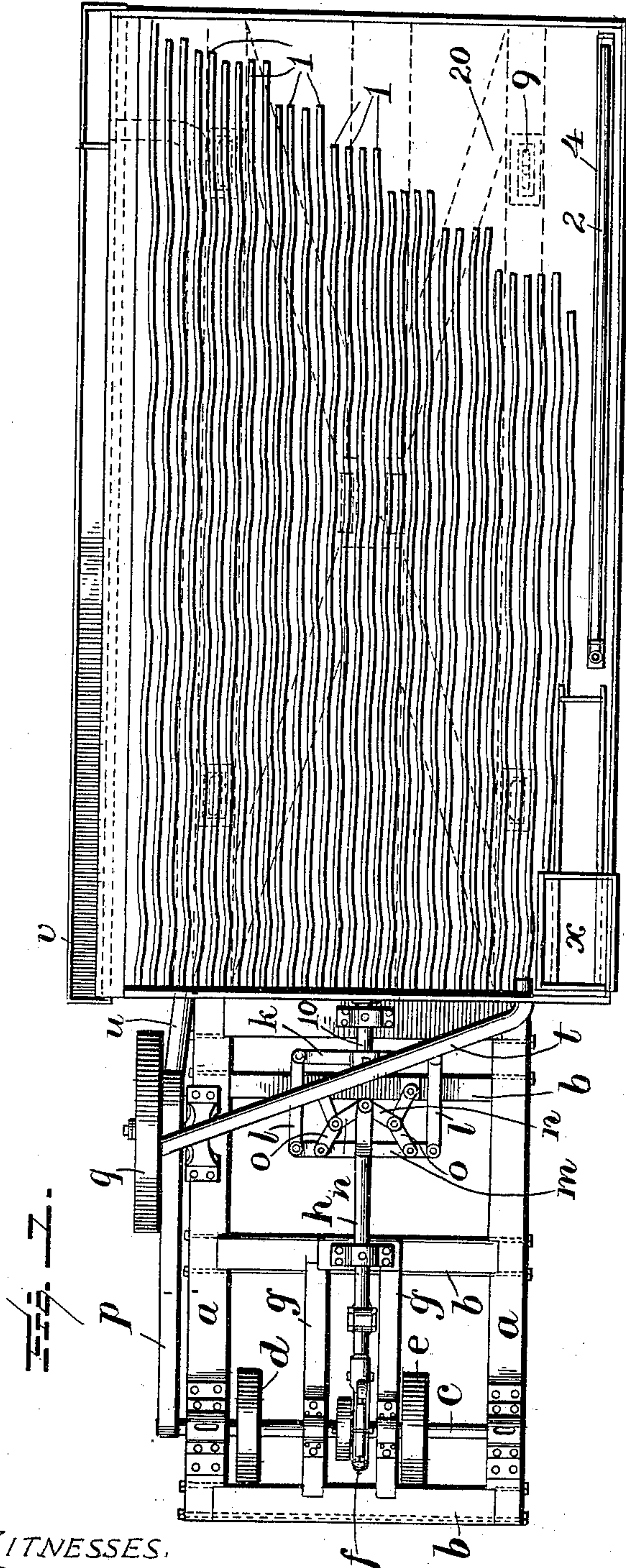


No. 671,348.

