

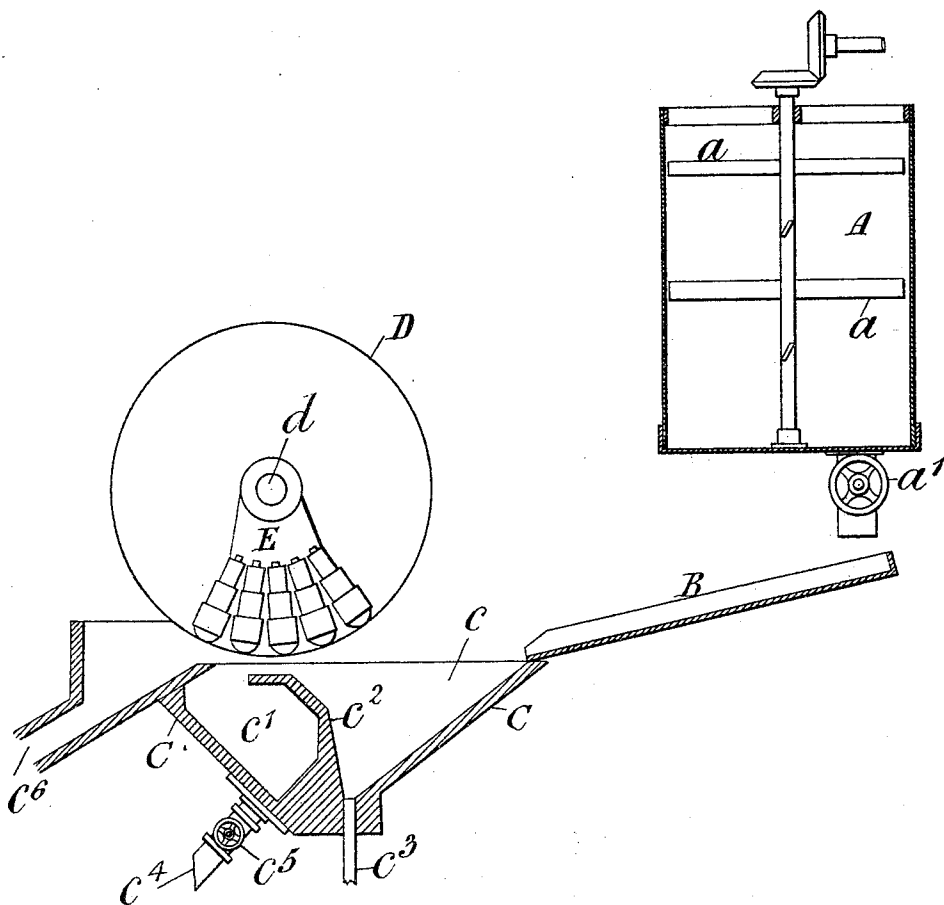
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PROCESS OF TREATING ORES.

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933,717.

Patented Sept. 7, 1909.



Witnesses.

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# UNITED STATES PATENT OFFICE.

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## PROCESS OF TREATING ORES.

933,717.

Specification of Letters Patent.

Patented Sept. 7, 1909.

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*To all whom it may concern:*

Be it known that we, ALFRED ARTHUR LOCKWOOD, chemist, and MARCUS REGINALD ANTHONY SAMUEL, merchant, subjects of the King of Great Britain, both residing at 12 Minories, in the city of London, England, have invented new and useful Processes of Treating Ores, of which the following is a specification.

The accompanying drawing is a diagram, with most of the parts in section, of an apparatus which may be employed in the practice of our invention.

This invention relates to the treatment of ores, tailings, concentrates or the like for rendering the constituent parts of ores which are non-magnetic or non-magnetizable or only slightly so separable by means of magnetic separators.

According to this invention an ore (by which term there is intended to be included tailings, concentrates or the like) is mixed with particles of a magnetic (by which term there is intended to be included any magnetizable substance) substance and a liquid under conditions such that the liquid adheres to some constituent part or parts of the ore in preference to the others causing such part and the particles to adhere together.

The details of the results of the following experiment show how the process may be carried out in practice. 200 lbs. of Broken Hill zinc tailings containing about 18.78 zinc, 5.14 lead having passed through a 40 mesh screen were treated as follows:—The ore was fed into an agitator with about 60 lbs. water to which was added 1000 grains sulfuric acid. To this pulp was added about 10 lbs. of magnetic paint made by mixing two parts by weight of finely ground cast iron with one part of oil gas tar (which is a residual oil obtained in the manufacture of oil gas). The agitation was continued for a few minutes and additional water was then run into the agitator and the pulp was fed into a magnetic separating apparatus. On testing a handful of the tailings so treated with a hand magnet, it was found that on contact it removed nearly all the metalliferous particles, a small percentage only being not affected.

