

2 Sheets—Sheet 1.

FURNACE.

Patented Feb. 2, 1886.

Fig. 1.

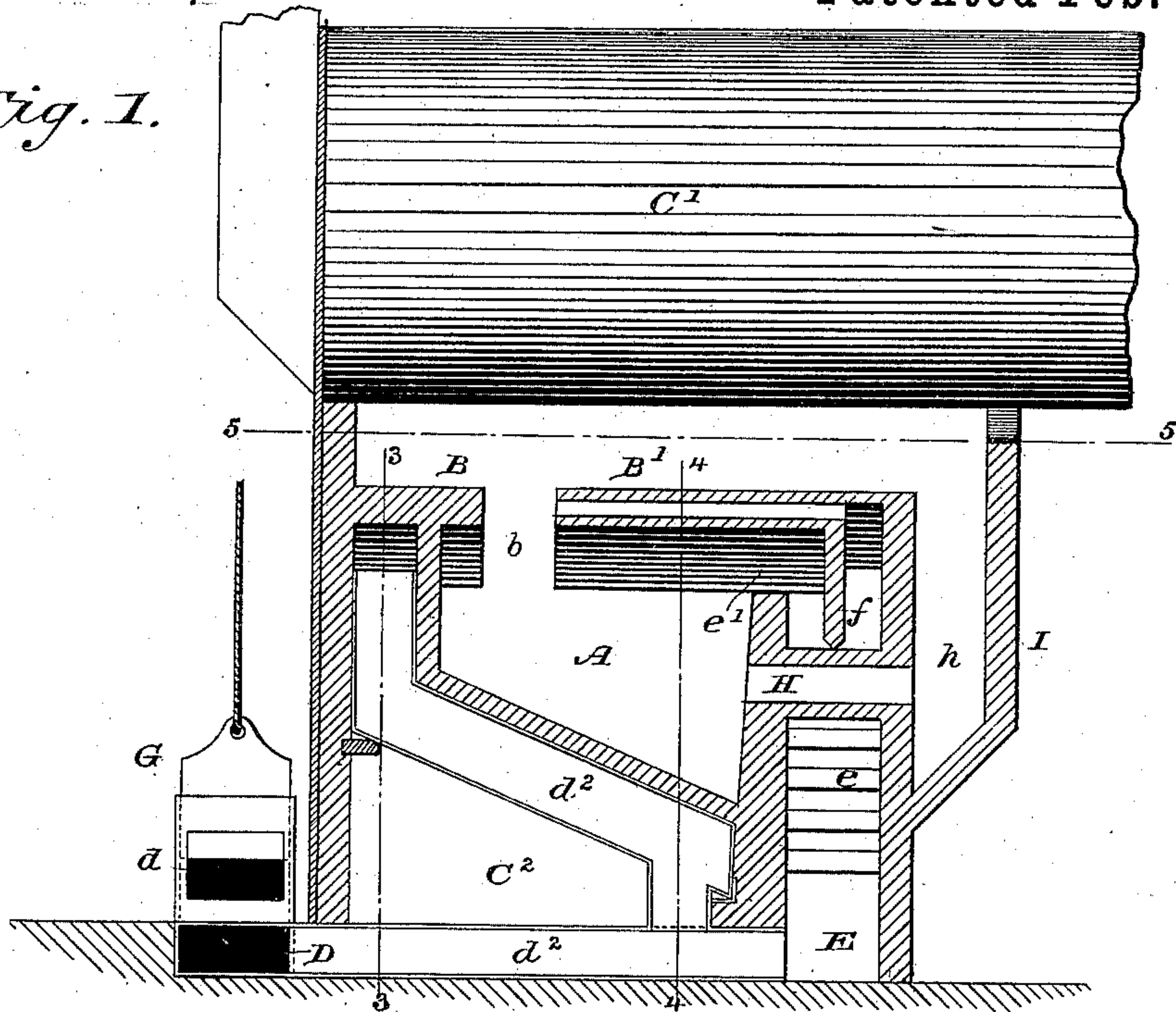
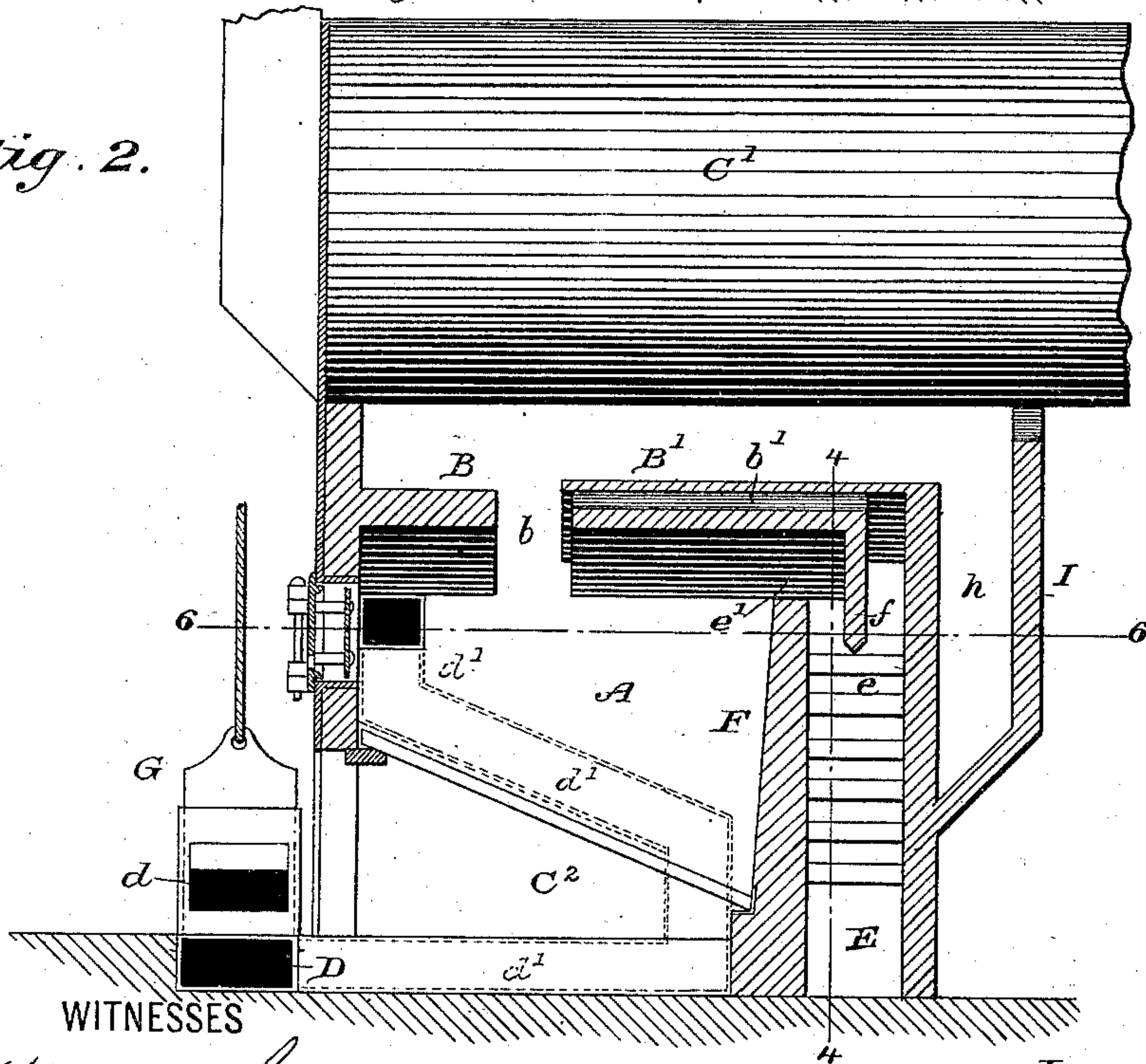


