A. B. YOUNG.

SINTERING MACHINE.

APPLICATION FILED AUG. 19, 1908.

930,259.

Patented Aug. 3, 1909.

4 SHEETS—SHEET 1.

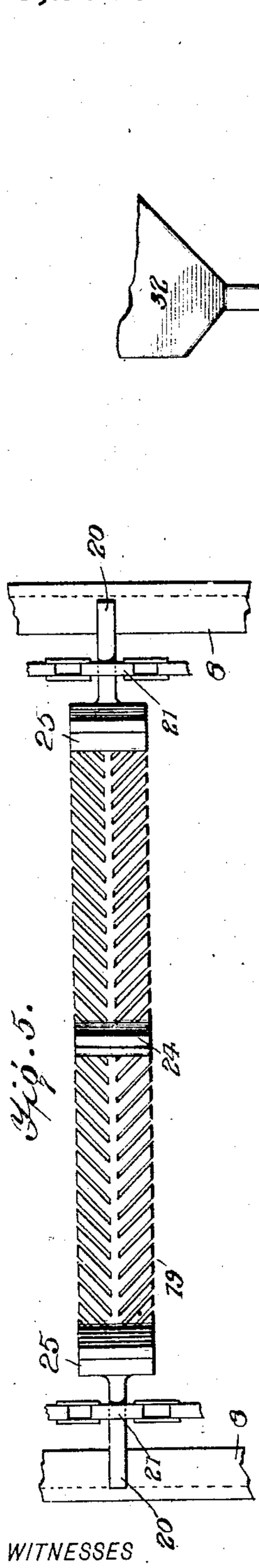

Fig. 5.

Fig. 7.

WITNESSES

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4 SHEETS—SHEET 2.

