(No Model.) 2 Sheets—Sheet 1.

G. JOHNSTON.

ORE CONCENTRATOR.

No. 490,849. Patented Jan. 31, 1893.

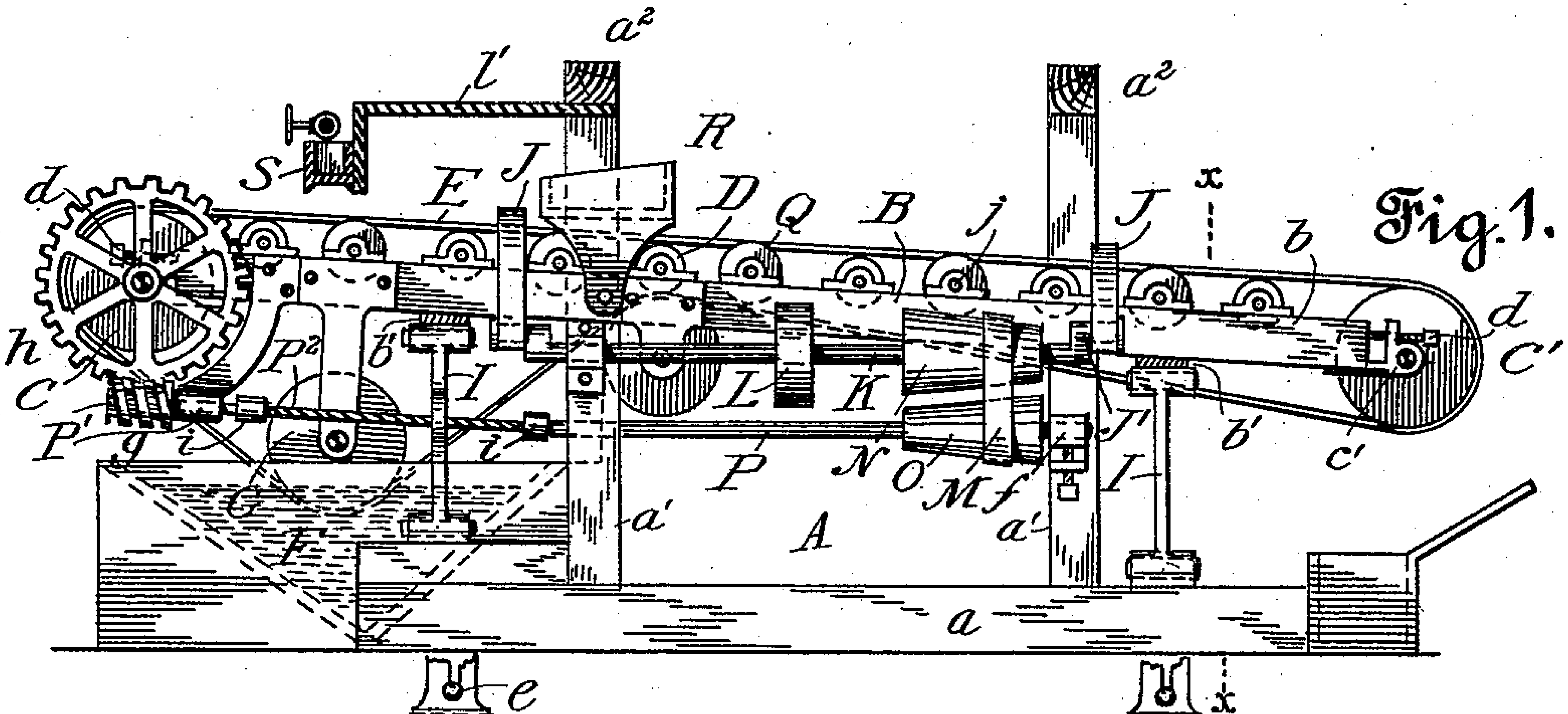


Fig. 1.

