No. 614,574. Patented Nov. 22, 1898.

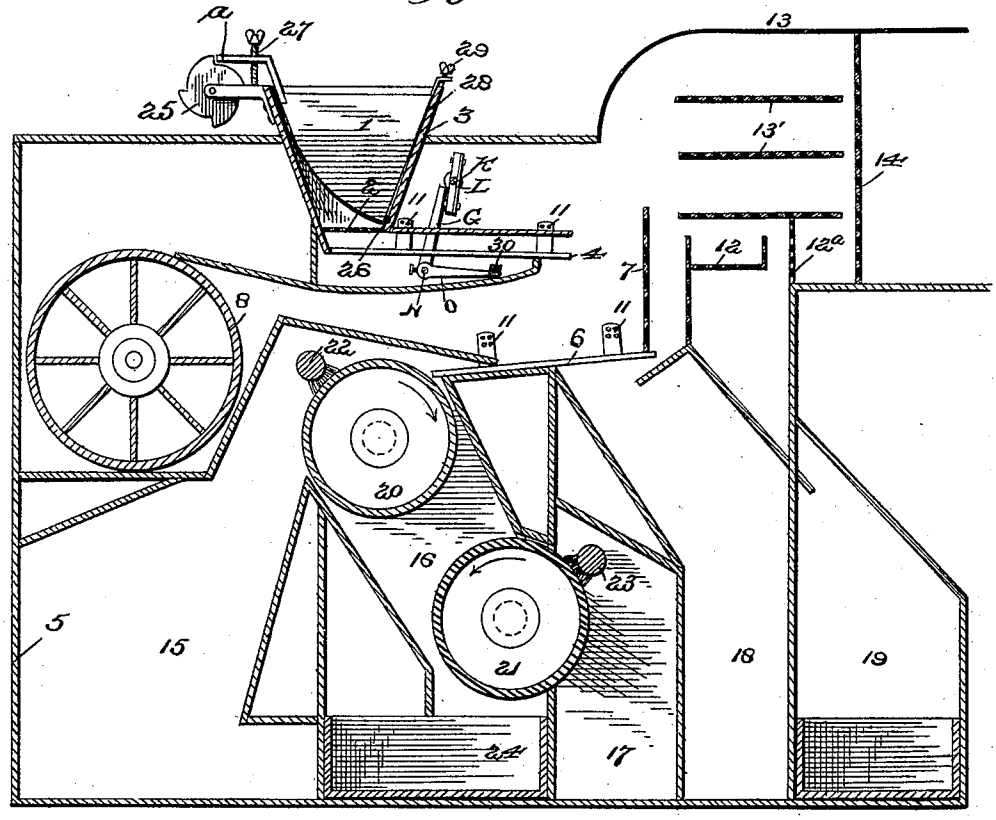
G. H. PATTERSON.

DRY MINERAL SEPARATOR AND CONCENTRATOR.

(Application filed July 30, 1897.)

(No Model.)

Fig. 1.



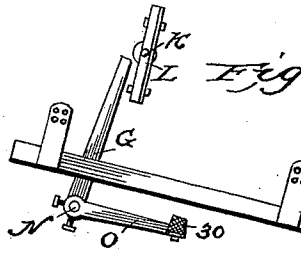


Fig. 3.

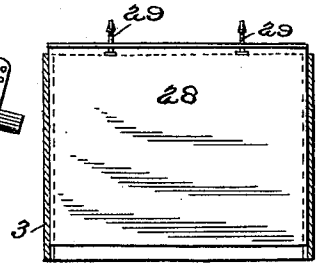


Fig. 2.

Attest
Walter Dwaddell
James M. Shuman.

Inventor
Geo. H. Patterson
by Ellis Spear
Atty.

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

UNITED STATES PATENT OFFICE.

GEORGE HUTTON PATTERSON, OF DENVER, COLORADO.

DRY MINERAL SEPARATOR AND CONCENTRATOR.

