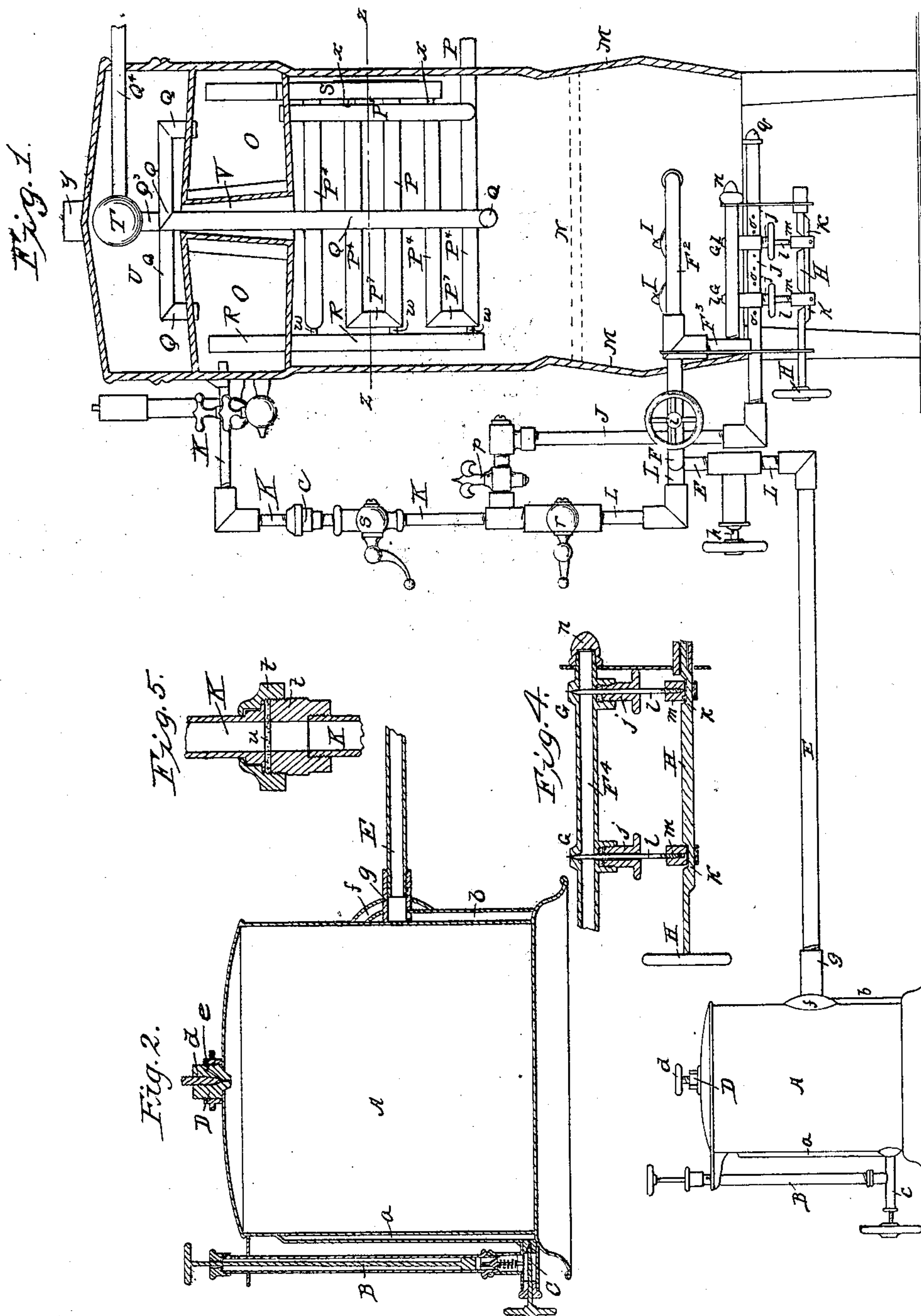


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HYDROCARBON BURNER.

No. 75,165.

Patented Mar. 3, 1868.



