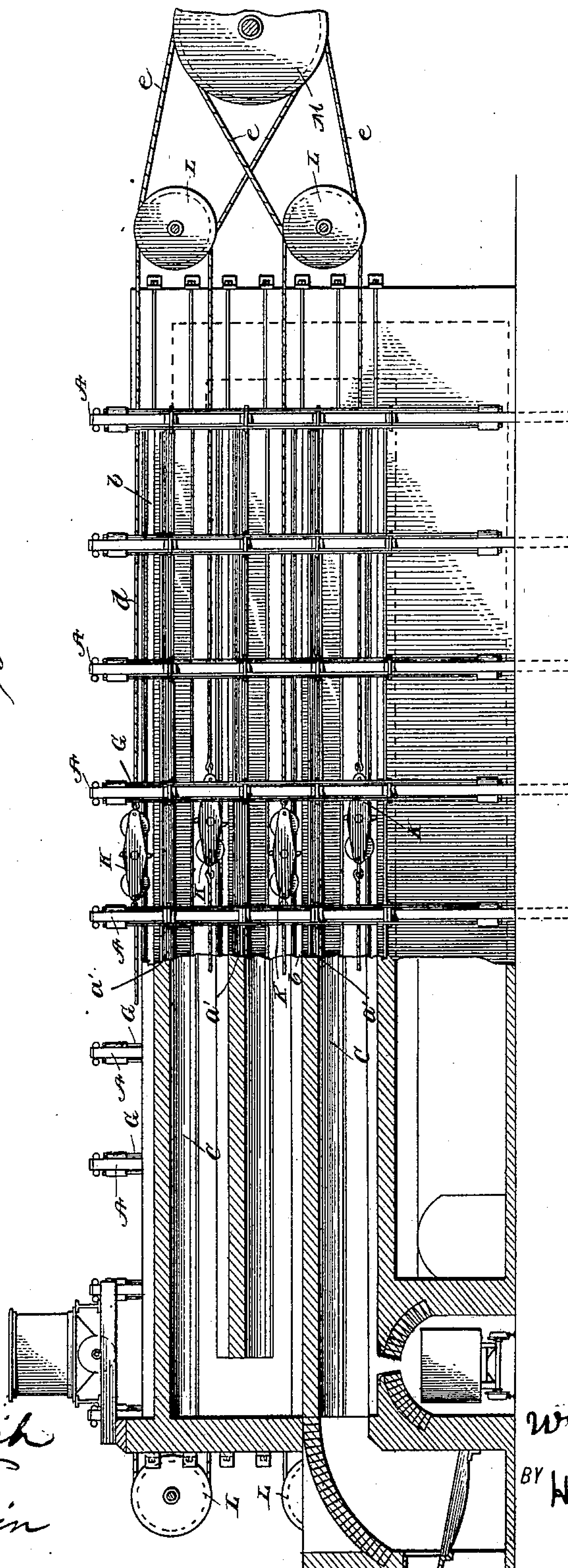
No. 626,632. Patented June 6, 1899.

W. E. ROBERTS.

HEATING OR ROASTING FURNACE.

(Application filed Dec. 28, 1895.)

(No Model.) 2 Sheets—Sheet I.



WITNESSES:

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Fig. 2.