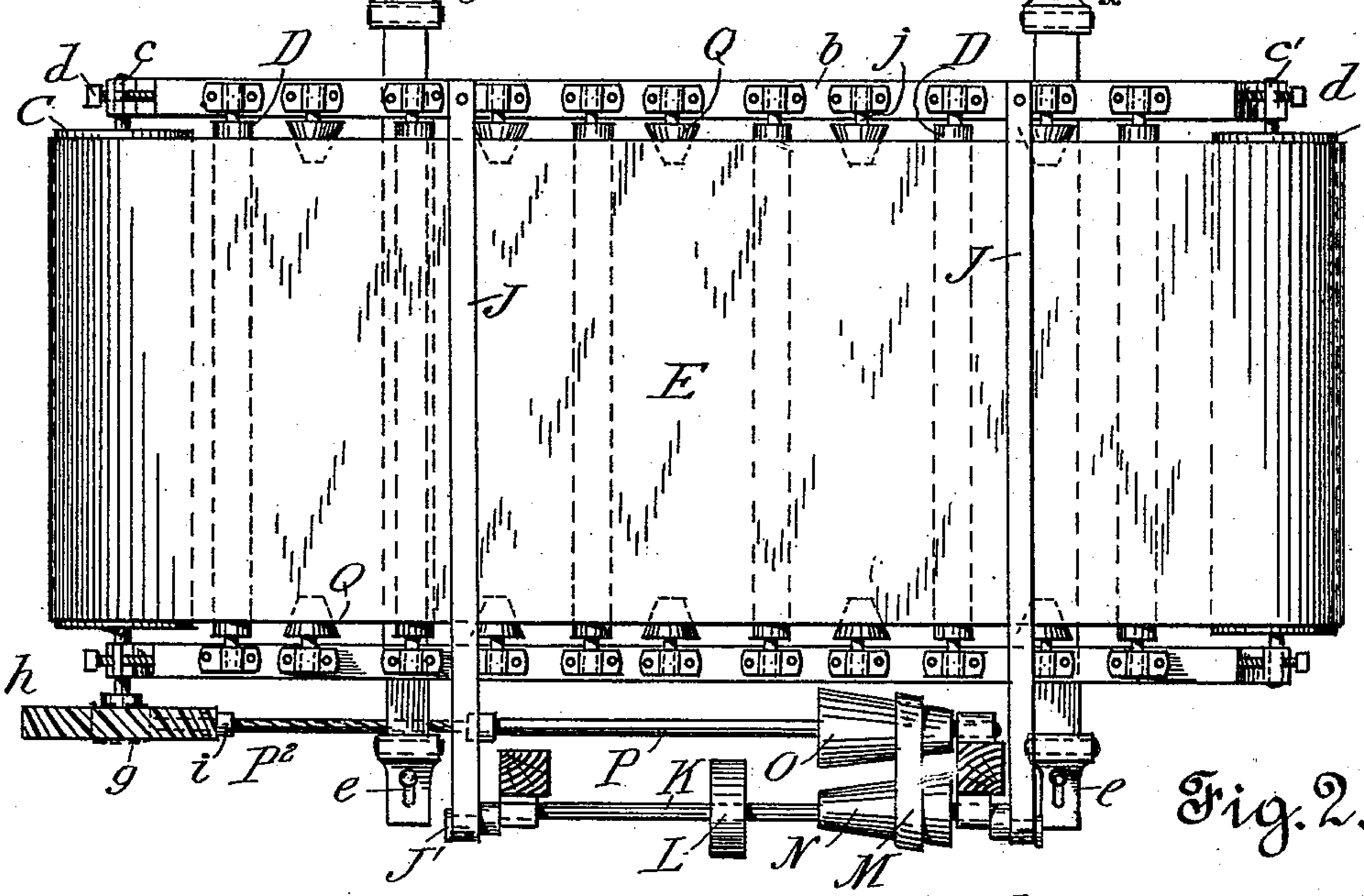


Fig. 2.