Fig. 2.



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(No Model.)

2 Sheets—Sheet 2.

J. B. BOULICAULT & J. LEHNBEUTER.

FURNACE.

No. 335,176.

Patented Feb. 2, 1886.

Fig. 3.

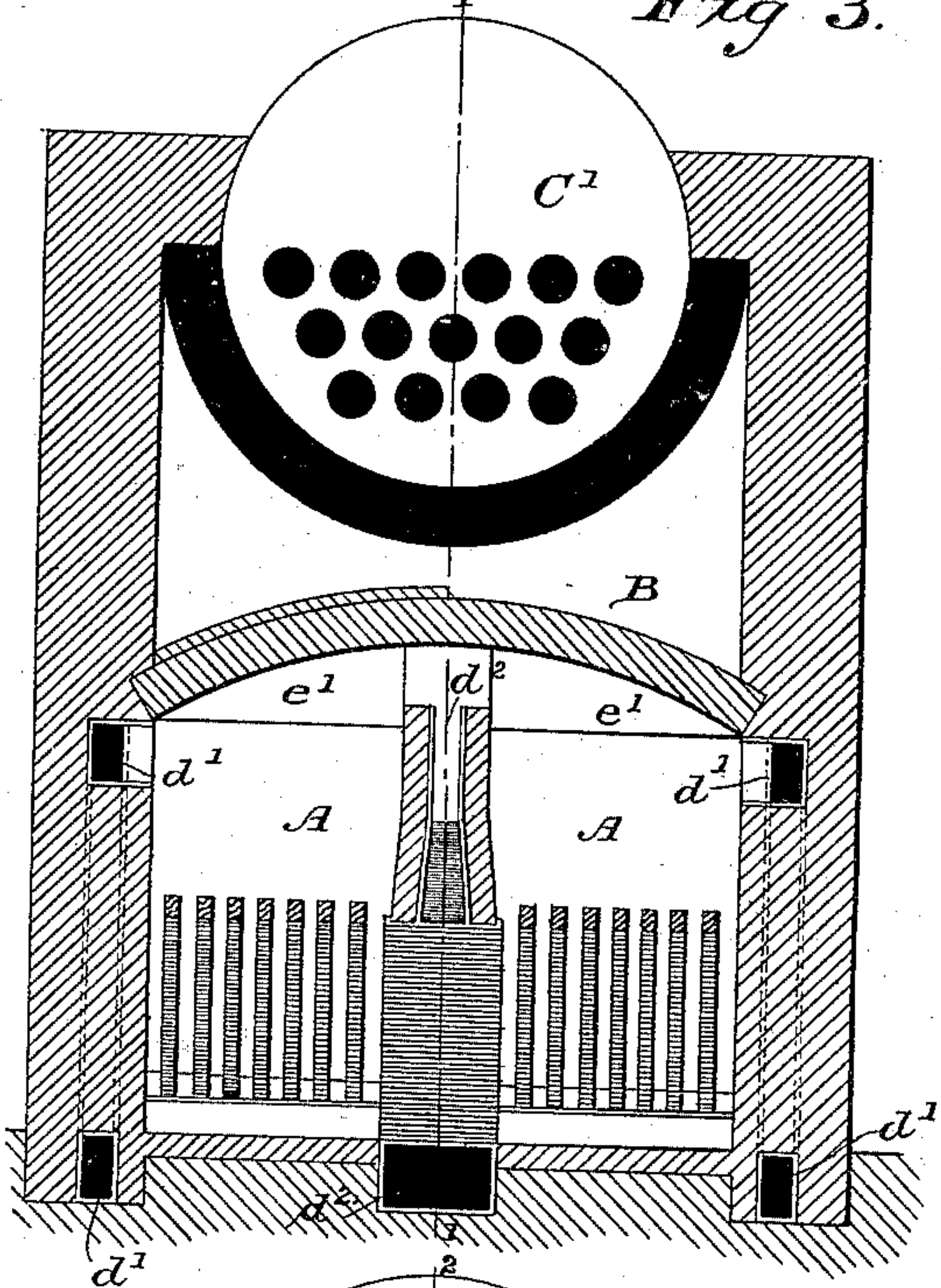


Fig. 5.

