

J. C. SMITH.
SHAKING ORE CONCENTRATOR.
APPLICATION FILED FEB. 12, 1914.

1,118,593.

Patented Nov. 24, 1914.

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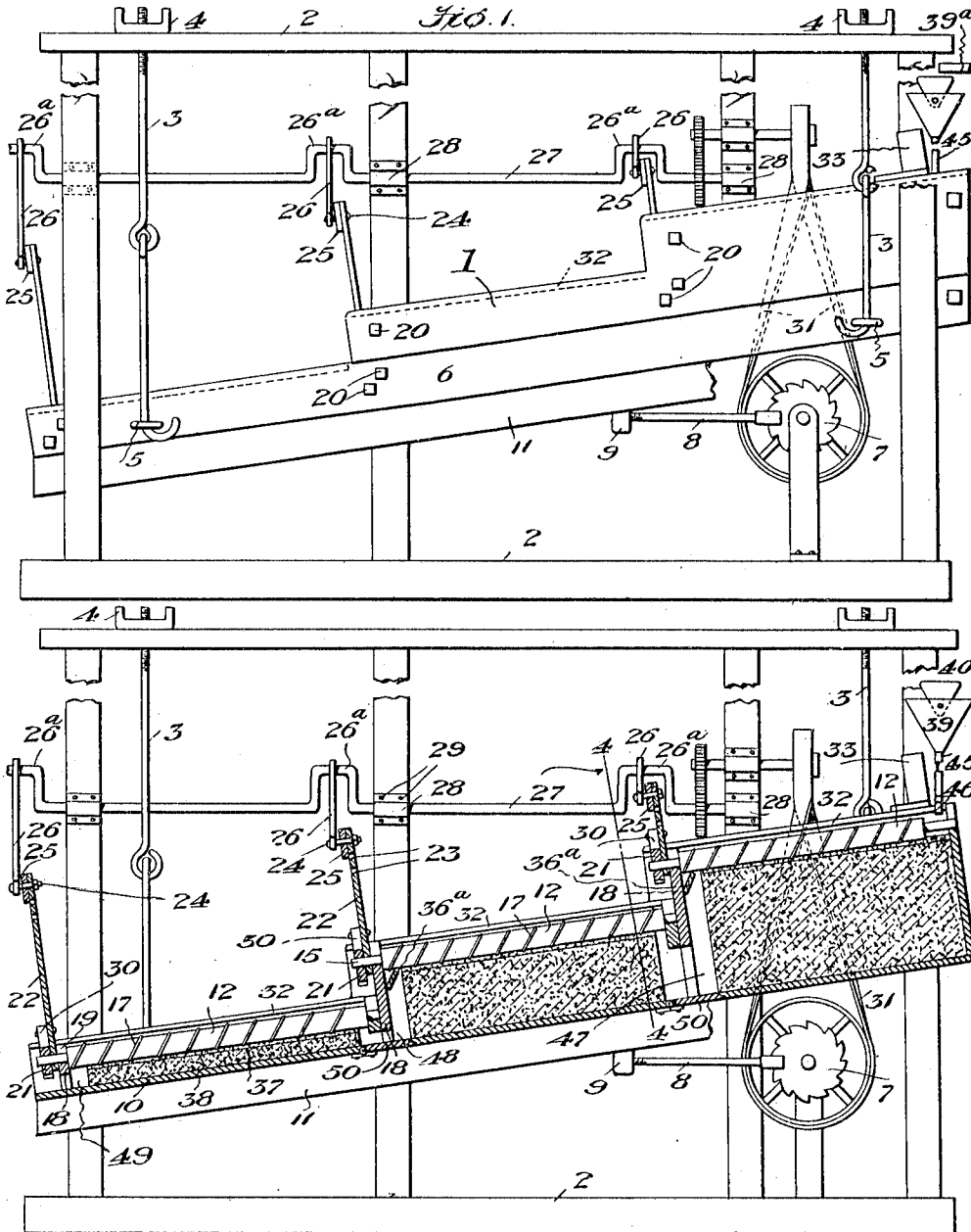


FIG. 2.

Inventor

John C. Smith

Witnesses

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Wm. C. Dashiell.

