

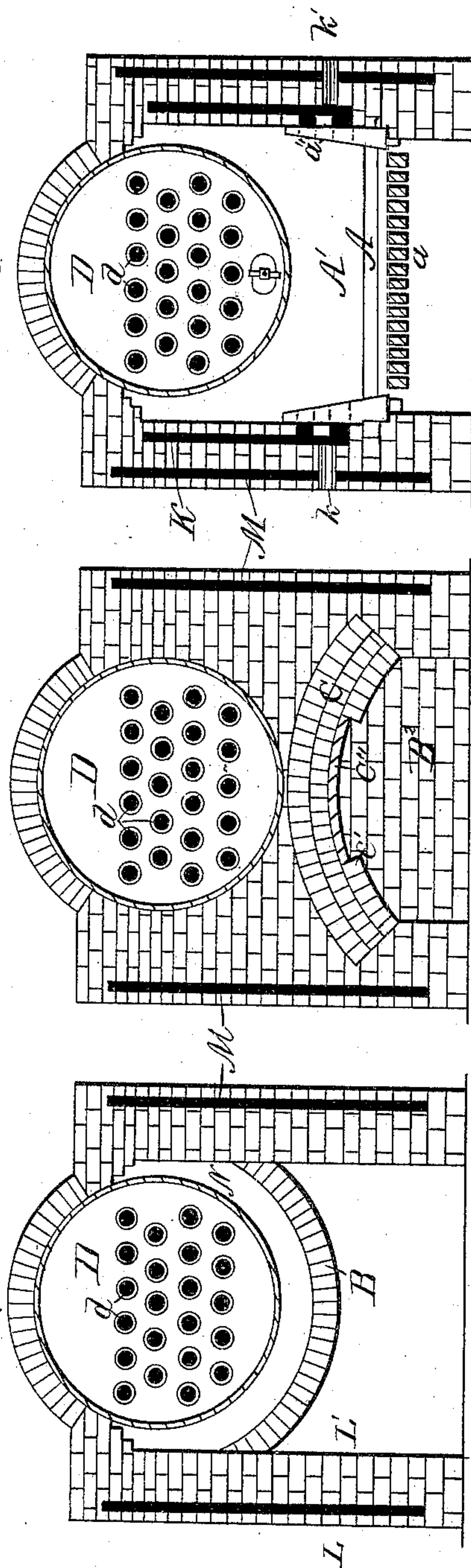
