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ORE SEPARATOR.

APPLICATION FILED FEB. 28, 1903.

906,535.

Patented Dec. 15, 1908.

2 SHEETS—SHEET 1.

Fig. 1.

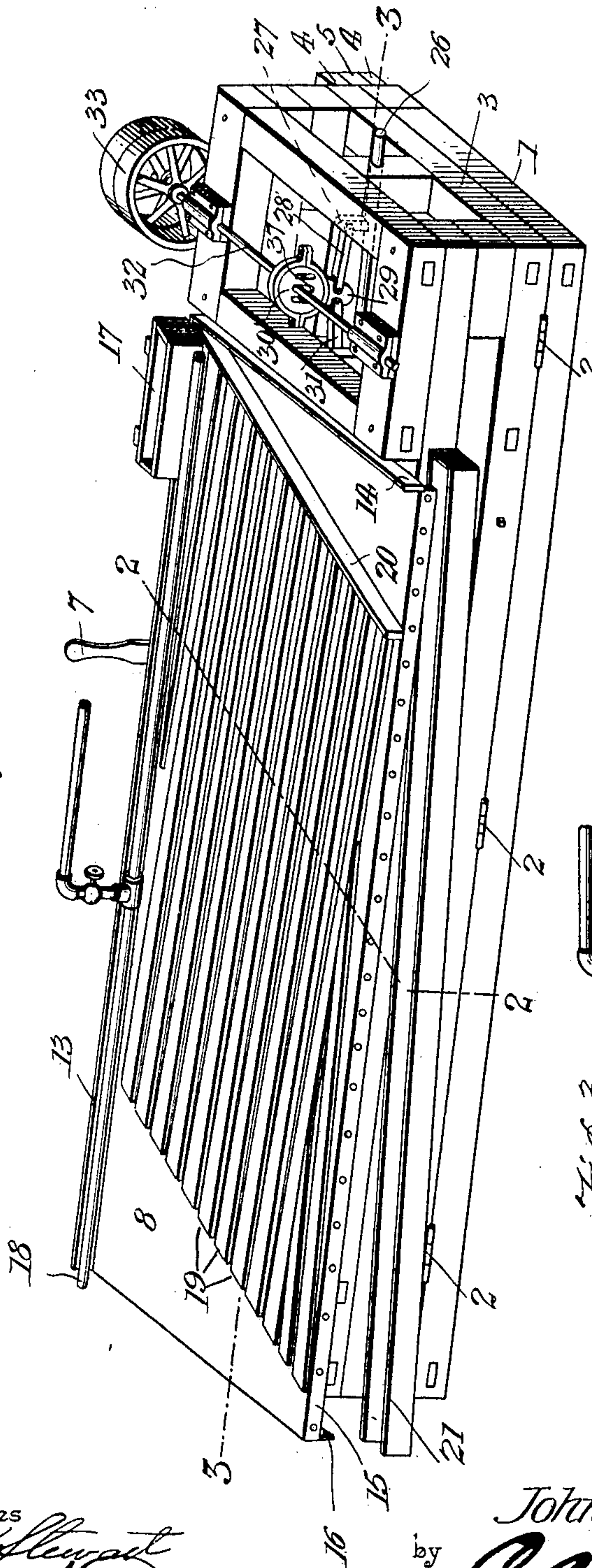
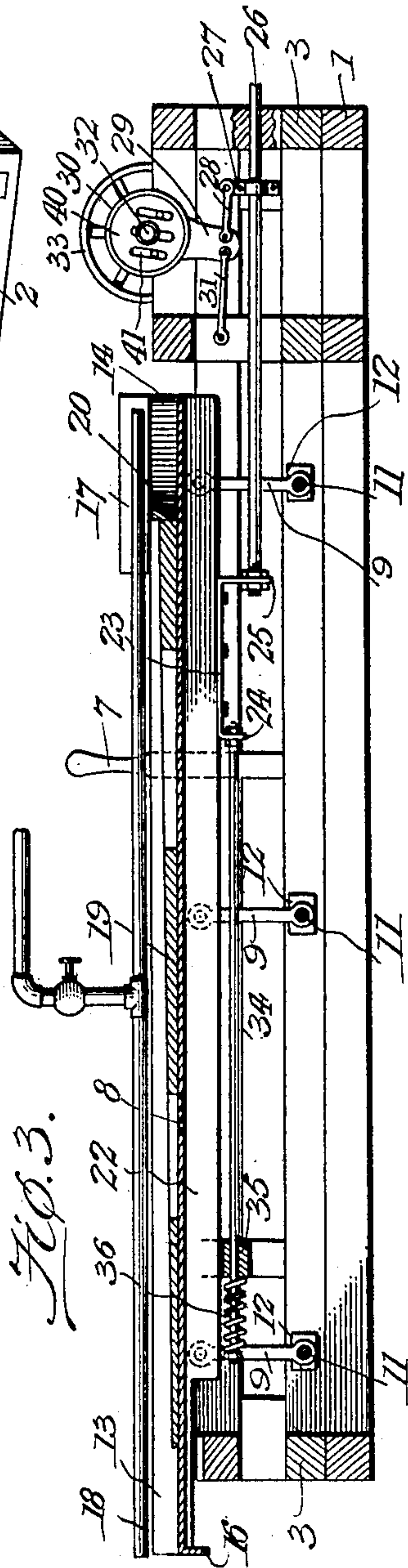


