

IMPROVEMENTS IN THE TREATMENT OF PRECIOUS ORES.

I, Henry Livingstone Sulman, of London, analytical chemist, do hereby declare the nature of my invention for "Improvements in the Treatment of Precious Ores," and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

This invention relates to the recovery of precious metals, especially gold, from ores, the invention being particularly directed to the recovery of "float" and finely-divided gold. The ores may be treated by the ordinary processes, such as crushing and amalgamating, hydraulic, and similar processes, which need not be further described here. It is well known that in these processes a very large quantity of the float and finely-divided gold escapes in the effluent water, some of it being carried upon the surface and some in suspension in the water. Now, I have found that by destroying (or, more accurately, diminishing) the "surface tension" of the water the gold which was previously supported upon the surface of the water will be precipitated, and can be easily collected. The destruction of the "surface tension" may be effected by the addition to the water of substances such as the caustic alkalies and their carbonates, soda cresylate, alkaline dextrins and albumens, saporien, and guilboa-bark, but the cheapest and most satisfactory substance appears to be soap. This may be made from any of the ordinary fats or fatty acids, resins, or resin acids commercially known and used for such purposes, and may contain either potash, soda, or ammonia as its base. I prefer to apply the soap in a fluid condition through suitable pipes or jets, as found most convenient, and its effect is to promptly destroy the surface tension of the water and precipitate the gold floating thereon, which will then readily adhere to the amalgamating-surfaces.

The soap may be added to the milling-water before crushing, or at any period subsequent to that operation as may be desired, and it may be in the form of a solid substance, but more conveniently as a solution.

The finely-divided gold in suspension in the milling-water I recover by mixing with the water a substance which can be made to form a coagulum and to precipitate so as to draw down with it the finely-divided gold. This affords another reason for preferring soap or a saponaceous substance for the purpose of destroying the surface tension. The soap is soluble in the milling-water, and mixes with the whole of it, so that by subsequently precipitating or coagulating the soap I can secure, in the manner above referred to, the finer particles of gold which are in suspension in the water. It is, however, not necessary that soap should be selected for this purpose. Various substances may be employed to effect this precipitation, such as lime, alum, magnesia, and many other metallic salts; acids also may be used for this purpose, such as dilute sulphuric or muriatic acid; but, as many of these substances are difficult to obtain at the mines, and expensive, I prefer to employ soap, and coagulate it with lime-water or a soluble salt of lime. The saponaceous material is thus recovered as an insoluble soap or soaps, and the fine particles of gold are found entangled in the curd thus formed.

As the water obtained in the mines and used in the treatment of the ores is usually hard, and would therefore require a large quantity of the saponaceous substance to give the desired results, I prefer to soften the water before using it, as less soap is required, and a larger proportion of gold is recovered. Adding a larger proportion of soap to hard water is not nearly so effective as softening the water first; any of the well-known processes may be employed for this purpose—say, for example, by treatment with lime, soda, ash, aluminate of soda, &c.

The subsequent precipitation may be effected when the soapy water is run into tanks, the water after the precipitation being strained through course strainers, and the coagulum dug out and thrown aside to drain; after which the gold may be recovered from it in any desired manner, conveniently by burning, and subsequent treatment by one of the well-known processes. Acids may be used for this purpose, but, owing to the difficulty of obtaining them at mines, burning is preferable.

Where it is not necessary to destroy the surface tension, another kind of coagulating substance may be employed, such, for example, as alum-sulphate of iron, silicate of soda, aluminate of soda, and other substances which, when dissolved in water, produce a gelatinous or flacculent precipitate upon the addition of a decomposing substance such as lime. This precipitate or coagulum will entangle or contain the finely-divided gold, and may be recovered by straining as before.

1. The process of recovering float gold by the addition to the milling-water of substances which diminish the surface tension of the water so as to cause the float gold to leave the surface and deposit.

2. The process of recovering finely-divided gold in suspension in the milling-water by dissolving therein substances capable of being precipitated in the form of a curd or coagulum, and precipitating the same so as to cause them to bring down with them the gold in suspension.

3. The use of soaps or saponaceous matter for the purpose of recovering float gold, as above described.

4. The use of soaps or saponaceous matter for the purpose of recovering finely-divided gold in suspension, as above described.

5. In a process for recovering float gold by means of soaps or saponaceous matter as above described, softening the water, and in the milling process, previously to adding the soaps or saponaceous matter thereto.

6. In a process for recovering finely-divided gold in suspension by means of soaps or saponaceous matter, as above described, the employment of lime-water or salts of lime for the purpose of subsequently precipitating the same.

7. The herein-described process for recovering gold in milling-operations, consisting of the following steps: (1.) If necessary, softening the water to be used in milling. (2.) Adding soap or saponaceous matter to precipitate the float gold. (3.) Precipitating the soap or saponaceous matter by the addition of lime-water or salts of lime to bring down the finely-divided gold in suspension.

Dated this 16th day of March, 1894.

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