2 Sheets—Sheet 1.

J. ASHCROFT.

Furnace-Doors.

No. 205,337. **Patented June 25, 1878.**

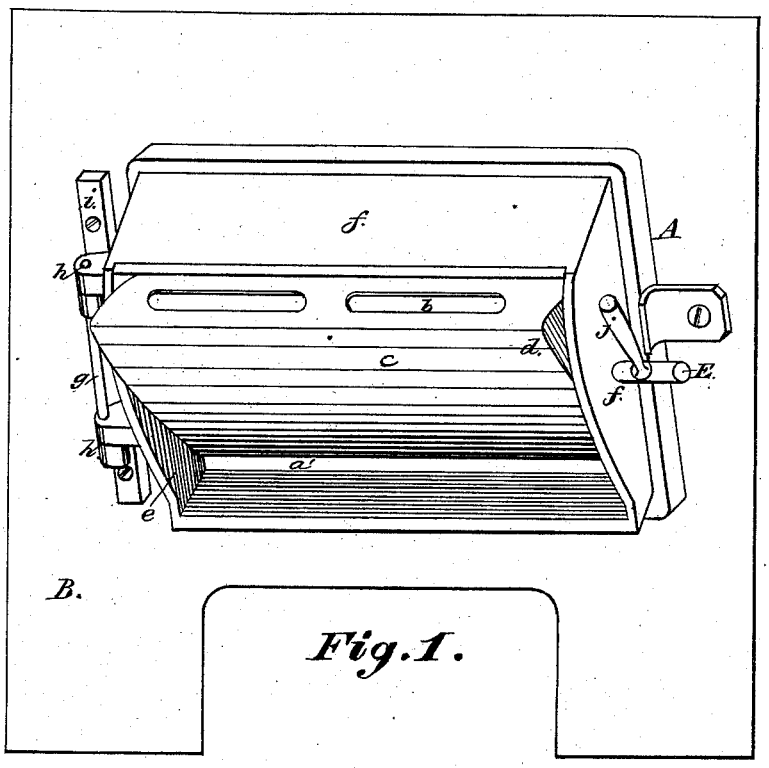


Fig. 1.

Fig. 5.

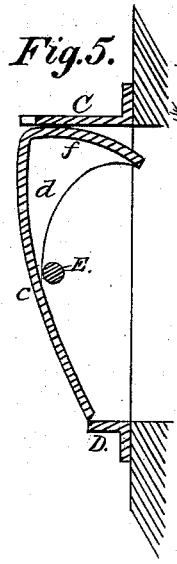


Fig. 2.

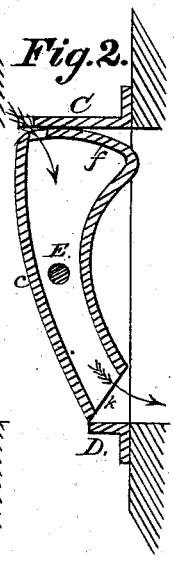


Fig. 4.

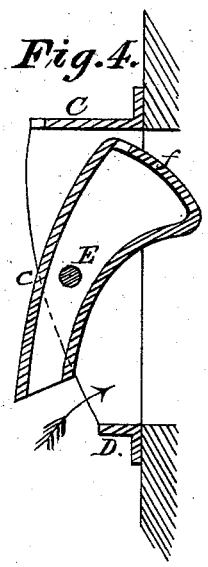
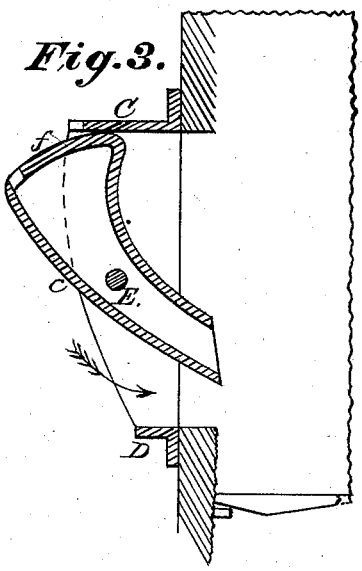


Fig. 3.



Witnesses
Frank Schaffler
Philip Boltman

Inventor:
John Ashcroft

2 Sheets—Sheet 2.

J. ASHCROFT.

Furnace-Doors.

No. 205,337. Patented June 25, 1878.

Fig: 1.

