

UNITED STATES PATENT OFFICE.

JOHN COLLINS CLANCY, OF NEW YORK, N. Y., ASSIGNOR TO CLANCY METALS PROCESS COMPANY, A CORPORATION OF NEW YORK.

TREATMENT OF PRECIOUS METALLIFEROUS ORES.

998,749.

Specification of Letters Patent.

Patented July 25, 1911.

No Drawing.

Application filed March 17, 1910. Serial No. 549,953.

To all whom it may concern:

Be it known that I, JOHN COLLINS CLANCY, a subject of the King of Great Britain, having declared my intention of becoming a citizen of the United States, at present residing at New York city, borough of Manhattan, in the county of New York and State of New York, have invented certain new and useful Improvements in the Treatment of Precious Metalliferous Ores, of which the following is a specification.

My invention relates to novel methods of treating ores bearing precious metals, which methods are particularly described and pointed out in the following specification and claims.

I have discovered that when the pulverized ore is converted into a pulp by mixing the said ore with a substantially non-acid solution of a thiocyanate containing a halogen salt, and electrolyzing this mixture, that the precious metals only will be dissolved to the substantial exclusion of the baser metals, and that the above solution may be used with advantage in conjunction with the ordinary cyanid solution, and that this process may be successfully applied to either rebellious or non-rebellious ore without preliminary roasting even though such ores contain reducing agents or tellurium or both.

In treating ores containing among other compounds silver sulfids, it may not be necessary to add a halogen salt to the thiocyanate solution as the nascent oxygen produced by the electric current will act according to the second equation shown herein.

I give the following examples of my process without, however, limiting myself to the details of each:

Example 1: 2000 pounds of pulverized ore are suspended in a solution of 2 pounds of thiocyanate, 2 pounds of caustic soda or caustic lime, 1 pound of potassium iodid in an agitation tank, the mixture being in the proportion of two parts said solution to one part of ore. This mixture of ore and solution is continuously circulated for a period of eight hours through an electrolyzer having a current density of about 50 amperes per square foot of anode surface.

About from 90 to 120 amperes are used per ton of ore.

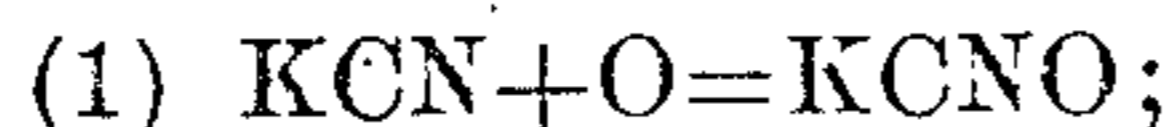
Example 2: 2000 pounds of pulverized ore are suspended in a solution of 2 pounds of thiocyanate, one pound of potassium cyanid, 2 pounds of caustic soda or caustic lime, 1 pound of potassium iodid in an agitation tank, the mixture being in the proportion of two parts said solution to one part of ore. This mixture of ore and solution is continuously circulated for a period of eight hours through an electrolyzer having a current density of about 50 amperes per square foot of anode surface. About from 90 to 120 amperes are used per ton of ore.

Example 3: 2000 pounds of the pulverized ore are suspended in a solution of 2 pounds of thiocyanate, 2 pounds caustic soda or caustic lime in an agitation tank, the mixture being in the proportion of two parts of said solution to one part of ore. This mixture of ore and solution is continuously circulated for a period of eight hours through an electrolyzer having a current density of about 50 amperes per square foot of anode surface. About from 90 to 120 amperes are used per ton of ore.

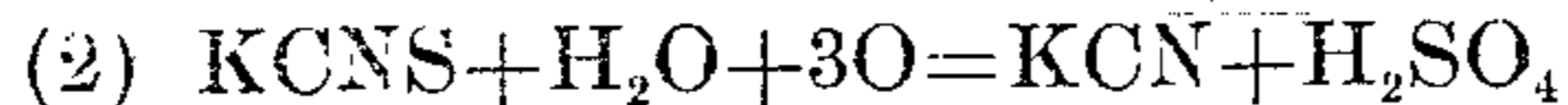
It will be seen that the function of the electric current is simply one to produce nascent oxygen or liberate iodine from the haloid salt. The electric current in the first and second examples liberates iodine from the contained potassium iodid which combines with the cyanid or the sulfo-cyanid to form cyanogen iodid. The cyanogen iodid as produced is an excellent solvent for gold contained in refractory ores containing gold tellurid, sulfids, arsenids, etc. In the third example, which does not contain halogen salt, the electric current generates potassium cyanid from sulfo-cyanid.