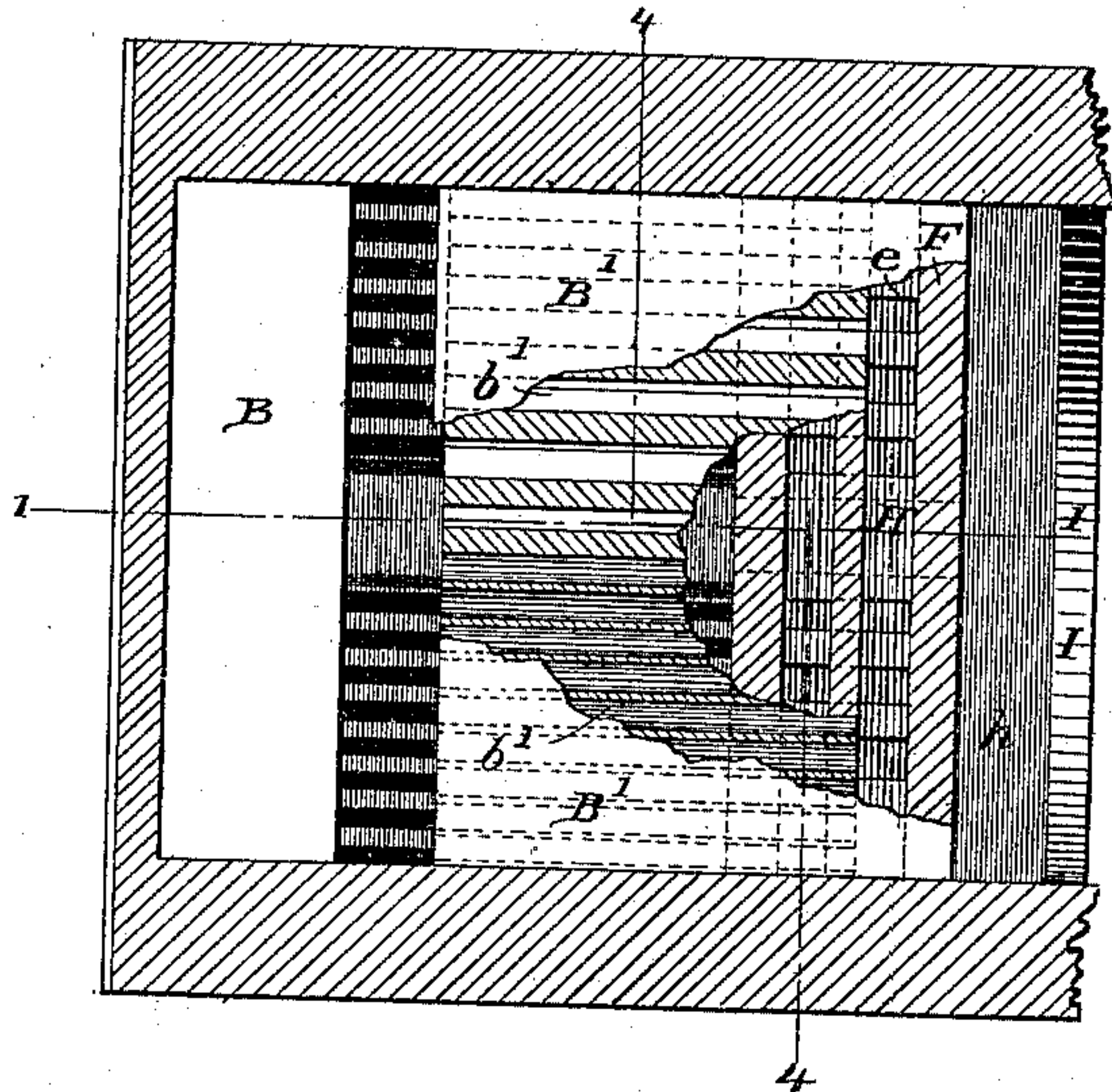


Fig. 4.

