

**P. L. WEIMER.**  
**Apparatus for Utilizing Waste Gases in**  
**Metallurgic-Furnaces.**

No. 147,455.

Patented Feb. 10, 1874.

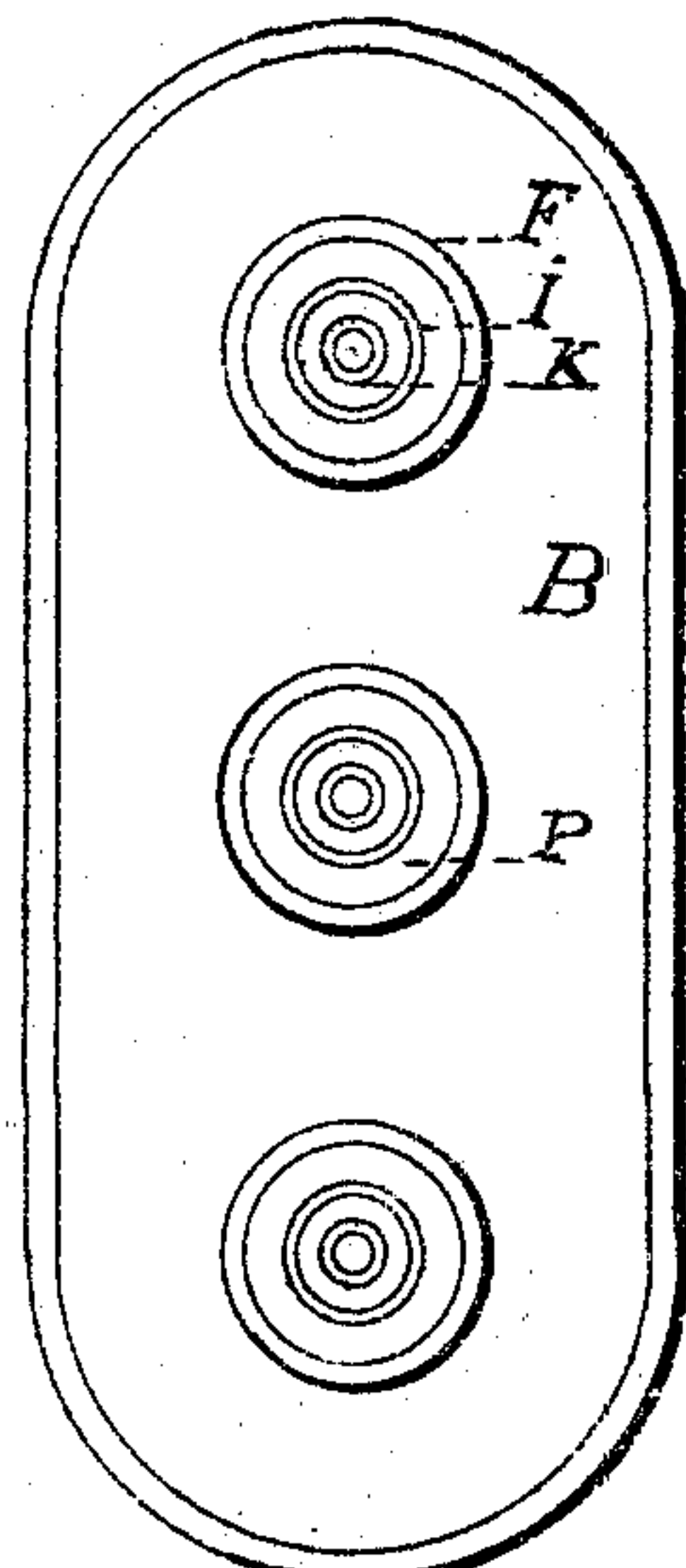
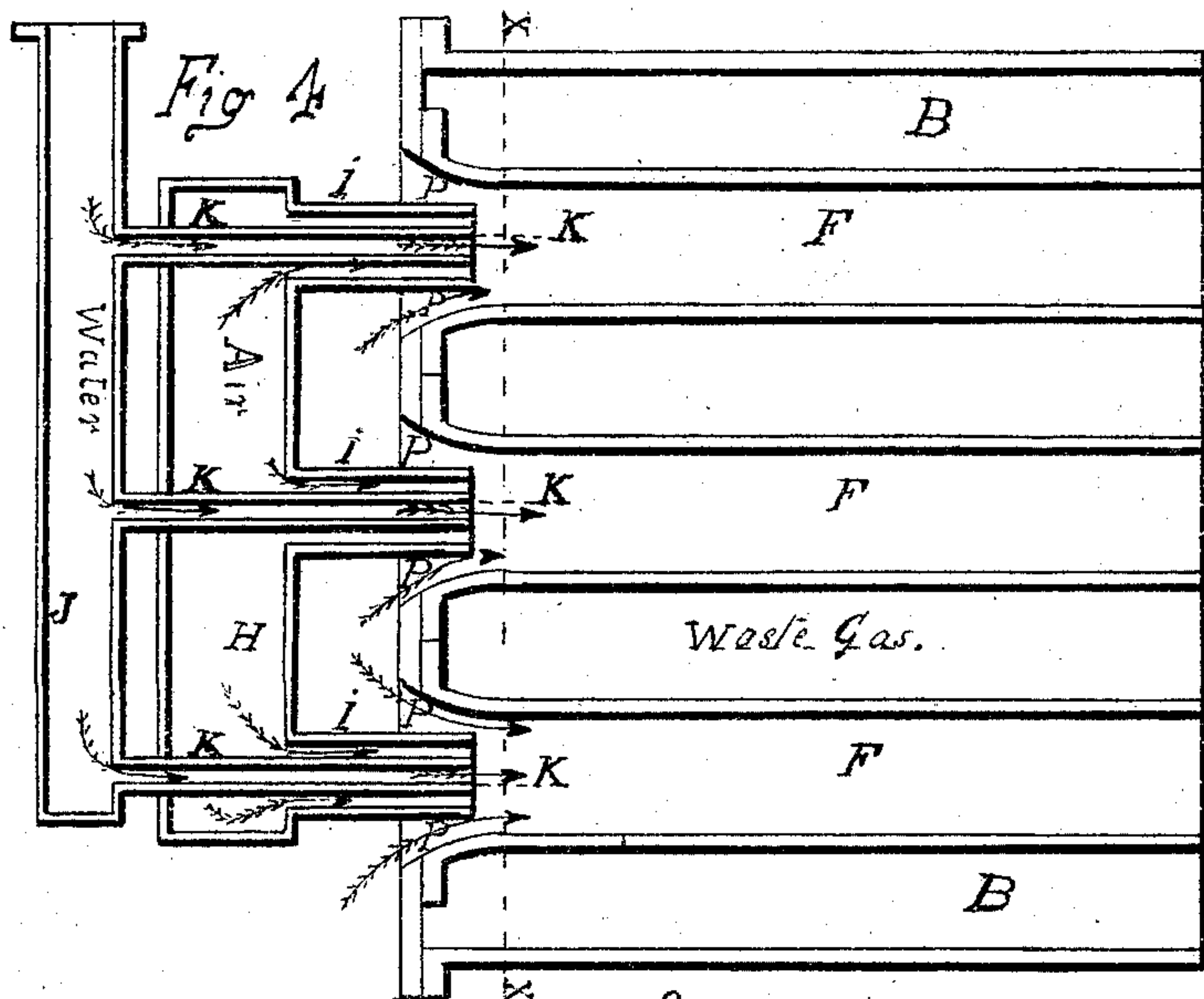


