

W. A. MARTIN.

Furnaces and Furnace-Doors.

No. 150,592.

Patented May 5, 1874.

Fig. 4.

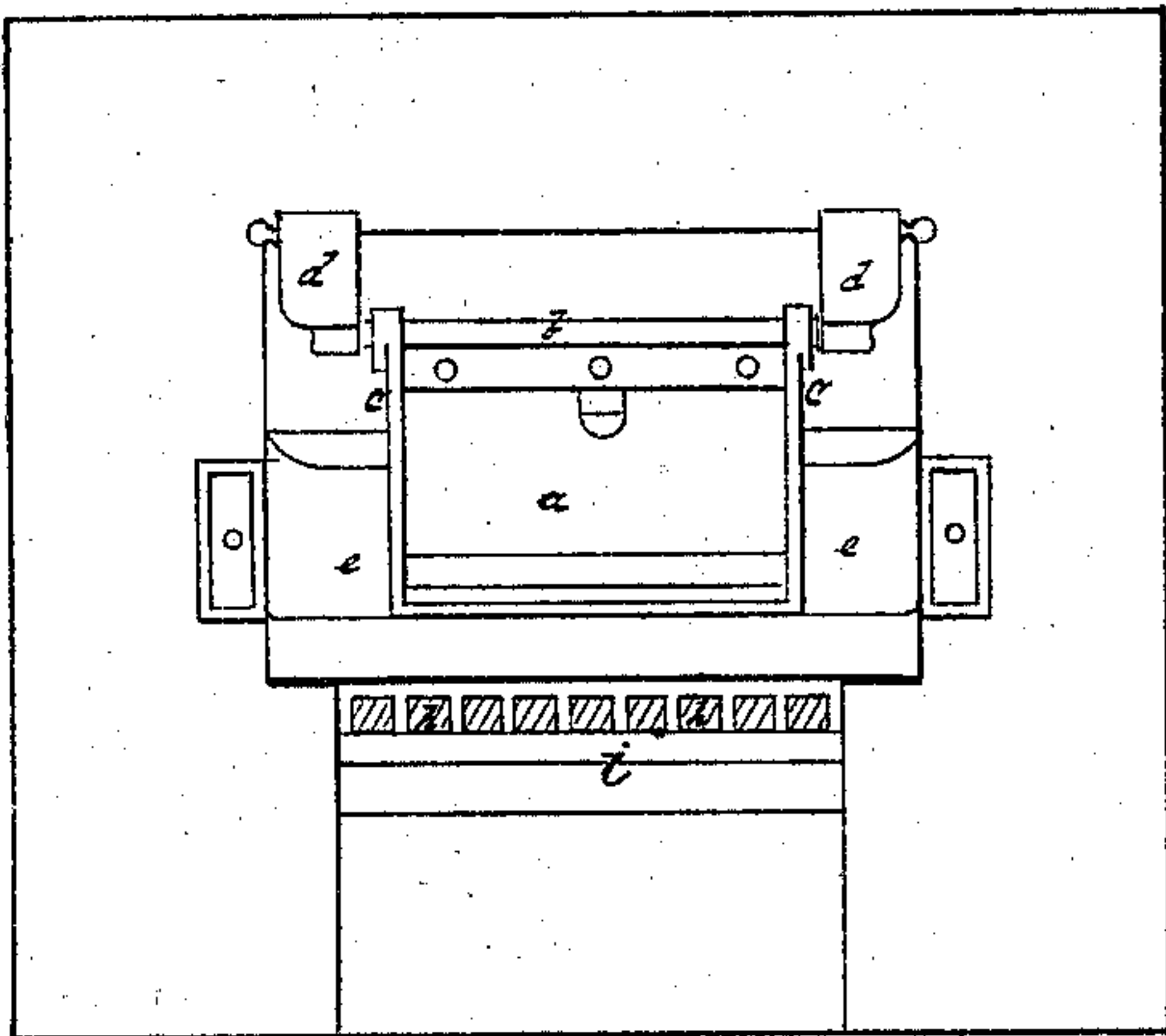


Fig. 3.