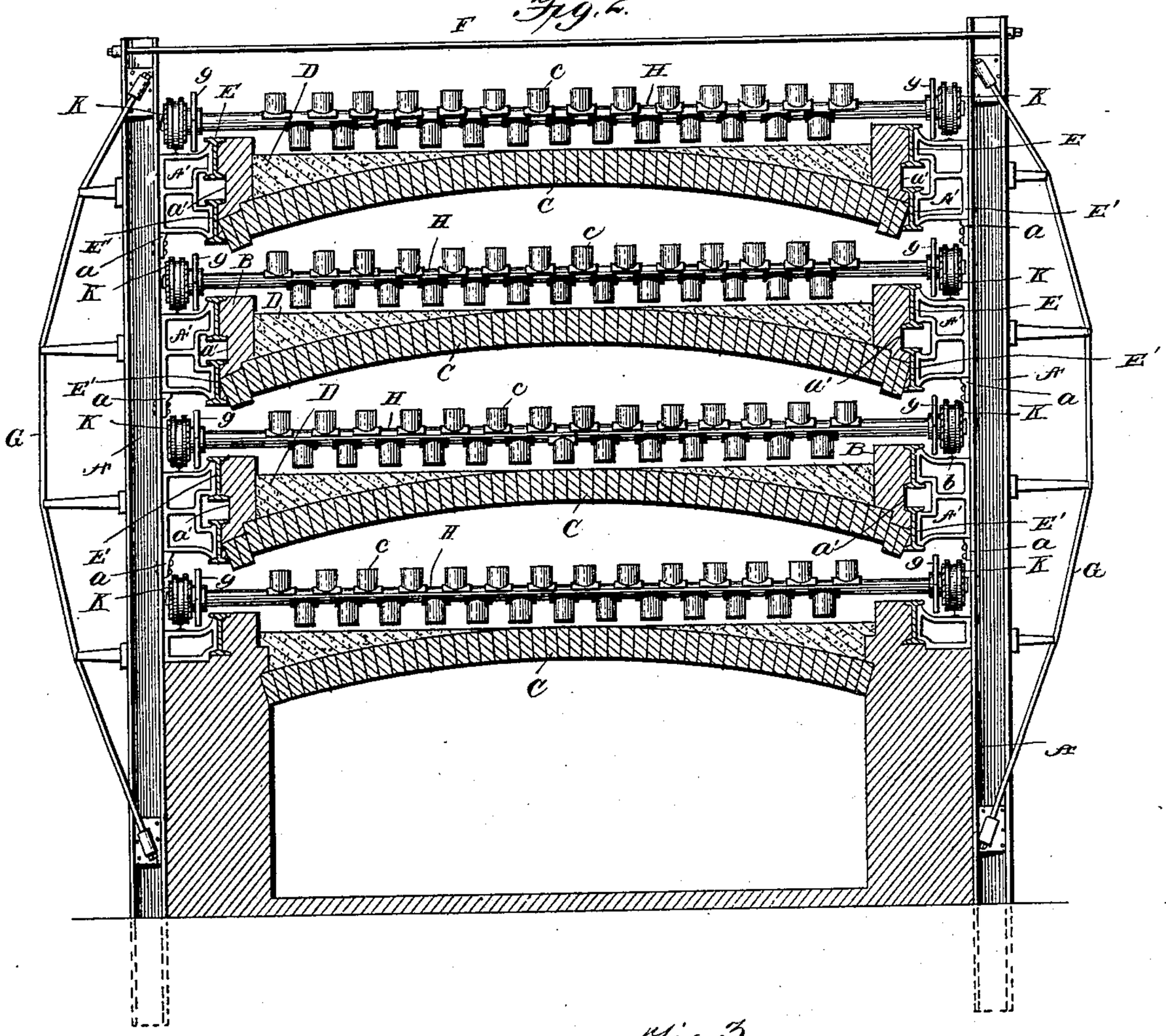


Fig. 3.