By

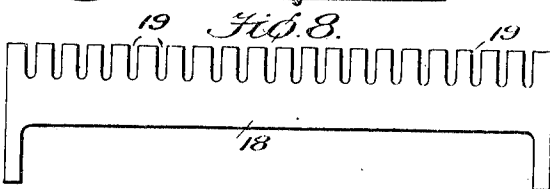
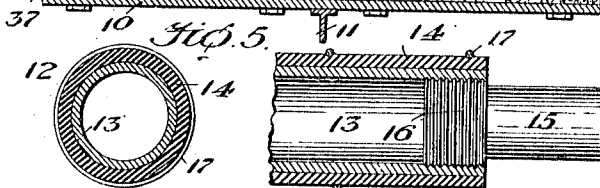
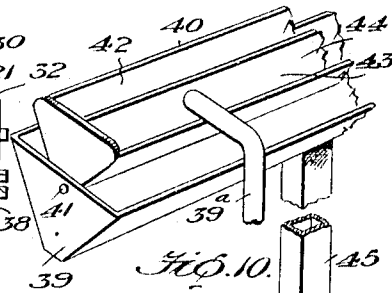
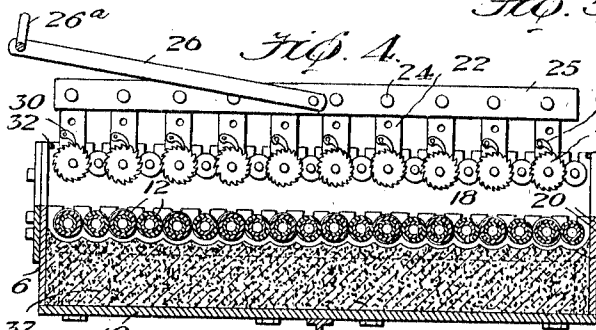
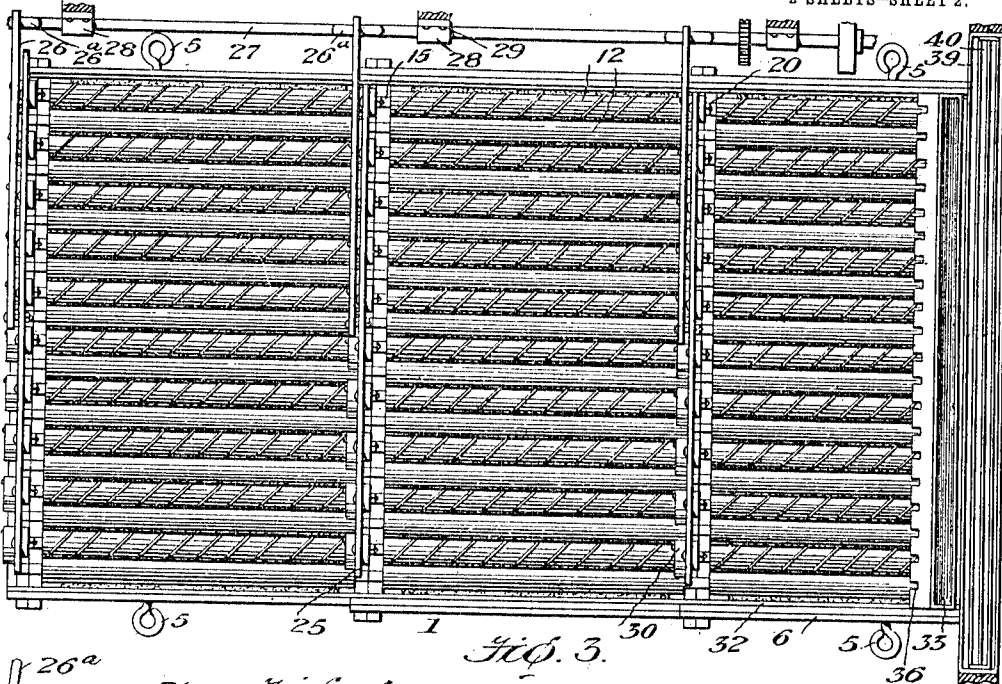
Attorney

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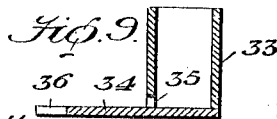
2 SHEETS-SHEET 2.



Witnesses

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UNITED STATES PATENT OFFICE.

JOHN C. SMITH, OF SALT LAKE CITY, UTAH.

SHAKING ORE-CONCENTRATOR.

1,118,593.

Specification of Letters Patent.

