

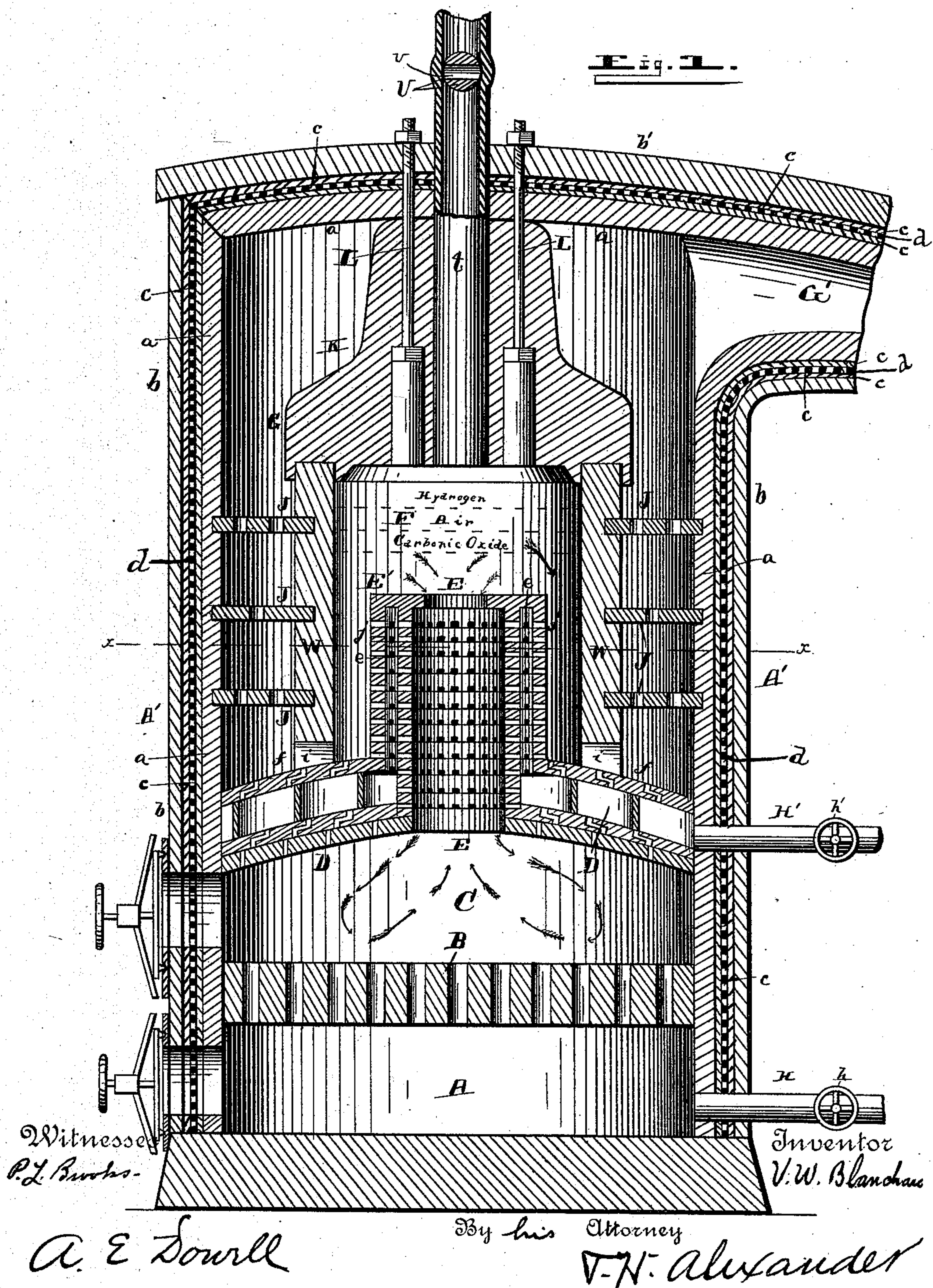
(No Model.)

2 Sheets—Sheet 1.

V. W. BLANCHARD.  
FURNACE.

No. 413,896.

Patented Oct. 29, 1889.





