(No Model.)

2 Sheets—Sheet 1.

J. H. NICHOLSON.

FURNACE.

No. 547,586. Patented Oct. 8, 1895.

FIG. 1.

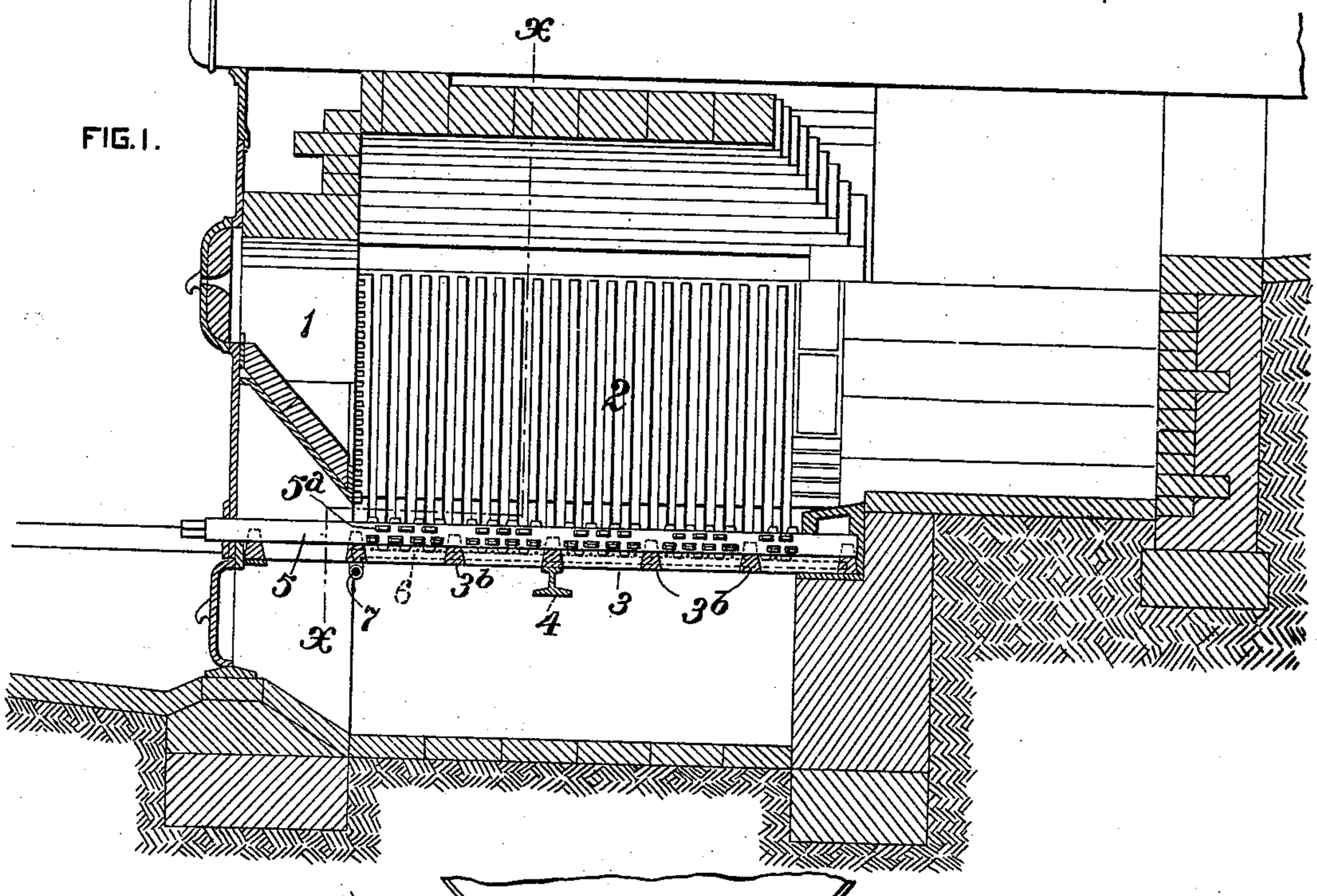
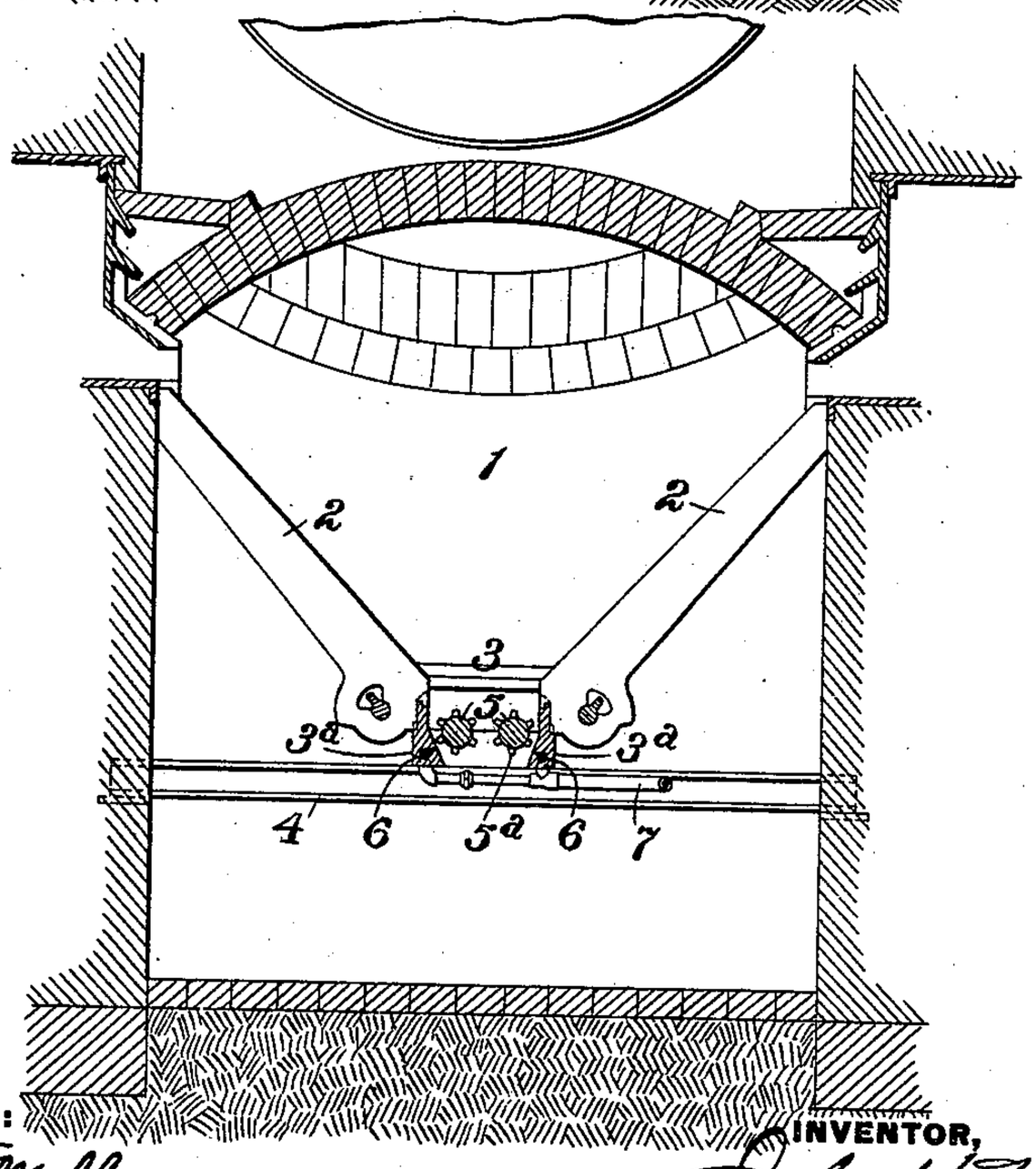