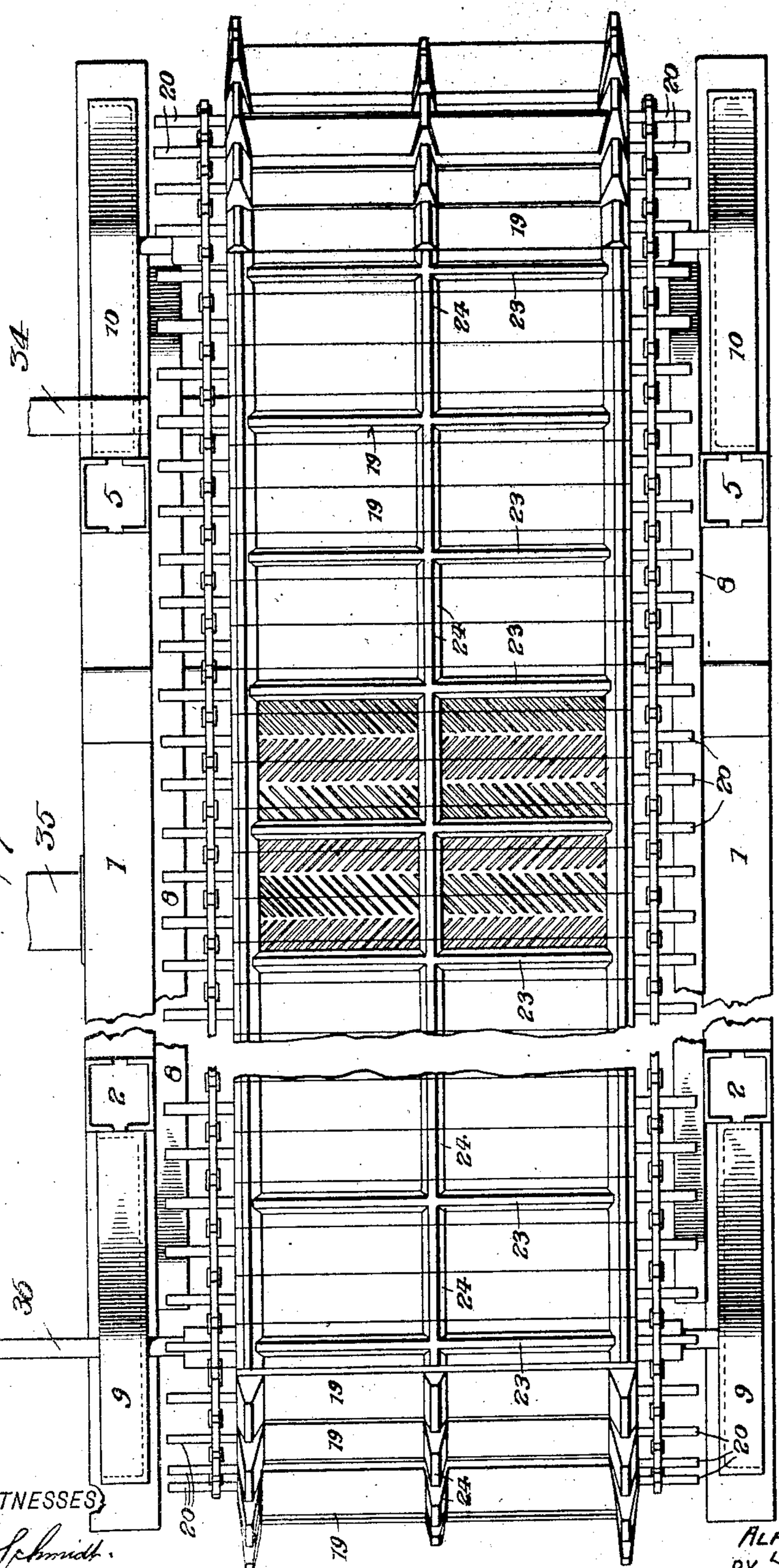

Fig. 2.

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4 SHEETS—SHEET 3.

Fig. 3.