Fig. 3.



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2 SHEETS—SHEET 2.

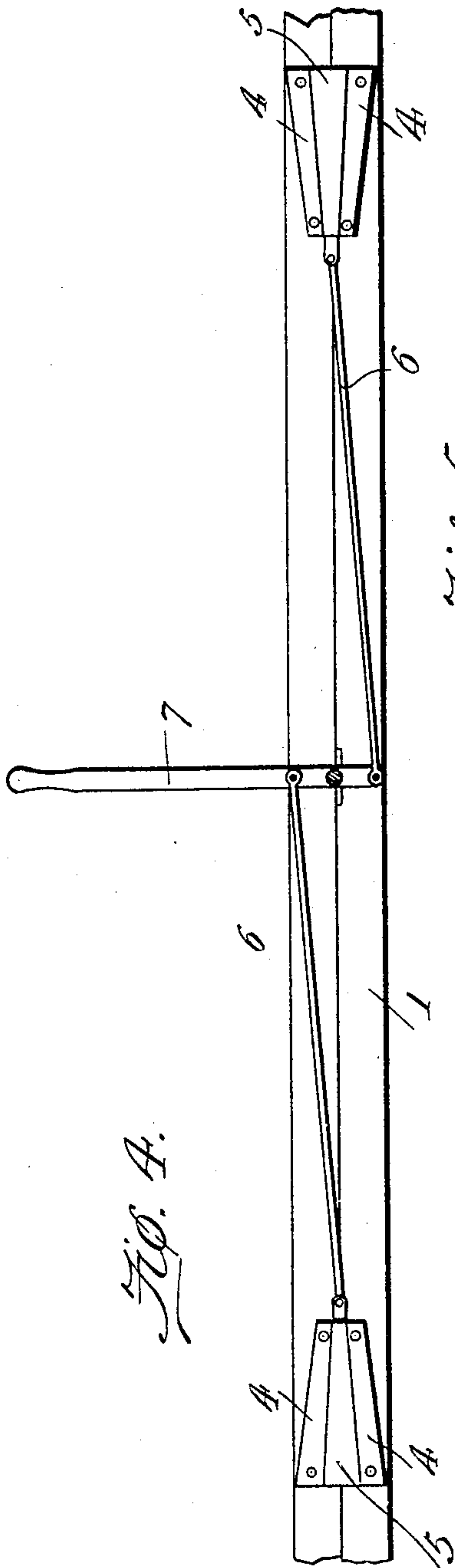


Fig. 4.