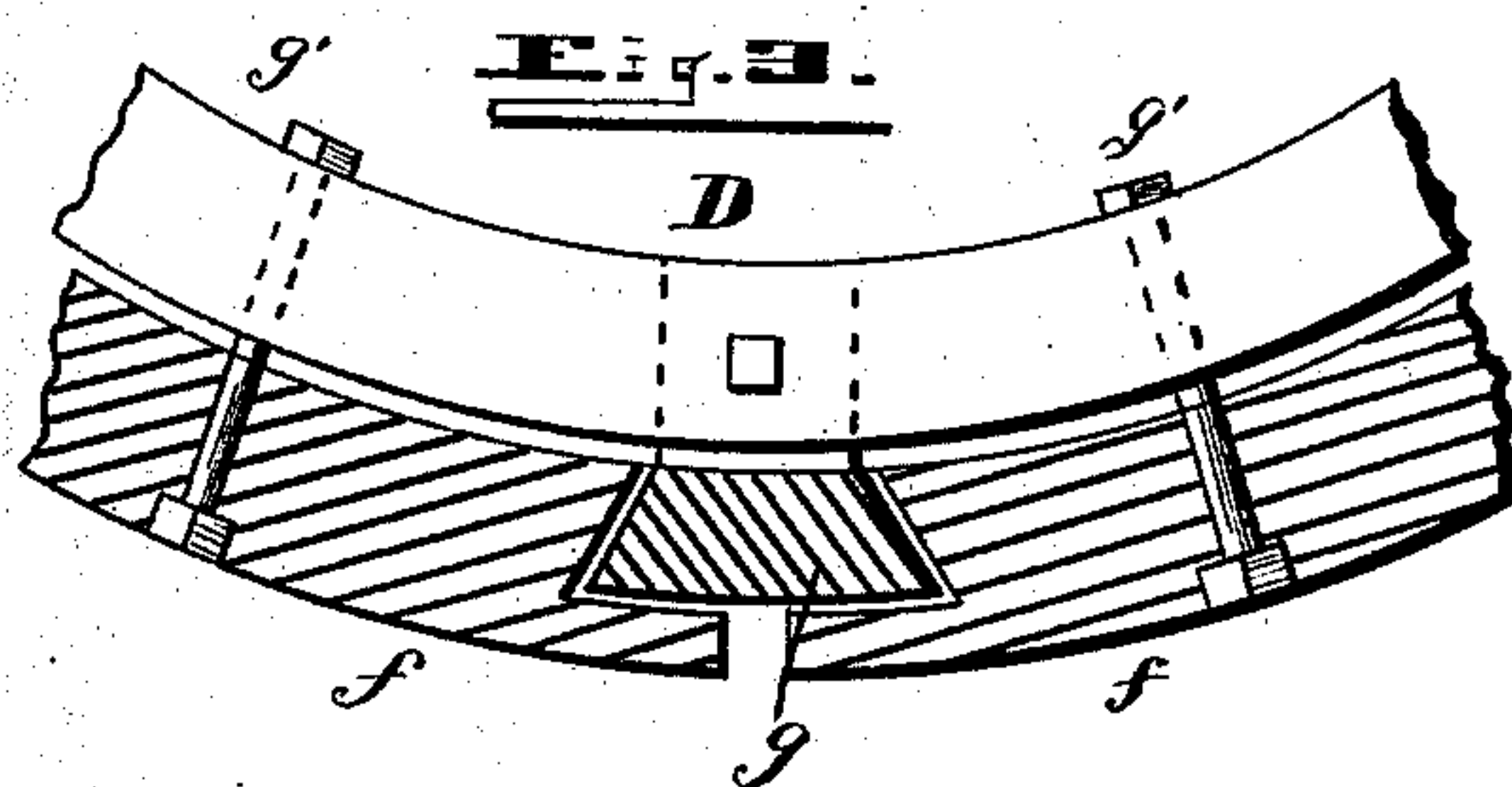
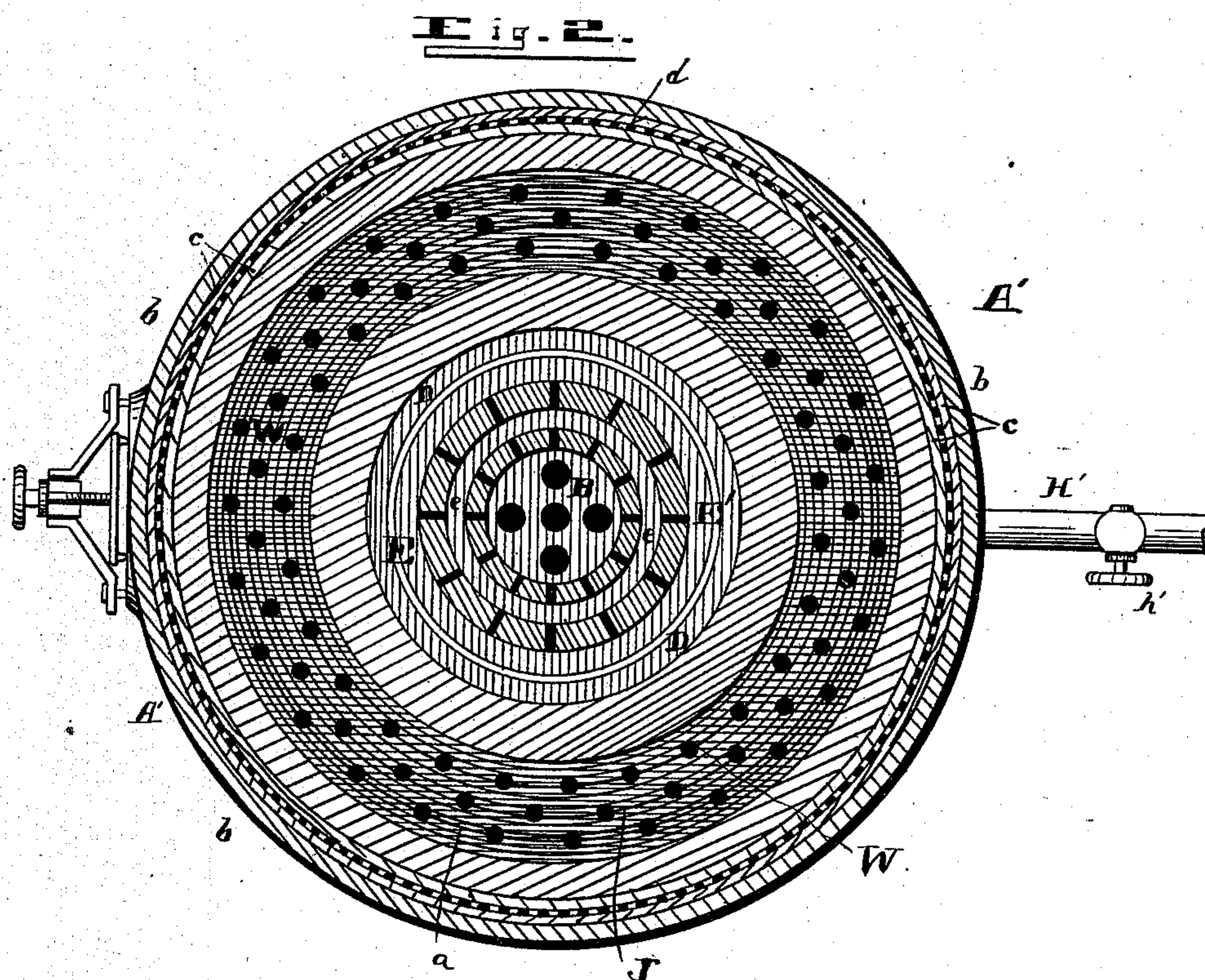
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Witnesses

