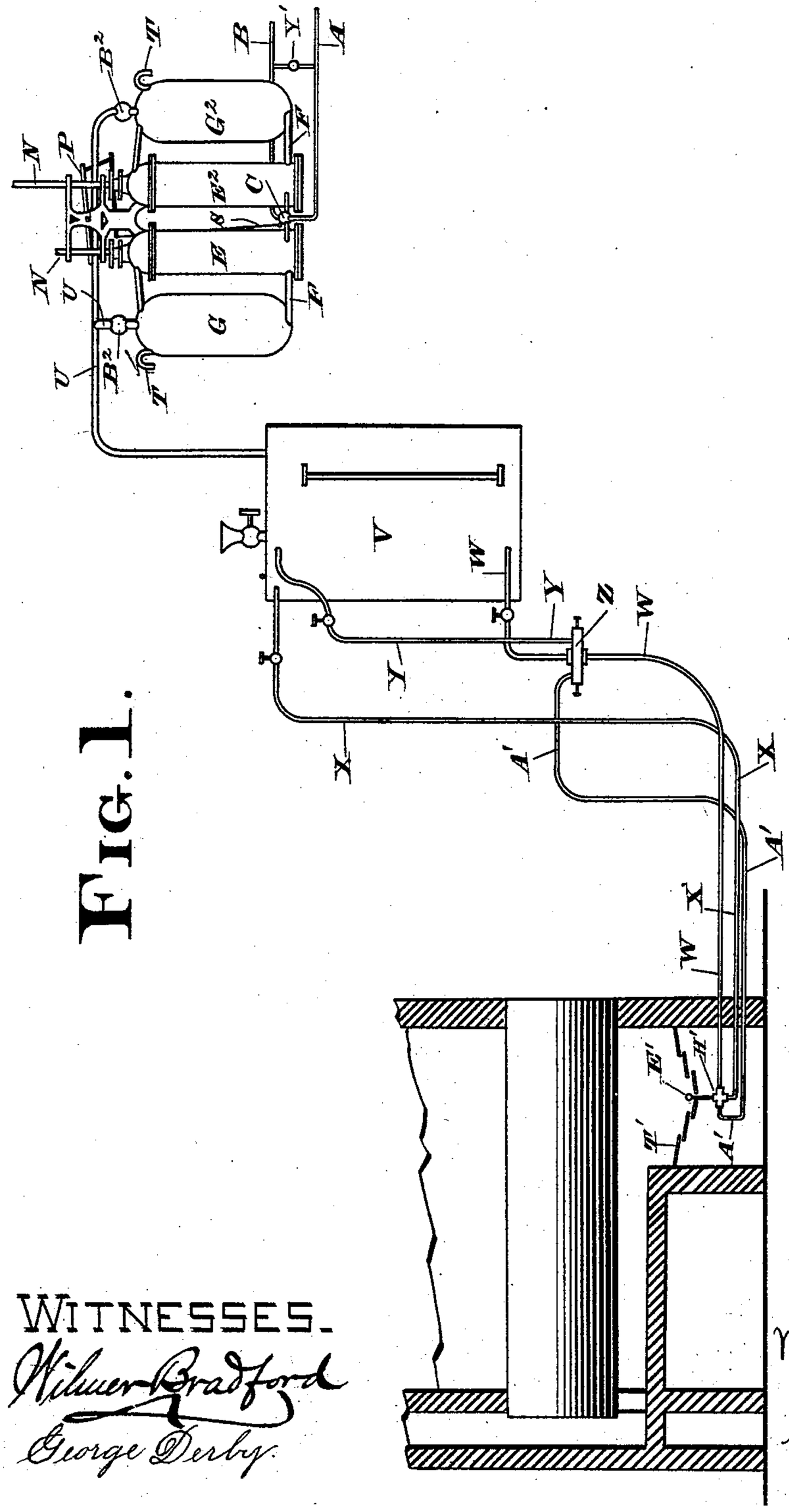
(No Model.) 5 Sheets—Sheet 1.

W. JASPER.

HYDROCARBON BURNER AND APPARATUS FOR BURNING HYDROCARBONS.

No. 275,390. Patented Apr. 10, 1883.

FIG. 1.



WITNESSES.

Wilmer Bradford

George Derby.

INVENTOR

William Jasper

By

Wm Smith

Attorney.

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W. JASPER.

HYDROCARBON BURNER AND APPARATUS FOR BURNING HYDROCARBONS.

