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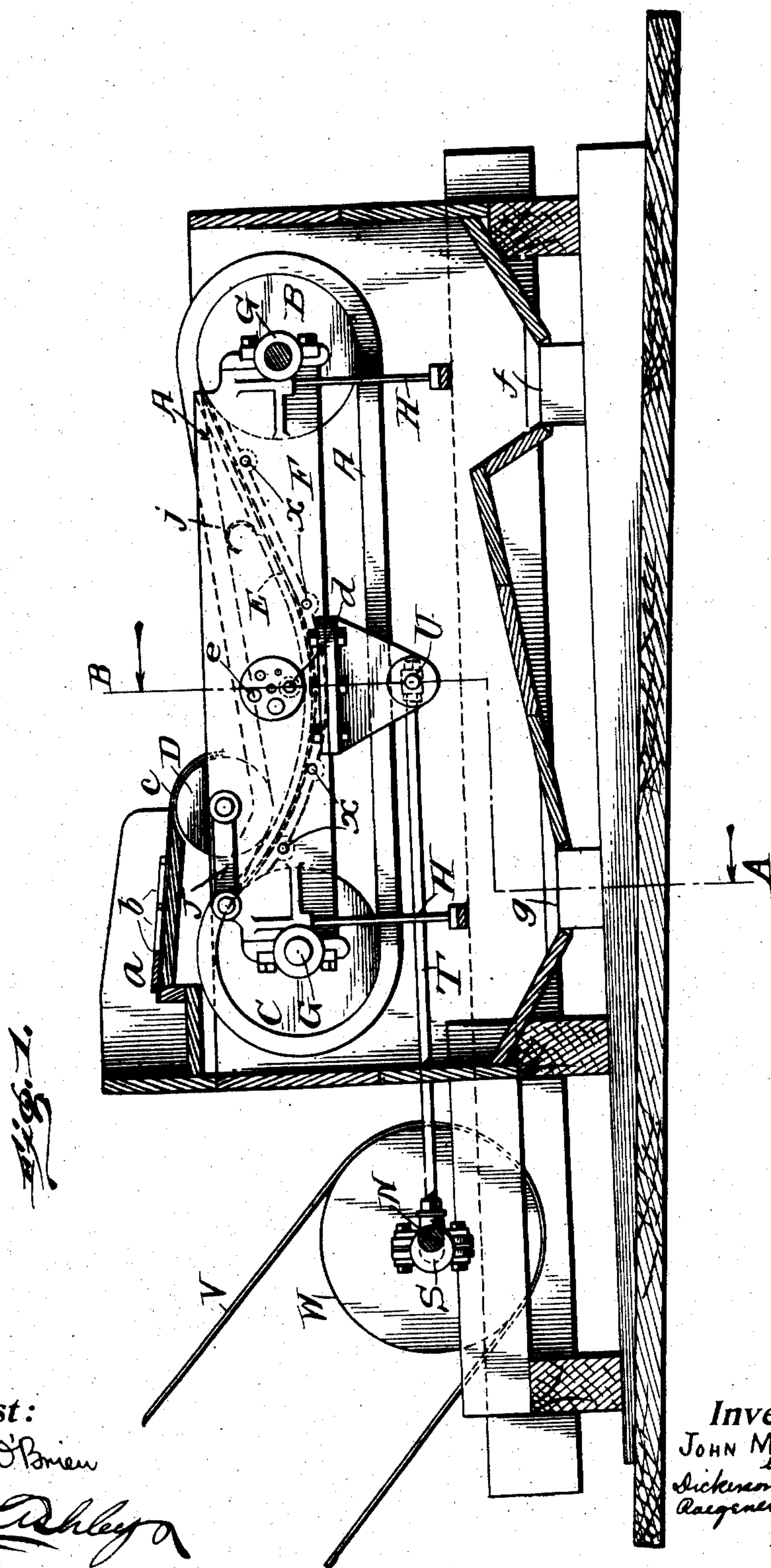
J. M. CALLOW.

PATENTED SEPT. 3, 1907.

SCREEN SIZING AND SEPARATING MACHINERY.

APPLICATION FILED APR. 24, 1905, RENEWED JUNE 1, 1906.

