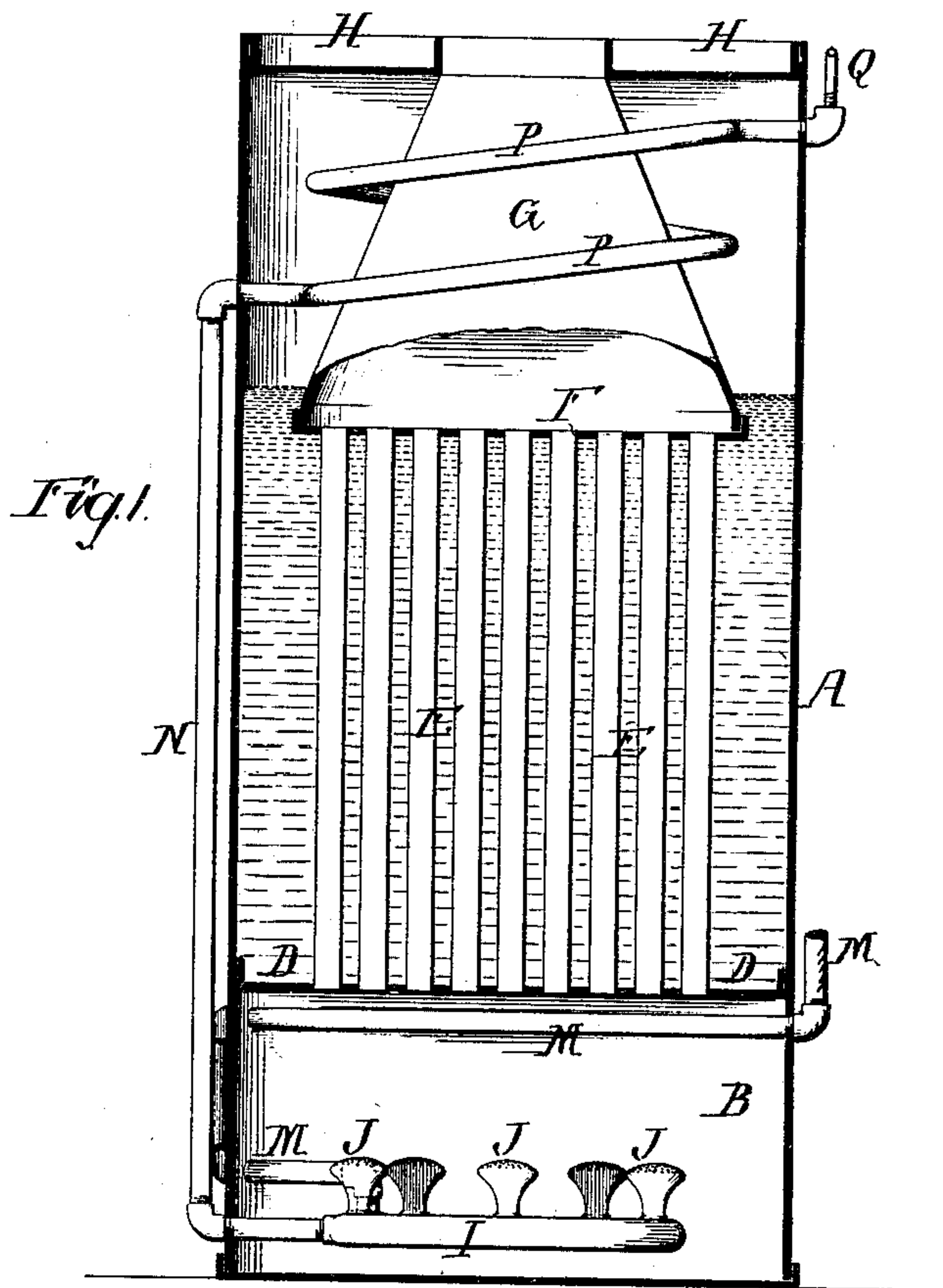


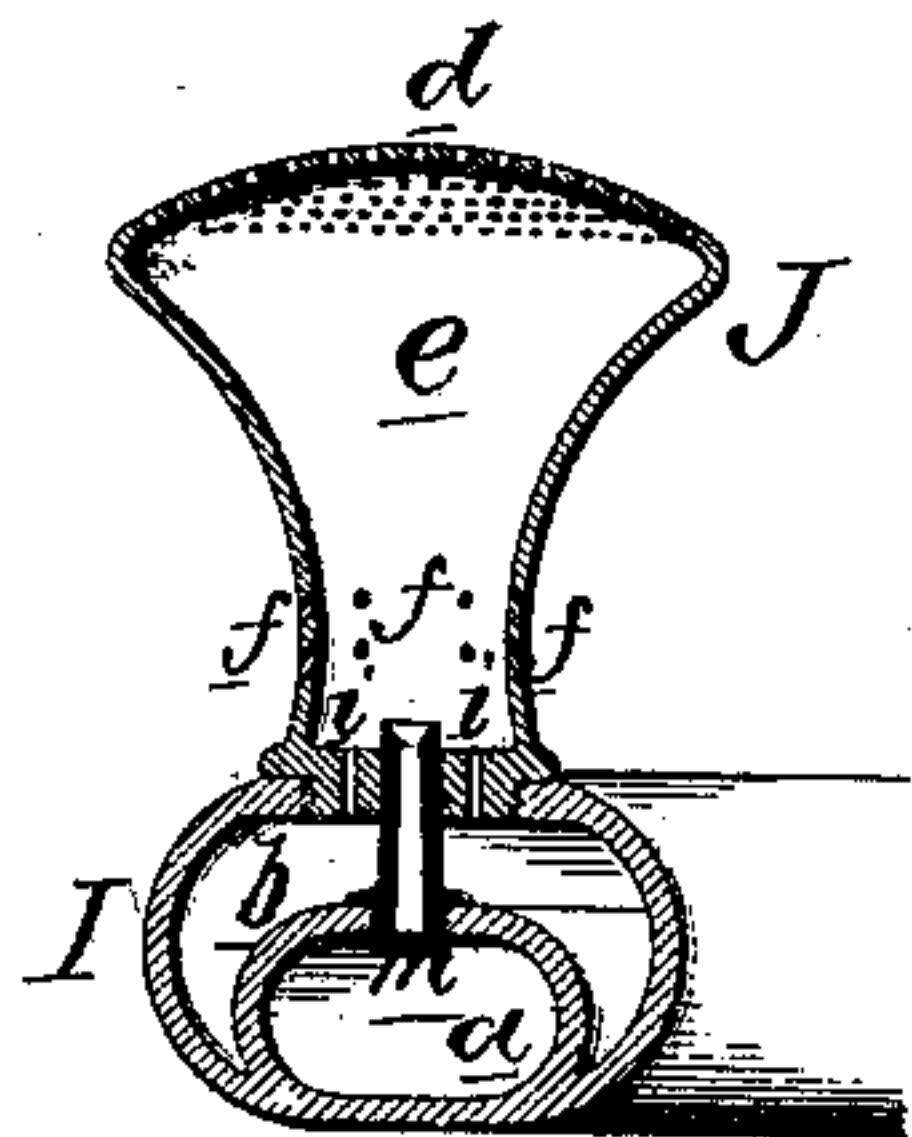
J. BISHOP.  
HYDROCARBON BURNER.

No. 189,421.

