

(No Model.)

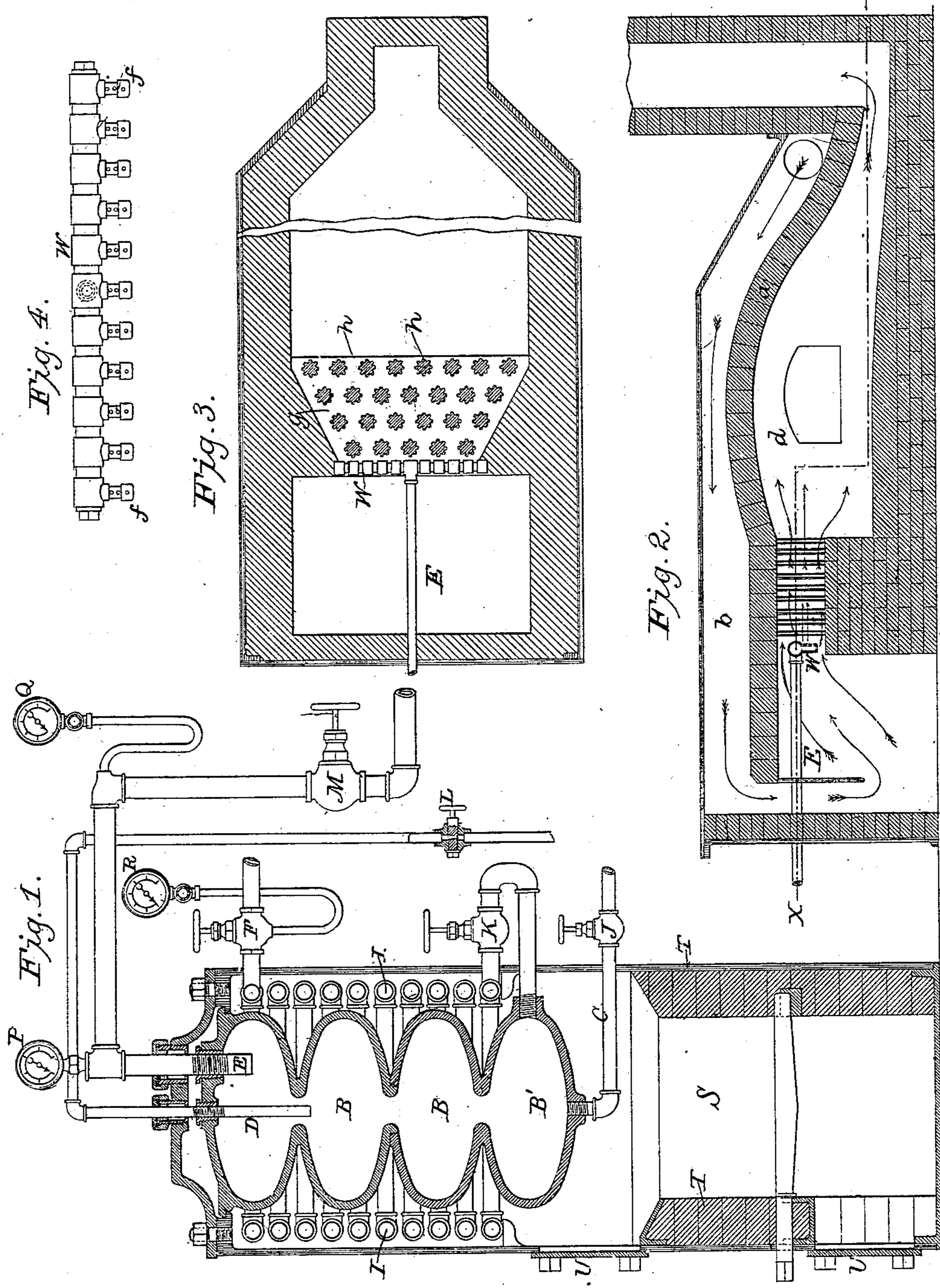
2 Sheets—Sheet 1.

H. F. HAYDEN.

APPARATUS FOR GENERATING VAPOR FROM LIQUID HYDROCARBONS.

No. 278,792.

Patented June 5, 1883.