4 SHEETS—SHEET 1.



Attest:
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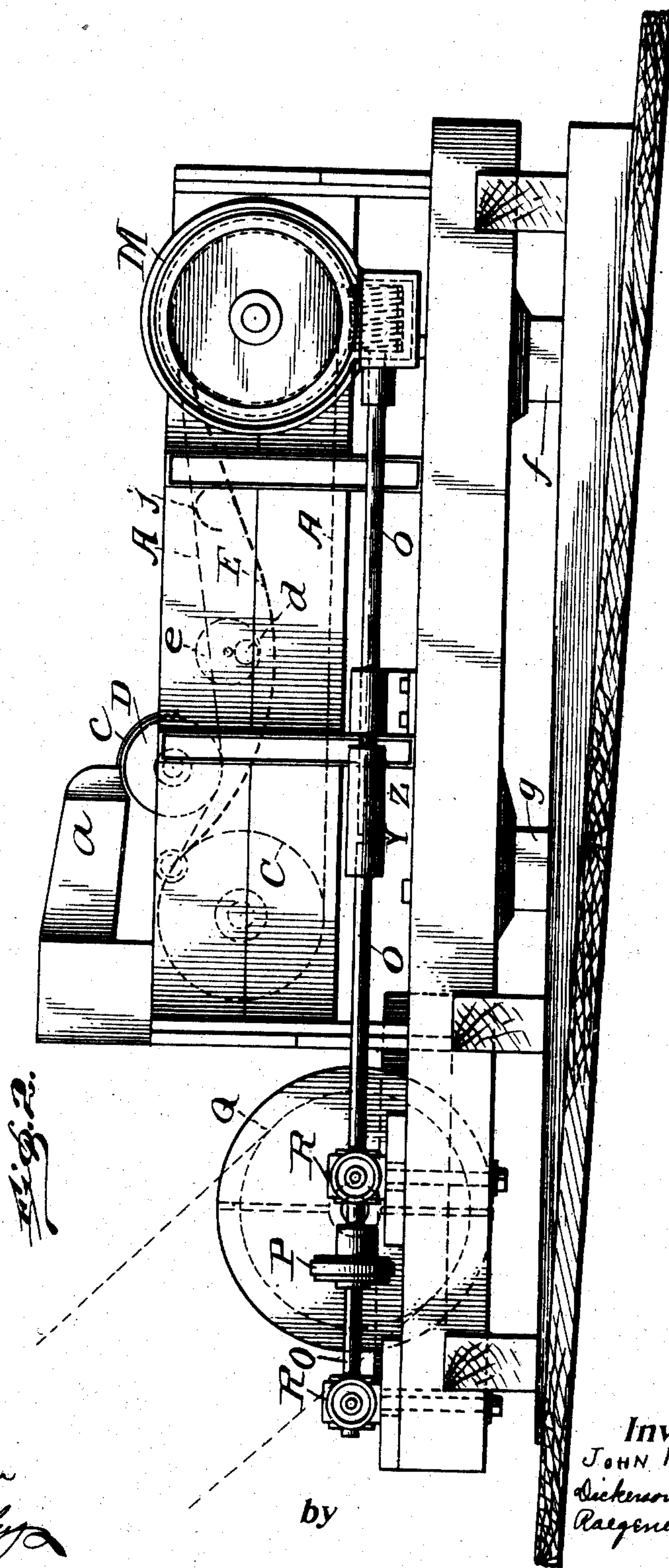
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4 SHEETS—SHEET 2.



