

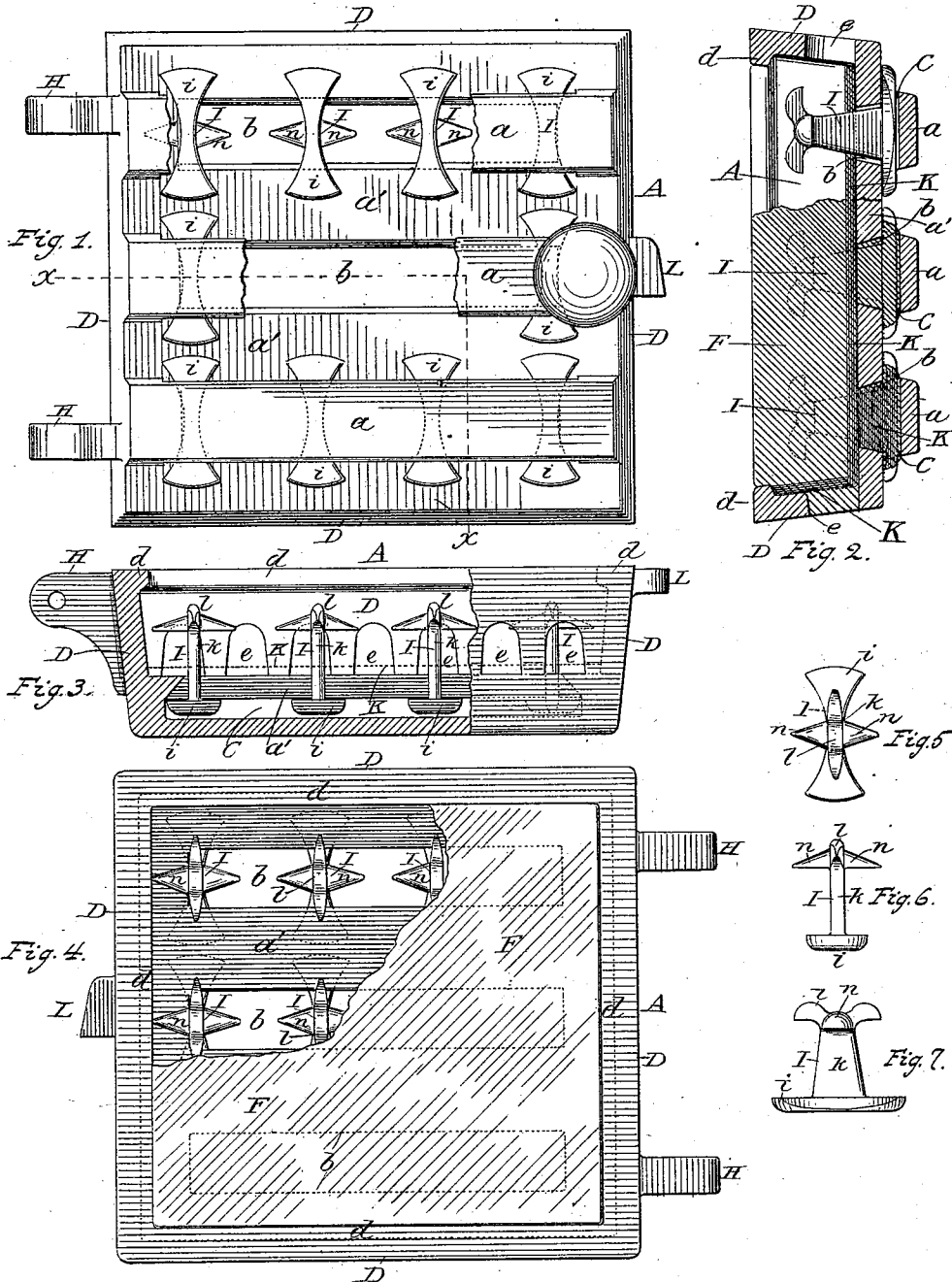
(No Model.)

3 Sheets—Sheet 1.

J. FEA.
FURNACE DOOR AND BOILER FRONT.

No. 471,667.

Patented Mar. 29, 1892.



