Jan. 18, 1938.

P. S. HOYT

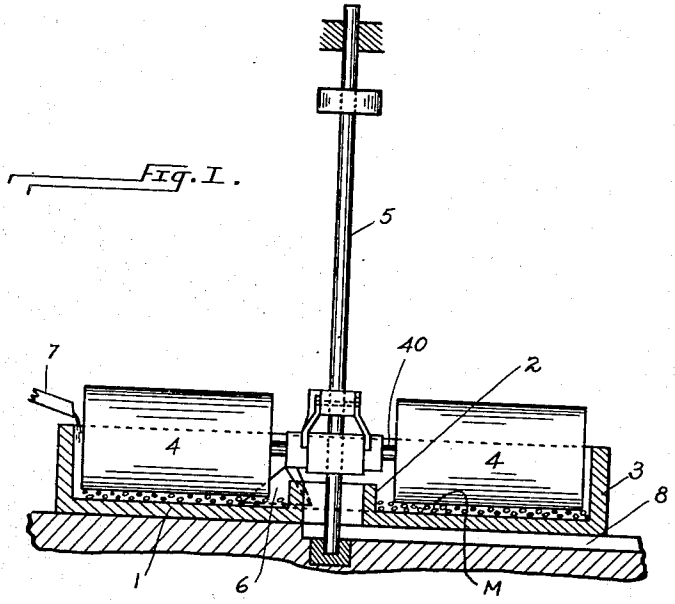
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TREATMENT OF CYANITE ORE

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Fig. I.



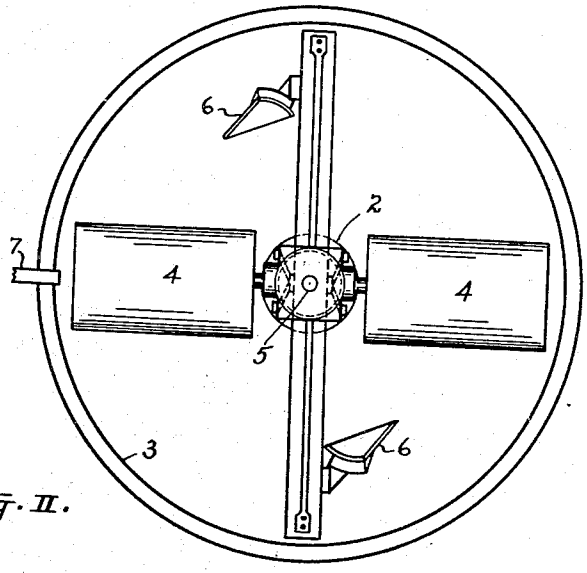


Fig. II.

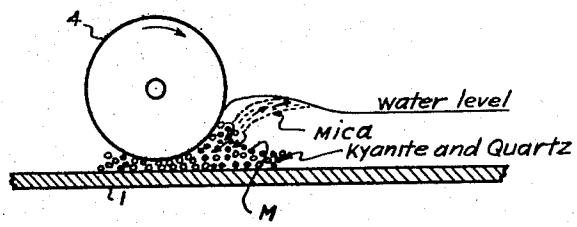
INVENTOR
Philip S. Hoyt
BY Christy & Wharton
his ATTORNEYS

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Fig. III.