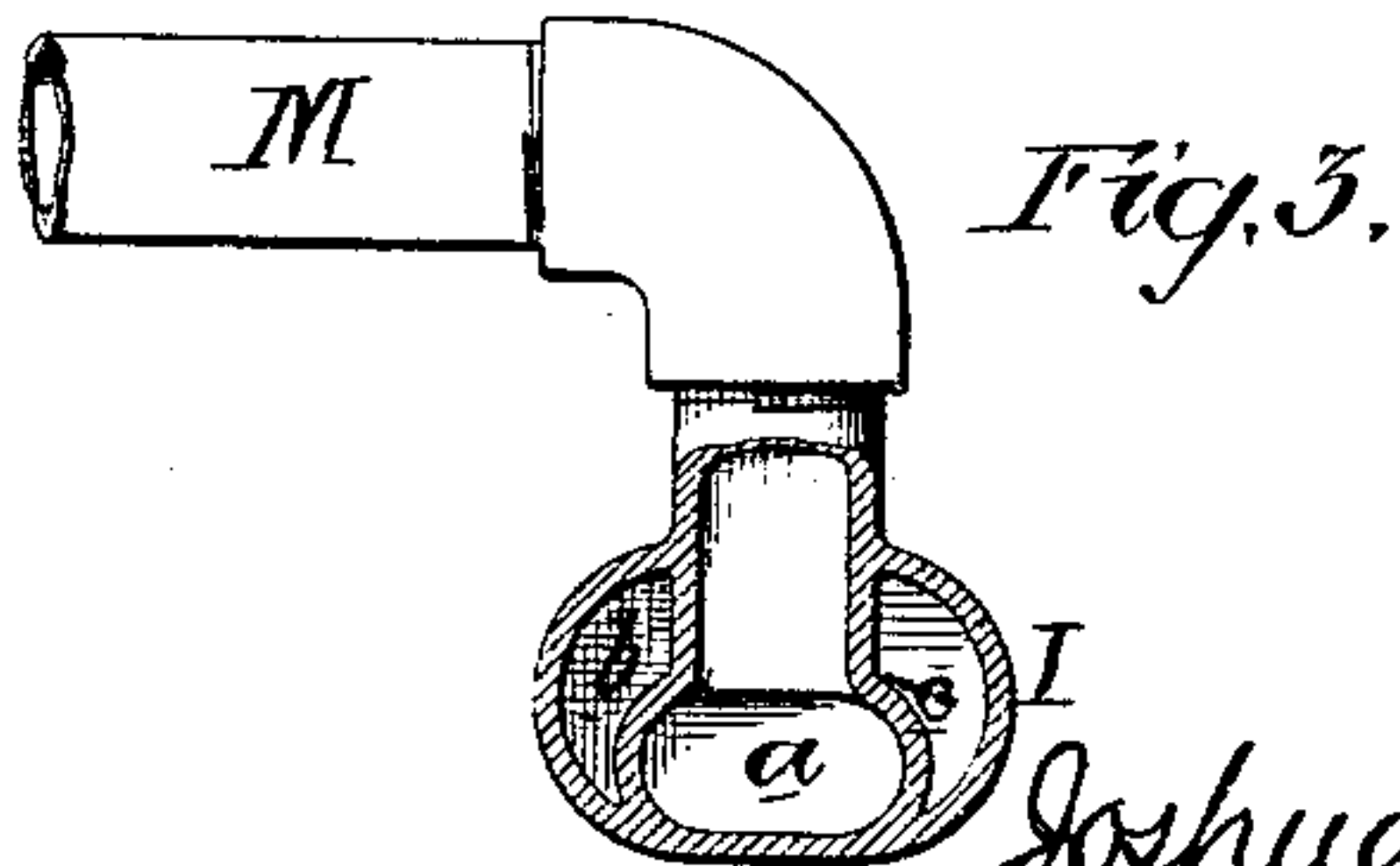
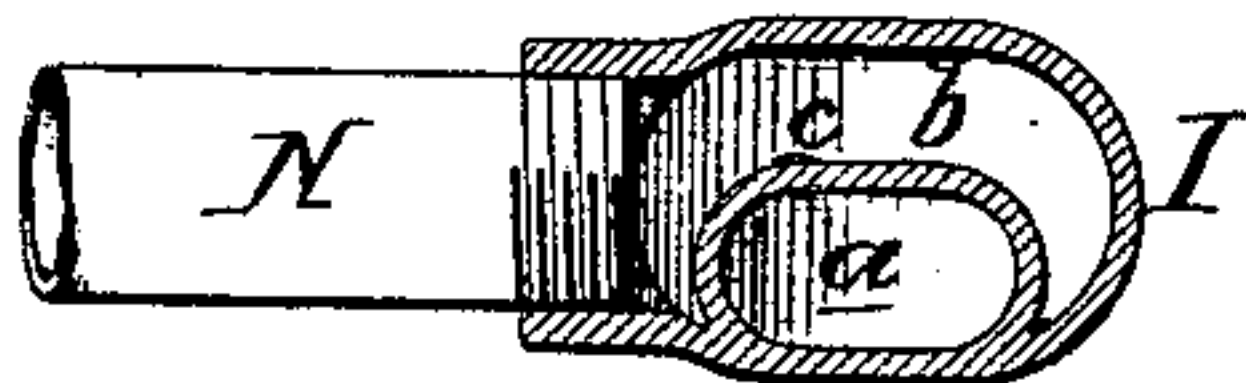
Patented April 10, 1877.



*Fig. 2.*



*Fig. 4.*



Witnesses.

Harry Smith  
John Rupertus

Joshua Bishop  
by his Attorneys  
Howe & Vandron



# UNITED STATES PATENT OFFICE.

JOSHUA BISHOP, OF PHILADELPHIA, PENNSYLVANIA, ASSIGNOR OF  
ONE-HALF HIS RIGHT TO JAMES FORNEY, OF SAME PLACE.