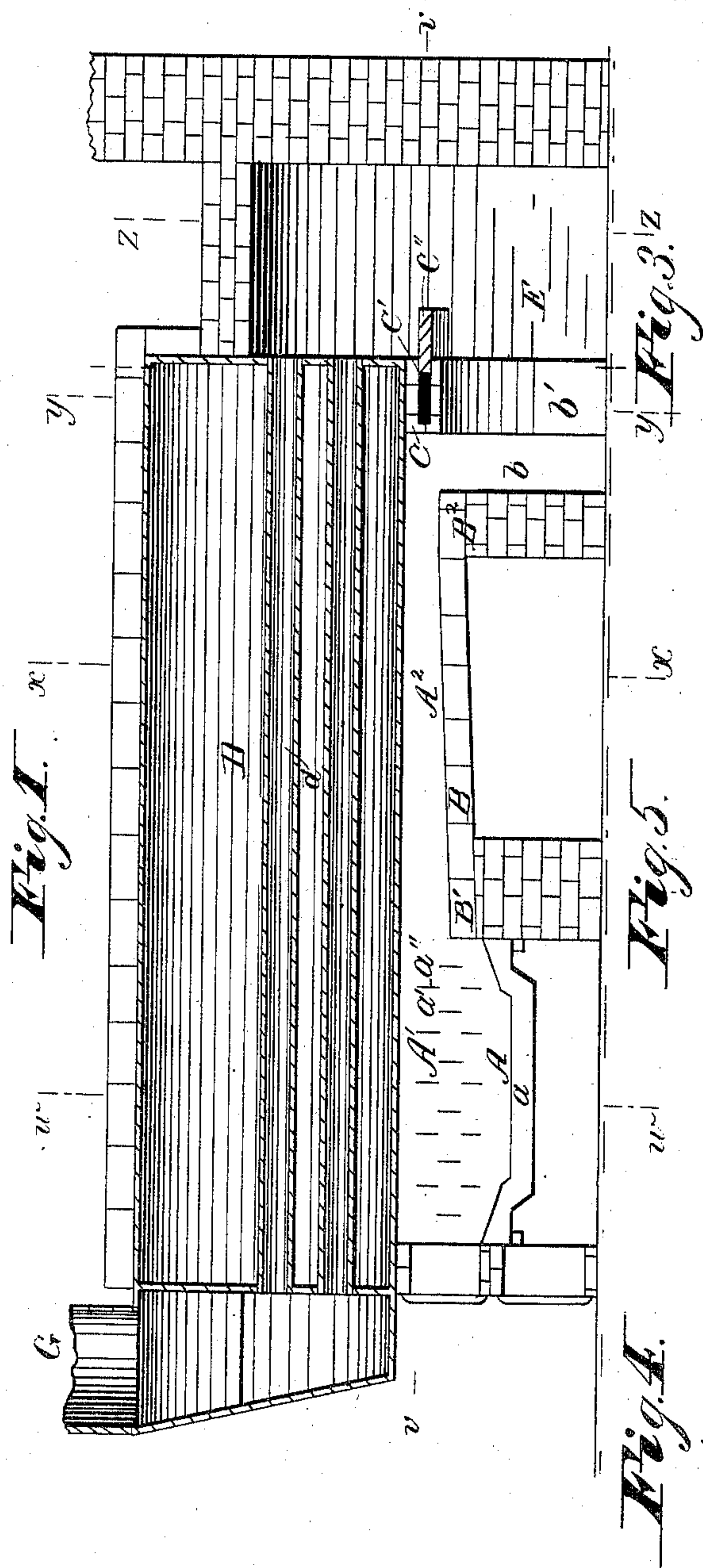
(No Model.)