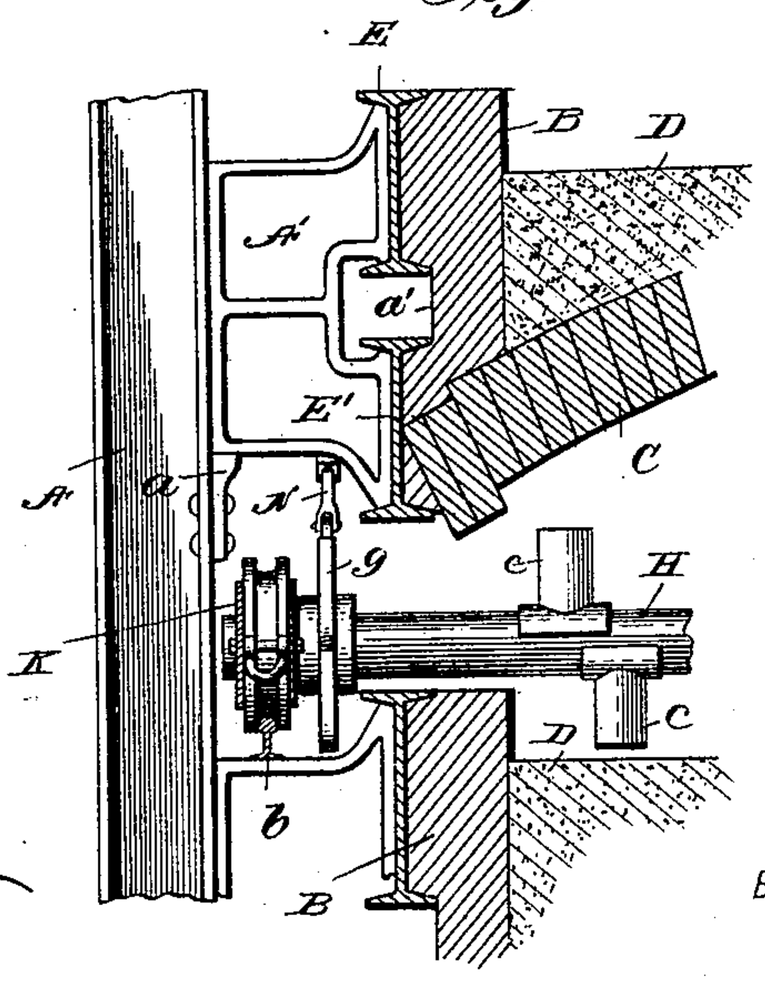
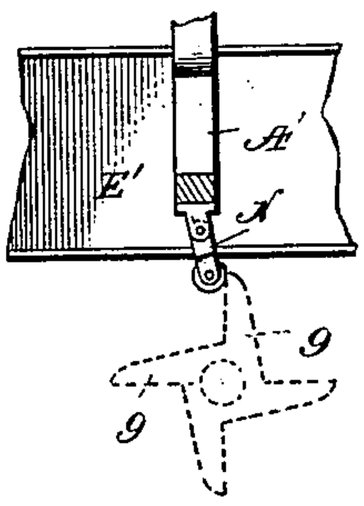


Fig. 4.



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UNITED STATES PATENT OFFICE.

WILLIAM E. ROBERTS, OF BUTTE, MONTANA.

HEATING OR ROASTING FURNACE.

SPECIFICATION forming part of Letters Patent No. 626,632, dated June 6, 1899.

Application filed December 28, 1895. Serial No. 573,587. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM E. ROBERTS, a citizen of the United States, residing at Butte, in the county of Silver Bow and State of Montana, have invented certain new and useful Improvements in Heating or Roasting Furnaces; 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 heating or roasting furnaces, and more particularly to the class of furnaces for calcining, desulfurizing, or chloridizing ores, in which a series of hearths are arranged one above the other and which communicate through alternate passages near their ends, each hearth being provided with a rake mechanically operated for agitating and propelling the ore or material along the hearth toward the discharge-opening. Its object is to afford a furnace structure wherein a number of ovens, one above another, are supported both vertically and longitudinally, whereby the structure may be carried to any desired height and length without impairing its strength and stability.

An additional object is the construction of a furnace or oven having its horizontal supports for carrying the arches and floors themselves so vertically supported as, while effectually obviating all danger of spreading resulting from the outward or side thrust of the arches, will afford brackets or seats on the vertical supports outside the walls of the ovens for the tracks over which the trucks supporting the ends of the rake-shaft travel.

A further object is to provide means for supporting both ends of the rake-shaft within the structure outside the furnace-walls in open passage-ways, whereby their supporting-trucks and their operative mechanism are removed from the heat of the furnace-chambers and whereby the rakes may be propelled by mechanism situated entirely outside the furnace-chambers and engaging either or both ends of the rake-shafts.

Also its object is to provide a furnace structure having a longitudinal opening through each side wall of each chamber or oven, through which the ends of the rake-shaft may travel and whereby the propelling mechanism may engage both ends of the said shaft away from the heat of the chamber.

With these objects in view my invention consists in certain novel details of construction and arrangement of parts hereinafter more fully described in the specification, illustrated in the drawings, and pointed out in the claims.

