

H. DALLEMAGNE.
 APPARATUS FOR THE SEPARATION OF ORES.
 APPLICATION FILED MAR. 31, 1911.

1,035,864.

Patented Aug. 20, 1912
 2 SHEETS—SHEET 1.

FIG. 1.

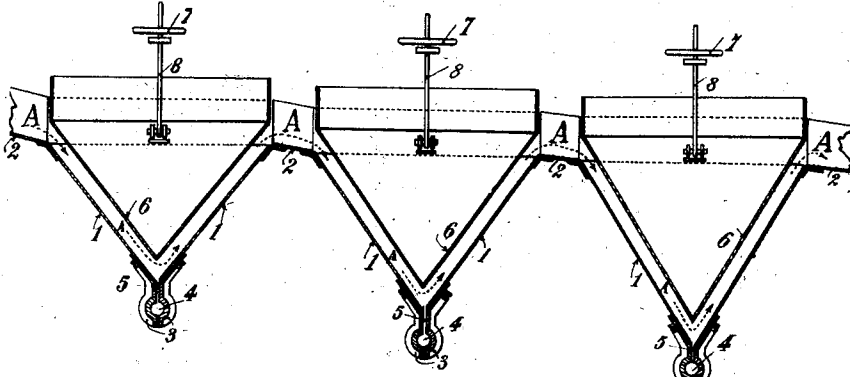


FIG. 2.

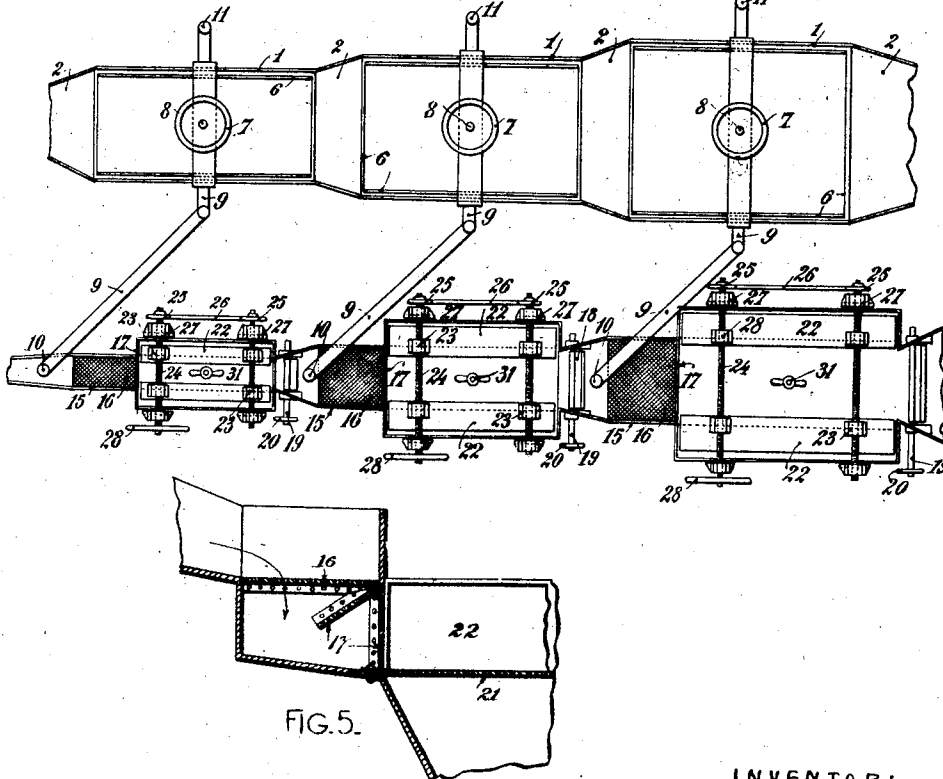


FIG. 5.