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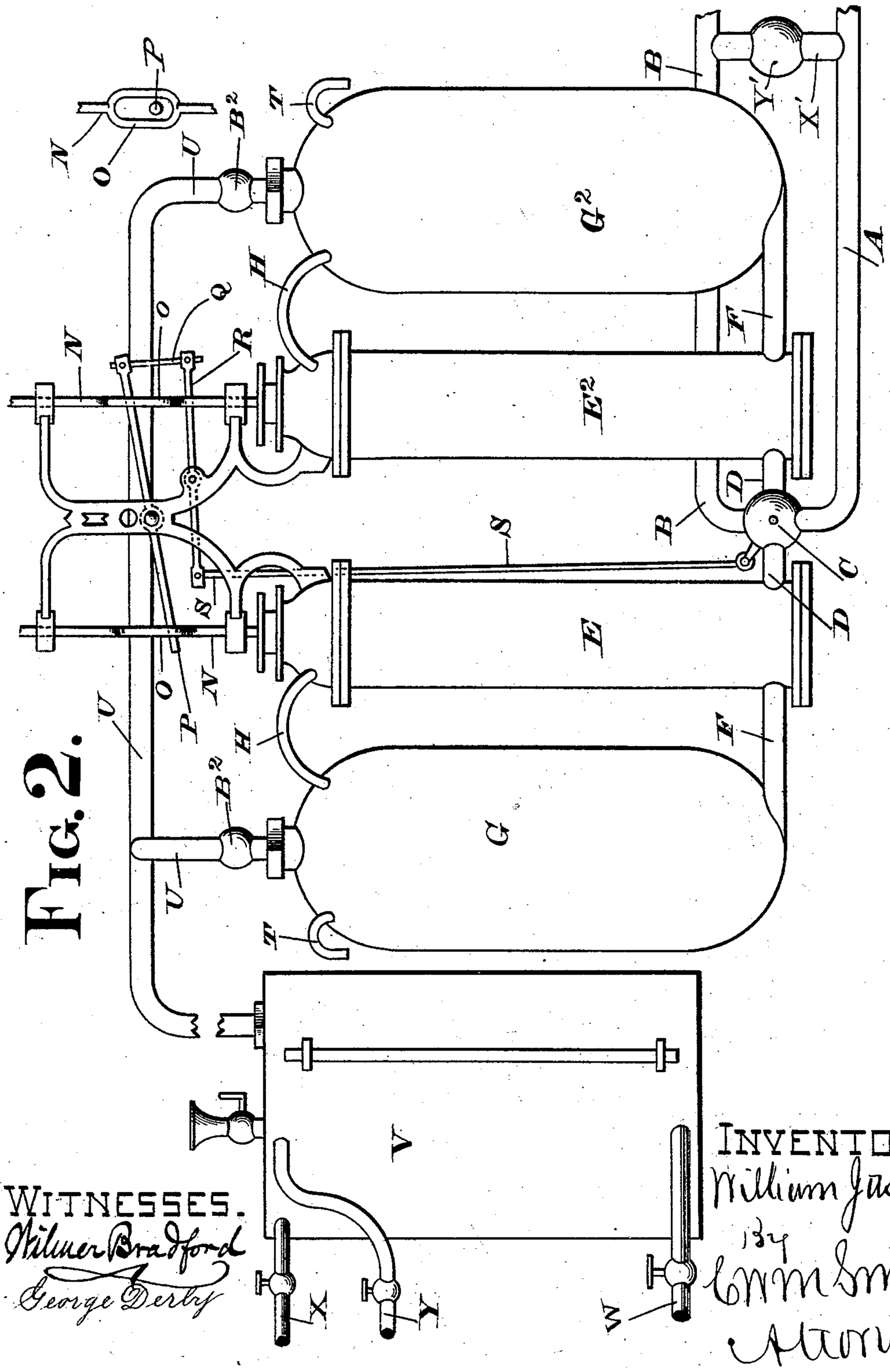
FIG. 2.



WITNESSES.
Wilmer Bradford
George Derby

INVENTOR.
William Jasper
per
Wm Smith
Attorney.

(No Model.) 5 Sheets—Sheet 3.

W. JASPER.

HYDROCARBON BURNER AND APPARATUS FOR BURNING HYDROCARBONS.

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FIG. 3.

