T. R. BUTMAN.

FURNACE-DOORS FOR BOILER AND OTHER FURNACES.

No. 184,061. Patented Nov. 7, 1876.

Fig. 1.

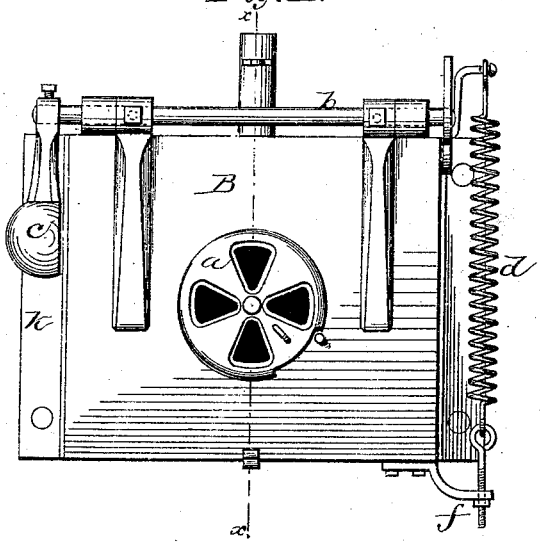


Fig. 2.

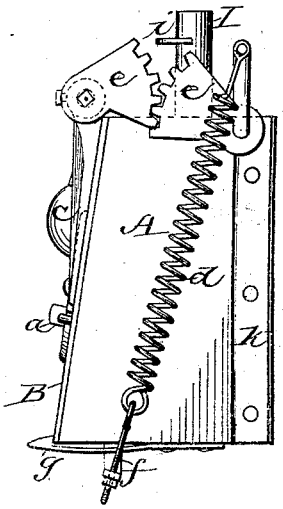
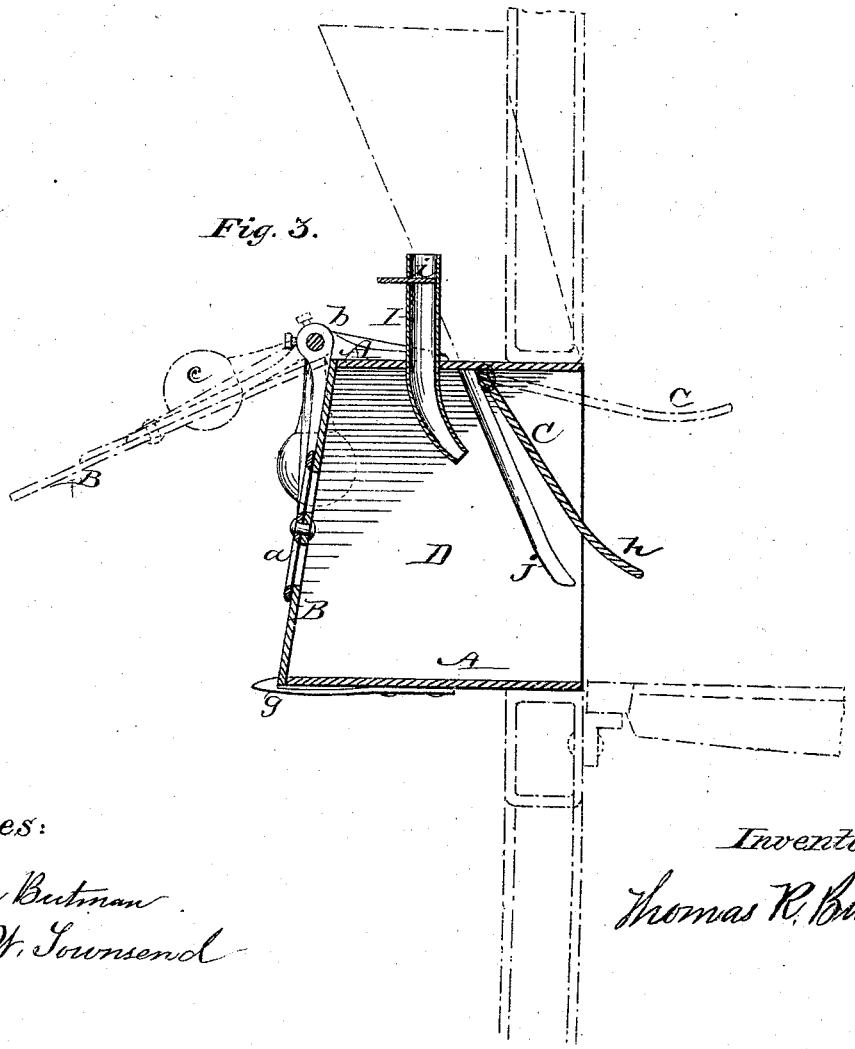


Fig. 3.



