2 Sheets—Sheet 1.

T. R. BUTMAN.

Furnace Door.

No. 199,182. **Patented Jan. 15, 1878.**

Fig. 1.

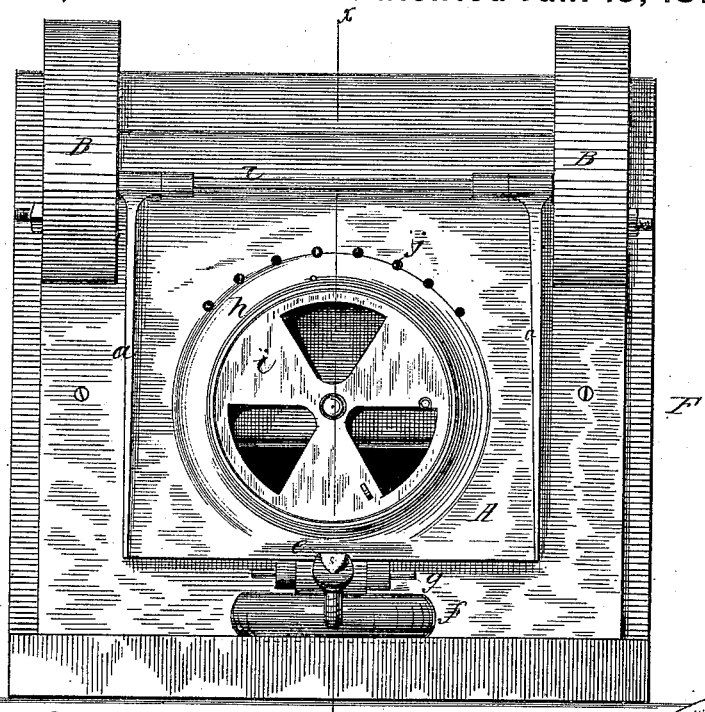

Fig. 2.

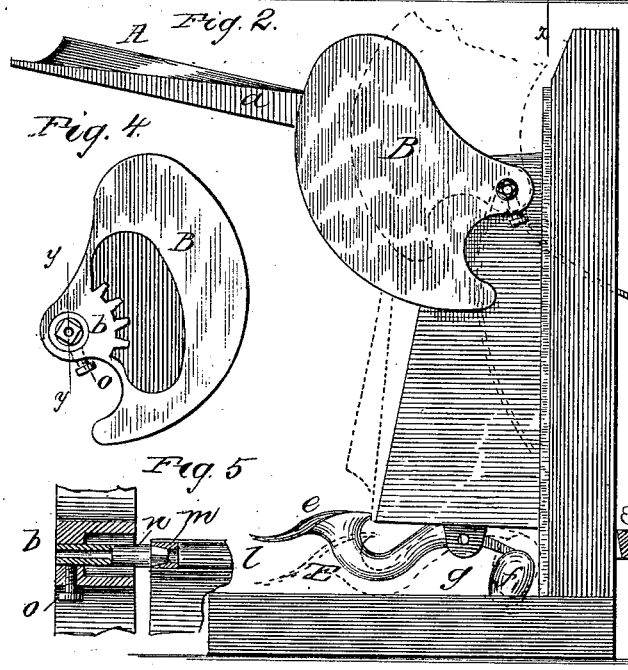

Fig. 3

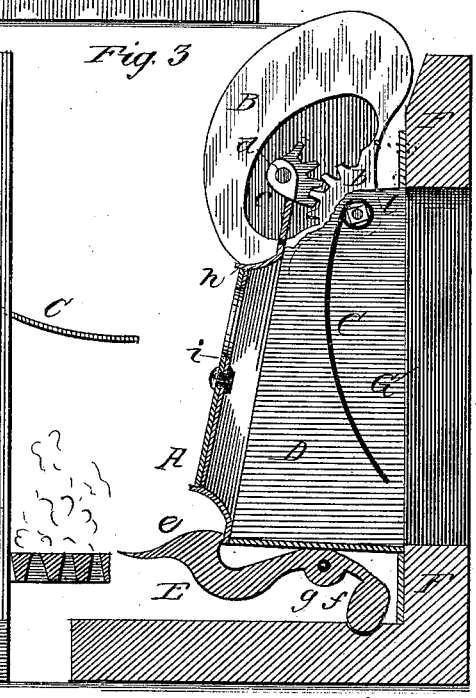

Fig. 4.