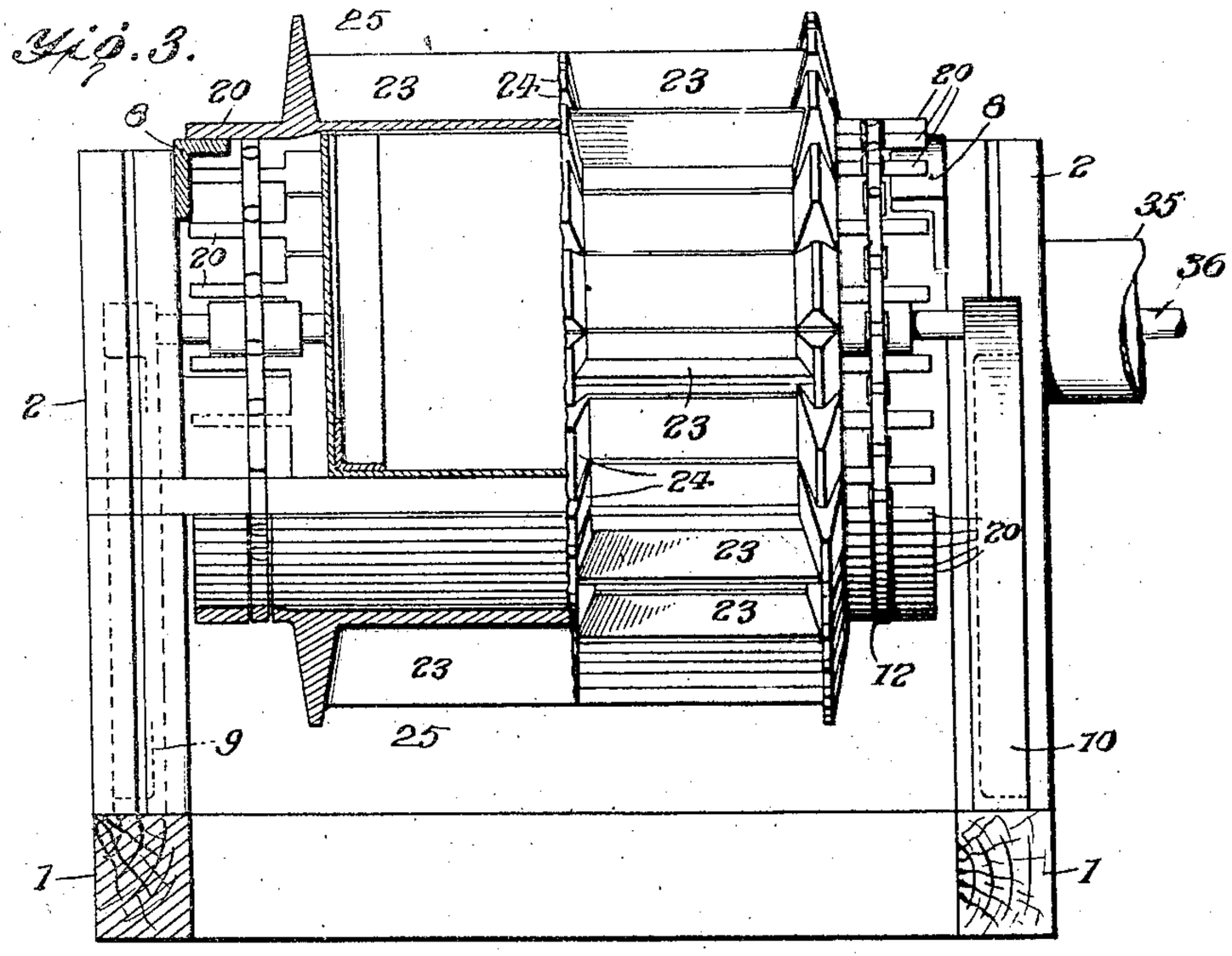
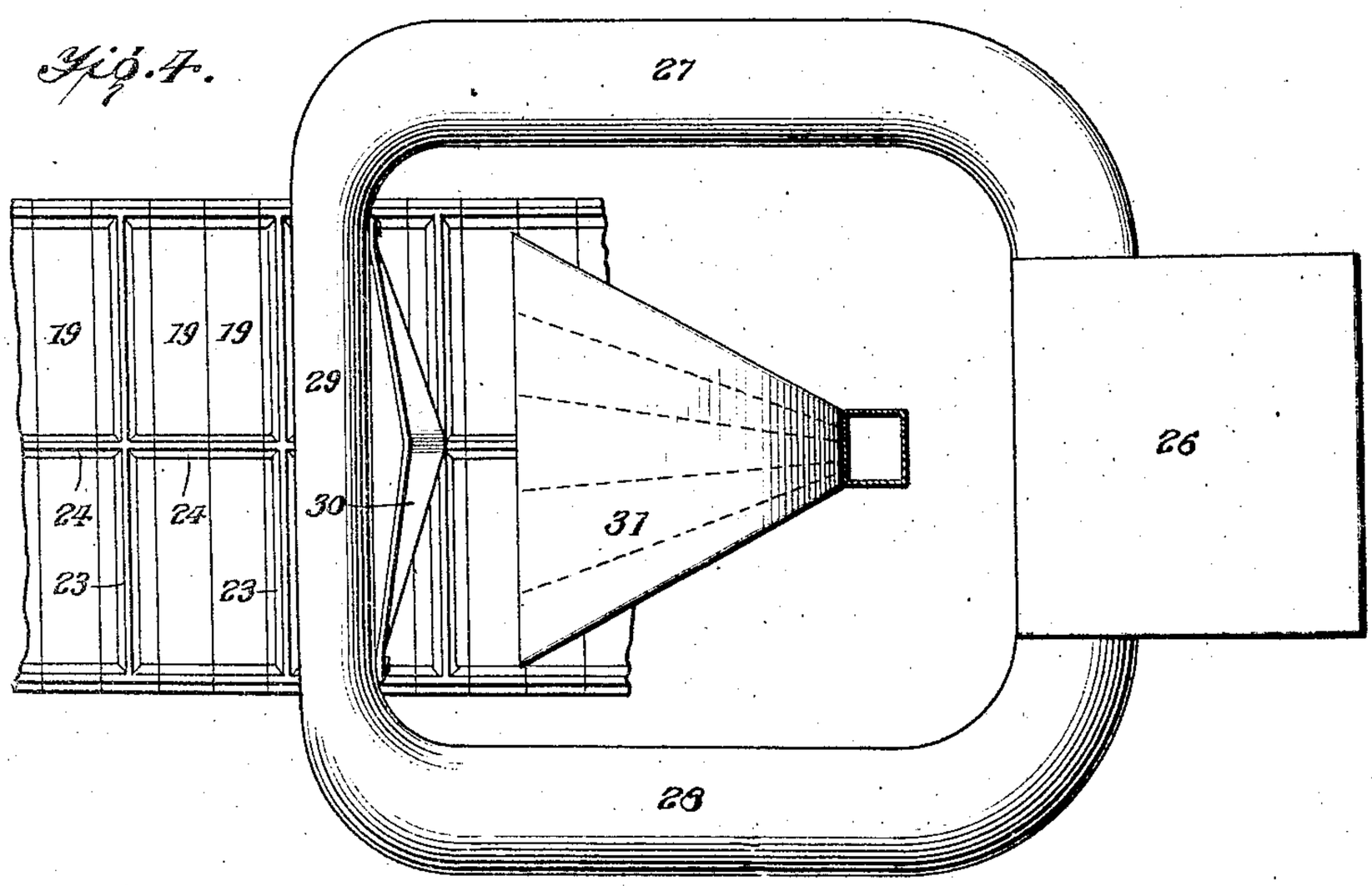