2 Sheets—Sheet 1.

D. UMBSTAETTER.  
STEAM BOILER FURNACE.

No. 324,898.

Patented Aug. 25, 1885.



Attest.  
W. D. Harrington  
b Fred Keller

Inventor  
Daniel Umbstaetter  
By J. M. Kelley  
Attorney

(No Model.)

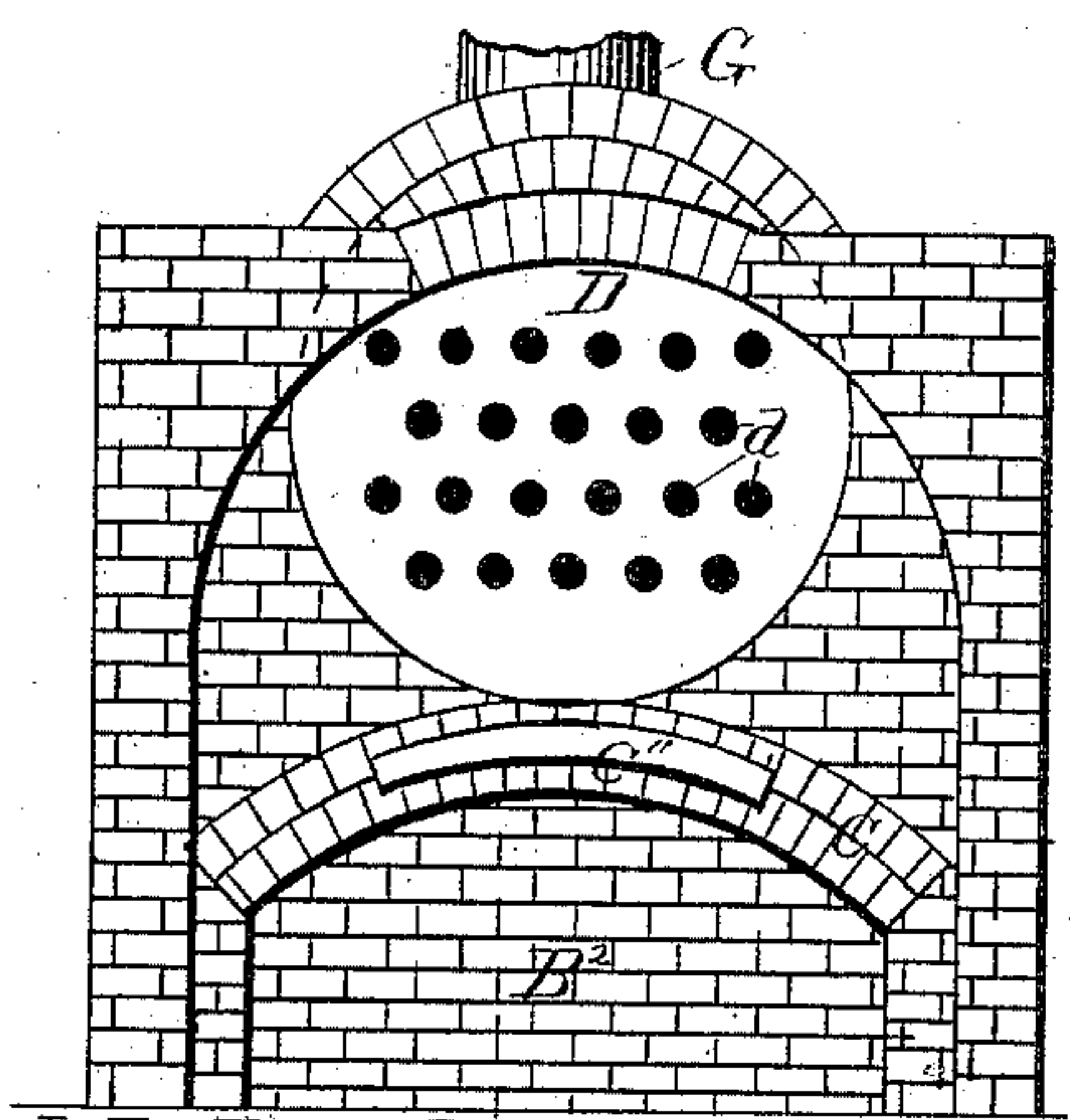
2 Sheets—Sheet 2.

