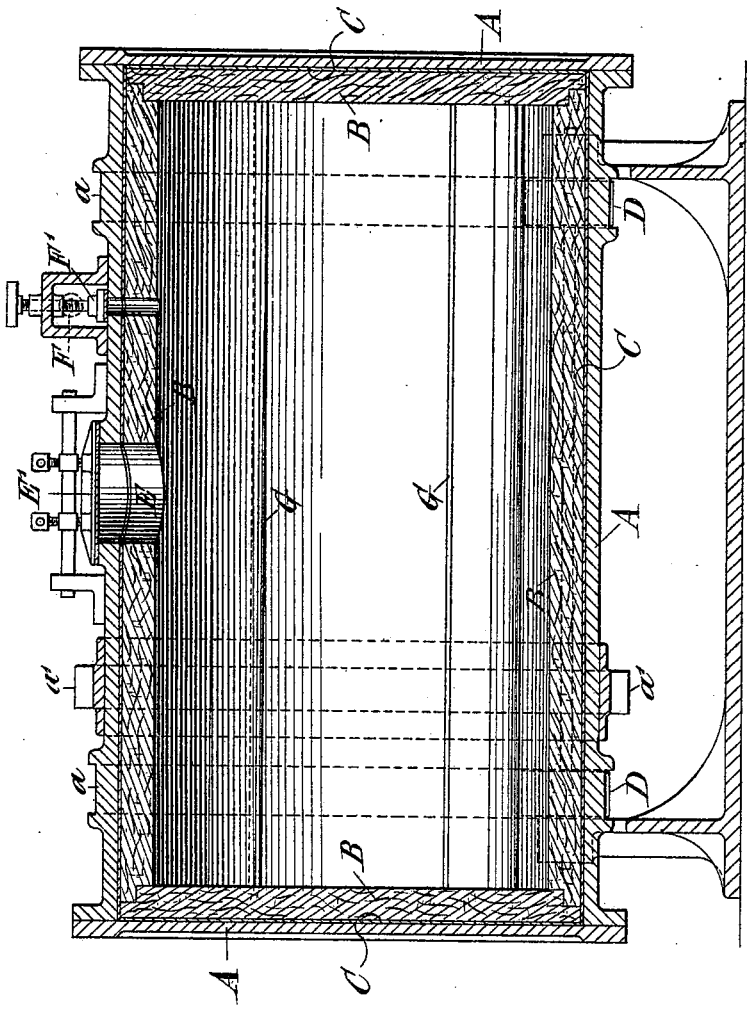
No. 646,006. Patented Mar. 27, 1900.

J. C. MONTGOMERIE & H. PARKES.

TREATMENT OF GOLD AND SILVER ORES, &c.

(No Model.) (Application filed May 29, 1897.)



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UNITED STATES PATENT OFFICE.

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TREATMENT OF GOLD AND SILVER ORES, &c.

SPECIFICATION forming part of Letters Patent No. 646,006, dated March 27, 1900.

Application filed May 29, 1897. Serial No. 638,796. (No specimens.)

To all whom it may concern:

Be it known that we, JOHN CUNINGHAME MONTGOMERIE, residing at Dalmore, Stair, in the county of Ayr, Scotland, and HENRY PARKES, residing at 237 Friern road, Dulwich, London, in the county of Surrey, England, subjects of Her Majesty the Queen of Great Britain and Ireland, have invented certain new and useful improved means applicable for use in the treatment of ores or compounds containing gold or silver and in means applicable for use in the treatment of such materials with the aid of solvents, (in respect whereof we have applied for Letters Patent in Great Britain to bear date April 21, 1897, No. 9,964,) of which the following is a specification.

This invention relates to the treatment of auriferous and argentiferous ores or compounds for the purpose of separating and collecting the gold and silver contained therein, the objects of the invention being to secure expedition, a high percentage of extraction, and economy in the cost of working.

The accompanying drawing illustrates a revolving barrel such as is usually employed in the treatment of ores.

A is the casing, which may be of cast-iron and be furnished with a wood or earthenware lining B. A lead or other suitable lining C is interposed between the casing A and lining B. The barrel is mounted upon rollers or wheels D D, which work in the tracks *a a*, formed on the casing, the rotation of the barrel being effected by means of a toothed pinion (not shown) gearing with the toothed rack or wheel *a'* on the barrel-casing.

E is the manhole for use in charging and discharging the barrel, the same being provided with a tight-closing cover E'.

F is the inlet for compressed air, furnished with a screw-down valve F'.