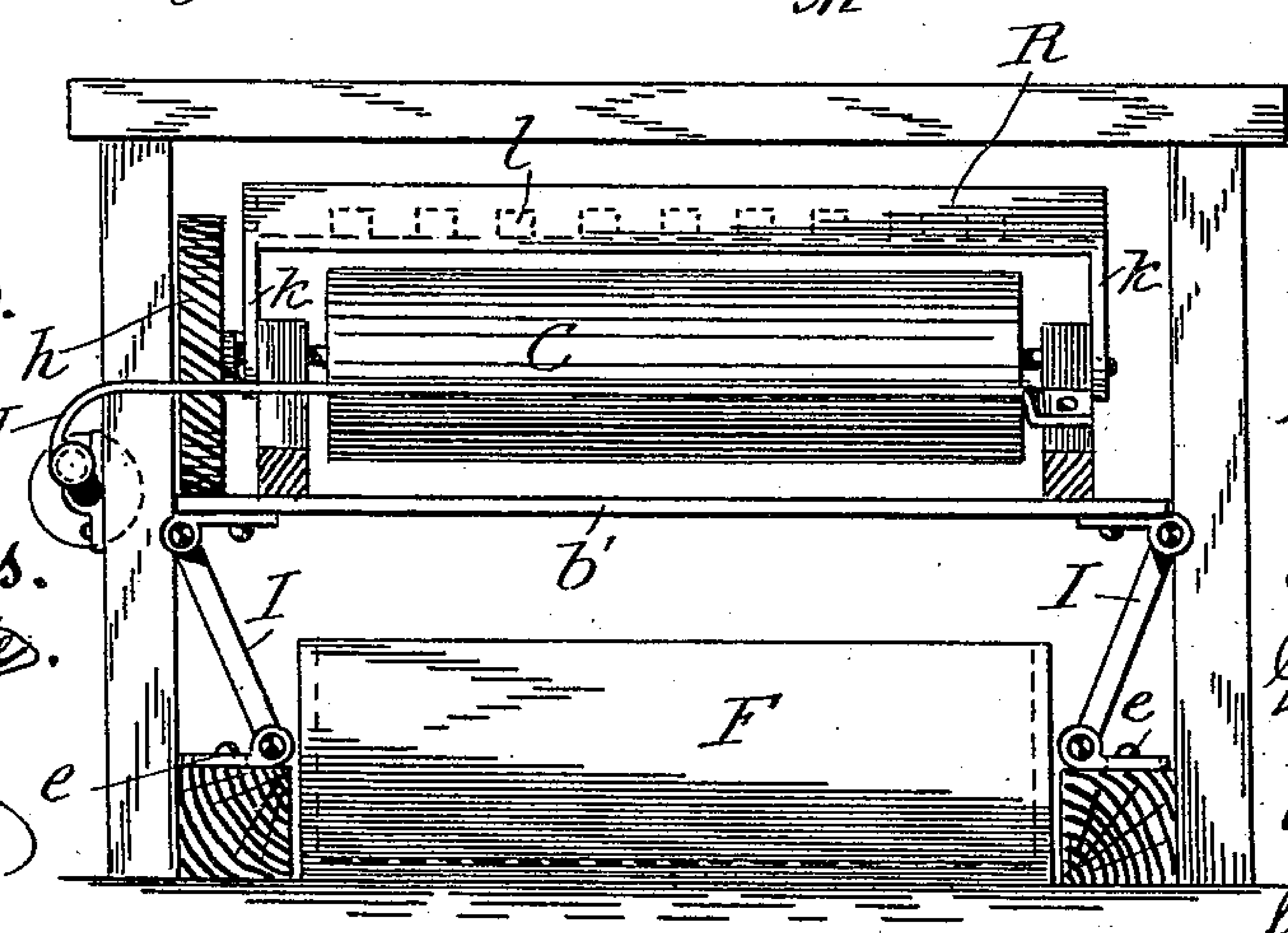


Fig. 3.

Witnesses.

F. E. Monteverde.

H. Gladden

Inventor.

George Johnston.

by his Attorneys

Spear & Seely.