FIG. 2.



WITNESSES:

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F. E. Gaither

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Att'y.

(No Model.) 2 Sheets—Sheet 2.

J. H. NICHOLSON.

FURNACE.

No. 547,586. Patented Oct. 8, 1895.

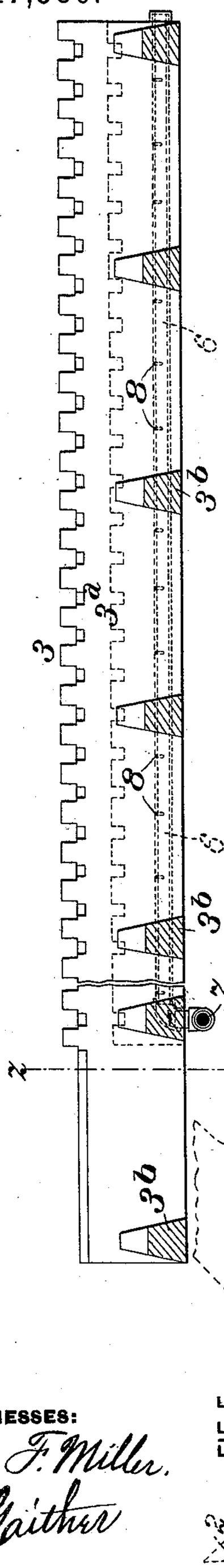

FIG. 4.

