

T. THOMAS.  
DESULPHURIZING FURNACE.

No. 491,274.

Patented Feb. 7, 1893.

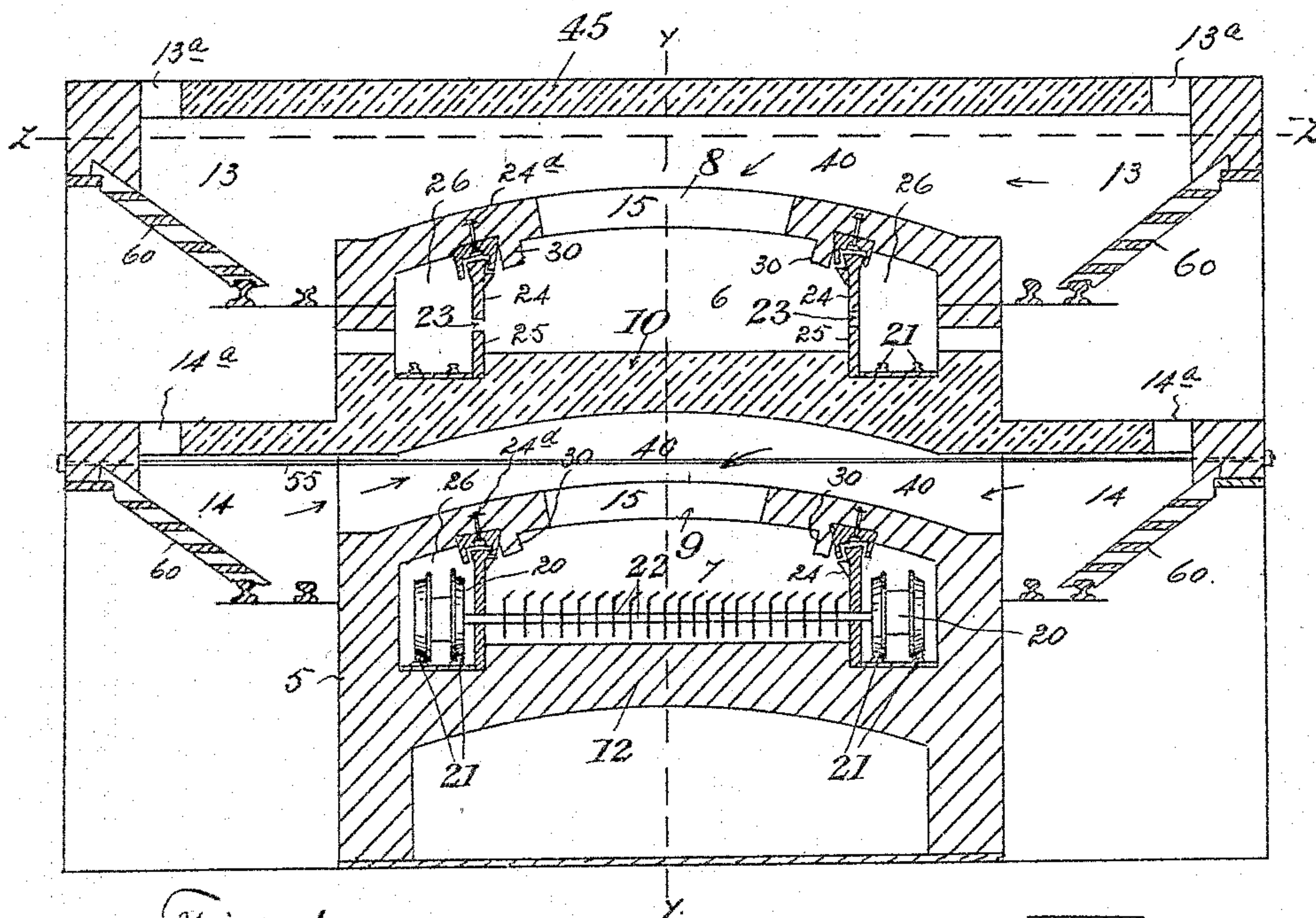


Fig. 1.