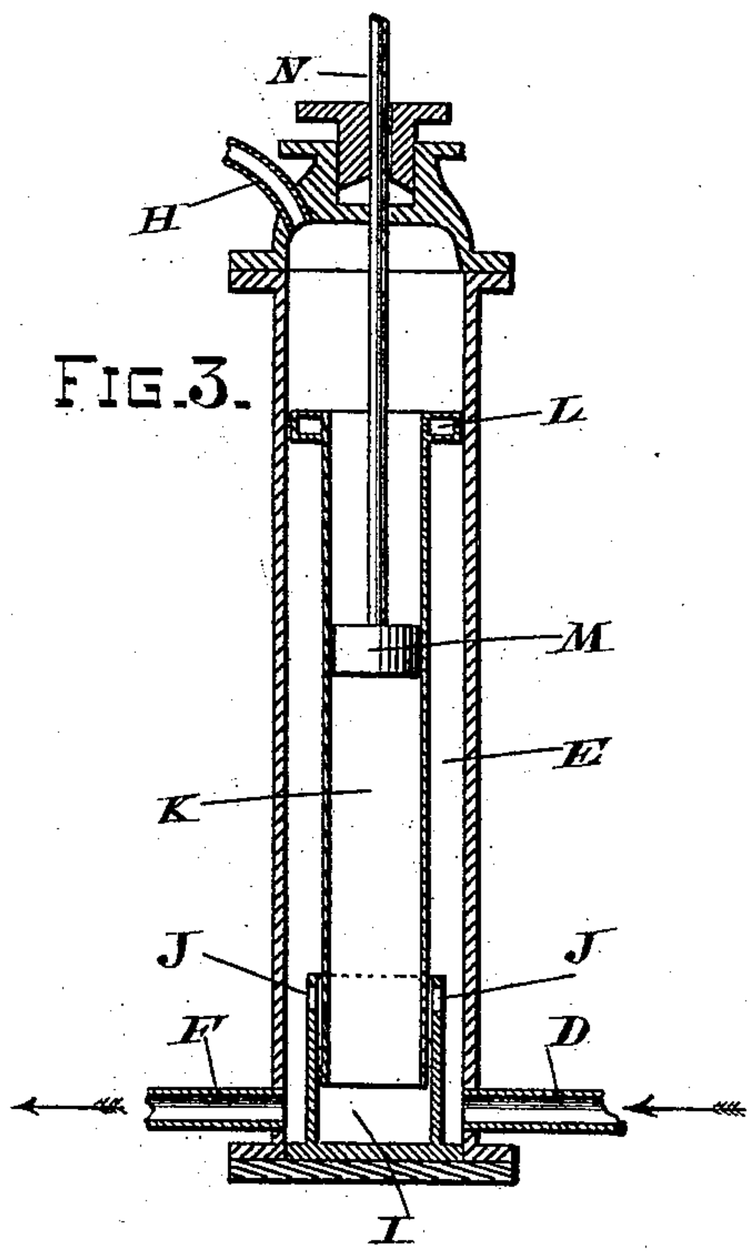


FIG. 4.

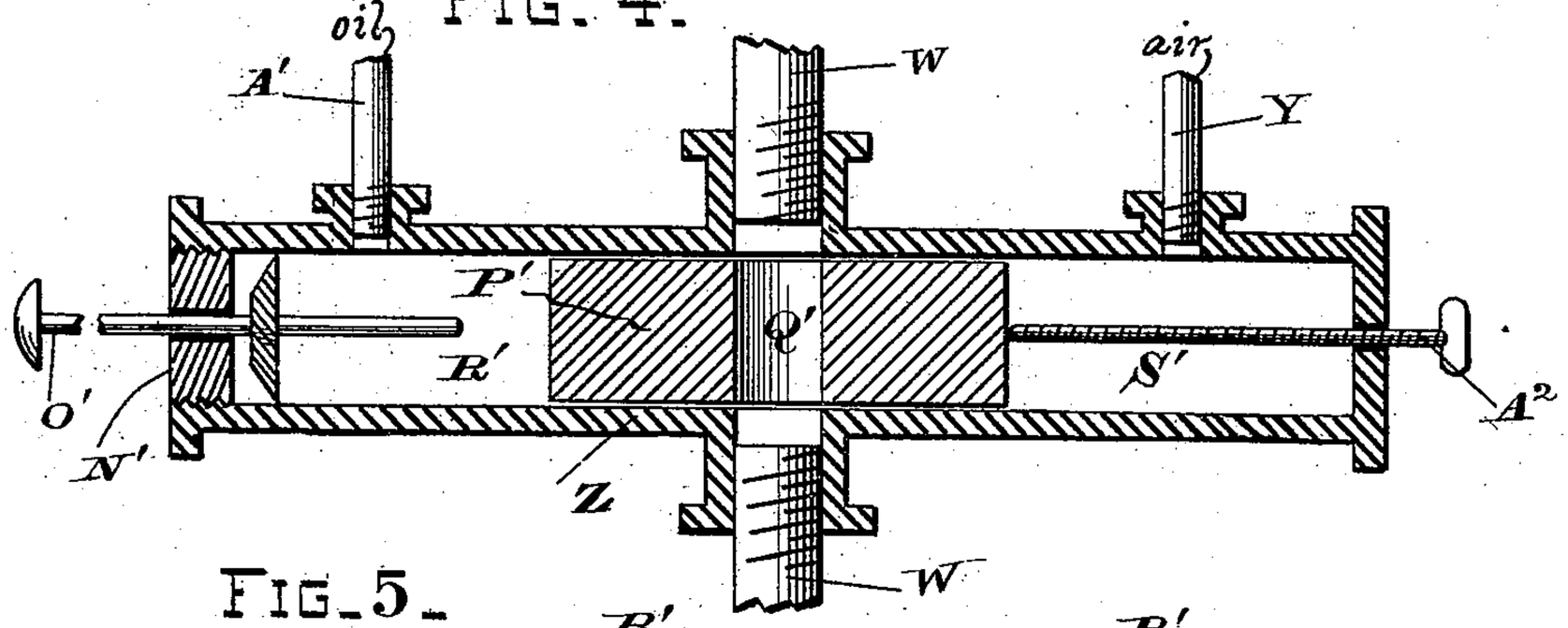


FIG. 5.

