

No. 689,070.

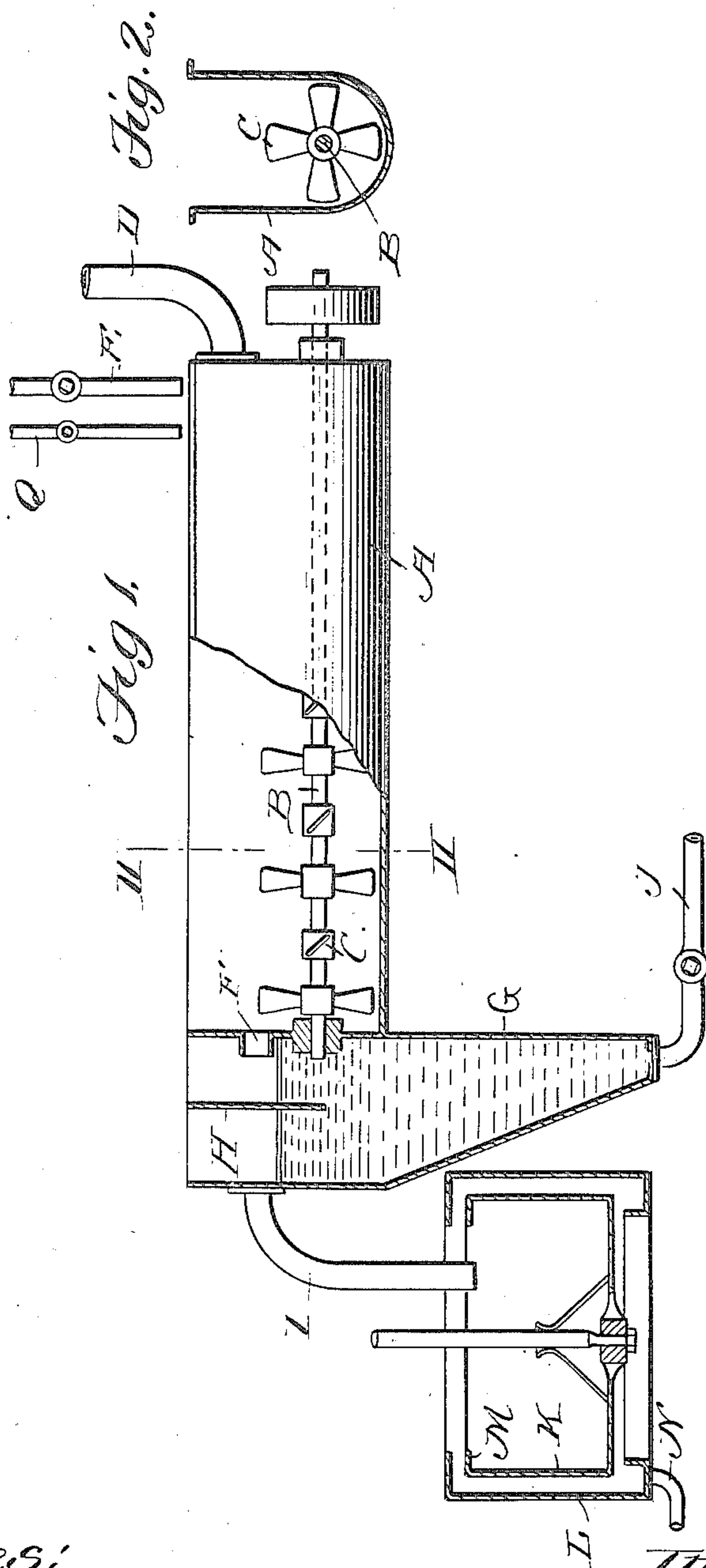
Patented Dec. 17, 1901.

A. S. ELMORE.

SEPARATING MINERAL SUBSTANCES BY THE SELECTIVE ACTION OF OIL.

(Application filed Apr. 13, 1901.)

(No Model.)



Witnesses:
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UNITED STATES PATENT OFFICE.

ALEXANDER STANLEY ELMORE, OF LONDON, ENGLAND.

SEPARATING MINERAL SUBSTANCES BY THE SELECTIVE ACTION OF OIL.

SPECIFICATION forming part of Letters Patent No. 689,070, dated December 17, 1901.

Application filed April 13, 1901. Serial No. 55,776. (No specimens.)

