

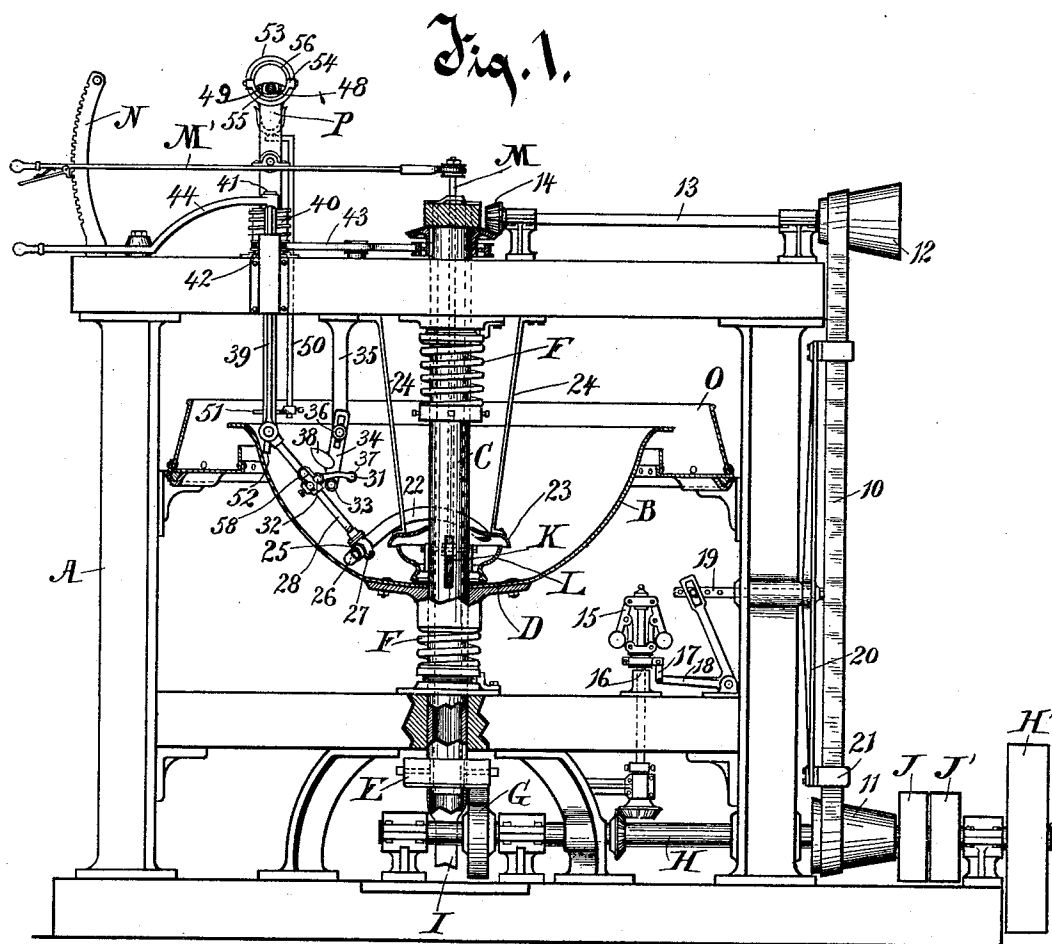
(No Model.)

3 Sheets—Sheet 1.

C. E. SEYMOUR.
ORE CONCENTRATOR.

No. 482,322.

Patented Sept. 6, 1892.