Witnesses:
W. Davidson Jones
C. M. Dillon

Inventor:
John FEA

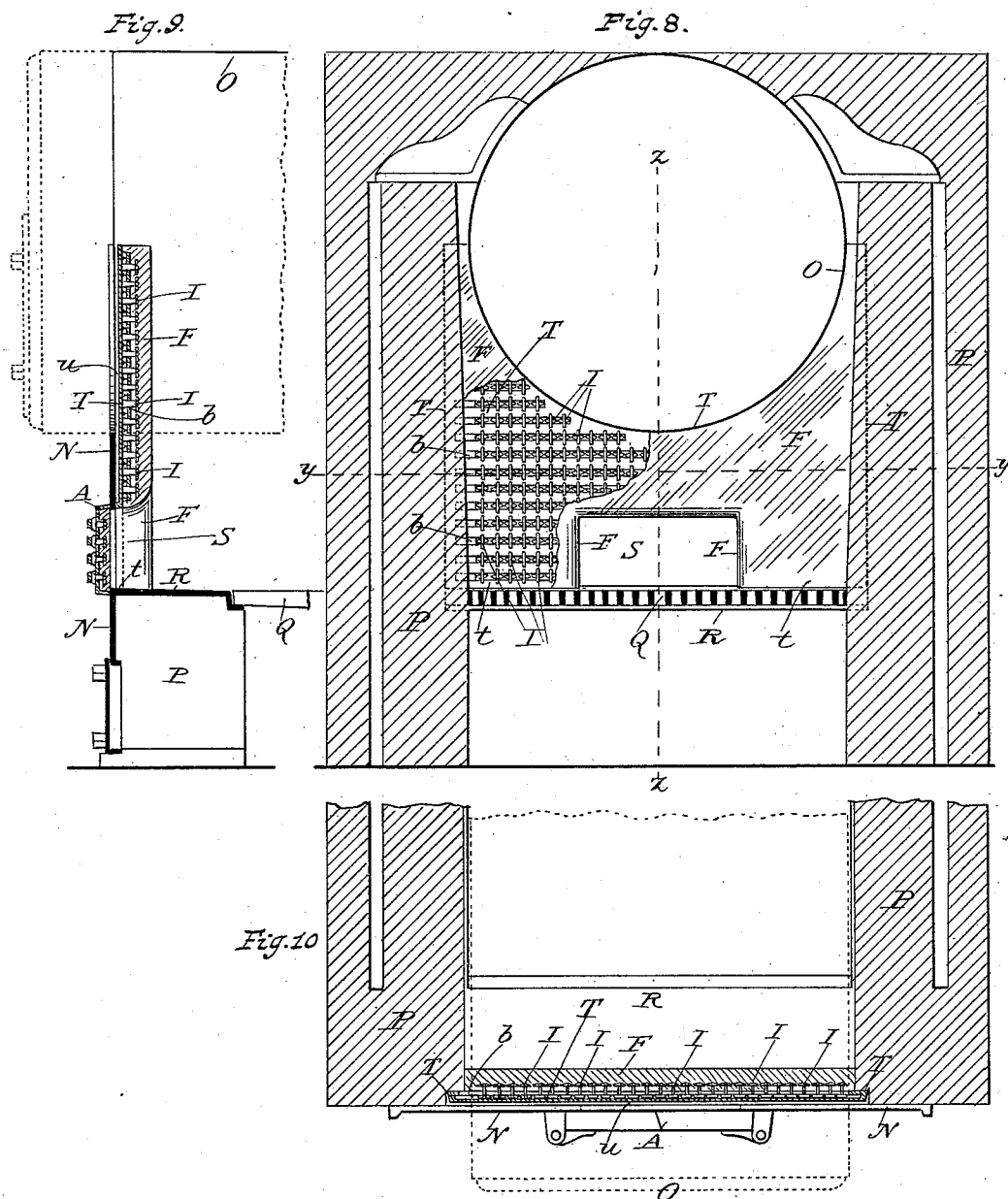
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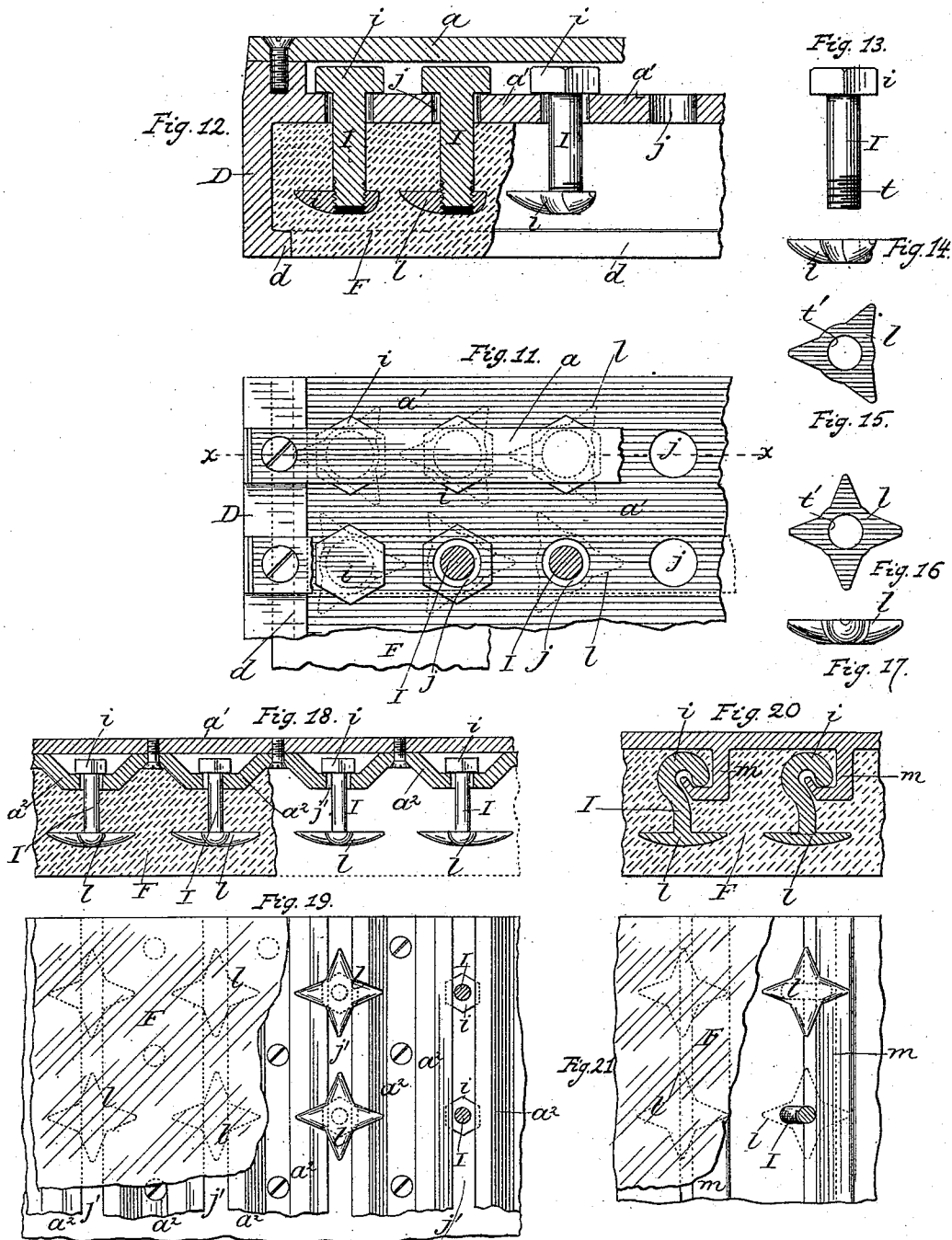
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Witnesses.
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UNITED STATES PATENT OFFICE.