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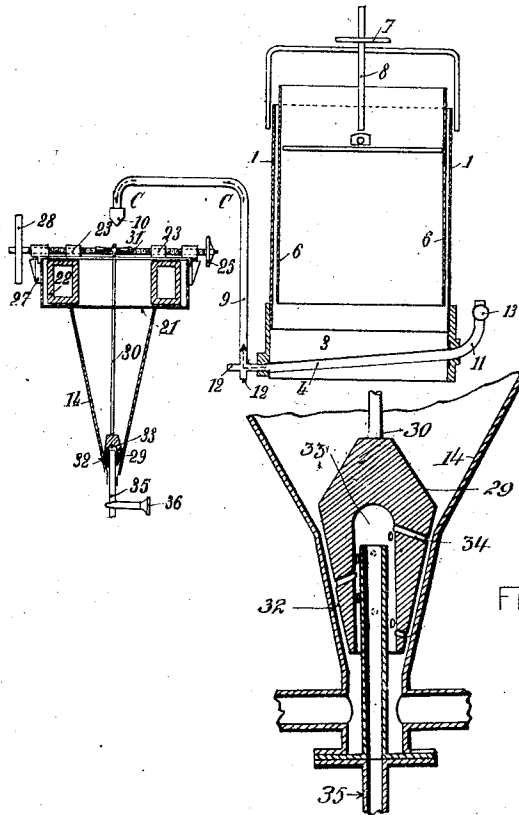
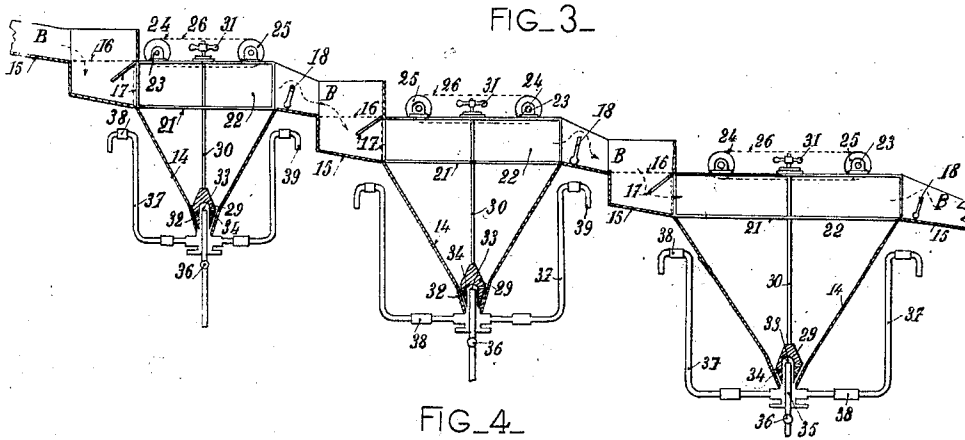
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APPARATUS FOR THE SEPARATION OF ORES.

1,035,864.

Specification of Letters Patent.

Patented Aug. 20, 1912.

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To all whom it may concern:

Be it known that I, HENRY DALLEMAGNE, citizen of France, residing at 78 Quai de Clichy, Clichy la Garenne, Seine, in the Republic of France, have invented new and useful Improvements in Apparatus for the Separation of Ores, of which the following is a specification.

This invention relates to an apparatus for the separation or classification of ores in grains of equivalent sizes, that is to say of the same speed of fall in water, comprising essentially a battery of classifying vessels called primaries, arranged in series one after another, in combination with one or several batteries of vessels called secondaries also in series in each battery, and connected parallel to the primary battery and between themselves in such a way that the substances obtained in one or several primary classifiers are conducted to one or several secondary classifiers to be classified again and so on.

The invention comprises also a special type of classifier specially adapted to be used as a secondary classifier and characterized by a device allowing the regulation of the size of field or classifying surface, by the employment of the perforated plates, and of gratings to suppress the eddies on the classifying surface and by a perforated valve regulating the classification at the outlet of each vessel, the whole of these devices allowing of obtaining apparatus having a classifying power not obtained hitherto.

