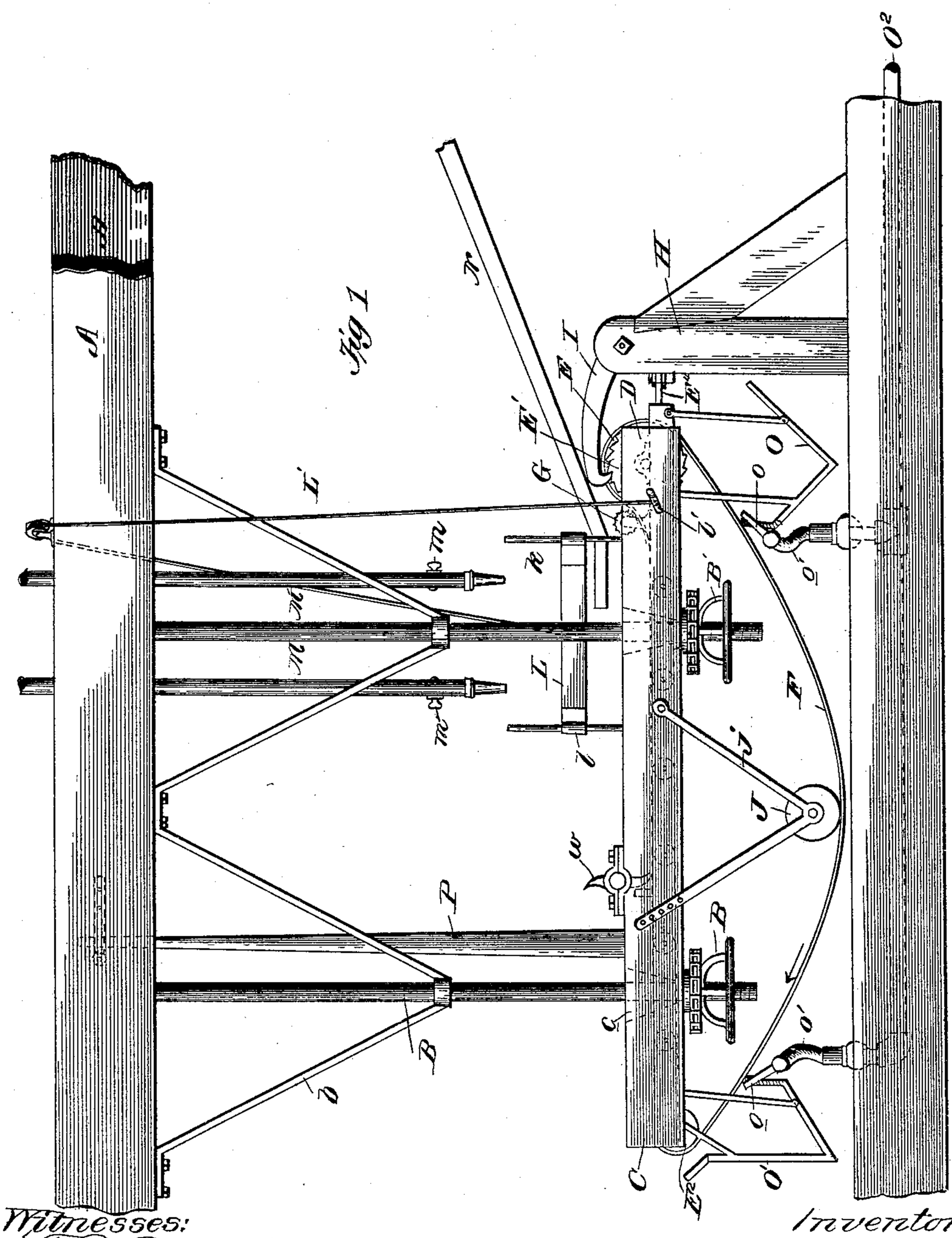
(No Model.) 2 Sheets—Sheet 1.

P. R. STANHOPE & F. WOOD.

ORE CONCENTRATOR.

No. 480,860. Patented Aug. 16, 1892.

Fig 1



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(No Model.) 2 Sheets—Sheet 2.

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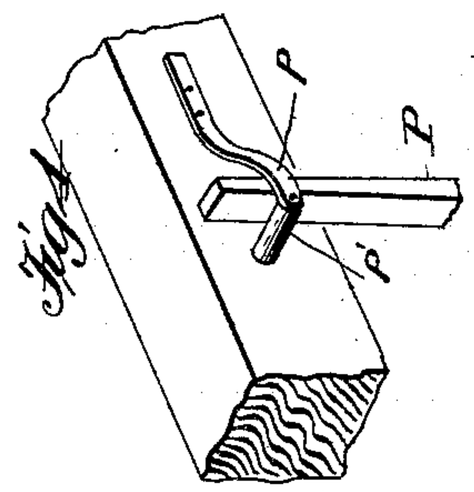

Fig. 4.

