(No Model.)

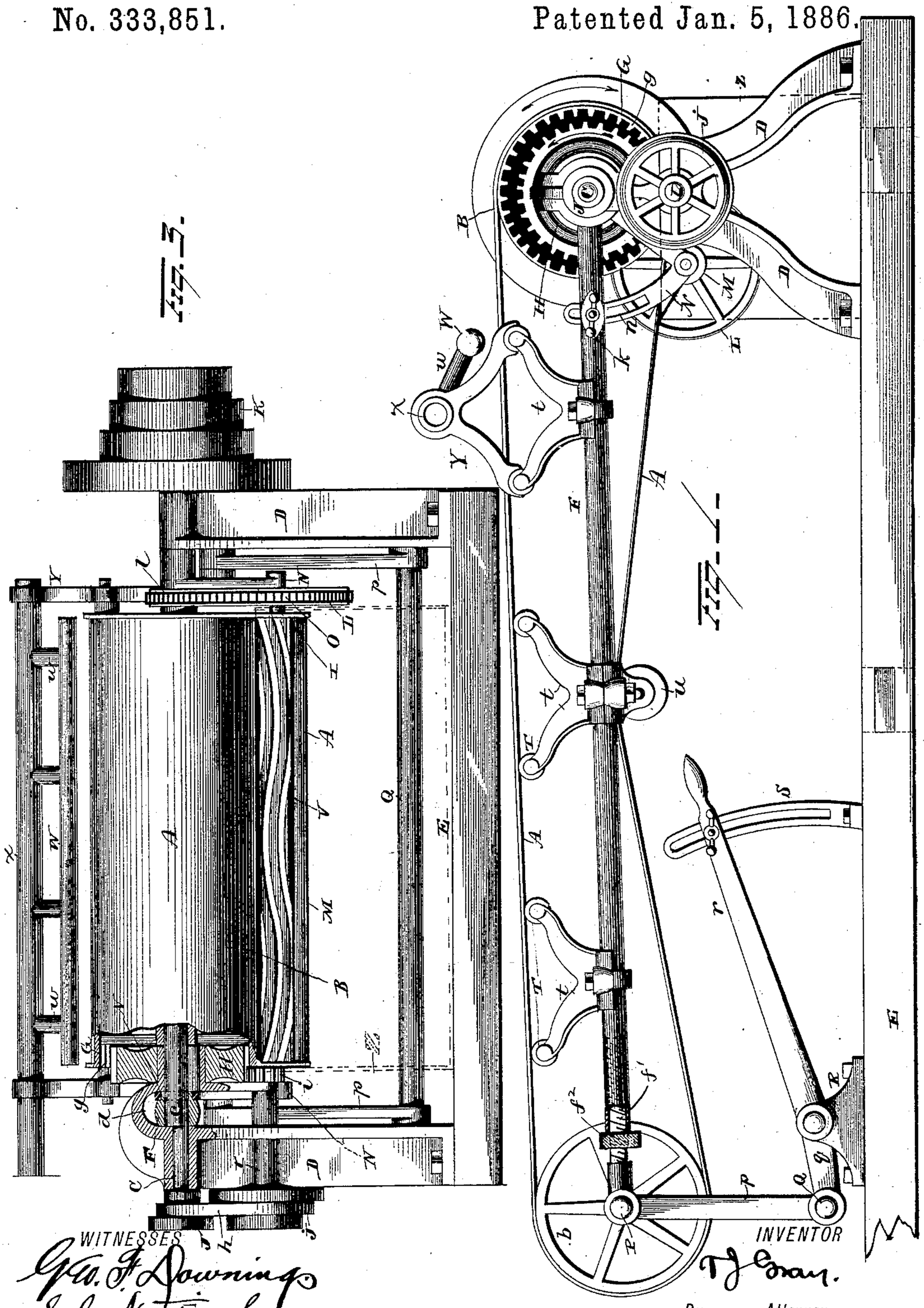
2 Sheets—Sheet 1.