Fig. 5.

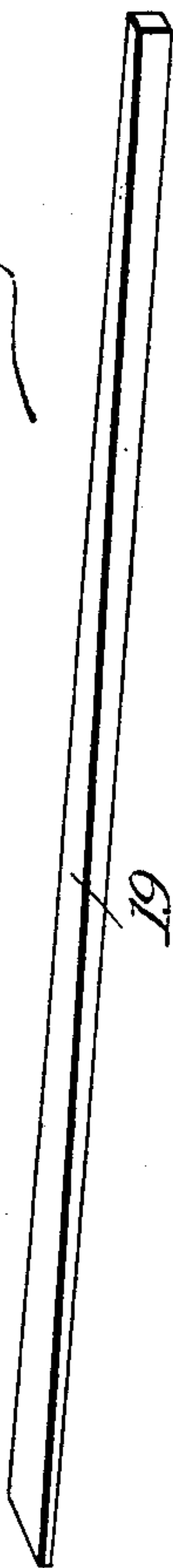


Fig. 6.

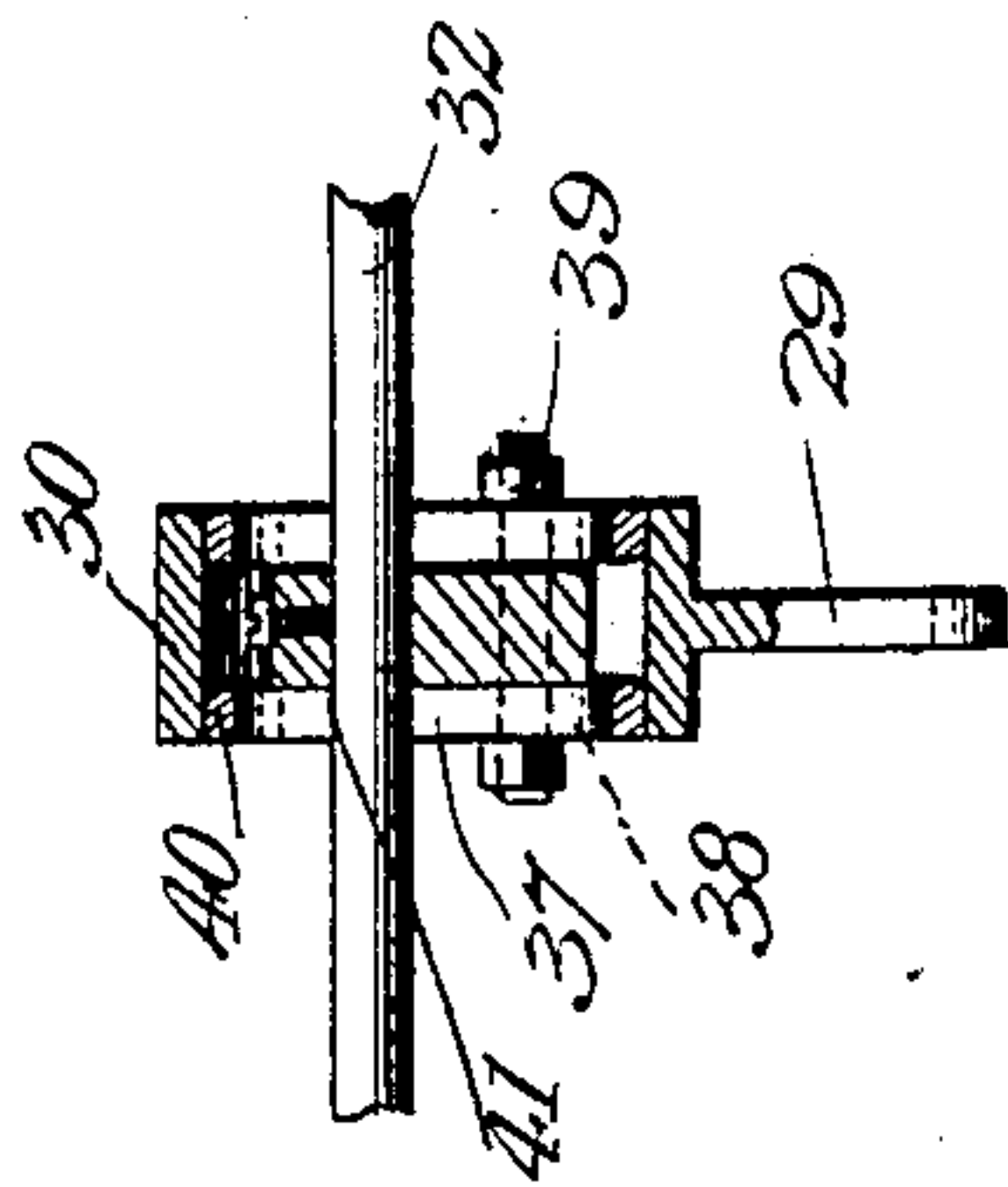
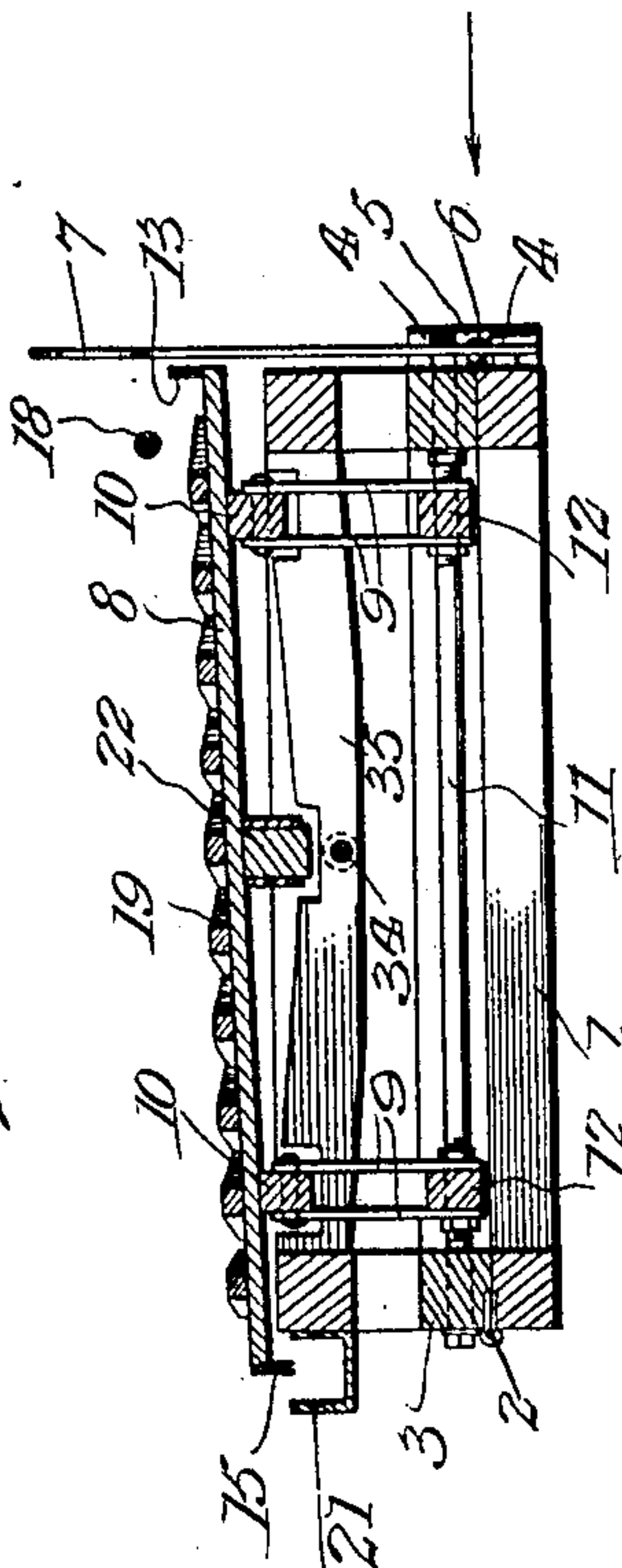


Fig. 2.