Fig. 4.



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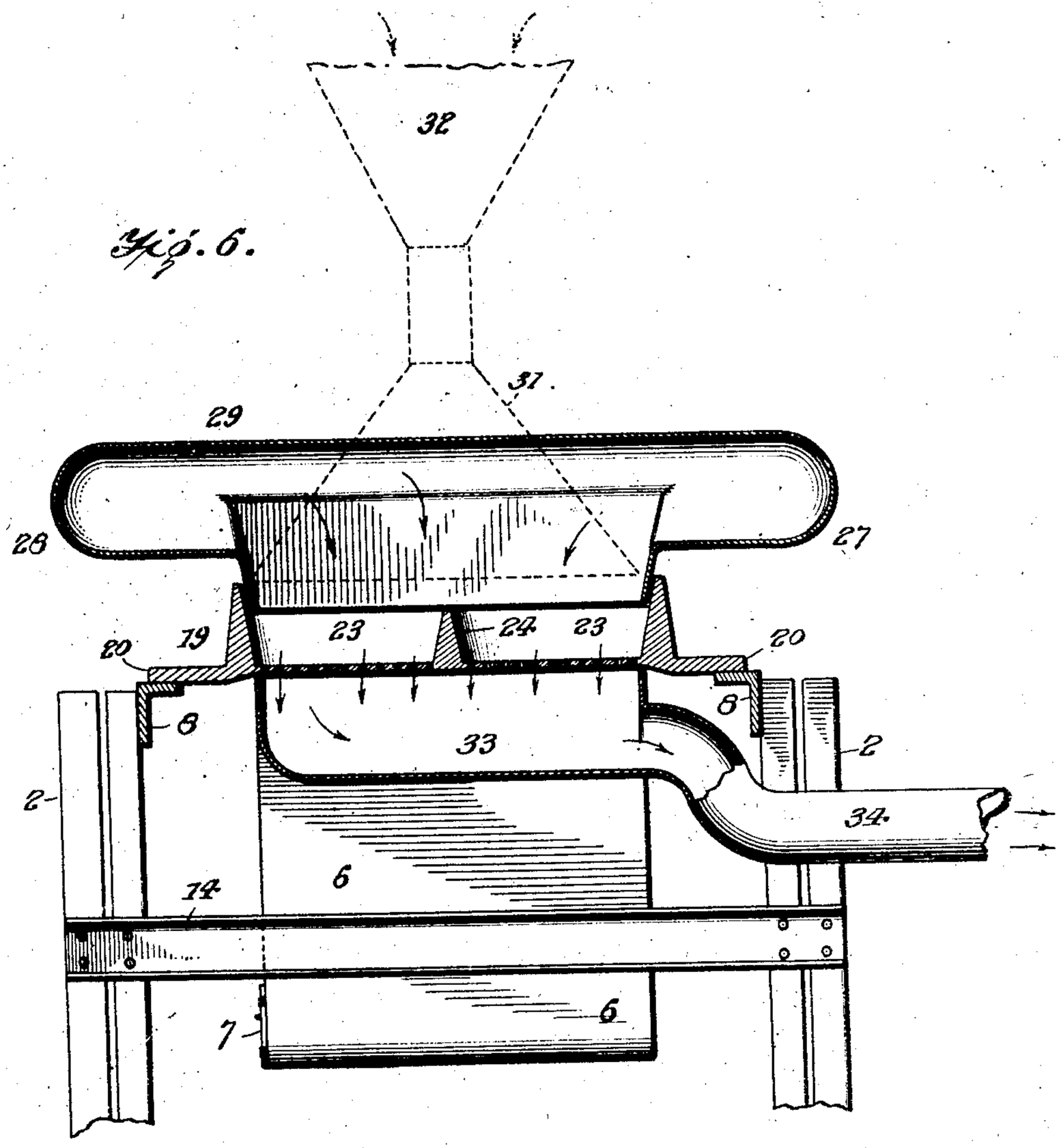
4 SHEETS—SHEET 4.