Fig. 3

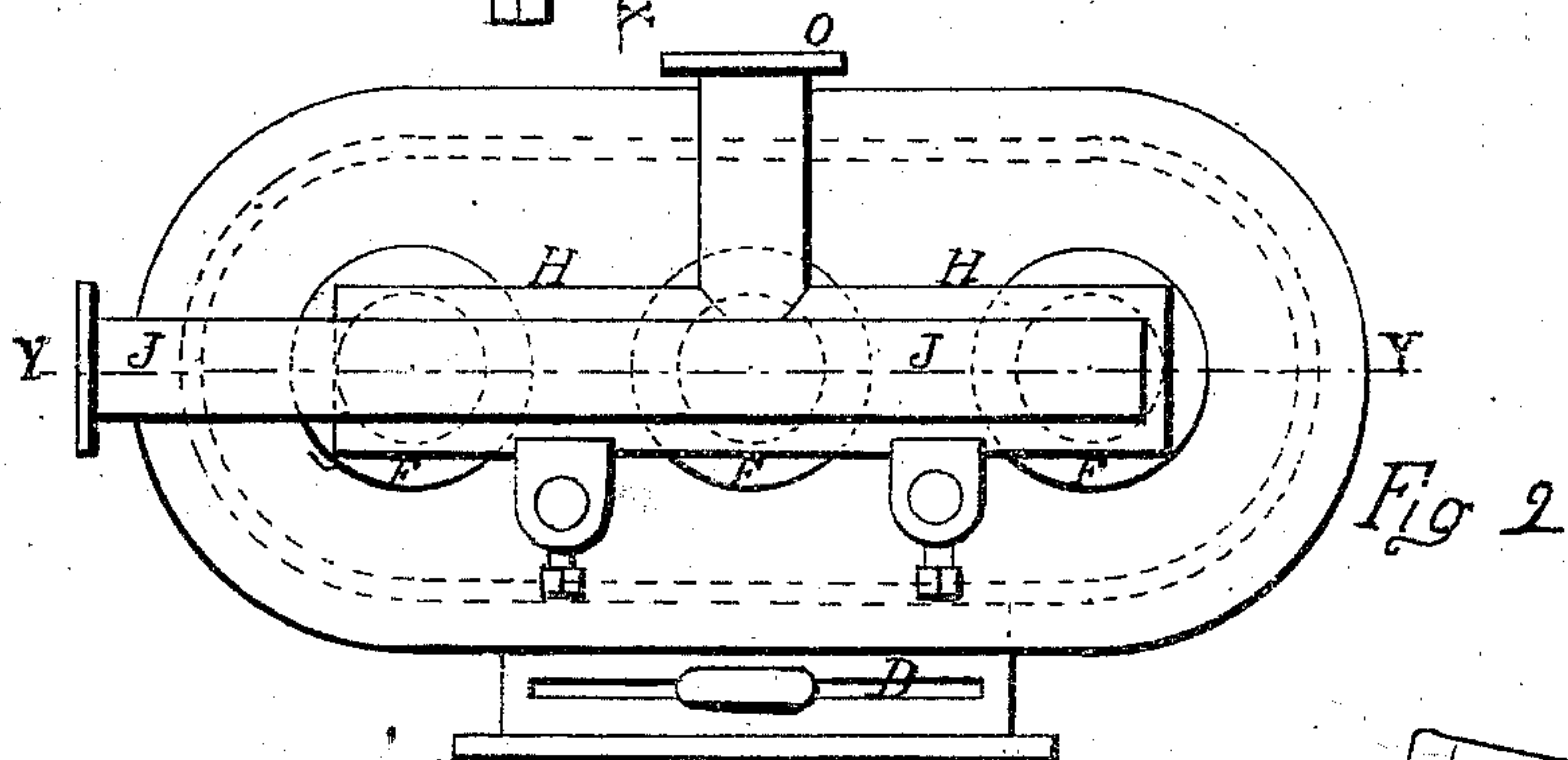


Fig. 2

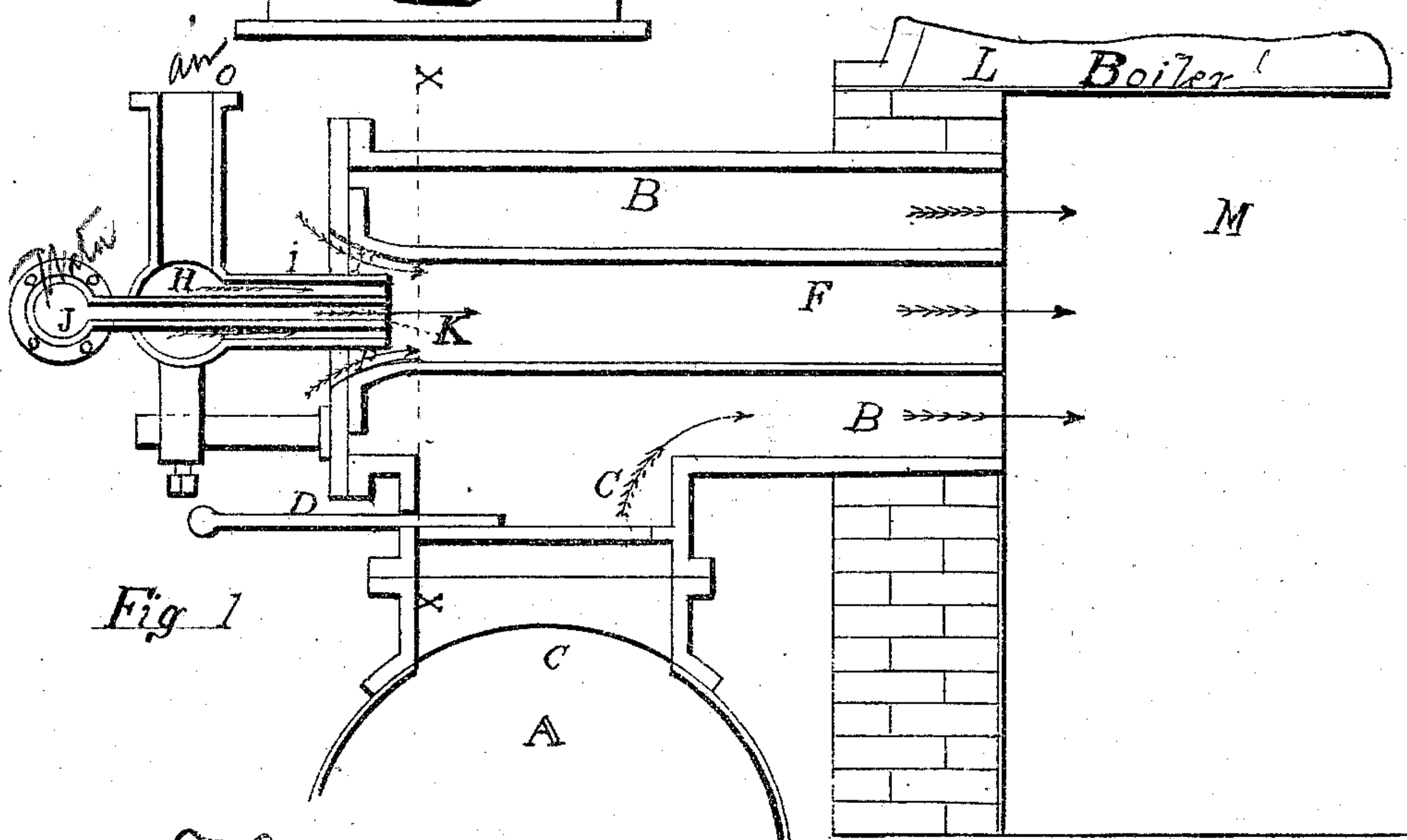


Fig. 1

*T. J. Worth*  
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# UNITED STATES PATENT OFFICE.

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## IMPROVEMENT IN APPARATUS FOR UTILIZING WASTE GASES IN METALLURGIC FURNACES.

Specification forming part of Letters Patent No. 147,455, dated February 10, 1874; application filed January 8, 1874.

*To all whom it may concern:*

Be it known that I, PETER L. WEIMER, of Lebanon, in the county of Lebanon and State of Pennsylvania, have invented a certain Mode of Stimulating the Combustion of the Waste Gases of Iron-Smelting Furnaces, of which the following is a specification:

In the operation of iron-smelting furnaces, the waste gases that were formerly allowed to escape at the tunnel-head, have for some time been utilized, both for heating the blast and for generating steam. In modern well-regulated furnaces, the gases are burned in the hot oven and under the boilers, by means of a burner or jet. This burner or jet consists of a large tube, either round or oval, through which the gases pass. In the center of this tube a series of smaller air-tubes are placed. The discharge ends of the air-tubes terminate at the mouth of the larger gas-tube. The current of gases passing through the larger tube meets the current of atmospheric air coming through the air-tubes at their mouth, when ignition and combustion take place.