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# UNITED STATES PATENT OFFICE.

JOHN GIDEON KIRKSEY, OF CARTHAGE, MISSOURI.

## ORE-SEPARATOR.

No. 906,535.

Specification of Letters Patent.

Patented Dec. 15, 1908.

Application filed February 28, 1903. Serial No. 145,870.

*To all whom it may concern:*

Be it known that I, JOHN GIDEON KIRKSEY, a citizen of the United States, residing at Carthage, in the county of Jasper and State of Missouri, have invented a new and useful Ore-Separator, of which the following is a specification.

My invention relates to ore separators, and is especially directed to that class of devices in which the ore or material to be separated is washed over the surface of a transversely inclined vibratory table and is concentrated according to its varying specific gravity, and is delivered in its separated condition at the delivery end of the table.

The invention has for its objects to produce a device of this character in which the ore, after first spreading transversely of the table in strata of varying degrees of purity, will, during the further separating action, be moved longitudinally of the table and, to some extent, in opposition to the current of water, and in which the lighter particles of the material will, during this longitudinal movement, travel in advance of the heavier particles, be separated therefrom, washed transversely across the table, and be concentrated in turn, while the gangue and other impurities will be finally delivered at the lower side of the table. Thus the material will be delivered in a thoroughly separated condition, and the employment of conveying mechanism for returning it to the table for a second treatment will be obviated.

To these ends the invention comprises the novel details of construction and combination of parts more fully hereinafter described.

In the accompanying drawings,—Figure 1 is a perspective view of my improved device. Fig. 2 is a vertical transverse section through the same on the line 2—2 of Fig. 1. Fig. 3 is a longitudinal sectional elevation on the line 3—3 of Fig. 1. Fig. 4 is a side elevation as viewed in the direction of the arrow in Fig. 2. Fig. 5 is a perspective view of one of the riffle strips. Fig. 6 is a detail view of the adjustable eccentric.

Referring to the drawings, 1 indicates the main or base frame of my improved separator, which has hinged thereto, at its front longitudinal edge, as at 2, a supplemental frame 3. These parts may be of any suitable or desired material, but are preferably composed of wood, and in the form of rectangu-

lar frames consisting of longitudinal bars united at their ends by transverse bars, as clearly shown in Fig. 1. The main and supplemental frames have secured to the rear side thereof, as illustrated in Fig. 4, wings 4 arranged in pairs and oppositely inclined longitudinally. Mounted between the wings are longitudinally slidable wedge-shaped blocks 5 which are pivotally connected by rods 6 with an operating lever 7 by means of which the blocks may be actuated to adjustably tilt or incline the supplemental frame transversely from its back toward its front for the purpose more fully hereinafter described.

Disposed over the supplemental frame is a vibratory table 8, preferably of rectangular form, composed of any suitable material, and movably sustained by means of vertical links 9 pivoted at their upper ends to sills 10 which extend longitudinally of the under face of the table and at their lower ends pivotally mounted on transverse rods 11 sustained at their ends by the supplemental frame 3. The links 9 are arranged in pairs and have interposed between their lower ends on the transverse rods 11 spacing blocks 12. In this connection it is to be noted that there are three of the rods 11 and that each carries two sets of links 9 arranged respectively adjacent to the front and rear sides of the table, and further, that the rear links are of a greater length than the front links, which imparts to the table an initial inclination downward from its rear toward its front transversely, which inclination may be varied according to the varying materials treated by means of the sliding blocks 5 and their attendant mechanism, as will be readily understood.

