

(No Model.)

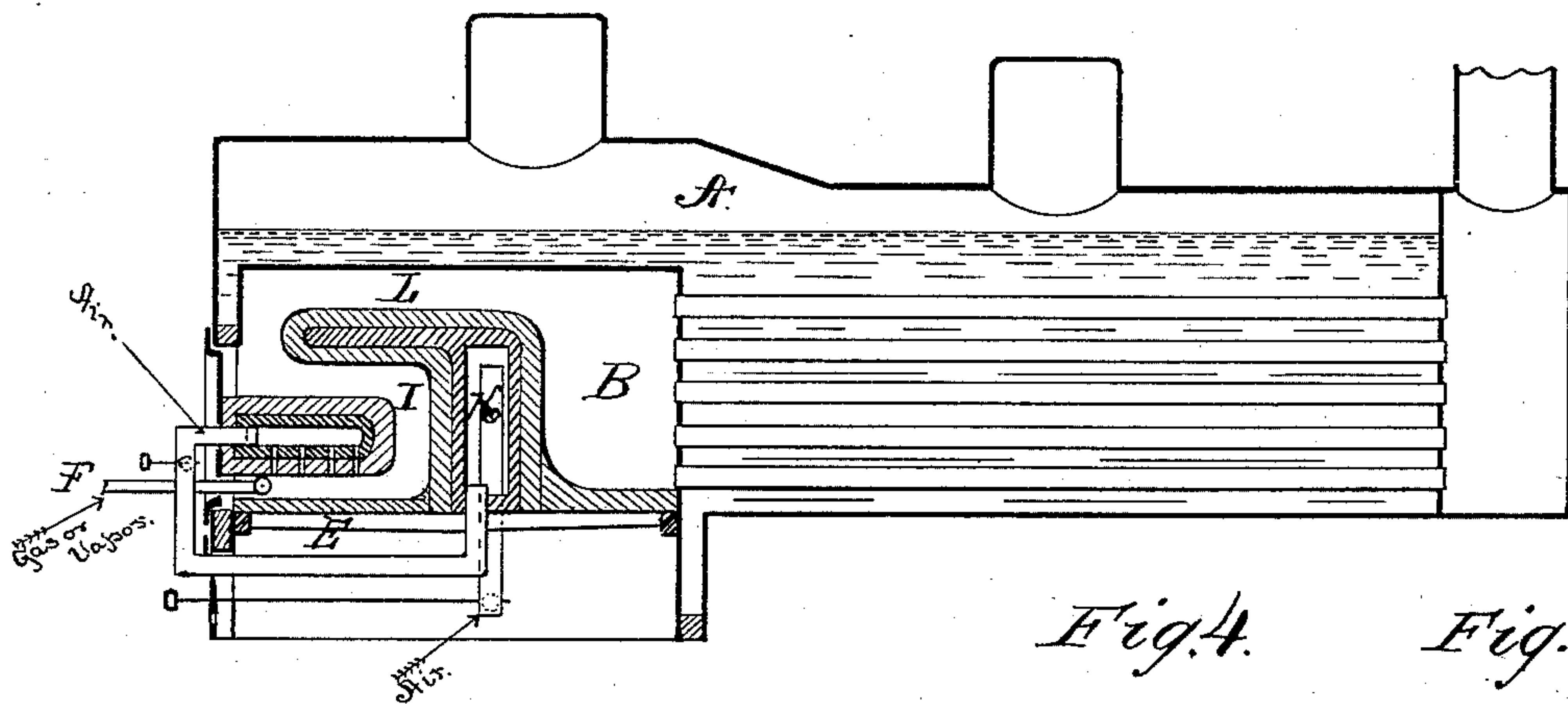
J. B. ARCHER.

BOILER FURNACE.