JOHN FEA, OF AMSTERDAM, NEW YORK.

FURNACE-DOOR AND BOILER-FRONT.

SPECIFICATION forming part of Letters Patent No. 471,667, dated March 29, 1892.

Application filed August 26, 1891. Serial No. 403,821. (No model.)

To all whom it may concern:

Be it known that I, JOHN FEA, a citizen of the United States, residing at Amsterdam, in the county of Montgomery and State of New York, have invented certain new and useful Improvements in Furnace-Doors and Boiler-Fronts; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to improvements in the construction of doors and fronts for steam-boiler furnaces; and it consists in a novel and effective means of securing and holding refractory lining material in place, and also in the general construction and combination of parts, as hereinafter more fully described, to preserve and render the parts more durable and prevent loss of heat by radiation.

It is well-known that fire-brick and cement linings when ruptured very soon crumble and break away by the expansive action of heat, and in the use of rigidly-secured studs or flanges on cast-iron plates for supporting such linings the heat is conducted through the lining material and communicated to the metal plates, which warp and force the lining material out of place. Consequently there is great loss of heat by radiation and vexatious delays in "shutting down" to make repairs.

Referring to the accompanying drawings, Figure 1 is a view of the front of a furnace-door embodying my improvements, with a portion broken away to show mortise-slots *b*; Fig. 2, a transverse section on line *x x* in Fig. 1, showing a portion of the lining material *F* in position and devices for securing and holding the same in place; Fig. 3, a longitudinal section on line *x x*, Fig. 1, showing perforations *e* in the rim *D*, a part of which is broken away to show the position of the anchors *I*. Fig. 4 is a rear view of the door partially filled and showing mortises *b* and the anchor-holding devices *I* in place. Fig. 5 is a view of anchors *I* from the conical head. Fig. 6 is a vertical elevation of Fig. 5. Fig. 7 is a longitudinal vertical elevation of Fig. 5. Fig. 8 is a transverse sectional elevation of a steam-boiler furnace, showing the mortised plate *T* embedded in the walls *P* and provided with a series of anchors *I*, partially covered with re-

fractory material *F*. Fig. 9 is a vertical section of Fig. 8 on the line *z z* in Fig. 8, and Fig. 10 is a transverse section at *y y* in Fig. 8. Fig. 11 is a sectional plan of a modification of my invention. Fig. 12 is a sectional elevation on the line *x x* in Fig. 11. Fig. 13 is a modification of my anchor having a threaded shank *I*. Fig. 14 is the anchor fluke-piece *l*. Fig. 15 is a detached plan. Fig. 16 is a modified plan of the anchor fluke-piece *l*. Fig. 17 is a horizontal view of Fig. 16. Fig. 18 is a sectional view of Fig. 19, showing a modification. Fig. 19 is an under view of Fig. 18. Fig. 20 is a sectional view of a modified form of anchors and supports, and Fig. 21 is a view of under side of Fig. 20.

A (see Fig. 1) represents a rectangular fire-door, but may be made oval, cylindrical, or of any other convenient shape or construction to conform to the shape of the door-opening in a furnace-front, my special improvements being adapted to any form of door-opening. I show the door without a register for the passage of air to the furnace, but provided with the usual hinges or lugs *H* and catch *L*. I construct the body of the door *A* of cast-iron or other suitable material with a rim *D*, having a series of perforations *e* and a flange *d* extending entirely around the rim *D*. (See Figs. 2, 3, and 4.) The outer main body of the door *A* has parallel slots or mortises *b*, which are covered with suspended parallel hood pieces or ribs *a*. A series of parallel openings or apertures *C* between hood-pieces *a* and mortises *b* are adapted to loosely admit the extended ends of fan-shaped stock-piece *i* of anchors *I*. The general shape of the anchors *I* is shown in detail in Figs. 5, 6, and 7 and consists of a flat conical-crowned bar or shank *k*, having at its broadest extremity a fan-shaped stock-piece *i*, adapted when in a parallel position to the mortises *b* to easily pass through the said mortises until they contact against the hood-pieces *a*, upon which they may be turned or revolved one-quarter around, so they may be secured in position substantially as shown in Figs. 1, 2, 3, 4, 8, 9, and 10 of the drawings. The conical extremity of the anchor *I* is provided with transverse barbs or spurs *n*, and at right angles thereto are attached the flukes or wings *l*, all preferably made of cast-iron. These

interchangeable anchor-pieces are placed at suitable distances apart in the longitudinal mortises or slots *b* and are then ready to receive the "stuffing," which consists of a flexible non-conductive fibrous material K, placed in the mortises *b* around the stock end of shank *k* and around the arms *i*, so as to fill the mortise-spaces *b* and apertures C, not occupied by the arms *i*, thereby forming an elastic gasket between the arms *i* and plates *a'*, and a layer of the same material is extended around the shanks *k* and over the inner surface of the rim D and held in place by the flange *d*. (See Fig. 2.) A coating of plastic fire-resisting cement F is then packed around and over the flukes *l* and spurs *n*, so as to completely fill the hollow space inclosed by the rim D, and have the flukes *l* and the spurs *n* substantially and wholly embedded within the body of the plastic material F. After the cement F is hardened or solidified into a homogeneous body it is retained in place intact by means of the adjustable anchors I.

The variable position of the particles composing the solidified mass of cement F when subjected to frequent and extreme changes of temperature, in conjunction with the comparatively cool exterior of the door A, is compensated for by a corresponding vertical and lateral movement of the shank *k*, arms *i*, and flexible fibrous material K in the mortises *b*. Therefore fracture of the cement F is prevented and the durability of the same enhanced. The flexible fibrous material K acts as a cushion between the hardened mass of cement F and the metal of the door A, and is a safeguard against fracture of any of the parts from shock of the impinging flange *d* against the front N as it receives the recoil of the hardened mass when the door is closed suddenly.