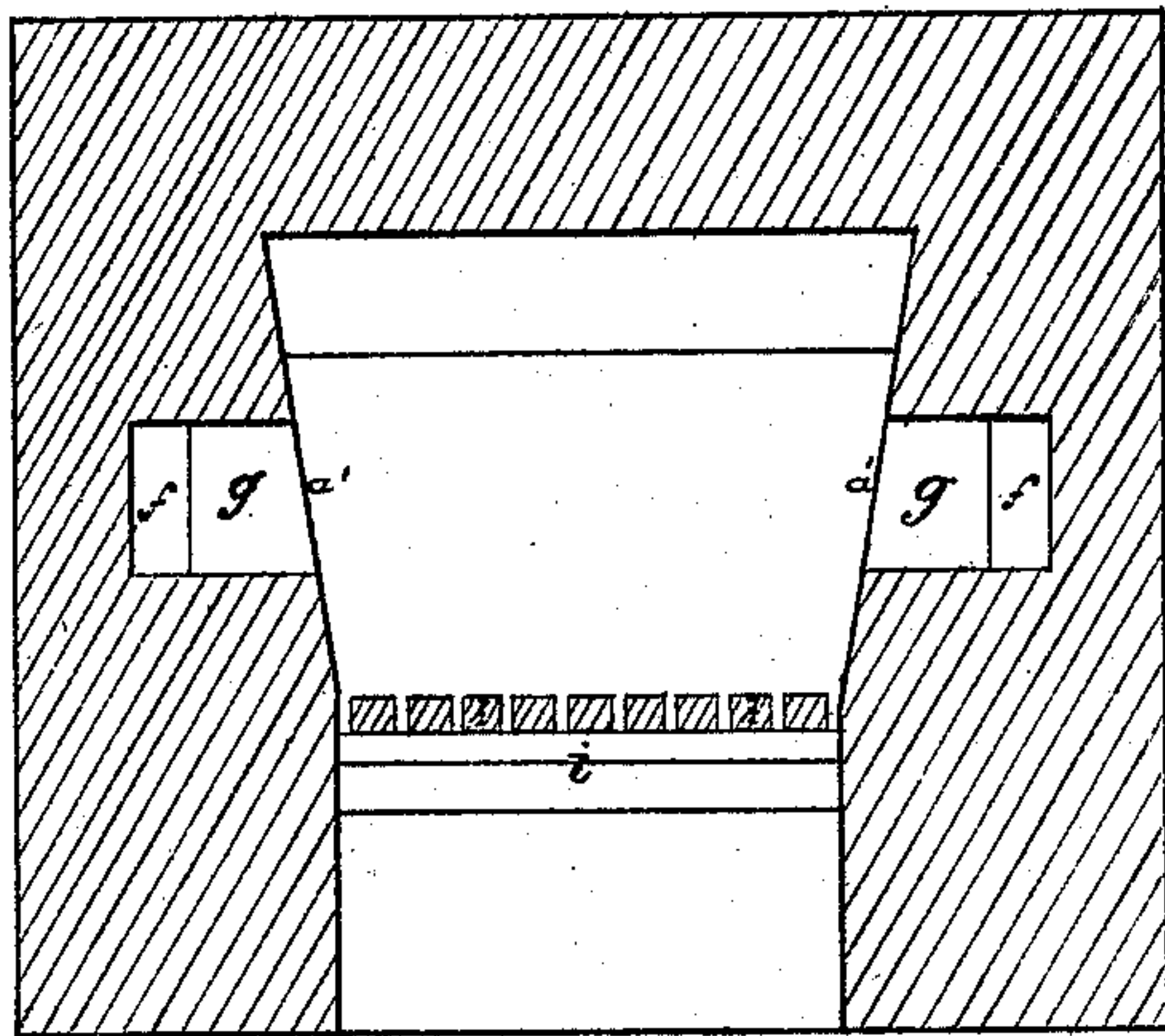


Fig. 2.