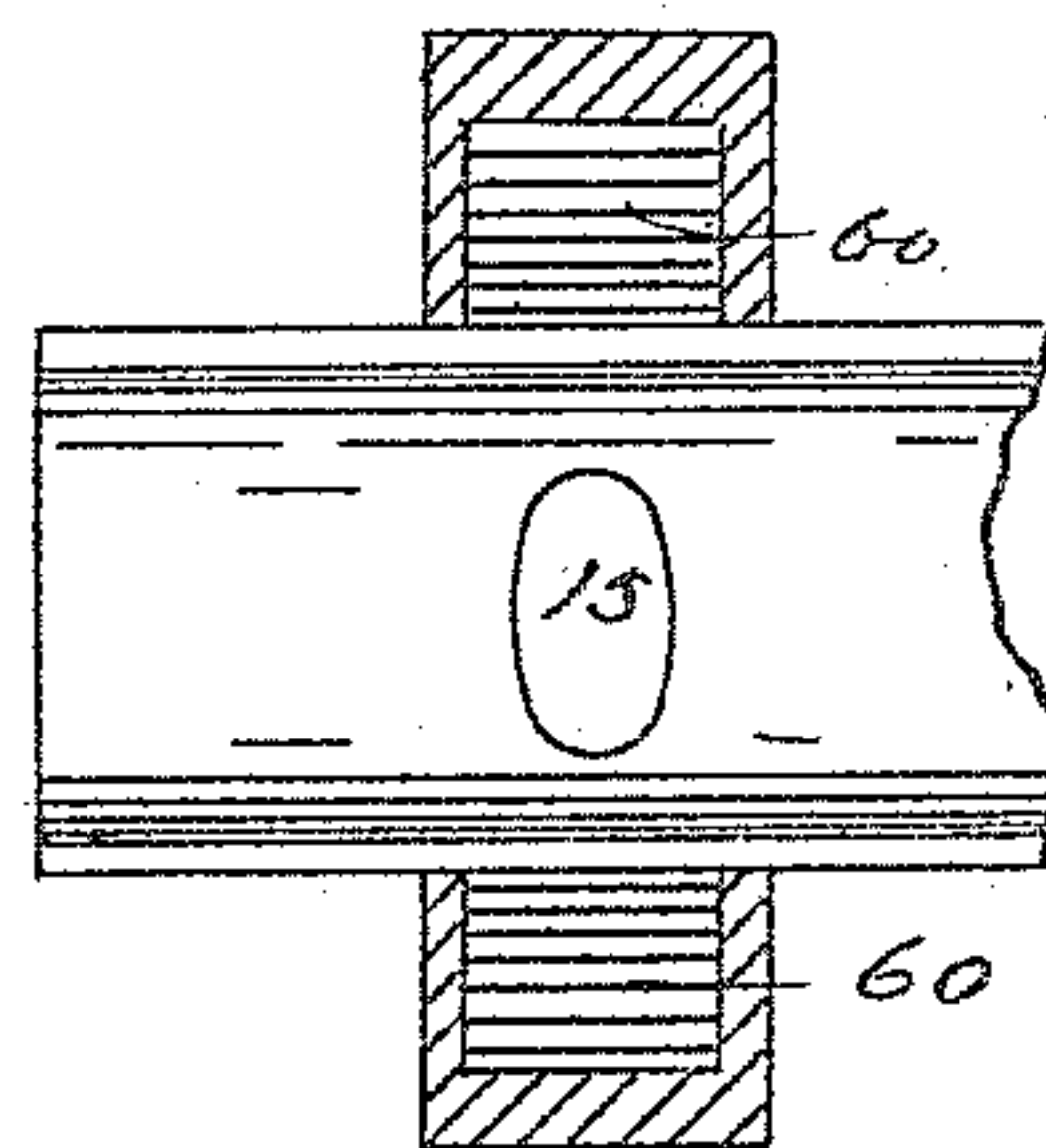


Fig. 4

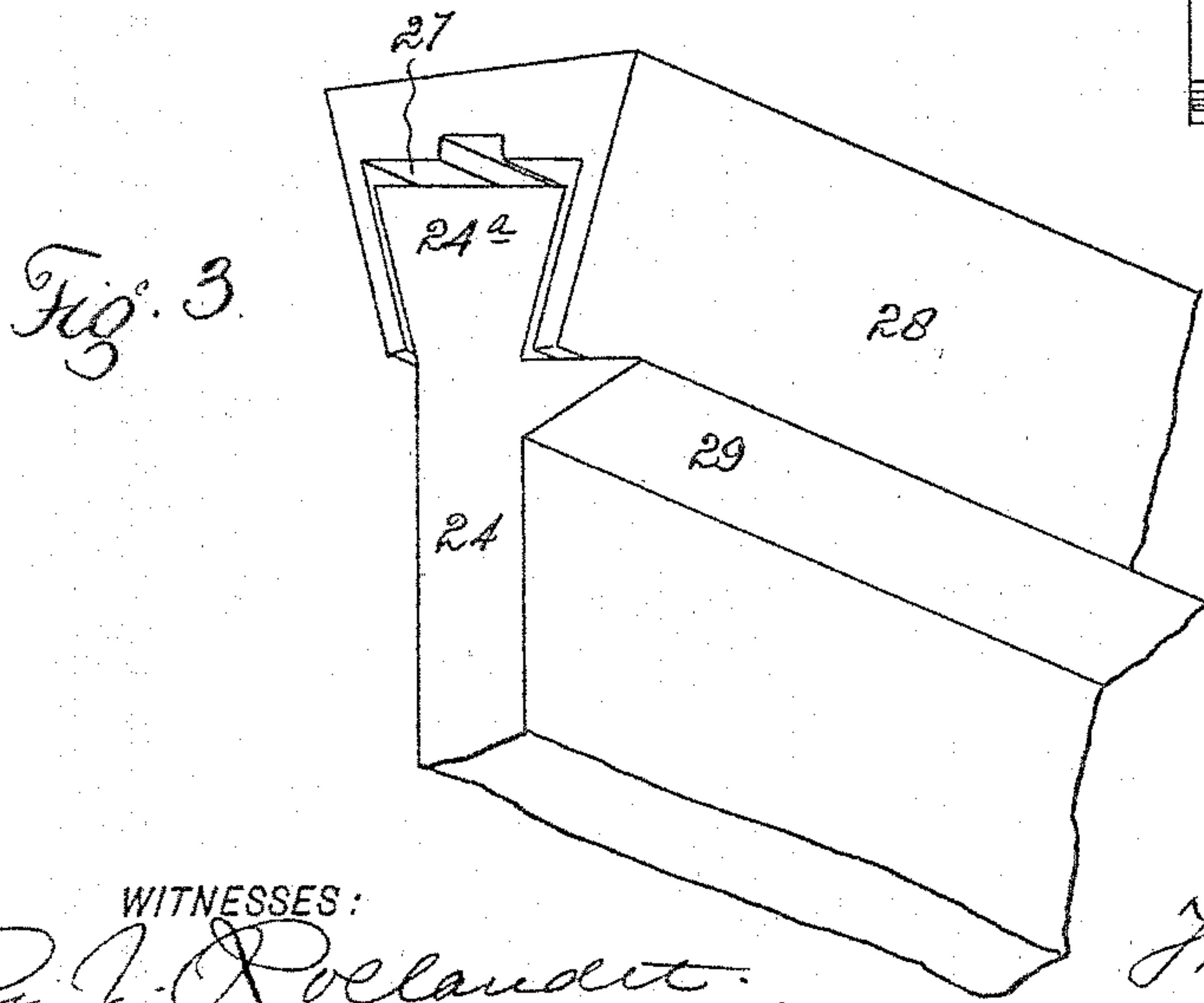


Fig. 3.

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(No Model.)