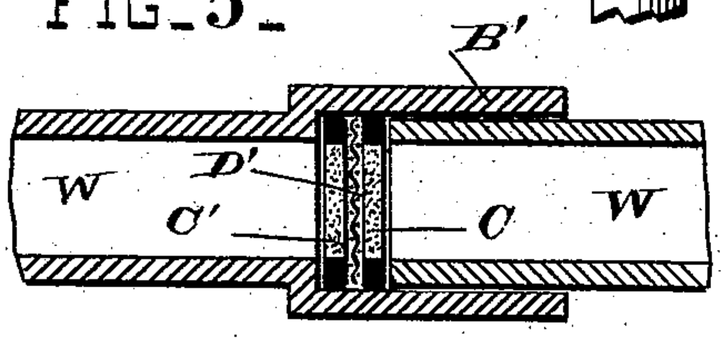
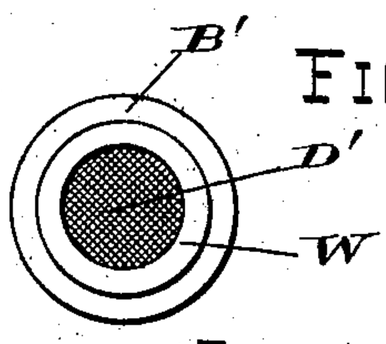


FIG. 6.



WITNESSES

Wilmer Bradford

George Dirby

INVENTOR

William Jasper

By

Wm Smith

Attorney

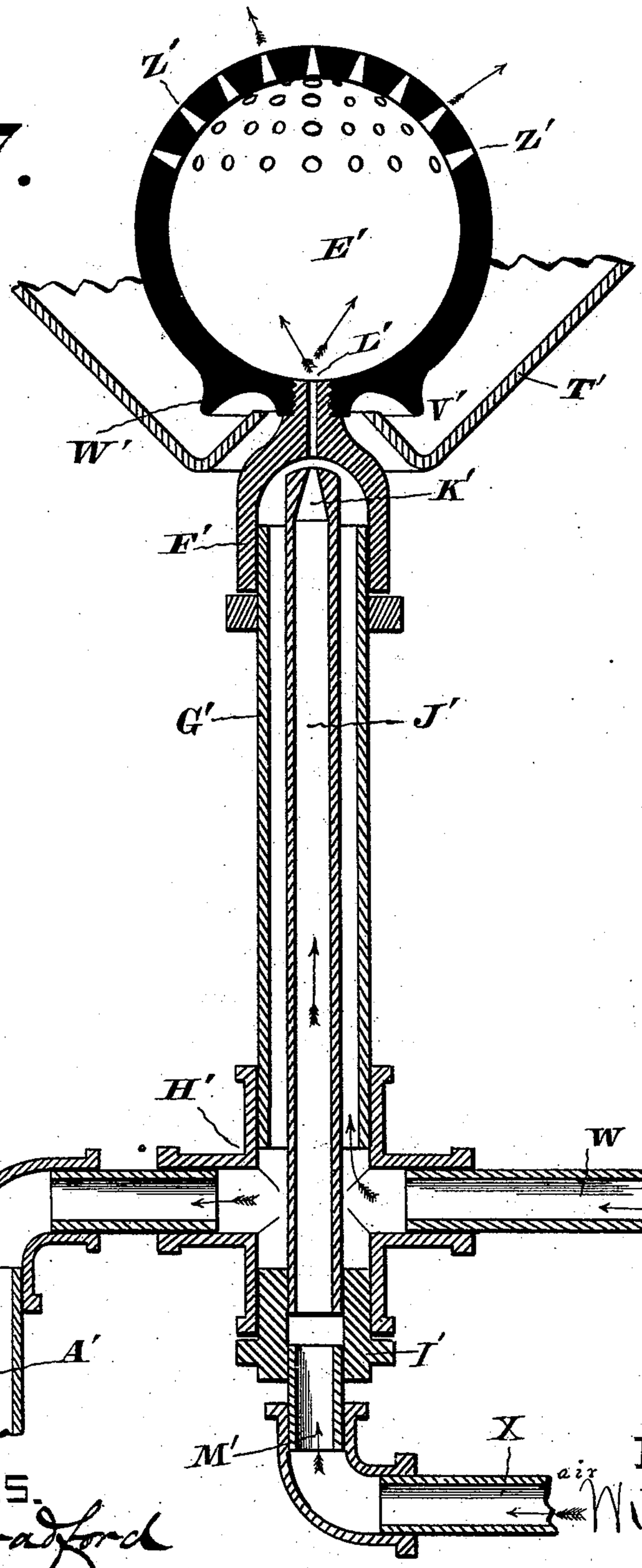
(No Model.) 5 Sheets—Sheet 4.

