

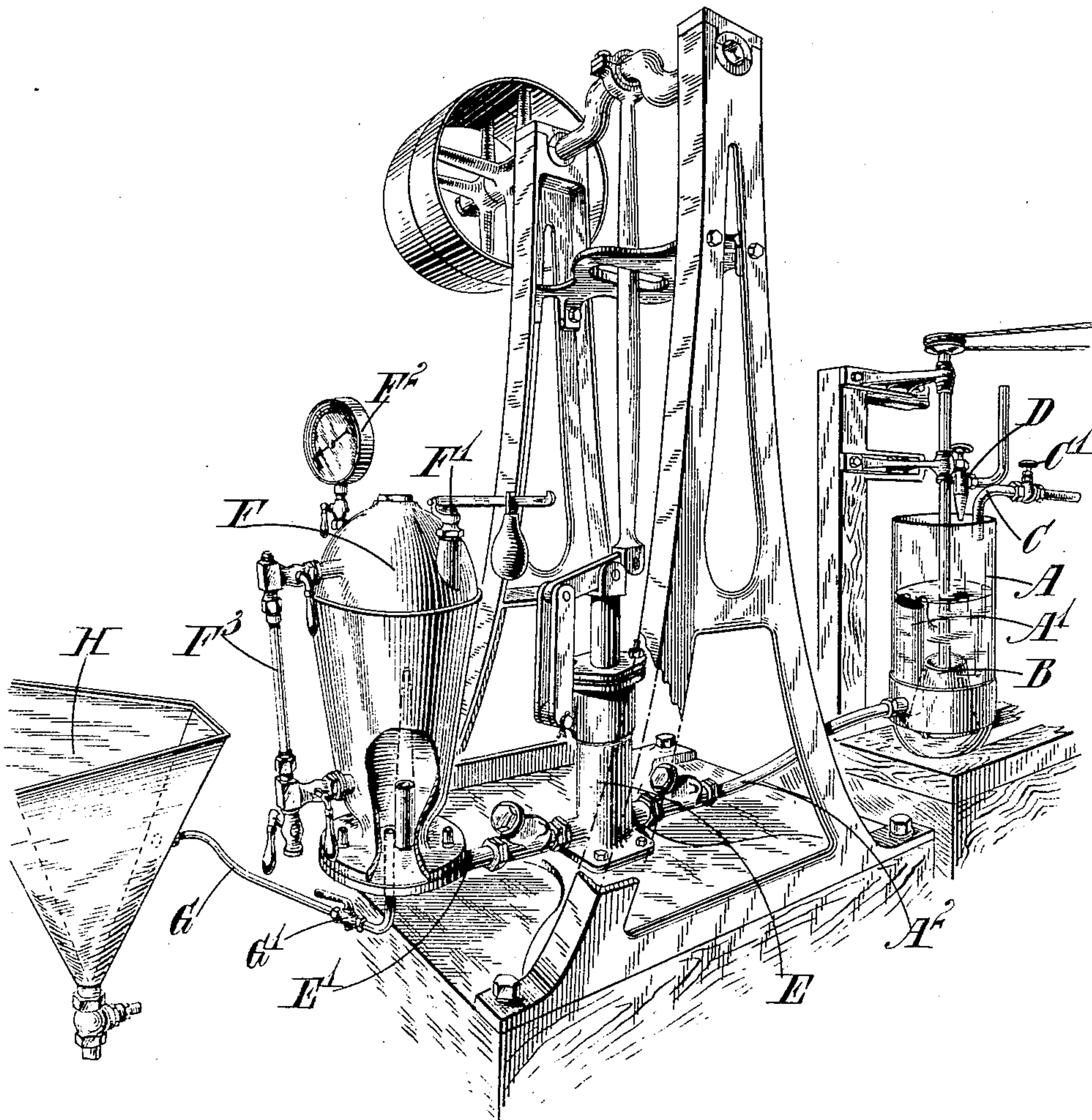
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PATENTED NOV. 6, 1906.

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ORE CONCENTRATION.

APPLICATION FILED JAN. 9, 1906.



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UNITED STATES PATENT OFFICE.

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ORE CONCENTRATION.

No. 835,479.

Specification of Letters Patent.

Patented Nov. 6, 1906.

Original application filed May 29, 1905, Serial No. 262,889. Divided and this application filed January 9, 1906. Serial No. 295,326.

To all whom it may concern:

Be it known that we, HENRY LIVINGSTONE SULMAN, HUGH FITZALIS KIRKPATRICK-PICARD, and JOHN BALLOT, subjects of the King of England, residing at London, England, have invented certain new and useful Improvements in Ore Concentration, of which the following is a specification.

This invention relates to improvements in ore concentration, and this application is a division of an application filed by us on May 29, 1905, Serial No. 262,889.