WITNESSES

John A. Svedberg
J. M. Burnham

INVENTOR

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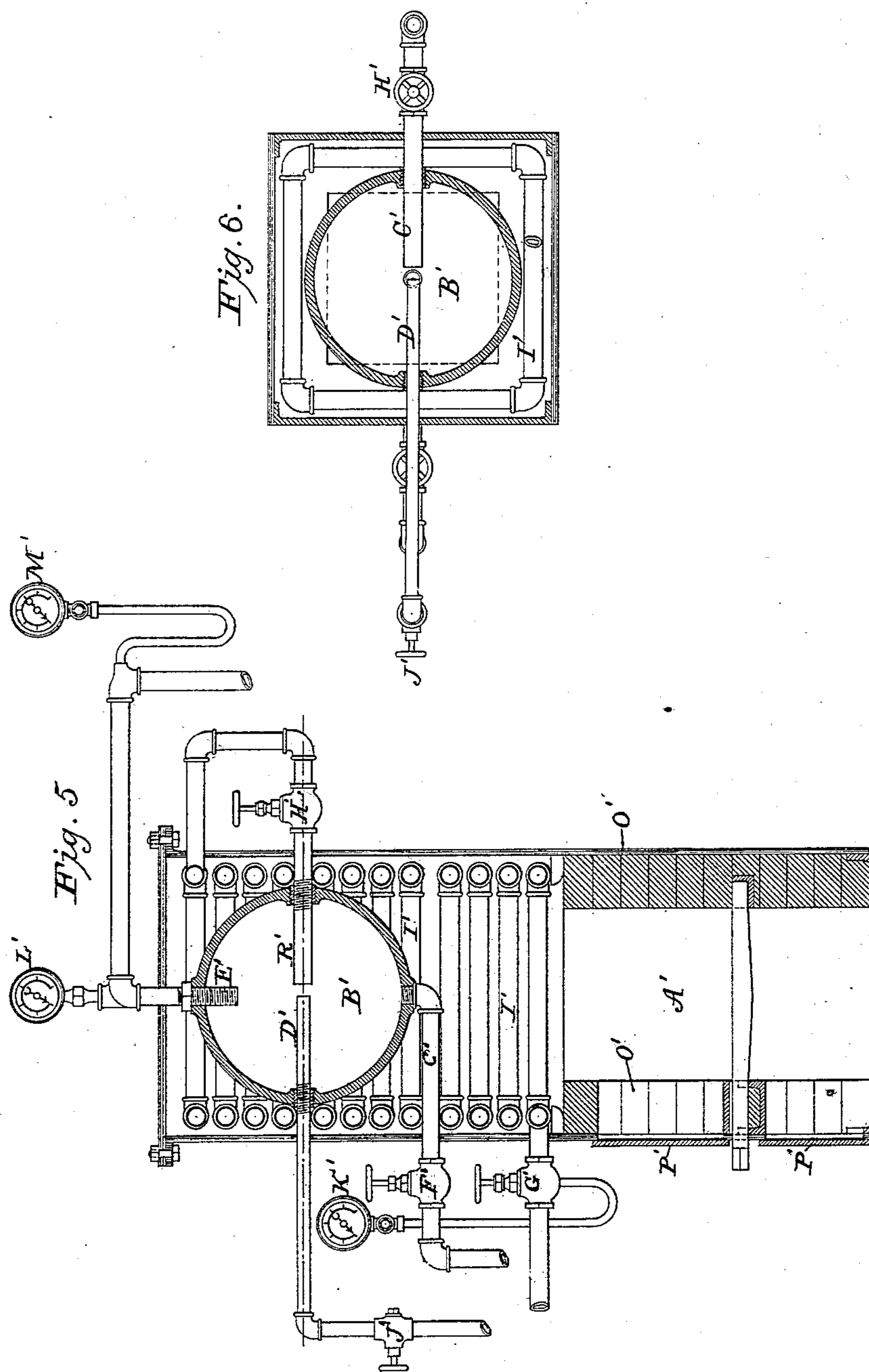
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ATTORNEYS.

UNITED STATES PATENT OFFICE.

HENRY F. HAYDEN, OF WASHINGTON, DISTRICT OF COLUMBIA, ASSIGNOR
TO THE INTERNATIONAL VAPOR FUEL AND CARBON IRON AND MANU-
FACTURING COMPANY, OF SAME PLACE.

APPARATUS FOR GENERATING VAPOR FROM LIQUID HYDROCARBONS.

SPECIFICATION forming part of Letters Patent No. 278,792, dated June 5, 1883.

Application filed June 11, 1881. Renewed March 26, 1883. (No model.)

To all whom it may concern:

Be it known that I, HENRY F. HAYDEN, a citizen of the United States of America, residing at Washington, in the District of Columbia, have invented certain new and useful Improvements in Apparatus for Generating Vapor from Liquid Hydrocarbons; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to letters or figures of reference marked thereon, which form a part of this specification.

My invention relates to that class of vapor-generators in which steam is used for causing the vaporization of liquid hydrocarbons; and the nature thereof consists in certain improvements in the construction of such generators, and novel combination of the parts thereof, hereinafter described.

In the accompanying drawings, Figure 1 is a view, taken partially in section, illustrating the apparatus. Fig. 2 is a longitudinal vertical section of the furnace in which the combustion of the vapor is effected. Fig. 3 is a horizontal section of the furnace in which the combustion of the vapor is effected. Fig. 4 illustrates in detail the vapor-burner. Figs. 5 and 6 illustrate, respectively, in vertical and horizontal section, a modification of the apparatus shown in Fig. 1.

The retort or generating-chamber B consists of two or more communicating spheroidal receivers, and has a pipe, C, provided with a valve, J, for drawing off the residua. A coil of superheating-pipes, V, is arranged on the outside of the generating-chamber, and between the same and the walls of the apparatus, the uppermost of which communicates with a steam-supply pipe, F, provided with a valve, and the lowermost of which communicates, by means of the pipe K, with the generating-chamber.

