

UNITED STATES PATENT OFFICE

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PROCESS OF SEPARATING MATERIALS OF VARYING DEGREES OF CONDUCTIVITY

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This invention relates to a process of separating materials of varying degrees of conductivity. More particularly, the invention relates to the separation of the metals found in various ores from the gangue.

Broadly stated, the invention resides in causing the metal particles of the ore to complete, by their presence, an electric circuit, the closing of which, through the metal particles, fuses the latter upon a carrier which carries the fused particles away from the gap at which they completed the electric circuit, leaving said gap open until additional particles of the metal find their way thereto to again complete a circuit.

By suitably regulating the voltage of the current employed certain metals can be extracted and retained, while other metals of a different degree of conductivity or higher fusing point will not be effected. For purposes of explanation I have illustrated, in the accompanying drawings, one form of apparatus which may be used in carrying out the process. However, it is to be understood that the invention here resides in the broad thought of separating metals, as above set forth, irrespective of the particular type of apparatus that may be employed in carrying out the process.

In the drawing:

Fig. 1 is a perspective view of the separating apparatus;

Fig. 2 is a perspective view of a current regulating and controlling device used in conjunction with Fig. 1.

Fig. 3 is a detailed view, upon a larger scale, of a part of the mechanism of Fig. 2, and

Fig. 4 is a transverse sectional view through the rollers, and associated parts, of Fig. 1.

Like numerals designate corresponding parts throughout the several figures of the drawing.

Rollers A are disposed upon opposite sides of, and in close proximity to, a stationary separating plate B, of inverted V-shape. Troughs C are provided with scraping edges c, which lie in contact with the outer sides of the rollers A. The rollers A are journaled

in bearings D, said bearings being supported upon the inclined upper side of a frame E. A transverse shaft J, driven by belt M, is mounted in bearings K, and carries bevel pinions H, which mesh with bevel pinions L, upon the ends of the shafts G, of the rollers A. This mechanism serves to rotate the rollers in the directions indicated by the arrows a. The stationary separating plate B rests upon plates of insulating material Z. The troughs C are carried by rods f, which are adjustable toward and from the rollers, as shown at F. The current controlling and regulating mechanism comprises a solenoid magnet T, the ends of the winding of which are indicated at X and W. This winding is wound about the hollow tube T, in which the core S, of the solenoid, moves. A wire V is connected to this core and extends to a source of current supply. The terminal X of the solenoid magnet also extends to the source of supply of the current. The core of the solenoid magnet carries a carbon contact point R, which co-acts with contact point Q, on support O. This support is adjustable upon a panel N, as indicated at P. A wire, or conductor Y, leads from the contact point Q to the fixed plate B. Thus, the circuit is as follows:

From the source of supply through wire V to core S; thence through contact points R and Q, when these are in engagement with each other, through wire Y to separating plate B. When the gap between a longitudinal edge of B, and either of the rollers A, is bridged by a particle or particles of metal, the circuit will be completed through the said roller, wire W, the solenoid winding and wire X, back to the source of current supply. The completion of this circuit through the particles of metal to be separated brings about such fusing of the metal as will cause it to adhere to the roller A. The metal then travels around with the roller A, until it is scraped off by the corresponding scraper c and deposited in the corresponding long trough C. It will be understood that the strength of the current employed will be such as to fuse the particular metal that it is desired to separate, and the current control-

ling and regulating device of Fig. 2 is designed to render it possible to vary the strength of the current, as may be needful.

As has been stated, the rollers A are disposed upon an angle. This, coupled with the fact that they continuously rotate in the direction of the arrows *a*, brings about a constant lifting and rotating of the ore which is fed upon the rollers at the upper end thereof; the gangue being discharged from the lower ends of said rollers. If, for example, gold bearing placer gravel, or other gravel bearing gold particles, is deposited upon the upper ends of the rollers and fed downwardly thereover, the gravel being a non-conductor of electricity, or of high resistance, passes over the rollers without being effected. The constant lifting and agitation of the gravel, as it feeds slowly downward over the rollers, causes the relatively heavy metal content, or the metal bearing content thereof, to seek the lowest point of the mass, which is the point where the longitudinal edges of the separating plate B lie closest to the rollers A. When either of the gaps *x* is bridged by a conductive particle of metal, a fusing of the metal takes place, as above described.