W. JASPER.

HYDROCARBON BURNER AND APPARATUS FOR BURNING HYDROCARBONS.

No. 275,390. Patented Apr. 10, 1883.

FIG. 7.



WITNESSES.

Wilmer Bradford

George Derby

INVENTOR.

William Jasper

By

C. M. Strick

Attorney.

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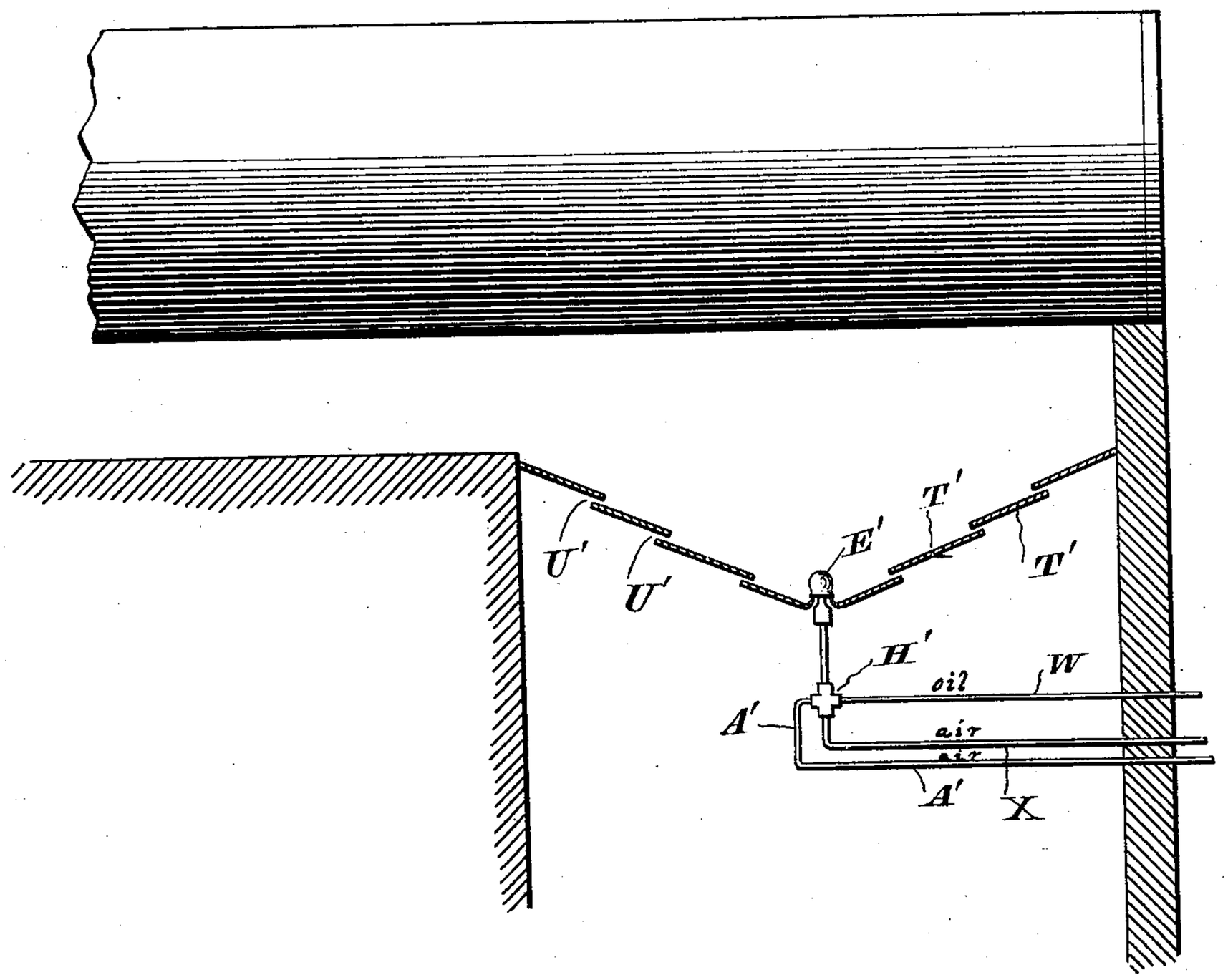
W. JASPER.