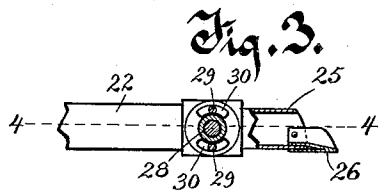
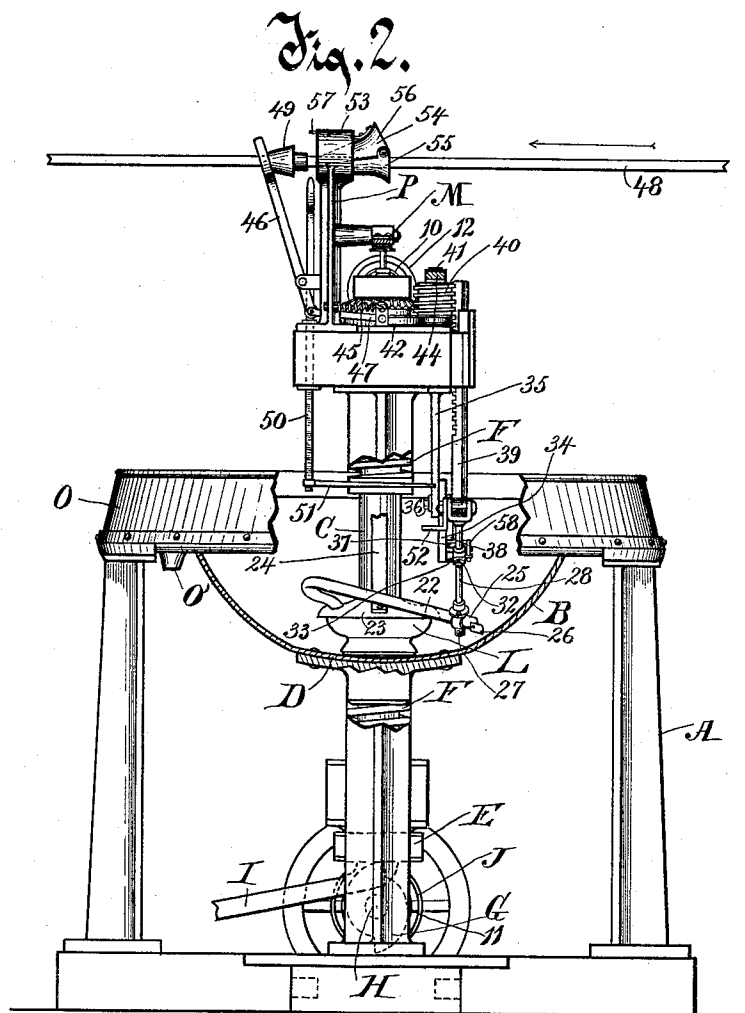
Witnesses.
W. H. Kerner,
Anna V. Faust.

Inventor.
Charles E. Seymour
By C. P. Benedict
Attorney.

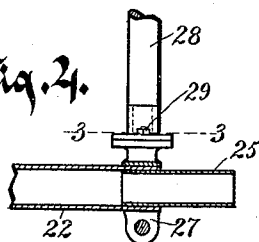
C. E. SEYMOUR.
ORE CONCENTRATOR.

No. 482,322.

Patented Sept. 6, 1892.



Witnesses.
W. H. Kuehn,
Anna V. Faust.



Inventor.
Charles E. Seymour
By C. T. Benedict
Attorney.