In the accompanying drawings, Figure 1 is a side elevation of my improved furnace, partly in section. Fig. 2 is a transverse vertical section. Fig. 3 is a detail showing the preferable form of the side brackets carrying the arches and hearths and supported by the vertical beams or columns. Fig. 4 is a detail showing a cam or collar on the rake-arm for revolving the rake-shaft, also the hinged arm for engaging same.

Referring more specifically to the various parts by letter, A represents a series of vertical beams or columns arranged alongside of the furnace-walls at suitable distances apart and a short distance from the wall, each provided on its inner face with brackets *a*, secured thereto to serve as a ledge or support for the outer edge of a bracket-casting A′ resting thereon and designed to support the side walls B, arch C, and hearth D of the roasting chamber or oven, which bear against longitudinally-disposed I-beams E E′, supported upon the opposite or inner edge of the casting A′. Said inner edge is provided centrally with a depression or recess *a′* to accommodate the upper flange of the I-beam E′ and the lower flange of the I-beam E, carrying, respectively, the arch C and hearth D. As the arch C, which forms the roof of the oven, is sprung from the lower I-beam E′, said I-beam is necessarily required to be heavier and stronger than the I-beam E in order to enable it to aid in resisting the outward or side thrust of the arch. The beam E not being subjected to said thrust may consequently be constructed of less weight and strength.

While I have shown, described, and prefer to use the two longitudinal I-beams E and E′ for the reasons stated, it is apparent that a single I-beam may be used without departing from the generic principle of supporting the side walls, hearths, and arches upon the brackets.

The vertical beams or columns A, arranged on each side of the furnace-walls, serve as backstays, being tied at their tops by the transverse rod F. They may be further strengthened and supported by the truss-rods G. (Shown in Fig. 2.) It will be obvious that by this construction any desired number of hearths or roasting-ovens may be safely and firmly supported one above another. Instead of single longitudinal beams extending throughout the entire length of the furnace for supporting the arches and hearths, as are employed in furnaces heretofore constructed, I employ separate beams of differing weight and strength for the arch and hearth, as already explained, thereby economizing in material, weight, and cost without interfering with the strength or stability of the structure, and I also employ a continuous series of any desired length, which are carried or supported by the vertical columns or beams A through the medium of the bracket-castings A′, as shown. I am thereby enabled to extend my furnace to any desired length without increasing the strain upon the longitudinal supporting-beams, as would be the case were a single continuous beam employed without the series of intermediate vertical supports. By the construction shown a continuous longitudinal slot or opening is afforded in each side wall above the hearth.

H represents the rake-shaft, which may be tubular for the purpose of admitting air or other cooling fluid throughout its interior. This shaft extends transversely across the hearth of the roasting-oven, and its ends project through the longitudinal slots or openings in the side walls and are supported by the trucks K, mounted upon tracks *b*, supported upon the castings A′. That portion of the rake-shaft within the chamber is provided on opposite sides with teeth or plows *c*, set at opposite angles. The trucks are designed to travel backward and forward over the tracks *b* and are propelled by chains or ropes *d*, passing over pulleys L, located at the ends of the furnace and actuated by a reversible or reciprocating drum M and bands *e*, as shown in Fig. 1. At or near each end of the furnace depends from the bracket-casting A′ a hinged arm N, adapted to engage a cam or spur collar *g*, mounted on the shaft H and shown in detail in Fig. 4, for the purpose of giving the said rake-shaft one-quarter turn at the commencement of its journey toward the opposite end of the hearth, whereby the teeth are caused to assume a non-operative or horizontal position away from the ore or other material when the rake is carried back from the discharge-opening and a vertical or operative position within the ore when moving toward it.

While I have described and illustrated this method of revolving the rake-shaft, I do not confine myself to such specific construction, as any other means that will accomplish the same object may be employed.

While I have described my improvements as applied to a straight or rectangular furnace, I do not confine myself to such construction, as it is obvious that they are equally applicable to a circular or elliptical form, and while I have shown and described the generic features of my invention as applied to a furnace having a series of heating chambers or ovens one above the other it is obvious that where only one oven or heating-chamber is desired the hearth of said oven may be supported on side walls built upon the ground, as shown at Fig. 2, and the roof or arch is supported on the I-beams, in turn supported on the brackets.