It will be apparent that since the winding of the solenoid is in series with the fusing circuit, the solenoid will be energized when the circuit is completed. The energizing of the solenoid causes the contact R to be lifted, thus breaking the fusing circuit. Consequently, when the fused particle is carried away from the gap *x*, the arc that would otherwise occur is prevented. As soon as the fused particle moves away from the gap, the solenoid is de-energized and the core R drops, so that when additional metallic particles come into the gaps *x*, they will again complete a circuit to bring about the fusing thereof upon the carrier electrodes, or rollers A.

It is manifest that many mechanical appliances can be devised, by those skilled in the art, to carry out the basic thought constituting my process. Consequently, it is to be understood that the invention is not limited to the use of any particular apparatus but resides in the conception of the idea disclosed herein.

Therefore, it is to be understood that the invention includes, within its purview, the employment of any means for the use of any process falling within either the terms or the spirit of the appended claims.

Furthermore, while the bulk of the valuable content of the ore will usually be found to be in particles so small as to be fusible, it will sometimes be the case that nuggets of considerable size will constitute the circuit completing elements. In such case, these nuggets may not be fused, and it will become desirable to remove them by hand. In order to apprise the operator when this condition exists, I may include, in the electric circuit,

an electric signal, such as a bell Z. While this bell will sound at any time that the circuit is completed, it will usually ring only momentarily, or until the metallic particle is fused. When a nugget of considerable size completes the circuit, the operator will be apprised of that fact by the ringing of the bell through a much longer period, and he will then seek and remove the nugget.

Having described my invention, what I claim is:

1. The herein described process for separating materials of varying degrees of fusibility and electrical conductivity, which consists of passing such materials longitudinally over two elongated electrodes which are included in a normally open electric circuit that is completed by the deposition of the material to be separated, therebetween, fusing conductive particles of said material upon one of said electrodes by the completion of the circuit of which it forms a part, discharging said fusible material laterally from the electrode upon which it is fused, and discharging the non-conductive portion of said material gravitationally and longitudinally from said electrodes.

2. The herein described process, which consists of passing an ore comprising conductive and non-conductive particles over a pair of spaced electrodes, one of which travels, said electrodes constituting a part of a normally open electric circuit, adapted to be completed by the deposition of particles of conductive metal from the ore between said electrodes, the current employed being of sufficient strength to fuse said particles of metal upon the travelling electrode, when said circuit is completed and then interrupting the circuit under the influence of the current flow set up by the completion of said circuit.

3. The herein described process, which consists of passing a metal bearing ore over a pair of spaced electrodes, one of which travels, said electrodes constituting a part of a normally open electric circuit, adapted to be completed by the deposition of particles of metal from the ore between said electrodes, the current employed being of sufficient strength to fuse said particles of metal upon the travelling electrode, when said circuit is completed, and then interrupting the circuit to prevent the formation of an arc, as the movement of the travelling electrode carries the fused particles away from the other electrode.

4. The herein described process which consists of passing an ore comprising magnetic and non-magnetic particles over a pair of spaced electrodes, one at least of which constantly moves in a direction laterally of said electrodes, and which electrodes are disposed in such position as to cause the material to be fed longitudinally therealong by gravity, said electrodes constituting part of a

normally open electric circuit, which is closed
by the disposition of particles of metal from
the ore therebetween, said particles being
fused under the influence of the current flow
5 set up by the closing of said circuit, by said
particles.

In testimony whereof he affixes his signature.

RALPH SHERER.

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