

(No Model.)

C. E. SEYMOUR.

MAGNETIC SEPARATOR FOR ORE CONCENTRATORS.

No. 482,323.

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Fig. 1.

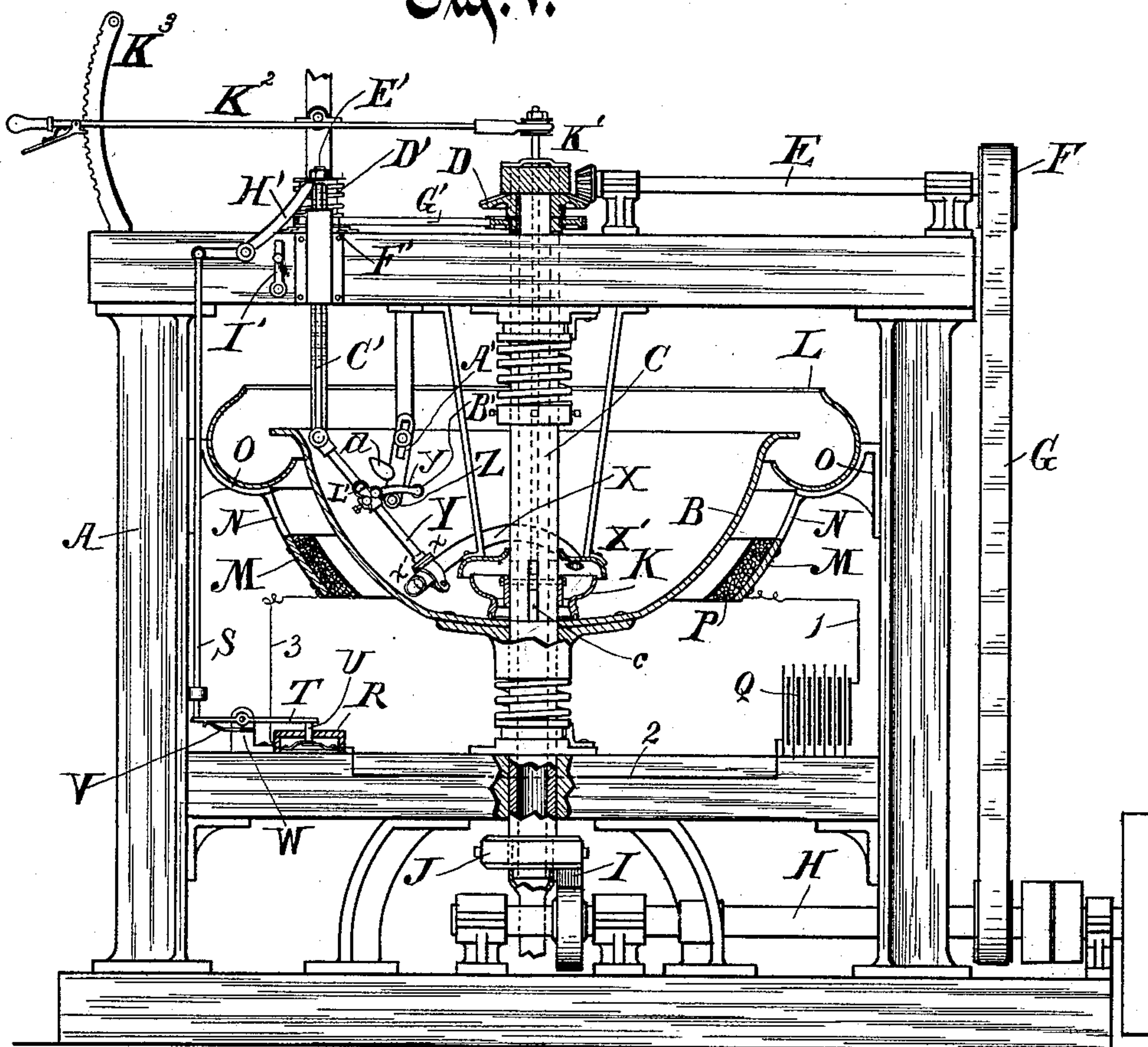


Fig. 2.