Fig. 5

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2 Sheets—Sheet 2.

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Fig. 6.

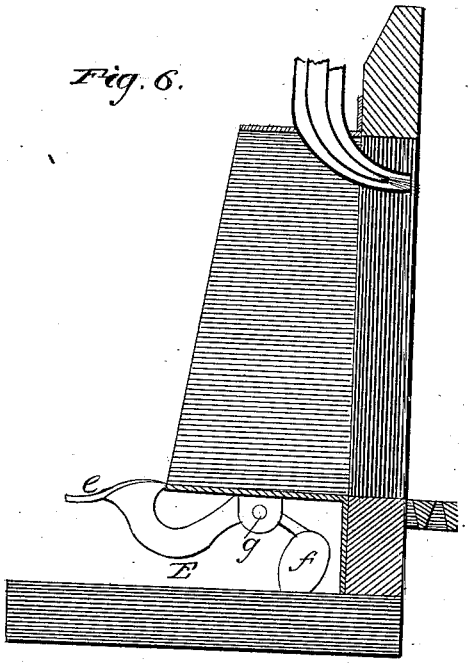


Fig. 7.

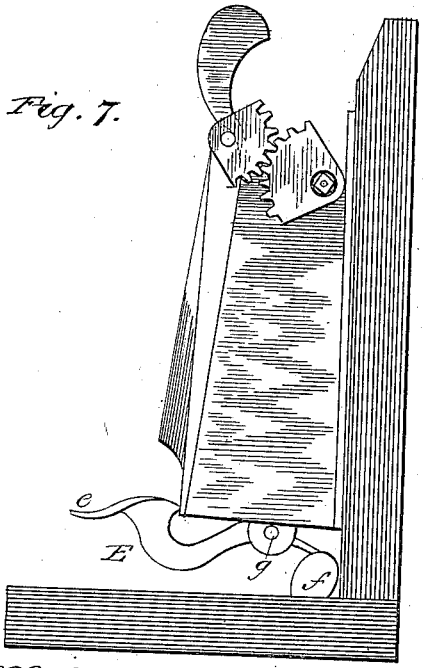
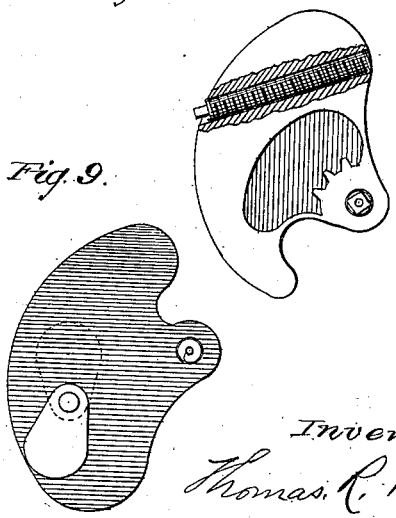


Fig. 8.

Fig. 9.



Witnesses
Fred G. Dieterich
D. P. Ford

Inventor
Thomas R. Butman

UNITED STATES PATENT OFFICE.

THOMAS R. BUTMAN, OF MILAN, OHIO.

IMPROVEMENT IN FURNACE-DOORS.

Specification forming part of Letters Patent No. **199,182**, dated January 15, 1878; application filed November 6, 1877.

To all whom it may concern:

Be it known that I, THOMAS R. BUTMAN, of Milan, in the county of Erie and State of Ohio, 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 a new and useful improvement in furnace-doors for steam-boilers and other furnaces, and relates to that class of doors by which an economical saving of fuel is secured and a more easy manipulation of its parts for the ready introduction of fuel to the furnace is accomplished, as will be hereinafter more fully described.