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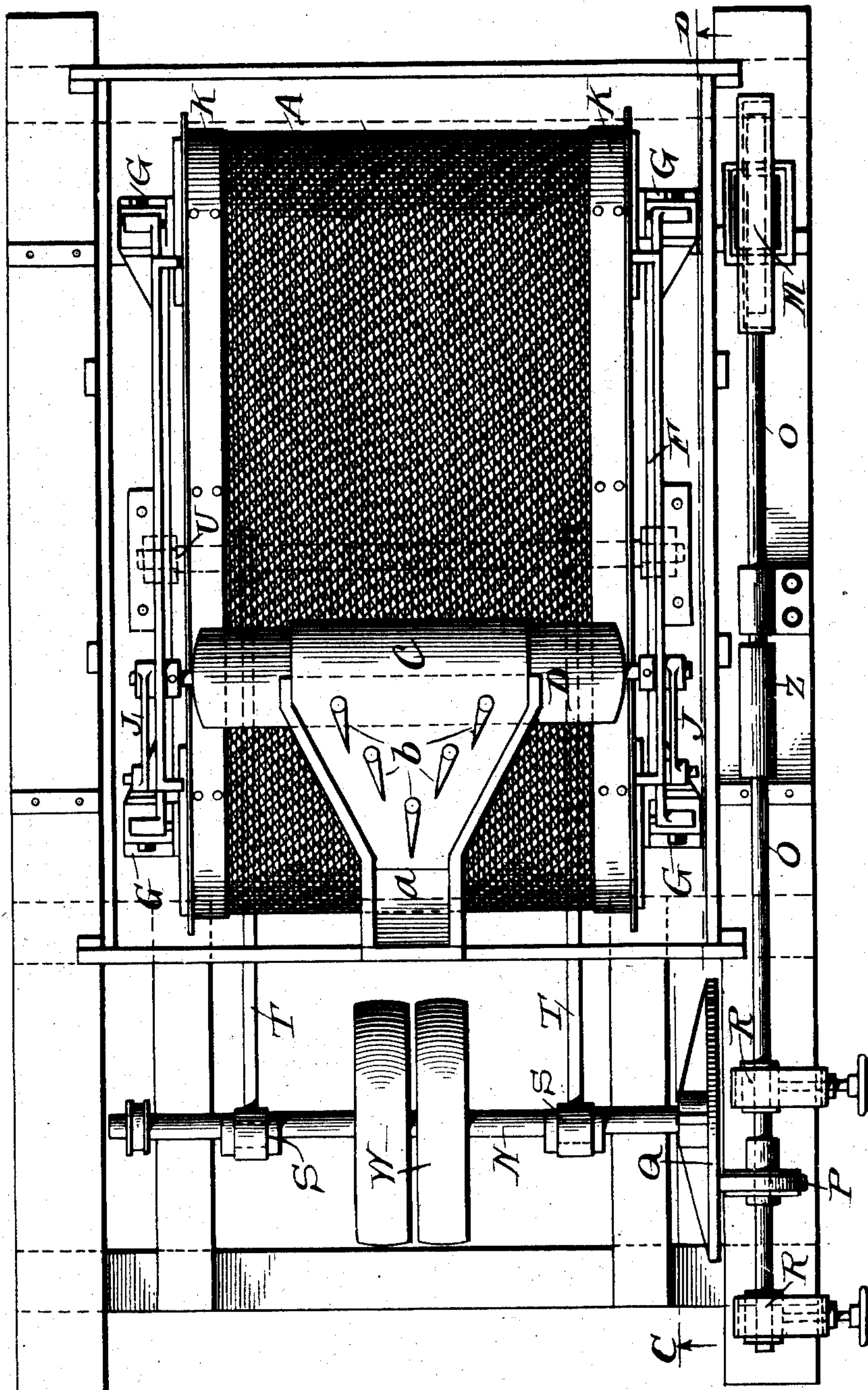
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4 SHEETS—SHEET 3.



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4 SHEETS—SHEET 4.