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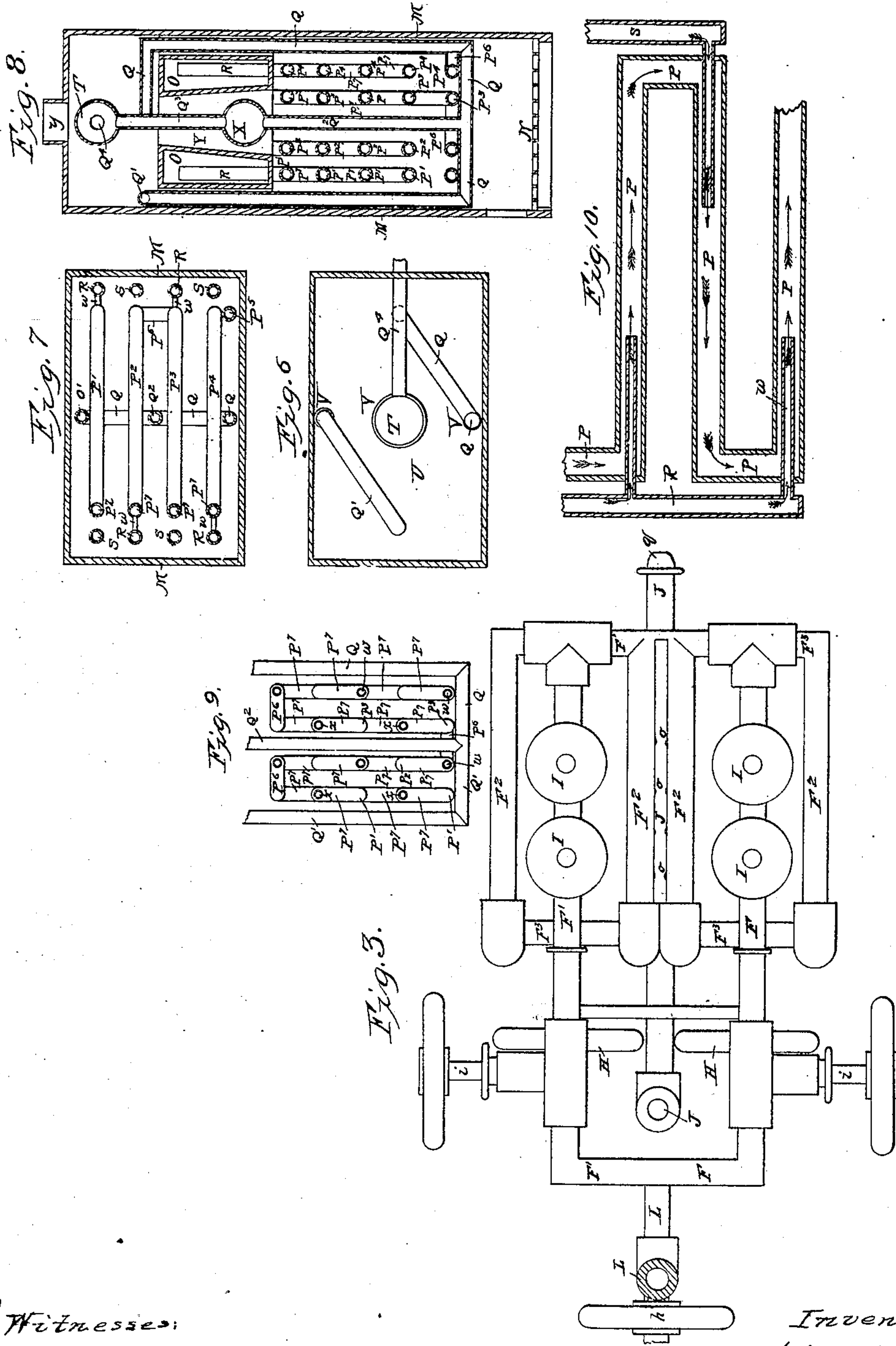
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# United States Patent Office.

JOHN S. HULL, OF CINCINNATI, OHIO.