Within the barrel one or more ribs or breaks G are provided, with a view to assisting in turning the mass during the revolution of the barrel.

In applying our invention to the treatment of ores containing gold or silver or gold and silver we crush the ore sufficiently fine to admit of its passing through a sieve of from forty to sixty meshes to the lineal inch. Generally the finer the ore is pulverized the higher the rate of extraction. The pulverized ore is subsequently treated in a barrel or vessel A along with water in sufficient quantity to render the mixture of the consistency of thin mud. The water is put into the barrel or other vessel employed, and the following substances are added thereto: first, cyanid of potassium or of sodium or other cyanid or mixtures of cyanids, such as potassium cyanid, with sodium cyanid; second, sodium oxid or its hydrate (caustic soda) or other alkali-metal oxid or a hydrate of an alkali-metal oxid or of an alkali-earth metal, and, third, sodium dioxid or sodium or potassium or other alkali metal or alkali-earth metal, nitroprussid, bromid, or fluorid, or barium dioxid or peroxid of lead or other suitable oxygen-yielding substance may be employed in conjunction with ammonium sulfate or other reagent, operating to liberate oxygen therefrom. Among these may be mentioned the alkali-metal salts whose acid radical contains bromin, fluorin, phosphorus—such as NaH_2PO_4, $Na_2HPO_4 .12H_2O$, $Na_4P_2O_7 .10H_2O$—carbon—such as $Na_2C_2O_4 .2H_2O$, $Na_2CO_3 .10H_2O$, $K_2C_4H_4O_6$—and sulfur, such as $Na_2SO_3 .7H_2O$, $Na_2SO_4 .10H_2O$, $NaHSO_4$. In some instances ammonium sulfate may also with advantage be employed in conjunction with the bromid or fluorid. Bromin or fluorin water may, if preferred, be substituted for a bromid or fluorid. The barrel is revolved for a short time in order to thoroughly mix its contents, and the ore having been added the barrel is then charged through the inlet F with air under a pressure of from fifty to one hundred pounds per square inch. The valve F' having been screwed down and the air-pump disconnected, the barrel is maintained in rotation until the precious metals are, so far as is practicable, dissolved, the time occupied with average ores being from four to six hours. The barrel is thereupon emptied, after first removing the manhole-cover E, the contents filtered and washed, and the solution treated in any known manner for the separation of the precious metals. We prefer, however, to filter and to proceed as regards the reuse of the liquor in the manner set forth in the specification to Letters Patent granted to John Cuninghame Mont-

gomerie, No. 524,601, dated August 14, 1894, and No. 532,895, dated January 22, 1895, and as regards the recovery of the precious metals from the solution in the manner described in the specification to Letters Patent No. 549,736, dated November 12, 1895.

The treatment above referred to may also be carried out in tanks without air-pressure or agitation. Under such circumstances it is preferable to allow the solvent liquid to percolate through the mass of ore repeatedly, the liquid as it passes away being fed back to the surface of the ore until the precious metals are sufficiently dissolved.

By way of example, a free-milling or ordinary refractory ore containing forty ounces, six pennyweights, and one grain of gold and one ounce, six pennyweights, and three grains of silver per ton may be treated with fourteen pounds of cyanid of potassium, ten pounds of caustic soda, five pounds of red lead, and four pounds of bromid or of sulfate of ammonia. These proportions will be subject to considerable variation with different descriptions of ore and according to the particular chemical agents selected, the most suitable proportions being, however, readily determinable by experiment. Inasmuch as a very small proportion of the chemicals, such as the cyanid and caustic soda, is consumed during the treatment of the first quantity of ore, the requisite quantity of chemicals necessary for the further strengthening of the solution on reuse in order to bring it up to its orginal strength can only be determined on testing the liquid subsequently to the treatment of a second quantity of ore. In any case the chemical agents mentioned under the third head must be added to each charge of ore as their chemical action becomes exhausted with each charge of ore. With ores or tailings operated on by the tank method of treatment weak solutions of cyanid and caustic alkali are generally used and the time allowed to complete the dissolution of the precious metals extended considerably, the rate of extraction being much slower. When an insoluble salt is used in tank treatment without agitation, it may be mixed with the ore or spread upon the top of it or arranged in layers throughout the ore.

What we claim as our invention, and desire to secure by Letters Patent, is—

In the extraction of gold and silver from ores or compounds containing the same, the herein-described process consisting in treating the ore or compound with a cyanid of an alkali metal, caustic alkali and barium dioxid in conjunction with ammonium sulfate substantially as set forth.

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Witnesses:
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