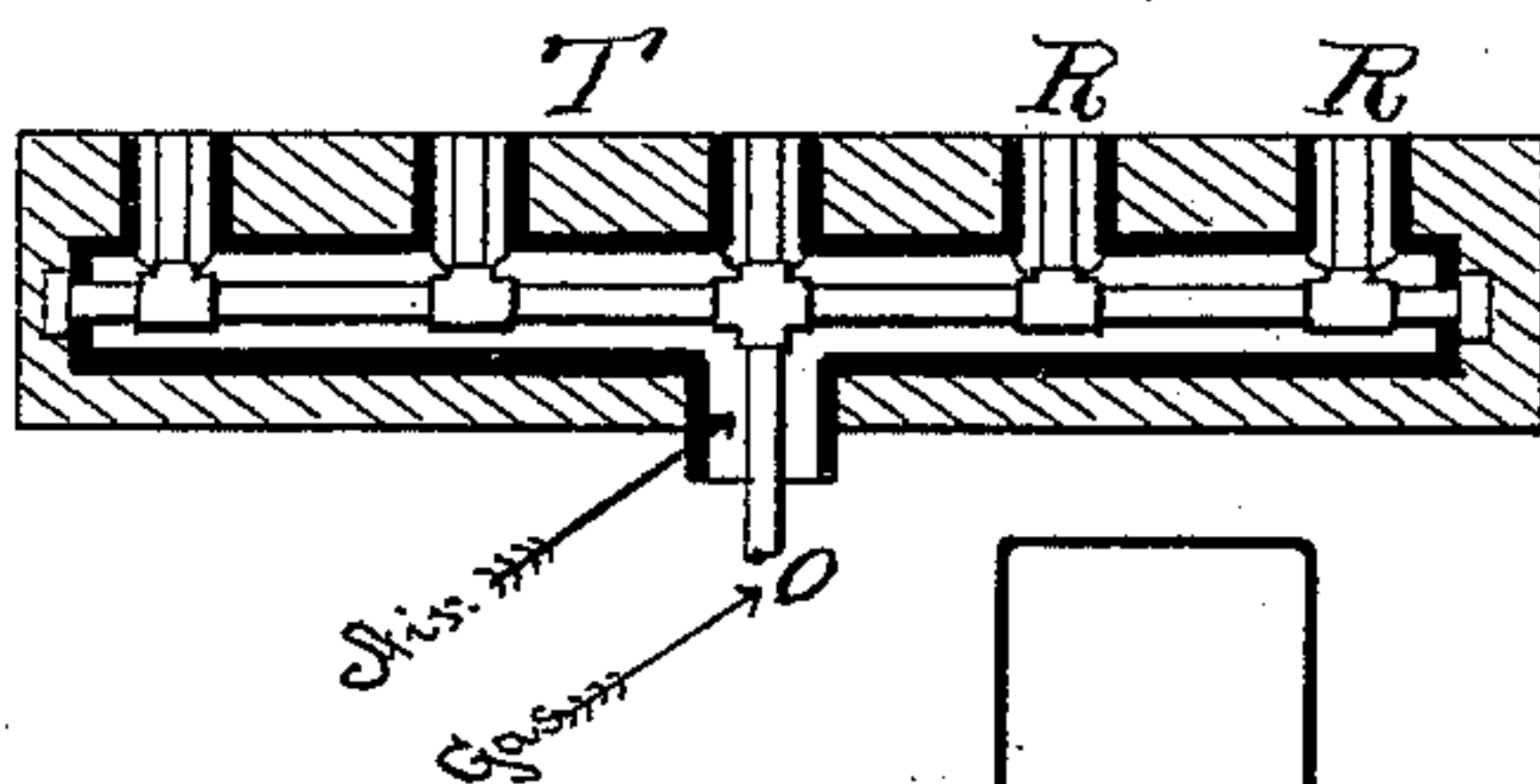
No. 341,626.

Patented May 11, 1886.