*Letters Patent No. 75,165, dated March 3, 1868.*

## IMPROVEMENT IN HYDROCARBON-BURNERS.

The Schedule referred to in these Letters Patent and making part of the same.

### TO ALL WHOM IT MAY CONCERN:

Be it known that I, JOHN S. HULL, of Cincinnati, in the county of Hamilton, and State of Ohio, have invented an Improved Hydrocarbon Heater for Generating Steam; and I do hereby declare that the following is a full and exact description thereof, reference being had to the accompanying drawings, making part of this specification—

Figure 1 being a side elevation of a complete steam-generating apparatus constructed with my improved hydrocarbon heater, the burner-case and some other parts being in vertical section.

Figure 2, a central vertical section of the oil-fountain or reservoir.

Figure 3, a plan on an enlarged scale of the hydrocarbon-burner apparatus.

Figure 4, a longitudinal vertical section of two of the burners with the adjusting-device connected therewith.

Figures 5, 6, 7, 8, 9, and 10, various views of a "steam-generator," as arranged in connection with the heater.

Like letters designate corresponding parts in all of the figures.

The general purpose of this invention is to produce an effective apparatus for generating steam, to be used in driving engines, and for other uses, by burning benzine, naphtha, petroleum, coal-oil, or any of the hydrocarbon fluids of like character, or alcohol.

My improvements relate to two general divisions of the apparatus, namely—

First, that part in which the hydrocarbon-fluid is contained, and from and by which it is forced to the burners, to be called the fountain or reservoir.

Second, the part in which the fluid is gasefied and burned, to be termed the burner-apparatus.

These parts are suitably adapted to the part in which the steam is generated and superheated, to be designated the steam-generator.

First, the fountain or reservoir. The vessel A, in which the oil is contained, is made air-tight, and of sufficient strength to sustain the internal pressure to which it may be subjected, say, one atmosphere, more or less. Its capacity may vary according to the amount of the fluid to be consumed in a given time, and to the frequency with which it may be convenient to replenish it. The most important feature of the fountain, as applied and adapted to the purpose of this invention, is the employment of atmospheric pressure in the same for forcing the oil to the burners with sufficient pressure to create a blowing jet of flame having any required intensity. Another important advantage derived from the use of this pressure is, that the fountain may be placed in any desired position in relation to the burner-apparatus, either above or below, and at any distance therefrom convenient. It is most frequently desirable to locate the fountain below the burners, of which arrangement this fountain is fully capable. In order to produce the atmospheric pressure over the fluid in the fountain, a force-pump, B, of any convenient and effective construction, is attached or applied to the reservoir, for pumping or forcing air therein. When once a sufficient amount of air has been forced into the reservoir, no more is required till all the fluid is driven therefrom, since the air expands sufficiently in the vessel to supply the place of the exhausted oil, and still exerts sufficient pressure for the purpose of forcing the oil to the burners. But sometimes it is desirable to withdraw the pressure on stopping the operation of the apparatus, in order to avoid leakage of the oil, should the stop-valves be imperfect or not fully closed. In such case the air must be pumped in again, on resuming the operation of the generator. A valve, *d*, and vent-aperture *e*, fig. 2, are employed for the purpose of letting off the condensed air when desired.

There are some other special features of construction applied to the reservoir to render its proper operation more sure, effective, or convenient:

1. A special opening for introducing the oil, and through which to clean out the reservoir when necessary. This aperture is closed by a screw-plug, D, which, as represented, furnishes the seat for the vent-valve *d*, above specified.

2. A cut-off valve, *c*, to close the passage between the pump B and the reservoir, in order to insure the retention of the compressed air in the vessel, even if the pump-valve should not be perfectly tight.

3. It being required to have a duct or passage, *a*, from the pump-passage to the top of the vessel, above the surface of the oil, to keep the oil from the pump, the special improvement here consists in locating the said



passage outside of the vessel A, in order that it may be readily reached for repairing or renewing. It may be made of a simple hollow strip of sheet metal soldered to the vessel.

4. It also being required to furnish a duct or passage, *b*, for the hydrocarbon-fluid from the bottom of the vessel to the conveying-pipe E, if the latter is located above the bottom, as it is generally most convenient to arrange it, the improvement here likewise is the location of the duct outside of the vessel A. Its construction may be the same as described for the duct *a*.