HYDROCARBON BURNER AND APPARATUS FOR BURNING HYDROCARBONS.

No. 275,390. Patented Apr. 10, 1883.

FIG. 8.



WITNESSES.
Wilmer Bradford
George Derby

INVENTOR.
William Jasper
By
Wm Smith
Attorney.

UNITED STATES PATENT OFFICE.

WILLIAM JASPER, OF SANTA CRUZ, CALIFORNIA.

HYDROCARBON-BURNER AND APPARATUS FOR BURNING HYDROCARBONS.

SPECIFICATION forming part of Letters Patent No. 275,390, dated April 10, 1883.

Application filed September 2, 1882. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM JASPER, a citizen of the United States, and residing at Santa Cruz, in the county of Santa Cruz and State of California, have invented certain new and useful Improvements in Hydrocarbon-Burners and Apparatus for Burning Hydrocarbons, of which the following is a specification.

My invention relates to certain improvements in hydrocarbon-burners and to the apparatus connected therewith; and the objects of my improvements are, first, to provide a new and improved form of hydrocarbon or petroleum burner, within which the hydrocarbon is vaporized or converted into a gas before it is injected or blown into the combustion-chamber; second, to provide an improved grate for a furnace employing vaporized hydrocarbons as a fuel; third, to provide an improved apparatus for supplying petroleum or other hydrocarbon to the burner; and, lastly, to provide a means whereby all liability to explosion or accident to the oil-supplying devices may be prevented. I attain these objects by the mechanism illustrated in the accompanying drawings, in which

Figure 1 is a general view illustrating my improved hydrocarbon-burning apparatus. Fig. 2 is a side elevation of the oil and the water and air tanks and cylinders. Fig. 3 is a vertical section of one of the cylinders. Fig. 4 is a vertical sectional view of the safety shut-off or gate on the oil-pipe. Fig. 5 is a sectional view, showing the position of the safety wire-gauze within a coupling or union on the oil or air pipe, and Fig. 6 is a plan view of the same. Fig. 7 is a vertical sectional elevation of the petroleum-burner. Fig. 8 is a sectional elevation of a steam-boiler, petroleum-grate, and burner.

Similar letters of reference are used to designate like parts throughout the several views.

At any suitable distance from the furnace I place the oil-tank and the water-tanks and cylinders for applying pressure upon the surface of the body of oil contained within the oil-tank. The air-pressure tanks or cylinders are to be secured upon any suitable foundation, and are to be in duplicate.

A represents the inlet water-pipe through which water is forced into the tanks and cylinders, and B the outlet-pipe. This pipe is supplied with a four-way cock, C, operated in a manner to be hereinafter described. The pipes A and B are connected by a short pipe, X′, provided with a balance-valve, Y′. From the main pipe or four-way cock there extends two branch pipes, D D, communicating with the lower ends of the cylinders E E^2. Connecting water-pipes F F extend from the bottom of the cylinders to the bottom of the water-tanks G G^2, and air-pipes H H connect the upper ends of said cylinders and water-tanks. The water-cylinders are constructed in the manner shown in section in Fig. 3.

To the bottom of the cylinder E or E^2, I secure the short open-ended guide cylinder or sleeve I, the top of which extends some distance above the inlet and outlet openings for the water, and is of a diameter considerably less than that of the cylinder E. Near the top of this sleeve I make a series of holes or openings, J. This sleeve forms a guide for the lower end of the open-ended cylinder K, which reciprocates within it, and has its upper end provided with a wide flange or hollow packing-ring, L, which is kept in continual contact with the sides of the cylinder E or E^2. The cylinder K is provided with a piston or plunger, M, the stem N of which passes through a suitable stuffing-box, and is provided with a loop or slot, O, which receives one end of a vibrating lever-rod, P, pivoted to a suitable supporting-frame, and to one end of which a rod, Q, is attached, which connects with the pivoted lever R, to the opposite end of which I pivot the connecting-rod S, extending down to the crank-handle or spindle of the four-way cock C, as shown in Fig. 2.

The tops of the water-tanks G G^2 are provided with lift or cup valves T T, which admit atmospheric air to the said tanks, but prevent its exit. Pipes U U, provided with cup-valves B^2 B^2, extend from the top of the water-tanks to the top of the oil-tank V, which is provided with the customary gage-glass and receiving funnel or pipe. From the lower end of the oil-tank extends a pipe, W, leading to the petroleum-burner, and from the upper end extends two air-pipes provided with suitable cocks. One of these pipes, X, extends to the petroleum-burner, while the other one (designated by the letter Y) leads to a self-acting shut-off placed on the oil-pipe W at any suitable point between

the oil-tank and the burner. This self-acting shut-off consists of a casing, Z, having a boss on either side, into which are screwed the ends of the oil-conducting pipe W, as shown in Fig. 4. Upon one of the sides of this casing there are two other bosses—one near each end—and into one of which is screwed the air-pipe Y, and into the other is screwed the oil-pipe A′, which is also connected with the burner. At one or both ends of the casing Z, I insert a plug, N′, through which passes the stem or push-pin O′, by which the position of the slide-valve P′ may be regulated. This slide-valve has a transverse opening, Q′, of the same diameter as the oil-pipe, and when aligned with the bore of said pipe permits of a free passage of oil through the cut-off. A set-screw, A^2, is inserted through the opposite end of the casing and bears against the end of the slide-valve P and prevents it being moved over by the pressure of the oil into a position in which the flow of oil through the pipe would be cut off.