Patented Nov. 24, 1914.

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To all whom it may concern:

Be it known that I, JOHN C. SMITH, a citizen of the United States, residing at Salt Lake City, county of Salt Lake, and State of Utah, have invented certain new and useful Improvements in Shaking Ore-Concentrators, of which the following is a specification.

This invention relates to shaking ore concentrators.

My object is to provide an improved shaking ore concentrator for the recovery of fine or flour metal commonly called "slimes" from low grade copper ore. Fine or flour ore is so light that it tends to float off of a concentrator with the wash-water and to go into the tailings.

My object is to provide, first, a shaking or vibrating concentrator having improved rotary riffles adapted to separate out the fine or flour metal or slimes and to prevent them from passing off with the wash-water.

The foregoing object is accomplished by the provision of rotary rolls, certain or all of which have riffled surfaces, said rolls being arranged parallel and adapted to pass the fine or flour ore or slimes down between them to be washed off and caught below. Preferably, but not necessarily, the riffled surface is in the form of a copper wire or rib arranged spirally around and carried by the roll, but it is not necessary for all the rolls to have a riffled surface or a riffled surface of the character set forth, as ordinarily alternate rolls will be provided with the riffled surface and the other rolls will be smooth or relatively unriffled. I prefer to make the rolls with a rubber or resilient exterior to assist in the retention of the fine particles of the slimes.

In carrying out the invention, I arrange the rolls at an inclination and sufficiently close together to retain a layer of liquid pulp thereover and permit stratification by gravity and also provide means for washing the under surfaces of the rolls to remove the adhering concentrates therefrom. The rolls are arranged sufficiently close together to prevent any of the water, sand, or refuse from passing between them. The metal being the heaviest, will stratify below the

crude overlying pulp and will settle down in the bottoms of the channels or grooves formed by the rolls so that a slight turn of the rolls will pass the metal underneath where it will be washed off.

While I am well aware that the washing of the under surfaces of the rolls may be carried out in different ways, I preferably employ a trough or troughs down which the wash-water flows and, while flowing, washes the concentrates from the rolls. There may be a separate channel or chute for each roll. If a plurality of sections of rolls are carried by the same shaking table, the wash-water may be conducted from one section to another, or each section may have its own washing means and the concentrates may be taken off separately from the different sections.

The shaking or vibrating table carrying the rolls may be mounted in any preferred manner and provided with any preferred head motion to afford the necessary shake or vibration.

While I am aware that various means could be employed for turning the rolls, I prefer to employ an improved pawl-and-ratchet mechanism for simultaneously turning all of the rolls of a given section.

One embodiment of the invention which is set forth fully hereinafter should be considered as illustrative, rather than restrictive, of the scope of the invention which is susceptible of various modifications without departing from the spirit and scope thereof.

In the accompanying drawings: Figure 1 is a side elevation; Fig. 2, a longitudinal section; Fig. 3, a plan view; Fig. 4, a cross-section on line 4-4, Fig. 2, looking in the direction of the arrows; Fig. 5, a detail cross-section of one of the rolls; Fig. 6, a longitudinal section thereof within the gudgeon in full lines; Fig. 7, a cross section of a pair of rolls showing how they contact with each other; Fig. 8, an elevation of one of the bearing plates; and Fig. 9, a cross-section of the launder. Fig. 10, a detail perspective of a portion of the wash-water feeder; and Fig. 11, a detail of an end of a splash board.

The concentrator 1 may be mounted and

shaken in any preferred manner. In the drawings there is shown a frame 2 from which the concentrator 1 is suspended by jointed and adjustable rods 3 which have adjusting hand-nuts 4 and are engaged by hooks at their lower ends with eyes 5 on the side beams or plates 6 of the concentrator 1. The head motion or shaking action may consist of a star-cam 7 acting on a rod 8 adjustably connected at 9 to the concentrator 1. The concentrator 1 may have a framework or bed of any suitable form and, in addition to the side plates 6, it has a bottom 10 which may have one or more longitudinal trusses or beams 11. I do not limit myself to the exact construction of frame shown and described.