Secured to and constituting a vertical upwardly extending flange along the higher longitudinal side of the table is a plate 13, a similar plate 14 forming a projecting flange at the front or receiving end of the table, while the lower longitudinal side and rear discharge end of the same are provided with similar plates 15 and 16 which extend downward from and constitute depending flanges.

Mounted at the front upper corner of the table is a box or hopper 17 which is secured in any suitable manner to the table and receives the material to be separated and delivers the same onto the table through suitable discharge openings formed in its bot-



tom. The material, which is delivered at the higher side of the table, is washed transversely across the same by water discharged from a suitably perforated pipe 18 which  
5 extends longitudinally of the table and is connected in any suitable manner with the vertical flange 13.

Secured to the upper face of the table in any suitable manner is a series of guides or  
10 riffles 19, constructed preferably of wood; and which extend longitudinally of the table, and are disposed slightly diagonally of the same from the lower side of its receiving end toward the higher side of its discharge  
15 end, are uniformly spaced apart, and at the receiving end of the table abut against a transversely and slightly diagonally disposed rail or flange 20. The ends of the  
20 riffles which abut against the flange 20 and which receive the material when first discharged from the hopper, are comparatively high and narrow and from the receiving end of the riffles gradually decrease in height and increase in width toward the rear or  
25 discharge end of the table. Thus the discharge end of the riffles is comparatively wide and flat, being, in fact, almost flush with the surface of the table when in position thereon.

30 When the material is first delivered onto the table, it will be washed transversely across the same and received in the spaces between the riffles, and, in its travel across the table, will be automatically separated,  
35 owing to the variation in its specific gravity, into strata of varying degrees of purity, the heavier or purer ores settling upon the table at its higher level, those next in purity and weight at a lower level, and so on until  
40 the gangue and other light impurities are delivered at the lower side of the table into a receiving trough 21. After this first primary separation of the ore, the same travels longitudinally of the table in its separated  
45 condition from the receiving toward the delivery end of the table, and a further and more thorough concentration follows, due to the fact that the spaces between the riffles converge toward the discharge end of the  
50 table and, owing to the gradually increasing friction and compression of the material between the sides of the riffles, retards the heavier and purer ores and permits the lighter and less pure particles to travel forward in advance of the same, and when these  
55 lighter particles reach a point of the riffles sufficiently low they are washed transversely across the table and concentrate with ores of a similar quality at a lower level. A still  
60 further separation of the ores results from the diagonal disposition of the riffles from the lower portion of the receiving end of the table toward the higher portion of its discharge end, which necessitates the material, during its longitudinal movement, trav-

eling to a certain extent against the current of the water. Thus the ore will, owing to these three separate and distinct concentrating actions, be delivered at the discharge end of the table in a thoroughly separated condition and in strata of varying  
70 degrees of purity. The material is caused to travel longitudinally of the table owing to a constant vibratory motion which is positively imparted to the same by mechanism  
75 now to be described.

Secured to the underside of the table in any suitable manner is a central longitudinal sill 22, and bolted to the sill is a metal plate  
80 having depending ends 24—25. This plate is situated some distance from the receiving end of the table and has secured to its depending end portion 25 one end of a horizontal rod 26 which extends parallel with  
85 the table and has its outer end slidingly mounted in suitable bearings formed in the supplemental framework of the machine at the front end of the latter, the other end  
90 portion of the rod having clamped to it an arm 27 formed of two metal plates. This arm, which is adjustable longitudinally of the rod, extends vertically upward from the same and has pivotally attached to its upper  
95 end one end of a link 28, which is pivotally connected at its other end with a vertically depending arm 29 carried by an eccentric 30. The arm 29 of the eccentric has also pivoted  
100 thereto one end of a link 31 which is pivoted at its other end to the framework of the machine. The eccentric 30 is mounted upon  
105 and operated by a drive shaft 32 journaled in suitable bearings transversely of the machine and provided with driving pulleys 33 in belt connection with any suitable source  
110 of power. As the shaft operates, the eccentric will, through the medium of its link connection with the shaft 26, reciprocate the latter longitudinally and impart to the table  
115 a vibratory reciprocating motion which, owing to the connection of the shaft to the table at a point distant from its receiving end, will be more thoroughly and equally distributed throughout the surface of the table, thus insuring a uniform concentration of the material under treatment.

