

No. 671,071.

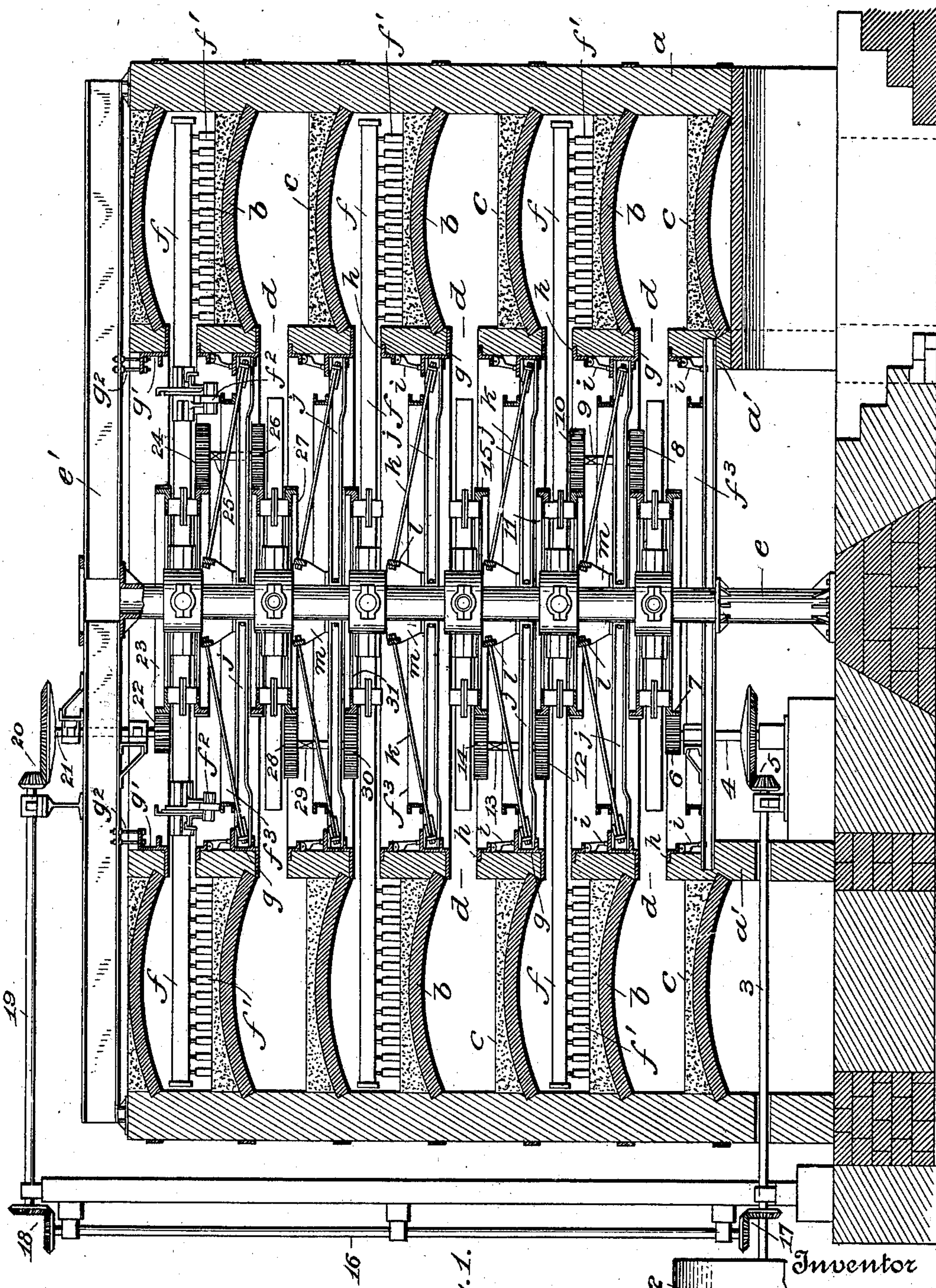
Patented Apr. 2, 1901.

R. F. PEARCE.
ORE ROASTING FURNACE.

(Application filed Apr. 18, 1900.)

(No Model.)

3 Sheets—Sheet 1.



Witnesses
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Fig. 1.

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3 Sheets—Sheet 2.