Several methods are known in which air and other gas is introduced, generated, or liberated in a pulp containing powdered ore in suspension, whereupon the gaseous films or bubbles attach themselves to certain particles, which are thereby caused to float, while other particles are not so floated.

The object of this invention is to improve such processes.

The invention is particularly applicable to the separation of oiled mineral particles from unoled particles in a pulp; but it is also applicable in some cases in which gaseous bubbles will selectively adhere to certain particles without the use of oil.

Among the previous processes depending upon gaseous flotation is that described in our previous United States patent, No. 793,808, dated July 4, 1905, in which the flotation of oiled mineral particles is brought about by the liberation of a gas in the pulp containing them.

According to this invention it is found that a convenient method of effecting the liberation or generation of gas-bubbles in such a pulp is to subject the latter to the action of compressed air or other compressed gas in a suitable vessel or apparatus from which the pressure can be subsequently relieved. If, for example, the ore-pulp after agitation with a small proportion of oil or other suitable substance having a preferential affinity for metalliferous minerals be subjected to the action of compressed air at a pressure of, say, fifty to one hundred pounds per square inch and after the lapse of a few minutes for the due solution of the compressed air or a portion of it by the pulp or the liquid be allowed to discharge itself into an open vessel at the normal atmospheric pressure, the whole of the oiled

mineral will at once rise to the surface of the pulp as a coherent scum or froth, which can be removed by skimming or by a surface current of water from the gangue, which remains sunk or suspended in the remainder of the pulp. A spitzkasten is a suitable type of vessel into which the superaerated pulp may be discharged. We have found this method very efficacious in cleaning up finely-divided ore products which have been submitted to oiling. We do not confine ourselves to the use of atmospheric air, as it is obvious that any suitable gas which is soluble in water to a sufficient extent under pressure and which preferentially attaches itself to oiled mineral particles may be employed to thus effect the gaseous flotation of the oiled mineral particles. It is to be understood that we do not use pressures below the normal atmospheric pressure at the time being in any portion of the operation.

The accompanying drawing represents in perspective view one form of the apparatus suitable for carrying this invention into effect.

A mixing vessel A (of which there may be several in series) is provided with a rotatable stirrer B. Crushed ore or similar finely-divided mineral is fed into the vessel A. A pipe C, controlled by a tap C', delivers circuit water to the vessel, and in cases where oil is used the oil is introduced through the pipe D in quantity sufficient to produce a thin coating of oil on these mineral particles, for which oil has an affinity.

The pulp mixed with oil escapes over the lip of a discharge-conduit A' and passes through the pipe A² to a pump E. Hence the pulp is pumped through discharge-pipe E' into the closed chamber F, which is constructed to withstand a considerable internal pressure and is provided with a safety-valve F', the pressure-gage F², and a gage-glass F³ to indicate the level of the pulp in the chamber. An outlet-pipe G, having a cock G', leads to a series of spitzkastens H, filled with circuit-water.

The operation is as follows: The cock G' is closed. Pulp is pumped into the chamber F, which contains air or other gas, and the pumping is continued until the pressure in the chamber rises to, say, fifty to one hundred pounds per square inch. The pressure is suf-

efficient to cause the air or other gas to be dissolved to a considerable extent in the pulp. After the lapse of a few minutes for the due solution of the compressed air or a portion of it by the pulp or the liquid the cock G' is opened and the pulp is discharged into the open spitzkasten H, where the liquid is of course under atmospheric pressure. The pump E may be stopped during this discharge. The whole of the mineral to which air-bubbles are attached—say the oiled mineral—at once rises to the surface as a coherent scum or froth. A surface current of water is maintained in the spitzkasten, and the floating material is thus removed and separated from the gangue, which remains sunk or suspended in the liquid.

It is to be understood that the expression "oil" includes any substance, such as oleic acid, which has a preferential affinity for certain mineral substances over others.

Having thus described our invention, what we claim, and desire to secure by Letters Patent, is—

1. The process of separating powdered minerals from one another which consists in suspending the powdered minerals in a liquid, subjecting the mixture to a gas-pressure and thereafter relieving the pressure whereby

bubbles of gas are liberated in the pulp and carry certain minerals to the surface.

2. The process of separating powdered minerals from one another which consists in agitating the minerals suspended in water with a small quantity of oil, subjecting the pulp to a gas-pressure and thereafter relieving the pressure whereby bubbles of gas are liberated in the pulp and carry the oiled minerals to the surface.

3. The process of separating powdered minerals from one another which consists in agitating the minerals suspended in water with a small quantity of oil, subjecting the pulp to a gas-pressure and thereafter distributing the pulp upon the surface of a column of water whereby the unoled particles sink while the oiled particles adhering to gaseous bubbles float and are thereby separated.

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

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