5. The use of two or more bosses, *f*, fig. 2, one within the other, for securing the pipe-coupling *g* to the vessel A. This duplication of the bosses gives a double bearing to the coupling, and prevents its tearing off. The bosses may be simply soldered to the vessel.

From the fountain or reservoir the hydrocarbon-fluid is conveyed through a conducting-pipe, E, to any required distance, and in any direction or directions. Common gas-pipe answers the purpose, the screw-joints, with the couplings or fittings, being slightly tapering or conical. The flow of the fluid in this pipe is cut off or controlled by a valve or stop-cock, *h*.

Second, the burner-apparatus. In most steam-generating apparatus, a considerable number of burners, producing an equal number of jets of flame, is required, though some very small apparatus may require only a single jet. But the heating power of the burner-apparatus generally requires to be capable of large variation; and although with the improved method of burning the hydrocarbon-fluids, each jet can be readily very much varied in size and intensity; it is very proper here to set forth fully the means of enlarging and diminishing the capacity of an apparatus of any size and power.

As a first general requisite, therefore, to this end, the supply-tube is divided into two or more branches, F F<sup>1</sup>, each to be provided with a cut-off valve, *i*, for cutting off or controlling the supply in its own tube, and each supplying a separate burner or set of burners, so that both may be used simultaneously, or either alone.

The second general means of producing a varied and multiplied capacity of the burner-apparatus is, that each branch-supply tube, F and F<sup>1</sup>, has connected with it any required number of burner-tubes F<sup>2</sup>, each tube having a single burner, or any required number of burners, G G, the number of burners being the fewest that should be required for use at any one time. These burner-tubes are most conveniently placed parallel with one another, horizontally, at an even height, and at a proper distance apart, so that all may be suitably arranged for acting on the steam-generator with uniform effect, and for easy regulation. The use of tubes F<sup>2</sup> for producing multiplied burners G G is perhaps the most simple and cheap method that can be adopted. But since the hydrocarbon-fluid is to be gasified, and the gases superheated to an intense degree, before issuing at the burner-jets, and these processes are to be effected by the heat of the burners themselves. Another feature of this burner-apparatus consists in the extension of multiplied sections of tubes, F<sup>2</sup> F<sup>2</sup>, forward and back over the burners G G, these sections of tubes being connected by cross-tubes F<sup>3</sup> F<sup>3</sup>, and all forming one continuous tube from each supply-tube F and F<sup>1</sup> respectively to its several burner-tubes F<sup>2</sup> F<sup>2</sup>, so that the gases, in passing through the tube-sections successively, become greatly rarefied and intensely superheated. In order to spread and extend the jet-flames around the superheating tube-sections F<sup>2</sup> F<sup>2</sup>, and under the steam-generator, disks or deflectors I I are secured just above the said tube-sections in position over the jets substantially as represented, or by any equivalent arrangement. The burner-tubes F<sup>2</sup> F<sup>2</sup> are preferably straight, so that all the burners G G on each may be in one straight line. This arrangement enables a means of adjusting the burner-points *l l* to be adopted, by which all belonging to one burner-tube may be adjusted together on simply turning one shaft or rod, H. The several points are respectively connected with cranks or eccentrics *k k* on the shaft H, the said cranks being at the same angle on the shaft, and of the same degree of eccentricity. The connecting-sleeves have transverse slots, in which the eccentrics move, of sufficient extent to allow all the side-play thereof necessary. The point-shafts screw into the sleeves, as shown at *m m*, whereby all the points can be adjusted in relation to one another, so as to produce flame-jets of equal size and intensity.

It being necessary to pack tightly around the shafts of the burner-points *l l*, below where they pierce the burner-tubes, an improved packing of asbestos is employed, as seen in fig. 4, against which the packing-screws *j j* are forced. This material withstands, without injury, any degree of heat to which the burners can be subjected, and has the best qualities in other respects for a packing.