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

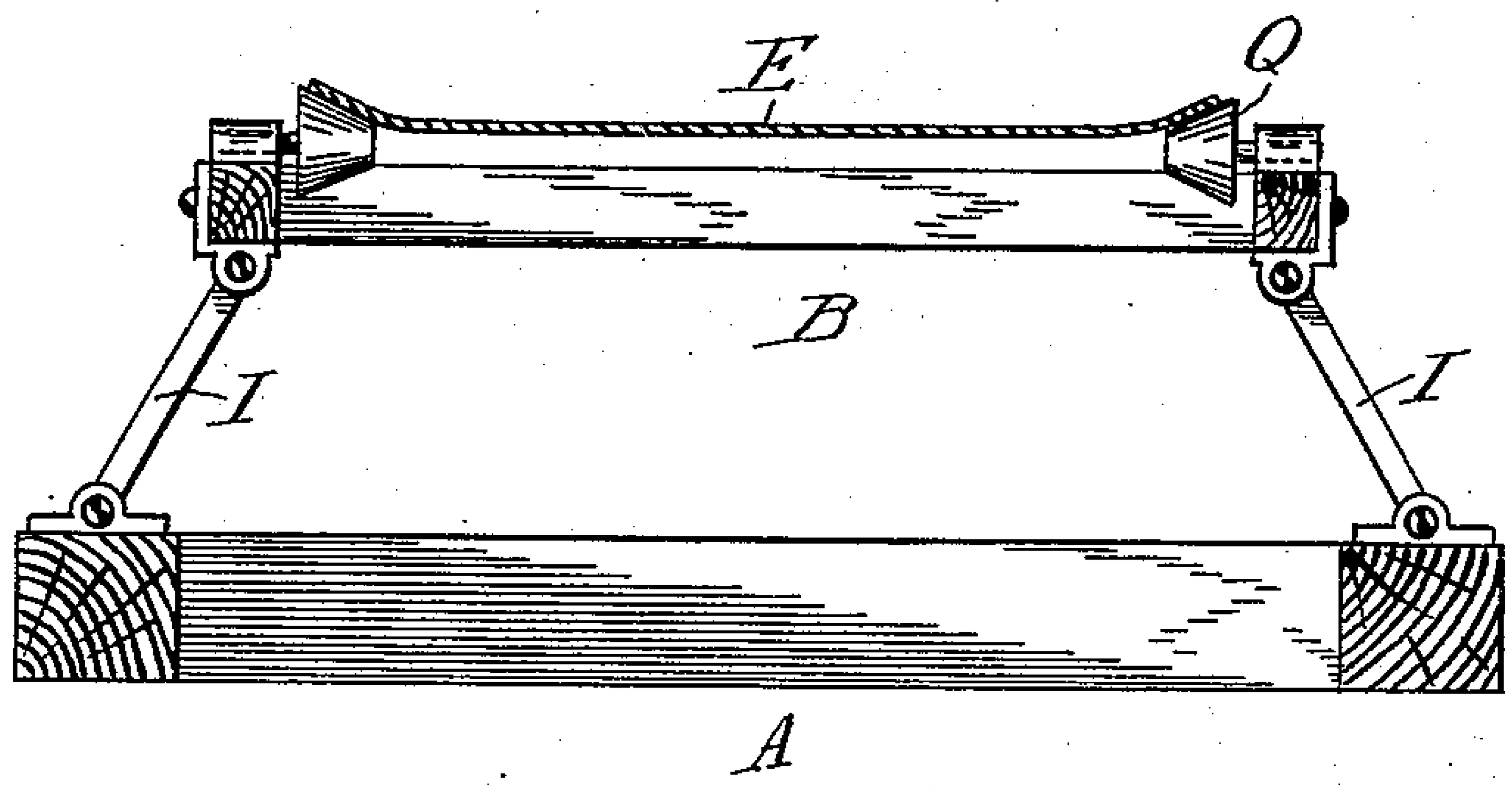
(No Model.) 2 Sheets—Sheet 2.

G. JOHNSTON.

ORE CONCENTRATOR.

No. 490,849. Patented Jan. 31, 1893.

Fig. 4.