J. H. MICHELSEN.  
ORE CONCENTRATOR.  
(Application filed Dec. 6, 1900.)

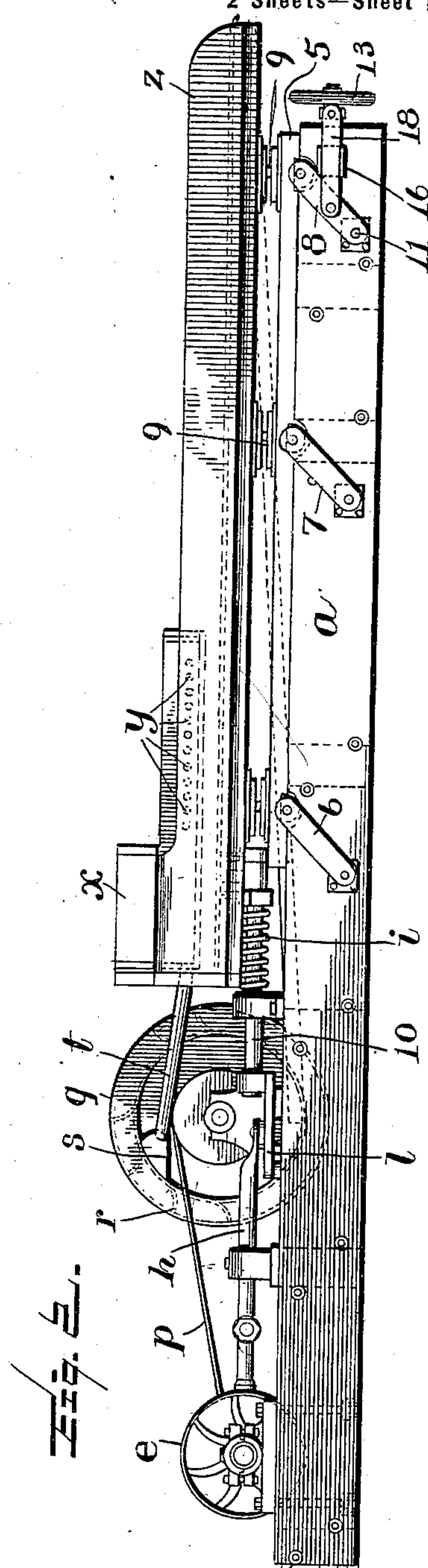
Patented Apr. 2, 1901.

(No Model.)



WITNESSES.  
L. C. Hills  
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2 Sheets—Sheet 1.