Fig. 6.



WITNESSES

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UNITED STATES PATENT OFFICE.

ALFALES B. YOUNG, OF SALT LAKE CITY, UTAH.

SINTERING-MACHINE.

No. 930,259. Specification of Letters Patent. Patented Aug. 3, 1909.

Application filed August 19, 1908. Serial No. 449,218.

To all whom it may concern:

Be it known that I, ALFALES B. YOUNG, a citizen of the United States, and a resident of Salt Lake City, in the county of Salt Lake and State of Utah, have made certain new and useful Improvements in Sintering-Machines, of which the following is a specification.

My invention relates to sintering devices, and more particularly to those sintering devices used in the treatment of sulfid and analogous ores, which have been ground to a finely divided state previously to their further treatment in the process of reduction.

An object of my invention is to provide a device in which the finely divided ore may be brought into a conglomerate mass by a sintering process and then may be delivered free from the machine in blocks of convenient size for subsequent treatment in a blast furnace.

A further object of my invention is to provide a device in which there is a continuous movement of the sintering grate, the latter being carried on an endless chain arranged to pass over two sprockets some distance apart, which effects a change of curvature of the bottoms of the grates, thereby facilitating the ejectment of the blocks of conglomerate material.

A further object of my invention is to provide a sintering machine of large grate capacity, which takes up comparatively little floor space and can be located in a building with a low ceiling, on account of its relatively small vertical height.

Other objects will appear in the following specification and will be particularly pointed out in the appended claims.

My invention is illustrated in the accompanying drawings, in which—

Figure 1 shows a side view partly in section of the sintering machine. Fig. 2 shows a plan view of the same. Fig. 3 shows an end view partly in section. Fig. 4 is a plan view of the igniting furnace and a portion of the traveling grate, and Fig. 5 is a detail plan view of an individual section of the traveling grate. Fig. 6 is a vertical section through the igniting box and the suction box.

Referring now to the drawings, 1 denotes in general the bed-frame of the machine. Carried by the bed-frame are the upright supports 2, 3, 4 and 5, which are arranged on each side of the machine in symmetrical relation. These supports are preferably of angle irons, although they may consist of timber. The supports 3 and 4 carry at their upper ends a suction or wind box 6, which has a bottom made of oppositely inclined sections, as clearly shown in the drawings. At the lower junctions of these sections are located hand-holes provided with doors 7, for cleaning out the wind box. The supports 2 and 5 carry at their upper ends rails 8, which extend in a horizontal direction between the two supports and are inclined or curved downwardly at a short distance beyond these supports.

Secured to the bed-frame are the bearing supports 9 and 10, at each end of the machine, these supports being designed to carry the sprockets 11 and 12 at their upper ends, the latter being mounted for rotation in bearings of the usual form.

In order to stiffen the machine so that there will be no possibility of yielding under the strain of a load, I provide the cross braces 13 and 14, extending transversely between the supports 2 and between the supports 5, and the inclined braces 15 and 16, extending from the supports 2 to the bearing support 9 and the bed-frame 1, respectively, at one end of the machine, and similar transverse braces 17 and 18 at the other end of the machine.

Arranged to move along the rails 8, and carried thereby, is an endless grate composed of a series of flexible sections. The construction of this grate is shown in Fig. 5.

