

No. 754,756.

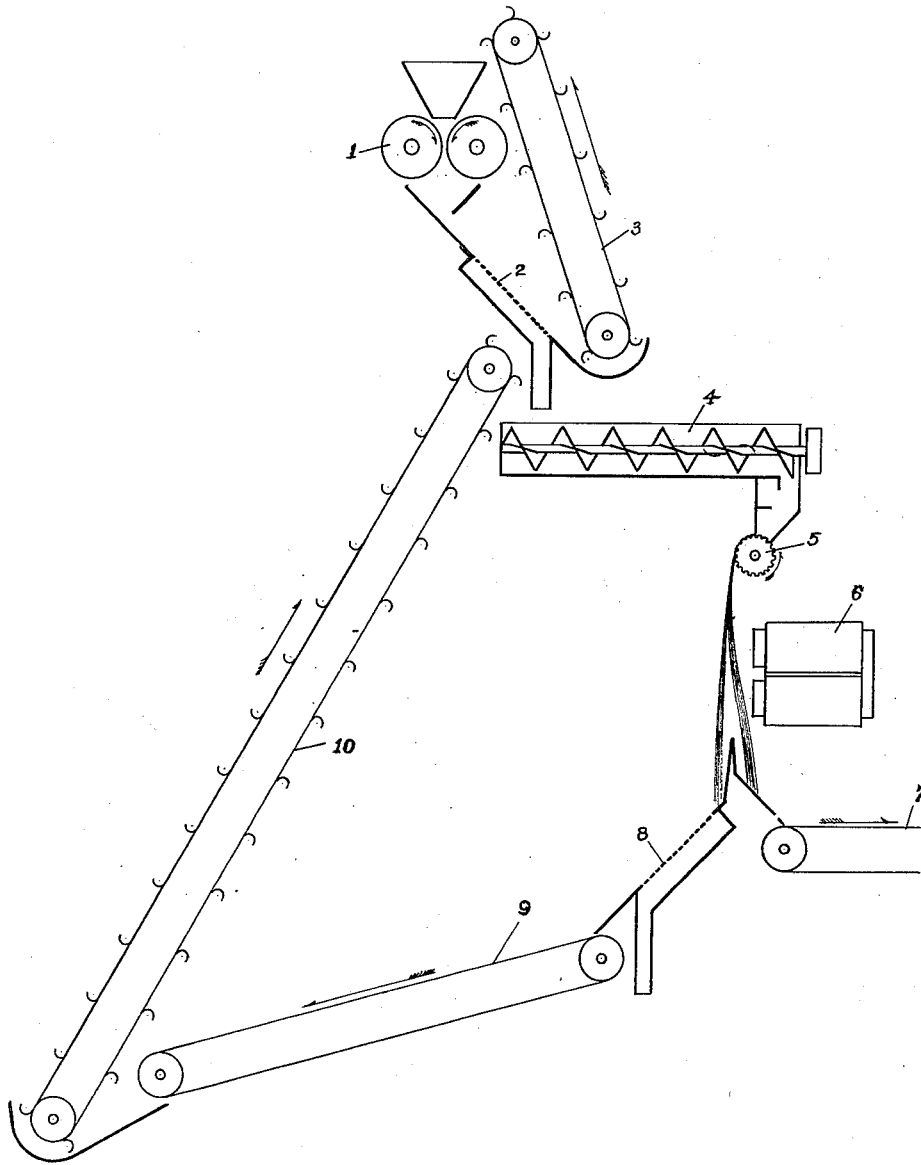
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PROCESS OF SEPARATING ORES FROM MAGNETIC GANGUE.

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NO MODEL.



WITNESSES

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PROCESS OF SEPARATING ORES FROM MAGNETIC GANGUE.

SPECIFICATION forming part of Letters Patent No. 754,756, dated March 15, 1904.

Application filed May 29, 1903. Serial No. 159,306. (No specimens.)

To all whom it may concern:

Be it known that I, THOMAS A. EDISON, a citizen of the United States, residing at Llewellyn Park, Orange, in the county of Essex and State of New Jersey, have invented certain new and useful Improvements in Processes of Separating Ores from Magnetic Gangue, of which the following is a description.

My invention relates to an improved process for treating ores in which a non-magnetic metal or metallic compound to be recovered—such as, nickel sulfid, copper pyrites, &c.—is admixed with a very much larger proportion of more or less magnetic gangue, such as pyrrhotite. While my improved process is capable of effective use in connection with any ores of this character, it has been specially designed for treatment of those nickeliferous ores which occur in very large deposits in some portions of the United States and which are composed for the most part of pyrrhotite and a small proportion (varying from two to ten per cent.) of non-magnetic nickel sulfid or other nickel compound.

I have heretofore proposed the treatment of nickeliferous ores by subjecting the magnetic pyrrhotite and non-magnetic nickel compound to the action of a magnetic separator for the purpose of separating the magnetic from the non-magnetic portions. Owing to the fact that with some nickeliferous ores the non-magnetic nickel sulfid or other nickel compound occurs in very small proportions admixed with practically pure pyrrhotite I find that the ordinary magnetic separation of such ores is not as perfect as is desirable, for the reason that the relatively large mass of magnetic particles tends to form clots which coalesce together by magnetic induction and entrap the non-magnetic particles which are therefore carried over into the concentrate or gangue, with the magnetic particles. The same objection is present when the attempt is made to treat by any known magnetic separating process any other ore having a relatively large proportion of magnetic material, such as pyrrhotite carrying small proportions of copper pyrites.