The nature of my invention consists in apparatus for projecting into the mass of burning gases at the mouth of the burner a volume of atmospheric air mingled or saturated with water in the form of fine spray. The air, being under a pressure of several pounds to the square inch, is projected with considerable velocity, carrying the fine water spray with it into the midst of the burning gases, in this manner supplying them with a large volume of oxygen, and greatly stimulating their combustion.

Figure 1 is a side sectional view of a burner as arranged to use my invention. Fig. 2 is a front elevation of the same. Fig. 3 is a cross-section of Fig. 1, drawn on the line X X. Fig. 4 is a sectional plan of Fig. 1 on the line Y Y.

A is the gas flue or conduit that carries the waste gases from the tunnel-head of the furnace to the gas-burner B. This burner B is an oval-shaped tube or cylinder, the waste gases entering it through the opening C, the flow being regulated by the sliding damper or valve D. The gases, taking the direction of the arrows, escape at the mouth of the burner B, at E. F F are a series of air-tubes, passing through the body of the burner B, for convey-

ing the necessary atmospheric air to the mouth of the burner, to ignite the gases. H is an air-pipe, placed transversely to the air-pipes F, and in front of the burner. Nozzles I I I project from the pipe H into the bell end of the air-tubes F F F. A smaller traverse water-pipe, J, is placed outside of the air-pipe H, and has a series of nozzles, K, running through the body of H into the center of the air-nozzles I, and terminating in a line with them. Cocks or valves (not shown in the drawing) control the flow of both air and water. L represents a boiler, and M the boiler-furnace, where the waste gases are consumed and utilized for generating steam.

The operation of my invention is as follows: The waste gases from the furnace in the gas-flue A will not ignite until brought into contact with atmospheric air. The valve D being opened, a flow of gas enters the burner B and escapes into the boiler-furnace M. At the mouth of the burner at E it comes into contact with the inflowing current of atmospheric air delivered by the air-tubes F F F, and is ignited, filling the boiler-furnace M with a large volume of flame. The combustion, however, is not as perfect as is desired, a large part of the gases passing away unconsumed, for want of a sufficient supply of oxygen. I, in order to furnish this want, introduce the air-jet H, with the nozzles I I I, introducing atmospheric air under a pressure into H, at the branch O. This air escapes with considerable velocity through the nozzles I I I into the air-tubes F F F. The velocity of the discharging air at I carries with it, through the tubes F F F, a large volume of air, entering at the annular spaces P P P, thus delivering at the mouth of the burner B a much greater volume of air than that merely escaping from the nozzles I I I. By this means, the quantity of air under pressure is economized, and a better distribution of all the air among the gases is attained.

I have discovered, in practice, that if the air projected into the gases is saturated or mixed with water in the form of a fine spray, that the combustion of the gases is greatly stimulated, and a much more intense heat is produced. To accomplish this object, I provide the water-pipe J, placed in the rear of the air-pipe H. Water on being let into this pipe



escapes at the nozzles K K K, into the very center of the air-jet, escaping from the air-nozzles I I I, and is blown with it in the form of fine spray into the ignited gases in the boiler-furnace M, resulting in greatly augmenting the heat, due to the very thorough mixing of the necessary oxygen supplied by the air and water with the consuming gases.

I am aware that atmospheric air under pressure has been projected into the heating-chambers of puddling-furnaces, and make no claim to air thus introduced.

My invention has for its primary object the introduction and thorough mixing with the waste gases of iron-smelting furnaces, in a state of combustion, of atmospheric air saturated or charged with water in the form of a fine spray.

I claim as my invention—

1. The combination of the air-injecting pipe H, nozzles I I I, water-pipe J, and nozzles K K K, substantially as and for the purpose hereinbefore set forth.

2. The combination of the air-injector H and nozzles I I, with the gas-burner B provided with tubes F F, into the front end of which the nozzles I I project, substantially as and for the purposes herein set forth.

3. The gas-burner B and tubes F, in combination with the air-injection pipe H, nozzles I I I, water-pipe J, and water-nozzles K K K, substantially as and for the purpose hereinbefore set forth.

PETER L. WEIMER.

Witnesses:

T. T. WORTH,  
TOBIAS REINOEHL.