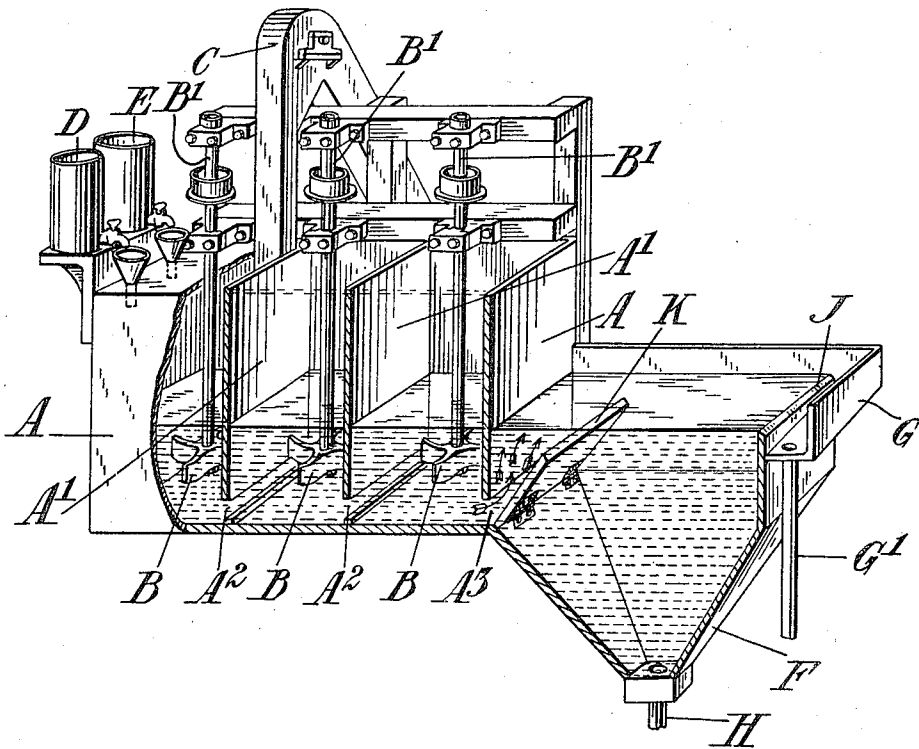


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by

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their attorney.

UNITED STATES PATENT OFFICE.

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ORE CONCENTRATION.

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Specification of Letters Patent.

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To all whom it may concern:

Be it known that we, HENRY HOWARD GREENWAY and HENRY LAVERS, subjects of the King of Great Britain and Ireland, and
5 residing, respectively, at Melbourne Mansions, No. 91 Collins street, Melbourne, State of Victoria, Commonwealth of Australia, and No. 2 Whittaker street, Broken Hill, State of New South Wales, Commonwealth
10 of Australia, at present of No. 27 Grenfell street, Adelaide, State of South Australia, Commonwealth of Australia, have invented new and useful Improvements in Ore Concentration, of which the following is a
15 specification.

This invention relates to improvements in ore concentration and has for its object the separation of certain constituents of an ore, such as metallic sulfids from other constituents such as gangue when the ore is
20 suspended in a liquid such as water.

According to this invention the crushed ore is introduced into water to which is added a very small quantity of an essential
25 oil, and the mixture is thoroughly agitated. The ore particles are thus or thereafter caused to come into contact with a gas such as air: the result is that metallic sulfid particles float to the surface in the form of a
30 froth or scum and can thereafter be separated by any well known means. Among the essential oils, which we have found suitable for this purpose are the essential oils of eucalyptus, cinnamon, thyme, sassafras,
35 pennyroyal, peppermint, cloves, lavender, sandalwood, wintergreen and rosemary, or mixtures of these, but we do not confine ourselves to these essential oils.

We have hereinafter, in the broader
40 claims, designated a suitable essential oil for this process as a froth producing essential oil.