At any suitable point on the oil-pipe W, and also on the pipe A′, between the burner and the safety shut-off, I place an ordinary pipe-coupling, B′, between the leather washers C′ of which I place a diaphragm or disk of wire-gauze, D′, as shown in Figs. 5 and 6. Should the oil in the pipe W become ignited, this wire-gauze will prevent the passage of the flames through the pipe and to the oil-tank, and an explosion will be prevented.

The top of the burner is surmounted by a hollow tip or globe, E′, formed of soapstone, fire-clay, plumbago, or any other suitable material which will withstand a high degree of heat, and it has its upper portion pierced with a series of holes, Z′, which are of a larger diameter at their base than at the top or discharge end. This tip is attached to a perforated bell-shaped dome, F′, which in turn is screwed down upon a section of tubing or oil-pipe, G′, and is held in position by a set-nut. The lower end of the tube G′ is screwed into the upper one of the four arms of the coupling or union H′. A plug, I′, is screwed into the lower arm, into which is screwed the air-pipe J′, which is about one-half the diameter of the oil-pipe which surrounds it. The top of this air-pipe J′ is made with a solid head provided with a single aperture, and rounded or beveled off at its upper end, so as to conform with the concavity of the dome F′. The hole or perforation K′ in the head of the air-pipe J′ should be on the same axial line with the hole L′ in the head or cap on the upper end of the oil-pipe. The lower part of the plug I′ receives a short pipe and coupling, M′, which connects with the air-pipe X, leading from the top of the oil-tank V.

One of the horizontal arms of the union or coupling H′ receives the oil-pipe W, and the opposite one receives the oil-pipe A′, leading back to the safety cut-off Z on the main oil-pipe W. Thus it will be seen that the pressure of oil in the chamber R′ of the shut-off is greater than the pressure of air in the opposite or air chamber S′, and by keeping the valve pressed back against the set-screw A^2 an opening is left for the passage of oil through the safety shut-off; but should any accident arise—such as the bursting, melting, or breaking of the burner or pipes immediately connected therewith—then the pressure will be reduced in the oil-chamber R′, and the greater pressure of the air in the chamber S′ will cause the valve P′ to slide to the left and bar the passage or flow of oil by closing the opening of the pipe W.

The grate-bars of the furnace are composed of sheets or strips, T′, of suitable material, extending laterally across the fire-box. The lower edges of the upper strips overhang the upper edges of those next below, leaving a space, U′, through which the atmospheric air enters the fire-box to promote combustion, as shown at Fig. 8. The lowermost of these grate-bars is made concave, and has an opening, through which the top of the dome F′ is inserted before the tip or globe is fastened thereto. The edges of this opening are flanged upward, so as to form a circular trough or recess, V′, into which the surplus oil from the burner drips, a circular projection, W′, being formed on the under side of the tip for the purpose of directing such drip into its proper channel. This arrangement for collecting the drip will be found to be of great advantage, especially when "starting up" the furnace, as the heat may not be sufficient to burn all oil that may be blown through the burner; but the surplus, by falling into the trough V′, will be ignited, and, by burning beneath the tip or globe, will heat it, and quicken the process of vaporization of the petroleum within the tip or hollow globe.

The operation of my improved hydrocarbon-burning apparatus will be as follows, to wit: Water is forced through the pipe A, either by an ordinary ram or force-pump, or from an elevated tank or reservoir, enters the pipe D, and passes into the cylinder E, and also into the tank G through the pipe F. As the water rises in the cylinder it will gradually raise the open-ended cylinder K by pressure upon the under side of the hollow packing-ring L. As the tank G and cylinder E become filled with water the air which they at first contained is compressed and forced through the pipe U and fills the upper part of the oil-tank V, and, by pressure upon the surface of the oil contained therein, forces it through the pipe W into the burner. When the cylinder K has been raised or floated up sufficiently high for the lower end thereof to rise above or clear the holes J—in the guide-sleeve I—water from the induction-pipe, from the tank G, and from within the cylinder E will rush through the said holes J, and, filling the cylinder K, will press upon the under side of the plunger or piston-head M, and by raising it up cause the lower end of the loop O to lift upon one end of the lever P, and by means of the connecting-rods and levers operate the four-way cock C and shut off the flow of water to the partly-

filled cylinder and tank and direct it to the unfilled ones E^2 G^2, and the whole operation will be repeated.