It may sometimes be desirable especially when the constituent part of the ore it is desired to separate consists of fine particles

(as in the case of some gold quartz) to mix the ground wet quartz with coarser particles of the magnetic substance to which sufficient of the adhesive liquid has been added to cause the fine particles to adhere to the magnetic particles.

The percentage of the adhesive liquid and of the magnetic particles may be varied to suit the particular method of separation or concentration to be employed. It is obvious that the stronger the magnetic field the less magnetic particles will be required, and the finer the magnetic particles the larger the surface exposed to the magnetic field.

In the practical application of this invention a few experiments may be necessary to gage the best percentages to use, taking into account the size of the particles to be separated, the separating device to be used and the power of the field.

The separation of the treated particles from the other constituent parts of the ore can be effected in any suitable manner either wet or dry. In some cases it may not be necessary to add magnetic particles as the ore may either by nature or by reason of a suitable treatment contain sufficient, when the ore is mixed with an adhesive liquid as described, for a greatly improved extraction to take place; the magnetic and non-magnetic metalliferous particles adhering together as before described.

In the drawings which show apparatus of known construction A is a vessel provided with an agitator *a*.

*a*<sup>1</sup> is a valve through which the ore mixed with water, oil and magnetic substance passes to a chute B into a magnetic separator. The separator consists of a tank C divided into two compartments *c* and *c*<sup>1</sup> by means of a partition *c*<sup>2</sup>.

*c*<sup>3</sup> is a pipe opening into the compartment *c* and through which water is forced.

*c*<sup>4</sup> is a discharge pipe issuing from the bottom of the compartment *c*<sup>1</sup> and provided with a regulating valve *c*<sup>5</sup>.

*c*<sup>6</sup> is a conduit for receiving the particles of ore.

D is a drum capable of rotation on a stationary shaft *d* and made of a metal such as brass.

E is a system of electromagnets connected to the shaft *d*.

The ore flows into the compartment *c* when it is met by a current of water rising from

the pipe  $c^3$ . The magnetic particles on passing the partition  $c^2$  are influenced by the magnet system by which the magnetic particles are drawn upward from out of the current of water against the drum D sticking to it as far as the magnet system extends and then falling into the conduit  $c^6$ . The non magnetic particles sink to the bottom and are discharged through the pipe  $c^4$ .

10 What we claim is:—

1. The process of treating ores, which consists in mixing with the ore a sufficient quantity of a magnetic substance and an adhesive non-metallic liquid adapted to cause the magnetic substance to adhere to some constituent part of the ore in preference to the others, and which renders it capable of separation by a magnetic separator, and then magnetically separating the particles thus adhered.

2. The process of treating ores, which consists in mixing an ore with a magnetic substance and an oily liquid adapted to cause the magnetic substance to adhere to some constituent part of the ore in preference to the others, and then magnetically separating the mixture.

3. The process of treating ores, which consists in mixing the ore with a magnetic substance and oil gas tar which causes the magnetic substance to adhere to some constituent part of the ore in preference to the others, and then magnetically separating the mixture.

4. The process of treating ores, which consists in mixing an ore with an acid, a magnetic substance and a non-metallic liquid adapted to cause the magnetic substance to

adhere to some constituent part of the ore in preference to the others and then magnetically separating the mixture. 40

5. The process of treating ores, which consists in mixing the ore with an acid, a magnetic substance and an oily liquid adapted to cause the magnetic substance to adhere to some constituent part of the ore in preference to the others, and then magnetically separating the mixture. 45

6. The process of treating ores, which consists in mixing an ore with an acid, a magnetic substance, and oil gas tar which with the magnetic substance is adapted to adhere to some constituent part of the ore in preference to the others, and then magnetically separating the mixture. 50

7. The process of treating ores, which consists in causing non-magnetic metalliferous particles to adhere with magnetic particles by means of a non-metallic liquid which with the magnetic particles is adapted to adhere to the metalliferous particles in preference to the gangue, and then magnetically separating the metalliferous particles from the gangue. 55

8. The process of treating ores, which consists in adding to an ore a mixture comprising a magnetic substance and a liquid which with the magnetic substance adheres to some constituent part of the ore in preference to the others, and then magnetically separating the mixture. 60

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