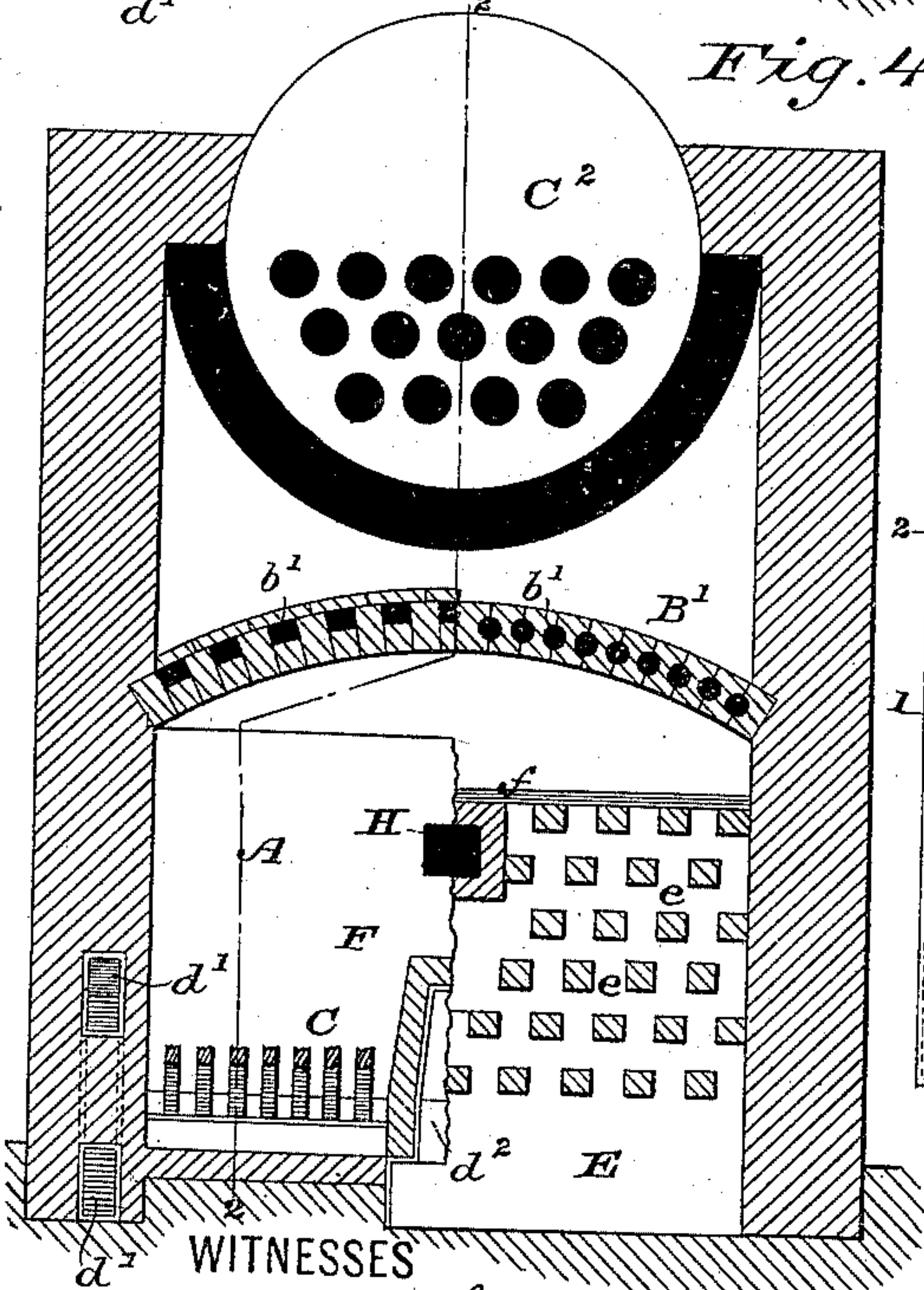