T. J. GRAY.

ORE CONCENTRATOR.

No. 333,851.

Patented Jan. 5, 1886.



WITNESSES

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(No Model.)

2 Sheets—Sheet 2.

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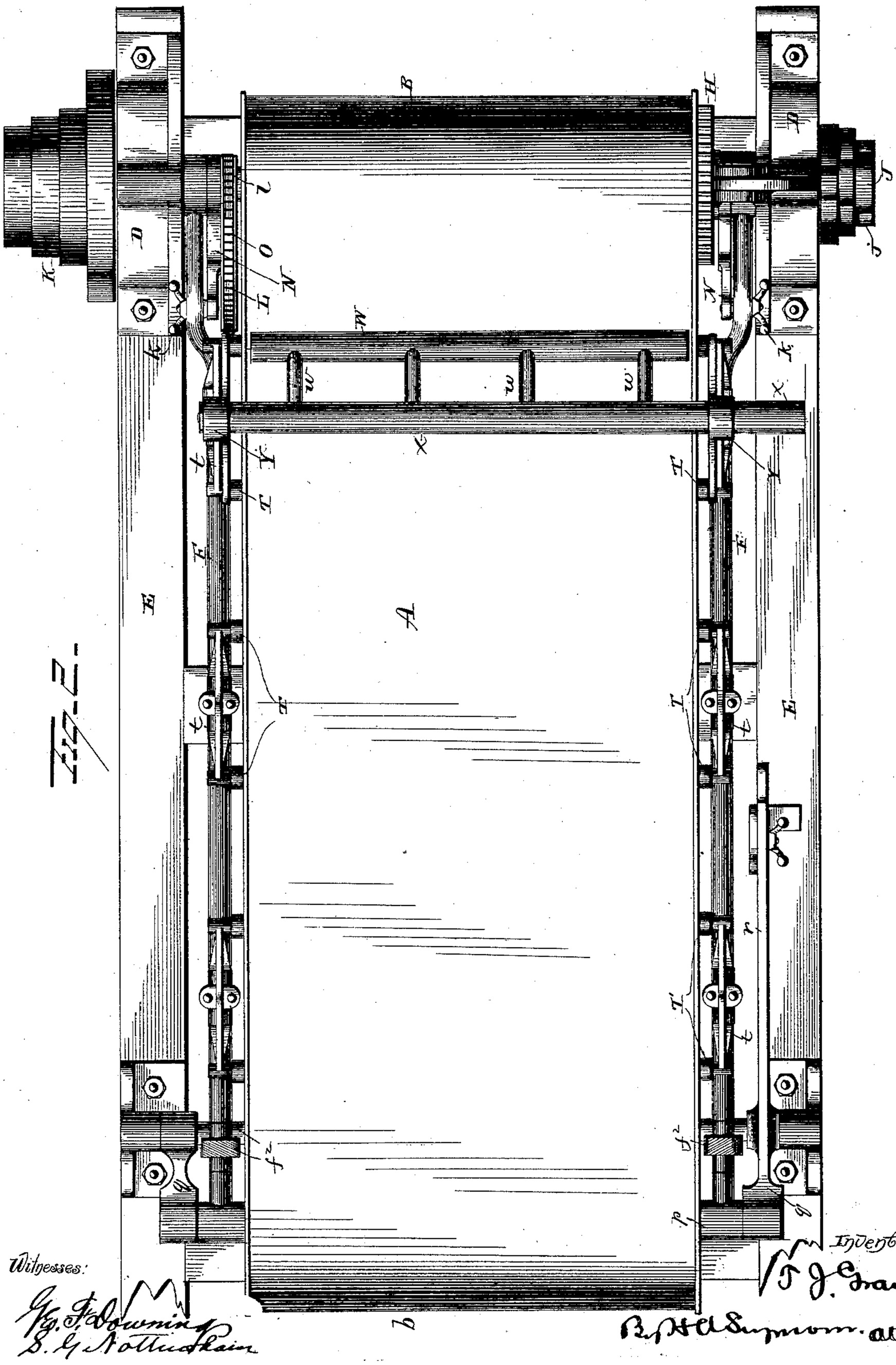

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UNITED STATES PATENT OFFICE.