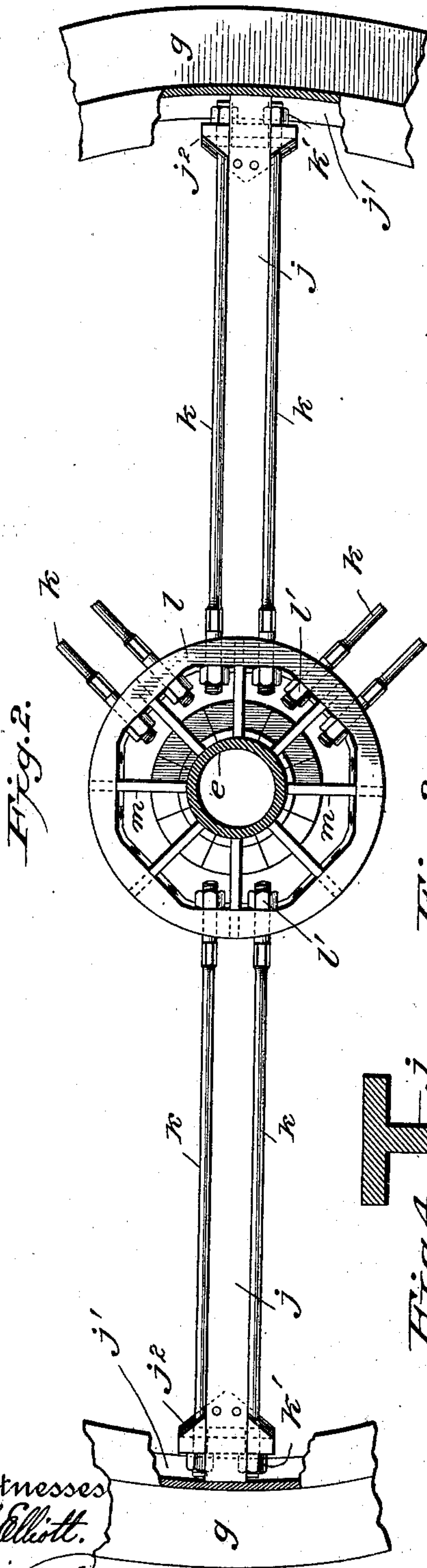


Fig. 2.

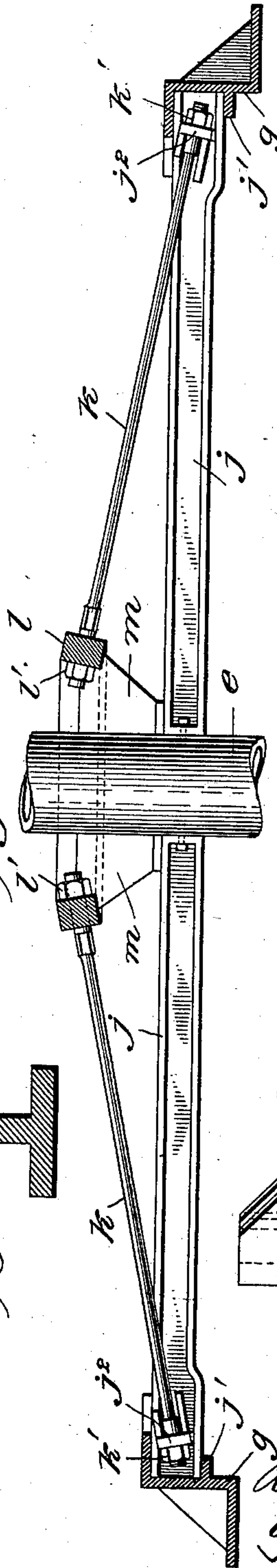


Fig. 3.

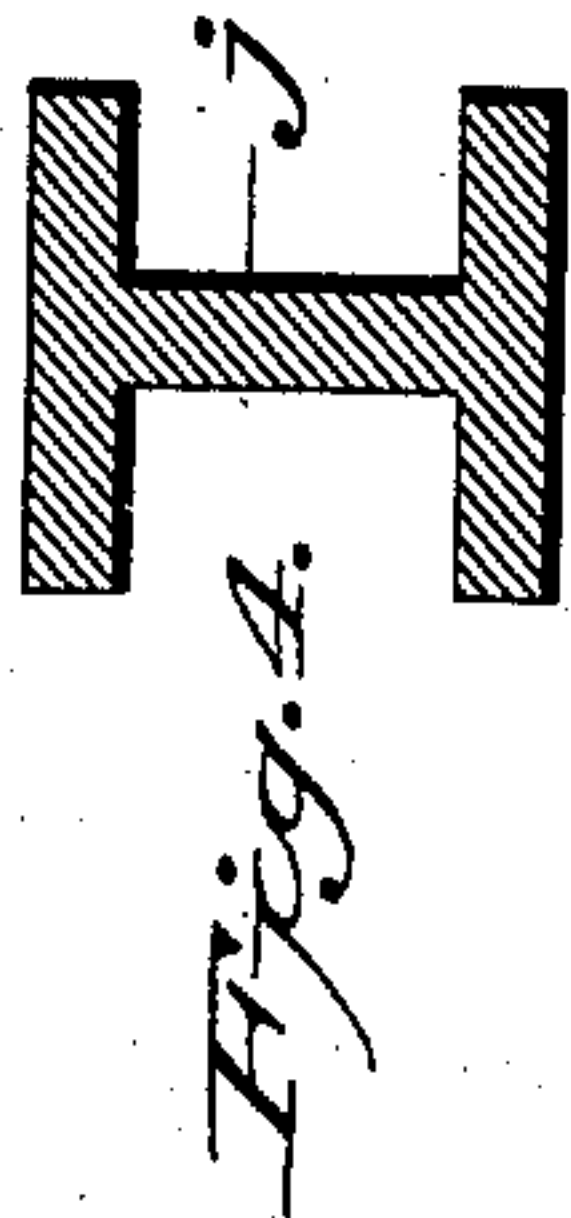


Fig. 4.

