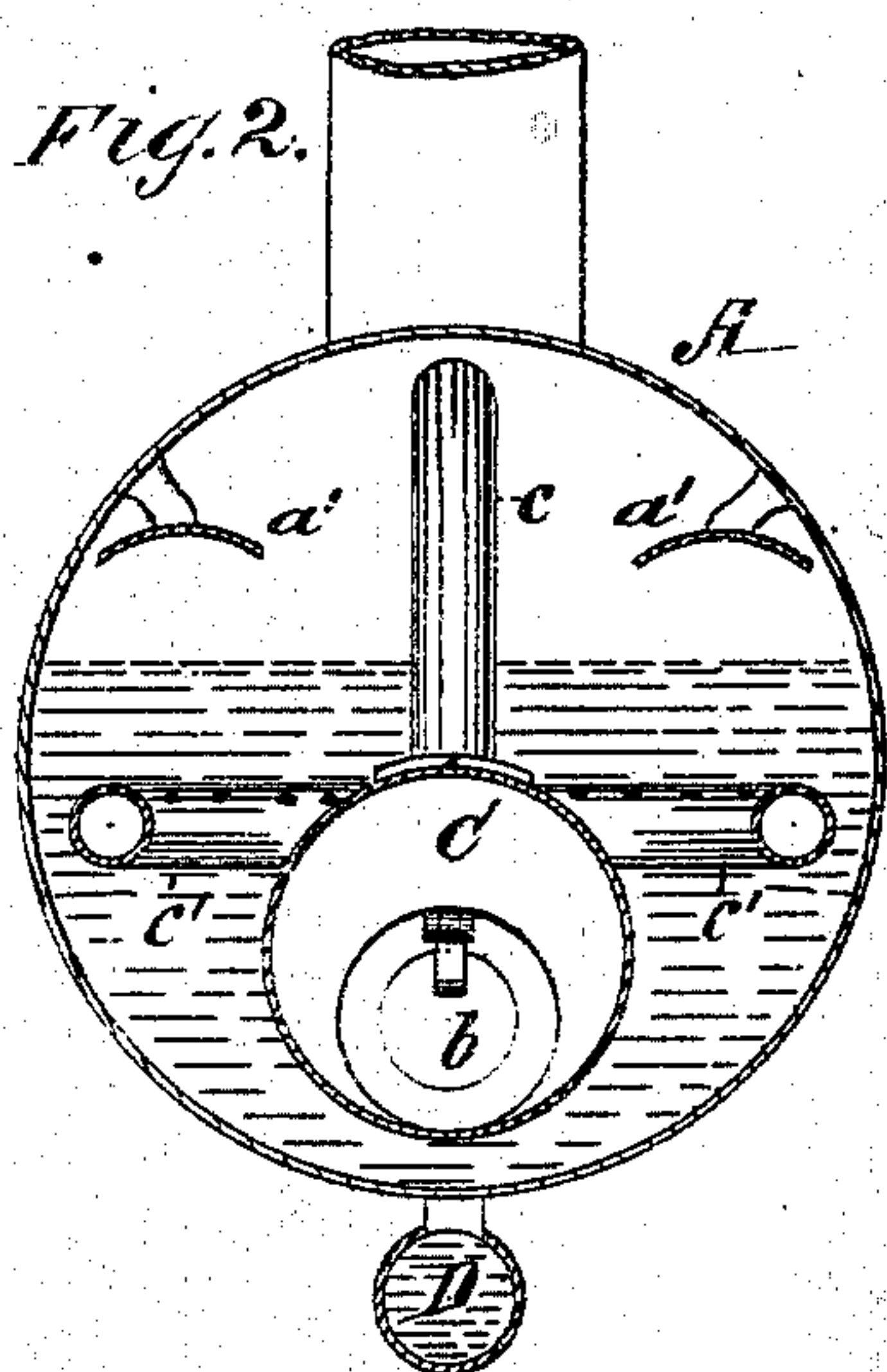
