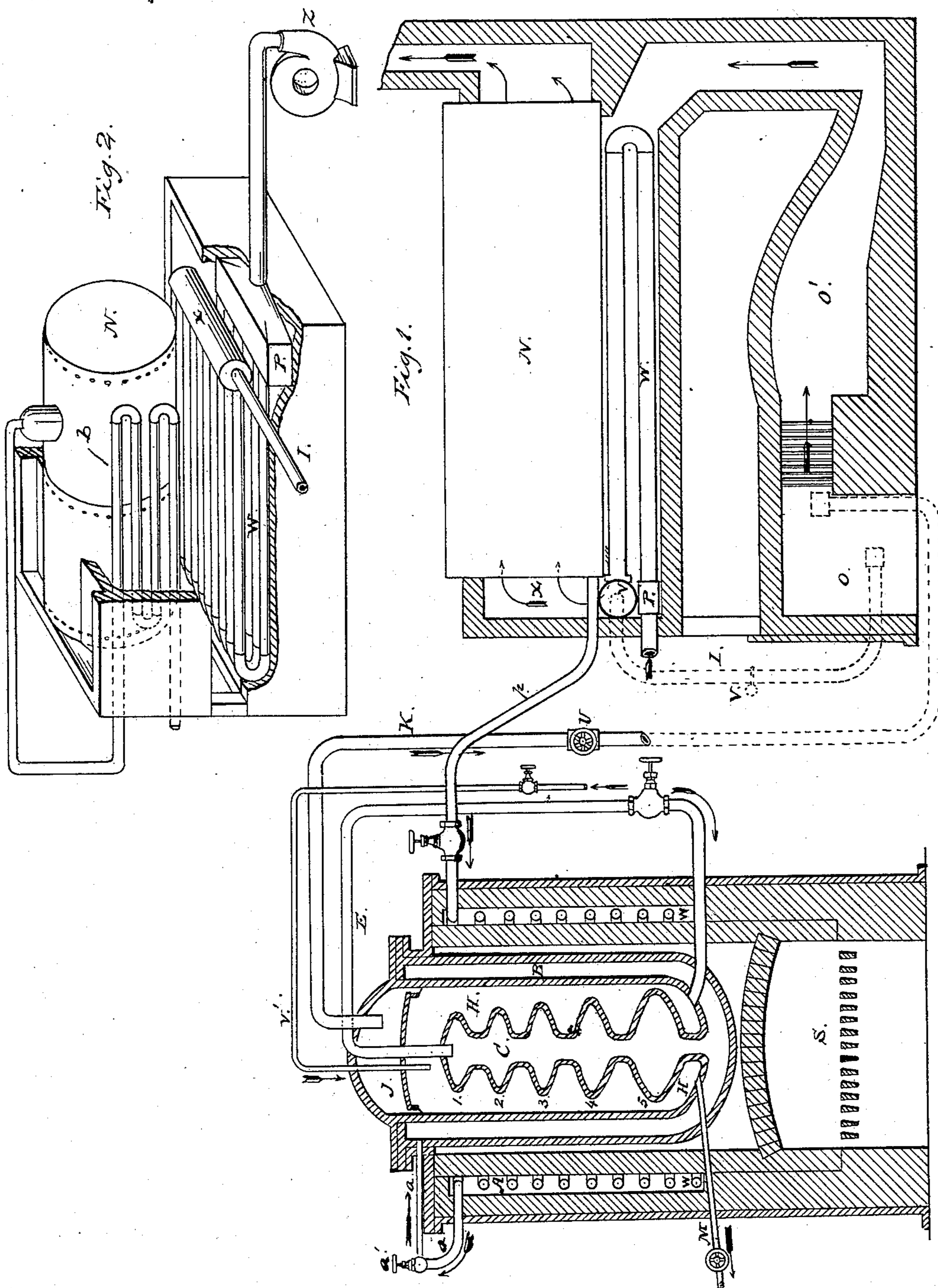


(No Model.)

J. B. ARCHER.  
HYDROCARBON FURNACE.

No. 279,904.

Patented June 26, 1883.



Attest;  
C. W. Howard  
C. H. Downes.

Inventor;  
J. B. Archer by  
C. S. Whitman  
att'y

# UNITED STATES PATENT OFFICE.

JOHN B. ARCHER, OF WASHINGTON, DISTRICT OF COLUMBIA.

## HYDROCARBON-FURNACE.

SPECIFICATION forming part of Letters Patent No. 279,904, dated June 26, 1883.

Application filed May 16, 1882. Renewed April 6, 1883. (No model.)

*To all whom it may concern:*

Be it known that I, JOHN B. ARCHER, a citizen of the United States, residing at Washington, in the District of Columbia, have invented certain new and useful Improvements in Hydrocarbon-Furnaces; 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.

My invention relates to that class of vapor-generators in which liquid hydrocarbons are vaporized by means of steam, and to furnaces in which hydrocarbons in a vaporous form are burned; and the nature of my invention consists in certain improvements in the construction of such generators and furnaces, as hereinafter described and shown.