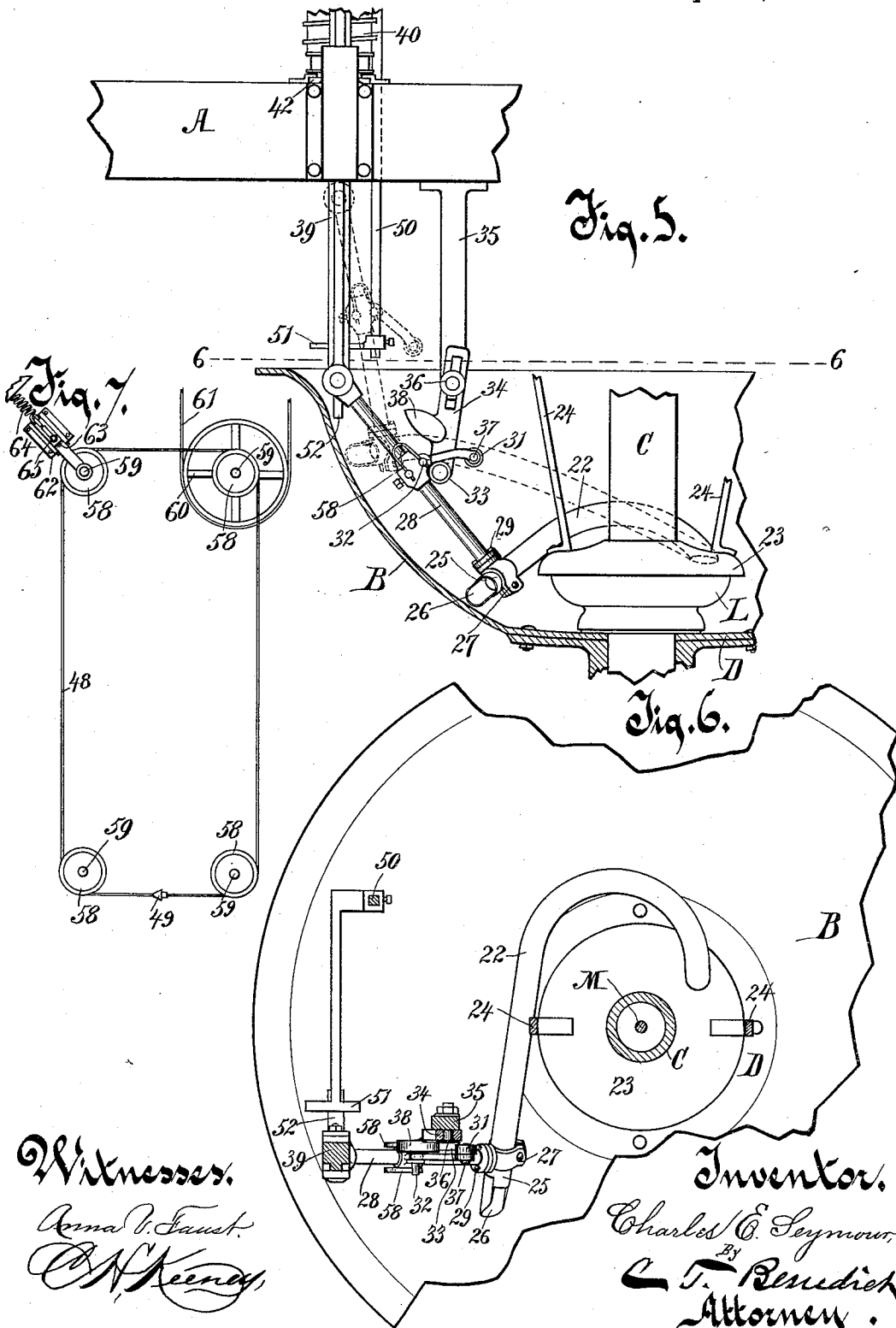
(No Model.)

3 Sheets—Sheet 3.

C. E. SEYMOUR.
ORE CONCENTRATOR.

No. 482,322.

Patented Sept. 6, 1892.



UNITED STATES PATENT OFFICE.

CHARLES E. SEYMOUR, OF LAKE GENEVA, WISCONSIN, ASSIGNOR TO THE SEYMOUR CONCENTRATOR COMPANY, OF CHICAGO, ILLINOIS.

ORE-CONCENTRATOR.

SPECIFICATION forming part of Letters Patent No. 482,322, dated September 6, 1892.

Application filed September 19, 1891. Serial No. 406,183. (No model.)

To all whom it may concern:

Be it known that I, CHARLES E. SEYMOUR, of Lake Geneva, in the county of Walworth and State of Wisconsin, have invented a new and useful Improvement in Ore-Concentrators, of which the following is a description, reference being had to the accompanying drawings, which are a part of this specification.