2 Sheets—Sheet 2.

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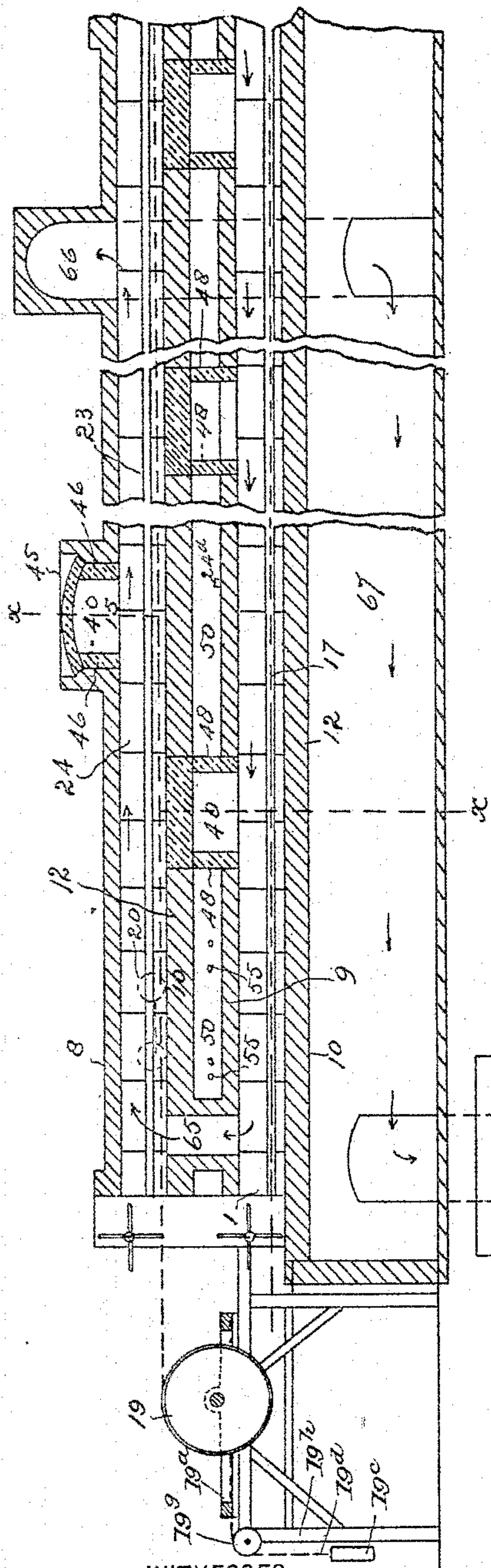
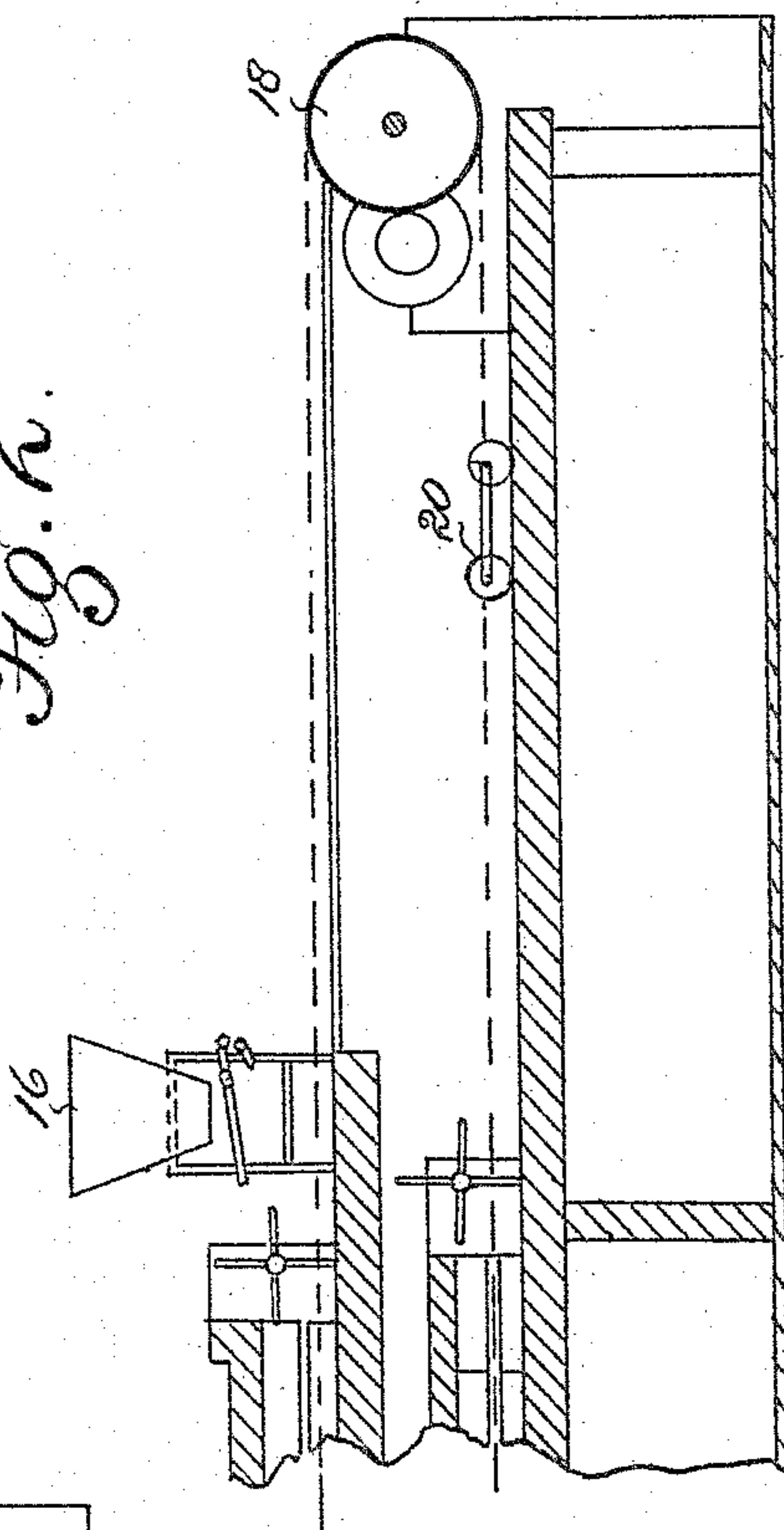