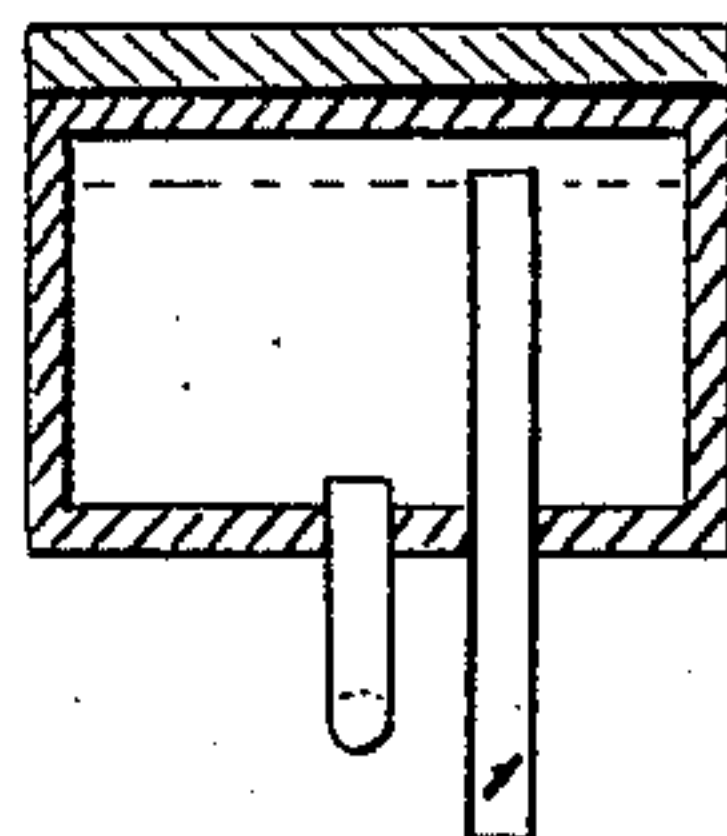
*Fig. 1.*



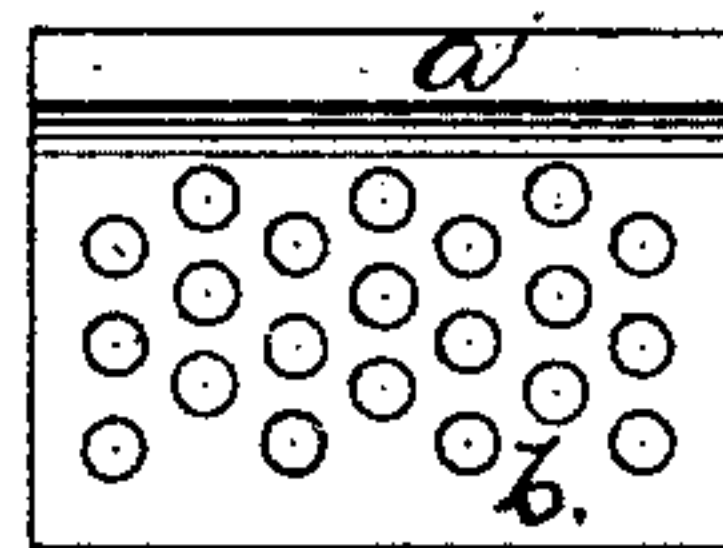
