W. W. HUBBELL.

FURNACE-DOORS FOR STEAM-BOILERS.

No. 187,384. Patented Feb. 13, 1877.

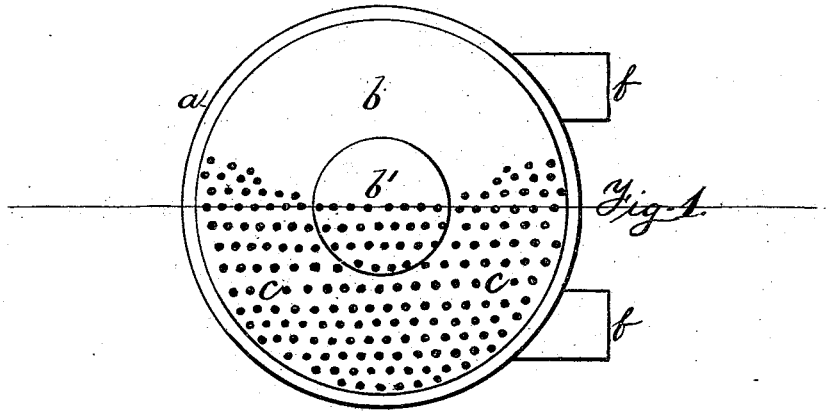

Fig. 1.

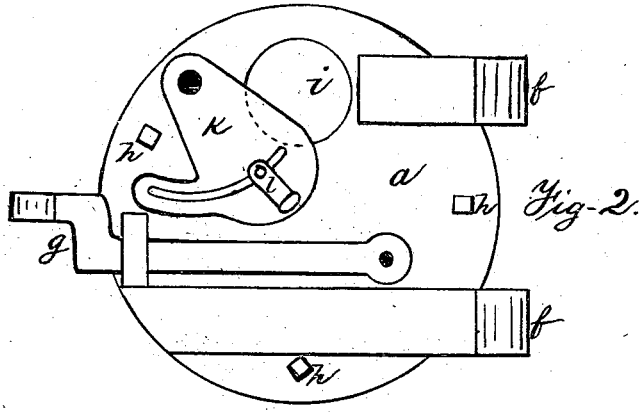

Fig. 2.

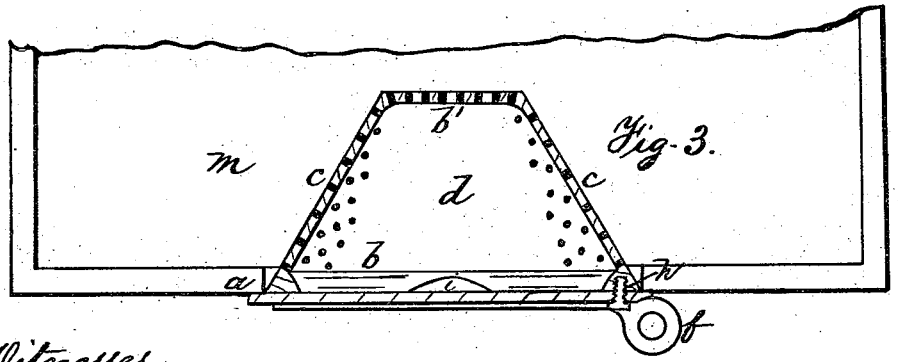

Fig. 3.

Witnesses.

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WILLIAM WHEELER HUBBELL, OF PHILADELPHIA, PENNSYLVANIA.

IMPROVEMENT IN FURNACE-DOORS FOR STEAM-BOILERS.

Specification forming part of Letters Patent No. **187,384**, dated February 13, 1877; application filed January 29, 1877.