Witnesses:

Emmana Butman

Cadd. W. Townsend

Inventor:

Thomas R. Butman

UNITED STATES PATENT OFFICE.

THOMAS REED BUTMAN, OF MILAN, OHIO.

IMPROVEMENT IN FURNACE-DOORS FOR BOILER AND OTHER FURNACES.

Specification forming part of Letters Patent No. **184,061**, dated November 7, 1876; application filed August 29, 1876.

To all whom it may concern:

Be it known that I, THOMAS REED BUTMAN, of Milan, in the county of Erie and State of Ohio, have invented certain new and useful Improvements in Furnace-Doors for Boiler and other Furnaces; 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 it consists of devices by which a large amount of saving in the consumption of fuel is secured by the entire substitution of heated air for cold, or as nearly so as practicable, where such air is heated from the waste products of combustion or the furnace itself, and which will be more fully hereinafter described.

Now it is well known to practical furnace men that a sufficient quantity of cold air to support combustion is commonly introduced through the doors fitted for this purpose, and that this cold air is admitted in large volumes. It is also well known that these volumes of cold air produce a chilling effect on the flame, and consequently a diminished amount of evaporation duty.

Now, to avoid the evil effects just enumerated, and prevent the passage of a current of cold air above the fire under the boiler, and also to secure a better diffusion, regulation, and admixture of the heated air with the half-burned hydrocarbureted gases over the fires and in the flame-chamber, and the development of all the heat that can be produced, and the entire prevention of smoke, is the main object of my invention.

The advantages of supplying heated air to furnaces to support combustion are fully set forth in my patents of March 16, 1876, No. 177,467, and August 15, 1876, No. 181,237; and the air may be heated by the means therein described, or by any well-known method, and be forced into the supply-pipe by means of a fan-blower, steam-jet, or any other well-known ordinary means.

In the accompanying drawing, Figure 1 represents a front elevation; Fig. 2, a side elevation; and Fig. 3, a vertical transverse section, showing in dotted lines the front of a furnace grate-bar and hopper. This figure also represents in dotted lines the door, its balancing device, and air-deflector in an open position.

In the drawing, A represents the form of the fire-door, rectangular in shape, but may be made oval, cylindrical, or any other convenient form, all the devices working equally well in any shape. The under side or sill of the door may incline inward, at any angle desirable; or may be horizontal, as shown. The door B swings horizontally, and may hang vertically, or at an outward or inward inclination, as may best suit, and is provided with a register, *a*, for the purpose of examining the fire, or for the admission of air into the air-chamber. At one end of the shaft *b*, upon which the door is hung, is suspended a weight, *c*, the object of which is to counteract a spring, *d*, which, by its tension, through the means of two segmental toothed gears, *e*, the door B and the deflector C are opened and held in any desired position. A crank is attached to the end of the shaft or trunnion upon which the deflector is hung or hinged, and the other end of the spring is attached to a fastening, *f*, secured to the bottom of the door-frame. Thus, it will be seen by the joint operation of the spring and the weight, the door and the air-deflector are opened and closed or held in any desired position. At the bottom of the door frame or sill is located a latch or fastening, *g*, by which the door is held in position when closed. Any other device that will accomplish this purpose will answer.

The deflector C (and which forms one of the main features of my invention) is concave or escalped on the inner side, or side next the fire, and the outer side convex; or may be bent upward at a symmetrical curve at its bottom *h*, said bent end slightly projecting into the furnace, giving the air the proper direction for its general diffusion among the gases. As the deflector is raised or lowered, the air or gases are deflected in different directions, so that they will more intimately commingle with gases.