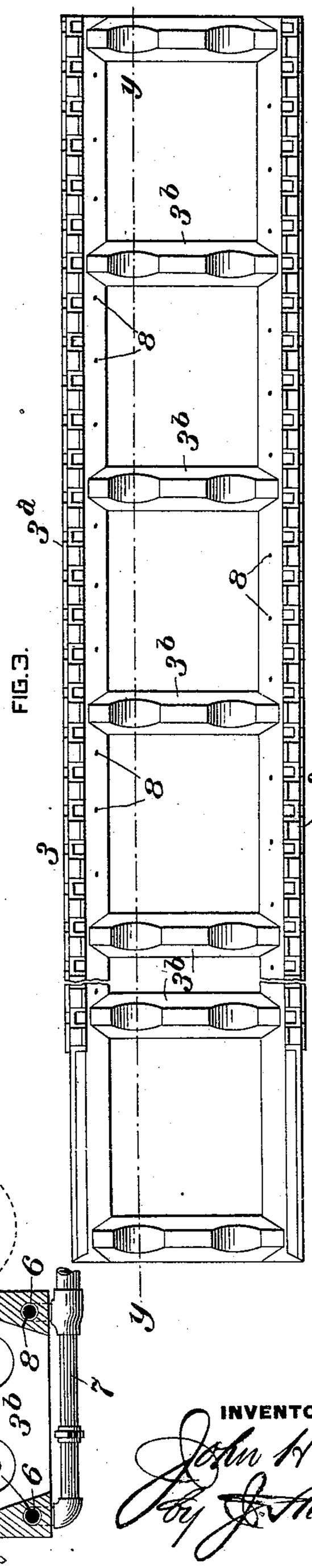

FIG. 3.

FIG. 5.

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UNITED STATES PATENT OFFICE.

JOHN H. NICHOLSON, OF PITTSBURG, PENNSYLVANIA.

FURNACE.

SPECIFICATION forming part of Letters Patent No. 547,586, dated October 8, 1895.

Application filed July 10, 1895. Serial No. 555,464. (No model.)

To all whom it may concern:

Be it known that I, JOHN H. NICHOLSON, a citizen of the United States, residing at Pittsburg, in the county of Allegheny and State of Pennsylvania, have invented or discovered a certain new and useful Improvement in Furnaces, of which improvement the following is a specification.

My improvement relates to the class of steam-boiler and other furnaces wherein opposite banks of grate-bars are inclined transversely in substantially V form, a clinker bar or bars being interposed between their lower ends and extending from the front to the back of the furnace-chamber.

The object of my invention is to provide a substantial support for the lower ends of the grate-bars in constructions of such character and one that is not liable to be affected by such high degree of heat as would cause the ordinary support to sag down, thereby disarranging the grate-bars and rendering the apparatus inoperative.

A further object of my invention is to provide means for keeping the clinker-bars cool and in fit condition for breaking up clinker, and whereby the clinker may be rendered hard and brittle, so as to be easily broken up as required.

The improvement claimed is hereinafter fully set forth.

In the accompanying drawings, Figure 1 is a vertical longitudinal section through a steam-boiler furnace in which my invention is applied; Fig. 2, a vertical transverse section on the line *x x* of Fig. 1; Fig. 3, a plan view, on an enlarged scale, of the grate-bearer; Fig. 4, a vertical longitudinal section through the grate-bearer, taken on the line *y y* of Fig. 3; and Fig. 5, a cross-section on the line *z z* of Fig. 4, the lower ends of the grate-bars being shown in dotted lines.