P. L. Brooks.

A. E. Towell

Inventor

Inventor  
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By *his* Attorney

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# UNITED STATES PATENT OFFICE.

VIRGIL W. BLANCHARD, OF NEW YORK, N. Y., ASSIGNOR TO JOSEPH A. DAVIS, OF SAME PLACE.

## FURNACE.

SPECIFICATION forming part of Letters Patent No. 413,896, dated October 29, 1889.

Application filed March 29, 1889. Serial No. 305,298. (No model.)

*To all whom it may concern:*

Be it known that I, VIRGIL W. BLANCHARD, of New York, in the county of New York and State of New York, have invented certain new and useful Improvements in Furnaces; and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, and to the letters of reference marked thereon, which form part of this specification, in which—

Figure 1 is a diametrical section through my improved furnace. Fig. 2 is a horizontal section through the furnace, taken in the plane indicated by the dotted line *xx* on Fig. 1. Fig. 3 is a sectional detail showing the manner of securing the fire-bricks to the hollow arch above the fuel-chamber of the retort.

This invention relates to improvements on the construction of furnaces which operate on the principle described in the Letters Patent granted to me on the 11th day of December, 1883, and numbered 289,963, which improvements will be fully understood from the following description and claims.

Reference being made by letters to the drawings, A designates the ash-chamber of the furnace; B, the fuel-support, which may be made of metal bars or which is preferably of perforated fire-brick.

C is the fuel-chamber; D, a hollow dome above this chamber.

E is a double-wall fire-brick magazine or tube arranged over the fuel-chamber and rising from the hollow dome D into a mixing-chamber F, outside of which is a secondary mixing-chamber G, that communicates with an outlet G'.

The ash-pit A is supplied with air in regulated quantities by means of a pipe H, provided with a valve *h* and leading through the outer wall A' of the furnace, and may communicate with air-heating chambers and a suitable air-forcing engine, as described in my patent above referred to. The outer wall A' is composed, preferably, of fire-brick *a*, a strong external metal casing *b*, and layers of asbestos paper *c*, having wire-gauze *d* interposed between the layers. I thus have a strong furnace-wall the casing of which is protected from intense heat by the non-conducting media *c d*, the latter or gauze serving to form numerous air-spaces between the

sheets of asbestos. The top of the vertical furnace-wall is composed of a strong external metal slab *b'*, of fire-brick lining, and the non-conducting media described for the vertical wall. The double wall or hollow dome D may be constructed of metal sections having a convolute channel through it communicating at one end with a pipe H', having a valve *h'*, for the introduction of heated air under pressure, and at the other end with the annular space *e* between the walls E' of the magazine E. The top and bottom of the dome D are covered with fire-bricks *f*, which may be segments of circles, and which are secured in their places by means of dovetail keys *g* and bolts *g'*, as shown in Fig. 3. Both the inner and outer walls E' of the magazine are thickly perforated for jetting air into this magazine, and also into a narrow space *j* surrounding it, which space constitutes part of the mixing-chamber F and communicates at several points *i* at its lower end with the lower end of the gas-mixing chamber G.

It is important that the vertical space *j*, surrounding the magazine E, should be small—say about seven-eighths the area of the tube through the magazine—first, for the reason that the gases should be condensed as they pass from the mixing-chamber F into chamber G, at the same time being supplied with highly-heated air in jets from the chamber *e* between the walls E' of the magazine, and, second, to cause a regurgitation of the gases, or flow thereof, back into the fuel-chamber again and through the bed of fuel therein, as indicated by the course of the arrows, Fig. 1. The products of the distillation of fuel in chamber C will rise through the center of the magazine E into the chamber F and be charged with highly-heated air, and as the gases accumulate in this chamber, owing to the contracted outlet, a portion of them will descend into the fuel-chamber C, and thence return into the mixing-chamber F, as above described, and indicated by the arrows, Fig. 1. By these means a most perfect combustion of the products of distillation is the result, and an intense heat is produced even before the gases are introduced into the mixing-chamber G. In this latter chamber G, I have horizontally arranged a number of fire-brick rings J, the edges of which are recessed into the fire-brick walls *a W* for the purpose of securing



them in place. Apertures are made vertically through the rings J and so arranged that the gases in their upward flight are compelled to take a tortuous course through the mixing-chamber G, wherein they are subjected to the intense white heat of the walls *a* W and the said perforated rings J.

The surrounding wall W of mixing-chamber F is surmounted by a cap or head K, of fire-brick, which is fitted gas-tight on top of said walls and firmly secured to the top walls of the chamber G by means of bolts and nuts L, as shown in Fig. 1, or other suitable manner. Centrally through cap K is a passage *t*, through which fuel is fed to the fuel-chamber C, the passage being closed by a suitable valve or door *v* during the operation of the furnace.