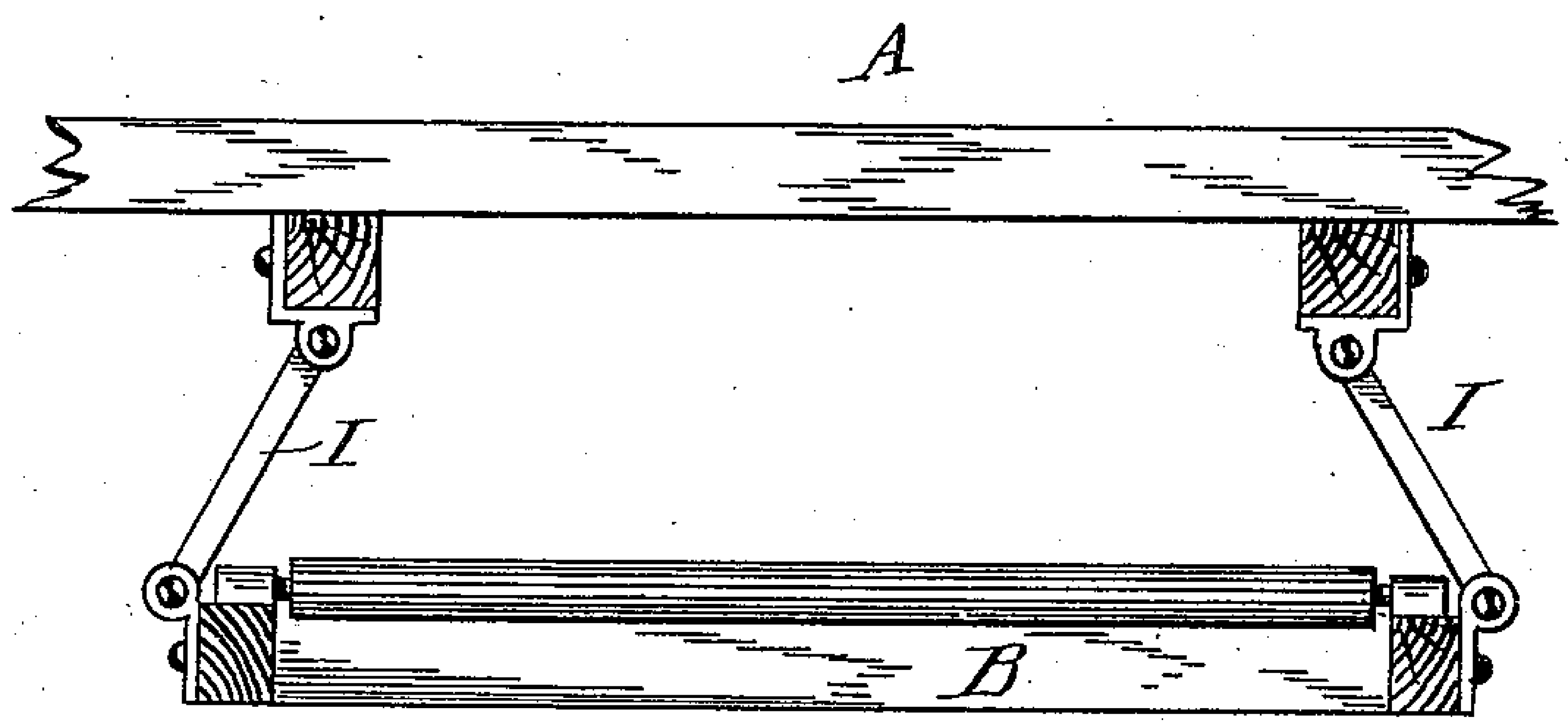


Fig. 5.

Fig. 6.