Fig. 5.

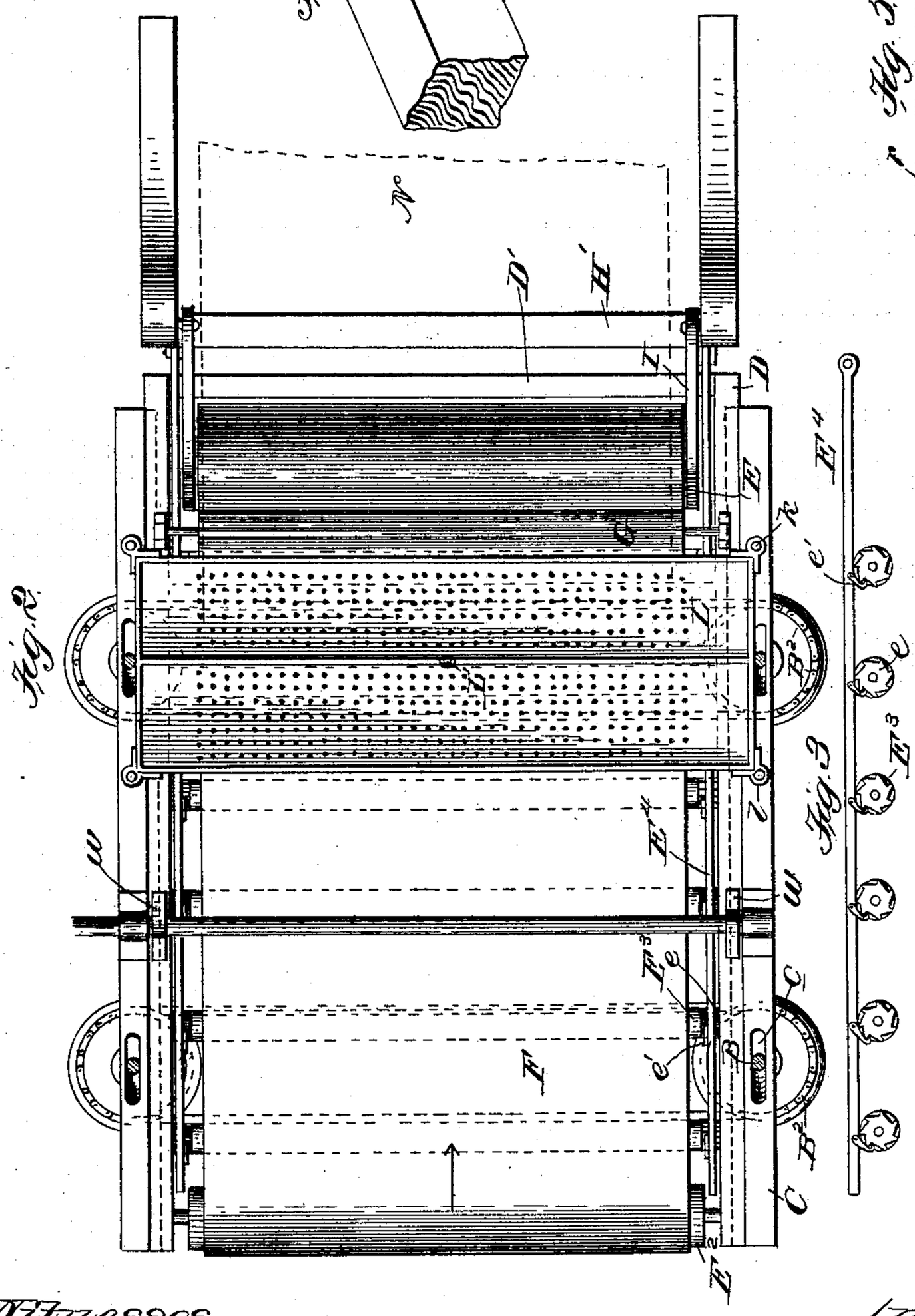

Fig. 2.

Fig. 3.

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UNITED STATES PATENT OFFICE.

PHILIP R. STANHOPE, OF DUMONT, COLORADO, AND FRANK. WOOD, OF BROOKLYN, NEW YORK.

ORE-CONCENTRATOR.

SPECIFICATION forming part of Letters Patent No. 480,860, dated August 16, 1892.

