

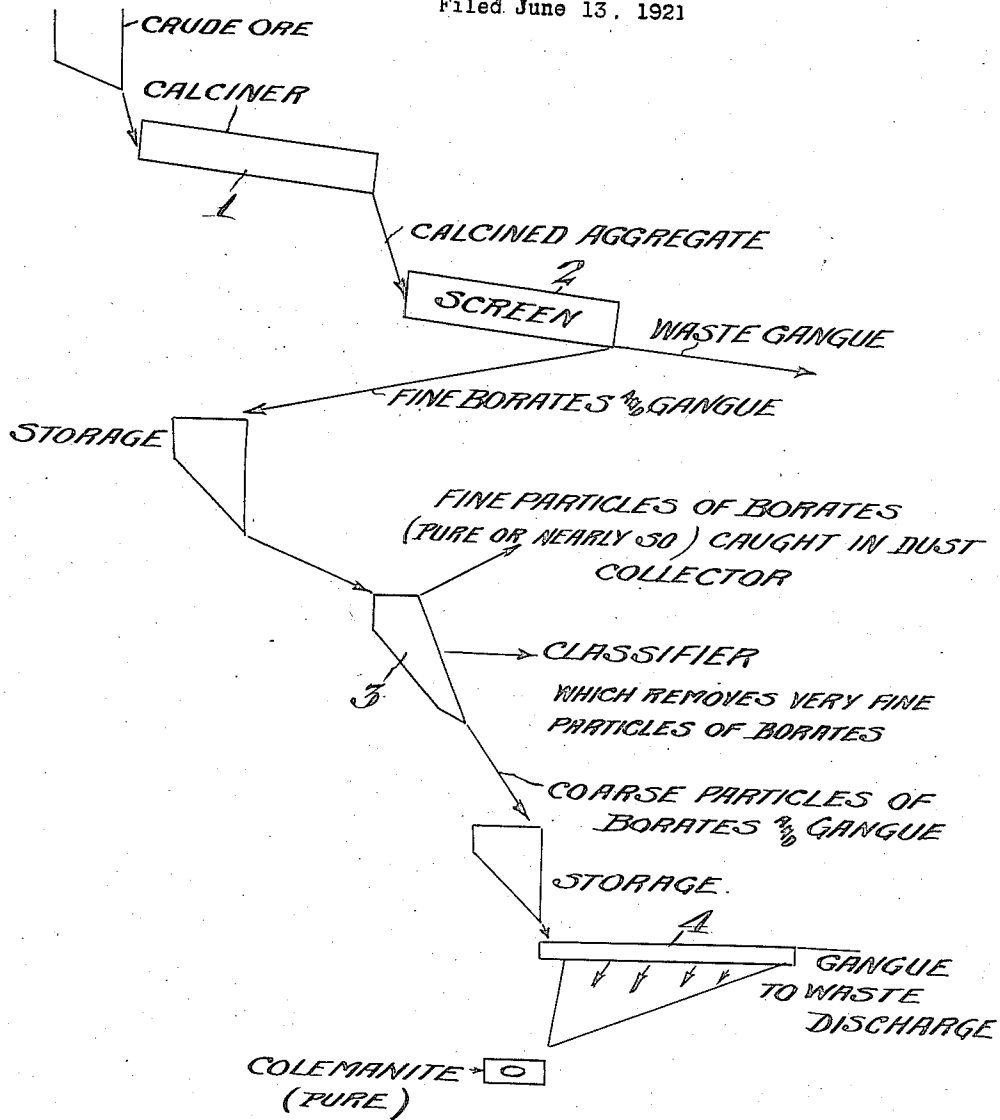
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PROCESS FOR SEPARATING COLEMANITE FROM ITS GANGUE

Filed June 13, 1921



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# UNITED STATES PATENT OFFICE.

CLARENCE M. RASOR, OF LOS ANGELES, CALIFORNIA, ASSSIGNOR TO PACIFIC COAST BORAX COMPANY, A CORPORATION OF NEVADA.

## PROCESS FOR SEPARATING COLEMANITE FROM ITS GANGUE.

Application filed June 13, 1921. Serial No. 477,259.

*To all whom it may concern:*

Be it known that I, CLARENCE M. RASOR, a citizen of the United States, residing at Los Angeles, in the county of Los Angeles and State of California, have invented a new and useful Process for Separating Colemanite from its Gangue, of which the following is a specification.

My invention relates to the art of recovering borates from borate bearing ore, and particularly to the art of recovering, in pure or nearly pure form, the borate contained in colemanite ore in combination with gangue.

The principal object of my invention is to provide a cheap and efficient process for separating colemanite from its gangue, the separation being more nearly perfect than separation by any method heretofore or at present used. This I accomplish in the apparatus illustrated in the accompanying drawing, which is very diagrammatic, in which 1 is a calciner, 2 is a screen, 3 is a classifier and 4 is a dry concentrator.