D. UMBSTAETTER.  
STEAM BOILER FURNACE.

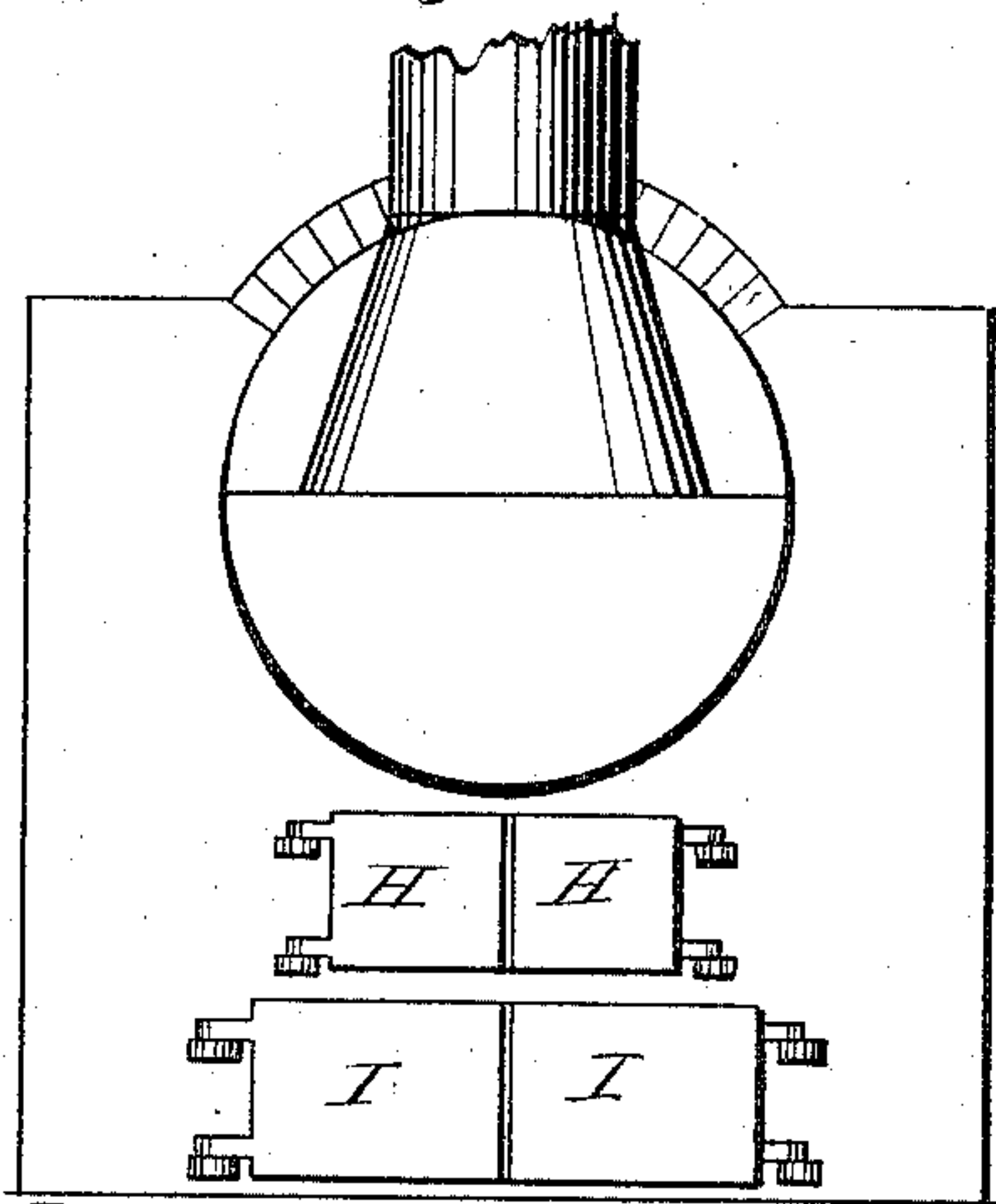
No. 324,898.

Patented Aug. 25, 1885.