In the annexed drawing: Figure 1 is a longitudinal section of three elements in series of a battery of primary classifiers of a known type. Fig. 2 shows in plan the arrangement of a battery of said primary classifiers mounted in parallel according to the invention with a battery of secondary classifiers of a special type. Fig. 3 is a vertical section of said secondary classifiers. Fig. 4 is a cross section of the two batteries in parallel shown in Fig. 2. Figs. 5 and 6 are detail views on a larger scale.

The classifying elements used as "primaries" and shown in section in Fig. 1 are of a type generally known. They each comprise a receptacle in the shape of a triangular prism 1. The different receptacles of a battery the dimensions of which increase in accordance with a varying rule in the same direction as the liquid current which trav-

erses them, are connected with one another by two inclined channels 2. Each receptacle comprises at its lower part, two plates 3 having between them a very narrow longitudinal opening 5 which terminates in an outlet channel 4, by which the heavy matters deposited are conducted to a siphon 9 provided at its extremity with a regulatable extension 10. Stoppers 12 (Fig. 4) allow cleaning of the channel 4 and the siphons 9.

Members 6 in form of triangular prisms are placed at the interior of the receptacles 1. They are suspended by threaded rods 8 carrying hand wheels 7 by means of which the members 6 can be lowered more or less into the receptacles 1. A tube 11 allows the introduction in each receptacle, of a current of water having a high pressure regulatable by a cock 13. This water current is for the purpose of cleaning, if necessary, the channel 4 and the slit 5 after an obstruction or any other mishap. The crushed ore carried along by a current of liquid follows the course indicated by the arrows A. Lowering of the prisms 6 in the receptacles 1 has the effect of diminishing the size of the passage for the minerals, and consequently causes an acceleration of the speed of current which then only allows, the substances of large size or of high "equivalent" to deposit and pass out by the slits 5, the channels 4 the siphons 9 and the orifices 10. Lifting of the prisms produces on the contrary an increase in the section of the passage causing a slackening of the liquid current and the deposit and outflow through the orifices 10 of the finer substances. This accordingly allows of obtaining through these orifices substances of size inversely proportional to that of the section of the passage.

The increase of the sizes of the receptacles 1 in proportion with the advance of the liquid current causes a proportional retardation of the latter and the deposit of more or less fine substances in the successive receptacles of the battery.

As above mentioned the invention consists, on the one hand, in connecting to a battery of elements called primary of the type described, or of any other type, one or several batteries called secondaries, the characteristic feature of the system lying in the fact that the secondary classifiers, which are connected together in series in

any manner, are connected in parallel to the primary classifiers so that the substances deposited in one or several primary classifiers are conducted to one or several secondary classifiers to be submitted there to further classification, etc.

The different classifiers may be connected together in different ways. Each primary classifier could for example feed one or more secondary receptacles in series, by its siphon 9, or a secondary receptacle could be fed by several primary receptacles. The first series of secondary classifiers could besides be connected in parallel to a second series, then the latter to a third etc. The secondary classifiers could have any suitable arrangement. They may in their most simple form be arranged similarly to the classifiers used as primary and described above with the difference that an ascendant injection of clean water is effected in a known manner through the narrow opening 5 of said classifiers in such a way as to assist the separation. This connection in parallel has the advantage of producing better classification and enabling the injection of clean water in the classifier used as primary to be dispensed with, whereby a much smaller consumption of water is necessary than with the classifiers hitherto used. The ore conducted to the secondary classifiers has in effect already been subjected to a first separation in the primary classifiers and it is in suspension in a volume of water considerably less than that which flows in these primary classifiers. The amount of clean water to be injected in said secondary classifiers to complete the classification is also reduced by a considerable amount. Preferably secondary classifiers are employed as represented in the annexed drawing and which are formed by inverted quadrangular pyramids 14 the dimensions of which increase in the direction of flow of the liquid current which traverses them for the same reasons as in the case of the primary classifiers. The receptacles 14 are in connection with one another by channels 15 provided with perforated plates or gratings 16, 17 which are for the purpose of mitigating the eddies.