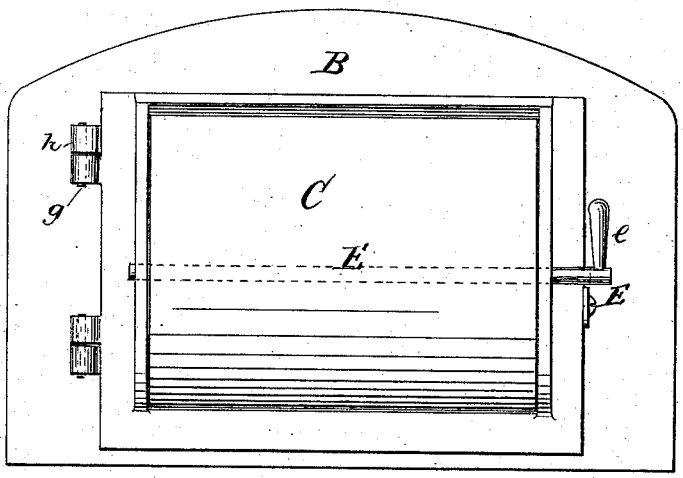


Fig: 2.

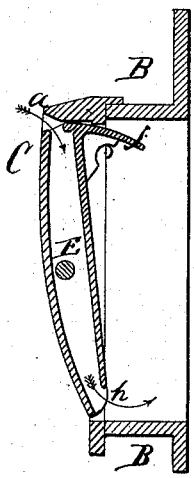


Fig: 4.

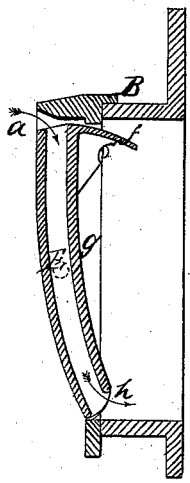
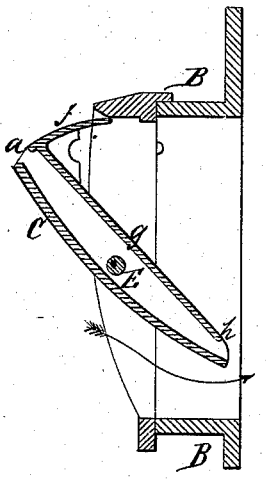


Fig: 3.



Witnesses:

Frank Schnuffler

Philip Bothman

III

Inventor:

John Ashcroft

UNITED STATES PATENT OFFICE.

JOHN ASHCROFT, OF BROOKLYN, NEW YORK, ASSIGNOR TO SARAH JANE ASHCROFT, OF SAME PLACE.

IMPROVEMENT IN FURNACE-DOORS.

Specification forming part of Letters Patent No. **205,337**, dated June 25, 1878; application filed March 12, 1878.

To all whom it may concern:

Be it known that I, JOHN ASHCROFT, of the city of Brooklyn, in the county of Kings and State of New York, have invented certain new and useful Improvements in Furnace-Doors; and I do hereby declare that the following is a full, clear, and exact description thereof, which will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to the letters of reference marked thereon, which form a part of this specification.

This invention relates to that class of furnace-doors which are designed to supply air to the furnaces of steam-boilers, and by which a better distribution of the air and a more complete mingling of the volatile gases arising from the incandescent fuel are produced, and hence a more complete combustion of the fuel; and it consists in the peculiar construction of the door, by which a stream of air is made to pass through the door, and at the same time between the under edge of the door and the door-sill, deflecting said air upon the burning fuel.

It also consists in suspending the door centrally and horizontally, by which it is made to vibrate at its top and bottom edges, and by which the quantity of air admitted to the furnace by means of the door is controlled.

It further consists in the box-like shape of the door, by which the inner or lining plate is made to deflect the air that rushes through the doorway when open from impinging upon the crown-sheet of the boiler, thereby preventing the well-known damaging results of such impingement—viz., the contraction and expansion due to the contact of cold air with boiler-sheets when highly heated, all of which, with minor details, will hereinafter more fully appear.

In the drawings, Figure 1, Sheet 1, represents an elevation, in perspective, of my improved door, partly opening inward at the bottom at *a'* for the admission of air, and exposing the openings at the top at *b*, also for admitting air to the fire. This figure also shows the door suspended from nearly a central and horizontal axis, by which it is made to balance itself in any desired position. It also shows the top and side plates *c d* and end plate *e*. The journals or pivots on which the door turns pass through the latter, and also through the end plate of the door-frame A at *f'*; but a shaft may extend all the way through to the other side, or it may be suspended in any approved manner, provided it be near the center. This swinging door is located in a frame, said frame being hung, like ordinary doors, by means of hinges, so the whole structure may be taken down and replaced by removing pintle *g*. The hinges *h* may be fastened to the front of the furnace B. or to strips *i*, which are capable of being secured to the furnace-front. The door from A has projecting from it four flanges, the top one, C, being the widest, and the bottom one, D, the narrowest, the end plates running from the top one to the bottom one striking a curved line, which line conforms to the curve of the door, which, as will be seen, curves inward from top to bottom. All these sides serve to prevent air from passing into the furnace when the door is in position. This door may be of cast-iron or constructed of any suitable material. A small lever, *j*, is attached to the journal-shaft E, by which the door is operated, and may be latched in any well-known form. This whole fixture is adapted to be attached to any furnace-front or doorway.