In Fig. 2 the flexible fibrous material K is shown dovetailed into the slots or mortises *b*, and the application of the same around the shanks *k* and arms *i* acts to preserve the equilibrium of the same before and after the cement F is applied, but not to that extent as to interfere with a free movement of each with the other, or independently. The non-conductive perforations *e* in rim D tend to protect the door A from heat communicated to flange *d* and prevent unequal expansion of the rim.

In Fig. 8 is shown the application of my invention to the inside lining of the front plate N of a steam-boiler furnace, wherein O is the boiler, P the walls, Q the grates, R the dead-plate, and S the fire-door opening. A slotted yoke-plate T, having legs *t* and provided with the door-opening S and resting on the dead-plate R and vertically supported in the walls P, is provided with a series of anchors I, around which the flexible fibrous material is packed and the plastic fire-cement F plastered over, so as to completely cover the anchors, as hereinbefore more fully described.

In Figs. 9 and 10 is shown an air-space *u*

between plate N and the auxiliary plate T, for the purpose of preventing radiation of heat.

I will here observe that I have shown and described a specific manner of securing the anchors to the frame or shell of the door. However, this specific construction of the shell or frame of the door may be materially changed without changing the nature of my invention, as the same principles are involved and shown in Figs. 11 to 21, inclusive, of the drawings, which are modifications of that part of my invention—to wit, securing the independent adjustable anchors in such manner that they may move in any direction as the green mass of fire-resisting material dries and shrinks, thereby preventing breakage of the anchors or refractory fire-lining, as it is obvious that with stationary anchors one or the other must, as a natural result, be broken or injured by the process of drying.

I will here remark that I can embody the radical principles of my invention with a door having a full and closed front, as shown in Figs. 11, 12, and 19 of the drawings.

I have also shown and described a specific form of anchor. These also may be modified as to form without changing the nature of my invention, as the special and generic principle of my invention consists in the construction and use of adjustable independent removable anchors. This I am not aware has heretofore been accomplished.

I show this application as a lining for the front plate of a projecting steam-boiler. It may also be used for arching over the fire-door opening and in rear of the boiler over the flues without changing the nature of my invention.

Having fully described my invention, what I claim, and desire to secure by Letters Patent, is—

1. A furnace-door constructed of a shell or frame provided with a series of mortises and a series of hood-pieces and adapted to receive and support therein a series of anchors, all as shown, described, and for the purposes specified.

2. A furnace-door constructed of a shell or frame provided with a series of mortises and a series of hood-pieces, combined with a series of anchors and adapted to be secured in said mortises, all substantially as and for the purposes set forth.

3. In combination with a shell or frame of a furnace-door, removable anchors adapted to secure and hold in position fire-resisting material, for the purposes described.

4. In combination with a shell or frame of a furnace-door, provided with a series of mortises, a series of hood-pieces, an inwardly-extending flange *d*, and independent removable anchors adapted to secure and hold in position fire-resisting material, for the purposes described.

5. A furnace-door constructed of a shell or frame, as described, provided with a series of mortises, a series of hood-pieces, and a series

of perforations *e* and adapted to receive and support therein a series of independent removable anchors, all as shown and described, and for the purposes specified.

5 6. A furnace-door constructed of a shell or frame, as described, provided with a series of mortises and a series of hood-pieces, combined with a series of independent removable anchors secured therein and containing a packing
10 of fibrous material and a fire-resisting material or cement, all substantially as and for the purposes described and set forth.

15 7. A furnace-door constructed of a shell or frame, as described, provided with a series of mortises and a series of hood-pieces, combined with a series of independent removable anchors secured therein and a filling of fire-resisting cement or material, all substantially as and for the purposes set forth and described.

20 8. In combination with the front plate N of

the boiler O, the mortises *b*, the removable anchors I, a stuffing of fibrous material, and a fire-resisting material, all as described and set forth.

9. In combination with the front plate N, a 25 series of mortises *b*, a series of independent removable anchors I, and a fire-resisting material F, all constructed and operating as and for the purposes shown and set forth.

10. The combination of a door-frame with 30 independent adjustable anchors and a refractory fire-resisting material, for the purposes set forth.

In witness whereof I hereunto subscribe my name and affix my seal this the 24th day of 35 August, 1891.

JOHN FEA. [L. S.]

Witnesses:

W. DAVIDSON JONES,
C. N. TILTON.