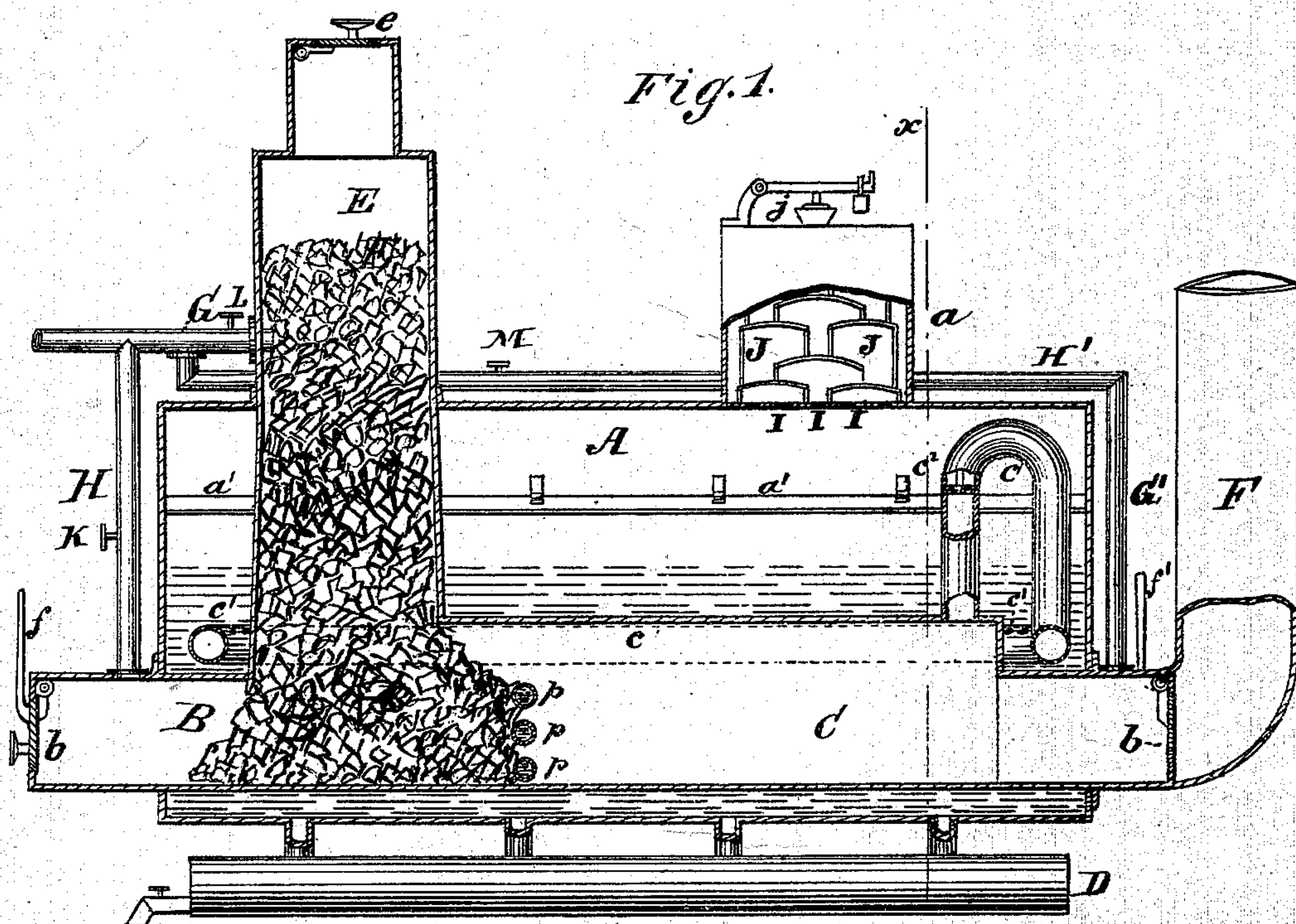