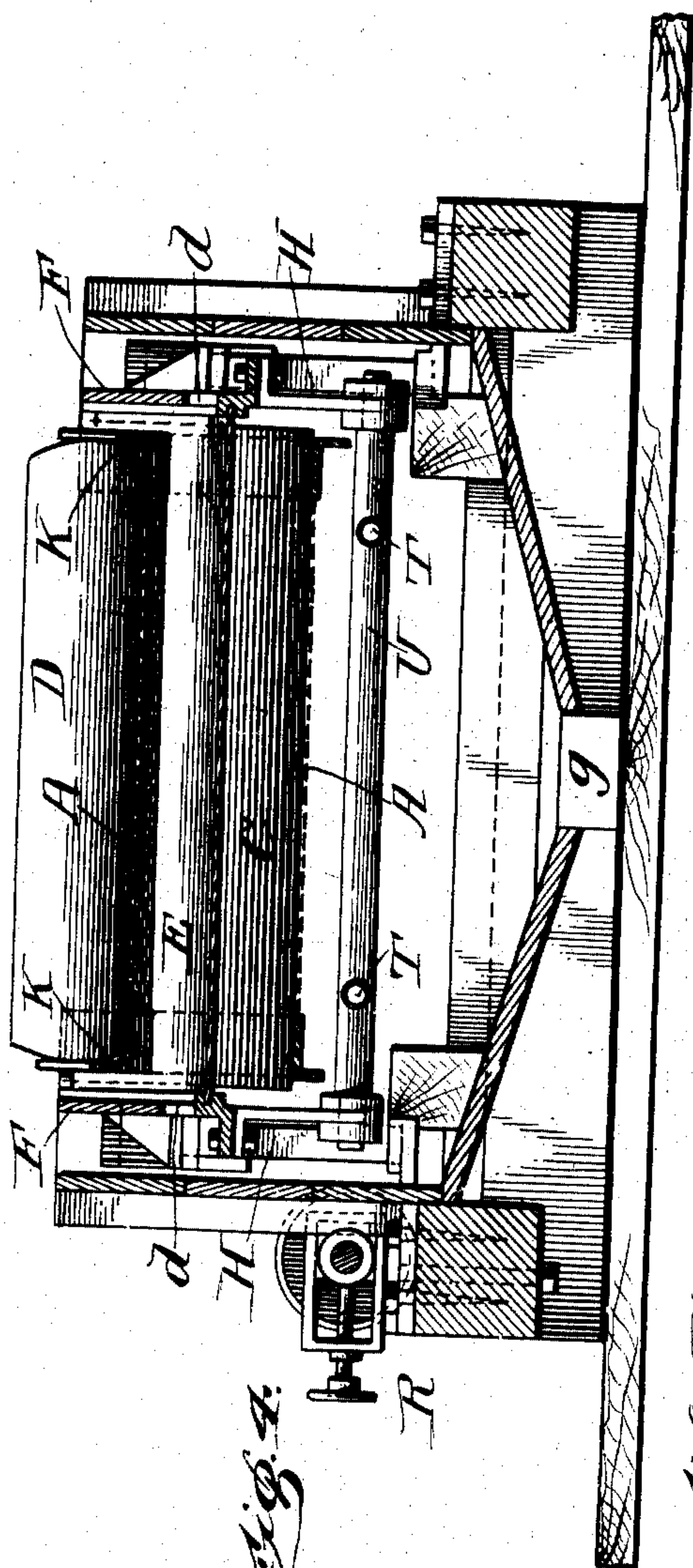


Fig. 4.