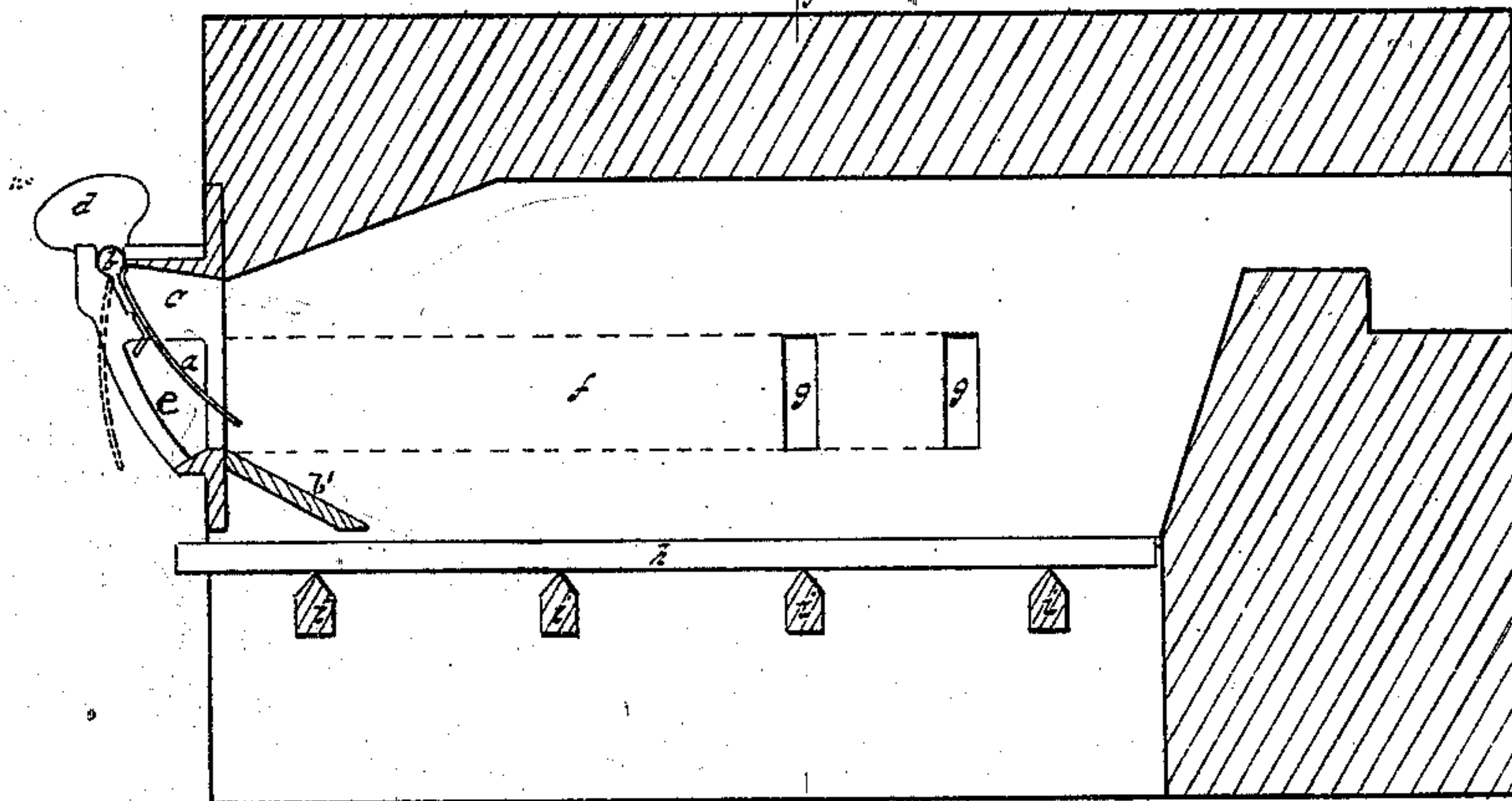