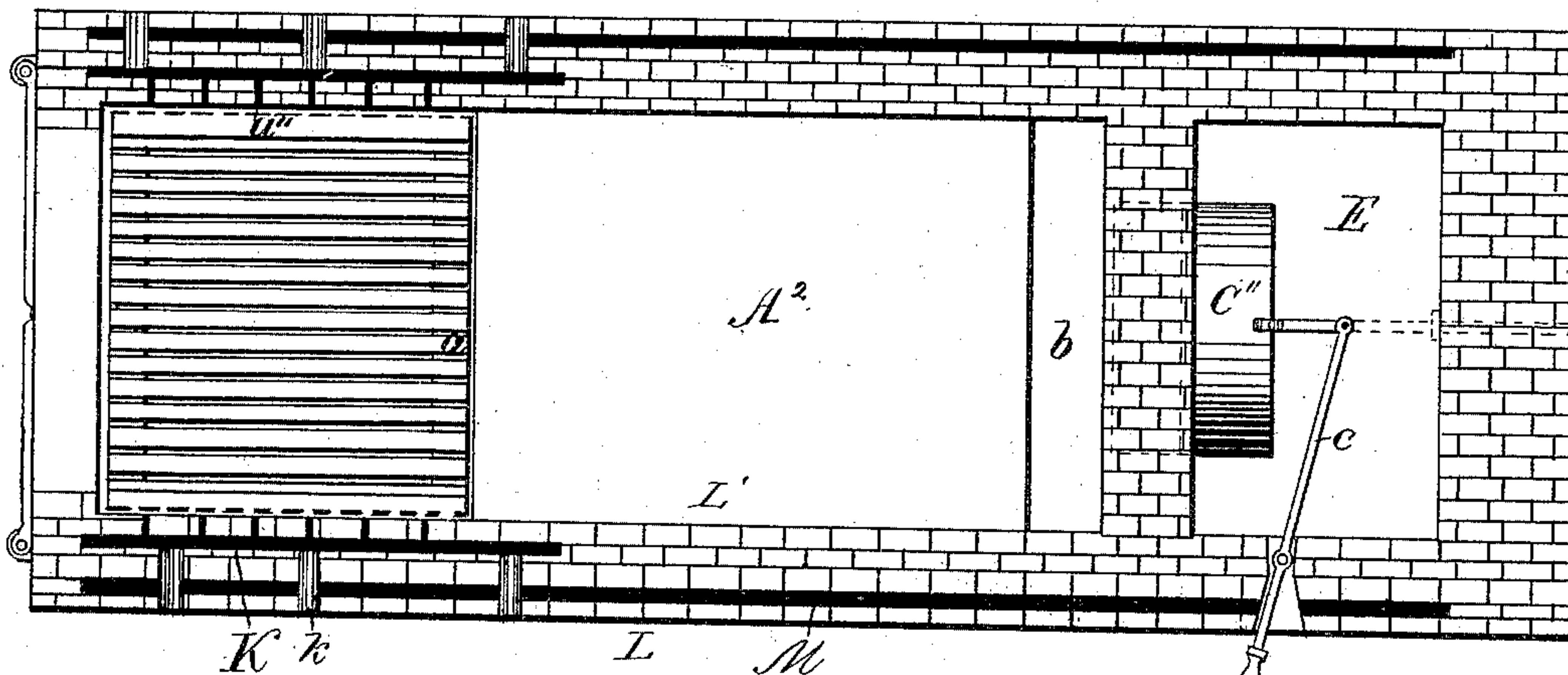
*Fig. 6.*



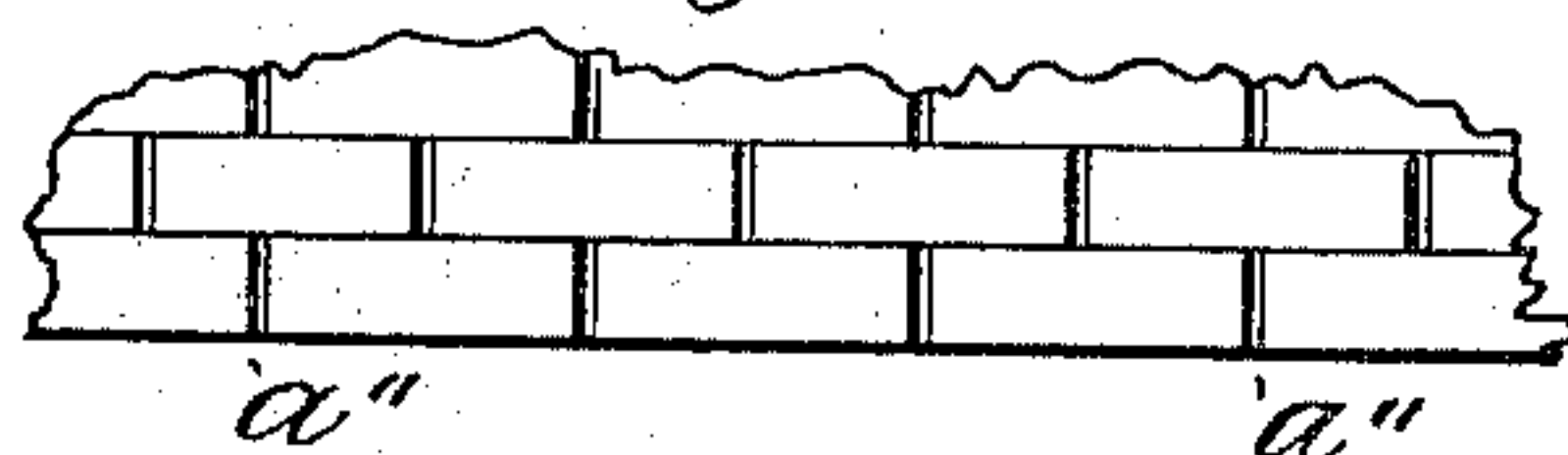
*Fig. 2.*



*Fig. 7.*



*Fig. 8.*



*Fig. 9.*



Attest:  
W. D. Harrington.  
J. Fred. Keller.

Inventor  
Daniel Umbstaetter  
By J. A. H. H. H.  
Attorney.



# UNITED STATES PATENT OFFICE.

DANIEL UMBSTAETTER, OF CLEVELAND, OHIO.

## STEAM-BOILER FURNACE.

SPECIFICATION forming part of Letters Patent No. 324,898, dated August 25, 1885.

Application filed March 24, 1885. (No model.)

*To all whom it may concern:*

Be it known that I, DANIEL UMBSTAETTER, a citizen of the United States, residing in Cleveland, in the county of Cuyahoga and State of Ohio, have invented certain new and useful Improvements in Steam-Boiler Furnaces, of which the following is a description.

The invention relates to means which are designed to facilitate and render certain the most thorough and economical consumption of the fuel and of the gases which are evolved therefrom; and it consists in certain novel features and combinations of features in connection with the fire-box or fuel-chamber, whereby an abundant supply of fresh cool air is supplied to the burning fuel, in certain novel features and combinations of features in the construction of the passages and chambers through which the smoke is carried from the fuel-chamber to the boiler, and in the combination of the fuel-chamber and its air-induction spaces with the peculiarly-constructed passages and spaces extending rearwardly therefrom and connecting it with the boiler-flues.

In the accompanying drawings, Figure 1 represents in vertical longitudinal central section a furnace which is provided with my improvements. Fig. 2 is a front elevation of the furnace. Fig. 3 is a transverse vertical section on the line *vv* of Fig. 1. Fig. 4 is a transverse vertical section on the line *xx* of Fig. 1. Fig. 5 is a transverse vertical section on the line *yy* of Fig. 1, the adjustable deflector being below the supporting and deflecting arch. Fig. 6 is a sectional elevation on the line *zz* of Fig. 1, looking toward the front. Fig. 7 is a horizontal section on the line *vv* of Fig. 1. Fig. 8 is a detail representing in elevation the manner in which the fire-bricks are laid to permit inflow of air between them, and Fig. 9 is a detail representing a top plan view of the construction shown in Fig. 8.

A is the fire-box; A', the combustion-chamber; A<sup>2</sup>, the rearwardly-diminishing longitudinal flue; *a*, the grate; *a'*, the fire-bricks composing the lining; *a''*, the air-induction orifices; B, the hearth or flue-bottom extending from the front bridge-wall, B', to the rear bridge-wall, B<sup>2</sup>; C, the retaining or supporting arch and main flame and smoke deflector,