THOMAS J. GRAY, OF CHICAGO, ILLINOIS, ASSIGNOR OF TWO-THIRDS TO JOHN T. GREENE AND GEORGE M. GROSS, OF SAME PLACE.

ORE-CONCENTRATOR.

SPECIFICATION forming part of Letters Patent No. 333,851, dated January 5, 1886.

Application filed April 29, 1885. Serial No. 163,842. (No model.)

To all whom it may concern:

Be it known that I, THOMAS J. GRAY, of Chicago, in the county of Cook and State of Illinois, 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 an improvement in ore-concentrators, and more particularly to that class of concentrators in which the ore is distributed on an endless carrier and subjected to the combined action of running water and a vibratory motion. Hitherto it has been customary to construct ore-concentrators of this character having a reciprocating motion in the direction of the endless-belt movement or transversely thereto, and in a very few instances the construction has been such that the belt was allowed to drop, affording a sudden vertical movement under the influence of gravity. This vertical movement is found to be a very desirable feature, but the means for producing it have hitherto been of such a character that the speed of the vibratory shaft has been necessarily limited and the best results have not been attained.

The object of my present invention is to provide means for imparting to an endless carrier both a horizontal and vertical vibratory motion which will admit of making the number of vibrations per second, as great as desired without danger of injury to the machine; a further object being to provide improved means for removing the ore from the carrier, for regulating the incline of the carrier, and for tightening the same; a further object being to provide a concentrator which shall be light, simple, durable, and effective; and with these ends in view my invention consists in certain features of construction and combinations of parts, as will be hereinafter described, and pointed out in the claims.

In the accompanying drawings, Figure 1 is a view of the machine in side elevation. Fig. 2 is a plan view, and Fig. 3 is an end view.

A represents an endless apron or belt, supported upon the head and foot drums, B *b*. The head drum, B, is loosely mounted on the power-driven and power-driving shaft C. The shaft C is journaled near its ends in suitable bearings formed in the standards D, the latter being rigidly secured to the bed-plate E. The upper end of one of the standards D is provided with an inwardly-projecting bearing for the wheel H, and at a point between said bearing or wheel with an opening, *d*, in which the head of one of the side rails, F, rests. This head is journaled on the crank or eccentric *c*, which extends from the inner face of one standard D to the inner face of the other standard. As only one wheel H is employed, only one of the standards is provided with an inwardly-projecting bearing, the other standard being perfectly plain. Between the supporting-standards D the shaft C is cranked, to correspond with the eccentricity of the crank or eccentric *c*, and on this portion of the shaft the head-drum above mentioned is mounted. To the end of the drum a wheel, G, is secured, provided with internal gear, *g*. A gear-wheel, H, having a diameter as much less than the diameter of the gear *g* as the eccentricity of the shaft C amounts to at the drum-bearing, is loosely mounted on the inwardly-projecting bearing, before referred to, concentric with the shaft C and in engagement with the gear *g*. A short shaft, I, is journaled in the standard D, beneath and parallel to the shaft C, and is provided on its inner end with a pinion, *i*, secured rigidly thereon and adapted to engage the gear-wheel H. On its outer end it is provided with a series of cone-pulleys, *j*, which correspond with a reverse series of cone-pulleys, J, on the shaft C. A band, *h*, connects one of the pulleys J with its corresponding pulley *j*, and thereby transmits the motion of the shaft C to the shaft I. The end of the shaft C opposite the gear, just explained, is provided with a series of band-pulleys, K, for receiving a band driven by the steam or other driving power. On this end of the shaft, conveniently in close proximity to the drum, is also secured a sprocket-pinion, *l*, for driving the wiper-roller M. Two sector-arms, N, are pivoted on bearings concentric with the drum-bearings, and are provided with arc-shaped slots *n*, through which they are secured to the side rails, F, in the desired vertical adjustment by means of clamp-screws *k*. The elbows of the arms N are provided with