My invention relates to improvements in an ore-concentrator of the same general class of the concentrator for which Letters Patent No. 456,968 were issued to me August 4, 1891.

The improvements and novel features of my present device relate, chiefly, to means for discharging the concentrates or heavier contents of the concentrator-pan, for controlling the discharging mechanism automatically, and for automatically regulating the speed of the pan-revolving mechanism.

In the drawings, Figure 1 is an elevation of the complete machine, parts being broken away and other parts being shown in section for better illustration of the device. Fig. 2 is an elevation of the complete machine as seen at right angles to the view in Fig. 1. Parts are broken away for showing otherwise hidden portions of the machine. Fig. 3 is a detail of the end of the pipe for cleaning up and discharging the concentrates, taken on line 3 3 of Fig. 4. Fig. 4 is a plan, partly in section, of the detail in Fig. 3 on line 4 4 thereof. Fig. 5 is an enlarged detail sectional elevation of the mechanism on the left hand of the vertical axis of Fig. 1, showing, also, in dotted lines a second position of the mechanism for operating the cleaning-pipe. Fig. 6 is a horizontal section on the plane indicated on line 6 6, Fig. 5, and Fig. 7 is a plan view of the endless cable and the necessary means for driving the same.

A is a frame of suitable construction for supporting the operative mechanism. The concentrator bowl or pan B is supported rigidly on the centrally-piercing hollow shaft C. The pan is preferably constructed of sheet metal and is formed with a substantially flat bottom D, extending from the shaft outwardly therefrom for a little distance, from which point it curves upwardly and outwardly, as in the form of bowl shown in the patent, No. 456,968, heretofore in use by me. The shaft

C has journal-bearings in the frame and is suspended yieldingly by the springs F F, coiled around it between collars on the shaft and suitable supports or bearings on the frame. The shaft and bowl supported thereon are arranged to be jumped up and down by the action of the cam G on the driving-shaft H, in connection with the springs F F. The cam G acts on a collar E, secured adjustably to the shaft C. The hollow shaft C at its lower extremity discharges into the laterally-turned discharging-pipe I, adapted to carry away the discharged contents of the pan. The driving-shaft H is provided with fast and loose pulleys J and J' and with a fly-wheel H'. Elongated slots K in the shaft C, just above the bottom of the pan, are ports for the discharge of the contents of the pan. An annular valve L about the shaft C bears, normally water-tight, being properly packed therefor, against the bottom of the pan, and prevents the discharge of the concentrates from the bowl into the hollow shaft through the ports K. This valve L is connected by cross-bars to the rod M, arranged centrally and movable endwise in the shaft C. This rod M is a stem to the valve, and an elastic lever-handle M', pivoted medially on a bracket on the frame, rides at one end in a grooved collar fixed on the rod M, and is adapted for raising and thereby opening and for lowering and thereby closing the valve L. The elasticity of the lever-handle M' provides for the vertical jumping movement of the pan without changing the relation of the valve L thereto. When tilted up or down, the handle M' is locked in place to the segmental rack N by a suitable spring-catch on the handle. The rack N is rigid on the frame. An annular trough O about the pan B just below its upper edge is adapted to receive the overflow or refused discharged by centrifugal force from the top of the pan and which is discharged therefrom through the pipe O'.

The mechanism thus far specifically described is substantially the same, except in the form of the pan, as that heretofore patented to me. It is desirable to revolve the pan at a uniform rate of speed which shall be sufficiently rapid to separate the contents of the pan by its centrifugal action, causing

the mineral and heavier particles of ore to settle against the walls and near the bottom of the pan, while the lighter portions of the gangue and refuse are carried by the centrifugal action out of the pan over its top into the trough O, and at the same time the speed of the pan should not be so rapid as to carry the mineral out of the pan by centrifugal force.

10 The separation of pulverized ore may be accomplished in my improved machine both in a dry state and while washing it with water.