This invention is principally intended as an improvement upon the furnace-door patented to me November 7, 1876, No. 184,061, embracing substantially the same principles therein alleged, only my present improvement is more simple in its construction, more durable in its working parts, and less liable to get out of order, and also by which the currents of air entering at the door, and also through the injecting-nozzle, are more under the control of the operator.

To this end, therefore, I will proceed to describe the first feature of my invention, which consists in providing my deflectors with weights of peculiar construction, by means of which the doors and deflectors are made to simultaneously open and close, and also to a tripping device, which is simple and durable, by which the door is automatically latched and readily opened by the attendant's shovel or his foot, as will more fully appear.

In the drawings, Figure 1 illustrates a front elevation of my improvement, clearly showing the over or lever balance weights in position. One weight possessing the specific gravity of both may be used; but the two are preferable; also showing the door in its position horizontally hung and provided with the usual register, the register-frame slightly projecting outwardly from the plane of the door, and over it is shown a series of perforations for the admission of air in jets. At the bottom of this figure is also shown the tripping device, which performs the function of a latch, and which automatically and securely holds the door shut when so required.

Fig. 2 illustrates a side elevation of the door and its attachments. In this figure the door and deflector are shown open, the dotted lines representing the position of the parts when closed, except that the tripping device is in its normal position, and its dotted lines shows its position at the time of the release of the door, said door and deflector flying open simultaneously by the depression of the tripping device by the attendant.

Fig. 3 represents a transverse section on the line *x x* of Fig. 1, by which the peculiar construction of my devices is more particularly pointed out, and while this figure plainly shows the eccentric cam-like recess or groove formed within the weight for the purpose of allowing an oblong or ear-shaped movement of said weight in its upward or downward course, and by means of which the toothed segment located within said recess is allowed full play on its periphery.

It will be observed that when the weight reaches the point to which it is intended that it shall open the door, the back of the toothed segment is so constructed that the upper end of the cam-like recess will arrest the further progress of said weight whether the weight be arranged to make the deflector to open more or less, as the case may be. This figure also shows the deflector and door when in a closed position, also the latch or tripping device with its counterpoised weight. This tripping device may be hung pendent from the bottom of the chamber, as shown, or may be arranged in any ordinary manner, so that the weight will always preponderate, and that the upper surface of the latch portion will be in such a position that when the door descends it will strike the bevel on the latch and slide into place, the latch immediately clutching it, and thus holding the door closed.

It will be further observed that the door is provided with an outwardly-projecting frame, which may be cast or bolted thereto, or may be round or square, but preferably as shown; and, while the said frame is used to attach a

register for the admission of air thereto, its principal object is to stiffen and brace the door, and thereby prevent it from twisting or warping. A further office of the above-named projecting frame is that the said door may be made much lighter than if made plain, and by this means I have as good results, and at the same time diminish the weight of the overbalancing lever-weights B. The door is further provided with outwardly-projecting stiffening-flanges at its edges, which may be seen at *a*, Fig. 1.

Referring more particularly to Fig. 3, which, more than any other, shows the gist of my invention, I will describe more in detail: A represents the door; B, the overbalance-weight; *b*, its toothed segment, which is cast solid with it; *c*, the corresponding toothed segment on the door-shaft *d*; C, the adjustable deflector; D, the door-chamber; E, the tripping device, provided with its bevel-shaped latch *e* and overbalance-weight *f* and fulcrum *g*. *h* shows the projecting frame, provided with register *i* and perforations *j*; F, the furnace-front, and G the door-aperture.

Fig. 3 further shows the relative position of the segmental gears, their shafts, the frame which forms the air-chamber, and the aperture in the front of the furnace-wall through which the fuel is introduced.