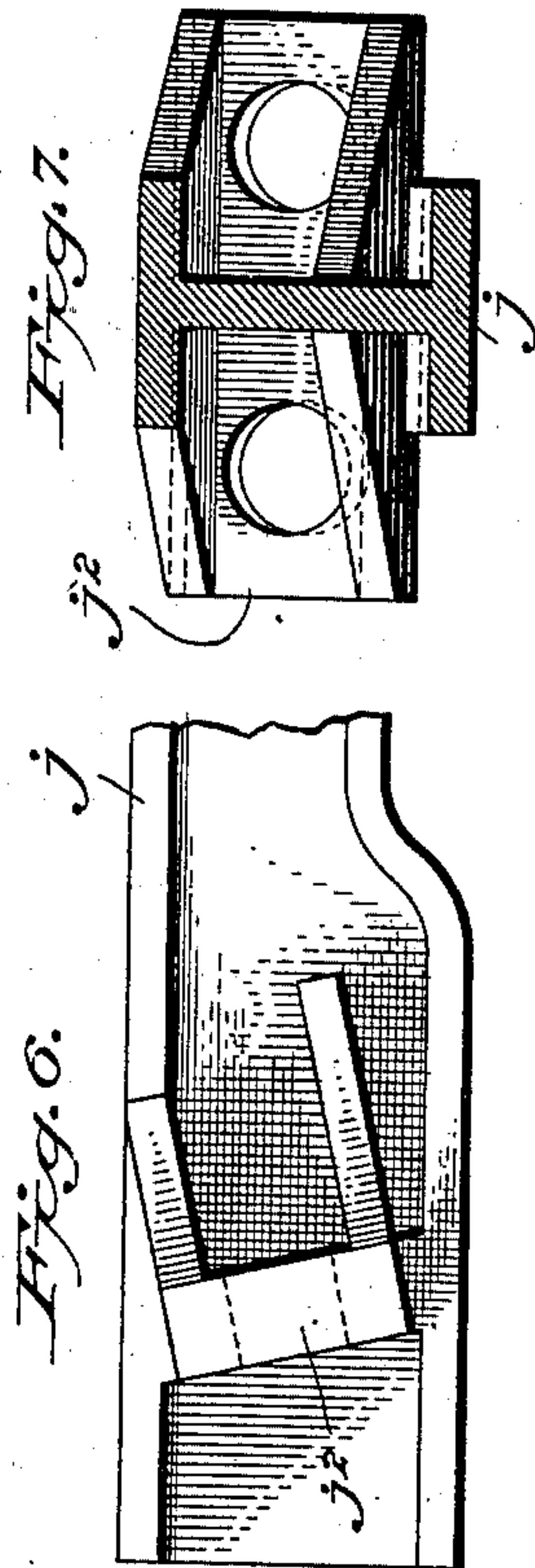


Fig. 5.