To regulate the speed of revolution of the pan, it is driven by a belt 10, running on a cone-pulley 11 on the driving-shaft and on a reversed cone-pulley 12 on a counter-shaft 13, which is provided with a pinion 14, meshing with a cog-wheel fixed on the shaft C. By shifting the belt 10 on the cone-pulleys 11 and 12 the speed of the pan revolvably can be increased or diminished, and this is accomplished automatically by means of a ball-governor 15, carried on an upright shaft 16, having its bearings in the frame and geared to the driving-shaft H. The lower movable collar of the governor is connected by a link 17 to one arm of the bell-crank 18, which is pivoted on the frame, and the other arm of which is suitably connected to the rod 19, having endwise movement in the frame, which rod is provided with laterally-projecting arms 20, having guides 21, through which the belt 10 runs. This device is so arranged that when the speed of the shaft H has become so great as to rotate the pan B too rapidly the governor by the spreading of its balls will tilt the bell-crank 18 and force the belt away from the frame and onto a smaller part of the cone-pulley 11 and onto a correspondingly-larger part of the cone-pulley 12, whereby the speed of the pan is suitably decreased. When the motion of the pan has become too slow by the reverse operation of the governor, the belt will be shifted to its former position and the speed of the pan thereby increased.

It is necessary to clean the pan of its mineral contents at frequent and usually regular intervals, and it is desirable to do this without stopping the mechanism and preferably to do it automatically. For cleaning up and discharging the pulverized and heavier mineral deposits that settle on the bottom and sides of the pan I provide a catcher and discharge-pipe consisting of the flexible pipe 22, which at its inner end is secured to and opens from above through the cap or hood 23 into the chamber or space within the sleeve or valve L, from which the therein-received material is discharged through the ports K. The hood 23 is secured rigidly to the hangers 24, fixed on the frame. The flexible pipe 22 is preferably a rubber tube lined with coiled wire to prevent its kinking. The pipe 22 is provided with a metal mouthpiece 25, having a soft-metal lip or scoop 26 secured thereto.

This lip 26 is advisably constructed of soft metal to prevent undue wearing or scraping of the surface of the pan, and may be readily replaced when worn out. The mouthpiece 25 is secured to the pipe 22 by a split collar or clamp 27, whereby the mouthpiece is capable of being adjusted about its axis revolvably on loosening the clamp. This catching and discharging device is adapted to have its mouth held near to the bottom or sides of the pan as the pan revolves, and thus to scrape or catch up the deposit of pulverized mineral on the bottom or walls of the pan, which by the centrifugal action of the deposit thus caught will be carried through the pipe and discharged into the valve-sleeve L. This action is also better accomplished with the aid of water usually supplied to the pan with the pulverized ore, which water, flowing through the pipe, aids to carry the mineral through it. Normally the mouth of this pipe is supported at a distance from the bottom and sides of the pan; but when it is desired to clean up the mineral deposit the mouth of the pipe is brought close to the bottom and sides of the pan for the purpose of catching the deposit. This pipe may be thus manipulated by hand; but I provide automatic mechanism to accomplish this work. To actuate this discharge-pipe 22 automatically, a rod 28 is secured at one end to the clamp 27, adjustably by bolts 29, passing through terminal disks in the abutting ends of the clamp and the rod, one of the disks being provided with segmental slots 30, through which the bolts pass and by means of which the relative positions of the rod and the pipe are adjusted. This provides for arranging the mouth of the pipe at a suitable angle to the pan. The rod 28 is provided with a laterally-extending finger 31, hinged to a sleeve 32, which is clamped adjustably on the rod 28. The finger 31 is arranged to be supported movably on a friction-roller 33 on a pin fixed in the arm 34, which is supported and adjustable on the hanger 35, fixed on the frame. The arm 34 is adjustable on the hanger 35 by means of the bolt 36 through a slot in the arm and through the hanger. The finger 31 also carries in its extremity a laterally-projecting pin 37, adapted to bear against and pass around the stud 38, fixed on the arm 34. At its outer end the rod 28 is hinged to the vertically-moving rack 39. A worm 40, revoluble on a pin 41, fixed in a movable block 42, is adapted by its rotation when in mesh with the rack 39 to raise or lower the rack in its ways on the frame. The worm is rotated by a belt 43, running on a pulley integral therewith and on a pulley on the shaft C. The block 42 is movable in ways therefor on the frame toward and from the rack, so that the worm 40 can be thrown out of or put in gear with the rack 39 by shifting the block, which may be done by the hand of the operator through the lever-handle 44, one arm of which is pivoted to the pin 41 and is pivoted medially on the frame. The worm 40 is held