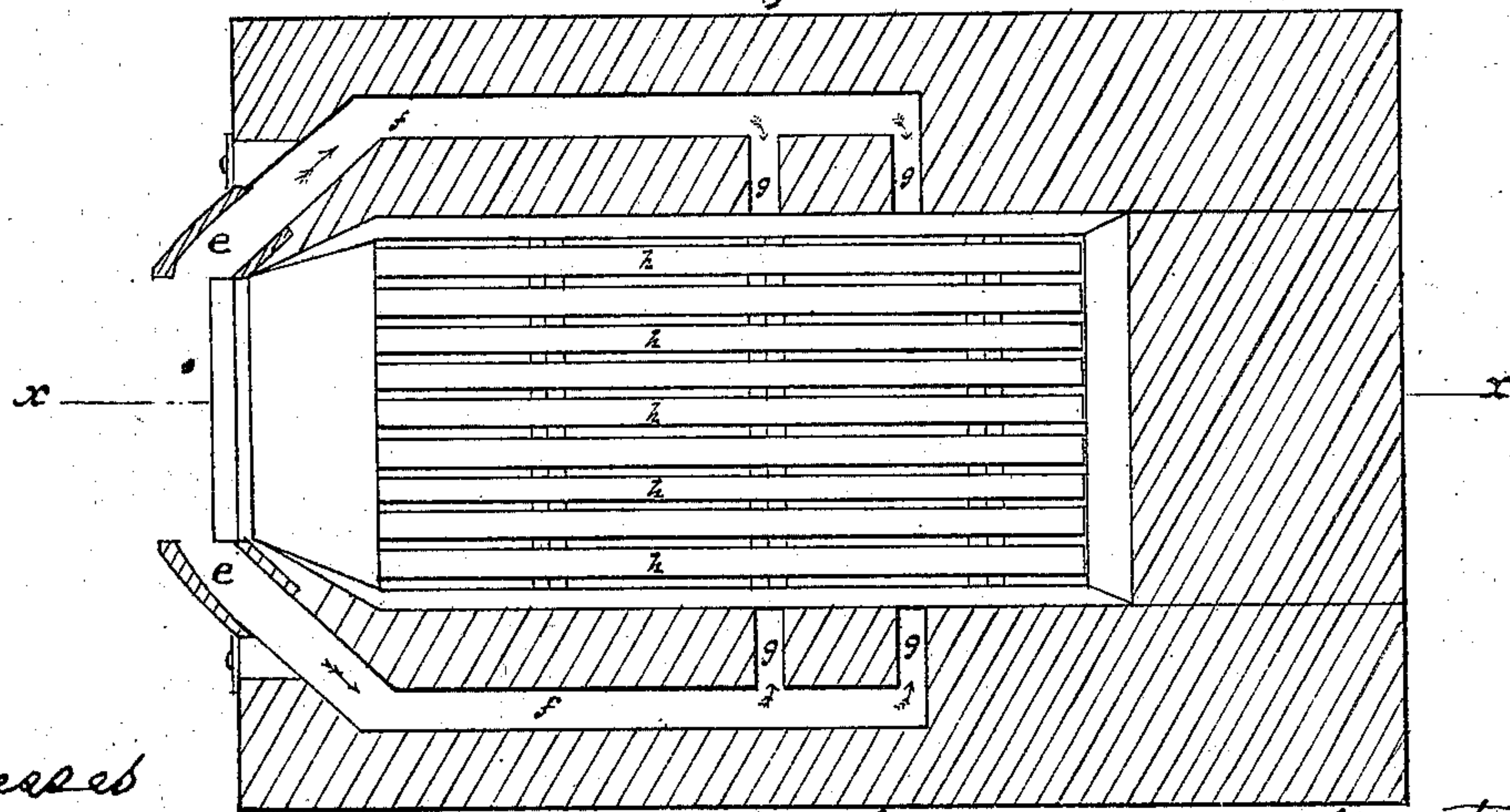