Fig. 4 clearly represents an important feature in the operation of my invention; and while this feature is simply employed in the manipulation of my furnace-door, and I do not claim it broadly in this operation, it is nevertheless applicable to many other mechanisms, and may be the subject of a future and separate application, but I will now describe it as applying to the present invention. The shape or form of the recess has already been fully set forth; but it will be seen that the cam or eccentric weight, as a whole, is cast in one piece, including the toothed segment. The weight is so graduated with relation to the teeth, which are concentric, that, as the weight descends and the door ascends in such a manner that when both pass the center of gravity the leverage is proportioned, so that when the weight comes to a stop, no violent shock or backlash occurs. This figure also shows the right-angled wrench and corresponding socket for the variation of the position of the air-deflector as occasion may require, also the usual set-screw.

Fig. 5 is a detail view in section on the line *y y* of Fig. 4, very plainly illustrating the manner of adjusting the deflecting-plate, as above described, which shows the device for changing the position of the adjustable deflector C. Said deflector is journaled on shaft *l*. The end of this shaft is provided with an angular socket, *m*, which clutches a corresponding angular shaft, *n*, both together forming the shaft or spindle of the adjusting deflecting-plate. This extended piece *n* is rigidly fastened to the overbalance-weight by a set-screw, *o*, passing through the hub of the segment. By these means the weights, as well as the deflecting-plate, are capable of adjustment.

Fig. 6 is a vertical section with the door and its appliances omitted, showing the manner of introducing or adapting the door to blasts of air or other vapor-burning material.

Fig. 7 is also a side elevation, and also showing a modification in the manner of applying the overbalance-weights, performing precisely the same functions ascribed to the foregoing figures, the door-deflector and tripping device being the same.

Fig 8 represents an elevation of one of the overbalanced weights detached. It will be seen that a screw-bolt of requisite weight is screwed into the upper portion of the same, for the purpose of adjusting the weight to correspond with the weight of the door and deflector combined when the ponderosity of the counterpoise is desired to be increased. A spanner-wrench is applied to the screw, and screwed out or in, according to the weight of the doors and deflectors.

Fig. 9 is a plan view of another modification of the counterpoise-weight, in which an additional weight is screwed on. It will be seen that varying the position of this oscillating weight the preponderance of the principal weight is also varied from the line of gravitation, thus compensating for any irregular weight in the doors and deflectors.

Having now fully described my invention, the construction and operation of the same, what I claim as new, and desire to secure by Letters Patent, is—

1. The combination, substantially as herein described, of the door, the deflecting-plate, and its eccentric or cam shaped overbalanced weights, operating together in the manner and for the purpose set forth.

2. The combination of the door, the deflecting-plate, and its overbalanced weights, provided with toothed segments, constructed to operate in the manner and for the purpose described.

3. The combination of the door and deflector with their operating segments and the cam-shaped recess, the back of the door-segment serving as a support for the counterbalance-weight, substantially as herein described.

4. The combination of the deflecting-plate and the overbalance-weight, said plate being provided with an angular socket in its journal-shaft, by which the plate may be set at any desired angle, as herein described.

5. The combination of the door, overbalanced as described, and the weighted tripping device E, whereby the door is held in position when closed, and automatically opening when released from said tripping device, as shown, and for the purpose set forth.

6. The combination of the door provided with the stiffening outwardly-projecting register-frame, whereby the door is prevented from warping, the tripping device, and overbalanced weights, said door being also pro-

vided with holes J for supplying the furnace with air, constructed and arranged in the manner and for the purpose set forth.

7. The combination of the door, the deflector-plate provided with its weights and segments, the tripping device, and the chamber formed between the door and the deflector, all arranged to operate as shown and described.

8. The combination of the door provided with the stiffening register-frame and register, the side or edge stiffening projecting plates *a*, with the chamber D, said door having the air-perforations J, with the tripping device, as shown and described.

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

THOMAS R. BUTMAN.

Witnesses:
FRED. G. DIETERICH,
I. B. WUNDERLY.