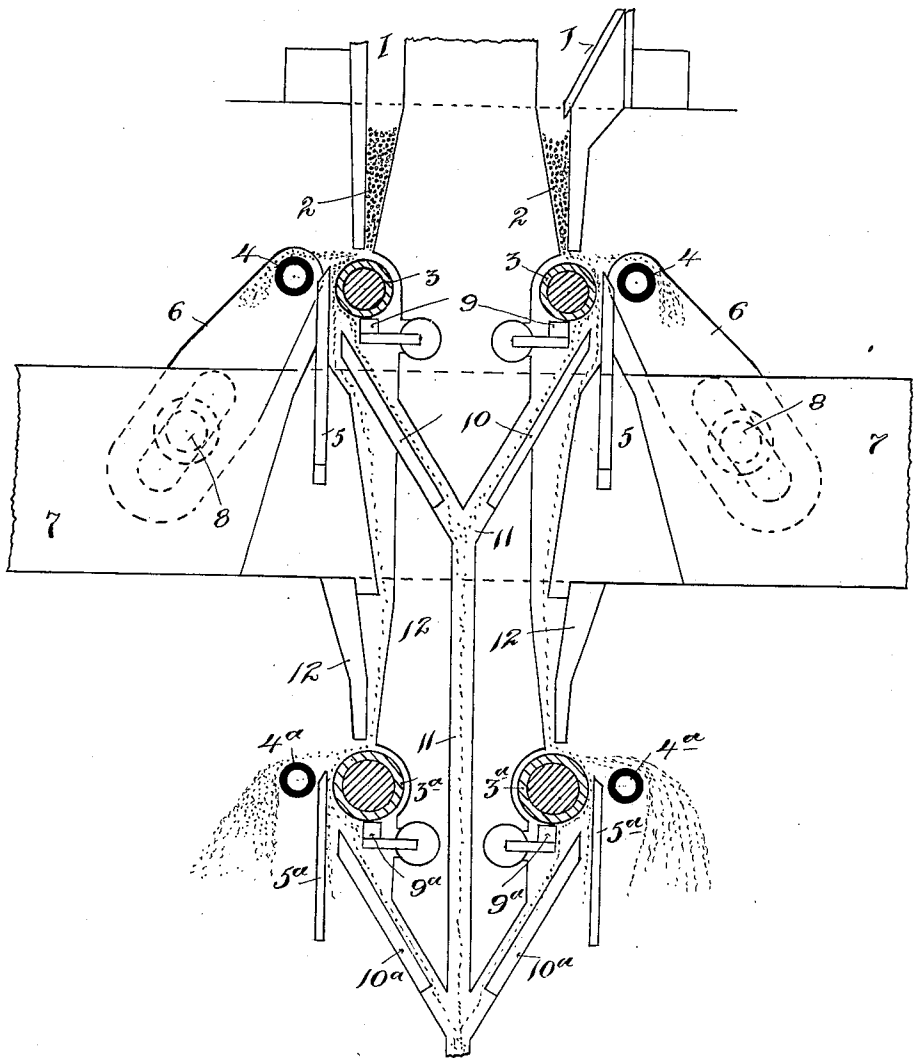
No. 831,916. PATENTED SEPT. 25, 1906.

M. WOODSOME.

ELECTROSTATIC APPARATUS.

APPLICATION FILED AUG. 2, 1904.



WITNESSES:

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ELECTROSTATIC APPARATUS.

No. 831,916. Specification of Letters Patent. Patented Sept. 25, 1906.

Application filed August 2, 1904. Serial No. 219,241.

To all whom it may concern:

Be it known that I, MILLARD WOODSOME, a citizen of the United States, and a resident of Boston, in the county of Suffolk and State of Massachusetts, have invented new and useful Improvements in Electrostatic Apparatus, of which the following is a specification.

My invention relates to "classifiers" or "graders" for ores, metals, and minerals.

It relates particularly to a classifier in which the peculiar properties of static or high-potential electricity are made use of to effect the separation or classification and to the arrangement of the several elements of a machine adapted to practically employ such electricity.

The object of this invention is to provide a device which shall rapidly, accurately, and economically produce a separation and classification of the various substances and values embraced in an ore or mineral or other heterogeneous mixture where the constituents are of differing susceptibility to the repellent effect of an electric charge.

To carry out this invention I have invented the machine whereof a convenient and approved form is set forth and illustrated in the accompanying drawing and specification.

The drawing shows two double machines, each consisting of two similar devices placed one above the other, the two similar pairs of apparatus discharging one of their classified products into a common chute or receptacle.

In the drawing, 1 is a hopper through which the crushed ore 2 is fed in a finely-spread-out stream to an electrode 3, connected to a source of static or high-potential electricity. Close to this highly-charged electrode 3 is placed another oppositely-charged electrode 4. Between the two electrodes there is an adjustable fender or divider 5, made of non-conducting material and serving both as a divider for the materials repelled from the electrodes and as a guide for the descent of the material arrested thereby. To insure a concentrated and strong electric field, the electrode 4 is preferably made smaller than the electrode 3 and can be formed of a wire or rod inclosed in a highly-insulating material, such as glass, micanite, &c. The electrode 4 is supported by an electrode-support 6, adjustably attached to the frame 7, as shown in one manner at 8. The electrode 4 is attached to an electric terminal of opposite polarity to that of electrode 3. This electrode 4 can be dispensed with; but its use increases the efficiency of the apparatus. Resting against the electrode 3, which rotates, is a brush 9 for sweeping off such of the material as remains sticking to the rotating electrode 3. Below the brush and adjacent to the fender or separator 5 is another adjustable separating-partition 10, whose purpose is to direct the adherent residue removed by the brush 9 into its proper receptacle. In the drawing this is shown at 11 as the common discharge-chute of the two double machines. There may be a necessity for a more thorough concentration than is obtained by the ore passing over the electrode 3, and hence below the separators 5 and 10 there is provided a conduit 12 for conveying the portion of the ore falling between the fenders 5 and 10 down to the electrode 3^a, where another concentration takes place and where 3^a, 4^a, 5^a, 10^a, and 9^a perform the same functions as are performed above by 3, 4, 5, 10, and 9.