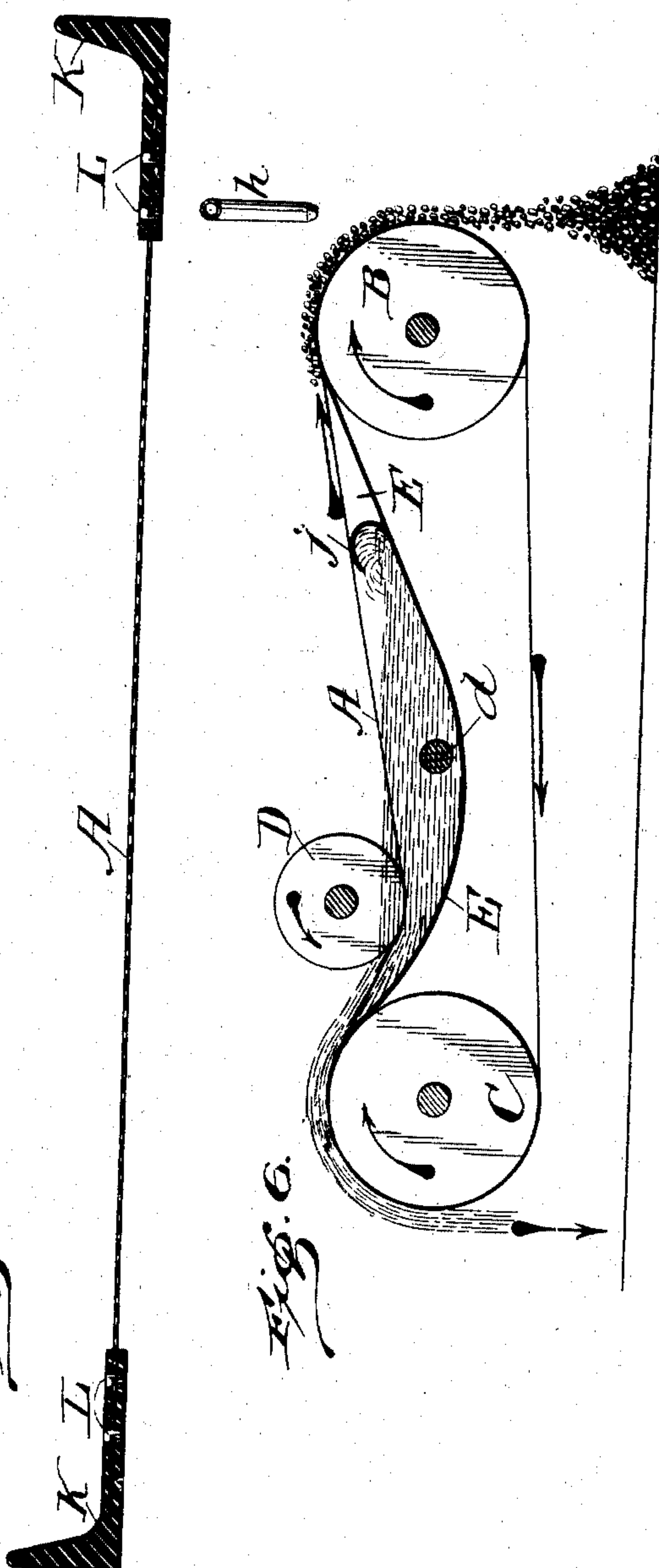


Fig. 5.

Fig. 6.

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UNITED STATES PATENT OFFICE.

JOHN M. CALLOW, OF SALT LAKE CITY, UTAH.

SCREEN SIZING AND SEPARATING MACHINERY.

No. 864,827.

Specification of Letters Patent.

Patented Sept. 3, 1907.

Application filed April 24, 1905, Serial No. 257,081. Renewed June 1, 1906. Serial No. 319,771.

To all whom it may concern:

Be it known that I, JOHN M. CALLOW, a subject of the King of Great Britain, and a resident of Salt Lake City, Utah, have invented certain new and useful Improvements in Screen Sizing and Separating Machinery, of which the following is a specification accompanied by drawings.

This invention relates to improvements in screening machines, but more particularly that class of screening machines provided with a flat perforated sheet, or delicate screen cloth, lying in a horizontal or inclined position on which the ore or other material to be screened is placed. In such machines, pieces small enough to pass through the holes are shaken through, by means of suitable shaking mechanism, while the oversize portions are retained, and are continuously discharged by the action of the machine, thus effecting a separation of the fine from the coarse.

The invention has special reference to the screening of wet material, although the machine may be utilized with any kind of material to which it is applicable.

Many difficulties have hitherto been encountered in screening wet material of any kind on horizontal or inclined screens. In all existing machines, whether of the slightly or greatly inclined types, whether operated with a comparatively slow end motion or rapidly vibrated or impacted at right angles to the plane in which they lie, the practical results are substantially the same, because as soon as the wet pulp strikes the screen the water passes through, leaving the ore in such a plastic condition that perfect work is practically impossible even when assisted by an excessive vibration or shaking of the screen or the addition of large volumes of water to keep the pulp in a dilute state.

A great improvement has been made in these general forms of machines by submerging or irrigating the screen surface, and shaking it in a bath or body of water, so that the pulp is kept in a perfectly free settling condition without the use of additional water. This is an important feature of the invention of my Patent, No. 788,246, granted April 25, 1905, but in the practical operation of the machine there disclosed, I have found that its capacity is limited by the ability of the differential actuating motion to discharge the oversize portions over the end of the machine, and if the rate of progression of the oversize could be increased the screening capacity would thereby be greatly augmented. It is a noticeable feature of all shaking screens, my own previous invention included, that the travel of the ore is obtained by what may be called "indirect" means. In the more common forms a mechanical shake or impact operating in conjunction with the inclination at which the screen cloth is set, is used to assist gravity in propelling the ore over the surface of the screen.

In my previous invention I have used one form of

the well-known differential motion, by which particles are carried forward at a high velocity from a position of rest on the screen, and the momentum which they acquire by reason of this imparted velocity and their own weight, is translated into a forward movement of the particles when the motion is reversed on its return stroke. This motion is so far successful that I am able to propel my oversize particles not only along a horizontal plane but even on and up a slightly inclined one. The rate of progression is however limited, especially on oversize material of low specific gravity, the particles of which do not possess sufficient weight in themselves to produce the necessary trajectory.

It would seem on first inspection, or it might be argued by one having little or no practical experience, that the rate of progression could be increased at will by lengthening the strokes and increasing their number, but such has not proved to be the case, and all attempts in this direction introduce another factor, namely, that any considerable increase of strokes or speed beyond a certain limit is accompanied by excessive vibration of the surrounding parts and the screen cloth itself, which is detrimental to the working of the machine and eventually destroys its mechanism.