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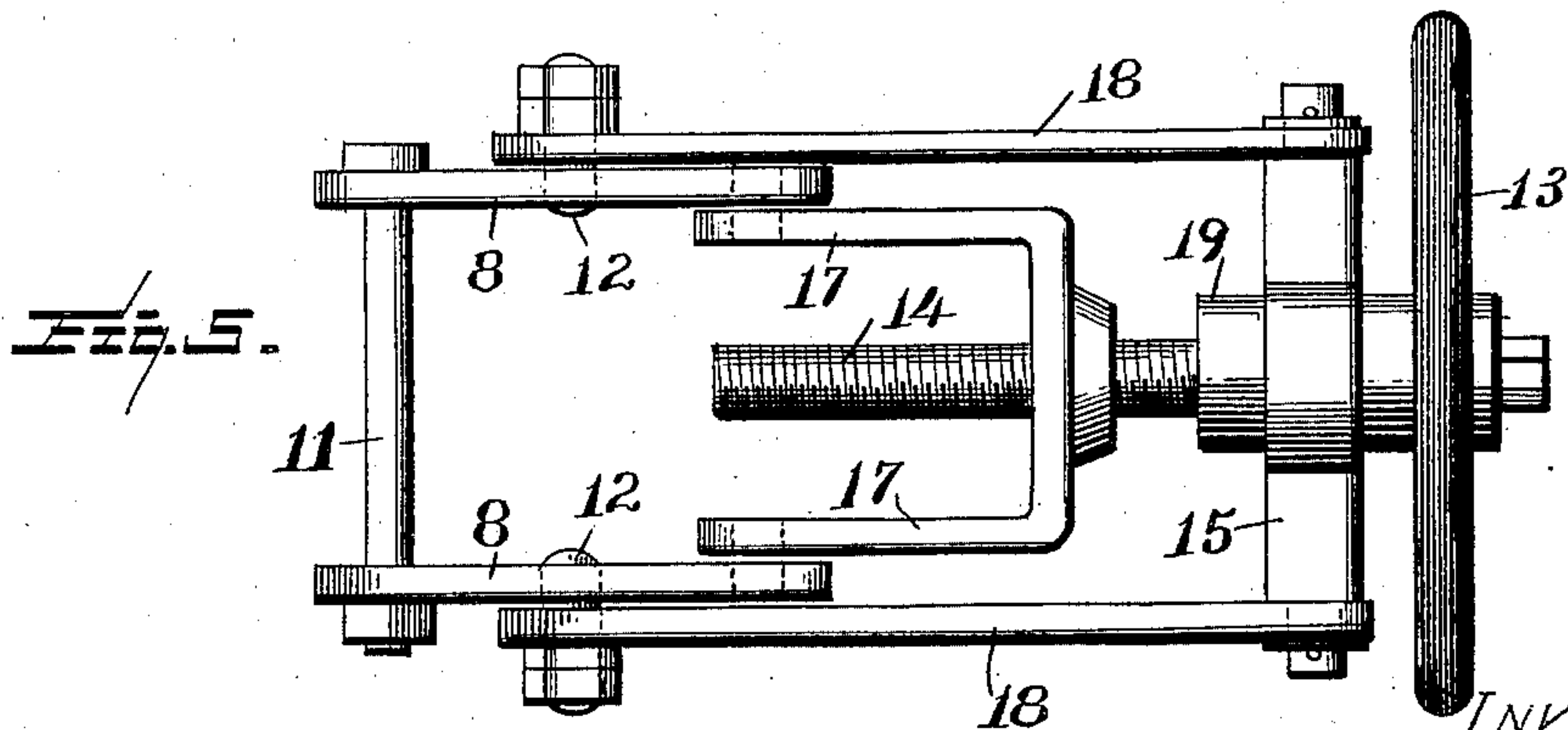
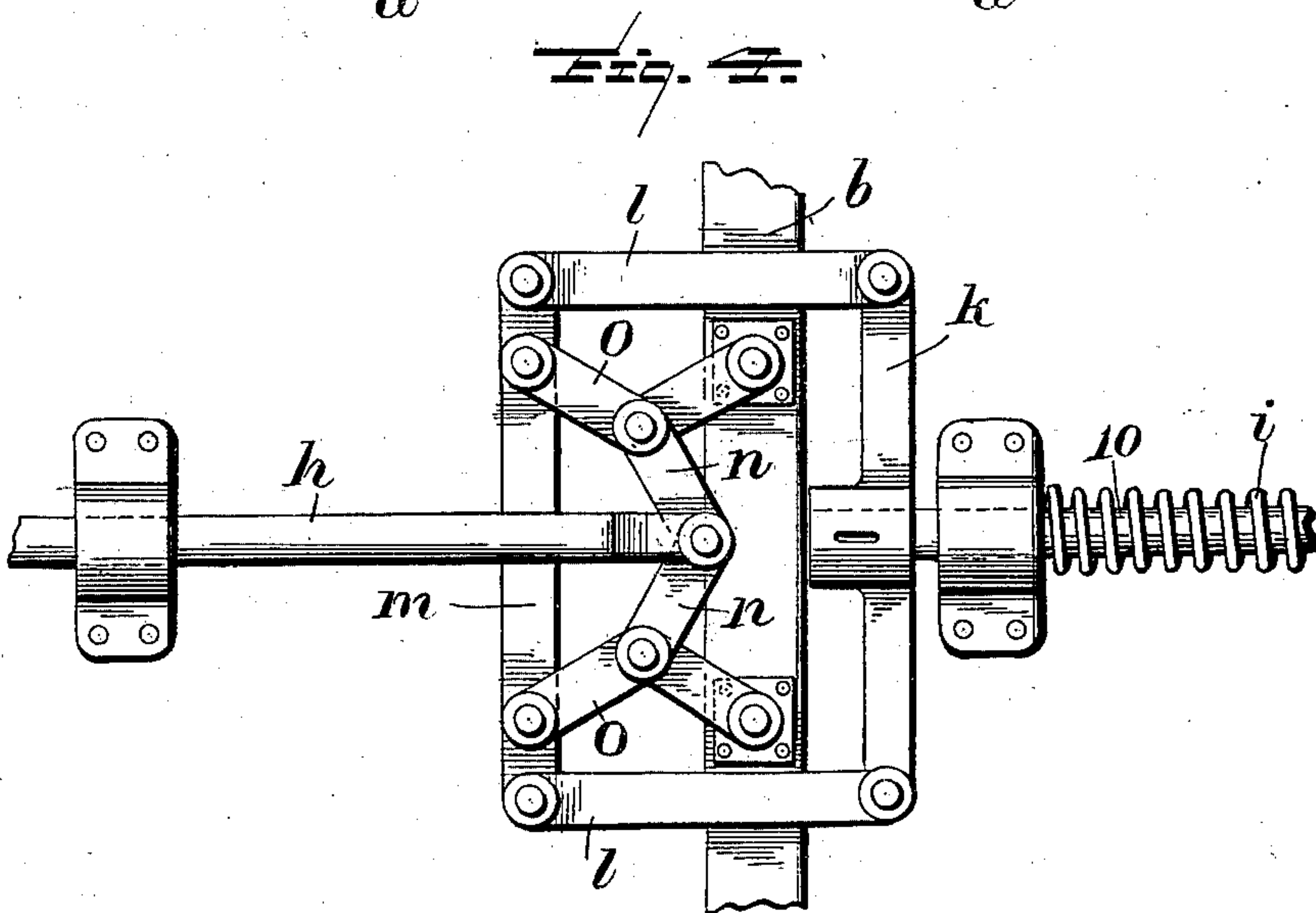