It will be seen that the bottom portion of the grate consists of bars 19, having a herring-bone arrangement. These grate bars are supported by means of a series of rods 20, which extend transversely of the rails 8, and which are adapted to ride thereon. The rods 20 are arranged to connect rigidly with the links 21 of the chain 22, which thereby forms a supporting member for the grate sections. This chain, which is looped around the two end sprockets 11 and 12, constitutes an endless carrier. Each individual grate section is provided with a laterally extending rod 20 at each end thereof.

In order to provide molds for the material deposited upon the grates, I arrange vertical plates 23 at equal intervals, shown in the drawing as upon each third section, and a series of vertical plates 24 along the tops of

the grate sections, thereby providing a series of rectilinear molds, each composed of a plurality of movable grate sections. At the opposite ends of the grate sections I provide the end pieces 25, these end pieces being higher than the dividing plates 23, as clearly shown in Fig. 1. When the grate sections are traveling along on the rail, the edges of the vertical plates 25 and 24 are together, the former constituting continuous side members, and the latter constituting a central dividing member, as clearly shown in Fig. 2.

In Fig. 1 I have shown a diagrammatic view of an igniting furnace. The latter I have designated in general by 26. The furnace is provided with the usual ash-pit and combustion chamber, and is of the reverberatory type. The products of combustion are caused to pass by the lateral pipes 27 and 28 to an igniting box 29, which is arranged in close proximity to the tops of the vertical plates 23. Secured to the igniting box is a plow 30 for leveling off the ore which is deposited by the distributer 31, leading from the hopper 32. Located immediately underneath the igniting box 29, and held closely into engagement with the bottoms of the traveling grates, is a suction box 33, which is connected by means of a pipe 34 to a suction fan, not shown.

The wind box 6, already referred to, extends from a point immediately adjacent the suction box 33, to a point not far from the sprocket wheel 11 and is of a width great enough to cover the full length of the grate sections, which, as shown, extend in a direction transversely to their line of movement. Connected with this wind box is a suction pipe 35, which is connected with a suction fan, not shown.

Either of the sprocket wheels may be directly connected with a drive shaft 36, or may be driven in any other suitable manner, provided a comparatively slow rotary movement is imparted to the sprocket wheel, thereby carrying the various grate sections in continuous succession along the supporting rail, underneath the distributer and igniter.

From the foregoing description of the various parts comprising my improved sintering machine, the operation thereof may be readily understood.

The powdered ore contained in the hopper 32 is fed through the distributer 31 in a well known manner, and falls upon the grate sections passing underneath. The stationary plow attached to the igniting box tends to level off the ore and to spread it evenly over the moving grates. The flame from the igniting furnace 26 is drawn downwardly through the igniting box and through the powdered ore into the suction box 33, and thence finds an exit by means of the pipe 34. The ore in the meantime has become intensely heated, and continues in this condition after it has left the position immediately above the suction box 33. It is now carried by the endless carrier over the wind box 6 which is constantly drawing in air through the hot material in the grate sections passing above it. Thus the combustion of the ore is continued until the mass is reduced to a conglomerate form. The division of the grate into rectilinear compartments provides molds for the sintering material of convenient size for further reduction in a blast furnace as has been already stated. When the compartments containing the sintered ore reach the left hand sprocket wheel 11, the individual sections, composing the compartment, in passing around the wheel, change their inclined relation with one another. In other words, the bottom of the compartment, as a whole, instead of remaining flat, now becomes curved. This tends to loosen the mass from the bottom, while at the same time the sides and ends of the compartments separate, thereby allowing the block to fall free from the grate into the receptacle provided for it. During the operation of sintering, fine ore dust is liable to drop through the crevices between the grate sections into a wind box 6, and in order to facilitate the cleaning of the latter, I have arranged the bottom of the box in alternately inclined sections, and at the bottom junction of these sections have provided hand-holes, which are accessible by opening the doors 7, thus greatly facilitating the cleaning of the wind box.

The operation of this device, it will be seen, is continuous and it may be used in any case where a sintering machine is necessary. Such substances as flue dust, a mixture of flue dust and sulfid ore, or any fine mineral substance containing a combustible, may be successfully treated by this machine.

I am aware that continuously operated carriers for sintering powdered ore are old, but I believe that I am the first to design a machine in which the ore is deposited and sintered in small compartments for the formation of blocks of convenient size for subsequent treatment, and to provide means for changing the curvature of the bottom of the grates and providing the grates with sides and ends relatively movable away from one another in order to positively loosen the material and to cause its ejectment.