bearings, in which the axle of the wiper-roll is journaled. A sprocket-wheel, L, is secured on the axle of the wiper-roll at a point corresponding with the sprocket-pinion *l*, and is connected with said pinion by a chain belt, O. The wiper is thus caused to retain its position relatively to the drum, and is rotated independently thereof. The other side rail F is also loosely journaled at one end on the eccentric. The foot drum, *b*, is loosely mounted on a shaft, P, secured to the upper ends of a pair of vibrating standards, *p*, the said shaft P being connected with the shaft C by the side rails, F. The lower ends of the standards *p* are pivoted on a rod, Q, secured to the ends of a pair of rock-arms, *q*, which in turn are mounted on a rod or other suitable bearings, R. One of the rock-arms *q* is extended in the form of a lever, *r*, by means of which the standards *p* are raised and lowered to give the endless carrier the desired incline. A sector-bar, S, is secured to the bed-plate in a convenient position to engage the lever *r* and lock the same in any desired vertical adjustment. The upper face of the carrier between the two drums is supported upon rollers T, conveniently journaled in the upper ends of standard-brackets *t*, secured firmly to the side rails, F. The brackets *t* are preferably constructed as shown, each having two diverging branches, and the center bracket is provided with depending lugs, in which a roller, *u*, is journaled, over which the carrier passes, thereby causing the said carrier to ascend from beneath both the head and foot drums, and so prevent the tailings passing off the foot and the ore passing over the head from passing beyond their respective receptacles at the head and foot. The side rails, F, are preferably constructed of pipe, to secure lightness, and each is provided with an independent screw-threaded section, *f'*, and nut f^2, for lengthening or shortening the rails, and thereby tightening or loosening the carrier-belt. The screw-threaded sections *f'* are rigidly secured to suitable sleeves on the shaft P and enter the open ends of the rails. The screw-threaded nuts f^2 are located on their respective screws between the sleeves and rails, and bear against the ends of the latter. By turning the nuts in one direction they are forced into contact with the ends of the side rails, and consequently move the shaft away from the side raiis and tighten the belt thereon.

The face of the wiper-roll is provided with a series of curved wipers, V, which are so arranged as to work the ore from the edges of the carrier toward the center. The general shape of one of the wipers is bow-shaped, with its ends lying in the same element of surface.

W is the sprinkler. It is preferably connected with a supply-pipe, *x*, by branch pipes *w*. The supply-pipe *x* is secured or keyed in bracket-standards Y, set on the head pair of brackets *t*. The sprinkler is thus kept at a uniform distance from the face of the carrier during its vibrating motions. Beneath the head drum is a tank of water, Z, which is kept at such a level that the drum B will dip into it when at the lowest point of its vertical vibratory movement and be above it when at the highest point of said movement.

It will be observed that the gear-wheel *i* is rotated by the shaft C, through the intervention of the belt *h*, and that the gear-wheel H is rotated by the gear-wheel *i*. The drum A, being loosely mounted on the shaft C eccentric to the wheel H, is moved around and in contact with the wheel H, and the teeth of the intaglio gear of the former coming in contact with the teeth turns the drum slowly in an opposite direction from that of the gear-wheel H, and imparts thereto a positive vibratory motion in two or more planes. The several motions of the carrier-belt would be obtained by having the said wheel H secured firmly to the standard and act as a fulcrum for the engagement of the intaglio gear *g;* but the advance of the carrier-belt would in this case be too rapid when the shaft was driven at a speed high enough to produce the requisite shaking motion. By introducing the independent shaft I and communicating motion to the wheel H by a pinion, *i*, secured on said shaft, and by means of the cone-pulleys on the shafts C and I, respectively, the advance of the carrier-belt is reduced to the proper speed and regulated as desired.