Fig. 1.



Witnessed
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UNITED STATES PATENT OFFICE.

WILLIAM ARENA MARTIN, OF LONDON, ENGLAND, ASSIGNOR OF ONE-HALF HIS RIGHT TO JOHN ASHCROFT, OF BROOKLYN, NEW YORK.

IMPROVEMENT IN FURNACES AND FURNACE-DOORS.

Specification forming part of Letters Patent No. 150,592, dated May 5, 1874; application filed February 18, 1874.

To all whom it may concern:

Be it known that I, WILLIAM ARENA MARTIN, of London, England, civil engineer, have invented Improvements in Furnaces and Furnace-Doors, reference being had to the accompanying drawing forming a part of this specification, and in which—

Figure 1 is a horizontal section of a steam-boiler furnace with my improvements applied to the same. Fig. 2 is a longitudinal vertical section on the line *x x*, Fig. 1. Fig. 3 is a transverse vertical section on the line *yy*, Fig. 2. Fig. 4 is a front elevation of the said furnace.

Like letters indicate the same parts throughout the drawing.

My said invention consists, chiefly, in the peculiar construction and arrangement of the furnace-door, whereby the said door is so supported as to open inwardly or outwardly, and admits the air in such a manner that it will all pass through, and not above, the fuel on the fire-bars; also, in the combination, with a furnace-door opening inward, of an inner plate, inclining downward toward the grate for the purpose of directing the air through the fuel on the grate-bars, causing it to penetrate the fuel, mix with the gases, and thus produce intense heat before rising or entering the flues, causing perfect combustion, and, consequently, preventing the emission of smoke or gases; also, in the combination of a furnace-door, opening both inward and outward, with a counter-balance, whereby the door will remain in whatever position it may be placed without retaining devices, and which, besides being a most convenient feature for fire-grates generally, is of special advantage for marine boilers, as its position is not affected by the rolling of the ship, and its opening and closing movement or intermediate adjustment is instantly made; also, in the construction of the fire-grate of separate bars, rectangular in their cross-section, and with square ends projecting outside of and beyond the front of the furnace, whereby they may be turned completely over by a spanner-key, and by which each separate bar can be easily revolved and kept in proper space without grooved bearers, withdrawn in a horizontal position, and put in place again while the furnace is in use, and freeing

the grate from dross and clearing the spaces for the free admission of air without opening the furnace-door, and in this way prevent a great loss of heat which would otherwise be admitted and cool the furnace, the chief design being to have the bars so that they can be turned over and over to present each of its four sides to the action of the fire, and to allow them to be taken out and put back again without any trouble with the fire or the grate; also, in the combination of a furnace-door, opening either inward or outward, with side openings, and side air-passages constructed to communicate with said openings and the interior rear of the furnace, for the purpose of admitting air to effect a more complete combustion whether the door be opened inward or outward.

I construct my improved furnace-door *a* with a horizontal axle or spindle, *b*, at the top part, resting in bearings made in the cheeks or frame *c* of the said furnace-door. The said axle or spindle *b* has a counter-balance weight, *d*, at each end, and is so arranged in its supports that the furnace-door will open either inwardly or outwardly with equal facility, and will remain in any position in which it is left. By opening the furnace-door *a* a few inches inwardly, as shown in Fig. 2, the air is caused to enter and pass through the fuel, and to mingle with the gases produced therefrom in the process of combustion, before they rise from the fuel, causing them to ignite and to be perfectly developed before leaving the furnace, instead of leaving the furnace in the condition of smoke. *b'* is a plate, between which and the said door the air enters the furnace, in the manner above described. In some cases I make openings *e* in the frame of the said furnace-door, which openings lead into horizontal passages or channels *f* in the brick-work at the sides of the furnace. From each of these passages I make a lateral passage, or two or more lateral passages, *g*, for the air. By this construction the air, besides entering as above described, enters through the said openings in the frame of the furnace-door, and passes along the said passages or channels into the furnace, as indicated by the arrows.