The calcination of the ores may be accomplished in any form of oven or furnace commonly employed to calcine or roast ores of any kind. The calcination of the colemanite ores has, in my process, two distinct objects—first, the creation of a difference in specific gravity of the borate and its gangue, and second, to create a decrepitation or breaking up into fine particles, of the borate content, the gangue not being materially reduced in size by the calcination.

After calcination as above, the calcined mass is passed over screens. The finely decrepitated borate and finely divided gangue passing through the screen for further treatment, and the larger particles of gangue being discarded as waste.

The screen may be of either the shaker, rotating, impact or other type, the separation as to screening being based solely on size.

(At this point in the process the ore being treated, excepting the coarse gangue discarded by screens, is in the form of an aggregate, containing particles of borate and particles of shale or gangue.)

The mixture of ore and waste is then taken to a pneumatic classifier—which may consist of any device, by which the finer particles of borate, ranging in size from 120 mesh to 200 mesh and finer, are lifted or floated off by means of drafts of air, pass-

ing upwardly, through the mass, the air floated particles being recovered by means of a dust-collector. This dust is a high grade borate.

(The residue, after "floating off" or removing the fines, now consists of particles of borate and particles of gangue.)

The residue from the classifier is then passed to any form of dry concentrator, such as a pneumatic table or a jig using air as a floating medium, by means of which, owing to the low specific gravity of the borate as compared with the gangue, the borate is readily separated from the gangue, and the operation is complete.

By the process herein sought to be patented, it is possible to remove from certain ores with which I am familiar from the aggregate which passes through the screens, 400 lbs. of gangue from every ton of material as at present and heretofore reclaimed.

Calcining of colemanite ore has two separate and distinct effects:—

1. Breaking up, into finely divided particles, the borate content.

2. Creating a marked difference in specific gravity, between the borate particles and the accompanying gangue.

"Colemanite" is the principal borate ore. When pure, it is a glassy crystal, composed of anhydrous boric acid, lime and water, in a given chemical ratio.

In calcining colemanite, the water of crystallization is driven off, in the form of steam or vapor. The freeing of the water causes the decrepitation.

After the colemanite is calcined, it has the same volume—but the particles are very porous, and therefore much lighter than in the natural state.

As calcination disturbs this ratio, the mineral is no longer "colemanite" in a technical sense. It may be called "calcined colemanite" or "borate."

The term "borate" applies to all forms of ores valuable for their boric acid content.

Dehydrated, or calcined colemanite is somewhat soluble in water. Thus, hot water will absorb 2% of its weight by boric acid, when brought in contact with dehydrated colemanite. Therefore, to avoid losses of the boric acid, wet concentration should be avoided.

Colemanite is rarely found pure, in large quantities. The usual occurrence is, crystals

of colemanite embedded in a shale gangue. The problem, to contend with, is the separation of the colemanite from the gangue.

Pure colemanite contains about 51% boric acid.

Pure dehydrated colemanite contains about 64% boric acid.

We attempt, by this process, to recover pure dehydrated colemanite.

For the purposes of this process, calcination is an essential to produce the difference in gravity between the borate and its gangue.

I claim as my invention:

1. A process of separating colemanite from its gangue which comprises: first, calcining a mixture of colemanite and its gangue, thus decrepitating and disintegrating the colemanite to form fine particles; second, screening the mixture, to separate the coarse particles of gangue from the fine particles of dehydrated colemanite and gangue; and, third, separating the fine particles of dehydrated colemanite from the gangue, by means of air flotation.

2. A process of separating borate ore from its gangue which comprises: first, calcining said ore to produce a difference in specific gravity between the ore and its gangue; second, sizing and classifying said ore; and, third, separating the lighter borates from their gangue by air flotation.

3. A process of separating colemanite from its gangue which comprises: first, calcining a mixture of colemanite and its gangue, thus decrepitating and disintegrating the colemanite to form fine particles; second, screening the mixture, to separate

the coarse particles of gangue from the fine particles of dehydrated colemanite and gangue, third, separating the fine particles of dehydrated colemanite from the gangue, by means of air flotation; and, fourth, causing a separation of the coarser particles of borate from the gangue in accordance with their relative specific gravities.

4. A process of separating colemanite from its gangue, which comprises: first, calcining a mixture of colemanite and its gangue, thus decrepitating the colemanite to form fine particles; second, screening the mixture to separate the coarse particles of gangue from the fine particles of dehydrated colemanite and gangue; and, third, floating off the fine particles of dehydrated colemanite from the gangue by blowing air upwardly therethrough, the fine particles of dehydrated colemanite being carried in the stream of air so produced.

5. A process of separating colemanite from its gangue, which comprises: first, calcining a mixture of colemanite and its gangue, thus decrepitating the colemanite to form fine particles; second, screening the mixture to separate the coarse particles of gangue from the fine particles of dehydrated colemanite and gangue; and, third, floating off the fine particles of dehydrated colemanite from the gangue by blowing air upwardly therethrough, the fine particles of dehydrated colemanite being thereafter caught and saved by a suitable dust collector.

In testimony whereof, I have hereunto set my hand at Los Angeles, California, this 2nd day of June, 1921.

CLARENCE M. RASOR.