The object of the present invention is to provide an improved process by means of

which a very perfect separation of the magnetic and non-magnetic particles can be effected in connection with any ores where the proportion of the non-magnetic material is very low.

To this end I practice my improved process as follows: The ore—composed, for example, of pyrrhotite and nickel sulfid or other compound—is first reduced by grinding to a condition of fineness, dependent to a certain extent upon the character of the material being treated; but for ordinary purposes the reduction of the material to particles which pass through a screen having four meshes per linear millimeter will give satisfactory results. In any event the screening of the material should be carried to a sufficient degree of fineness as to practically isolate the magnetic and non-magnetic particles. To the ground material I now add a much larger bulk of a coarser non-magnetic material, preferably quartz sand. When the material being treated has been so reduced that the largest particles are not greater than one-fourth of a millimeter in diameter, the coarser material should be composed of particles about one-third of a millimeter in diameter or, in other words, the product of a three-mesh-per-millimeter screen. This same proportion may be observed when the material to be treated has been reduced to other conditions of fineness. The proportion of coarser material, such as quartz sand, added to the material to be treated may vary from two to seven times the bulk of the latter. The pyrrhotite, nickel sulfid or other nickel compound, and added coarser material are intimately mixed together and passed through a suitable magnetic separating apparatus. Owing to the presence of the added coarser materials the magnetic particles are separated and prevented from coalescing under the effect of magnetic induction, but are drawn directly out of the mass by the magnetic attraction and do not entrap the non-magnetic particles, and in consequence practically all of the nickel, copper, or other metal or metallic compound is recovered in the tailings. These tailings, which are rejected by the magnetic separator, are composed of the non-magnetic added material, such as quartz sand and the

nickel sulfid or other nickel compound or copper pyrites, &c. These two materials can now be effectively separated by screening, owing to their difference in size, and the quartz sand or other added material can be used over and over again in facilitating other separating operations.

My improved process is very simple and effective and permits the commercial working of low-grade nickeliferous copper and other ores which, under existing processes, cannot be effectively treated magnetically.

In the attached drawing, forming a part of this specification, I illustrate a convenient apparatus by which my improved process may be practiced.

The material is ground by the grinding-rolls 1 and sufficiently fine particles are separated by the screen 2, the coarse tailings being returned to the grinding-rolls by an elevator 3. The ground material is passed to a mixer 4, in which it is intermittently mixed with the approximately constant load of coarser material. By means of a roller-feed 5 the mixture is fed to a magnetic separator 6, the magnetic particles being drawn out and carried off by a belt 7 and the non-magnetic tailings and coarser material being passed over a screen 8. By means of the belt 9 and elevator 10 the coarser material is returned to the mixer for repeated use.

I claim—

1. The process of treating magnetic ores carrying a small proportion of a non-magnetic material to be recovered, which consists in grinding the ore to a sufficient fineness to free the non-magnetic particles, in adding thereto a predetermined and larger bulk of a coarser non-magnetic material, in subjecting the mixture to the action of a magnetic separator whereby the non-magnetic material to be recovered together with the added coarser material will be rejected as tailings, and finally in separating the added coarser material from the original non-magnetic material, substantially as and for the purposes set forth.

2. The process of treating magnetic ores carrying a small proportion of a non-magnetic

material to be recovered, which consists in grinding the ore to a sufficient fineness to free the non-magnetic particles, in adding thereto a predetermined and larger bulk of a coarser non-magnetic material, in subjecting the mixture to the action of a magnetic separator whereby the non-magnetic material to be recovered together with the added coarser material will be rejected as tailings, and finally in screening the tailings to separate the added coarser material, substantially as and for the purposes set forth.

3. The process of treating nickeliferous ores composed essentially of pyrrhotite and a smaller proportion of a non-magnetic nickel compound, which consists in grinding the ore to a sufficient fineness to free the non-magnetic particles, in mixing therewith a predetermined and larger bulk of a coarser non-magnetic material, in subjecting the mixture to the action of a magnetic separator, whereby the non-magnetic nickel compound and added coarser material will be rejected as tailings, and finally in separating the non-magnetic nickel compound from the added coarser material, substantially as and for the purposes set forth.

4. The process of treating nickeliferous ores composed essentially of pyrrhotite and a smaller proportion of a non-magnetic nickel compound, which consists in grinding the ore to a sufficient fineness to free the non-magnetic particles, in mixing therewith a predetermined and larger bulk of a coarser non-magnetic material, in subjecting the mixture to a magnetic separator, whereby the non-magnetic nickel compound and added coarser material will be rejected as tailings and finally in screening the tailings so as to separate the non-magnetic nickel compound from the added coarser material, substantially as and for the purposes set forth.

This specification signed and witnessed this 25th day of May, 1903.

THOMAS A. EDISON.

Witnesses:

FRANK L. DYER,

ROBERT RAFU.