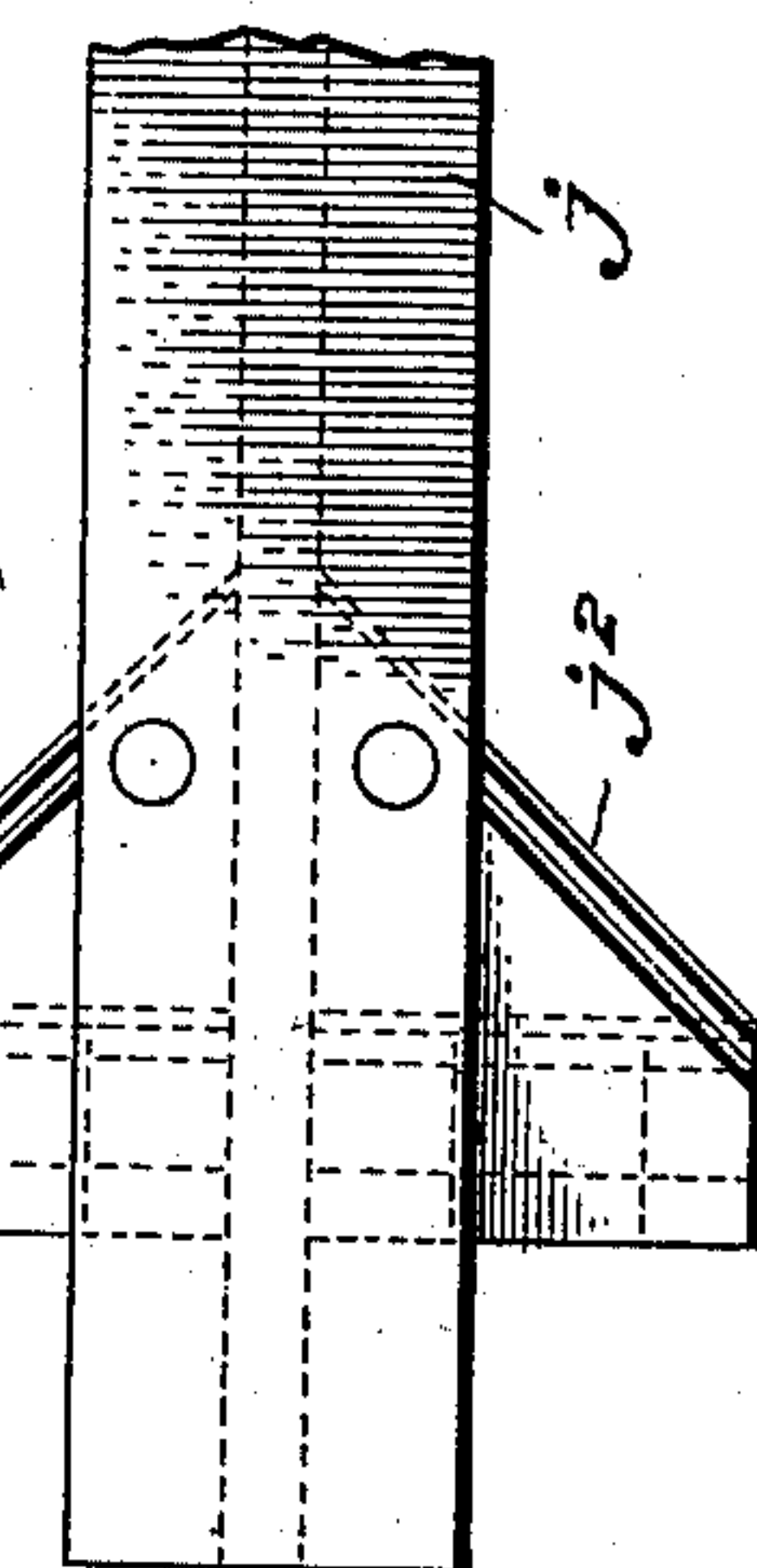


Fig. 6.

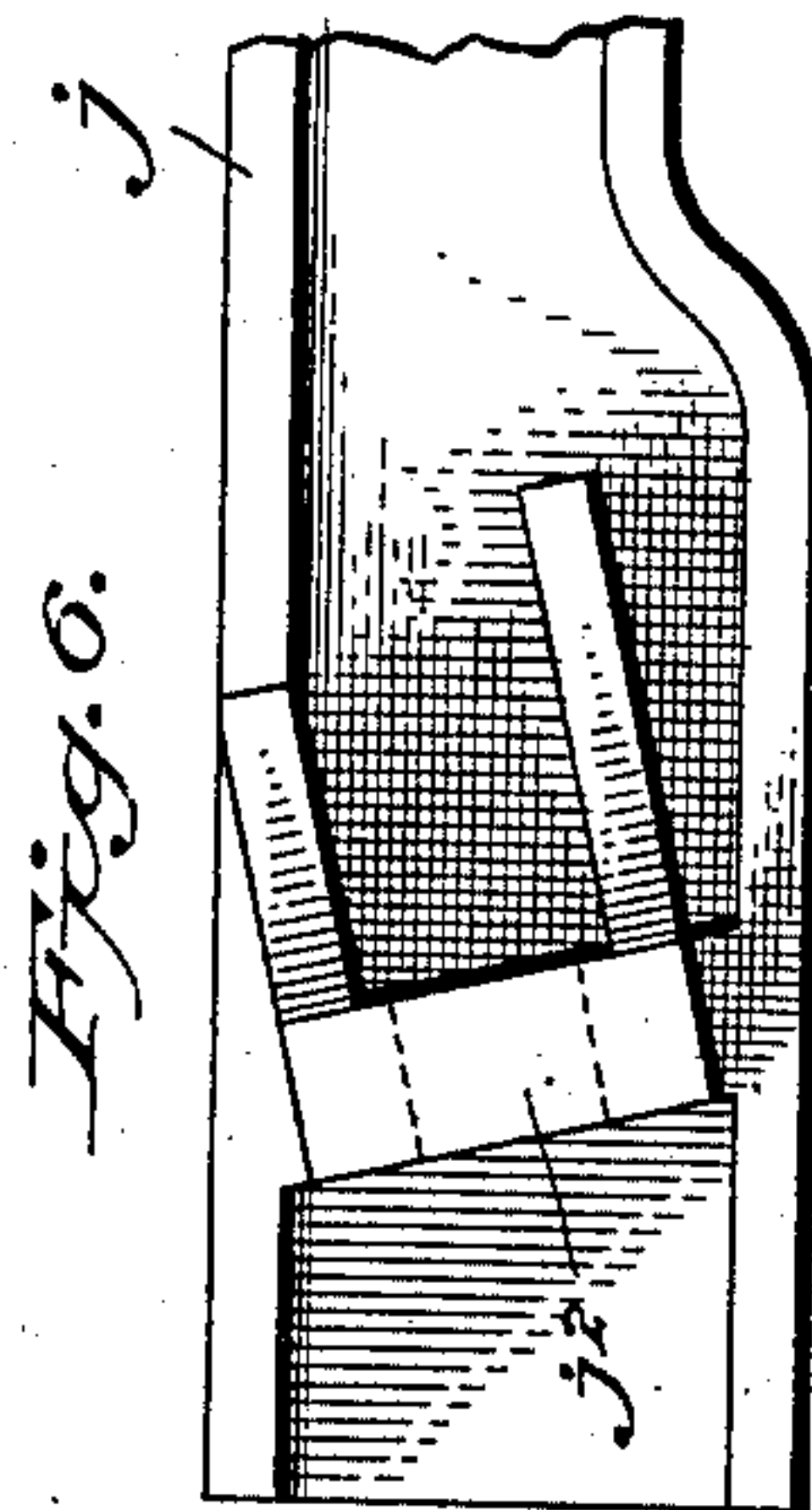


Fig. 7.