O. W. KETCHUM.

Combined Furnaces and Steam-Generators.

No. 139,795.

Patented June 10, 1873.



Witnesses:
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UNITED STATES PATENT OFFICE.

OLIVER W. KETCHUM, OF TORONTO, CANADA.

IMPROVEMENT IN COMBINED FURNACES AND STEAM-GENERATORS.

Specification forming part of Letters Patent No. **139,795**, dated June 10, 1873; application filed December 17, 1872.

To all whom it may concern:

Be it known that I, OLIVER W. KETCHUM, of Toronto, Province of Ontario, in the county of York and Dominion of Canada, have invented a new and useful Improvement in Pressure, Combustion, Smoke-and-Gas-Consuming Furnaces and Steam Generators; and I do hereby declare the following to be a full, clear, and exact description of the same, reference being had to the accompanying drawing forming a part of this specification.

The invention consists in a mode of producing a continuous combustion of fuel in the furnace of a steam-generator (after ignition) by forcing one or more currents of air upon it, as hereinafter described. It also consists in conveying the heat and products of combustion (after passing through a horizontal flame-chamber) to the water in the boiler by means of a pipe constructed so as to curve upward from the flame-chamber above water-mark, and return below water-line, passing through the boiler horizontally and discharging into the water through pipe having perforations which increase in size and number toward the end. The invention also consists in providing the boiler on the inside with concave projections running through its length on both sides above the pipes referred to, and above the water-line, so that the ebullitions of water above said pipes, and caused by escape of gas, are thrown back into the middle of boiler. It also consists in providing the dome of boiler with concave pieces of iron resting one upon the other, constructed with spaces between each and between the sides of dome, to act as additional deflectors.

Figure 1 is a longitudinal vertical section, and Fig. 2 is a cross section through line *x x* of Fig. 1.

A in the drawing represents a steam boiler with dome *a*. E represents a fuel-cylinder constructed in boiler A. B is the fire-box. C represents a flame-chamber. F is a pipe which may or may not be used to carry off the smoke when the natural draft is used in starting fire. C C¹ represent a pipe curved upward from flame-chamber above water-line and again returning below water-line, running the length of boiler and returning to the end. The pipe C C¹ contains a self-acting valve *c*²,

and below water-line contains perforations increasing in size and number toward the end, so as to distribute generally through the boiler the products of combustion. The valve *c*² closes of its own weight, when pressure is taken off from the air-pump, thus preventing water in the boiler having contact with the fuel. The purpose of the curved pipe C containing the valve is to serve as an additional preventive to the flow of the water from boiler into the flame-chamber. *a' a'* represent a concave projection above water-mark constructed over the pipe *c' c'* and running the length of the boiler in both sides, so as to deflect the water cast up by ebullitions within the boiler. I I I are perforations in the boiler-plate. J J are additional deflectors made of concave pieces of iron constructed to rest one above the other, with a space between each and a space between the sides of dome, so that water driven up into the dome may be thrown back, and priming thus prevented. *b b* are air-tight doors in fire and flame chambers B C, with a hinge at the top opening inward and having a lever *f' f'* for convenience in opening and shutting same. *p p* are ordinary transverse boiler-tubes constructed so as to confine the fuel within chamber or fire-box B. H G H' G' are tubes from an air-pump entering the fire and flame chambers B C at front and rear respectively, and also entering cylinder E. They contain ordinary cocks, K L M, to regulate supply of air as required. D is an ordinary mud-drum with cock at the end to relieve boiler of refuse when required.

The fuel is filled into the cylinder E through the air-tight door *e*, and its own gravity causes it to fall into fire-box B and be self-feeding as combustion progresses. The air-pump being set in motion, the air is forced into the pipes H G H' G' into the cylinder E and chamber B, and then through the fire. This causes an absorption of the oxygen in large quantities by the fire and causes more intense heat than by ordinary draft, as well as more perfect combustion. The continuous pressure drives the nitrogen and gases through the flame-chamber into the pipe C C¹ and compels its final discharge through the perforations in the pipe into the water of the boiler.

When it is desired to start the fire the air-tight doors may be opened to create a natural draft till sufficient steam is generated to work the air-pump.

The valve c^2 , when pressure is cut off from the air-pump, falls down of its own weight and prevents the water in the boiler from coming into contact with the fire.

The concave deflectors $a' a'$ are placed over the perforated pipe $c c'$ so that the water thrown up by ebullitions within the boiler is thrown back into the middle of boiler and primage prevented. The deflectors J J are additional preventions against priming.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. A vertically self-feeding furnace, a flame-chamber and a boiler, all made air-tight and combined with air-forcing apparatus, in the manner and for the purpose described.

2. The pipes $c c'$ arranged and combined with the flame and water chambers, in the manner and for the purpose specified.

3. The deflectors $a' a'$ arranged over the pipes c' , as and for the purpose described.

4. The steam-dome a provided with a series of superposed deflectors J, applied as and for the purpose set forth.

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Witnesses:

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