By the above-described peculiar mechanism for imparting the several motions to the carrier-belt, the drum-shaft may be run at a high rate of speed, making from two hundred to three hundred revolutions per minute, while the carrier-belt travels from five to eight feet during the same time. There is perfect freedom from the dropping, jerking motion of the ordinary cam construction, and yet the ore on the belt is thoroughly shaken and the heavy particles of metal brought in contact with the belt. The dipping of the belt in the water at each revolution of the shaft is also a great advantage, as it has the effect of a thorough rinsing of the belt, which in the ordinary constructions cannot be obtained on account of the slow motion of the belt through the water. In short, the construction as a whole is eminently calculated to surmount the objectionable features of the concentrators hitherto in use and at the same time embody all their good features and several important and highly advantageous new features.

It is evident that many slight changes might be resorted to in the form and construction of the several parts described without departing from the spirit and scope of my invention; hence I do not wish to limit myself strictly to the construction herein set forth; but,

Having fully described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In an ore-concentrator, the combination, with the drum-shaft, the drum mounted eccen-

trically thereon and provided with an intaglio gear, a foot drum, and an apron carried by said drums, of a gear-wheel mounted concentrically on the shaft and in engagement with the intaglio gear, whereby a rotary motion of the shaft rotates the drum and imparts thereto a positive vibratory motion in two or more planes, substantially as set forth.

2. In an ore-concentrator, the combination, with the drum-shaft, the drum mounted eccentrically thereon and provided with an intaglio gear, a foot drum, and an apron mounted on said drums, of a gear-wheel mounted concentrically on the shaft in engagement with the intaglio gear, a pinion mounted on an independent shaft in engagement with the gear-wheel, and means for transmitting the motion of the drum-shaft to the independent shaft, whereby the rotary motion of the drum on its shaft is reduced, while the vibratory motion of the drum is rapid, substantially as set forth.

3. In an ore-concentrator, the combination, with the drum-shaft, the drum with its intaglio gear mounted eccentrically thereon, the gear-wheel mounted concentrically thereon, the foot drum, and an endless apron mounted on said drums, of the independent shaft with the pinion gearing with the said gear-wheel, and cone-pulleys on the two said shafts for varying the rotary motion of the drum relatively to the vibratory motion of the same, substantially as set forth.

4. The combination, with head and foot drums, and endless-belt carrier, and the shaft on which the head drum is eccentrically mounted, of a wiper-roller journaled in bearings fulcrumed on the drum-shaft concentric with the drum, and means for transmitting the rotary motion of the drum-shaft to the roller-shaft, substantially as set forth.

5. The combination, with head and foot drums, an endless-belt carrier and the shaft on which the head drum is eccentrically mounted, of the wiper-roller, the vertically-adjustable arms fulcrumed on the eccentric portion of the drum-shaft, and a pinion secured on said eccentric portion, substantially as set forth.

6. The combination, with the head and foot drums and the endless-belt carrier supported thereon, of tubular side rails connecting the drum-shafts and provided with screw-threaded sections, whereby the lengths of the rails are made adjustable for the purpose substantially as set forth.

7. The combination, with one of the drums and an endless-belt carrier, of a lever fulcrumed on the bed-plate, and the drum-shaft supports hinged to its end whereby the slant of the carrier is determined, substantially as set forth.

8. The combination, with the head-drum, having a vertical vibratory motion, and the carrier-belt supported thereon, of a water-tank located beneath the drum and adapted to retain water at a height which will allow the drum to dip therein at each vibration, substantially as set forth.

9. The combination, with the endless-belt carrier and the wiper-roller located in close proximity thereto, of wipers arranged on the surface of the wiper-roller in bow-shaped form for working the ore or metal toward the center of the belt, substantially as set forth.

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

THOMAS J. GRAY.

Witnesses:
GEORGE B. DURKEE,
JOHN T. GREENE.