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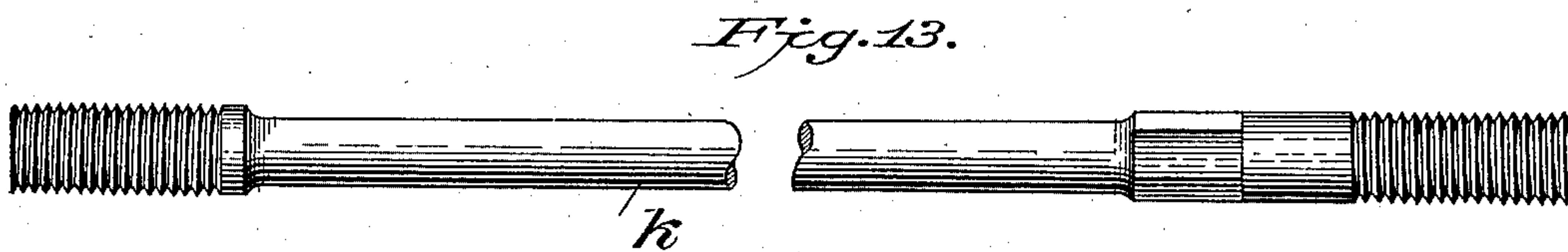
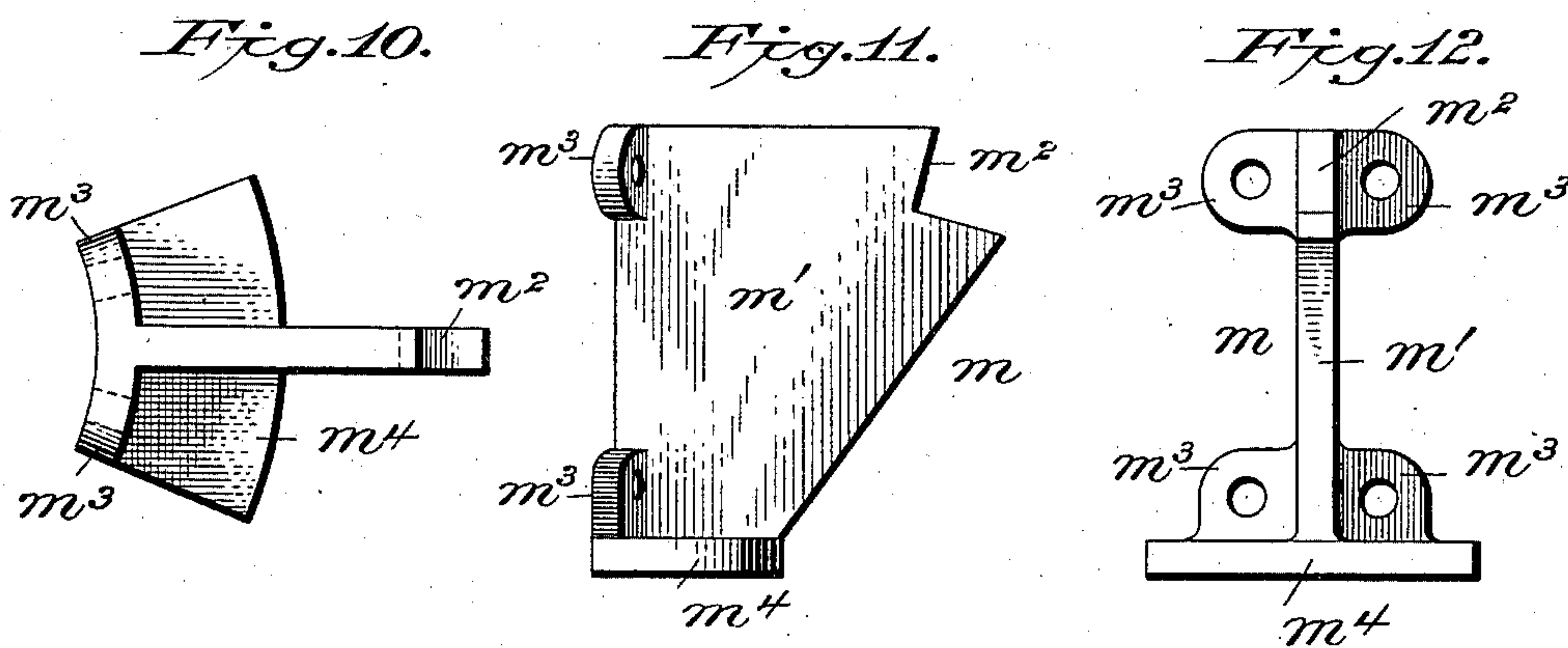
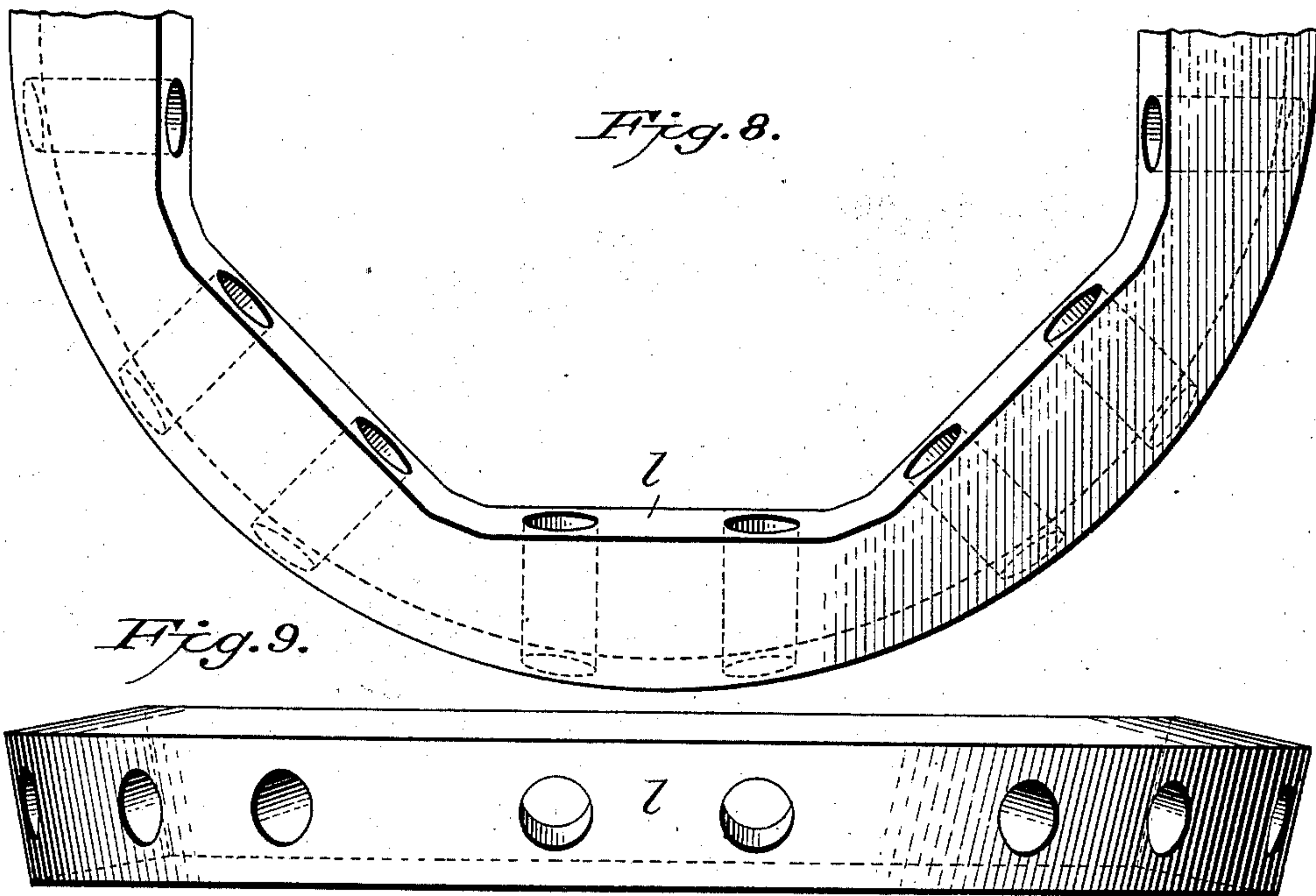
Patented Apr. 2, 1901.