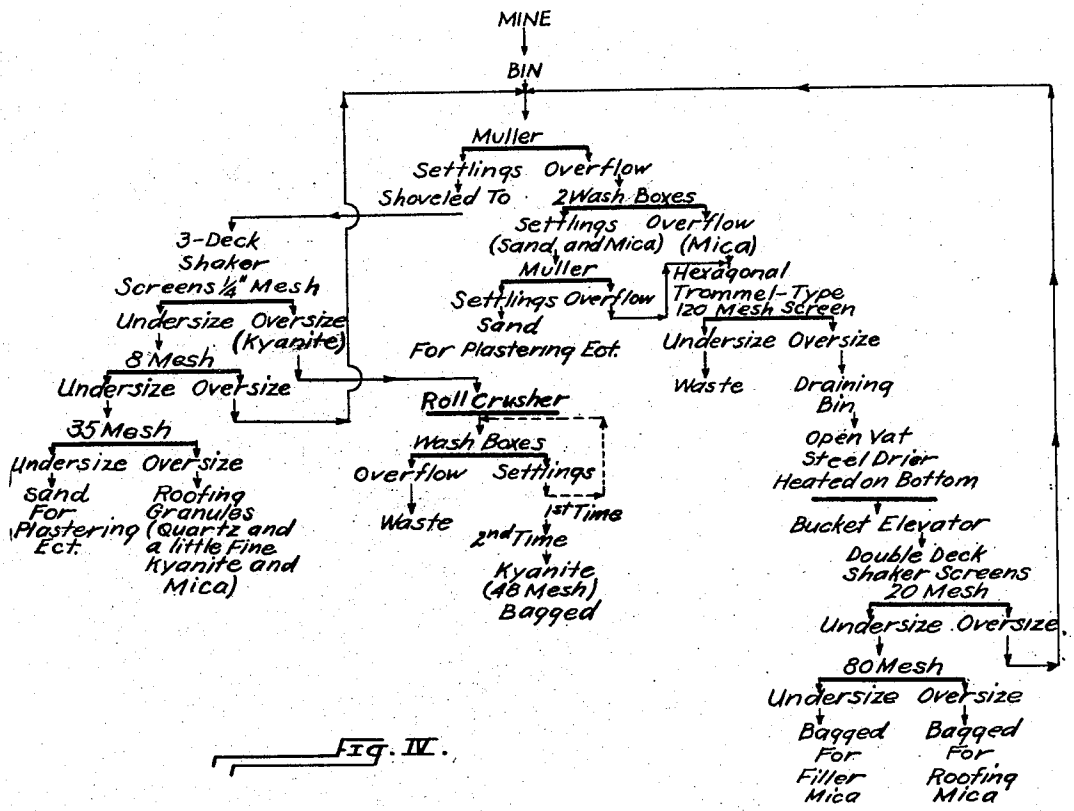


Fig. IV.

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UNITED STATES PATENT OFFICE

2,105,597

TREATMENT OF CYANITE ORE

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Application January 26, 1937, Serial No. 122,393

2 Claims. (Cl. 209—6)

This invention relates to the treatment of cyanite ore, and, specifically, to the recovery in marketable and useful condition of the constituent substances of cyanite ore. The invention consists in a method of treatment that is both inexpensive and adequate.

In the accompanying drawings Fig. I is a view, partly in vertical and axial section, partly in side elevation, of a mill employed in the performance of the invention; Fig. II is a view of the same apparatus in plan from above; Fig. III is a diagrammatic illustration of the mill in operation; and Fig. IV is a flow-sheet of operation.

Cyanite ore of Georgia is a cyanite-mica schist. In it cyanite crystals are present, ranging in size from about one fourth of an inch to an inch and a half in length; and these crystals are aggregated with and formed into a rigid conglomerate with particles of quartz and of mica. I have discovered that, by crushing under limited pressure, it is possible, without appreciable fragmentation of the relatively hard crystals of cyanite, to free them from the quartz and the mica, and I have found that by crushing the material while it is swept by a stream of water the released particles of mica may be borne away on the stream, while the cyanite crystals and the particles of quartz gravitate to the bottom of the container in which the stream flows. Thereafter, the relatively large cyanite crystals may by screening be separated from the relatively small quartz particles.