serving to support the rear end of the boiler and to deflect the flame and smoke downwardly, so that they will pass through the vertical flue *b* and the short horizontal arch-flue *b'* before being discharged into the secondary combustion-chamber or expansion and flame chamber E, from which they enter the flues *d* of the boiler D. C' C' are ways or bearings formed within or under the arch C, to receive a slidable deflector or flame spreading and distributing plate or block, C'', which is composed of heavy fire-brick or of steatite or other refractory material, and which is provided with an operating rod or lever, *c*. G is the smoke-stack. H H are the fire-doors. I I are the ash-pit doors. K is the fresh-air chamber. *k* are the passages for introducing air to the fresh-air chamber; *k'*, the doors or register plate for controlling the passages *k*. L is the outer wall of the furnace; L', the inner wall of the furnace. M is the dead-air chamber or non-conducting space in the body of the furnace-wall. N is the pocket in the angle formed by the top of the furnace and the front face of the transverse supporting or retaining wall at the rear extremity of the boiler.

In the practical operation of this class of furnaces it has often been found that the combustion of the fuel has been unequal and imperfect in consequence of inequality in the supply of oxygen to the same, and it has frequently been observed that while the fuel in the middle of the fire-box has been quickly burned to ashes, portions of the same at the sides of the fire-box have been but partially consumed, or, in some instances, not at all. The tendency of the air in the ash-pit is to rise mainly at the middle of the fire-chamber, because at that point the temperature is highest and the consequent rarefaction is greatest; and it is obvious that just in proportion as this tendency is increased and the heat at the center of the chamber is intensified the supply of air to other portions of the chamber is diminished. By introducing fresh unheated air in thin currents through the side walls of the fire-box, as in my construction, an abundant supply of pure oxygen for the support of combustion at that point is furnished, thus equalizing the combustion throughout the fire chamber. Another important result



arising from the provision of the lateral slots discharging strong currents into the fuel-chamber and into the combustion-chamber above the same is found in the partial suppression of the upward draft, which further equalizes the combustion without in any degree impairing, but on the contrary augmenting, the heat-producing function of the furnace. The incoming lateral currents, striking the vertical currents at right angles, tend to check and retard the same, and the fuel is thus more thoroughly utilized, the ordinary intervals between the chargings in furnaces of this character being increased by several minutes. The fire-bricks alongside the fuel-chamber, and also those which are directly above the same, are placed a short distance apart, so as to form at their ends the narrow vertical air-induction orifices already described.

At the junction of the arch with the transverse supporting-wall at the sides of the boiler and above the supporting-arch a pocket is formed for the temporary retention of the escaping heated currents, which are thus effectively utilized in heating the rear portion of the boiler, and this utilization is further increased by the provision of the fixed deflector at the rear of the longitudinal flue, the deflector becoming so highly heated under the continued impact of the heated currents as to constitute, in effect, a burner-plate, the gases flashing into flame as they are brought into contact therewith. This deflector is, at its lower middle portion, on a level with the rear extremity of the bottom of the longitudinal flue, and this construction is of great advantage in the practical utilization of the deflector as a gas-consuming surface, since if the deflector extended to a point considerably lower the action of the products in heating the same would necessarily be much less effective.

The relation of the diving-flue to the secondary combustion-chamber or expansion-chamber, in which it is merged, and its exits, and to the fixed deflector, is such as to cause an eddying action of the currents within the chamber and about the deflector, the effect of which is the completion of the combustion of the inflammable portions of the smoke and gases, and the deposition at the bottom of the chamber of ashes and all the heavier carbonaceous products of combustion, much of which would otherwise be deposited in the flues of the boiler.

Under some circumstances, as when the furnace is provided with a very tall chimney, or when it is located in a very elevated situation, the draft may be so strong as to cause an undue proportion of the products to enter the lower flues of the boiler to the exclusion of the flues which are more remote from the short horizontal flue, and when this condition is found to exist the slidable deflector is moved rearwardly, causing the currents to rise higher before reaching the boiler, and

also causing them to be deflected outwardly toward the sides, so that a due proportion of the same will enter the upper and outer flues, and thus avoid any inequality in the supply of heat to the contents of the boiler. This slidable deflector will be operated by a rod or lever connected thereto, and extending through a suitable opening in the side wall or in the rear wall, and this operating rod or lever will be provided with a stop, which will prevent the entire withdrawal of the deflector from its seat. If desired, notches upon the rod or upon the wall may indicate the adjustment of the deflector within its ways.