Witnesses.

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## MAGNETIC SEPARATOR FOR ORE-CONCENTRATORS.

SPECIFICATION forming part of Letters Patent No. 482,323, dated September 6, 1892.

Application filed October 2, 1891. Serial No. 407,524. (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 Magnetic Separators for 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 has relation to certain improvements in magnetic separators for ore-concentrators, whereby the concentrating pan or bowl is magnetized by induction or demagnetized at will, the object being the accumulation of the magnetic minerals when in a fine or pulverized state, free from the non-magnetic particles.

A further object is to provide for the automatic opening and closing of the circuit employed in connection with my invention.

In the illustration of the device I prefer to show the same in connection with a concentrator such as herein shown and described. It is to be understood, however, that I do not limit its application to this form of device, as it would be evident from the description which follows that it may be employed with equally good results in connection with various other forms.

In the accompanying drawings, Figure 1 is an elevation of the complete machine, showing my invention applied thereto, parts being in section and other parts broken away. Fig. 2 illustrates a modification in the means employed for magnetizing the pan or bowl.

Like letters and figures of reference refer to like parts throughout both the views.

Referring to the drawings, the letter A indicates a frame of suitable construction for supporting the operating mechanism, B the concentrator bowl or pan, and C the hollow shaft supporting rigidly said pan. This hollow shaft is suspended yieldingly by springs coiled around it between collars on the shaft and suitable supports or bearings on the frame, and is provided at its upper end with a beveled gear D, which meshes with a corresponding gear upon the end of the horizontal shaft E at the top of the frame, said shaft carrying upon its opposite end a pulley F, which receives an endless belt G, which belt also

passes around a pulley carried upon a lower horizontal driving-shaft H. This driving-shaft carries upon its inner end a cam I, acting against a collar J, adjustably secured to shaft C. It will thus be seen that the shaft and bowl are arranged to be jumped up and down by the action of the cam I on the driving-shaft H in connection with the coiled springs on said shaft.

An annular sleeve-valve K about the shaft C bears normally water-tight, being properly packed therefor against the bottom of the pan to prevent the discharge of the concentrates from the bowl into the hollow shaft through ports *c* in said shaft. This valve K is connected by cross-bars to the rod K', arranged centrally and movable endwise in the shaft C. This rod K' forms a stem to the valve, and an elastic lever-handle K<sup>2</sup>, pivoted medially on a bracket on the frame, rides at one end in a grooved collar fixed on said rod and is adapted for raising, and thereby opening, and for lowering, and thereby closing, the valve K. The elasticity of the lever-handle K<sup>2</sup> provides for the vertical jumping movement of the pan without changing the relation of the valve K thereto. When tilted up and down, the handle K<sup>2</sup> is locked in place to the segmental rack K<sup>3</sup> by a suitable spring-catch on the handle. An annular trough L about the pan B, just below its upper edge, is adapted to receive the overflow or refuse discharged by centrifugal force from the top of the pan.

Below the trough L is an annular band or ring M, which is supported by a series of arms N, depending from the bracket O. Upon the inner face of this annulus or ring a continuous insulated electric wire is coiled about the pan, adapted to carry an electric current and form an induction-coil, with a slight space intervening between the same and the outer surface of the pan or bowl, so as not to interfere in the least with the revolution or vertical movement of the latter. This induction-coil is in and forms part of an electric circuit and acts by induction electrically on the metal pan or bowl to charge it electrically in the same manner that the induction-coil of an electro-magnet acts on its core.

Q is a battery in the electric circuit formed by the wires 1, 2, and 3 leading thereto from



the coil P, of which coil these wires are the termini, the wires 2 and 3 being the continuation of each other, interrupted only by the circuit-breaker R.