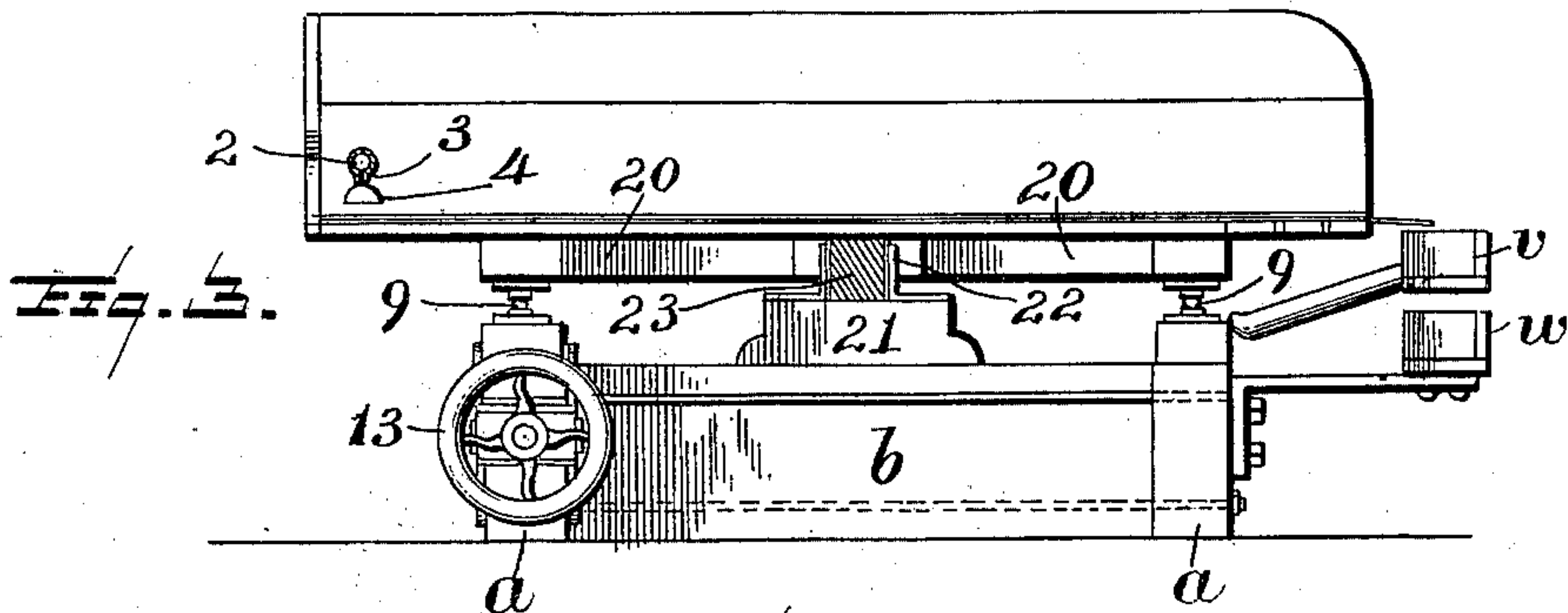
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(No Model.)