Fig. 2.



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# UNITED STATES PATENT OFFICE.

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## DESULPHURIZING-FURNACE.

SPECIFICATION forming part of Letters Patent No. 491,274, dated February 7, 1893.

Application filed April 25, 1892. Serial No. 430,618. (No model.)

*To all whom it may concern:*

Be it known that I, THOMAS THOMAS, a citizen of the United States of America, residing at Denver, in the county of Arapahoe and State of Colorado, have invented certain new and useful Improvements in Desulphurizing-Furnaces; and I do 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, reference being had to the accompanying drawings, and to the figures of reference marked thereon, which form a part of this specification.

My invention relates to improvements in furnaces for desulphurizing chloridizing or roasting ores, and particularly to that type of these furnaces in which the carriages for the endless distributing chain, are located at the sides of the roasting chamber and protected from the heat of this chamber by fire-brick partitions extending the entire length thereof. These partitions are provided with a longitudinal slot located at about their vertical center, in which the shaft travels which connects the carriages located on the opposite sides of the chambers. This slot divides each of these partitions into two longitudinal sections, namely, one supported on the bottom of the chamber and projecting upwardly, and the other supported from the arch above the chamber and therefore depending or projecting downwardly.

My improvement relates specially to this depending section of the partition, since as the furnaces have been constructed heretofore they have been found impracticable by reason of the fact that these depending sections of the partitions are soon destroyed, presumably by the expansion of the metal brackets which form the support for the tile sections. The metal brackets supported by rods secured in the arch above are provided with lugs or hooks which engage apertures formed in the tile sections and thus support the depending portion. In practice and under the influence of the degree of heat necessary in a furnace of this character, these tile sections soon crack and break away and unless repaired at once (which can only be done

by shutting down and cooling the furnace) the metal carriages are exposed to the same degree of heat as the ore in the chamber, and therefore soon destroyed or rendered worthless, whereby the object sought by locating the carriages at the sides of the furnace, namely to better protect them from the heat of the roasting chamber, fails of its accomplishment. Hence to overcome this difficulty is the object of my present invention, and I attain it by the employment of the features, arrangements and combinations hereinafter described and claimed.

My improved furnace will be fully understood by reference to the accompanying drawings in which is illustrated an embodiment thereof.

In the drawings, Figure 1 is a vertical cross section of the furnace taken on the line  $x-x$ , Fig. 2, which is a vertical longitudinal section taken on the line  $y-y$ , Fig. 1. Fig. 3 is a fragmentary perspective view of the metallic support for the tile sections, one of which is shown in place. Fig. 4 is a fragmentary horizontal section taken on the line  $z-z$ —Fig. 1 showing a plan view of the lower roasting chamber.

Similar reference characters indicating corresponding parts or elements in the several views let the numeral 5 designate the vertical side walls of the furnace provided with the upper and lower longitudinal roasting or desulphurizing chambers 6 and 7 respectively.

The side walls are connected by the transverse arches 8 and 9 which form the top walls of the chambers and other arches 10 and 12 which form the corresponding bottom walls. These chambers are supplied with heat from the fire boxes 13 and 14 located at suitable intervals outside the main side walls 5 of the furnace, the heat first taking the direction indicated by the arrows and passing through the openings 15 formed in the upper walls or arches and then traveling longitudinally through the chambers in the direction of the stack. The ore to be treated is first fed to the upper chamber through a hopper 16 located at what I shall term the forward end of the furnace. From the forward end of chamber 6 the crushed ore is carried by the



endless distributing chain 17, first to the rear end of the chamber whence it passes to the corresponding extremity of the chamber below and is carried through this chamber to the forward extremity of the furnace, and discharged properly roasted or desulphurized. This endless distributing chain 17 passes over the terminal wheels 18 and 19, the former as shown in the drawings being journaled in a suitable stationary support and rotated by applying power to its shaft in any suitable manner, thus communicating motion to the chain. Wheel 19 is journaled in a movable support 19<sup>a</sup> provided with a weight 19<sup>c</sup> connected with the movable support by a chain 19<sup>d</sup> passing over a roller 19<sup>e</sup> journaled in a suitable framework 19<sup>b</sup>. This construction maintains the distributing chain at the proper tension. This chain is intermediately supported by the carriages 20 mounted upon track rails 21, each pair of carriages being connected by a transverse shaft 22 which moves in the longitudinal slot 23 separating the upper and lower parts 24 and 25 of the fire brick partition separating the roasting chamber proper from the lateral chambers 26 in which the carriages 20 move. The upper part 24 of this partition is composed of sections supported in a longitudinal wedge-shaped groove or socket 27 formed in metallic bars 28 which are cast in sections of suitable length and bolted to the upper arches 8 and 9 of the roasting chambers in such a manner as to form a continuous groove or socket the entire length of the chambers on each side. This socket-groove is wedge-shaped in cross section, being largest at the top and tapering downward as shown in Figs. 2 and 3. The upper edge 24<sup>a</sup> of the fire-clay tiles or sections constituting part 24 of the side partition is shaped to correspond with the groove 27 which it enters, being made sufficiently small to slide easily therein, since the sections must be inserted at the open extremities of the socket-grooves and moved along until the entire upper part 24 of the partition is formed. Since the sections fit loosely in the groove as shown, all injurious results from the contraction and expansion of the metal bars is avoided. The tile sections are provided on the inner side with a longitudinal projection 29 which extends below the lower inner edge of metal bars 28 and thus protects this edge from the heat of the roasting chamber. The inner sides of these metal bars are protected by a depending fire-brick partition 30 set into and forming a part of the upper arches 8 and 9 of the desulphurizing chambers.