To all whom it may concern:

Be it known that I, ALEXANDER STANLEY ELMORE, a citizen of England, residing at 4 Bishopsgatestreet Within, London, England, have invented a certain new and useful Improvement in Separating Mineral Substances by the Selective Action of Oil, (for which I have applied for a patent in Great Britain, dated March 28, 1901, No. 6,519,) of which the following is a specification.

The selective action of oil has been utilized for separating metallic substances from earthy or rocky constituents of ores. This has generally been done by pulverizing the ore and suspending it in a considerable quantity of water, so as to make a freely-flowing pulp, then mingling with it oil, preferably heavy oil, such as is obtained from petroleum after some of the lighter oils have been distilled from it. When the mixture rests, the oil, with most of the metallic substances entrapped in it, floats at the top and is separated from the rocky or earthy matters, which are run off with the water as tailings. The oil is afterward separated from the metallic substances, usually by centrifugal action. In carrying on this separating process I have discovered that in some cases a slight acidulation of the mixture greatly enhances the selective action of the oil, so that metallic substances, as well as other mineral substances, such as sulfur and plumbago, can be separated from the earthy matters with which they are naturally associated better than when there is no acid present. By this means some metallic substances can be separated from others—such, for instance, as sulfids from oxids. The acidulation may be effected either by adding a little acid to the oil, in which case an acid that will dissolve in or mix readily with the oil, but which is insoluble, or nearly so, in water—as, for instance, oleic acid—is to be preferred, or the acid may be added to the aqueous pulp, in which case sulfuric acid may be employed or the acid cuprous liquors obtained in mine working. The quantity of acid added in either case is small, as it often need not exceed one five-hundredth part of the volume of oil or water employed in the operation. The quantity of acid required to produce the best result varies, according to the character of the material treated, and I

therefore do not confine myself to any definite proportion.

An apparatus by which my process can be carried out in practice and which forms the subject of a pending application for Letters Patent filed the 8th day of August, 1901, Serial No. 71,372, is illustrated by the accompanying drawings, in which—

Figure 1 is a view partly in section and partly in elevation, and Fig. 2 a cross-sectional view.

In applying my invention to the separation of metallic and earthy or rocky ingredients of ore I prefer to mix with the powdered ore from five to ten times its weight of water, forming a thin freely-flowing pulp, which I allow to flow into the mixer A through a pipe D. Into this mixer I also admit a thin stream of oil from a pipe E, provided with a regulating-valve, and a small quantity of acid from a pipe Q, also provided with a regulating-valve. The oil and acid are mixed with the pulp by the rotating beater C. The oil by its selective action coats or absorbs the metallic particles, sulfids, the tellurids, and the like. If plumbago, elementary sulfur, or other substances of like character are present, the oil attaches itself to or coats such particles, while it does not coat or attach itself to the rocky or earthy particles present. The liquid mineral pulp, oil, and acid are caused to travel along the mixer A and become thoroughly mixed. This mixture issues by an opening F into a subsidence-tank G, which has in its upper part a partition H, extending down a little below the level of an outlet-pipe I. In the tank G a separation takes place of the metallic from the rocky or earthy ingredients of the mixture, the metallic ingredients adhering to the oil and by it floated to the top on the left side of the partition H, while the earthy and rocky ingredients subside and are allowed to issue through a pipe J, provided with a regulating-cock. The metallic ingredients, with the oil and acid, are discharged by the pipe I into the drum K of a centrifugal machine which revolves rapidly in a casing L. The drum has an inwardly-projecting flange M at its upper edge. As the drum revolves the metallic matters, owing to their density, accumulate in an annular layer at the circumference of the drum, while the oil

and acid collect inside and flow over the flange M into the casing L, whence they are conducted away through a pipe N. From time to time the revolution of the drum is stopped and the
5 metallic matter removed.

Having thus described the nature of this invention and the best means I know of carrying the same into practical effect, I claim—

10 The process for separating metallic and rocky constituents of ore which consists in mixing pulverized ore with water and mixing the ore and water with oil in the presence of

an acid, allowing the mixture to rest whereby the oil having the metallic substances entrapped in it floats at the top of the mixture, 15 and separating the metallic constituents from the oil, substantially as described.

In testimony whereof I have hereunto set my hand in presence of two subscribing witnesses.

ALEXANDER STANLEY ELMORE.

Witnesses:

GERALD L. SMITH,
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