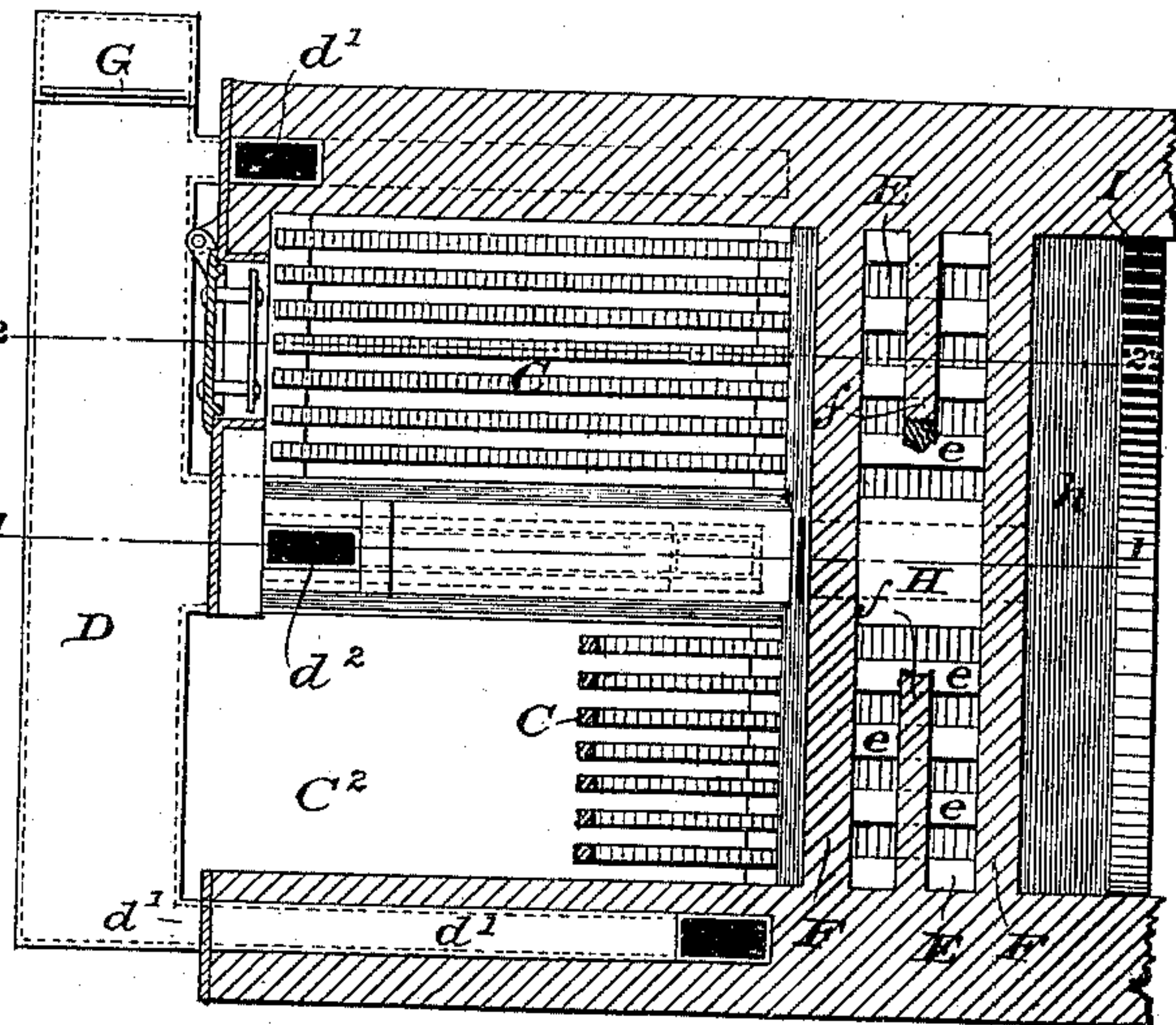