*Fig. 3.*



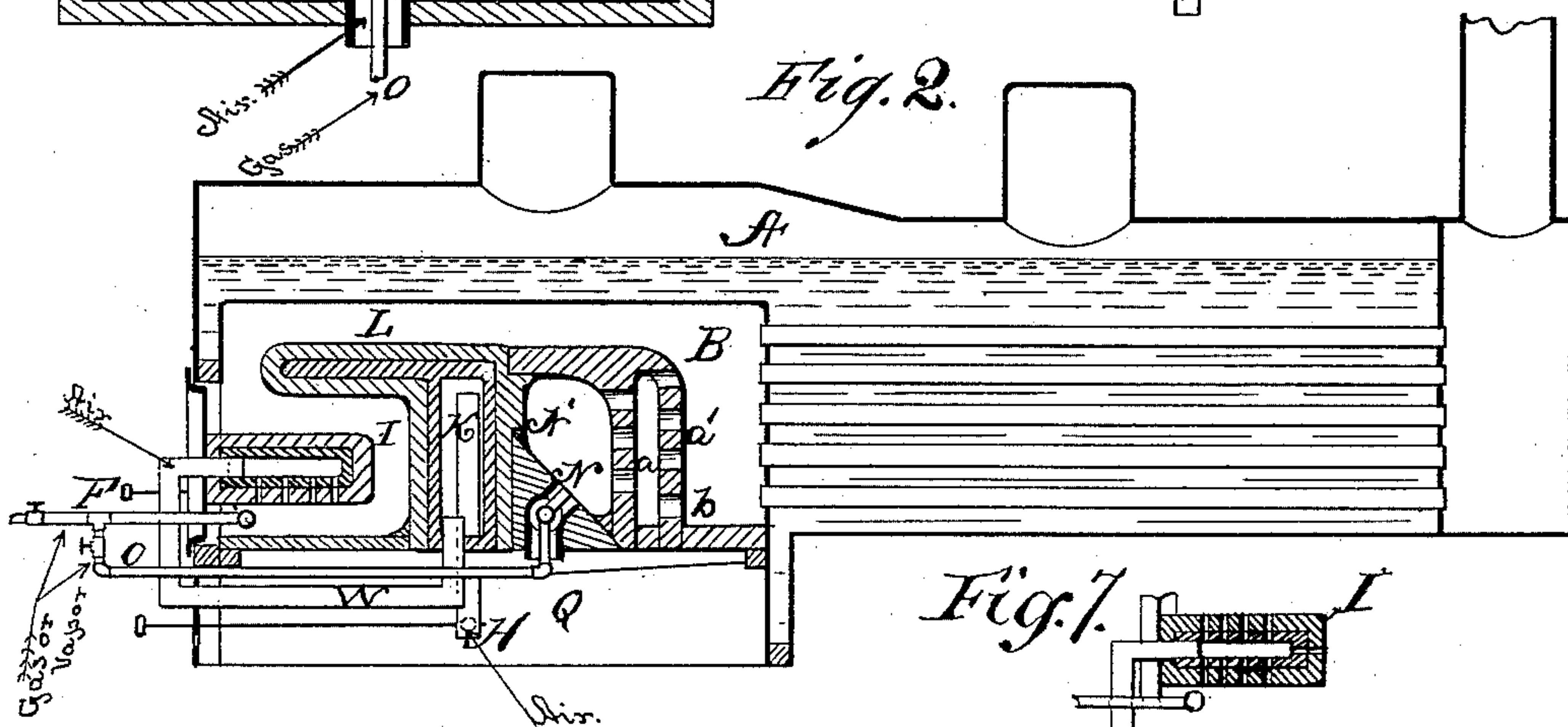
*Fig. 4.*



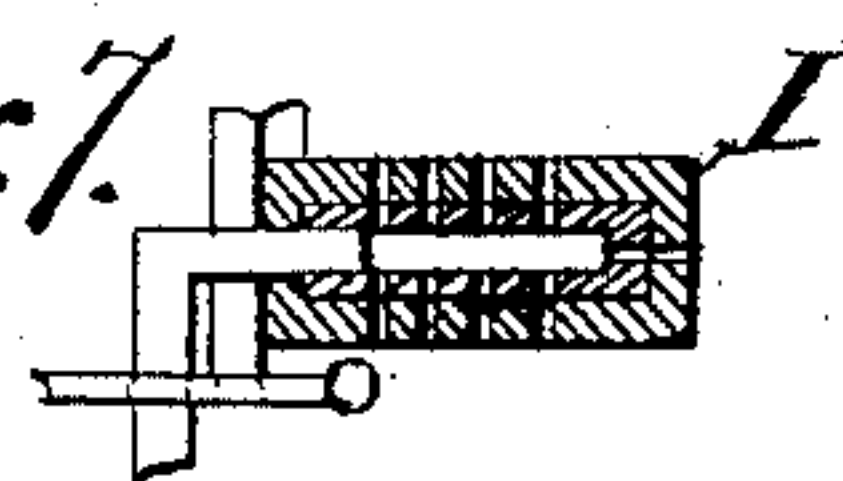
