H. A. LAUGHLIN.

FURNACE DOORS.

No. 184,473. Patented Nov. 21, 1876.

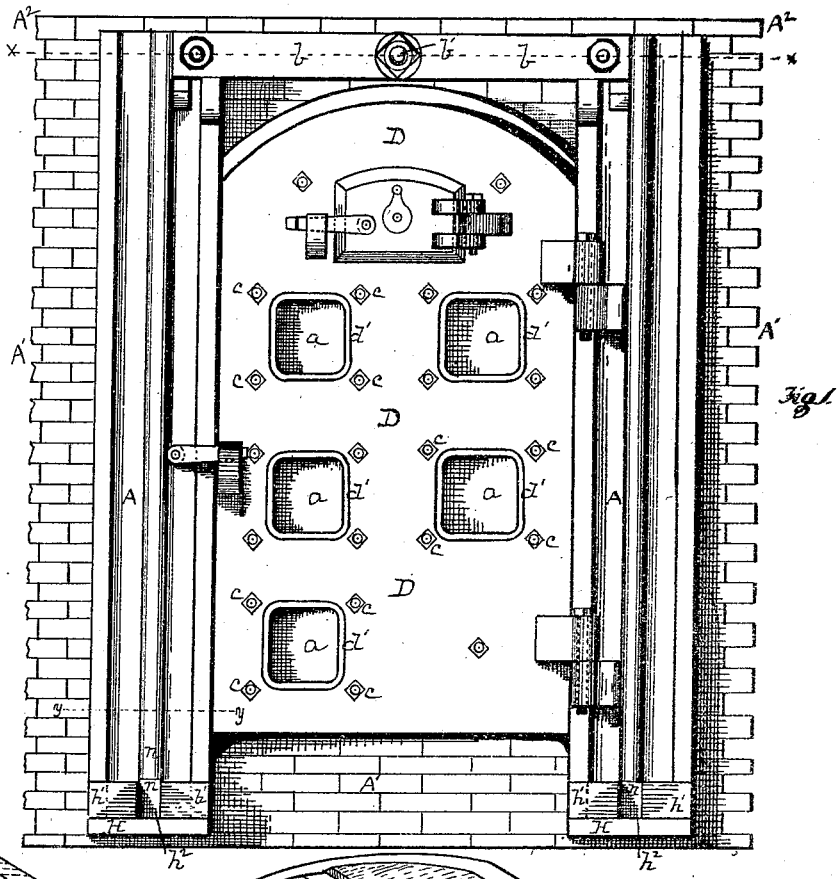

Fig 1

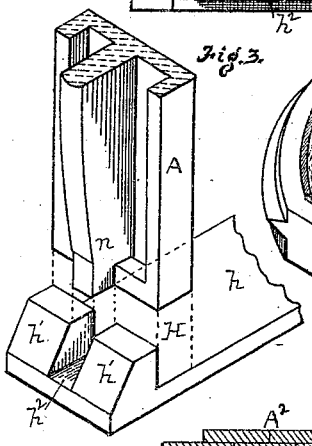

Fig. 3.

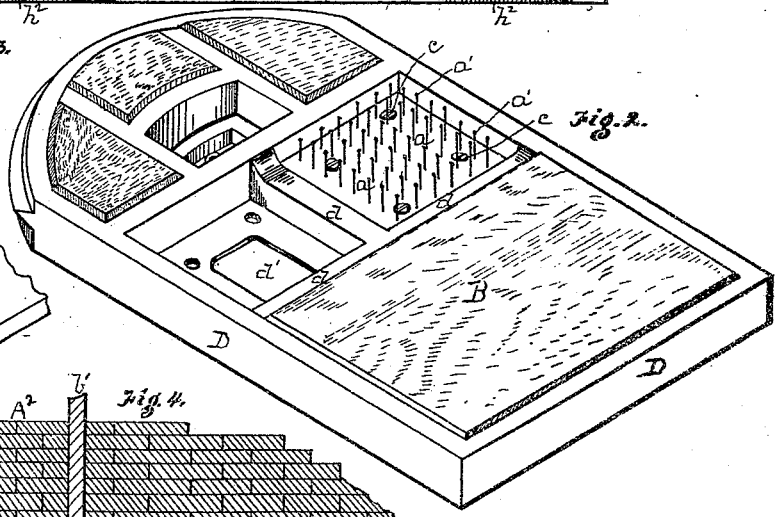

Fig. 2.

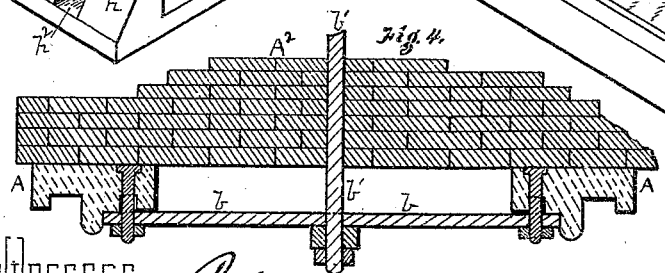

Fig. 4.

Witnesses.

C. Parker.

Inventor.

Henry A. Laughlin
by George H. Christy
his Atty.

UNITED STATES PATENT OFFICE.

HENRY A. LAUGHLIN, OF PITTSBURG, PENNSYLVANIA.

IMPROVEMENT IN FURNACE-DOORS.

Specification forming part of Letters Patent No. **184,473**, dated November 21, 1876; application filed September 19, 1876.