Instead of having the suction box 33 located beneath the traveling grate below the igniter, I may arrange the suction box above and have an updraft instead of a down draft. In the arrangement which I have illustrated the creation of a very strong draft at the point of ignition insures the sintering of the top layer of material, owing to the great heat caused thereby.

It is obvious that other forms of the device based upon the same general idea, might be made, but I regard as my own, and desire to claim, all such modifications as clearly fall within the spirit and scope of the invention.

I claim—

1. In a sintering device, a frame, sprocket wheels mounted upon said frame, an endless sprocket chain carried upon said sprocket, rails mounted upon said frame and extending between said sprockets, a series of grate sections carried by said sprocket chains and arranged to ride on said rail, certain of said grate sections having division plates attached thereto, and each section being provided with end plates, said division plates and end plates dividing the surface of the assembled grate sections into a series of rectilinear compartments, an igniter in close proximity to said grate sections, a suction box arranged underneath the grate sections in line with said igniter, a wind box arranged between said sprocket wheels immediately underneath said grate sections, and means for imparting motion to said sprocket wheels.

2. In a sintering device, a frame, a pair of sprocket wheels mounted on said frame, an endless sprocket chain carried thereby, a series of grate sections borne by said sprocket wheel, a rail for supporting said grate sections, division plates carried by certain of said sections and arranged to form compartments, means for filling the compartments with powdered material, means for initially igniting the material, means for continuing the combustion of the material, and means for imparting a continuous movement to said grate sections.

3. In a sintering machine, a frame, a pair of sprocket wheels mounted on said frame, and provided with an endless sprocket chain, a traveling grate carried by said sprocket chain and composed of individual grate sections, division plates on said grate forming compartments, said division plates being relatively movable to each other, whereby a positive loosening and ejectment of the material carried is effected when the grate passes one of said sprocket wheels.

4. In a sintering machine, an endless grate composed of a series of individual sections provided with vertical end plates, vertical longitudinal division plates carried by certain of said sections, a transverse division plate carried by each section, the side and end plates being arranged to form rectilinear molds when the sections of the grate are in horizontal alinement.

5. In a sintering device, a frame, a pair of sprocket wheels mounted thereon and provided with an endless sprocket chain, a traveling grate carried on said sprocket chain, and provided with a series of rectilinear compartments, means for feeding material into said compartments, means for igniting the material, and means for continuing the combustion of the material.

6. In a sintering device, a frame, a pair of sprocket wheels mounted thereon and provided with an endless sprocket chain, an endless grate provided with compartments carried on said sprocket chain, means for delivering material to said grate, and means for sintering said material.

7. In a sintering device, an endless grate divided into compartments having relatively movable sides and ends, means for depositing material upon said endless traveling grate, means for sintering said material, and means for ejecting the sintered material through the relative movement of the sides and ends of the compartments.

8. In a sintering device, an endless traveling grate, means for charging said grate, means for igniting the charge, means for sintering the charge, means for molding the sintered charge into blocks, and means for positively loosening and ejecting the molded blocks.

9. In a sintering device, an endless traveling grate having compartments formed thereon, means for charging said grate, means for sintering the charge, and means for varying the size of the compartments to effect the loosening of the material carried thereon.

10. In a sintering device, an endless traveling grate provided with compartments, means for depositing material upon said grate, means for sintering the material in said compartments, and means for changing the curvature of the bottom of the grate and thereby loosening the material carried thereon.

11. In a sintering device, a traveling grate comprising a series of compartments, each compartment having a bottom of relatively movable parts, means for charging said grate, and means for sintering the charge.

12. In a sintering device, a traveling grate comprising a series of compartments, each compartment having sides of relatively movable parts, means for charging said grate, and means for sintering the charge.

13. In a sintering device, a traveling grate comprising a series of compartments, each compartment having ends of relatively movable parts, means for charging said grate, and means for sintering the charge.

14. In a sintering device, a traveling grate comprising a series of compartments, each compartment having bottoms, sides and ends of relatively movable parts, means for charging said grate, and means for sintering the charge.

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Witnesses:
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