The objects of my present invention are, therefore, to avoid the disadvantages attendant upon the use of screening apparatus of the character referred to, and by "direct" means, as distinguished from the "indirect" means above discussed, remove and discharge the oversize. I arrange the mechanism so that the rate of progression shall be under perfect control and adjustment, and thus improve the screening apparatus and render it much more efficient in operation.

To these ends the invention consists of apparatus for carrying out the above objects, embodying the features of construction, combinations of elements and arrangement of parts, having a general mode of operation substantially as hereinafter fully described and claimed in this specification and shown in the accompanying drawings, in which,—

Figure 1 is a longitudinal, vertical, part-sectional view of the machine on line C. D. Fig. 3. Fig. 2 is a longitudinal side elevation of the machine; Fig. 3 is a plan view of the machine; Fig. 4 is a transverse sectional view of the machine on line A B, Fig. 1; Fig. 5 is an enlarged, detailed, transverse sectional view of the screen cloth and its carrying belts and edges; Fig. 6 is a diagrammatic longitudinal section of the rollers, screen belt and pan.

Referring to the drawings, A represents the screen cloth with which the screening or separating is done. It is preferably in the form of an endless band or belt, and passes over the head or driving roller B and the tail roller C and under the deflecting roller D. Under the upper surface of the screen belt is arranged a pan E, the ends of which are preferably tangent with the rollers

B and C, and the sides are connected to the sides of the machine F, the whole being suitably held together by the bolts *x x*.

G G are bearings for the shafts of the rollers B and C, and H H are struts which support the screen and its framework at all four corners. The deflecting roller D is held in position by links J, and serves to deflect and tighten the screen belt by its own weight. The whole machine is preferably set at an inclination with the horizontal so that the delivery roller shall be somewhat higher than the tail roller.

The screen belt is shown in enlarged section in Fig. 5; A is the screen cloth, K K are endless bands of rubber or other flexible material, with vertical side flanges, the horizontal leg of each being split along its whole length and receives the edges of the screen cloth, which are fastened by the staples L L or other suitable means. These flanged edges K K serve the purpose of carrying the screen cloth in its travel around the rollers, taking the strain and pull due to the revolution of the driving roller and preventing this strain or pull from coming upon the delicate screen cloth. The flanges serve also to confine the oversize and ore on the screen and prevent its overflowing the edges of the cloth.

Suitable driving means, as a worm and wheel M, are attached to the shaft of the head roller and connected with the driving shaft N by suitable means, as the worm shaft O, the friction pinion P and the friction disk Q. The friction pinion P is movable along the shaft O for varying the speed of the shaft, and is held in contact with the friction disk Q by the adjusting boxes R R. The shaft N is also provided with cranks S to which are fitted connecting rods T, connected to the frame of the machine by the cross bar U. Power is applied to the shaft N by suitable means as the driving belt V and the pulleys W, and the machine is given a horizontal end shake, while at the same time the head roller B is driven by means of the worm and wheel M through the connecting shaft O and the friction disk and pinion P and Q. The worm shaft O is preferably broken at Y and is provided at this point with a sleeve Z keyed to one section and working loosely on a feather key on the other, to allow of the movement of the worm shaft caused by the reciprocation of the machine.

a is a feed box and apron provided with distributing buttons *b* and a flexible apron *c* for protecting the deflecting roller D.

d d are orifices in the sides of the machine covered with revolving disks *e*, in which are a series of different sized holes for varying the size of orifice as may be necessary for the proper operation of the machine. Other suitable means may be provided for this purpose.

f and *g* are discharge holes in the bottom of the machine for the discharge of the products from their respective ends.

The operation of the machine is as follows: The machine is set in motion by the driving belt V and reciprocated endwise, the screen being caused to travel forward by the mechanism already described; the material to be treated, together with its accompanying water, is fed into the feed box *a* and distributed over the roller D and falls on the moving screen belt A. The oversize portions are at once carried forward by the screen belt and discharged over the head pulley B and dropped into the hopper *f*. To assist in the complete