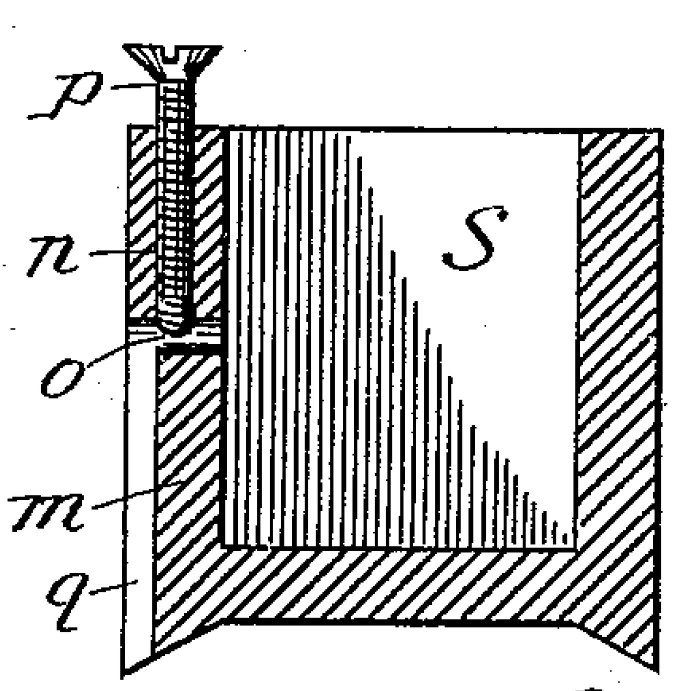
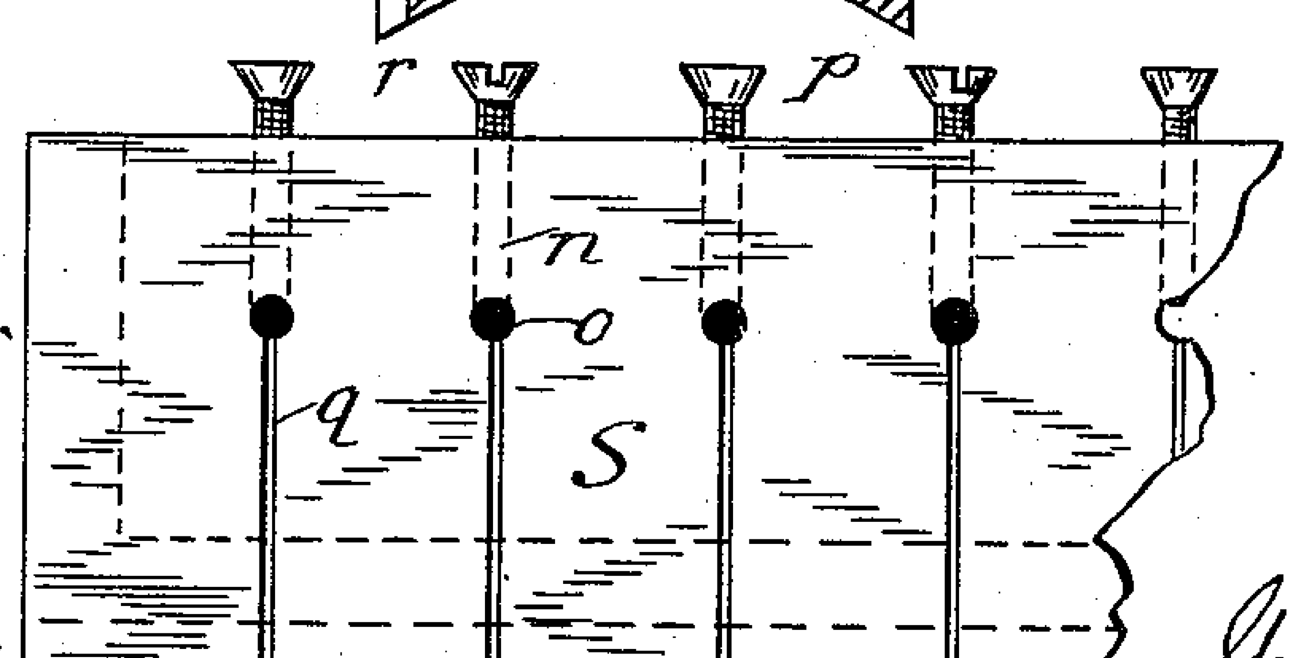


Fig. 7.



Witnesses.
F. L. Monteverde
A. Gladden

Inventor.
George Johnston
by his Attorneys,
Spear & Seely.

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

UNITED STATES PATENT OFFICE

GEORGE JOHNSTON, OF SAN FRANCISCO, CALIFORNIA.

ORE-CONCENTRATOR.

SPECIFICATION forming part of Letters Patent No. 490,849, dated January 31, 1893.

Application filed July 25, 1891. Serial No. 400,730. (No model.)

To all whom it may concern:

Be it known that I, GEORGE JOHNSTON, a citizen of the United States, and a resident of the city and county of San Francisco, State of California, have invented certain new and useful Improvements in Ore-Concentrators; and I do hereby declare that the following is a full, clear, and exact description of the same.

My invention relates to ore concentrators of the class in which an inclined endless belt is carried by, and has a longitudinal movement upon, a frame to which a lateral movement is imparted. The pulp from the stamp mill is supplied to the belt by suitable feeding devices, and is carried up the incline to a point where it meets a supply of water. The combined lateral and longitudinal movement of the belt and the agitation of the pulp and water thus produced, causes a separation of the pulp, the sulphurets and heavier precious particles sinking to the bottom in contact with the belt, and the water and waste material running down the incline and escaping at the lower end of the belt. The sulphurets pass up the incline and are carried with the belt around the guide roller at its upper end, and down through a water tank below, where they are washed off and deposited. This is a general description of the operation of the class of concentrators to which my invention belongs, and its operation in general conforms thereto.

My improvements consist, generally speaking, in a novel manner of connecting the belt frame carrying the moving belt to the stationary main frame, so as to produce an oscillatory motion of the former; further in means for changing the degree of oscillation given to such frame; further in a flexible connection for the shaft which gives the belt its "up hill" motion, whereby a rigid shaft is enabled to impart motion to gearing which is carried by and oscillated with the belt frame; further, in the construction of the water box or distributer; and finally, in certain details of construction which need not be specifically alluded to here, but which are fully hereinafter described, and pointed out in the claims, and are shown in the accompanying drawings, in which—

Figure 1, is a side elevation of my concentrator; Fig. 2, is a plan view with the pulp and water boxes removed; Fig. 3, is a cross-section on the line x—x of Fig. 1; Fig. 4, is a cross-section to illustrate a modification in the manner of connecting the supporting links; Fig. 5, represents another modification; Fig. 6, is a cross-section of the water box; Fig. 7, is a front elevation of the same.