My improved furnace-door is not restricted

to its use in combination with a furnace of the construction shown in the drawing, although the said furnace and door are advantageously used in combination, as described.

I employ iron fire-bars *h* from one inch to about one inch and a half in thickness. These bars are placed in the furnace below the level of the frame of the said furnace-door. They are supported upon transverse bearers *i*, and project outside the front of the furnace, as shown in Fig. 2, and I prefer that some should project slightly beyond the other, the long and short bars being placed alternately. By this arrangement the said bars are left entirely free at their ends for expansion. Each bar can be turned round to free it from the dross or clinkers which adhere to it, a spanner or key being applied to the bar for this purpose.

As will be seen, by referring to Fig. 3, my improved furnace is so constructed that it is wider at the top than at the bottom, so that the two sides *a'* are inclined or sloping. This construction of the furnace economizes the heat, and renders the furnace more effective in heating the boiler.

As the door hangs from the top instead of the side, it will swing either inward or outward to any angle required, and, when set as shown in Fig. 2 of the drawings, will cause the air to enter at the lower part only by impinging upon and being deflected by the inclined plate *b'*; and as air at the common temperature is heavier than the heated gases inside it penetrates the fuel, becomes flame, and produces a very marked effect upon the combustion of the fuel, and by obtaining the maximum heat of the furnace reduces the labor of the stoker and economizes the fuel. The balancing feature of the door is produced by securing the weights *d* upon the axis of the door, so that they will be eccentric to said axis and project therefrom in the same radial line, as shown in Fig. 4, and as these weights are designed to be equal in weight to that of the door, they therefore effect its complete counter-balance, and are provided with handles, by which to adjust the door. The door is hung upon two side plates, *c c*, which project and curve or incline downward to the base of the door, which is made to conform to the opening between these plates, and when open inward, the air rushing in will strike the inclined face of the door, and thus be forced downward, the side plates preventing its lateral escape.

So effectually does this plan keep the door and its frame cool that the door is usually made of ordinary sheet-iron, which has been found to be sufficiently durable for the purpose. The door when made is an entirety, complete in itself, with counterpoise, and only requires attachment to the furnace-front open-

ing, and as such is a new article of trade and manufacture, applicable to every style of furnace or coal-burning heater.

The fire-bars *h* being lengths of wrought-iron simply placed upon the knife-edges of the bearers *i*, each bar can be easily revolved with little or no friction, and by their square projecting ends, each bar can be turned by means of a key-spanner, and the whole set can be thus turned in about one minute. The bars being square in their cross-section, are thereby kept in proper space with each other, because their angles in turning them strike each other, and thus keep them spaced without having them seated in socket-bearers.

By this arrangement, also, each bar can be lifted from its bearer by simply inserting beneath each bar a flat bar the thickness of the air-spaces, for breaking up bituminous and cooking coals; and this iron is inserted without opening the door, by passing it into the ash-pit door and resting it upon the cross-bearers as a purchase.

I claim as my invention—

1. A furnace-door constructed, supported, and arranged that it may be opened either inwardly or outwardly, as herein set forth.

2. In combination with a furnace-door opening inward, of an inner inclined bed-plate, *b'*, substantially as described, whereby the air is caused to pass through instead of over the fuel on the grate-bars.

3. In combination with a furnace-door opening both inward and outward, of a counter-balance, substantially as and for the purpose described.

4. The air-openings *e* and the door *a* opening both inward and outward, in combination with the air-passages *f f* and outlet-flues *g g*, substantially as herein set forth, and for the purpose stated.

5. The grate-bars *h*, of square cross-section having their front ends projecting outside of the furnace front, substantially as described, whereby they may be revolved upon their cross-bearers and lifted, withdrawn and replaced without opening the furnace-door, and keep their spaces.

6. The combination of grate-bars *h*, of square cross-section, and made to be revolved each independently of the other with knife-edged cross-bearers *i*, arranged as shown, and for the purpose described.

7. A furnace-door opening both inward and outward, with its frame and counter-balance, as a new article of trade and manufacture.

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