SPECIFICATION forming part of Letters Patent No. 614,574, dated November 22, 1898.

Application filed July 30, 1897. Serial No. 646,478. (No model.)

To all whom it may concern:

Be it known that I, GEORGE HUTTON PATTERSON, a citizen of the United States, residing at Denver, in the county of Arapahoe and State of Colorado, have invented certain new and useful Improvements in Dry Mineral Separators and Concentrators, of which the following is a specification, reference being had therein to the accompanying drawings.

My invention relates to improvements in dry mineral separators and concentrators of the class provided with an air-blast for separating the lighter gangue from the mineral values.

The object of my present invention is to provide a machine which will separate not only the lighter gangue, but also the heavier gangue or black iron sand and all magnetic material, and to concentrate the lighter minerals in a separate compartment.

The ore is fed from a suitable hopper to movable trays covered with copper or other metal riffles, which may be treated with dry quicksilver or otherwise, as found desirable, and while dropping from one tray to another it is subjected to an air-blast which removes the lighter particles of gangue. After leaving the lower riffles it falls upon magnetic rolls which separate the black iron sand and magnetic material from the gold, silver, and platinum, the latter falling into a receptacle beneath, while lighter values by proper screens duly arranged are carried into another compartment as a concentrate free of slimes, the slimes being carried off.

In the accompanying drawings, in which is illustrated an embodiment of my invention, Figure 1 is a vertical section taken through the complete machine. Figs. 2 and 3 show details.

5 designates a suitable casing upon which is mounted a stationary hopper 3, having a screen 2 at its lower extremity. Within this hopper is a movable hopper 1, which receives the material and feeds it to the outer stationary hopper, which directs the material to the upper riffle-tray 4. Beneath the riffle-tray 4 is located another riffle-tray 6, and in line with the space between these riffle-trays is a vertical screen 7, stretched across the path of an air-current generated by suitable blast-inducing mechanism 8. The trays 4 and 6 are subjected to a vibratory movement by any suitable mechanism. The trays are suspended and carried by springs 11 11, facilitating the movement of the material falling therein.

To the right and in the path of the air-current are screens 12 12^a. The mesh of these screens 12 12^a may be regulated as desired, each having a different mesh. Above the screens 7 and 12 12^a is formed an air-expansion chamber 13, arranged and fitted with screen landing-trays 13′ of fine meshes, varying in size, as desired, with screens 14 across the outlet of this chamber, all so located as to catch the fine or float mineral held in suspension by the air-current. The air-current is under control, which allows for increase or decrease of the blast, as desired, to treat the material presented to it.

The space within the casing 5 is divided into compartments 15, 16, 17, 18, and 19 by means of suitable partitions.

The magnetic rolls 20 and 21 are located mainly in compartment 16, but project into compartments 15 and 17, respectively. The brushes 22 and 23, which engage the rolls, are so located as to brush the magnetic material into the compartments 15 and 17. The arrangement of the parts is such that the gold and silver, which are non-magnetic, are carried to a drawer 24 placed in the bottom of compartment 16.

In operating the machine the rolls 20 and 21 are rotated in opposite directions, as indicated by the arrows. This may be accomplished by a crossed belt connecting pulleys on their respective shafts or in any other suitable manner. These rolls are charged by a direct current from any convenient electric source or by dynamo attached to each machine. The brushes 22 and 23 are revolved against the rolls and run in the opposite direction to the rolls by any suitable mechanism, as cross-belt and pulleys on their respective shafts. The revolving brushes as arranged are more efficient in cleaning the rolls than any other method.