Having described my invention, I claim—

1. The combination, in a steam-boiler furnace, the side and rear walls of the ash-pit of which are imperforate, and the side walls of the longitudinal flue of which are imperforate, of a fuel and combustion chamber which is provided in its side walls, from end to end thereof, with several series of narrow vertically-arranged orifices, an air-chamber at either side of such fuel and combustion chamber, discharging into the vertical orifices, and passages which extend directly outward from the air-chambers through the walls of the furnace, whereby fresh unheated air is discharged into the fuel and combustion chamber in numerous vertical ribbon-like currents.

2. In a steam-boiler furnace, the side walls of the longitudinal flue of which are imperforate, a fuel and combustion chamber which is lined with imperforate fire-bricks, which longitudinally are placed a short distance apart, so as to leave between them a narrow vertical passage, and air-chambers outside of the fuel and combustion chamber, which communicate with the exterior air by passages which extend directly outward through the side walls of the furnace, and which communicate also through the narrow vertical passages with the fuel and combustion chamber, in combination as described.

3. In a steam-boiler furnace, the combination of a boiler, a fuel and combustion chamber, an unobstructed imperforate longitudinal flue, the bottom of which gradually rises from the rear extremity of the fire-box to the rear end of such bottom, a vertical diving-flue behind the rear bridge-wall, a vertical boiler-supporting transverse arched wall, which terminates downwardly in a fixed deflector, which at its center is in the same or nearly the same horizontal plane as the rear upper extremity of the rear bridge-wall, and which constitutes the rear boundary of the longitudinal flue, a short horizontal flue beneath the fixed deflector, and embracing the entire space within the furnace below the fixed deflector, and a secondary combustion or expansion chamber behind the transverse wall, the secondary combustion or expansion chamber discharging into the flues of the boiler.

4. The combination, in a steam-boiler furnace, of a boiler, a fuel and combustion chamber, an unobstructed imperforate longitudi-



nal flue which extends rearwardly from the fuel and combustion chamber, a flue which extends downwardly from the rear extremity of the longitudinal flue to the bottom of the furnace, a short horizontal flue which extends rearwardly from the flue which extends downwardly, and which embraces the entire space between the bottom of the boiler-supporting wall and the bottom or foundation of the furnace, a secondary combustion or expansion chamber which receives the volatile products of combustion from the short horizontal flue, and which communicates with the flues which lead through the boiler to the smoke-stack, and a fixed deflector directly behind the rear extremity of the longitudinal flue, which terminates downwardly at its center at a point horizontally opposite the upper extremity of the rear bridge-wall.

5. The combination, in a steam-boiler furnace, of a tubular boiler, a fire-box or fuel-chamber, a longitudinal flue which leads rearwardly from the fuel-chamber, a flue which extends downwardly from the longitudinal flue, a short horizontal flue which leads rear-

wardly from the downwardly-extending flue, a secondary combustion or expansion chamber which receives the volatile products of combustion from the short horizontal flue, and which discharges into the boiler-flues, a fixed deflector directly behind the rear extremity of the longitudinal flue and above the short horizontal flue, and a horizontal longitudinally-slidable deflector which is applied upon the fixed deflector.

6. The combination, in a steam-boiler furnace, of a fuel and combustion chamber, which is provided from end to end with lateral vertical air-induction openings, an unobstructed longitudinal flue which diminishes in area from the front rearwardly, flues and a chamber which connect the longitudinal flue with the flues of the boiler, and a fixed deflector at the rear extremity of the longitudinal flue, and directly beneath the rear end of the boiler.

DANIEL UMBSTAETTER.

Witnesses:

EDWARD S. MEYER,  
EMIL JOSEPH.