It should here be remarked that while one set of tanks are being filled the water from the other set will pass off through the four-way cock into the discharge or outlet pipe B, such discharge being accelerated by the fall given to the discharge-pipe, and also by the pressure of the atmospheric air which enters through the cup-valve T. The compressed air in the oil-tank V will force the oil through the pipe W to the burner, and through the hole or tube L′ into the hollow tip E′, and at the same time a current of air will likewise be forced through the air-pipe X, and, issuing through the hole K′ in the end of the pipe J′, will cause a jet of air to be blown through the oil flowing through the tube L′. The commingled air and oil will then issue or be blown upwardly through the conical apertures Z′ in the jet or tip E′ in the form of a vapor or gas, which, upon ignition, burns with a fierce and steady blaze.

In a large furnace any suitable number of burners may be employed, and they may be arranged in one or more rows or circles, and may be made of any desired size, shape, and capacity. It may also be employed for household purposes; and I have found that one burner is sufficient to fully heat an ordinary-sized stove or range. By this construction it will be seen that there is no wastage of oil, as the trough V′ in the grate-plates catches all oil which may drip from the jet-holes and retains it until consumed; also, that all danger of explosion is prevented by means of the disks of wire-gauze placed transversely across the bore of the oil and the air pipes, and that means are provided for automatically shutting off the supply of oil to the burner in case of any accident thereto by which the equilibrium of the air and oil pressure in the safety shut-off Z would be destroyed; and, also, that by means of the reciprocating action of the water tanks and cylinders a steady and constant pressure of air is had upon the surface of oil in the oil-tank, and that a steady flow of commingled oil and air is had from the burner into the furnace. It will be understood, however, that I do not herein specifically claim the construction of the air-compressing apparatus, as described, such being reserved for a future application.

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

1. In the combustion-chamber of a hydrocarbon-furnace, the floor or grating composed of the inclined overhanging plates or grate-bars T′, having a space, U′, for the passage of atmospheric air, and having the central and lowest plate flanged up so as to form a trough, V′, all when constructed and arranged to operate substantially in the manner and for the purpose set forth.

2. In a burner for the combustion of hydrocarbons, the fire-proof tip or hollow perforated globe E′, dome or cap F′, having a hole, L′, oil-pipe G′, air-pipe J′, having a contracted outlet, K′, union H′, oil-pipes W and A′, and air-pipe X, all when combined, constructed, and arranged to operate substantially in the manner and for the purpose set forth.

3. In an apparatus for the combustion of hydrocarbons, the combination, with the oil-supplying pipe W, leading to the burner, of the safety shut-off Z, placed transversely upon the supply-pipe, and consisting of the casing Z, within which operates the sliding perforated plate or valve P, air-pipe Y, and air-chamber S′, oil-pipe A′, leading from the burner, and oil-space R′, the whole being constructed, combined, and arranged to operate substantially in the manner and for the purpose shown and set forth.

4. In an apparatus for burning hydrocarbons, the combination of an oil-tank, V, having means for introducing oil and compressed air, the union H′, connected with a suitable hydrocarbon-burner, the oil-pipe W, and air-pipe X, connecting said oil-tank and union, a self-acting shut-off, Z, communicating with the oil-pipe W, an air-pipe, Y, leading from the upper part of the oil-tank to an air-chamber in one end of the shut-off, and the oil-pipe A′, leading from an oil-chamber in the opposite end of the shut-off and connecting with the union H′, all substantially as and for the purpose described.

5. In an apparatus for burning hydrocarbons, the combination, with the grate-plates T′, having troughs V′, of the perforated dome F′ and the globe-shaped burner E′, said burner being composed of soapstone, plumbago, or similar material, and having apertures Z′ and a rounded annular projection, W′, substantially as and for the purpose described.

6. In an apparatus for burning hydrocarbons, the combination of the union H′, oil-pipes W and A′, air-pipe X, coupling M′, plug I′, air-tube J′, the oil-tube G′, surrounding said air-tube, the dome F′, and burner E′, all substantially as shown and described.

7. The combination of an oil-tank, an apparatus for compressing air and forcing the same into said tank, one or more hydrocarbon-burners adapted to project above the grate-bars and into the combustion-chamber of a furnace, oil-pipes and air-pipes connecting said oil-tank and burner, and a self-acting safety shut-off communicating with the oil and air pipes, substantially as shown and described.

In testimony that I claim the foregoing I have hereunto set my hand and seal this 15th day of August, 1882.

WILLIAM JASPER. [L. S.]

Witnesses:
WILMER BRADFORD,
CHAS. E. KELLEY.