*Fig. 5.*



*Fig. 2.*



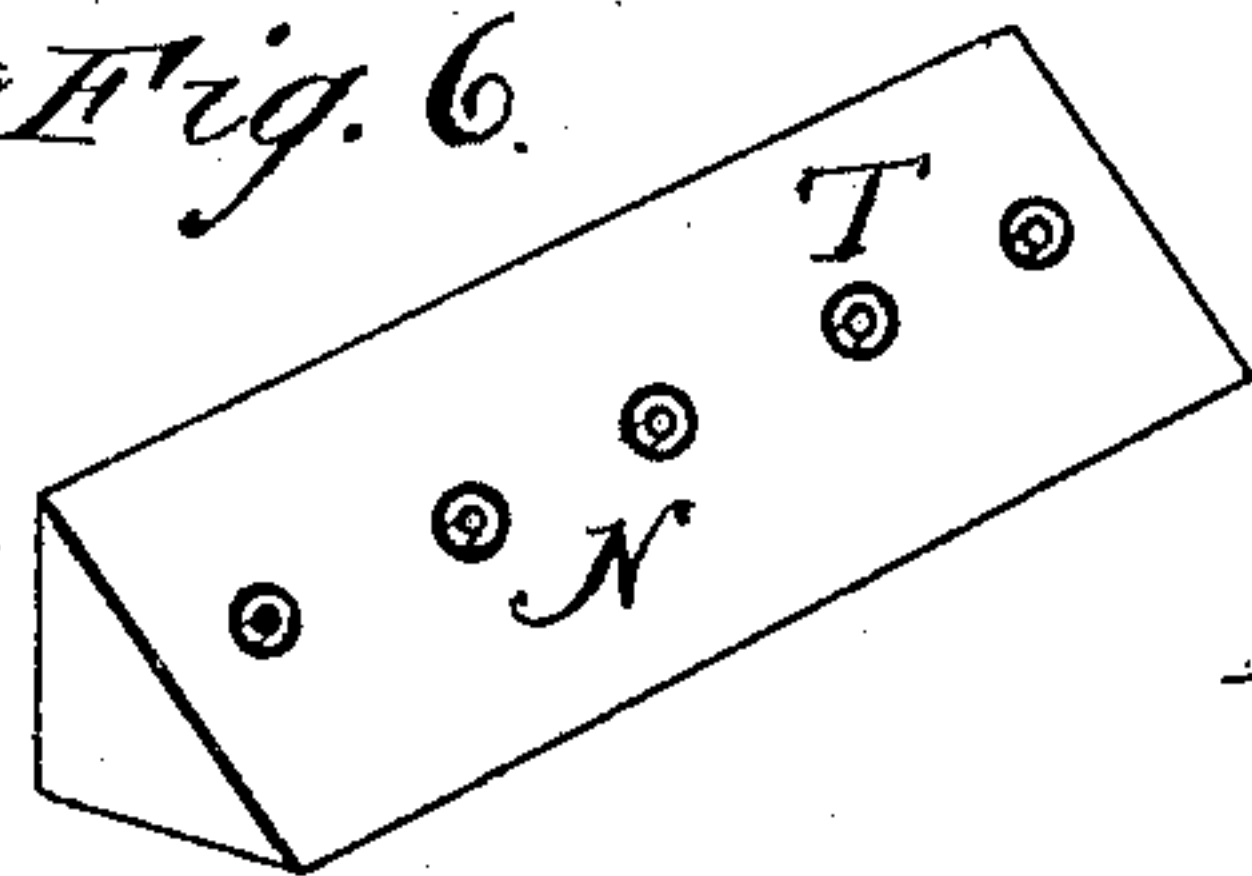
*Fig. 7.*



Witnesses:

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J. B. Lawyer



Inventor:  
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# UNITED STATES PATENT OFFICE.

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

## BOILER-FURNACE.

SPECIFICATION forming part of Letters Patent No. 341,626, dated May 11, 1886.

Application filed May 25, 1885. Renewed April 12, 1886. Serial No. 193,647. (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 Boiler-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 boiler-furnaces in which gas or hydrocarbon vapor is the fuel employed, and the nature thereof consists in certain novel combinations of parts thereof hereinafter described.

In the accompanying drawings, in which corresponding parts are designated by similar letters, Figure 1 is a longitudinal vertical section of a boiler-furnace having my improvement applied thereto. Fig. 2 is a longitudinal vertical section of a boiler-furnace having, in addition to the features of construction shown in Fig. 1, an auxiliary burner. Fig. 3 illustrates in detail the auxiliary burner. Fig. 4 is a transverse vertical section, illustrating the air-heating chamber; and Fig. 5 illustrates a fire-brick tile provided with holes, which is used with the auxiliary burner shown in Fig. 6. Fig. 6 illustrates in perspective the auxiliary burner shown in Fig. 2. Fig. 7 shows the burner detached from the apparatus.

The boiler A is of the usual construction, and the fire-box B is of the usual size used in the locomotive steam-engines. The gas or vapor enters the fire-box of the furnace immediately above the fire-brick tile E, which is placed upon the grate-bars by the pipe F, which is provided with a stop-cock or valve, and the air to support combustion by the pipe H, which is also provided with a valve or stop-cock by which the inflow of air may be accurately regulated or entirely shut off. The grate is arranged immediately below the point at which the gas or vapor enters the fire-box, and upon it is placed a plate of fire clay, E, or bricks constructed of refractory and heat-absorbing material, which is intended to absorb a portion of the heat generated by the combustion of the gas.

Above the point at which the gas enters the fire-box is placed the box-shaped tile of fire-brick, I, having a lining of iron or steel, which is provided with holes upon its under side and end, through which the air from the hot-air chamber K flows downward upon the gas. As the specific gravity of the air is greater than that of the gas the effect of this construction is to cause the former to sink through the latter, and thus create an intimate intermixture of these fluids and a very perfect combustion. A projecting shelf or arch, L, of fire-brick, is arranged immediately above the box-shaped tile I, and with it forms a sinuous passage, through which the flame passes to the flues of the boiler.

A branch pipe, O, provided with a stop-cock or valve for regulating or shutting off the flow of the gas, leads from the main gas-induction pipe F to the auxiliary burner N, which is supplied with the required amount of air to support the combustion of the gas from the space Q below the grate-bars. The burner N is in this instance placed in the lower part of a combustion chamber, N', and in the rear of perforated walls *a a'*, which are upright structures of fire-clay provided with holes *b*, which are arranged in such a manner that the flame from the burner N will be obliged to take a zigzag course in passing through them.

The construction of the burner is best shown in Figs. 3 and 6, in which O designates the gas-pipe having a series of jets, R, which pass upward through holes T cut in the triangular prism of fire-brick, lined by an iron or steel casing in such a manner as to form an annular passage for the air around each jet.

The air entering through the pipe H, which is provided with a valve or stop-cock for regulating or shutting off the supply of air, passes upward into the hot-air chamber K, which is constructed of fire-brick and lined with an iron or steel casing.