normally out of mesh with the rack 39 by a spring 45, which draws the block 42 away from the rack.

To automatically put the worm 40 into gear with the rack 39 at regular intervals when the mechanism is in operation, a tripping or shifting lever 46, pivoted medially on the bracket P, fixed on the frame, is connected at its lower end by a link 47 to the block 42, and is arranged when tilted toward the left at its upper end, as shown in Fig. 2, to shift the block 42 toward the rack and put the worm into mesh therewith. An endless cable 48 is provided with a cone-shaped button 49, adapted as the cable is carried forward in the direction of the arrow to take into the forked end of the lever-handle 46 and carry it laterally toward the left and hold it in that position for a brief time, but sufficiently long so that the worm 40 will by its rotation in that time raise the rack 39 to the full height desired to carry the mouth of the pipe 22 along up the side of the pan to near its top. The cable 48, to adapt it for the purpose of holding the lever 46 in this position for a brief space, is provided with a certain amount of slack, which during the space of time that the lever-handle 46 is to be held to the left is taken up, or the same purpose may be accomplished by so arranging the endless cable 48 that it shall run with a sufficient amount of friction on its carrying-pulleys to carry the lever 46 with it when the lever is in engagement with the button 49 to the limit of the movement of the lever-handle, and thereupon by the slight additional strain on the cable to permit it to slip on its carrying-pulleys. To release the button 49 from the lever 46, the detaching-rod 50, having end-wise movement in the frame, is provided with an arm 51, adapted to engage a pin 52 on the rack 39 and be carried up thereby, whereby the rod 50 is carried against the rear part of the button 49, and the button and cable are elevated sufficiently thereby to release the button from the forked end of the lever-handle 46. The rod 50 falls by gravity away from the cable when no longer supported by the pin 52, when it goes down with the rack 39.

To provide for the button 49 striking the lever 46 with considerable force, I employ a device for checking the motion of the cable, which consists of a ring 53, through which the cable runs, which ring is rigid on the bracket P. To this ring I secure a yielding funnel 54, through which also the cable runs. This funnel 54 is constructed in two parts or jaws, the larger open end of which is outward toward the coming button as it travels with the cable, and the inner end is within the ring 53. The lower part or jaw 55 is rigid to the ring 53, and the upper part or jaw 56 is hinged at its larger and outer end to the jaw 55, and is held yieldingly thereto by a spring 57, secured rigidly to the jaw 56 and bearing against the inner surface of the ring 53. This checking device is adapted to receive the thrust of the button and check its movement slightly, tak-

ing up a little of the slack in the cable, so that the button when released from the funnel strikes the lever 46 with sharpness, tilting it and throwing the worm into gear with the rack.

The foregoing-described endless cable and allied devices are fully described and claimed in my application for patent, Serial No. 419,880, filed in the Patent Office on February 1, 1892.