To all whom it may concern:

Be it known that I, HENRY A. LAUGHLIN, of Pittsburg, county of Allegheny, State of Pennsylvania, have invented or discovered a new and useful Improvement in Kiln, Coke, Oven, and Furnace Doors; and I do hereby declare the following to be a full, clear, concise, and exact description thereof, reference being had to the accompanying drawing, making a part of this specification, in which—like letters indicating like parts—

Figure 1 is a front outside elevation of my improved door and door-fastenings as applied to a coke-oven. Fig. 2 is a perspective view of the inner face of the door, but with one of the panel-plates and a portion of the filling or lining omitted. Fig. 3 is a detached perspective view of the supporting-shoe of the side frame, and also of the lower end of one of the bars of said frame; and Fig. 4 is a sectional view through *x x*, Fig. 1.

In doors for furnaces, coke-ovens, kilns, &c., where a high heat is used or developed, considerable loss and expense are incurred from the burning out and breaking down of linings and the breakage of doors and door-frame.

I have constructed a door, door-frame, and fastenings adapted to lessen materially the loss and expense otherwise incurred.

The stile or body D of the door is made of cast-iron in the usual way, except that the inner side is divided by ribs *d* into any desirable number of panels, and at or about the center of each panel is an opening, *d'*. But the ribs *d*, while made high enough and heavy enough to secure for the door the desired strength, are preferably made so that the lining or filling B, when applied, will cover and protect them as against the heat. For each panel so made I cast a panel-plate, *a*, and arrange in the mold, so as to be secured thereto in the operation of casting, a series of studs or pins, *a'*, preferably headed at their outer ends, and so arranged, by preference, that the filling or lining B, when applied, will cover and protect them as before. Common nails of the proper length may be used for this purpose. One of these plates is then placed in each panel, and there secured by rivets or bolts and nuts *c*, after which the door is laid down, inner side up, and a plastic mixture or composition, B, composed of any suitable materials adapted to resist the action of a high heat, is filled in onto the plates *a* between, onto, and around the studs *a'*, and preferably over the ribs *d*. After this filling is hardened or solidified in the usual or any suitable way the door is ready for use.

With the panel-openings *d'* the metal forming the body of the door is less liable to break by expansion and contraction than would otherwise be the case. When it does crack in any part it is more easily repaired than with the ordinary construction. The door, for this purpose, is removed from its hangings, the filling B is cut along the lines of the ribs *d*, adjacent to the place injured, the bolts or rivets *c* loosened from the outside, and the necessary panel-plates *a* removed. By drilling and riveting, the injured part can be strengthened by an angle or T iron splice, the parts replaced, and the joints of the filling refilled.

By the use of studs *a'* the filling is more perfectly supported as against burning out or breaking down; and, if it burns away in spots, it may be refilled, or a panel-plate may be taken out and a new one inserted and filled, as before.

My invention also includes the fastenings of the door-frame. This frame commonly consists of two heavy-ribbed cast-iron uprights, A A, secured to the brick-work A^1 by cross-tie bolts, which extend through the floor and roof of the furnace, kiln, or oven, and through the opposite wall. The expansion and contraction of the heated walls, or the bulging of the walls, sometimes results in the breaking of these uprights A A; or, the roof or floor burning away, the tie-rods become weakened and break, with a great resulting expense in rebuilding or repairing. For the lower tie-rods I substitute a shoe, H, the inner end *h* of which is built securely into the brick-work. The outer projecting end has lugs h^1 h^1, inside of which the lower end of the upright A is placed. Between the lugs h^1 is a recess, h^2, in which is seated a rib, *n*, cast on the upright A. Thus secured, the foot of the upright A is held against displacement either outwardly or laterally. In case of excessive strain the inner end *h* of the shoe will give enough to prevent the breakage of the upright, but will

still have enough of a bearing on the masonry to keep the upright A in place. If the masonry gives way, it is easily and quickly rebuilt. The upper ends of the uprights A are connected by a comparatively light cross-bar, *b*, and one or more tie-rods, *b'*, pass through this cross-bar, and through or over the roof A^2. Any excessive strain will then result merely in breaking the cross-bar, which is easily and cheaply replaced.

Various modifications may be made in the devices described without a substantial departure from the scope of the invention. For example, studs on the plate *a* may be cast on, or ribs may be substituted for the studs as the mechanical equivalent thereof. Also, the shape of the interlocking parts of the shoe H and the foot of the upright A may be varied, provided only the upright be supported and held thereby as against outward and lateral displacement. Also, broken bricks or other suitable refractory material may be filled in along with the plastic portion of the filling, the latter being filled in, around, and under the broken bricks in like manner as around the studs.

I claim herein as my invention—

1. A cast-iron door-body having openings *d'* therein, in combination with removable panel-plates *a*, covering the openings, substantially as set forth.

2. A series of studded panel-plates, *a*, in combination with a door-body, having transverse ribs *d* and openings *d'*, substantially as set forth.

3. A plastic filling, B, in combination with studded plates *a* and paneled door-body, substantially as set forth.

4. A shoe, H, in combination with upright A, the two interlocking, substantially as set forth.

5. The uprights A, connected at their upper ends by cross-bar *b*, in combination with one or more tie-rods passing through the cross-bar, substantially as set forth.

In testimony whereof I have hereunto set my hand.

HENRY A. LAUGHLIN.

Witnesses:

GEORGE C. BURGWIN,

GEORGE H. CHRISTY.