5 The letter S indicates a vertical rod which at its lower end connects with a horizontal medially-pivoted lever-key T, the latter in turn being provided with a downwardly bent or depending arm U, which bears against the  
10 circuit-contacting wire 3. The two points of the circuit-breaker are held normally in contact by a spring V, which is secured to a standard W, to which key T is also pivoted. The free end of the spring bearing against  
15 the outer end of said key T lifts it, forcing its inner end U downwardly, thus holding the two points of the circuit-breaker yieldingly in contact. In this position the electric circuit is closed and a continuous current is provided. In order, however, to open the circuit  
20 or periodically interrupt the electric current, it is only necessary to force the rod S downwardly, overcoming the action of spring V, thus throwing the points out of contact, said  
25 points being of spring metal arranged to separate when pressure thereon is removed.

The operation just described can of course be readily accomplished by hand; but it is more desirable that the same be effected automatically. To this end I employ in connection with  
30 the vertical rod S certain mechanism hereinafter described, which serves the function of periodically making and breaking the current.

For cleaning up and discharging the heavier  
35 pulverized mineral deposits that settle on the bottom and sides of the pan I provide a catcher and discharge-pipe consisting of a flexible pipe X, which at its inner end is secured to and opens from above through a cap  
40 or hood X' into the chamber or space within the sleeve-valve K, from which the therein-received material is discharged through the ports c. The hood X' is secured rigidly to hangers on the frame. The flexible pipe X is  
45 preferably a rubber tube lined with coiled wire to prevent its kinking, and is provided with a metal mouthpiece  $\alpha$ , having a soft-metal lip or scoop  $\alpha'$  secured thereto. This catching and discharging device is adapted to have its  
50 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 centrifugal action of the deposit thus caught  
55 will be carried through the pipe and discharged into the valve K. This action is also better accomplished by the aid of water usually supplied to the pan with the pulverized ore, which water flowing through the pipe  
60 aids to carry the mineral through it. To actuate this discharge-pipe X automatically, a rod Y is secured to one end thereof, said rod being provided with a laterally-extending finger  $\gamma$ , which is arranged to be supported movably on a friction-roller Z, carried by a pin  
65 fixed on an arm A'. The finger  $\gamma$  also carries at its extremity a laterally-projecting pin

B', adapted to bear against and pass around the stud  $\alpha$ , fixed on said arm A'. At its outer end the rod Y is hinged to a vertically-moving rack C'. A worm D', revoluble on a pin  
70 E', fixed on a movable block F', is adapted by its rotation when in mesh with the rack C' to raise or lower said rack in its ways in the frame. The worm is rotated by a belt G', run  
75 on a pulley integral therewith and on a pulley on the shaft C. It will of course be obvious that as the worm rotates the rack is carried upwardly, and with it the arm Y, by means of which the mouth of the pipe X is  
80 drawn slowly up along the side of the pan, while the finger  $\gamma$  will be drawn along on the friction-roller Z to its extremity, and will thereafter bear against the under face of the stud  $\alpha$  until it is carried entirely above said  
85 stud and the mouth of pipe X is carried nearly to the top edge of the pan. The block F' is movable in ways therefor in the frame toward and from the rack, so that said worm can be thrown in and out of gear with the  
90 rack. If after the gear and rack are in mesh and the discharge-pipe X has been operated by drawing the same upwardly, as before described, the worm is now thrown out of gear with the rack, the weight of said rack and the  
95 pipe X will allow them to drop, the pin B' falling on top of the stud, and being thereby carried inwardly, keeping the mouth of the pipe X away from the side of the pan until the rack shall have reached the lowest limit  
100 of its travel, when the upper end of the rod Y will be somewhat lower in the pan than shown in Fig. 1, and the mouth of the pipe X will by the rod Y tilting on the pin B' be carried upwardly and inwardly away from  
105 the surface of the pan. The finger  $\gamma$  is hinged on a collar on rod Y in such manner that it is capable of folding limitedly toward the rod Y, but is not permitted to swing outwardly relative to said rod farther than to the position  
110 substantially as shown in Fig. 1. A spring L', fixed on the collar on rod Y, bears against the finger  $\gamma$  and holds it yieldingly outwardly in the position shown in Fig. 1. As the rod Y is raised by the rack the finger  $\gamma$ ,  
115 passing below and along the stud  $\alpha$ , is swung inwardly somewhat toward the rod, but immediately assumes its normal position on passing under the stud, so that it is in a proper position to engage the stud as the rod is lowered  
120 by the release of the rack from the worm.