cleansing of the belt of any adhering particles, the spray pipes *h* are preferably provided. The undersize portions of the feed, together with the water, fall through the screen cloth into the pan E and pass out through the orifices *d* into the catch bottom, and thence to the hopper *g*. The perforated disks *e* in front of the orifices *d* are now revolved until the right sized hole covers the orifice, and thereby the water is raised in the pan E high enough to wash or irrigate the screen cloth by the end shake of the machine, any amount of water greater than can pass the orifices being splashed over the tail roller C and thence into the hopper *g*. The front end of the machine being higher than the back, no water or undersize can pass over it, and this is furthermore prevented by the deflector *j* which, on the backward stroke of the machine, throws the water back toward the tail end. In this way the ore on the screen is subjected to a very perfect process of washing, cleansing it of slimy particles and making a perfectly clean, sized product. Since the wave action is in the opposite direction to the discharge of the oversize, the particles retained on the screen are met and washed many times by the opposing waves. The discharge of some of the water over the tail roller also serves a most important purpose, cleansing and washing the oncoming screen cloth of any slimes and particles entrapped in its meshes, and thus enabling a perfectly clean and unblinded surface to be continuously presented for the reception of the materials to be screened.

By means of the movable friction pinion P, a variable rate of speed can be given to the screen belt, and the rate of progression of the oversize varied at will, according to the requirements of the materials to be separated. The discharge of the oversize is also independent of the gravity of the material, and is unaffected within wide limits of the angle at which the screen cloth lies; it can thus be rendered independent of the speed of the reciprocating motion, and its consequent destructive effects, the reciprocation being only frequent enough to do the necessary washing; the wear on the screen cloth is also distributed over the entire surface of the screen belt,—a unique and important novelty not possessed by any existing machine designed for this purpose.

I claim and desire to secure, by Letters Patent, the following:—

1. In screen sizing apparatus, the combination of a frame, a water tank thereon, an endless traveling band of screen cloth, means for supporting it at its ends above such tank, intermediate means for deflecting the working portion of the band below the level of the supporting means and into the water, and means for imparting a reciprocating motion to the frame.

2. In screen sizing apparatus, the combination of a frame, means for imparting reciprocating motion thereto, a water tank on the frame, an endless traveling band of screen cloth, means for supporting it at its ends above such tank, intermediate means for deflecting the working portion of the band below the level of the supports and into the water, and means for maintaining a substantially constant amount of water in the tank.

3. In screen sizing apparatus, the combination of a frame, means for imparting a reciprocating motion thereto, a water tank on the frame, an endless traveling band of screen cloth, means for driving said band, means for varying the speed of travel of the same, and means for throwing back the water in the tank at each forward stroke of the machine.

4. In screen sizing apparatus, the combination of a frame, means for imparting a reciprocating motion there-

to, a water tank on the frame, an endless traveling band of screen cloth, means for deflecting the working portion of the band into the water, means for maintaining a substantially constant amount of water in the tank, and
5 means for throwing back the water in the tank at each forward stroke of the machine.

5. In screen sizing apparatus, the combination of a frame, means for imparting a reciprocating motion thereto, a water tank on the frame, head and tail rollers, an endless band of screen cloth traveling over said rollers, means for deflecting the working portion of the band into the water, and means for throwing back the water in the tank at each forward stroke of the machine.
10

6. In screen sizing apparatus, the combination with a frame, means for imparting reciprocating motion thereto, a water tank on the frame, an endless traveling band of screen cloth, a roller arranged to deflect the working portion of the band into the water, and a deflector in the tank adapted to throw back the water at each forward stroke of the machine.
15 20

7. In screen sizing apparatus, the combination of a water tank head and tail rollers, an endless traveling band of screen cloth, means for driving said band of screen cloth, means for varying the speed of travel of the same, and means for throwing back the water in the tank over the tail roller.
25

8. In screen sizing apparatus, the combination of a water tank, head and tail rollers an endless traveling band of screen cloth, means for deflecting said band into the water, means for maintaining a substantially constant amount of water in the tank, and means for throwing back the water in the tank over the tail roller. 30

9. In a screen sizing apparatus, the combination of a water tank, head and tail rollers, an endless band of screen cloth traveling over said rollers, means for deflecting the band into the water, and means for throwing back the water in the tank over the tail roller. 35

10. In a screen sizing apparatus, the combination with a water tank, head and tail rollers of an endless traveling band of screen cloth, a roller arranged to deflect the band into the water in the tank, and a deflector in the tank adapted to throw back the water in the tank over the tail roller. 40

In testimony whereof I have signed this specification in the presence of two subscribing witnesses.

JOHN M. CALLOW.

Witnesses:

T. E. CONRAD,
MAE THORNE.