Fig. 6.



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UNITED STATES PATENT OFFICE.

JEAN B. BOULICAULT AND JOSEPH LEHNBEUTER, OF ST. LOUIS, MO.

FURNACE.

SPECIFICATION forming part of Letters Patent No. 335,176, dated February 2, 1886.

Application filed March 2, 1883. Serial No. 86,797. (No model.)

To all whom it may concern:

Be it known that we, JEAN B. BOULICAULT and JOSEPH LEHNBEUTER, both of the city of St. Louis, State of Missouri, have invented certain new and useful Improvements in Furnaces, of which the following is a specification.

The object of our invention is to obtain a more perfect combustion of the fuel, thereby reducing loss by smoke, and increasing the heating capacity and the economy of the furnace.

Letters Patent were granted to Jean B. Boulicault on the 30th day of August, 1881, numbered 246,452, for an improved furnace and smoke-consumer, wherein a current or stream of air is led through a flue at the back of the furnace and its course broken as it rises by transverse bars, so that it may be warmed in its passage, being finally introduced into the fire or combustion chamber at the upper rear part thereof, and drawn over it toward the front by the draft which is above the grate-bars and near the front of said chamber.

Our invention retains the general features of the Boulicault furnace; but for a more complete consumption of the smoke we have introduced certain modifications and additions, intended to bring fresh jets or streams of the external air into contact with the flames at a series of points, so that they may always have a supply of oxygen until combustion is complete.

In the drawings, Figure 1 is a longitudinal section centrally through a furnace embodying our invention; Fig. 2, a second longitudinal section through the same furnace; Fig. 3, a vertical transverse section through said furnace; Fig. 4, a second vertical transverse section on a different line; Fig. 5, a horizontal section on the line 5 of Fig. 1, and Fig. 6 a second horizontal section on the line indicated by corresponding number.

A represents the combustion-chamber of the furnace, covered by an arch, B B', which is pierced transversely, as in the above-mentioned patent, above the grate-bars and near the front wall, for the ventage or chimney-draft, but except at this point forms a close or imperforate ceiling to said chamber.

C are the grate-bars, placed at an incli-

nation and removable, as in said patent, and C' is any boiler, should one be used.

In front of the ash-pit C², lying transversely, is an air-trunk, D, receiving external air through a port, d, at one side of the furnace, and extending substantially the whole width of said furnace, exposed to some extent to the heat of the flames radiated through the pit, so that the air therein may be raised in temperature in its passage. From this air-trunk flues d' lead through the brick-work at each side of the ash-pit horizontally until they reach the rear of the pit, and are then carried up vertically to the level of the grate-bars, when they return toward the front, finally opening into the combustion-chamber immediately under the arch close to the front wall of the furnace. This irregular course is given them that the air may be raised still higher in its temperature by the heat radiated through the walls before it finally enters the combustion-chamber. A third flue, d², leads from the main flue centrally along or beneath the floor of the ash-pit until it reaches the rear, then rises and passes along the grate-bars above them toward the front, where it becomes vertical, and discharges immediately beneath the crown of the arch. This flue, being surrounded by the burning fuel, will be bridged with fire-brick. The horizontal portion of the flue d² also opens into the air-duct E in the bridge-wall F at the rear of the combustion-chamber, so that a current of air may be drawn up therethrough, broken and retarded, and warmed as it goes, by the transverse bars or bricks e, finally entering the combustion-chamber through a port, e', in the wall immediately beneath the arch. Heretofore this latter air-supply has been introduced to the combustion-chamber or brought into contact with the flames at only this single point—that is, beneath the arch at the rear of the chamber. In our present invention we divide it by a partition, f, depending within the duct, one portion of it being conducted through the port in the bridge-wall into the combustion-chamber, and the second portion passing through the small flues b' in the rear section, B', of the arch, and discharging into the flames as they are drawn through the opening b by the chimney-draft, but not at

any other point, thus insuring that the air passing through these flues shall be highly heated, without, however, parting with any of its oxygen until the moment it strikes the flames rushing through the draft-opening, when its effect will be expended and felt in the heating-chamber alone.

By the arrangement described we supply fresh air to the combustion-chamber or to the flames at five different points—from two ports at the sides of the chamber, from a port at the front immediately beneath the crown of the arch, from the vertical duct in the rear wall immediately beneath the arch at the rear of the chamber, and from the series of horizontal flues in the arch itself, the latter jets mingling with the flames as they are rushing with great force through the constricted opening in the arch under the influence of the chimney-draft.