Carried by the framework of the concentrator in any suitable manner are rolls 12 arranged to receive the pulp on their upper faces and adapted to concentrate or separate out the fine or flour ore or slimes and to force the concentrates between them for subsequent taking off below. These rolls are preferably of the construction shown in Figs. 5, 6 and 7, consisting of a center core or tube 13, an outer rubber or elastic or yieldable shell or facing 14, and suitable gudgeons or journals 15. The latter may be screwed into the end of the core 13 at 16. It is not necessary for all of the rolls 12 to be rifled, but certain of them, preferably every alternate one, should be rifled. I am aware that different forms of riffls may be employed and I do not limit myself, except where stated in the claims, to the specific form of riffl shown which is a copper wire 17 wound spirally around and secured to and preferably slightly embedded in the shell or facing 14, and preferably pressing against and into the elastic or yielding face 14 of the smooth roll adjacent thereto. The riffls on the rolls catch and force the slimes or fine ore down between the rolls. The gudgeons 15 may be mounted in any suitable manner which will permit the rolls to be put in or taken out when necessary. I preferably employ bearing plates 18 of the form shown in Fig. 8 which have bearing slots 19 in which all of the gudgeons 15 at one end of a given set of rolls are received. A corresponding plate at the other end of a given set of rolls constitutes bearing means therefor. The plates 18 may be secured to the sides of the table 1 by suitable fastenings 20, or in any other manner. On one end of every alternate roll I provide a ratchet-wheel 21 which may be carried by one of the gudgeons 15. These ratchet-wheels are preferably carried by those rolls which have the riffl 17 so that the rifled rolls will be positively driven. I do not limit myself to the location or number of the ratchet-wheels, nor to the use of ratchet-wheels as a turning means for the rolls, except where stated in the claims, as

other means can be employed for turning the rolls.

Referring to Figs. 2 and 4, there are mounted on the gudgeons which carry the ratchet-wheels 21, rockers 22 which may be provided with a plurality of holes 23 for their adjustable connection by a belt 24 to an operating bar 25. One operating bar 25 serves to rock all of the rockers 22 for a given set of the rolls 12. In the drawings I have shown three sets of rolls and there are, therefore, three operating bars 25. The operating bars may be reciprocated in any desired manner, as for instance, by pitmen 26 operated by eccentrics or cranks 26^a carried by a shaft 27 mounted in bearings 28 suitably secured at 29 to the side of the frame 1. The rockers 22 carry pawls 30 which engage the ratchet-wheels 21. As the shaft 27 is turned, as by a belt 31, for instance, the bars 25 are relatively slowly reciprocated and the rolls 12 are relatively slowly turned. The pitmen have a loose connection with cranks 26^a to compensate for the throw of the table.

The sides 6 carry longitudinally extending retainers 32 which may consist of pieces of rubber hose on a central core, which prevent the overflow of the pulp which is passing over the rolls 12.

The pulp may be introduced to the highest section of rolls in any preferred manner, as for instance, by a launder consisting of a box or trough 33 extending transversely across the head of the concentrator and provided with a bottom 34 (Fig. 9) and numerous small holes 35 arranged at intervals lengthwise thereof for the delivery thereof to the bottom 34 whence it is distributed through slots or notches 36 onto the rolls (Fig. 3).

Suitable means may be provided for catching the concentrates passed downwardly between the rolls. I prefer to mount upon the frame 1 and between the sides 6 thereof, cement 37 and to provide the upper surface thereof with a plurality of channels or chutes 38 for the wash-water, said chutes being preferably of the same curvature as the rolls and lying just below them, being separated therefrom by a very slight space so that the wash-water flowing down the channels washes off the concentrates from the rolls and so that the lower parts of the rolls may at times be immersed in the wash-water. The channels may be formed by molding cement on the frame 1 and pressing the rolls 12 down into said cement, afterward allowing the cement to set. Splash boards 36^a (Figs. 2 and 11) deflect the flow downwardly at the lower ends of the channels 38.

The wash-water may be obtained from a tank 39 (Fig. 10) supplied by periodic flushings from an automatically rocking trough 40 pivoted at 41 and having two compart-

ments 42 and 43, separated by a partition 44. The water is supplied to the compartments 42 and 43 alternately by pipe 39^a. A down pipe 45 connects tank 39 to an elongated delivery mouth 46 which is positioned (Fig. 2) to discharge into the upper ends of channels 38. The wash-water may pass into pits or wells 47, 48 and 49 and the concentrates be taken off from said pits through suitable closures or doors 50 in the bottom 10, but I do not limit myself to this construction except where stated in the claims. If desired, a separate source of wash-water for the channels of each of the sections could be employed. In the form shown, the wash-water passes from the channels of one section to those of the next section below.