The operation of the machine is as follows: Assume an ore that it is desired to classify into three graded products. The ore descending the hopper 2 comes in contact with the rotating electrode 3. Its conductive portion becomes charged by contact with the electrode 3 and that part is thrown out over the separator 5, this action being assisted by the electrode 4. This isolates one of the graded products of the classification. A second constituent of the ore is less charged by the electrode or in the short interval perhaps not at all charged and falls down by gravity between the separators 5 and 10 into another receptacle or is passed on, if desired, to the lower electrode 3^a to be further concentrated. This gives the second of the graded products of the classification. The third or residue portion may be composed of a material so fine that it sticks to the electrode 3 and is brushed off by the brush 9

into the receptacle to which separator 10 leads, in the drawing shown as the common tailings-receptacle.

When certain ores are submitted to the action of an electrostatic separator, the fine-mesh portion, more commonly called "slimes," is readily repelled, while in certain other ores they are not repelled to any extent. Taking advantage of this fact, I can so construct and adjust my machine that I can obtain the slimes product as a separate product from the relatively coarser particles of the ore. In certain ores the slimes carry a large percentage of the mineral values of the ores, while in certain other ores they carry a very small percentage of such mineral values. It therefore becomes advantageous to separate or classify this slimes product from the coarser mesh of the ores. In those ores in which the slimes product is repelled from the electrodes the slimes mineral is also repelled, and I obtain as a product the slimes mineral plus a certain percentage of the slimes of the gangue. In this class of ores the slimes product is repelled from the electrode 3, and at this electrode very little of the coarser conductive particles are repelled. These coarser particles are repelled at the electrode 3^a. In the class of ores in which the slimes product is not repelled from the electrode I get as a product a large percentage of the slimes of the gangue and a very small percentage of the slimes of the minerals. Of the coarser mesh of the ores the mineral values or conductors are repelled from the electrode as a high-grade mineral product. In ores where the slimes are repelled from the electrode both the slimes and the coarser mineral particles of the ore from a product that in most cases is applicable to smelting and the slimes and coarser mineral values do not need to be separated, or, if it is desirable, the slimes product that is repelled from the electrode, as 3, can be collected as a separate product. This would be advisable when the repelled mineral product is to be further pulverized, the slimes product being already mineral.

In ores where the slimes are not repelled I have in many cases a product that is applicable to amalgamation or cyaniding at the mine, while of the coarser meshes of this ore, the mineral values having been expelled, the mineral values are available as a smelter product. I have thus by the electrostatic separator classified the ore into a product for treatment at the mine and a product for shipment to the smelter. A specific ore applicable to this classification is an ore containing chlorids of silver, sulfids of copper, and a porphyry gangue. The crushed ore is subjected to the electrostatic separator, and the sulfids of copper with a proportion of the chlorids of silver are repelled from the electrode and is available as a smelter product. The slimes of the porphyry gangue and the coarser mesh of the porphyry gangue are separated into two products containing chlorids of silver, and these two products are applicable to amalgamation at the mine. As another example, take an ore containing chlorids of silver and sulfids of iron, gold, and a quartz gangue. The crushed ore is submitted to the electrostatic separator, and the chlorid of silver in the form of a slimes product is separated by repulsion from the gangue and from the sulfids of iron. The sulfids of iron are separated by expulsion at the next electrode from the quartz gangue and are available as a smelter product. The quarts gangue is a worthless tailings product. The chlorids of silver are applicable to amalgamation at the mine.

The great value of the electrostatic classifying-separator resides in the fact that with it I can separate from such ores as have been mentioned above as examples and from most ores in general the relatively fine mesh commonly called "slimes," of the ores, either as a repelled product or as one of the tailings products. This is something that has not hitherto been done profitably by any mechanical or electric process so far as I am informed.

Having thus fully described my invention, what I claim is—

1. In an electrostatic separator, a pair of opposed electrodes, means to feed material to the surface of one of said electrodes, a fender between the two electrodes, with its upper edge between the vertical tangent to the electrode upon which the material is fed and the opposed electrode, a second fender below the first electrode with its upper edge between the aforesaid vertical tangent, and said electrode.

2. In an electrostatic separator, a repelling-electrode and opposite electrode, means to feed material upon the repelling-electrode, a fender with its upper edge between the vertical tangent to the repelling-electrode and the opposite electrode, a second fender below the repelling-electrode with its upper edge inside of said vertical tangent, and a scraper in contact with the repelling-electrode above said second fender.

3. In an electrostatic separator, the combination of a rotary cylindrical repelling-electrode, an opposed electrode, a fender with its upper edge between the vertical plane tangent to the rotary cylinder and the opposed electrode, a second fender below the rotary electrode and between it and said vertical tangent.

4. In an electrostatic separator, the combination of a rotary cylindrical repelling-electrode, an opposed electrode, a fender with its upper edge between the vertical plane tangent to the rotary cylinder and opposed electrode, a second fender below the rotary

electrode and between it and said vertical tangent, and a scraper in contact with the rotary electrode, the upper edge of said second fender being between said vertical tangent and a vertical plane passing through the line of contact of the scraper with the rotary electrode.

Signed by me at Boston, Massachusetts, this 10th day of June, 1904.

MILLARD WOODSOME.

Witnesses:
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