Another important feature of my inven-

tion is the pipe or nozzle I, provided with any well-known valve, *i*, by which the blast of air, steam, gases, or fluid is controlled. This pipe I may be connected to any fan-blower, steam-boiler, or fluid-reservoir from which any combustible may be supplied, or a nozzle composed of concentric pipes for the introduction of atmospheric air, steam, hydrogen, or any other combustible gases, by which they may be all simultaneously admitted into the chamber D, and through it into the furnace.

I will now refer to the chamber D, and the important part it serves in carrying out my invention. This chamber is formed by all the sides of the door-frame, and the door on the outside and the deflector C on the inside. When air alone is fed through the door, it is in a measure sufficiently heated for some furnaces; but where highly-heated air is required it is additionally heated in this chamber by the reflected heat from the fire; but when air-gases, steam, &c., are simultaneously fed, then the chamber D becomes a mixing-chamber, and the whole mass is fed to the furnace together.

The letter J represents stops for the deflector C to rest against. These stops are important when coal or any heavy fuel is fed through a hopper. The deflector in that case becomes a guide or chute for the even distribution of the fuel over the grate-surface, and at the same time serves as a deflector for the air. This deflector may be perforated, if desired, but works well, as it is shown.

It may be remarked that this door and its auxiliaries are all complete and connected to the door-frame, so that when the frame is inserted in the front of the furnace it is ready for operation. The frame being made of sheet iron, it takes up but little space, and may be fitted into any of the furnace-doors of ordinary construction without further change or alteration of the furnace front.

It may be further remarked that this door-frame chamber, and all as presented, may be applied to any of the door-apertures of the various furnaces now in use with very little cost, and, further, the bottom or sill may be used as a dead-plate or coking-chamber with beneficial results; and, furthermore, the esthetic effect of the fixture to the front of the furnace is good, and to which it forms a relief. Furnaces that are already provided with frames and dead-plate the fixture may be attached by tapping out a few holes in the face of the furnace, and the apertures fitted flatly up against said face, when it is ready for use, as may be seen at *k*, Fig. 1.

The grate-bars may be lower down than represented, or located where they would best subserve the purposes desired.

Weights with chain or with lever-crank, &c., may be substituted for the spring, and other modifications may be made without departing from the spirit of my invention.

Operation: When the door is to be opened the draft from the pipe may be partially shut off. The latch or door fastening is then depressed, when the door and deflector simultaneously fly open or upward by means of the tension of the spring. This spring is attached to the arm of the deflector by means of a crank, and to this same arm is attached a segment of a gear-wheel, which clutches into the teeth of a corresponding segment keyed on the arm of the door. Therefore, when the spring or weight pulls down the segment on the arm of the deflector it also pulls down the segment on the arm of the door, and thus the door and deflector rise together. A counterbalance weight is hung on the other end of the door-arm, which also assists the spring to open the door at a certain angle; but if this weight is hung vertically it will resist the spring and assist the door in shutting.

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

1. The combination of the door B, movable hinged or pivoted deflector C, and chamber D, operating in the manner and for the purpose set forth and described.

2. The combination of the door B, movable hinged or pivoted deflector C, and chamber D with the frame A, operating in the manner and for the purpose set forth and described.

3. The combination of the door, the deflector, chamber D, and the nozzle or pipe I, substantially in the manner described, and for the purpose set forth.

4. The combination of the door B, deflector C, spring *d*, cog-gear *e e*, with or without the weight *c*, whereby said door and deflectors are simultaneously opened in the manner and for the purpose set forth.

5. The combination in furnace-doors, of the door, its register and latch, chamber D, deflector C, pipe or nozzle I, all operating in the manner and for the purpose set forth.

6. The door-shaft and door, the deflector-shaft and deflector, the escalpe at its lower end, the cogs and spring-weights, and door-fastenings, combined with the chamber D, all operating in the manner and for the purpose described.

7. The combination of the door-frames A, door B, deflector C, and stops or rests J, whereby said deflector may be used for the double purpose of a coal-distributer and air-deflector, substantially in the manner and for the purpose set forth and described.

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

THOMAS REED BUTMAN.

Witnesses:
EMMA BUTMAN,
CADD W. TOWNSEND.