My invention is herein shown as applied in a steam-boiler furnace 1, provided with grate-bars 2, inclined downwardly from its sides to points near its longitudinal center line and slightly above the ash-pit. The lower ends of the grate-bars 2 rest in notches formed upon the upper edges of a rectangular grate-bearer 3, which consists of two longitudinal bars 3^a, extending from the front to the rear of the furnace and connected at regular intervals by transverse bars 3^b, formed integral therewith. The grate-bearer 3 is supported at its ends on the front and rear walls of the furnace, respectively, and at its center by a transverse T-rail 4, upon which it rests, said rail extending across the furnace and resting in the side walls thereof. Sufficient space is left between the longitudinal bars 3^a of the grate-bearer 3 for the introduction of two longitudinal rotary clinker-bars 5, which rest upon bearings formed upon the upper edges of the transverse bars 3^b and extend through the front of the furnace a sufficient distance to be rotated by hand or by any suitable mechanism. The rotary clinker-bars 5 are provided with short radial projections or teats 5^a for the purpose of breaking and grinding up the clinker which accumulates at the bottom of the grate. The construction so far as above described is one which is known in practice and is not in and of itself claimed as of my present invention. The rotary clinker-bars 5 being located at the bottom of the V-shaped grate the burning fuel slides down toward them, and it will be obvious that the fuel will tend to choke and form clinkers between the rotary clinker-bars and the lower ends of the grate-bars 2. In practice it has been found that the clinker forms a bridge between the lower ends of the opposite grate-bars, due to the rotary clinker-bars grinding away the lower part of the accumulated clinker, and when this bridge of clinker becomes too great to sustain its own weight it will fall down in a mass between the rotary clinker-bars, and being of too tough a nature to be readily ground will cause them to become so clogged up or broken as to render the apparatus inoperative. To overcome this objection it has been customary to locate a steam pipe or pipes either at some distance below or on either side of the grate-bearer and to cause jets of live or exhaust steam to issue therefrom and impinge upon the accumulated mass of clinker for the purpose of rendering it brittle and causing it to crumble and fall to pieces to be broken up by the rotary clinker-bars. This practice has been found to be objectionable, as owing to the location of the steam-jets the steam issuing therefrom will act as an injector and tend to draw a considerable quantity of air with it

into the lower end of the V-shaped grate, thereby greatly promoting combustion and causing such an intense degree of heat at this point as will cause the clinker-bars to become highly heated and liable to be twisted and the grate-bearer to become heated to such a degree that it will sag down under the weight of the grate-bars and allow them to drop out of place.

In the practice of my invention pipes 6 are cast in the lower portions of the longitudinal bars 3^a of the grate-bearer 3 of a length approximate to the length of the grate, said pipes being connected to a main supply-pipe 7 for the admission of live or exhaust steam, which pipe is located below the grate-bearer and connected to any suitable source of supply. Holes or perforations 8 are drilled at intervals through the longitudinal bars 3^a into the pipes 6 at such an angle as will cause the jets of steam issuing therefrom to impinge upon the rotary clinker-bars 5 and keep them at a temperature sufficiently low to prevent any warping or twisting thereof. A sufficient quantity of steam will pass around the clinker-bars to act upon the clinker in the bottom of the grate, rendering it brittle and causing it to crumble and fall upon the rotary clinker-bars, where it is ground up and then dropped into the ash-pit. The steam passing through the pipes 6, cast in the longitudinal bars 3^a, keeps said bars at a temperature sufficiently low to prevent them from sagging down, as in the ordinary constructions, where the grate-bearer is made solid and is subjected to intense heat. Owing to the close proximity of the perforations 8 to the clinker-bars 5, too much air will not be drawn into the lower part of the grate, thereby preventing the objection of unduly high heat at this point, which, as before stated, has been found to exist when the steam-jets are located at some distance from the bottom of the grate.

While I have shown and described a grate-bearer having a steam-pipe cast therein, it will be obvious that the longitudinal bars 3^a may be cast hollow without departure from the spirit of my invention, although the form shown is that which I deem preferable in practice. It will also be obvious that my improved grate-bearer may be used in connection with any number of rotary clinker-bars or in constructions where no clinker-bars are used.

I claim as my invention and desire to secure by Letters Patent—

1. In a furnace, the combination, substantially as set forth, of a hollow or tubular grate bearer, provided with a series of discharge openings adjacent to the space in which clinker tends to collect, and means for supplying steam thereto, said steam being discharged as closely as practicable to the mass of clinker, for the purpose of cooling the grate bearer and rendering the clinker brittle.

2. In a furnace, the combination, substantially as set forth, of a grate bearer, a steam pipe extending longitudinally therein, and provided with openings for discharging steam therefrom into the bottom of the furnace, adjacent to the space in which clinker tends to collect therein, and means for supplying steam thereto for cooling the grate bearer and rendering the clinker brittle.

3. In a furnace, the combination, substantially as set forth, of a grate bearer having a longitudinal steam pipe or passage in each of its sides, openings for discharging steam from each of said pipes or passages in the direction of the longitudinal central plane of the furnace, and adjacent to the space in which clinker tends to collect therein, and means for supplying steam to each of said pipes or passages.

4. In a furnace, the combination, substantially as set forth, of a grate bearer, having a longitudinal steam pipe or passage in each of its sides provided with openings for discharging steam in the direction of the longitudinal, central plane of the furnace, one or more clinker bars located between said discharge openings, and means for supplying steam to said pipes or passages.

In testimony whereof I have hereunto set my hand.

JOHN H. NICHOLSON.

Witnesses:
J. SNOWDEN BELL,
F. E. GAITHER.