The flues in the arch may be formed in various ways. As shown in Fig. 4, they may be either square, rectangular in cross-section, or round, and it is apparent that the fire-bricks of which the arch is constructed may be so shaped or molded that they will be formed by the simple setting of said brick in constructing the arch. A damper, G, controls the inlet to the air-trunk D, from which the various flues are supplied, so that the air-supply may be moderated or increased in all at once. If it is desired to independently control the separate flues, they will each be supplied with dampers. They may also draw directly from the external air, the purpose of the trunk being only to give the air-supply a preliminary warming, and to bring all the flues under the control of a single damper. The irregular course given to the flues is partly for convenience in construction and economy of space, but mainly to expose them to the heat and cause the air passing through them to be sufficiently raised in temperature before it enters the combustion-chamber. It is therefore obvious that their course may to some extent be changed without departing from the principle of our invention.

In said former patent there was no connection with the chimney, except through the opening in the arch. We find it desirable to connect with the chimney-draft at the rear of the combustion-chamber by a small flue or ventage, H, passing through the rear wall at this point, and a vertical duct, *h*, into which it opens, formed by the second bridge-wall, I, as shown. This leaves the main draft still through the arch, but gives sufficient transverse draft to maintain the combustion of the fuel at the rear of the grate-bars, which has heretofore been incomplete.

We claim as our invention—

1. The combination, in a furnace, of a combustion-chamber, a close arch crowning it, a draft-opening through said arch near the front of the chamber, and air-ports supplying external air to said chamber at the front and rear of the arch immediately beneath its crown,

said air-ports being fed from a flue or flues traversing the length of the furnace and exposed to the heat-rays.

2. The combination, in a furnace, of a combustion-chamber, a close arch which covers it, a draft-opening through said arch, and air-ports supplying fresh air to the chamber immediately beneath the crown of said arch at front and rear, and also at each side of the chamber, said air-ports being fed from a flue or flues traversing the length of the furnace and exposed to the heat-rays therefrom.

3. The combination, in a furnace, of a combustion-chamber, a close arch which covers it, a draft-opening through said arch, air-ports opening immediately beneath the crown of the arch at front and rear, air-ports opening at the side of the chamber, and air-flues supplying external air immediately at and transversely along the draft-opening through the arch.

4. The combination, in a furnace, of a combustion-chamber, a close or imperforate arch which covers it, a draft-opening through said arch near the front of said chamber, air-flues passing longitudinally through the rear section of said arch and discharging immediately into the draft-opening, and an air-trunk traversing the length of the furnace, and heated thereby, to a connection with the rear of said flues.

5. The combination, in a furnace, of a combustion-chamber, a close or imperforate arch which covers it, a draft-opening through said arch near the front of said chamber, air-flues passing longitudinally through the rear section of said arch and discharging immediately into said draft-opening, and an ascending air-duct in the bridge-wall at the rear of the chamber, supplying said flues at its head, and having a connection at its foot with the external air.

6. The combination, in a furnace, of a combustion-chamber, a close or imperforate arch which covers it, a draft-opening through said arch near the front of said chamber, air-flues passing longitudinally through the rear section of said arch and discharging immediately into said draft-opening, an ascending air-duct in the bridge-wall at the rear of the chamber and supplying said flues at its head, and a connection at its foot with the external air, and transverse bars interrupting said duct to retard the air-current as it rises to the flues in the arch.

7. The combination, in a furnace, of a combustion-chamber, an arch covering it, a draft-opening through said arch, an air duct or compartment in the rear wall, an opening from said duct into the combustion-chamber immediately beneath the rear of the arch, and air-flues from said duct leading through the corresponding section of the arch to the draft-opening.

8. The combination, in a furnace, of an air-trunk laid transversely along the front of the ash-pit, and an air-flue leading therefrom cen-

trally beneath the ash-pit, and returning upward to a discharge-port at the top and front of the combustion-chamber.

5 9. The combination, in a furnace, of an air-trunk laid transversely along the front of the ash-pit, a horizontal air-flue leading therefrom beneath the ash-pit to a vertical duct in the rear wall of the combustion-chamber, an air-port from said duct opening into the upper rear part of said chamber, and air-flues
10 leading from said duct to the draft-opening or ventage.

10. The combination, substantially as herebefore set forth, of the transverse air-trunk, its damper, the side and central flues, the rear air-duct, and the flues through the fire-arch. 15

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