The following is an example of one
45 method of carrying this invention into effect:—

Water containing a small percentage of sulfuric acid in solution, say from 0.1% to 0.5%, and containing also a small quantity
50 say 0.4 lbs. to 2.25 lbs. per ton of ore to be treated of an essential oil such as eucalyptus oil is with finely pulverized ore introduced into an agitating apparatus in the proportion of from three to five parts by weight of water to one part by weight of ore. The

agitation is carried out in such a way as 55 thoroughly to disseminate air through the mixture which is thereafter discharged into a spitzkasten. It is found that a froth floats on the surface of the water in the spitzkasten. This froth contains a large propor- 60 tion of the metallic sulfids but is substantially free from gangue. Any well known means may be employed for collecting the froth.

If desired the resulting tailings can be 65 retreated by the same process with or without the addition of fresh quantities of the substances referred to.

The action may be in some instances be improved by heating the mixture and in 70 some instances, as in the concentration of copper pyrites, the operation may be conducted without the addition of acid.

To graphically illustrate one way of practicing the present invention, there has been 75 shown in the accompanying drawings a perspective view of one form of apparatus, parts being broken away to disclose the interior construction.

Several agitation vessels A are placed in 80 series. These may conveniently be large vats separated by partitions A¹ having openings A² at the bottom so that the liquid may pass from one to another. Each vessel is provided with a rotatable stirrer B which is 85 conveniently of the form shown in the drawing. Each stirrer is carried on a spindle B¹ rotated at a high speed by any convenient means. Crushed ore or similar finely divided mineral is fed into the first vessel A 90 through any convenient ore-feeding device such as C, and water is also fed into the vessel A. A small proportion of one or more essential oils which enable metallic sulfids to be floated by air under the con- 95 ditions specified may be introduced from the feeding vessels D and E. The liquid containing ore in suspension is vigorously agitated in the agitation vessels and escapes at the outlet A³ highly charged with air. 100

A settling apparatus consisting of one or more spitzkasten F, is placed immediately at the outlet from the agitation apparatus. As shown in the drawing, the spitzkasten F has a launder G to receive the floating froth 105 which passes away through the outlet G¹. The liquid and the sunken material pass out through the outlet H at the bottom of the

spitzkasten. The level of the liquid in the spitzkasten is slightly above the lip J. Within the spitzkasten is placed an inclined baffle or guide plate K, which may be made adjustable, extending upward from below the inlet A³ and arranged to direct the stream of ore particles and air-bubbles toward the surface of the liquid in the spitzkasten.

10 We claim:

1. The herein described process of concentrating ores, which consists in mixing finely divided ore with water containing a froth-producing essential oil, agitating the mixture to form a froth, and separating the froth.

2. The herein described process of concentrating ores, which consists in mixing finely divided ore with water containing a small quantity of a froth-producing essential oil, agitating the mixture to form a froth, and separating the froth.

3. The herein described process of concentrating ores which consists in mixing finely divided ores with water containing a froth-producing essential oil, heating the mixture, agitating the heated mixture to form a froth, and separating the froth.

4. The herein described process of concentrating ores, which consists in mixing finely divided ores with water containing eucalyptus oil, agitating the mixture to form a froth, and separating the froth.

5. The herein described process of concentrating ores, which consists in mixing finely divided ores with water containing a small

quantity of eucalyptus oil, agitating the mixture to form a froth, and separating the froth.

6. The herein described process of concentrating ores, which consists in mixing finely divided ore with water containing eucalyptus oil, heating the mixture, agitating the heated mixture to form a froth, and separating the froth.

7. The herein-described process of concentrating ores, which consists in mixing the ore in a finely divided condition with water and a froth-producing essential oil, the latter in the proportion of less than one-fifth of one per centum of the ore, agitating the mixture to form a froth and separating the froth.

8. The herein-described process of concentrating ores, which consists in mixing the ore in a finely divided condition with water and eucalyptus oil, the latter in the proportion of from .02% to .1% of the ore, agitating the mixture to form a froth and separating the froth.

In testimony whereof we have signed our names to this specification in the presence of two subscribing witnesses.

HENRY HOWARD GREENWAY.

Witnesses:

CHARLES NICHOLAS COLLISON,
W. H. CUBLEY.

HENRY LAVERS.

Witnesses:

THOS. ROUNSWELL,
EDW. POVEY.