R. F. PEARCE.
ORE ROASTING FURNACE.

(No Model.)

(Application filed Apr. 16, 1900.)

3 Sheets—Sheet 3.



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UNITED STATES PATENT OFFICE.

RICHARD FRANCIS PEARCE, OF BUTTE, MONTANA, ASSIGNOR TO THE
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ORE-ROASTING FURNACE.

SPECIFICATION forming part of Letters Patent No. 671,071, dated April 2, 1901.

Application filed April 16, 1900. Serial No. 13,016. (No model.)

To all whom it may concern:

Be it known that I, RICHARD FRANCIS PEARCE, a citizen of the United States, residing at Butte, in the county of Silverbow and State of Montana, have invented a certain new and useful Improvement in Ore-Roasting Furnaces, of which the following is a full, clear, and exact description.

This invention relates to furnaces for roasting ores, and more particularly to what is known on the market as the "Pearce Turret-Furnace," the same being illustrated in the United States Letters Patent No. 488,797, dated December 27, 1892, and No. 506,129, dated October 3, 1893, granted to Richard Pearce.

In order to increase the capacity of the furnace within a given circumference, superficial area, or ground-plot, it has been proposed to superpose one hearth upon another, very much after the order of a house or edifice having a number of stories one upon another. Inasmuch, however, as only the outer wall of the furnace is continuous from bottom to top and the inner wall has a continuous slot or horizontal opening above the floor of the hearth, it is necessary to provide some means for supporting the inner wall and the roof of the hearth from above and in such way as to permit the free rotation of the stirrer or rabble arms as they are swept through the furnace and in these horizontal slots.