The air-supply pipe H is represented in the drawings as an upright tube extending upward nearly to the top of the hot-air chamber; but it is obvious that this construction may be varied in many ways known to those skilled in the art to which this invention relates. For



instance, the tube H may be provided with perforated branch pipes in such a manner as to deflect the incoming air in many required directions. The air entering at the top of the pipe H flows downward through the hot-air chamber to the pipe W, leading to the box-shaped tile I, and is thus made to impinge upon the iron or steel lining of the hot-air chamber, which is highly heated by the heat generated in the combustion-chamber, and thus it reaches the gas from the pipe F, with which it combines to produce combustion in an intensely-heated condition. The flame thus generated sweeps in a zigzag direction through the sinuous flue, formed by the box-shaped tile I and the shelf projection or arch L, into a horizontal sheet-flue beneath the rear end of the boiler, and thence to the tubular flues and the smoke-stack in the usual manner, impinging on its way upon the fire-brick casing of the hot-air chamber K and combustion-chamber N'. By this construction it will be noted that not only is the flame deflected against the inner lining of the boiler, but it is also made to flow around the hot-air chamber and auxiliary combustion-chamber, and thus it not only heats the boiler in the most effective manner, but also imparts heat to the incoming air and raises the temperature of the auxiliary combustion-chamber.

The air from the space Q beneath the fire-box passes into the annular air-passage T, surrounding the branch gas-pipe R, where it comes into contact with the entering gas and with it enters into combustion within the auxiliary combustion-chamber N', which has already been heated by the escaping products of combustion, as above described. The flame thus generated passes in a zigzag direction through the holes in the walls *aa'*, re-enforces the heat of the flame generated in the fire-box, and passes, in the manner hereinbefore described, through the boiler-flue to the smoke-stack.

I do not herein claim the combination of a perforated tile which admits the air above the gas with a gas-induction pipe and a grate upon which is placed refractory material, as such a construction is described and claimed in another application filed by me and numbered 159,366; but

What I claim, and desire to secure by Letters Patent, is—

1. The combination of the box-shaped tile I, provided with an iron or steel lining, and perforations upon its under side, which ad-

mit the air above the gas, the gas-induction pipe F, and the air-heating chamber K, exposed to the direct action of the flame, as and for the purpose described.

2. The combination of the box-shaped tile I, provided with an iron or steel lining, and perforations upon its under side and end, which admit the air above the gas, the gas-induction pipe F, the air-heating chamber K, shelf or arch L, as and for the purpose described.

3. The combination of the box-shaped tile I, provided with an iron or steel lining, and perforations upon its under side and end, which admit the air above the gas, the gas-induction pipe F, the air-heating chamber K, the pipe W, leading from the hot-air chamber to the box-shaped tile, as and for the purpose described.

4. The combination of the auxiliary combustion chamber N', the perforated wall *aa'*, and the burner N, as and for the purpose described.

5. The combination of the auxiliary combustion-chamber N', the perforated walls *aa'*, the triangular prism of fire-brick provided with holes T, and the gas-pipe O, provided with branch pipe R, as and for the purpose described.

6. The combination of the auxiliary combustion-chamber N', the perforated walls *aa'*, the burner N, the gas-pipe F, provided with a branch-pipe, O, and the box-shaped tile I, provided with perforations on its under side and end, as and for the purpose described.

7. The combination of the box-shaped tile I, provided with perforations upon its under side and end, the gas-induction pipe F, the air-heating chamber K, communicating with the box-shaped tile, the auxiliary combustion-chamber N', the burner N, and the branch gas-pipe O, as and for the purpose described.

8. The combination of the shelf or arch L, the box-shaped tile I, provided with perforations upon its under side and end, the gas-induction pipe F, the air-heating chamber K, communicating with the box-shaped tile, the auxiliary combustion-chamber N', the burner N, and the branch gas-pipe O, as and for the purpose described.

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Witnesses:

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