2 Sheets—Sheet 2.



WITNESSES.

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# UNITED STATES PATENT OFFICE.

JOHN H. MICHELSEN, OF BUTTE, MONTANA, ASSIGNOR OF ONE-HALF TO  
MILLER LA MOTHE BORGLUM, OF SAME PLACE.

## ORE-CONCENTRATOR.

SPECIFICATION forming part of Letters Patent No. 671,348, dated April 2, 1901.

Application filed December 6, 1900. Serial No. 38,903. (No model.)

*To all whom it may concern:*

Be it known that I, JOHN H. MICHELSEN, a citizen of the United States, residing at Butte, in the county of Silverbow and State of Montana, have invented certain new and useful Improvements in Ore-Concentrators; and I do hereby 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.

My invention relates to improvements in ore-concentrators, and has for its object to provide a concentrator which will have a better action than similar machines now ordinarily in use and which will therefore produce better results.

This invention is a specific improvement upon my former patent, No. 636,679, dated November 7, 1899.

My invention consists in the novel device hereinafter described, and particularly pointed out in the claims.

In the accompanying drawings, Figure 1 shows a plan view of my improved ore-concentrator. Fig. 2 is a side elevation of the same. Fig. 3 is an end elevation of the same. Fig. 4 is a detail view, on an enlarged scale, showing the toggles and spring. Fig. 5 is a top view of the means for varying the inclination of the table.

The machine comprises a stationary frame made of longitudinal timbers *a*, rigidly connected by cross-timbers *b*. A driving-shaft *c* is located in journals near one end of the frame, which shaft is provided with a driving-pulley *e* and a fly-wheel *d*, although the latter may be omitted, if desired. It is of course evident that a sprocket wheel and chain may be substituted for the pulley and belt to drive the concentrator. On the shaft *c* is mounted an eccentric *f*, between two short beams or braces *g*. This eccentric may be made adjustable, if desired, to vary the throw of the machine. To this eccentric *f* is attached the pitman *h*, which by its reciprocation shakes the table. A short connecting-rod 10 is attached to the bottom of the table, and connecting this connecting-rod 10 with the pitman *h* is a frame composed of four arms *k l m l*, pivoted together at their ends. Coiled around this connecting-rod 10 is a spring *i*,

having one of its ends abutting against the vibratory table and its opposite end against an abutment on the frame of the machine. At the end of the pitman *h* are two short links *n*, each of which is pivoted to the pitman *h* and to a toggle *o*, the members of which are connected, respectively, to one of the cross-beams *b* and to the side of the frame *m*. A belt *p*, driven from the shaft *c*, drives the elevating-wheel *q*, mounted in bearings on one of the beams *a*. This wheel *q* is provided with elevating-buckets *r*, which discharge into a vessel *s*. A pipe *t* runs from this vessel *s* and delivers water therefrom onto the table *z*. Another pipe *u* is connected to the receiving-trough *v*, into which the table *z* discharges, and conducts the water back to the elevating-wheel *q*, while mud, &c., is discharged into the trough *w*, situated below the end of the