To all whom it may concern:

Be it known that I, WILLIAM WHEELER HUBBELL, of Philadelphia, State of Pennsylvania, have invented an Improved Furnace-Door of Locomotive and other similar Steam-Boilers, of which the following is a specification:

The object of my invention is to consume the smoke and combustible gases which arise from the fuel in the furnace; and the nature of my invention to do this consists in constructing the furnace-door of locomotive and other similar steam-boilers wherein the draft is caused by the exhaust steam, with an air-chamber within the door, and an inner perforated jacket, extending within the furnace and outer air-receiving aperture, so as to admit, and for the purpose of admitting, air in jets, partly heated, through the door and into contact with the unconsumed gases in the front part of the furnace, immediately above the body of fuel, to speedily cause their complete combustion, and also consume the smoke, and thereby increase the generation of steam in the boiler, with the same or a less amount of fuel, and allow the exhaust-pipe nozzles to be enlarged, if desired; and the improvement be applicable to engine-boilers now in use, and be easily and cheaply renewed when burned out, without cutting or injury to the boiler.

The invention is applicable to any form of furnace-door opening, and is illustrated by the figures of the accompanying drawing, in which—

Figure 1 is a face view of the inside of the door. Fig. 2 is a face view of the outside of the door; and Fig. 3 is a horizontal section through the middle of the door and front of the furnace.

Like letters denote like parts.

The outer face of the door *a* consists of an iron plate or frame, with the usual hinges *f* and latch *g*, opening and shutting in the usual manner. To the inside face of this door-plate I secure, with rivets or screw-bolts *h*, an iron conical or tapering plate or jacket, *b*, projecting inwardly, and forming an air-chamber, *d*, between this inner and the outer door-plates within the furnace. The lower half of this conical plate is perforated with holes about a quarter of an inch in diameter, and four to each inch and a half square. The sides *c* of the conical plate face toward the sides of the furnace and downward, to direct the jets of air correspondingly, and the front face *b'* directs the jets of air forward, thus bringing the jets most speedily into contact with the gases and smoke as they rise from the fuel in the front portion of the furnace, and causing their complete combustion by the oxygen of the jets of air uniting with the carbon and other combustible gases of the fuel.

The upper half of the conical plate is left unperforated, as the best form of admitting the jets, though it may be slightly perforated in this conical projecting-inwardly construction of my door.

The conical plate projects about six or eight inches in the furnace. It may project more or a little less, but should extend in far enough to distribute the jets of air among the gases in the front part of the furnace.

The outer door-plate *a* has an opening, *i*, through it about four inches in diameter, over which is an adjustable slide-door, *k*, to admit more or less air through into the chamber *d*. This slide-door opens or closes the opening *i*, more or less, to regulate the quantity of air, and is fastened by a set-screw, *l*, and slot near the middle or at the end of the slide-door. In this chamber *d* thus projecting into the furnace *m* the air becomes partly heated, before it passes through the perforations in jets into the furnace among the gases.

By opening the door the perforations are exposed, to be easily cleaned or brushed off if clogged with dirt, and when burned the conical plate is easily removed and a new one secured in its place, or a new door supplied, without loss of the use of the locomotive.

The door-opening *i* is located opposite the upper unperforated portion of the conical chamber, so as to deflect the air downward through the perforations in the lower portion of the chamber; and the entire front end *d'* may be left unperforated in large doors, instead of the upper portion only, (shown in the drawing,) to increase the deflection downward. The sides of the chamber are best tapered conically, but may be either curved or be par-

allel, or be cylindrical, and always projecting into the furnace and perforated, to distribute the air toward the sides of the furnace.

These modifications are only variations I suggest in the form of my invention. The diameter of the chamber must diminish forward less than the door-frame opening, to allow the door with its projecting chamber to open.

The partial vacuum caused by the exhaust steam causes the air to flow through it and operate as described.

The conical plate may be either cast-iron, or wrought-iron, or steel, and may be cast in one piece with the door-frame.

I claim as my invention—

1. The furnace-door for locomotive or similar steam-boilers, consisting of the conical or tapering perforated plate *b*, projecting into the furnace *m*, air-chamber *d*, and plate *a*, with opening *i*, constructed and operating substantially as described.

2. The door provided with the opening *i*, located opposite the unperforated portion of the conical chamber *d*, projecting into the furnace, and perforated in the lower half so as to deflect the air downward and sidewise through the said perforations in the chamber, as described.

3. The conical perforated plate *b*, attached to the furnace-door frame or plate, projecting into and forming perforated chamber-sides in the furnace *m*, for the purpose and operating as described.

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Witnesses:

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