Briefly the operation may be stated as follows: A sufficient amount of fuel is supplied to chamber C to start a fire. The valve *h'* in pipe H' is shut and the valve in pipe H fully opened, more fuel is added, and when it has been raised to a high state of incandescence the valve *h* of pipe H is nearly closed, allowing only such a quantity of air under pressure to enter the ash-pit as is sufficient to keep down the temperature of the grate. Valve *h'* in pipe H' is now opened and a strong blast of heated air is forced through dome D into chamber *e* between walls E', surrounding the magazine or vertical passage E, from which chamber *e* the air (or oxygen) is forced in jets through both walls E and caused to commingle with the gases which regurgitate down through the magazine upon and into the bed of incandescent fuel, whereby a rapid combustion of fuel is realized, and the gases descending through the narrow passage *j* are mixed before they enter the mixing-chamber. In chamber F and passage *j* the gases resulting from the distillation of the fuel unite with the oxygen of the air and form carbonic-oxide gas, which is subsequently further supplied with air or oxygen and carbonic-acid gas by the means above described, which is conducted off through outlet G'.

By the process of combustion in the furnace above described the hydrogenous element of the fuel is the first to be liberated above the grate, such liberation being effected soon after the fire is kindled at a temperature of about 200° to 800° Fahrenheit. The hydrogen in a gaseous form immediately rises into chamber F and is consumed by the free oxygen supplied through the inner perforated wall of the air-magazine. The combustion of the hydrogen in this closed top central portion of the furnace soon raises the temperature of the air-magazine and the mixing-chamber to a state of intense incandescence, which is of great service in effecting a perfect combustion of all of the combustible elements by which they are traversed.

Having thus described my invention, what I claim is—

1. In a furnace, the double-wall magazine

or tube E, having both of its walls perforated horizontally, in combination with an air-supply pipe, a fuel-chamber, a mixing-chamber above said tube, and a narrow vertical passage leading from the latter to an exterior mixing-chamber G, all constructed and adapted to operate substantially as described.

2. In a furnace, the combination, with a fire-chamber, of a hollow dome above the same, having an interior air-channel, a tube rising from said dome and having double walls, each laterally perforated, the space between the walls of said tube communicating with the air-passage in said dome, the mixing-chamber above said tube, the descending flue exterior thereto, and the exterior gas-mixing chamber communicating at bottom with said flue, substantially as described.

3. In a furnace, the combination of a central double-wall magazine, both of the walls of which are perforated, a double-walled dome having an air-channel communicating with the space between the walls of the magazine, means for supplying air thereto under pressure, a mixing-chamber F, passages *j*, and a mixing-chamber G, having perforated rings in it, substantially as described.

4. In a furnace, the combination of the fuel-chamber C, the hollow dome D, open at top, the double-walled tube having each wall perforated, the mixing-chamber F, descending flues exterior to said tube, and the exterior chamber G, and annular perforated rings therein, all constructed and arranged to operate substantially as and for the purpose described.

5. In a furnace, the combination, with a fire-box, of a dome D, a double-walled tube having each wall perforated, an annular wall W exterior thereto, and a cap closing the top of said wall, all substantially as and for the purpose specified.

6. A furnace consisting of an exterior casing, a fire-chamber therein, a hollow dome D, the double-walled tube having each wall perforated, the wall W exterior to said tube, the cap K, and annular perforated rings J J, all substantially as described.

7. In a furnace, the combination of the fuel-chamber C, having a grate, a hollow dome D, tube E, having double laterally-perforated walls, mixing-chamber F above said tube, the descending flues inside the same, the air-supply passages and jets in said dome and tube, and the mixing-chamber G exterior to said tube and chamber F and separated therefrom by a fire-brick wall, all constructed and arranged to operate substantially as and for the purpose described.

In testimony that I claim the foregoing as my own I affix my signature in presence of two witnesses.

VIRGIL W. BLANCHARD.

Witnesses:

CHAS. R. CLARKE,  
THOS. M. WYATT.