In order to compensate for lost motion and a consequent irregularity in the vibratory motion of the table, I secure to the  
120 arm 24 of plate 23 one end of a rod 34 which has its other end slidingly mounted in a block 35 fixedly sustained by the framework of the device and mounted upon the rod between the block and a head 35 secured to  
125 its outer end, a buffer spring 36 which is normally expanded and against the action of which the table is reciprocated.

In order that the vibratory motion of the table may be suitably regulated or adjusted according to the quality of the material under treatment, I provide for a ver-  
130



tical adjustment of the eccentric 30 relative to the shaft 32. For this purpose the end plates of the eccentric are slotted, as at 37, for the reception of the shaft, and are further slotted, as at 38, for the reception of adjusting bolts 39 connected at their inner ends to an inner adjusting member 40 disposed upon the interior of the eccentric and are perforated, as at 41, to receive the shaft. From this it will be seen that by operating the bolts 39 in their slots 38 to adjust the members 40, the eccentric may be moved to vary its eccentricity relative to the shaft, thus varying its throw and consequently the longitudinal reciprocation of rod 26 and the table, which can consequently be adjusted to a nicety.

It will be noted that the table utilized in the present construction is of uniform thickness and that the riffles are fastened upon the upper flat face of the table. The top of the table forms the bottom of the grooves, whereas the edges of the riffles constitute the side walls thereof. By providing riffles which are fastened to the top of the table it is not necessary to go to the expense of constructing a special form of table. Riffles of the construction shown and described can be readily attached upon the flat surface of any table. These riffles can be made as articles of manufacture and can be substituted by the user for riffles which are broken or otherwise injured upon the table. It will be noted that the bottom and top faces of each riffle are counter parts so that the riffle can be secured upon the table with either face downward, thus making it easy to manufacture and apply. Moreover, should the upper edges and surfaces of the riffle become worn as a result of constant use the riffle may be detached and inverted and the worn face pressed tightly upon and secured to the surface of the table.

From the foregoing it will be seen that I produce a device in which there will be a thorough and perfect concentration of the ores, one in which the ores will be delivered in a separated and graded condition from

the discharge end of the table, while the gangue and other impurities will be delivered transversely of the table at its lower side, and that, owing to the perfect separation of the ores attendant upon my device, the employment of conveying mechanism to return the ore to the table for a second treatment, and, in fact, a second treatment of the ores, is obviated. In attaining these ends it is to be understood that I do not limit or confine myself to the details of construction herein shown and described inasmuch as various minor changes such as would suggest themselves to the skilled mechanic may be made therein without departing from the spirit or scope of my invention.

Having thus described my invention, what I claim is:—

1. As an article a riffle for ore separators comprising a flat elongated strip gradually increasing in width and diminishing in thickness toward one end, the side edges of the strip being straight from end to end and perpendicular to the faces thereof, the two faces of the strip being duplicates.

2. The combination with an inclined table having a flat uninterrupted upper surface; of a plurality of similar riffles secured upon and disposed entirely above the upper surface of the table, said riffles being inclined upwardly toward the discharge end of the table and each riffle comprising a flat elongated strip gradually increasing in thickness toward one end, the side edges of the strip being straight from end to end and perpendicular to the faces thereof, the upper and lower faces of the riffle being duplicates, said riffles forming grooves therebetween, the top of the table constituting the bottom of the grooves.

In testimony that I claim the foregoing as my own, I have hereto affixed my signature in the presence of two witnesses.

JOHN GIDEON KIRKSEY.

Witnesses:

H. L. SHANNON,  
W. G. MOORE.