The hopper 1 is trunnioned within the casing 5 and may be actuated by a cam-wheel 25, which engages a projecting arm *a* on the hopper, and in the movement the lower end of the hopper is thrown against a resilient buf-

fer 26. The hopper rebounds from this shock and this keeps up the movement necessary to feed the material to the screen 2 at the mouth of the hopper. The amount of movement of the hopper is regulated by the screw 27 passing through the arm *a*. The hopper has an open side closed by a movable gate 28, regulated by screw 29, which is raised or lowered, as desired, to regulate the feed or to shut off the material from feeding into the machine, if required. The material passes to the inclined riffle-tray 4, which disintegrates and breaks up any of the ore which may be inclined to cling together in masses, and after passing over this tray 4 the material falls into the path of the current from the air-blast. The mineral, together with the heavy fine gangue, as black iron sand, will fall upon the riffle-tray 6, while the heavier gangue will pass through the screen and fall into compartment 18. The light fine gangue is carried by the air-blast through the screens 7 and 12, thence discharged from the machine.

The material rejected by the fine screen 12 will fall into the compartment 18 as a concentrate, while the material rejected by screen 12^a will fall into compartment 19 as tailings. The mineral and magnetic iron sand which have fallen upon the inclined vibrating riffle-tray 6 pass thence to the upper magnetic roll 20. The black sand and other magnetic material cling to this roll, while the gold and silver or non-magnetic metals fall downward through the compartment 16 into the receptacle 24. The black sand or other magnetic material which escapes the roll 20 will be caught by the roll 21 below, thus effecting a complete separation of all magnetic material from the mineral. The partitions of the compartment 16 are so arranged as to bring the material sufficiently near to the magnetic rolls to enable them to perform their function to the best possible advantage.

Below the riffle-trays 4 and 6 I place bumpers 30, at least two for each tray, only one of which is shown, these being so arranged as to strike the bottom of the trays, and thus prevent material from lodging or sticking thereto and also facilitate the downward movement of the material. These bumpers 30 are actuated by any suitable devices, such as arms O and G on shaft N, the arm G being operated by a cam L on the shaft K. The force of the blow can be controlled and made more or less, as required.

This invention is not only applicable for dry "placer" work, but is even better for free gold, silver, and platinum ores. When the ore is crushed to about seventy mesh, it separates the mineral in a clean clear manner from all the gangue matter and where pyrites are present acts as a concentrator thereof as well.

The air-expansion chamber 13 is most important, as by it the fine gold is secured, which is otherwise carried out by the strong blast. By this chamber the air immediately loses its force by the expansion, so that the fine gold carried up by the force simply settles down the moment the pressure is released and lands upon fine-mesh screens contained in the chamber. At the same time the air escapes without pressure beyond what is necessary to carry out the fine gangue or slimes.

I do not limit myself to any particular application of the invention, as it may be used in many other situations than those enumerated.

Having thus described my invention, what I claim is—

1. In combination, the hopper, the riffle-plates 4 and 6 arranged with a space between the same, an air-blast device discharging in between the riffle-plates, a screen arranged directly across the path of said blast and an enlarged expansion-chamber situated above the direct discharge and a series of screens within said chamber, substantially as described.

2. In combination, the hopper, the riffle-plates 4 and 6 arranged with a space between the same, an air-blast device discharging in between the riffle-plates, a screen arranged directly across the path of said blast and an enlarged expansion-chamber situated above the direct discharge, a series of superimposed screens arranged horizontally in said chamber, and a cross-screen to the rear of said horizontal screens extending from side to side of said chamber, substantially as described.

3. In combination, the riffle-plates, the stationary outer hopper, and feeding mechanism comprising a supplemental hopper extending down into the main hopper and hung therein means for giving the inner hopper a jarring irregular oscillating movement laterally in relation to the main hopper, and a gate for the supplemental hopper carried directly thereby, substantially as described.

4. In a separator, a stationary hopper, a movable hopper within the same, a gate controlling the opening from said movable hopper, a buffer in line with the lower end of the hopper, and means for vibrating the hopper, substantially as described.

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

GEORGE HUTTON PATTERSON.

Witnesses:

P. NORMAN NISSEN,

AUG. SCHNEIDER.