The base of each of the pyramids is formed by a perforated plate or grating 21 on which can be transversely displaced two blocks 22 actuated by screws 24 with opposite threads which are carried by bearers 27 and draw nuts 23 fixed on the blocks. The movement is given to the whole by wheels 28 and the two screws are connected by the pinions 25 and the chain 26. This arrangement allows of separating or bringing together the two blocks of each receptacle and of diminishing or increasing the speed which is to be given to the liquid current which passes between them. Sluice boards 18 mounted on axles 19

and actuated by means of hand wheels 20 allow of increasing or lowering the level of the liquid above the plates 21. The point of each pyramid is formed by a conical part blocked by a plug or valve 29 suspended on a threaded rod 30. A hand wheel 31 allows of raising or lowering each valve 29 and of thus varying the size of the section of the passage 32. Each valve is hollow as shown at 33 and is perforated at 34 in the direction of a helix to allow the outlet of liquid which arrives under pressure through the tube 35 and of which the flow is regulated by the cock 36. The substances passing with the liquid current across the perforated plates 16 and 17 are classified on the plates 21. The fine particles of low equivalent sustained by the ascending current introduced by the pipe 35 do not pass through these plates and are carried to the following receptacle with a regulatable speed inversely proportional to the distance which separates the blocks 22. The substances having passed through the plate 21 fall toward the point of the pyramid traversing the section 32 where they are submitted to a fresh classification and are finally evacuated by the siphons 37 provided with regulatable orifices 39 and with movable joints 38 which allow of maintaining these orifices at the desired height. As can be understood this type of secondary classifier has in itself important advantages due notably to its arrangement for the regulation of the size of the classifying surface, allowing of accelerating or of retarding the speed of the current; to the perforated valve effecting a classification at the outlet; to the employment of perforated plates, gratings and sluice boards which regulate the current and suppress eddies on the classification surface, and to the employment of outlet siphons of variable height, allowing of regulating the speed of flow of the classified substances as desired.

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

1. In combination a primary battery of settling classifiers connected in series by overflows, and one or more secondary batteries comprising hydraulic classifiers, the units of each secondary battery being connected in series by overflows, means connecting each unit of a secondary battery to a corresponding unit of the preceding battery and adapted to deliver the settled products of each unit of one battery to the corresponding unit of the secondary battery.

2. In an apparatus for classifying ores, means forming a classifying surface, means for causing a liquid stream containing the ores to be classified to pass over said classifying surface, means for directing a liquid stream upwardly through the classifying surface and means for regulating the width

of said classifying surface, comprising two side blocks together with means for drawing said side blocks nearer to each other or spreading them apart.

5 3. In an apparatus for classifying ores, the combination of a receptacle flaring upward, and having a conical outlet at the bottom, an upwardly extending tube in said outlet, means for forcing water through said tube, a hollow valve into which the tube extends, the lower part of said valve having a conical shape similar to that of the outlet and being provided with holes arranged along a helix, and means for raising and
10 lowering the valve, substantially as described and for the purpose set forth.

15 4. In an ore classifier, the combination of a classifying receptacle provided with channels on the inlet and outlet sides thereof, a

perforated plate in the receptacle on a level 20 with the bottom of said channels, at the point of connection with the receptacle, perforated plates arranged in the channels and through which the liquid current is adapted to pass, said perforated plates having the purpose of mitigating eddies, and pivoted sluice boards in the channels on the outlet side of the receptacle for regulating the level of the liquid above the first-named perforated plate. 25

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses. 30

HENRY DALLEMAGNE.

Witnesses:

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