Fig. 2, Sheet 1, represents the door when closed, allowing only sufficient air to pass through it to keep the door cool. This figure is in vertical cross-section, and clearly illustrates the curves of the front and back plates, the upper air-opening, and the beveled lower edge *k* of the door. It will be seen that the outside plate is the longest, forming a deflector, the curve giving direction to the air-current. This figure, with Figs. 3 and 4, Sheet 1, shows the door-frame secured to an ordinary furnace-front.

Fig. 3, Sheet I, shows the door open, either for the reception of a large volume of air or for fuel, the lower portion of the door extending into the fire-chamber, giving a better direction to the draft; but of course it is evident that this opening may be graduated to

any degree for the admission of just such quantities of air as may be requisite.

Fig. 4, Sheet 1, presents the door opening outwardly, for the purpose of cooling off the fire. It will be readily seen that with the door in this position the inner plate forms at its upper side an abrupt segmental curvature, pointing in the direction of the fire, so that when the air rushes in it is directed upward from the fire; but by the abrupt curve it is prevented from immediate contact with the crown-sheet of the boiler, so that the bad effect of suddenly cooling off the boiler-sheets is obviated. The air for the cooling of the door in this figure enters from the lower edge, and out at the top. All these figures show the central pivot or shaft, upon which they hang and upon which they are vibrated. The upper plate *f* forms the arc of a circle, and running from the top of the inner plate to the top of the outer plate, and serves a double purpose. First, it prevents the air from rushing over the door when open by its segmental top, which keeps it in close contact with the upper frame-plate; and, secondly, by the enlargement formed by its peculiar shape, the air is partially heated before its induction to the furnace.

In Sheet 2, Fig. 1 represents a front elevation of the door and frame, the door being shut, and also showing the position of the shaft running through the door from one side to the other, extending at one end far enough to apply an attachment to it for operating it.

Figs. 2, 3, and 4, Sheet 2, represent a vertical section of other forms or modifications of my improved door.

In Figs. 2 and 3, Sheet 2, the inner plate is made straight, and Fig. 4, same sheet, the plates are curved, but parallel to each other. The same method of suspending these forms of door is applied as in those of Sheet 1. The top plate *f* has the same curvature as the first; but, instead of forming a box, the plate projects inward, while the openings on the side are protected by angular plates.

It sometimes happens with old furnaces that the doorway is provided with an annular outward-projecting flange; and to more readily attach my doors to such construction, I provide the door-frame with a corresponding flange, but somewhat larger, so that it may be secured on the outside of the old doorway-flange with but little or any alteration. This outside flange also serves, when the door-frame is shut, to sustain the weight of the door, and hold the frame firmly while the door is being operated.

The fire may be raked, sliced, and supplied through the swinging door without opening the hinged frame.

It is obvious that many other modifications may be made involving the principle of my construction—such as making the swinging door of a single piece, as shown at Fig. 5, Sheet 1, or with a liner perforating the door on the outside—without departing from the spirit of my invention.

I am aware it is not new to make a hollow door; neither is it new to swing doors horizontally opening inward and outward, and do not broadly claim such; but

What I do claim, and desire to secure by Letters Patent, is—

1. A swinging door hung centrally and horizontally, and balanced without counterpoise-weights, and adapted to open inwardly and outwardly, substantially as set forth and described.

2. A hollow door horizontally hung at or near its center, balanced to remain at any fixed position for the introduction of air to the furnace, in the manner set forth and described.

3. A furnace-door whose axis of motion is at or near its center on a horizontal line, the inner and outer walls or plates of which are made of different curvatures, for the purpose set forth and described.

4. A swinging door horizontally hung at or near its center, in combination with a door-frame hinged and swinging, as and for the purpose set forth and described.

5. A swinging door horizontally hung, the inner wall of which is constructed of different curves, so that when the door is opened outwardly the air is deflected from the crown-sheet of the boiler, for the purpose set forth and described.

6. A furnace-door horizontally hung at or near its center, adapted to supply air to the furnace through it when closed, and through it and under it when open, or partially so, substantially as set forth and described.

7. The combination, in a furnace-door, of the centrally-swinging portion, the frame swinging portion, and the projecting flanges, arranged to operate in the manner set forth and specified.

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Witnesses:

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PHILIP BOTHMAN.