## IMPROVEMENT IN HYDROCARBON-BURNERS.

Specification forming part of Letters Patent No. 189,421, dated April 10, 1877; application filed  
December 29, 1876.

*To all whom it may concern:*

Be it known that I, JOSHUA BISHOP, of Philadelphia, Pennsylvania, have invented a new and useful Improvement in Hydrocarbon-Burners, of which the following is a specification:

The object of my invention is to construct a simple, compact, and effective device for the use of hydrocarbons as fuel in steam-boiler furnaces, &c.; and this object I attain in the manner which I will now proceed to describe, reference being had to the accompanying drawing, in which—

Figure 1 is a vertical section of a steam-boiler with my improved hydrocarbon-burner, and Figs. 2, 3, and 4 enlarged sectional views of different parts of the apparatus.

A is the outer shell of the boiler, which, in the present instance, incloses the combustion-chamber B, the latter being bounded above by the tube-sheet D, to which are secured the lower ends of the tubes E, the upper ends being secured to a tube-sheet, F, which is attached to the lower end of a funnel-shaped uptake, G, the upper end of the latter passing through the top plate H of the boiler and communicating with the chimney. This construction may be varied, however, without affecting the character of my invention.

In the combustion-chamber B, beneath the tubes E, is a pipe, I, which may be either straight, annular, or coiled, as desired, and this pipe is furnished with any desired number of burners, J.

The pipe I has two chambers, *a* and *b*, the former being arranged at the bottom of the pipe and the other above, the two chambers being separated by a partition, *c*.

With the chamber *a* communicates a pipe, M, Fig. 3, while with the chamber *b* communicates a pipe, N, Fig. 4, the pipe M extending first to the outside of the shell A, then upward a short distance, then across the combustion-chamber immediately beneath the tubes, and then to the steam-space of the boiler, in any suitable manner, while the pipe N, after passing through the shell of the boiler, extends upward to a point adjacent to the steam-space of the same, when it enters the boiler, and is coiled within the same at

P, the end of the coil being continued through the shell, where it communicates with a pipe, Q, leading to a reservoir of hydrocarbon, suitably placed. The pipe Q is less in diameter than the coil P, in order to permit the free expansion of the hydrocarbon into vapor, when it reaches the heated coil.

Each of the burners J consists of a shell, flared at the upper portion, and having a perforated convex top, *d*, the chamber *e* within the burner communicating with the external air through perforations *f* in the sides of the shell and with the chamber *b* of the tube I through perforations *i* in the bottom of the same.

Projecting through the bottom of the shell, and extending a short distance into the chamber *e*, is a nozzle, *m*, the bore of which communicates with the chamber *a* of the tube I.

The operation of the device is as follows:

Steam from the steam-space of the boiler passes through the pipe M, and in crossing the combustion-chamber becomes superheated, and in this condition enters the chamber *a* of the tube I, and escapes into the burner in a jet from the nozzle *m*.

Hydrocarbon passes from the reservoir through the pipe Q and through the coil P in the steam-space of the boiler, where it becomes vaporized, and in this condition passes through the pipe N and enters the space *b* of the tube I, where it is brought directly into contact with the heated casing *c*, inclosing the steam-chamber *a*, so that its maintenance in a vaporized condition will be assured.

The jet of steam from the nozzle *m* induces the entrance into the chamber *e* of the burner J of vapor from the chamber *b* through the openings *i*, and of air through the openings *f*, the steam, hydrocarbon vapor, and air becoming intimately mixed in the chamber *e* before escaping through the perforations in the top of the same, where the mixture will burn with an intense heat.

In case this heat is so great as to have a tendency to burn the pipe M, if it passed directly across the combustion-chamber, as shown, said pipe may be carried for a short distance around one side of the combustion-chamber, where the heat is not so intense.

I claim as my invention—

1. The combination of the vapor-pipe N and the steam-pipe M, with the tube I, its burners J, and chambers *a* and *b*, the former communicating with the burners through openings *i* and the latter through nozzles *m*, as set forth.

2. The combination of the tube I and its chambers *a* and *b*, with the burners J, their openings *i* and *f*, and the nozzles *m*.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

JOSHUA BISHOP.

Witnesses:

HERMANN MOESSNER,

HARRY SMITH.