Referring to the drawings, a pan 1 of annular form is provided, whose inner wall 2 is of less height than its outer wall 3. This pan is advantageously formed of, or at least floored with, wood. In the pan a pair of mullers 4, also formed of wood and of empirically determined optimum weight, are mounted to roll in response to the rotation of a centrally arranged and vertically standing shaft 5. The axles 40 upon which the mullers turn are connected to the shaft 5 in a hinged union that permits vertical swing of the mullers, but permits them to bear with their inherent weight upon material spread on the floor of the pan. Plows 6, borne also by the shaft 5, and arranged to rearward of the mullers, throw the material under treatment into fresh heap formation, after it has been crushed to a bed beneath the muller. A pipe 7 is provided, discharging over the outer wall 3 of the pan, and at the outer margin of the pan provides a stream of water that fills the pan, and overflows over the brim of the wall 2, and into the well, whence there is discharge, as indicated at 8.

In the mill actually constructed and operated with success, the pan is of wood. It is ten feet in diameter; its inner wall 2 is eight inches high. The mullers, formed of solid hard wood, are each thirty inches in diameter, and forty-eight inches long. The mullers rest upon the charge M of material under treatment. The weight of each of the two wooden mullers 4 is 1100 pounds, this weight being calculated as an operating weight and including the water absorbed in the wooden muller. The speed of rotation of shaft 5 is 16 R. P. M. The actual rate of water flow is 50 gallons a minute or more.

In describing operation, reference is made to Fig. III. The pan being filled with water, and the in-flow and the over-flow being maintained, the shaft 5 is set in rotation, and a charge of coarsely broken cyanite ore is shovelled in. A typical charge amounts in all to six tons. This quantity is fed in slowly in the course of three hours. The run for a single charge requires about five hours in all. The shaft continues to turn at moderate speed, and the flow of water also is moderate. The advancing mullers roll upon the charged ore, crushing and fragmenting it. Behind each advancing muller the following plow enters the bed of material leveled beneath the muller, and throws it into fresh heap formation, before it is again borne upon by the next advancing muller. In this operation the effect already indicated is gained: The relatively hard and relatively large crystals of cyanite are by the crushing action freed of the adhering mica and quartz. From them the particles of mica and quartz fall away. The particles of quartz, freed by the crushing operation, gravitate with the cyanite crystals, and rest upon the floor of the pan, but the particles of mica, being foliate in form, and having large surface area relative to mass, are borne upon the surge of water in advance of the muller, and are swept by the concentric flow over the brim of the wall 2 into the central well, and are carried away on the stream as it flows through the passageway 8. Indeed, the operation is such that the attrition tends rather to give polish to these foliate particles of mica, so that the mica recovered in the operation is of superior quality.

When in such manner the mica has been freed and washed away, and the out-flow of mica flakes has substantially ceased (a condition that is brought about in the course of about five hours), mill operation is arrested. The residue lying on the floor of the pan is shovelled out and screened. In the screening the relatively small particles of

quartz pass through the screens, and the cyanite crystals, substantially unfragmented and in substantially clean condition, remain on the screen.

The speed of rotation of the operating shaft 5, and, consequently, the speed of advance of the mullers 4, should be moderate. Increase of speed tends to effect a grinding of the quartz to small particle size. The volume and rate of flow of water may vary widely. There is a minimum necessary to effect the carrying away of the mica particles. This minimum rate of flow may be empirically determined. Beyond that the rate may increase indefinitely and with unchanged effect, so far as concerns the actual carrying away of the mica particles.

I claim as my invention:

1. The method herein described of treating cyanite-mica schist which consists in crushing a mass of schist while inundated by a flowing stream of water, whereby the mica is separated and removed, and screening the residue, whereby the separated quartz is removed.

2. The method herein described of treating cyanite-mica schist which consists in crushing to limited pressure a mass of schist and thereby breaking away from the unbroken cyanite crystals the adhering particles of quartz and of mica, while the mass is inundated by a flowing stream of water, whereby the mica is borne away upon the stream while the cyanite crystals and the quartz particles gravitate to the bottom of the stream, and then screening the material that has so gravitated to the bottom of the stream, whereby the quartz is separated from the crystals of cyanite.

PHILIP S. HOYT.