Application filed February 4, 1892. Serial No. 420,276. (No model.)

To all whom it may concern:

Be it known that we, PHILIP R. STANHOPE, residing at Dumont, county of Clear Creek, State of Colorado, and FRANK. WOOD, residing at Brooklyn, in the county of Kings and State of New York, citizens of the United States, have invented certain new and useful Improvements in Ore-Concentrators; and we 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.

Our invention relates to an improvement in ore-concentrators; and it consists in the construction and arrangement of parts more fully hereinafter described, and definitely pointed out in the claims.

The object and purpose of this invention is the provision of an improved apparatus for separating the valuable from the worthless products of ores in a manner resulting in a substantially complete separation of the minerals from the ore, effective and inexpensive, greatly expediting the usual method of concentration, and diminishing the amount of labor usually coincident with this industry. This object we attain by the construction illustrated in the accompanying drawings, wherein like letters of reference indicate corresponding parts in the several views, and in which—

Figure 1 is a side elevation of the apparatus. Fig. 2 is a top plan view with the supporting-beam removed. Fig. 3 is a detached detail of the means for actuating the intermediate carrying-rolls. Fig. 4 is a detail perspective of the abutment for the springs, and Fig. 5 is a detail section of a portion of the apron or belt.

In the drawings, A represents the supporting-beams, located above and one on each side of the machine, from the under side of which depend the supporting-pillars B, the same being braced and rigidly held in place to prevent vibration by the oblique brace-bars *b*. Secured on the lower ends of the pillars B are the tracks or rails C, the pillars passing entirely through the same and provided on their under sides with screw-threads, on which hand-nuts B′ are secured, on which the rails rest. These hand-nuts are provided with suitable sprocket-wheels, around which and across the frame sprocket-chains B^2 pass, so that a simultaneous movement of the nut on the opposite pillars may be had when it is desirable to adjust the plane of the track. To prevent the tracks from binding when one end is raised slightly above the other, the apertures in the rails through which the pillars pass are elongated and tapered, as shown at *c*, Figs. 1 and 2.

The rails C are provided on their inner faces with suitable inwardly-projecting supporting-flanges, (shown in dotted lines, Fig. 2,) on which the side bars D of the reciprocating table are placed, and may be, if desired, supplied with suitable casters to reduce the friction between the table and the track. This table has a cross-head D′ extending entirely across the same, flush with and connecting the forward ends of the side bars D, the outer faces of the cross-head and ends of the side bars being on the same plane to form an abutting or bumping surface for the table. On the upper forward faces of the side bars is secured in suitable bearings a large actuating drum or roll E, the periphery of which projects above the rails C and on the ends of which are secured ratchet-wheels E′, the slope of the teeth of which incline on the upper portion of the wheel toward the front of the machine. Over this drum E is passed an endless belt or apron F, the same passing over a roller E^2, journaled in the ends of the side bars at the rear end of the table.

E^3 E^3 represent a series of small rolls journaled in the side bars of the table at intervals between the drum E and the roll E^2 and below the plane of the supporting-axle of the drum E. These rolls serve as intermediate carriers for the belt, and may be increased or decreased in number, according to the nature of the material being acted upon, their purpose also being to prevent the formation of pockets in the belt, caused by the weight of the material. On the ends of these rolls E^3 are secured ratchet-wheels *e*, which are engaged by pawls *e′*, pivoted on a sliding bar E^4, working in the rails or tracks C.

Located above the apron, adjacent to the rear of the drum E, is a corrugated roll G, journaled in suitable bearings projecting

from the upper faces of the side bars D, the position of the roll being such that it is engaged by the belt or apron as the same is moved, so that the apron or belt is held in a horizontal position while on the intermediate carrying-rolls, thereby increasing the pitch of the apron at the point between the first carrying-roll and the drum E, the corrugations in this roll G acting as carriers and preventing the roll from obstructing the passage of the mineral up the apron.

At the head of the machine is a fixed bumper H, consisting of two end posts united by a bumping block or bar H′, extending entirely across the head of the machine, the posts being situated at a point directly in front of the side bars of the table, the bar H′ having a position directly in front of the bar D′ of the table, so that as the table is reciprocated a direct impact is had across the entire end thereof, thereby effectually preventing the material on the apron from collecting or ridging, as is the case when the bumper is located so that the impact would be at the center of the table only.