A many-storied or multiple-hearth turret-furnace is especially advantageous for the utilization of the heat generated by the roasting of those ores which contain combustible ingredients, such as sulfur, and in which the roasting ore descends from one hearth or story to another successively to the point of discharge. The exits for the roasting ore from one hearth to another afford the passage-way for the heat from one hearth to another, and thus the several hearths may be supplied with a single heating apparatus common to all.

My invention consists in a cantaliver support for the inner walls in such a many-storied or multiple-hearth furnace; but I wish to state now that although my invention is designed primarily for use in connection with the Pearce turret-furnace still I do not limit my invention to that one application thereof.

In the accompanying drawings, illustrating

my invention, in the several figures of which like parts are similarly designated, Figure 1 is a vertical section illustrating my invention applied to a six-storied turret-furnace, and the remaining figures show details of the cantaliver mechanism, as follows: Fig. 2 is a horizontal section or plan, and Fig. 3 a vertical section or elevation; Fig. 4, a cross-section of one of the chords; Fig. 5, a plan view of one end of a chord; Fig. 6, a side elevation of the same end of said chord; Fig. 7, a transverse section of one of the chords looking toward its end next the furnace. Fig. 8 is a plan view of half of the anchor-plate; Fig. 9, an elevation thereof. Fig. 10 is a plan view, Fig. 11 a side elevation, and Fig. 12 a front elevation, of one of the supports for the anchor-plate. Fig. 13 is a plan view of one of the truss-rods.

Upon any suitable foundation is erected the outer continuous wall *a*, of masonry or other material, and the inner wall *a'*, and between these walls are sprung the arches *b b* for any desired number of stories or superposed hearths, and above these arches are built the beds *c* of the hearths, and it will be observed that the arches *b* of the stories not only serve to support the hearths of superposed stories, but they also form the roofs of subjacent stories. The inner wall *a'* is made with as many horizontal slots *d* as there are hearths or stories, and each slot is continuous from end to end of the furnace, and thus it becomes apparent that the inner wall between each slot must be independently supported not only vertically, but also transversely, and the support of this inner wall constitutes a main feature of the present invention, as will hereinafter more fully appear.

A central column *e* is erected upon a suitable base and is connected at its upper end with a cross-beam *e'*, erected upon the top or roof of the furnace, and this column *e* supports stirrer-arms *f* and means to rotate said arms, and said arms project into the hearths through the horizontal slots *d* and are supplied with rabbles *f'*. The arms *f* are supported by trucks *f''*, which run upon tracks *f'''*, erected upon the chords hereinafter described, and I have shown this construction in detail only in the upper hearth of Fig. 1. Inasmuch as these stirrer-arms and their rab-

bles are not novel features of this present invention, I deem their further description unnecessary and simply refer to Fig. 1 of the accompanying drawings and the patents mentioned for their illustration.

Upon reference to Fig. 1 will be seen one arrangement of driving mechanism for the stirrer-arms of a multiple-hearth furnace. There is a band-pulley 2 on a shaft 3, which is geared to a vertical shaft 4 by bevel-gearing 5, and said shaft 4 has a pinion 6, which meshes with a double-toothed ring 7 on the stirrer-arms, which in turn meshes with a pinion 8 on a shaft 9, which carries a pinion 10, which meshes with a similar double-toothed ring 11 on the stirrer-arms next above, the upper ring of which latter in turn meshes with a pinion 12 on the shaft 13, carrying a pinion 14, which meshes with a single-toothed ring 15 on the stirrer-arms next above. This series of gears may be repeated upwardly; but it is probably more economical and efficient to employ a vertical shaft 16, geared at 17 with the power-shaft 3 and in turn geared at 18 with a counter-shaft 19, which is geared at 20 with a vertical shaft 21, which carries a pinion 22, meshing with a double-toothed ring 23 on the uppermost stirrer-arms, and this double-toothed ring meshes with a pinion 24 on a vertical shaft 25, which carries a pinion 26, meshing with a double-toothed ring 27, carried on the stirrer-arms next below, and this double-toothed ring 27 meshes with a pinion 28 on a shaft 29, which also carries a pinion 30, in mesh with a single-toothed ring 31 on the stirrer-arms next below. I illustrate this form of driving the various stirrer-arms or rabblers as one of several possible ways for accomplishing this purpose.

Each section of the inner wall between the slots d has a metallic foot-plate g , as shown more in detail in Fig. 3, and it also has a cap-plate h , each of which is built into the wall, and the cap-plate h and foot-plate g are connected by links i , so as to tie them together and to tie together the material of the wall; but it is obvious that the foot-plate and the cap-plate may be made integral and in sections or otherwise, so long as they serve to connect one another and hold together the material of the inner wall. The foot-plate g' of the uppermost hearth may be suspended by bolts g^2 from the beam e' . In order to sustain these sections of inner wall vertically and from collapse horizontally or transversely, I employ the beams j , hereinbefore and hereinafter referred to as "chords," and the inner ends of these chords are supported upon the column e in any suitable manner, as by screws, as indicated in Figs. 1 and 3, while their outer ends rest in pockets j' , formed in the foot-plates g . These chords are provided with wings j^2 , projecting laterally therefrom and at an angle to the perpendicular to receive the ends of the truss-rods k , which truss-rods have shouldered ends to abut against one face of these wings,

and their extremities are reduced and screw-threaded to receive nuts k' . The other ends of these truss-rods are likewise shouldered and passed through holes in an anchor-plate l , and their extremities are reduced and screw-threaded to receive nuts l' . Preferably the screw-threads on opposite ends of the truss-rods are rights and lefts, so that by turning the rods in one direction the nuts at both ends may be tightened up or loosened, as desired.