Another improvement applied to this burner-apparatus consists in the introduction of steam-jets into the flame-jets, in order to increase the intensity of the heat thereof, by furnishing additional hydrogen from the decomposition of the steam, the freed oxygen thereof also rendering the combustion more complete. The steam is brought through a pipe or pipes, J, which extend horizontally between and a little below the burners, and have small jet-apertures *o o* so located as to direct the steam into the flame-jets. This steam-pipe may connect with a pipe, K, leading from the steam-generator, and the flow of steam is regulated in the said pipe J, or cut off therefrom, by a stop-cock, *p*, fig. 1. The sections and coupling-connections of the pipe J are such as to allow adjusting movements of the jet-branch either sidewise or in any direction.

Another use of steam in the burner-apparatus is its introduction into and passage through the supply and burner-tubes F, F<sup>1</sup>, F<sup>2</sup>, F<sup>3</sup>, and F<sup>4</sup>, for the purpose of cleaning deposits and impurities therefrom, whenever it may become necessary. For this purpose a branch steam-pipe, L, leads from the steam-pipe K, and communicates with the oil-supply tubes F F<sup>1</sup>, near their junction with the conducting-pipe E. There are, at the extreme ends of the burner-tubes F<sup>2</sup> F<sup>2</sup>, removable caps *n n*, or an equivalent device, for opening the ends of said tubes when steam is to be passed through them, by turning a stop-cock, *r*, in the steam-pipe L. The steam passes through the entire length of the burner-tubes, and out at the openings usually closed by the caps *n n*, thereby speedily clearing the whole of all obstructions. Not only has each branch J and L of the steam-pipe K a stop-cock, to cut off steam therefrom, or let it into the same, but the main pipe K has a stop-cock, *s*, to cut off steam entirely from the burner-apparatus when desired.



Besides the shafts of the burner-points, all the joints and couplings of all parts of the apparatus, where it is necessary to use packing, are packed with asbestos, which is admirably adapted to that purpose, wherever heat, and especially where excessive heat is employed, by its power of withstanding great heat without detriment. The application of this packing is indicated at the coupling-joint *t* of the pipe *K*, shown in section on an enlarged scale in fig. 5. The packing is represented at *u*. This specific representation and reference will illustrate the feature of improvement in all other places where it is desirable to employ it.

What I claim as my invention, and desire to secure by Letters Patent, in a hydrocarbon-fluid apparatus for generating steam, is—

1. A heater or burner-apparatus, supplied at all points of combustion by the force of compressed air acting upon the fluid, substantially as and for the purpose herein specified.
2. I also claim a cut-off valve, *C*, between the pump *B* and the reservoir, for the purpose set forth.
3. I also claim the location of the air and fluid-ducts *a* and *b* outside of the reservoir, substantially as and for the purpose specified.
4. I also claim the double bosses *f*, for attaching the pipe-coupling to the reservoir, for the purpose set forth.
5. I also claim the arrangement of the burners *G G* in numbers upon different tubes, *F<sup>1</sup> F<sup>2</sup>*, which are separately or in sets, provided with cut-off valves, so as to increase or diminish or distribute the burners to any desired extent, substantially as herein set forth.
6. I also claim the superheating-tubes *F<sup>2</sup> F<sup>2</sup>*, extended over the burners, and communicating with the pipes *J J*, substantially as and for the purpose herein set forth.
7. I also claim the arrangement of flame-deflectors *I I* over the superheating-tubes, substantially as specified.
8. I also claim the arrangement of numbers of burners, *G G*, in line with one another, so that the burners *///* of each set may be connected with one adjusting-shaft, and adjusted simultaneously, substantially as specified.
9. I also claim the adjustment of the said burner-points separately to their connections with the common adjusting-shaft, for the purpose set forth.
10. I also claim the introduction of the superheated-steam jets into the flame-jets of the burners directed thereto, substantially as and for the purpose herein specified.
11. I also claim the employment of steam for clearing out the supply and burner-tubes, which are so arranged as to admit the passage of the steam through them, substantially as herein described.

JOHN S. HULL.

Witnesses:

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WM. F. BROWNE.