The device or pipe 22 for catching and discharging the mineral from the bottom and sides of the pan, as shown in Fig. 1, are in the position substantially that it has when commencing the work of this discharge near the bottom of the pan. The worm 40 is in engagement with the rack 39, as shown in Fig. 2, and by the rotation of the worm the rack will be gradually raised, carrying the mouth of the pipe 22 slowly up along the side of the pan, while the finger 31 will be drawn along on the friction-roller 33 to its extremity and will thereafter bear against the under surface of the stud 38 until it is carried entirely above the stud 38 and the mouth of the pipe 22 is carried nearly to the top edge of the pan. Thereupon by the release of the worm 40 from the rack 39 the weight of the rack and pipe will allow them to drop, the pin 37 falling on the top of the stud 38 and being thereby carried inwardly, keeping the mouth of the pipe 22 away from the side of the pan until the rack shall have reached the lowest limit of its travel, when the upper end of the rod 28 will be somewhat lower in the pan than shown in Fig. 1, and the mouth of the pipe 22 will by the rod 28 tilting on the pin 33 be carried upwardly and inwardly away from the surface of the pan. The finger 31 is hinged on the sleeve 32 in such manner that it is capable of folding limitedly toward the rod 28, but is not permitted to swing outwardly relative to the rod 28 farther than to the position substantially as shown in Fig. 1. A spring 58, fixed on the sleeve 32, bears against the finger 31 and holds it yieldingly outwardly in the position shown in Fig. 1. As the rod 28 is raised by the rack 39 the finger 31, passing below the stud 38, is swung inwardly somewhat toward the rod, but immediately assumes its normal position on passing beyond the stud, so that it is in proper position to engage the stud as the rod is lowered by the release of the rack from the worm.

When water is used in the concentrator with the pulverized ore, a certain amount of it will, when not carried to the sides of the pan by centrifugal action, enter and be discharged with the lighter refuse through the ports K above the top of the valve L. The contents of the pan not otherwise discharged therefrom are let out by raising the valve L and allowing the refuse or otherwise undischarged material to pass out through the ports K.

A number of these machines may be arranged in a series to be operated automatically by a single cable 48, the button 49 serv-

ing to trip successively the lever 46 in each of the series of machines.

The arrangement of the cable 48 is shown in Fig. 7. It is carried, preferably, on four pulleys 58, mounted on shafts 59, one of said shafts carrying the driving-wheel 60, which is actuated by a belt 61, driven by any suitable source of power. A device is also shown in this figure for taking up the slack of the cable, which consists of a bifurcated pulley-carrying arm 63, reciprocable in ways 62 and connected yieldingly to a permanent structure by the spring 64. The cable runs on the pulley 58, mounted in the arm 63.

What I claim as new, and desire to secure by Letters Patent, is—

1. In an ore-concentrator, the combination, with a pan-carrying shaft, of a governor connected to and actuated by the driving mechanism, a bell-crank lever, one arm of which is connected by a link to the movable collar of the governor and the other arm of which bell-crank is connected to movable belt-guiding arms, and a pulley-belt passing around a cone-pulley on the driving-shaft and a reversed cone-pulley on a counter-shaft, said belt being adapted to be engaged by the movable arms connected to the bell-crank and to be shifted by the same with relation to its position on the cone-pulleys, substantially as set forth.

2. In a centrifugal concentrator or separator, the combination, with a revoluble pan fixed on a vertical shaft capable of vertical movement and a cam secured to and actuated by the driving-shaft, which cam is arranged by its revolution to regularly elevate the pan and permit it to fall, of a counter-shaft geared to and driving the pan-shaft and connected to the driving-shaft by a belt on reversed cone or speed pulleys, and a governor geared to the driving-shaft and arranged to automatically shift the belt so as to regulate the speed of the pan at a uniform rate and a predetermined speed varying, as desired, from the speed of the pan-elevating cam, substantially as described.

3. In a centrifugal ore-concentrator, the combination, with a revoluble pan fixed and carried on a vertical hollow shaft, of a flexible discharge-pipe having an open mouth at one end adapted to sweep along the side of the pan and gather deposits therefrom and secured at its other end to a part fixed on the frame and arranged to discharge into a cup or sleeve and thence through a port into the hollow shaft, substantially as described.