The anchor-plate l may be made as a cast or wrought ring, inclined substantially parallel with the incline of the wings j^2 , and it is supported upon the column e by means of brackets m , the details of which are shown in Figs. 10, 11, and 12, and the same consisting of a vertical web m' , notched at m^2 to receive the anchor-plate l , and having ears m^3 m^3 , by which they may be bolted around the column e , and also, if desired, having the bottom flange m^4 for the reception in any desirable way of the chords j .

As will be seen, the truss-rods k are arranged at an angle to the chords j , and these elements, in connection with the column e , anchor-plate, and foot-plates, constitute a cantaliver construction which will adequately support the sections of the divided inner wall against vertical displacement and also against collapse or transverse displacement. I have shown this cantaliver construction as made up of eight series for each wall-section; but obviously any number of series may be employed necessary to insure a stable structure. By this cantaliver-support of these sections of inner wall I am enabled to construct a furnace of any number of superposed stories or hearths, and thus while increasing the capacity of hearth-area of the furnace and the roasting capacity and the utilization of developed heat from the material undergoing treatment I do not require added ground-plot or increased fire-surface.

It will be understood that in the construction of the many-storied or multiple-hearth furnace provision is made for the delivery of the ore to be treated into the uppermost hearth and for the discharge of the ore successively from one hearth to another until it is finally thrown out of the furnace from the lowermost hearth and that these exits from one hearth to another or from one story to another also furnish passage-ways for the heat from the fire-chamber beneath them to the several hearths above and that the heat developed by any combustible material in the ore being treated may be utilized.

A further advantage obtained by my multiple-hearth construction is that the hearths may be brought much nearer vertically than if separately built, and thus the full benefit of the heat from one to another may be more fully utilized, and this feature is of especial benefit in roasting those concentrates, heavy pyritic ores, or any free-burning material which contain sufficient sulfur or other com-

bustible matter effecting or contributing to calcination.

As already indicated, I do not limit my invention to its application to the "Pearce turret-furnace," so called, or to other furnaces of the turret pattern, but mean to include as within my invention all those classes of furnace in which one of the walls is slotted horizontally and must be supported independently of the foundation.

Not only is my invention applicable to a multiple-hearth furnace or many-storied furnace, but obviously it may be utilized for the support of the upper portion of any wall that is separated from its foundation—as, for example, in a single-hearth furnace of this general character.

What I claim is—

1. In an ore-roasting furnace, the combination with an outer solid wall, and an inner horizontally-slotted wall, of a column spaced apart from the inner wall, and a cantaliver support for the portion of the inner wall above the slot, comprising a trussed chord projecting from the column and connected with the said inner wall, substantially as described.

2. The combination of a horizontally-slotted wall, a vertical column spaced apart from the wall, and cantalivers connecting the portion of the wall above the slot with the column, and comprising a series of horizontal chords attached to the wall and column, and truss-rods rising at an angle from the wall ends of the chords and connected to the column, substantially as described.

3. In an ore-roasting furnace, the combination of an outer solid wall, an inner horizontally-slotted wall, a series of hearths arranged between said walls, each hearth having one of the slots in the inner wall, a vertical column arranged at a distance from the inner wall, and a series of trussed chords connect-

ing the several sections of the slotted inner wall above the slots with said column, substantially as described.

4. The combination of a wall, slotted horizontally and thereby divided into sections, a foot-plate for each section, a vertical column arranged at a distance from the wall, horizontal chords connecting each of the said foot-plates and column, an anchor-plate on said column for each section, and truss-rods connecting each of the anchor-plates and their respective chords, substantially as described.

5. In a multiple-hearth ore-roasting furnace, the combination of a solid outer wall, an inner wall divided by horizontal slots, arches sprung between these walls, each arch forming the crown or roof of the hearth below it and the support for the base or bed of the hearth above it, a vertical column spaced apart from the inner wall, and trussed chords interposed between the column and the sections of inner wall to support the said sections of inner wall, substantially as described.

6. In a multiple-hearth ore-roasting furnace, the combination of a solid outer wall, an inner wall divided by horizontal slots, arches sprung between these walls, and each arch forming the crown or roof of the hearth below it and the support for the base or bed of the hearth above it, each of the sections of inner wall being provided with a foot-plate, a vertical column, chords connecting said foot-plates and vertical column, and truss-rods connecting the ends of the chords next the wall with the column, substantially as described.

In testimony whereof I have hereunto set my hand this 10th day of April, A. D. 1900.

RICHARD FRANCIS PEARCE.

Witnesses:

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W. W. JOHNSTON.