In the accompanying drawings, in which corresponding parts are designated by the same letters, Figure 1 is a view partially in section of a vapor generator and furnace having my improvements applied thereto. Fig. 2 is a perspective view illustrating the arrangement of the pipes in which the air and also the steam are heated by the outgoing products of combustion from the furnace.

In the drawings, H designates the cylindrical chamber in which the vapor is generated, which is surrounded by an annular steam-space, B, which communicates by means of the pipe *a* with a coil of pipe, A, arranged within a receptacle, W, which coil is connected by the pipe *p* with the steam-supply. This cylindrical chamber H has within it a steam-space, C, which communicates with the steam-jacket B. The steam admitted through the pipe *a* is regulated by a valve, *a'*, and flows downward to the bottom of the steam-jacket B, heating the exterior of the generating-chamber H in its passage, from whence it rises through the interior of the steam-space C to the pipe E, which conducts it into the bottom of the generating-chamber H. The interior steam-space consists of a number of communicating receivers of spheroidal form. These receivers increase in size from the upper one downward, so that the liquid hydrocarbons which are not vaporized on entering the generator through the pipe V' will drop downward from one receiver to another in a graduated manner. The

steam from the receiver C, having been conducted into the bottom of the generator H, rises upward and meets the descending liquid as it drops from one receiver to another. The hydrocarbon vapor is carried off by the pipe K to the mixing-chamber O of the furnace, and any residuum which may remain in the generating-chamber H is carried off by the pipe M. The steam made use of for vaporizing the hydrocarbons is generated in a boiler, N, which is heated by the escaping products of combustion from the furnace. The boiler is arranged in a receptacle or flue-space, X, above the combustion-chamber of the furnace, and the pipe reaching from the boiler to the vapor-generator is doubled or coiled on each side thereof, as shown at *b*, so as to present as much surface as possible to the escaping products of combustion. A series of air-pipes, W, are also arranged within the receptacle or flue-space X, for the purpose of utilizing the heat of the escaping products of combustion from the furnace for heating the incoming air, which unites with the gas from the generator in the mixing-chamber O. The air is forced by means of the blower Z into the box P, from whence it is distributed by a series of pipes, W, in such a manner as to absorb the heat from the escaping hot gases. The air thus heated is collected in the receiver X, from whence it is conducted by the pipe I to the mixing-chamber O. The flow of air and gas into the mixing-chamber through the pipes I and K, respectively, may be accurately adjusted by means of valves at V and U or other proper points upon the said air and gas pipes. At the base of the generator is a furnace, S, from whence the products of combustion, rising, expand into the space W through perforations in the wall, and finally pass off through a smoke-pipe.

The operation of the apparatus is as follows: The requisite amount of steam is admitted, which flows through the coil A and pipe *a* to the annular steam-space B on the outside of the generator, from whence it flows upward through the interior steam-space, *c*, and pipe E to the bottom of the generating-chamber H, where it comes in contact with the liquid hydrocarbon, which enters through the pipe V' and flows downward over the outer surface of

the spheroidal receivers 1, 2, 3, 4, and 5. The liquid hydrocarbon flows over the edge of the upper receiver, 1, and drops upon the outer edge of the receiver 2, from whence it drops successively to the receivers 3, 4, and 5. In other words, the outer edges of the receivers successively intercept the liquid in its downward progress and spread it outward to meet the ascending steam. By causing the receivers 1, 2, 3, 4, and 5 to gradually increase in size from top to bottom, a very thorough intermixture of the steam and liquid is effected, and this intermixture is rendered still more perfect by the circular deflector J, which is attached to the walls of the generator H in such a manner as to cause the gas generated in the said generator to be deflected outward over the exterior edges of the deflector before passing into the eduction-pipe K. The steam should flow through the chamber H under sufficient pressure to carry the hydrocarbons in vaporous form through the pipe K to the mixing-chamber O, where they meet the air entering through the pipe V, and are thoroughly intermixed therewith. The inflammable mixture from the mixing-chamber O is ignited and performs its work in the furnace o, from whence the spent gases and products of combustion are carried by the draft upward to the flue-space or receptacle, in which are arranged the boiler, steam-pipes, and air-heating pipes. The air thus heated flows downward through the pipe V to the point where it is mixed with the vapor from the generator, and thus raises the temperature in the furnace o to a high de-

gree, and produces a flame adapted to metallurgical operations requiring an intense heat.

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

1. The combination of a furnace in which the incoming air to support combustion and the steam for vaporizing liquid hydrocarbons are heated by the spent gases and products of combustion with the described apparatus for generating vapor from liquid hydrocarbons, as and for the purposes described.

2. In the apparatus for generating vapor from liquid hydrocarbons herein described, the generating-chamber having an internal steam-space consisting of spheroidal receivers increasing in size from top to bottom, as and for the purposes described.

3. The combination of the spheroidal receivers of gradually increasing size, the pipe through which the steam enters the generating-chamber, and the oil-supply pipe, as and for the purposes described.

4. In the apparatus for generating vapor from liquid hydrocarbons herein described, the combination of the deflector, the steam and oil supply pipes, and the spheroidal receivers, as and for the purposes described.

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

JOHN B. ARCHER.

Witnesses:

GEO. W. DRESSER,

FRANK M. ELKINS.