4. In a centrifugal ore-concentrator having a revolving pan fixed on a hollow shaft, a flexible discharging-tube arranged to sweep the sides of the pan and gather deposits therefrom and discharge them into the hollow shaft, and a metal mouthpiece secured adjustably to the flexible tube, combined substantially as described.

5. In a centrifugal ore-concentrator having a revolving pan fixed on a hollow shaft, a

flexible discharging-tube arranged to sweep the sides of the pan and gather deposits therefrom and discharge them into the hollow shaft, a metal mouthpiece secured to the flexible tube, and a soft-metal lip or scoop secured to and projecting from the mouthpiece, combined substantially as described.

6. In an ore-concentrator having a revoluble pan fixed on a hollow shaft and a flexible tube arranged to gather and discharge deposits from the sides of the pan, a rod connected to the tube, a rack connected to the rod, and a worm connected operatively with and so as to be revolved by a revolving shaft of the mechanism, which worm is arranged to be put in gear with the rack to elevate it, combined substantially as described.

7. In a concentrator having a revoluble pan fixed on a hollow shaft and a flexible tube arranged to gather and discharge deposits from the sides of the pan, a rod connected to the tube, a finger on the rod, bearing movably on a pin in a supporting-arm, and means for raising the rod, substantially as described.

8. In an ore-concentrator having a revoluble pan fixed on a hollow shaft and a flexible tube arranged to gather deposits from the sides of the pan and discharge them into the shaft, a rod connected to the tube, a finger hinged on the rod, arranged to fold in one direction and bearing on a pin in a supporting-arm, and a stud arranged to receive the bearing and thrust of the finger as the rod is raised and lowered, combined substantially as described.

9. In an ore-concentrator having a revoluble pan and a swinging discharge-pipe adapted to sweep the sides of the pan and gather and discharge deposits therefrom, a means for elevating the flexible tube, comprising a rack connected to the tube, a worm adapted to mesh with the rack, a block movable on the frame, on which block the worm is axled, a spring arranged to retrieve the block and hold the worm out of gear with the rack, and means for moving the block and putting the worm temporarily in gear with the rack, combined substantially as described.

10. In an ore-concentrator having a revoluble pan and a flexible pipe arranged to sweep the sides thereof and gather and discharge deposits therefrom, means for automatically elevating the flexible tube, comprising a rack connected to the tube, a worm adapted to mesh with the rack, a block movable on the frame, on which block the worm is axled, a spring arranged to retract the block and hold the worm out of gear with the rack, a tripping-lever arranged to shift the block and put the worm temporarily in gear with the rack, and an endless cable provided with a button adapted to engage the tripping-lever and tilt it, combined substantially as described.

11. In an ore-concentrator having a revoluble pan and a flexible pipe arranged to sweep the sides thereof and gather and discharge

deposits therefrom, means for automatically elevating the flexible tube, comprising a rack connected to the tube, a worm adapted to mesh with the rack, a block movable on the frame, on which block the worm is journaled, a spring arranged to retract the block and hold the worm out of gear with the rack, an endless cable provided with a button adapted to engage the tripping-lever and tilt it, and a detaching device consisting of a rod movable vertically in the frame, having an arm arranged to engage a pin on the rack as it is elevated and to be raised thereby, which rod is adapted to strike the button on the cable and throw it out of engagement with the tripping-lever, combined substantially as described.

12. In an ore-concentrator having a revolving pan, a flexible discharge-pipe and an au-

tomatic device for lifting the pipe, operated by an endless cable provided with a button, a motion-checking device comprising a ring secured to the frame, through which ring the endless cable passes, and a funnel in two parts or jaws, one of which is rigid to the ring and the other of which is hinged to the fixed part and is provided with a spring closing the movable jaw yieldingly against the fixed jaw, which funnel is adapted to receive yieldingly the thrust of the button on the cable and check the motion of the cable temporarily, substantially as described.

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

CHARLES E. SEYMOUR.

Witnesses:

CHAS. S. FRENCH,

W. H. HAMMERSLEY.