In order to form a continuous longitudinal support the entire length of the furnace for the metal bars 28 and the depending fire clay partition connected therewith the upper arches 8 and 9 are made continuous in front of the fire boxes, on each side of the openings 15, and of the same thickness as the rest of the arch. As heretofore constructed these arches have been interrupted in front of the

fire boxes the entire width of the furnace, a thin plate of fire clay having been placed immediately in front of the fire boxes and over which the heat passes to the openings leading to the roasting chambers, said fire clay plates being supported by metal bars underneath, which form the support for the depending metal brackets heretofore mentioned. Experience has proven that these bars soon become so warped and misshapen by the heat, that the depending brackets and the fire clay partition which they support are practically useless.

The use of the fire clay plate in front of the fire box in the old style of furnaces leaves a passage way for the heat between said plate and the top of the arch, while in my improved furnace, the arch being of the usual thickness in front of the fire box, a space 40 must be left above the arches 8 and 9 to allow the heat to pass to openings 15. In the case of arch 8 this is accomplished by forming a transverse auxiliary arch 45 above opening 15 and across the furnace, this arch being supported by walls or partitions 46 located on each side of opening 15 and resting upon the main arch 8. The furnace is so constructed that a space is left between the arch 9 and the bottom of the chamber above, this space extending the entire length of the furnace. Now to drive the heat directly to the roasting chamber transverse partitions 48 are constructed on each side of the opening 15 and reaching from the arch 9 to the bottom 12 of the furnace next above. The spaces 50 between partitions 48 form air chambers or spaces through which transverse tie rods 55 pass and whereby they are removed from excessive heat. In the old style furnace these tie rods are embedded in the arch and therefore more exposed to the heat than in the air chambers 50 of my improved furnace.

In front of the fire boxes the extremities of the bolts 24<sup>d</sup> which support bars 24 are protected by layers of fire brick, while in the air chambers these bolt extremities are exposed and accessible without difficulty when repairs are needed; while in the style of furnace heretofore used, these extremities of the sustaining rods are embedded in the arches and can only be reached with great difficulty.

In the construction of my improved furnace I prefer to make use of the inclined grates 60, since fine coal or "slack" may be poured thereon without clogging or choking the grate. The coal is fed to these boxes through openings 13<sup>a</sup> and 14<sup>a</sup>. Any desired number of these boxes may be employed. More of the boxes are used in connection with the lower chamber than the upper one, since the ore is first fed into the upper chamber, and when first exposed to the heat gives off a greater quantity of sulphur than subsequently, and the combustion of this sulphur forms a part of the fuel or takes the place of coal to a certain extent; while by the time the ore reaches the lower chamber it has been



deprived of the greater part of its sulphur and more coal must be employed to furnish the requisite degree of heat, hence the fire boxes communicating with the lower chamber are more numerous. The heat takes the course indicated by the arrows through the lower chamber to the rear and up through channel 65 to the upper chamber and thence back to the front thereof and escapes through channel 66, taking a downward course as indicated by the dotted lines in Fig. 2, to one side of the furnace and thence through passage way 67 underneath arch 10 and out to the stack 68.

Having thus described my invention what I claim is:—

1. A desulphurizing and chloridizing furnace having an endless distributing chain supported upon side carriages in combination with depending partitions lying between said carriages and the roasting chamber proper and supported in wedge-shaped socket-grooves, the edges of the partitions received by the grooves being of corresponding shape, substantially as described.

2. A desulphurizing furnace having an endless distributing chain suitably supported at the extremities of the furnace and immediately supported by side carriages, of partitions separating the carriage chambers from the roasting chamber proper, and composed of an upwardly projecting part and a depending part, the latter being supported in wedge-shaped socket-grooves formed in metal bars secured to the top walls of the chambers, substantially as described.