Near the base of the apparatus is a furnace, S, from whence the products of combustion, rising upward, impinge against the generating-chamber and superheating-coils and finally pass off through a smoke-pipe, which is not shown in the drawings. The liquid hydro-

carbon is introduced into the generating-chamber by means of the pipe D, provided with valve L, which communicates with the source of supply, and the hydrocarbon vapor is carried off by the pipe E, which is provided with a pyrometer, P, and valve M.

The operation of the apparatus is as follows: The requisite amount of steam is admitted by means of the valve F into the superheater V, where additional heat is imparted to it by the heated gases from the furnace S. The steam thus superheated flows through the pipe K to generating-chamber B, where it comes in contact with the liquid hydrocarbon which enters through the pipe D. The arrangement of the spheroidal receivers B is such as to cause the vaporization of the hydrocarbons flowing through them according to their volatility—that is to say, the most volatile hydrocarbons are vaporized first and the least volatile last, while the highly-heated steam also attacks the carbonaceous residua and forms hydrogen gas and carbonic oxide. The steam should flow from the generator under sufficient pressure to carry the hydrocarbons in vaporous form to the burner W, and the liquid hydrocarbon flowing out at the end of the pipe D and the superheated steam passing upward through the spheroidal chambers should be thoroughly intermixed.

Figs. 5 and 6 illustrate, respectively, in vertical and horizontal section, a modification of the apparatus shown in Fig. 1. According to this construction the generating-chamber consists of a single sphere or spheroid, B', provided with a pipe, C', having a valve, F', for drawing off the residua. A coil of superheating-pipes, I', is arranged on the outside of the generating-chamber, and between the same and the walls of the apparatus, the lowermost of which communicates with a steam-supply pipe, G', having a valve, and the uppermost of which communicates by means of a pipe, R', having a valve, H', with the generating-chamber. Near the base of the apparatus is a furnace, A', from whence the products of combustion, rising upward, impinge against the superheating-coil I' and generating-chamber B', and finally pass off through a smoke-pipe. (Not shown in the drawings.) The liquid hydrocarbon is intro-

duced into the generating-chamber by means of the pipe D', provided with a valve, J', which communicates with the source of supply, and the hydrocarbon vapor is carried off by the pipe E', which is provided with a pyrometer, L'. The requisite amount of steam having been admitted by means of the valve G' into the superheater, it receives an additional amount of heat from the heated gases leaving the furnace, and thus superheated flows through the pipe R' to the generating-chamber, where it meets the oil entering through the pipe D' and vaporizes it. The highly-heated steam will also attack the carbonaceous residua of vaporization and form therewith hydrogen gas and carbonic oxide.

The gas and vapors generated as herein described may be burned in the furnace illustrated in Figs. 2, 3, and 4, in which *a* represents the crown of the furnace, over which flue *b* is arranged, through which air enters the combustion-chamber *d* in a continuous manner from the source of supply. The vapor-supply appliance consists of a pipe, E, communicating with the generator, and the pipe W, arranged at right angles therewith, and provided with a series of downwardly-projecting tubes, *f*, having apertures cut therein for the escape of the gas. The mixing-chamber, in which the vapor and air are thoroughly intermixed, consists of a series of posts or pillars, *h*, arranged within the passage G, through which these fluids enter the combustion-chamber. These pillars should be made of some highly-refractory material, in order that they may absorb and store up the heat generated by combustion and impart it to the entering air and vapor. I prefer that these pillars shall be arranged in zig-zag relation to each other, so that the entering vapor and air impinging against the same will become thoroughly heated and intermixed.

The combustion-chamber and appliances for burning the gas are not herein claimed, as they will form the subject-matter of another application for Letters Patent of the United States.

I do not claim herein the combination of the retort or generating-chamber composed of two or more communicating spheroidal receivers and a pipe for the direct introduction of the steam into the generator; nor do I claim the combination of the generator, the pipe for supplying the liquid hydrocarbons, the pipe for admitting steam, the pipe for carrying away the vapor, and the superheater, as those combinations form the subject-matter of another application for Letters Patent filed by me on the 11th day of June, 1881.

Having thus described my invention, I claim and desire to secure by Letters Patent of the United States—

1. In the apparatus for generating vapor from liquid hydrocarbons herein described, one or more spherical or spheroidal vapor-generators exposed to the direct action of the products of combustion, and having a steam-induction pipe and oil-induction pipe exterior to the furnace, as and for the purposes described.

2. In the apparatus for generating vapor from liquid hydrocarbons described, the combination of one or more spherical or spheroidal vapor-generating chambers exposed to the direct action of the products of combustion, an oil-induction pipe entering the top, a steam-induction pipe, and a superheater communicating therewith, as and for the purposes described.

In testimony whereof I affix my signature in presence of two witnesses.

HENRY F. HAYDEN.

Witnesses:

C. S. WHITMAN,
F. M. BURNHAM.