A represents a stationary supporting frame of any suitable construction, but shown here as consisting of longitudinal sills a—a, uprights a'—a', and transverse beams a^2, a^2.

B is the inclined oscillating belt frame composed of longitudinal side beams b—b connected by cross braces b', b' and at the ends by the guide rollers C, C′ which are journaled in movable bearings c—c' connected to the beams b—b, and adjustable by means of screws d, in order to tighten or loosen the ore belt as may be required. A series of rollers D, is journaled in the frame B, over which, and around the rollers C, C′, passes the ore belt E. There are some features in the construction of this belt which will be hereinafter described, but at this point it is sufficient to say, that it is made of suitable flexible material such as canvas, and may be provided with riffles on its surface if desired.

The water tank F is situated at one end of the main frame below the high end of the belt, and a guide roller G is journaled in hangers suspended from the belt frame, so that the roller will dip into the tank, and carry the belt with it. The belt after leaving the tank passes over another guide roller H which directs its course to the end roller C′.

I have termed the lateral motion of the belt frame and belt an oscillating motion, to distinguish it from the ordinary horizontal side shake, as well as from the movement produced by mounting the belt frame upon base rockers. The horizontal side shake is ordinarily produced by supporting or suspending the belt frame by vertical swinging rods, having a parallel motion, by means of which the surface of the belt maintains a constant horizontal plane as it shakes.

I support or suspend my belt frame by links I, which may be either rigid bars, or wooden or metal springs. These links are pivoted to the main frame and to the belt frame, and are placed at an angle to one another (Fig. 3), so as to swing with a non-parallel motion. Either or both the pivot bearings for these links may be made adjustable as shown at e in order that the angle may be changed, and a greater or less variation from the horizontal plane be given the belt. In Fig. 3, I have shown these links as tending to converge downwardly. The effect of their side swing is to give the belt a swinging motion on an upward curve. But in Fig. 4 I have shown the links as tending to diverge downwardly—in which case the swing of the belt is on a downward curve. In other words, any one point on the surface of the belt moves in an arc, the direction of whose curvature relatively to the horizontal, depends upon the convergence or divergence of the links; the amount of movement depending upon the angle at which the links are placed. The modification shown in Fig. 5 will be readily understood without detailed explanation. It consists simply in suspending the links from the upper part of the main frame, instead of supporting them upon its lower part. The angular relations of each pair of oppositely placed links are preserved, and the results obtained thereby are precisely similar to those just described.

The movement of the upper part of the belt, when the links are arranged as shown in Fig. 3, is like that of a belt supported upon rockers working upon a base; but there are important advantages attending my construction. Where rockers are employed, the amount of transverse movement out of the horizontal, given to the belt, is constant and unchanging, because it depends upon the curvature of the rockers, and the throw of the crank which operates them; and these are fixed at the time of construction. In my device, the adjustment of the links to different angles, enables me to change, increase or diminish the vertical movement of the belt, within limits only fixed by the amount of slide that can be given at the pivotal connection of the links. Another advantage is, that the amount of lateral swing on a curve, given to the roller suspended in the water tank is very much greater than can be given such a roller by means of a rocker which works upon a pin at its contact point where the motion is very slight. I am thus enabled to more thoroughly wash the belt in the tank, and more effectually to clear it from the sulphurets some of which might otherwise escape and be washed off by the water flowing down the incline, and lost.

The lateral oscillation of the belt frame is imparted by pitmen J, connected to cranks J′ upon the driving shaft K which is journaled in bearings upon the stationary main frame. The pitmen extend across the belt and are connected to the side beam of the belt frame. The shaft K which carries the driving pulley L, is connected by a belt M running on two cone pulleys N, O, to the counter shaft P, which is the driving shaft for giving the longitudinal or "up-hill" movement to the belt. By using these cone pulleys, I am enabled, by shifting the belt M to change the speed of the shaft P; and to accomplish this easily, and at the same time provide a belt tightener, I journal the shaft P in adjustable boxes f (Fig. 1), by means of which the strain on the belt may be increased or diminished as required.