It may be seen from the following equations the reason for using thiocyanate alone or in conjunction with the simple cyanid solution in preference to the ordinary alkaline cyanid solution is that, if cyanid solution be used without containing sulfocyanid or the addition thereof, the nascent oxygen produced by the electric current destroys the cyanid by converting the same into cyanate, which is not a gold solvent,

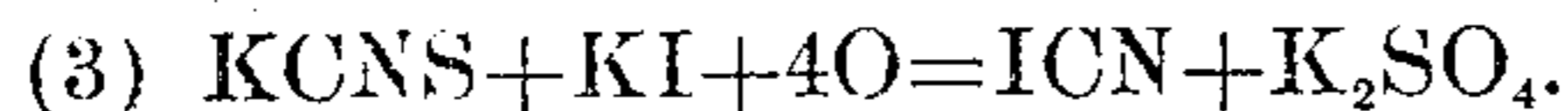
and, therefore, simply results in the destruction of the cyanid,—after the following equation



5 whereas by using thiocyanate the equation as



it will be seen from the equation No. 2 that
10 cyanid is produced when the solution is kept alkaline, and the cyanid so formed is not decomposed as long as there is thiocyanate present in the solution. By adding a halogen compound to the thiocyanate solution
15 which may or may not contain free alkaline cyanid and electrolyzing same, the following equation takes place:



20 The same solution can be used again and again by keeping up the requisite strength in thiocyanate, but no further addition of potassium iodid is necessary, except to compensate for mechanical losses. The nascent
25 oxygen produced by the electric current regenerates the iodine to begin its work over again. Between each operation it is desirable to pass the liquor through zinc shavings in the ordinary way to extract the
30 values which it contains.

In the above example the desired result is prevented if the solution be substantially acid, but the solution may be alkaline, neutral or slightly acid. By slightly acid, I
35 mean this: that while a solution of thiocyanate may be technically termed "slightly acid" because showing acidity to certain tests, yet for practical purposes it is substantially non-acid. Such a solution I call
40 a substantially non-acid solution as well as those which are alkaline or neutral.

Having thus described my invention and examples of different ways of carrying it into effect, it will be understood that various

modifications and changes in the described 45 processes may be made and equivalent substances may be employed without departing from the spirit of my invention and without exceeding the scope of my claims.

What I claim and desire to secure by Letters Patent of the United States is:— 50

1. The process of treating ore containing precious metals which consists in subjecting ore to a thiocyanate solution, containing a halogen salt, and electrolyzing the mixture. 55

2. The process of treating ore containing precious metals which consists in subjecting ore to a solution containing a thiocyanate, a soluble cyanid and a halogen compound, and electrolyzing the mixture. 60

3. The process of treating ore containing precious metals which consists in subjecting the ore to a solution containing thiocyanate, and a soluble iodine compound, and electrolyzing the mixture. 65

4. The process of treating ore containing precious metals which consists in subjecting ore to a solution containing a thiocyanate, a soluble cyanid, and a soluble iodine compound, and electrolyzing the mixture. 70

5. The process of treating ore containing precious metals which consists in subjecting the ore to a substantially non-acid solution of thiocyanate, and electrolyzing the mixture. 75

6. The process of treating ore containing precious metals which consists in subjecting the ore to a substantially non-acid solution of thiocyanate containing a soluble cyanid, and electrolyzing the mixture for a sufficient 80 period to extract the precious metals.

In testimony whereof I have hereunto signed my name to this specification in the presence of two subscribing witnesses.

JOHN COLLINS CLANCY.

Witnesses:

M. E. MCNINCH,
A. B. AHRENS.