On the upper ends of the posts of the bumper H are pivotally secured the pawls I, the teeth of which engage the ratchet-wheel E′ on the drum E, the weight of the pawls and their position at all times tending to carry the toothed ends down, so that they will at all times engage the teeth of the wheel. The ends of the bars E^4 are also connected with a bumper H, and as the table is reciprocated, which movement is acquired by cams *w* engaging abutments on the table in the usual manner, the rollers are turned, thereby causing the belt to revolve. The cams *w* are mounted on a transverse shaft journaled on the track, which shaft is rotated by any suitable means.

To regulate the tension of the belt on the rollers, an idler J is employed, engaging the inner face of the belt below the table and supported by suitable bars *j*, pivoted at one end to the track and adjustably secured to the track at the opposite end by having apertures formed therein, through which suitable pins pass into the track, the bars *j* being arranged obliquely to cause a vertical movement of the roller J as the adjustment is made.

Mounted loosely upon suitable standards *k*, projecting upwardly from the rails C near the forward end of the machine, is a perforated water-receptacle L, having sleeves *l* formed at its corners, fitting loosely over the standards. The receptacle L is divided centrally by a suitable partition, to the center of which is secured an adjusting-cord L′, passing up over one of the beams A and carried down to and secured by a suitable button *l′* to one of the rails C. By this means the receptacle may be raised or lowered to increase or decrease the fall of the water through its perforated bottom, thereby varying the strength of the streams, which is necessary in treating different grades of ore.

M M represent the supply-pipes for the receptacle L, provided with suitable cut-off valves or plugs *m*, so that one or both of the compartments of the receptacle may be used.

To introduce a regular uniform supply of material onto the apron, we employ a chute or conductor N, inclining downwardly to a point directly below the forward edge of the water-receptacle, and from this point carried out horizontally below and terminating below the forward compartment of the receptacle L. It is constructed of a width substantially equal to the width of the apron, as shown in dotted lines, Fig. 2, so that as the wave or ripple of the material to be acted upon, caused by the movement of the battery, flows down its surface, it will be discharged in impulses or waves, the water coming through the forward compartment of the receptacle striking the pulp or material, loosening the mineral, so that it will be precipitated to the bottom, cleaning and delivering the material from the end of the conductor or feed in a regular and uniform manner to completely coat that portion of the apron immediately. By this means the mineral is first discharged from the feed and falls on the apron in front of the tailings or pulp, so that it will be immediately carried forward. This feature we regard as of great importance to the complete and satisfactory operation of the apparatus.

O and O′ represent the "launders" or conveying-troughs located at the opposite ends of the machine, the former receiving the mineral, the latter the tailings. The inner walls of these troughs are carried up in close proximity to the outer face of the apron and serve as dams to conduct the water from the apron into the troughs. At this point they are perforated and have projecting therethrough at an angle of about ninety degrees spraying-nozzles *o*, connected by flexible hose *o′* with the rinsing-water-supply pipe O^2. These nozzles are arranged at such an angle relative to the apron that the streams issuing therefrom will be directed at a slight angle against the outer face of the apron, striking and pealing off the material adhering thereto, the surplus water being taken from the apron by the dams formed by the walls of the troughs, it being understood that these nozzles are arranged and secured to a cross-pipe extending entirely across the apron, so that the entire surface thereof will be cleansed. The object of supplying the rear of the machine with the construction and devices immediately above described is to prevent the water and the tailings from running down the apron against the movement thereof. To at all times retain the walls of the troughs in contact with the apron or in close proximity thereto, these troughs are supported and carried by the reciprocating table, the yielding nature of the hose *o′* permitting of the movement of the nozzles.

To permit the vertical movement of the table and to cause the table to reciprocate or

move against the action of the cam, we secure to the table suitable vertical springs P, their upper ends being tapered and secured in yokes *p*, having friction-rolls *p'* thereon, against which the flat faces of the springs engage. The yokes are connected to and supported by the supporting-beams A.

Heretofore it has been usual and customary to use in connection with this class of concentrators a rubber apron or belt or a belt formed of fabric through which the water will percolate. Both of these forms are, however, more or less objectionable, for the reason that in the former case the aprons have a smooth outer surface and in the latter the water passing through carries more or less mineral therewith, as well as injuring the parts of the machine directly below. To overcome this objection, we employ a belt or apron formed of an inner layer of rubber cloth Q and an upper layer of fabric R, preferably of wool having a short fiber or fuzz *r*. This surface acts as a carrier or retainer for the fine particles of mineral, causing thereby a more complete separation, as the mineral is lodged between the fibers, the length of the fiber being such that as the water from the nozzle impinges against the same the mineral is dislodged and deposited in the trough.

