UNITED STATES PATENT OFFICE.

BERTRAM HUNT, OF SAN FRANCISCO, CALIFORNIA.

EXTRACTION OF METALS FROM ORE OR THE LIKE.

SPECIFICATION forming part of Letters Patent No. 699,108, dated April 29, 1902.

Application filed July 12, 1901. Serial No. 68,061. (No specimens.)

To all whom it may concern:

Be it known that I, BERTRAM HUNT, a native of Scotland and a British subject, residing in the city and county of San Francisco, State of California, have invented an Improvement in the Extraction of Metals from Ores or the Like; and I hereby declare the following to be a full, clear, and exact description of the same.

This invention has for its object the treatment of ores containing gold, silver, copper, zinc, nickel, &c., in a single operation; and it is especially applicable to such ores when containing a relatively small amount of copper, zinc, or base metals, which prevents their successful treatment by the ordinary cyanid process.

My invention and process consists in leaching the ores or tailings with a solution containing a quantity of free ammonia and a quantity of a cyanid.

It is known that the double cyanids of zinc and potassium and of copper and potassium have a solvent power for gold and that the cyanids of gold, silver, and copper and other base metals are soluble in ammonia.

I have discovered that on leaching some ores containing gold, silver, and copper with a solution containing two to three per cent. of ammonia and two pounds of potassium cyanid per ton of ore that the gold, silver, and copper were extracted.

It is not possible to give exact proportions of the ammonia and cyanid required, as they must be varied to suit ores of varying composition.

In the case of a low-grade material containing gold and silver with two or three tenths of one per cent. of copper (which is sufficient to prevent its treatment by the ordinary cyanid process) I would leach with a solution containing one pound or more of potassium or other cyanid to the ton, this depending upon the richness of the ore, and two or three pounds of ammonia to the ton.

Instead of using ammonium hydrate I may use a salt of ammonia, such as the sulfate, and mix lime or other alkali with the ore under treatment.

In some cases a small amount of an oxidizing agent may be used with the ammonia and a cyanid. If the material treated contains any ferrous salt, it should be removed by adding the ammonia solution and either an oxidizing agent, or it may be oxidized by the air, which prevents its conversion into a ferrocyanid. This should be done previous to the addition of the cyanid.

In some cases mercuric cyanid may be used instead of an alkaline cyanid. In the case of richer material containing a considerable proportion of copper a larger quantity of ammonia would be required. Theoretically sixty-three parts of copper require thirty-four parts of ammonia to dissolve it; but in practice I would always use an excess of ammonia.

In the case of tailings or other low-grade material requiring the use of very dilute solutions I would leach in ordinary vats fitted with suitable filter-bottoms.

In some cases agitation can be employed with advantages, and in such cases I would prefer to use a barrel fitted with an internal filter. The gold and silver may be recovered from the solution by electrolysis, precipitation by zinc, or other well-known process, and the copper or other base metals may be recovered by boiling off the ammonia and so precipitating the metals or by other well-known methods.

In some cases the solution can be used repeatedly, being brought up to the required strength at each treatment by the addition of the required amounts of cyanid and ammonia. In other cases the ammonia may be recovered by distillation and a portion of the cyanid may be recovered as cyanid of copper or zinc or other metallic cyanid by precipitation with a metallic salt or its neutralization by the addition of an acid.

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

1. The process of extracting metals from ores and the like, consisting in leaching the material containing the metal with a solution containing a quantity of free ammonia and a quantity of a cyanid salt.

2. A process of extracting metals from ores, consisting in pulverizing and leaching the

ores or materials with a solution in which a cyanid salt and free ammonia are present and adding to the solution an oxidizing agent.

3. The process of extracting metals from ores, consisting in leaching the pulverized material with a solution containing a cyanid compound, a salt of ammonia, and an alkali capable of liberating ammonia from the salt.

4. The process of extracting metals from ores, consisting in leaching the pulverized material with a solution containing free ammonia and a cyanid salt, and afterward recovering the metal by precipitation.

In witness whereof I have hereunto set my hand.

BERTRAM HUNT.

Witnesses:
GEO. H. STRONG,
S. H. NOURSE.