3. The combination in a desulphurizing furnace having two chambers one located above the other and an endless distributing chain supported on side carriages, and passing through both chambers of metal bars secured to the upper arches of the chambers and provided with wedge shaped socket-grooves, and depending partitions fashioned to enter said grooves and located between the carriage chambers and the roasting chamber proper, substantially as described.

4. The combination in a desulphurizing furnace having two chambers one located above the other and an endless distributing chain supported upon side carriages, and passing through both chambers of partitions separating the roasting chambers proper from the carriage chambers and consisting of a suitable upwardly projecting part resting upon the bottom of the chamber and a depending part, the latter being supported by bars provided with socket grooves for the reception of the correspondingly shaped edge of said depending part, substantially as described.

5. A desulphurizing furnace having upper and lower chambers and an endless distributing chain provided with supporting carriages and passing through both chambers in combination with partitions separating the chambers into a central roasting compartment and two side compartments for the carriages, each

partition being composed of two parts, namely a lower part supported by the bottom of the chamber and a depending upper part supported by bars having wedge-shaped grooves for the reception of the upper edge of the partition which is correspondingly shaped and adapted to fit loosely therein, substantially as described.

6. The combination in a desulphurizing furnace having upper and lower chambers, of partitions composed of fire clay tiles, and separating each chamber into three longitudinal compartments, namely, a central compartment for roasting the ore and two narrow side compartments for the carriage supporting the distributing chain, each partition being composed of two parts, an upwardly projecting part resting on the bottom of the chamber and a depending part composed of sections having their upper edges wedge-shaped, and metal bars secured to the top of the chambers and having grooves of corresponding shape for the reception of the wedge-shaped edges of the partition-sections, substantially as described.

7. A desulphurizing furnace having upper and lower chambers and an endless distributing chain supported by carriages, and passing through both chambers of fire clay partitions dividing each chamber longitudinally into three compartments, each partition being composed of two parts, the upper part being composed of sections having their upper edges wedge-shaped and supported by metal bars having socket grooves of corresponding shape for their reception, the depending sections being provided with inner projections adapted to protect the lower edges of the grooved bars from the heat, and the top of the arch being provided with a depending fire-brick protector for the sides of the metal bars, substantially as described.

8. A desulphurizing furnace having fire-clay partitions dividing the chambers longitudinally each partition having a depending sectional part, the upper edges of the sections being wedge-shaped and supported by metal bars secured to the upper arches, of the chambers and provided with socket-grooves in which the wedge-shaped edges of the partition sections fit loosely, the metal bars being suitably protected from the heat of the furnace, substantially as described.

9. A desulphurizing furnace having upper and lower chambers and suitable fire-boxes communicating therewith, the upper arches of the chambers being continuous in front of the fire boxes and between said boxes, and suitable openings in the arches for the passage of heat to the chambers, there being a space left above the arch to allow the heat to pass from the fire box to these openings, substantially as described.

10. A desulphurizing furnace having upper and lower chambers, and suitable fire boxes communicating therewith, the upper arches of the chambers being provided with central



openings in front of the fire boxes, said arches being continuous between these openings and said boxes, there being a space left above the arches for the passage of heat from the fire box, the heat being directed to the openings by transverse partitions on each side thereof, substantially as described.

11. In a desulphurizing furnace the combination of the upper and lower chambers, the endless distributing chain located therein and supported by side carriages, fire boxes communicating with the chambers through openings in the tops of the arches above the chambers, said arches being continuous between the openings and the fire boxes, and metal bars secured to said arches and provided with dovetail-sockets or grooves forming a continuous support for the depending partition sections which separate the carriage compartments from the roasting com-

partment of the furnace, substantially as described.

12. A desulphurizing and chloridizing furnace having upper and lower chambers, fire boxes communicating therewith, the upper arches of the chambers being continuous except where the openings are left for the passage of heat to the chambers, a space being left above the arch of the lower chamber, transverse partitions on each side of the openings in this arch and intermediate air chambers through which the transverse tie rods pass, substantially as described.

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

THOMAS THOMAS.

Witnesses:

WM. McCONNELL,  
MURIEL STRODE.