The shaft which gives the longitudinal motion to the belt is composed of two parts P, P′, the latter being journaled in a bearing in the belt frame, and having a worm g, engaging with a screw gear wheel h on the journal of the driving roller C. As the main part P of the shaft is journaled in the stationary main frame, while the part P′, driving roller, and gearing must swing with the belt frame, a length of flexible shafting is interposed, and connected by couplings i—i to the two parts of the shaft P. Any kind of flexible shafting may be used but I prefer to employ a sufficiently stiff piece of wire rope or cable, which is well fitted for the purpose.

Journaled in the sides of the belt frame and alternating with the rollers D, is a series of cones Q, mounted upon short stub axles j. (See Fig. 4.) The purpose of these is to turn up the edge of the belt as it passes over the rollers D and thus form a continuous flange to retain the pulp and prevent overflow at the sides. Such cones have been used before for the same purpose, but have always been formed with the rollers D. The result was that the difference in speed, produced by the difference between the diameters of the roller and the cone, would cause a drag on the belt, and its consequent wear. By making the cones separate and independent, both cones and rollers take simply the speed of the belt, and there is no unequal strain upon the latter.

R represents the pulp box supported by standards k on the belt frame and shown as provided with a series of orifices l in front, to distribute the pulp to the belt.

I have heretofore referred to the belt as composed of canvas or like textile material. In order to preserve the belt from wear and the liability to decay, I boil or soak the canvas in a weak solution of glue, gelatine, or other animal fiber, which thoroughly permeates it. I then boil it in tan bark water, which converts the gelatine into tannate of gelatine and produces a textile fabric of great durability, and which also resists decay.

S, (see Figs. 6 and 7,) represents the water box situated in front of the pulp box, and supported by an arm l' connected to the main frame. The front board m of the box has its upper edge perforated a sufficient distance with a series of vertical holes or passages n. At the bottom of this series, and intersecting the holes composing it, is a series of horizontal holes or passages o, extending entirely through the board so as to let water pass from the interior of the box. Each of the vertical holes n is provided with a screw or plug p, by means of which the water may be entirely shut off from each passage o, or allowed to run freely therefrom, and otherwise regulated. The water escaping from the holes o is conducted to the belt, by vertical grooves or "saw cuts" *q* extending down to the lower edge of the front board; the latter being beveled to a sharp edge *r* to prevent the water from finding its way backward along the bottom of the box. This is an exceedingly cheap, simple, and effective way of constructing the water box, and of regulating not only the amount of water supplied to the belt, but its proper distribution over the surface.

What I claim is:—

1. In combination, a belt frame, means for sustaining the same consisting of links I at its opposite sides pivoted to the belt frame and the main frame to have movement laterally thereof only said links being permanently set at an angle to each other, and means for moving the frame on the angularly arranged supporting links, substantially as described.

2. In combination, a belt frame means for supporting and directing the movement of the same consisting of the links I having movement transversely of the frame only, said links being set permanently at an angle to each other and being capable of adjustment to vary the said angle, and the means for moving the frame, substantially as described.

3. In an ore concentrator, the combination of a stationary main frame, an oscillating belt frame carrying a longitudinally moving belt, a shaft journaled in the main frame, gearing for driving the belt, and a flexible section in the said shaft for transmitting the motion of the shaft to the belt, and yet permitting the belt and its frame to oscillate, the end of said flexible shaft being journaled on the oscillating frame, substantially as set forth.

4. In an ore concentrator, and in combination, a stationary main frame, a transversely oscillating belt frame having guide rollers for a longitudinally movable belt, a gear wheel connected to one of said rollers, a shaft composed of two rigid parts, one journaled in the main frame, the other in the belt frame, and connected together by a flexible section, and a worm on the part of the shaft connected to the belt frame, and engaging said gear wheel, substantially as, and for the purposes set forth.

5. In an ore concentrator, a water distributing box, having its front board provided with a series of vertical holes extending partially through it, a series of horizontal holes extending transversely through the board and intersecting the vertical series, vertical grooves or saw cuts and screws or plugs in the vertical holes for regulating the flow of water through the horizontal holes, substantially as set forth.

In testimony whereof I have hereunto affixed my signature, in the presence of two witnesses, this 18th day of July, 1891.

GEORGE JOHNSTON.

Witnesses:

L. W. SEELY,

M. R. BRYAN.