In order to utilize the upward vertical movement of the rack C', so as to effect automatically the opening and closing of the circuit, I secure to the upper end of rod S a bell-  
125 crank lever H', the free end of one member of which is adapted to bear against the upper end of rack C'. As the rack ascends, therefore, the long arm of the bell-crank will be moved outwardly and the short arm downwardly. This will force the rod S downwardly, and the lower end thereof, bearing  
130 against the horizontally-pivoted key T, will cause the uplifting of the inner end of said



key, and thus free the points of the circuit-breaker from contact. When the worm D' is thrown out of mesh with the rack C', the latter will by gravity return to its initial position and allow the bell-crank arm to fall by gravity, the bell-crank lever to resume its normal position, and the circuit-breaker to close.

Beneath the bell-crank lever is pivoted a button I'. This button serves the purpose of holding the inner member or arm of the bell-crank lever outwardly, thus breaking the circuit and continuing it unclosed while the machine is being cleaned or the mineral is being taken from the pan. This button is pivoted at its lower end and provided near its upper end with a short handle. In practice it is turned to the left until the upper end contacts with the bell-crank, and, bearing against the same, will operate the vertical rod S to force it downwardly and break the circuit.

In Fig. 2 I have shown a slightly-modified arrangement, which is similar in all respects to the other construction, except that I employ a series of electro-magnets instead of the induction-coil M, which in this instance I have designated by letter J', arranged about the pan, the operation of which will be readily understood.

From the above it will be seen that the feature of magnetizing the concentrating pan or bowl is not only adapted to the particular form of concentrator herein shown and described, but is equally well adapted to any form of concentrator having a revolving bowl or pan even though the automatic mechanical features described in detail are omitted.

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

1. In an ore-concentrator, an upright revoluble bowl adapted to receive and hold pulverized ores while being separated by centrifugal force by the rotation of the bowl, in combination with electric devices arranged around the bowl on the outside thereof at a distance from and opposite to its upwardly and outwardly flaring sides, which electric devices are adapted to magnetize or charge the bowl electrically by induction, substantially as described.

2. In an ore-concentrator, an upright revoluble bowl adapted to receive and hold pulverized ores while being separated by centrifugal force by the rotation of the bowl, in combination with a coil of insulated wire

about the bowl on the outside thereof opposite to and at a distance from its sides, which coil of wire is in and forms a part of the electric circuit, whereby when in activity electrically the bowl is by induction magnetized or charged electrically, substantially as described.

3. In an ore-concentrator, an upright revoluble bowl adapted to receive and hold pulverized ores while being separated by centrifugal force by the rotation of the bowl, in combination with a coil of insulated wire about the bowl on the outside at a distance therefrom, which wire forms a part of an electric circuit, a circuit-breaker in the circuit, and a battery also in the circuit for generating the electricity therefor, substantially as described.

4. In an ore-concentrator, the combination of a concentrator pan or bowl, means for magnetizing the same, an electric circuit, spring-actuated contact-points within said circuit, a pivoted key provided with an arm bearing upon one of the contact-points, and a vertical rod connected to the outer end of said key, substantially as set forth.

5. In an ore-concentrator, the combination of a concentrator pan or bowl, means for magnetizing the same, an electric circuit, a circuit-breaker within the circuit, said circuit-breaker consisting of spring-closed contact-points, a pivoted key, a rod bearing against the key, a bell-crank lever having one arm secured to the upper end of the rod, and a pivoted button constructed to engage said bell-crank lever and hold the contact-points out of engagement, substantially as set forth.

6. In an ore concentrator, the combination of a concentrator pan or bowl, means for magnetizing the same, an electric circuit, a circuit-breaker within said circuit, a rod for controlling the circuit-breaker, a bell-crank lever having one arm secured to the upper end of the rod, and a rack or part arranged to be moved vertically in the frame of the machine and adapted to engage the inner member of the bell-crank and cause the operation of the circuit-breaker, substantially as set forth.

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

CHARLES E. SEYMOUR.

Witnesses:

CHAS. S. FRENCH,  
R. H. READ.