Referring to Figs. 2 and 10, the water from pipe 39^a first fills, for instance, compartment 42, whereupon the trough 40 tilts, precipitatively discharging its contents into the tank 39 and the latter rapidly rushes down pipe 45 and out through delivery mouth 46. The tilting of the trough 40, positions the other compartment 43 where it will receive water from the pipe 39^a and, subsequently, the weight of the water therein tilts the trough 40 in the opposite direction, discharging the contents of the compartment into tank 39. This again positions compartment 42 for re-filling. Thus, a large volume of wash-water is periodically discharged into the upper ends of the channels 38.

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

1. In an ore concentrator, the combination of a plurality of rotatable rolls arranged parallel with their surfaces in relatively close disposition and at such inclination and spacing that they retain a layer of liquid pulp thereover and permit stratification by gravity, said rolls being adapted to pass the concentrates between themselves, means for flowing pulp over the rolls, and means for removing the concentrates from below the rolls.

2. In an ore concentrator, the combination of a plurality of rotatable rolls arranged parallel with their surfaces in relatively close disposition and at such inclination and spacing that they retain a layer of liquid pulp thereover and permit stratification by gravity, said rolls being adapted to pass the concentrates between themselves, means for flowing pulp over the rolls, and means for washing the under surfaces of the rolls to remove the concentrates therefrom.

3. In an ore concentrator, the combination of a plurality of rotatable rolls arranged parallel with their surfaces in relatively close disposition and at such inclination and spacing that they retain a layer of liquid pulp thereover and permit stratification by

gravity, said rolls being adapted to pass the concentrates between themselves, means for flowing pulp over the rolls, and individual wash-water chutes or channels under the respective rolls.

4. In an ore concentrator, the combination of a series of rotatable rolls arranged parallel with the peripheries of successive rolls substantially touching each other said rolls being at such inclination and spacing that they retain a layer of liquid pulp thereover and permit stratification by gravity, means for flowing pulp lengthwise over the rolls, and means for removing the concentrates from the rolls.

5. In an ore concentrator, the combination of a series of rotatable rolls arranged parallel with the peripheries of successive rolls substantially touching each other, said rolls being at such inclination and spacing that they retain a layer of liquid pulp thereover and permit stratification by gravity, certain of said rolls being rifled, means for flowing pulp lengthwise over the rolls, and means for removing the concentrates from below the rolls.

6. An ore concentrator having a plurality of rotatable rolls provided with elastic or yielding surfaces arranged relatively close to each other and adapted to pass the concentrates between themselves, the inclination and spacing of said rolls being such as to retain a layer of liquid pulp thereover and permit stratification by gravity.

7. An ore concentrator having a plurality of rotatable rolls provided with elastic or yielding surfaces arranged relatively close to each other, certain ones of such rolls having a rifled surface bearing against the surface of an adjoining roll, the inclination and spacing of said rolls being such as to retain a layer of liquid pulp thereover and permit stratification by gravity.

8. An ore concentrator having a plurality of rotatable rolls provided with elastic or yielding surfaces, certain ones of said rolls being provided with riffls which contact with an adjoining roll, the inclination and spacing of said rolls being such as to retain a layer of liquid pulp thereover and permit stratification by gravity.

9. An ore concentrator having a plurality of rotatable rolls provided with elastic or yielding surfaces substantially contacting with each other the inclination and spacing of said rolls being such as to retain a layer of liquid pulp thereover and permit stratification by gravity, and means for flowing or flushing wash water against the under surfaces of said rolls to remove the concentrates therefrom.

10. In an ore concentrator, the combination of a plurality of rotatable rolls relatively arranged and adapted to pass the concentrates between themselves, the inclination

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and spacing of said rolls being such as to retain a layer of liquid pulp thereover and permit stratification by gravity and means common to all of said rolls adapted for simultaneously rotating them at substantially the same speed, means for flowing pulp over the rolls, and means for removing the concentrates from the under sides of the rolls.

11. As a new article of manufacture, a

concentrator roll having a yielding rubber surface and provided with a metallic riffle projecting or raised from said surface.

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

JOHN C. SMITH.

Witnesses:

A. M. CHENEY,
JOHN JENSEN.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."