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

1. A calcining-furnace comprising a series of vertical or upright posts between the ends of the furnace and at suitable localities to insure the strength of the structure, brackets carried by said posts, longitudinal I-beams carried by the inner ends of said brackets, and distant from said posts, an arch of masonry carried by the said I-beams, side walls and hearth carried by suitable supports, longitudinal continuous slots through the side walls, and extending from end to end thereof and past the vertical posts, and means for closing said longitudinal slots when desired, substantially as described.

2. A calcining-furnace comprising vertical or upright posts, a vertical series of brackets carried by, and extending inwardly from said posts, longitudinal I-beams carried by the inner free ends of the brackets, and a series of sets of arches, hearths and side walls of masonry carried by the longitudinal I-beams, each set of arches, hearths, and side walls separated from the next adjacent set by longitudinal slots extending laterally from the heating-chamber and into the open space between the side walls and the vertically-arranged posts, whereby the entire masonry of the furnace may be carried by supports lateral to the side walls and heating-chambers and access be had to the heating-chambers from one end to the other substantially as and for the purpose set forth.

3. In a furnace composed of a series of ovens or heating-chambers one above another, the combination with vertical supports ranged alongside the walls, of horizontal longitudinally-disposed beams supporting the roof or arch of one oven, the floor of the next above, and the side walls, and brackets carried by the vertical beams and engaging and supporting the horizontal beams, substantially as and for the purpose set forth.

4. In a furnace composed of a series of ovens or heating-chambers one above another, separate longitudinal beams one above another of differing weight and strength, the lower and heavier supporting the roof or arch of one oven, and the upper and lighter the floor of the next oven above, in combination with ver-

tical beams or columns ranged along the side walls of the furnace, and brackets carried by the vertical beams engaging and supporting the horizontal beams, substantially as and for the purpose set forth.

5. A furnace having a series of upright beams or columns along its sides, brackets secured thereto and supporting the masonry sides of the oven or heating-chamber at some distance from the columns, longitudinal tracks on said brackets, continuous longitudinal openings through both side walls and extending past the columns, a rake, the ends of the shaft of which project through the longitudinal openings of the walls of the heating-chamber, and supports for said shaft ends outside the walls of the heating-chamber but within the columns and resting on said tracks for supporting and operating the rake, all arranged and combined substantially as and for the purpose described.

6. A furnace or oven structure provided with longitudinal openings through each side wall of its heating-chamber, longitudinally-disposed beams adapted to carry and support the masonry of the oven or furnace; upwardly-extending beams or columns along the walls of the heating-chamber adjacent to the longitudinal openings; brackets secured to the upwardly-extending beams and interposed between them and the longitudinal beams and supporting the latter, a rake-shaft and means for supporting it outside the walls but within the furnace structure, substantially as and for the purpose set forth.

7. In a furnace structure having longitudinal openings through the side walls of its heating-chambers, the combination with horizontal longitudinally-disposed beams carrying the floors and arches of the heating-chambers, of vertical supporting beams or columns ranged along the side walls of the heating-chambers adjacent to the longitudinal openings therein, brackets interposed between the vertical and horizontal beams and secured to each, and a platform or track supported upon the interposed brackets between the vertical beams and side walls of the heating-chambers, substantially as and for the purpose set forth.

8. In a furnace structure composed of a series of ovens or heating-chambers one above the other and having longitudinal openings through their side walls, pairs of horizontal longitudinally-disposed beams located one above the other, adapted to support, respectively, the arch or roof of one oven and the floor of the next above, vertical beams or columns ranged along the side walls of the ovens adjacent to the longitudinal openings therein, interposed brackets secured to the vertical beams or columns and engaging and supporting the longitudinal beams, and a platform or track upon the brackets between the vertical supports and longitudinal openings, adapted to support the projecting ends of a rake-shaft and its operative mechanism, substantially as and for the purpose set forth.

In testimony whereof I affix my signature in presence of two witnesses.

WILLIAM E. ROBERTS.

Witnesses:
F. P. DAVIDSON,
JARED E. GAYLORD.