The table *z* is provided with waved riffles 1, which vary in length, the shortest being at one side of the table near the receiving-trough and the longest being on the other side. The table is supported in the usual way by anti-friction-rollers 9, which are located between cup-shaped bearings, which are situated, respectively, upon the tables and the supports thereof. To vary the inclination of the table, one side thereof is supported by the movable beam 5, which extends along one side of said table. This beam is supported by three pairs of links 6, 7, and 8, pivoted to one of the side beams *a* and to the beam 5. A bolt 11 passes through the beam *a* and supports and unites each pair of links. At about the middle of the links 8 are attached by pivots 12 two side bars 18, guided by clips 16 upon the beams *a*. These side bars are united by an end bar 15, which carries a perforated block 19 for the reception of an adjusting-wheel 13. This wheel carries a screw-threaded rod 14, which works in a nut carried by the arm 17, attached to the beam *a*, which is cut away for this purpose. It will be obvious that by turning the wheel 13 the beam 5 will be raised or lowered, carrying with it the table. At one corner of the table is the feeding-hopper *x*, which is provided with a series of holes *y*, which deliver the crushed ore, whether mixed with water or dry, upon the table. A pipe 2



extends nearly the whole length of the table. This is provided on its under portion with a series of openings 3, which deliver upon a convex spreading device 4. Water is supplied to this pipe in any desired way and serves when the table is shaken to concentrate the ore by carrying off the lighter and usually worthless particles. By means of pipe *u* the water which has been used to wash the ore may be used over again repeatedly. This is of great advantage in certain sections where the water-supply is limited. It also affords means of saving the "float-gold," so called, which is so light that it is carried off by the water. Mercury may be deposited, if desired, between the riffles 1 to catch the particles of gold and silver. This mercury will be retained upon the table by the peculiarly-shaped riffles employed, the mercury being unable to pass the waves in the riffles. If desired, the table may be braced by means of braces 20 on its under side, and it may be held in position by a projection 23, located at the junction of the braces 20, which projection 23 is guided by angle-plates 22 upon the projection 21, carried by one of the cross-beams *b* of the machine.

The operation is as follows: Ore is fed into the hopper *x*, either mixed with water or in the form of powder, and passes out through the openings *y* onto the table *z*. The shaft *c* is rotated, and by the medium of the toggle-and-spring connection a rapid vibratory movement is given to the table, water being supplied at the same time to the pipe 2. This short quick vibration would be so jerky as to be objectionable were it not for the use of the coiled spring *i*. By the use, however, of the toggles and spring I am enabled to give a very rapid vibratory motion to the table, which motion is at the same time smooth and even, all lost motion being taken up. Concentration takes place on the table, due to its rapid movement and the flow of water thereover. The clearer part of this water is taken from the trough *v* and led back to the elevating-wheel *g*, by which it is again carried back to the table.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent of the United States, is—

1. In an ore-concentrator, the combination with a main frame, a vibratory table mount-

ed thereon, means carried by said frame for adjusting the height of one side of said table, and means for delivering the material upon said table; of a main driving-shaft, a pitman connected to and adapted to be operated from said main shaft, a connecting-rod connected to said table, a frame secured to said connecting-rod, compound toggles mounted in said frame, one pair of said toggles forming a connection between said frame and the main frame, and a toggle forming a connection between said pitman and the above-mentioned toggles, substantially as described.

2. In an ore-concentrator, the combination with a main frame, a vibratory table mounted thereon, means carried by said frame for adjusting the height of one side of said table, and means for delivering the material upon said table; of a main driving-shaft, a pitman connected to and adapted to be operated from said shaft, a connecting-rod connected to said table, a frame secured to said connecting-rod, compound toggles mounted in said frame, one pair of said toggles forming a connection between said frame and the main frame, a toggle forming a connection between said pitman and the above-mentioned toggles, and a coiled spring mounted upon said connecting-rod, and interposed between said main frame and table, substantially as described.

3. In an ore-concentrator, the combination of a supporting-frame provided with a projection, a vibrating table provided with riffles supported on said frame and guided by said projection, means for varying the inclination of said table, a rectangular frame connected to said table, a pair of toggles connected to the frame of the machine and said rectangular frame, a pitman, links connecting said pitman with said toggles, a coiled spring having one end abutting against the frame of the machine, and its other end bearing against an abutment on the vibrating table, an elevating-wheel, a pipe for delivering water from said table to said wheel, and means for driving said pitman and said wheel, substantially as described.

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

JOHN H. MICHELSEN.

Witnesses:

AUGUSTUS T. MORGAN,  
MILLER BORGLUM.