By the above-described construction it will be seen that as the table is reciprocated back and forth the movement causes the rotation of the apron, the pawls engaging the ratchet-teeth, rotating the rolls the distance of one notch or more, according to the extent of the vibration of the table. By this means we get a positive movement of the cloth in an exceedingly simple manner. By using the large roll or drum E the mineral adhering to the belt or apron is carried up at an incline and the heavy foreign matter is thrown back and carried or forced by the repeated bumping over the rear of the table, while such finer particles or tailings containing mineral that are forced over with the water and other material adhere to the apron and are carried down by the water into the trough O'.

We are aware that many minor changes in the construction and arrangement of the parts of our device can be made and substituted for those herein shown and described without in the least departing from the nature and principle of our invention.

Having thus described our invention, what we claim as new, and desire to secure by Letters Patent, is—

1. In an ore-concentrator, the combination, with the stationary track, of a reciprocating table mounted thereon, means for reciprocating the table, a stationary bumper at one end of the table, having a cross-bar thereon of a length equal to the width of the table, a cross-bar on the end of the table in direct alignment with the said other cross-bar and arranged to impinge against the same throughout its entire length, carrying-rolls on the table, an endless belt on the rolls, and means for moving the belt, actuated by the movement of the table, substantially as described.

2. In an ore-concentrator, the combination, with a stationary track, of a drum monuted on the track at the forward end thereof, a roll at the rear of the track, a series of intermediate carrying-rolls, means for positively and simultaneously actuating the intermediate rolls and drum upon the vibration of the table, means for vibrating the table, an endless belt on the rolls, and a stationary bumper with which the table engages, substantially as described.

3. In an ore-concentrator, the combination, with a stationary track, of a drum mounted on the track at the forward end thereof, a roll at the rear of the track, a series of intermediate carrying-rolls, means for positively and simultaneously actuating the intermediate rolls and drum upon the vibration of the table, an endless belt on the rolls, a roll above the belt adjacent to the drum, and a stationary bumper with which the table engages, substantially as described.

4. In an ore-concentrator, the combination, with a stationary track, of supports for the track, hand-nuts secured on the support, against which the track rests, sprocket-wheels on the hand-nuts, and chains connecting the sprocket-wheels of the opposite supports, substantially as described.

5. In an ore-concentrator, the combination, with a stationary track, of a reciprocating table on the track, means for reciprocating the table, an endless belt on the table, means for rotating the belt, a bumper, a feed-trough, and a vertically-adjustable water-receptacle on the track, having a perforated bottom, substantially as described.

6. In an ore-concentrator, the combination, with a stationary track, of supports for the track, a reciprocating table on the track, an endless belt carried by the table, means for moving the belt, a bumper, a water-distributing receptacle above the belt, and an unobstructed feed-trough or conveyer extending down to a point adjacent to the belt beneath the water-receptacle and formed with a horizontal discharge end and of a width substantially equal to the width of the belt, substantially as described.

7. In an ore-concentrator, the combination, with a stationary track, of a reciprocating table mounted thereon and a traveling belt on the table and a vertically-adjustable water-receptacle mounted on the track above the table and formed with a perforated bottom, substantially as described.

8. In an ore-concentrator, the combination, with a stationary track, a reciprocating table thereon and means for reciprocating the table, of a drum mounted on the table and extending above the same, a carrying-roll on the table in the rear of and below the plane of the upper surface of the drum, an endless belt on the rolls and drum, a stationary

bumper with which the table engages, and means on the bumper for rotating the drum, substantially as described.

9. In an ore-concentrator, the combination, with a stationary track, of a reciprocating table mounted thereon, means for reciprocating the table, an endless belt carried on the table, launders or discharge-troughs supported by and arranged below the ends of the table, having their inner walls carried up into close proximity to the belt, nozzles extending through the trough at an inclination, a water-supply, and a flexible connection between the water-supply and the nozzles, substantially as described.

10. In an ore-concentrator, the combination, with a support, a reciprocating table, and the endless belt, of discharge-troughs arranged below the ends of the table, having their inner walls up to and within the path of the belt, nozzles passing through the walls at an inclination and terminating at points slightly in advance of the walls, and means for supplying the nozzles with water, substantially as described.

11. In an ore-concentrator, the combination, with a stationary support, reciprocating table, and endless belt, of a series of nozzles arranged at an incline slightly less than the inclination of the under surface of the belt, means for supplying the nozzles with water, and a dam located in the rear of the nozzles and in close proximity to the belt, substantially as described.

In testimony whereof we affix our signatures in presence of two witnesses.

PHILIP R. STANHOPE.
FRANK. WOOD.

Witnesses:
L. S. BACON,
REEVE LEWIS.