

# UNITED STATES PATENT OFFICE.

FRANCIS J. HOBSON, OF GUANAJUATO, MEXICO.

## SELECTIVE SOLVENT FOR SILVER.

No. 827,368.

Specification of Letters Patent.

Patented July 31, 1906.

Application filed July 18, 1905. Serial No. 270,300.

*To all whom it may concern:*

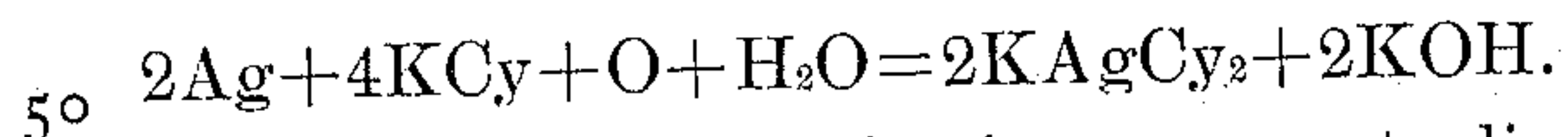
Be it known that I, FRANCIS J. HOBSON, a citizen of the United States, now residing at Guanajuato, in the Republic of Mexico, have invented certain new and useful Improvements in Selective Solvents for Silver, of which the following is a specification.

My present invention consists of a selective solvent for silver in ores the action of which has some points of affinity with and some of difference from that of cyanid solutions in dissolving silver or gold. It is particularly useful in those ores in which the silver is present in combination with sulfur, and as sulfur is present in almost all silver ores the selective affinity which forms the great utility of my invention is nearly always brought into play.

The particular solvent which I have devised and the selective action of which I have experimentally demonstrated many times is a mercurous potassic cyanid the formula of which is  $\text{KHgCy}_2$  and which forms with silver when present with sulfur a double salt, the cyanid of silver and potassium, freely soluble in water, and the sulfid of mercury, substantially insoluble in water and in ordinary metallurgical processes forming a part of the residue. The reaction to which I have referred may be expressed verbally as follows: silver sulfid + mercurous potassic cyanid = cyanid of silver and potassium + sulfid of mercury, or, in chemical symbols, as follows:



My improved solvent does not attack gold, and although it forms the same salt of silver and potassium in solution as cyanid of potassium when the latter dissolves silver it does not do so in the same manner, since potassium cyanid dissolves silver by the well-known Elsner's equation, which may be represented verbally as follows: silver + cyanid of potassium + oxygen + water = cyanid of potassium and silver + potassium hydrate or caustic potash, and in chemical symbols is represented thus—

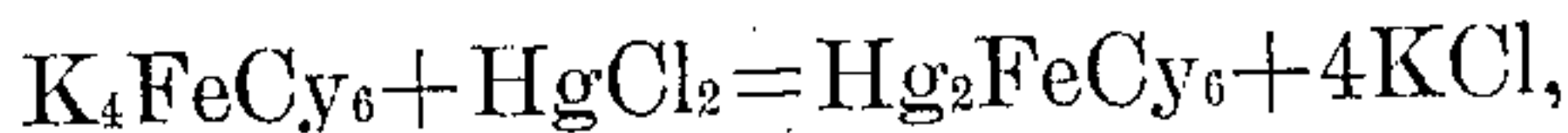


Free oxygen in solution is necessary to dissolve silver and form the double salt of potassium and silver with cyanogen. The same

equation applies to the solution of gold, gold replacing silver in it.

I may produce the mercurous potassic cyanid in any desired way, since the particular method of its production does not seem to affect the results. I may, for example, add mercurous chlorid ( $\text{Hg}_2\text{Cl}_2$ ) to a solution of potassium cyanid, ( $\text{KC}_y$ ).

Another method which I may use is to add mercuric chlorid (corrosive sublimate— $\text{HgCl}_2$ ) to the ordinary mill cyanid solutions containing ferrocyanid of potassium. The reaction here may be expressed verbally as follows: ferrocyanid of potassium + mercuric chlorid = ferrocyanid of mercury + chlorid of potassium, or, expressed in chemical symbols,



followed by the reaction which may be expressed verbally, thus: ferrocyanid of mercury + cyanid of potassium = ferrocyanid of mercury and potassium + mercurous potassic cyanid, or, expressed in chemical symbols,



The most suitable strength of the solution of the salt is of course to some extent dependent upon the silver content of the ore and the form in which the metal is present; but I have obtained good results with solutions from .05 to .50 per cent.

The metal may be separated from the solution in any of the approved methods used in the cyanid processes commonly employed, as by precipitation by zinc-dust or shavings, electrolysis, &c.

So far as I am aware, I am the first to use the described salt as a selective solvent for silver, whether in the precise manner suggested in the foregoing description or in other ways, and that feature I wish to protect by my claims.

In order to obtain the best results, the solution should be kept alkaline, and this may be effected by the addition of any suitable alkali, such as caustic potash or soda, although in most cases lime will be found to be not only the cheapest but the best alkali. Such changes as are necessary to adapt the solvent and the process of using it to the ordinary difficulties arising in the treatment of

varying ores I regard as within the skill of all competent metallurgical chemists, who will be able to apply the new agent under varying conditions from the directions contained in the foregoing specification.

Having thus described my invention, what I claim, and wish to protect by Letters Patent of the United States, is—

1. As a solvent of silver, a mercurous salt of cyanogen and an alkaline metal.

2. As a solvent of silver, an alkaline solution of a mercurous salt of cyanogen and an alkaline metal.

3. As a solvent for silver in ores, a solution of mercurous potassic cyanid.

4. As a selective solvent for silver when in

combination with sulfur, a solution of potassium cyanid to which has been added mercurous chlorid.

5. As a selective solvent for silver when in combination with sulfur, an alkaline solution of potassium cyanid to which has been added mercurous chlorid.

6. As a solvent for silver in the presence of sulfur, a solution of mercurous potassic cyanid, having the formula  $\text{KHgCy}_2$ , and of approximately .05 to .50 per cent. in strength.

FRANCIS J. HOBSON.

Witnesses:

T. J. JOHNSTON,  
MARY AGNES NELSON.



It is hereby certified that in Letters Patent No. 827,368, issued July 31, 1906, upon the application of Francis J. Hobson, of Guanajuato, Mexico, for an improvement in "Selective Solvents for Silver," errors appear in the printed specification requiring correction, as follows: In line 71, page 1, the symbol " $\text{HgCl}_2$ " should read  $2\text{HgCl}_2$ ; same page, line 8, after the word "ores," line 20, after the word "devised," line 21, after the word "times," line 22, after the word "cyanid," and line 40, after the word "silver," commas should be inserted; line 23, after the formula, a semicolon should be inserted, and line 41, after the word "manner," the comma should be stricken out and a semicolon inserted instead; and that the said Letters Patent should be read with these corrections therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 18th day of September, A. D., 1906.

[SEAL.]

E. B. MOORE,

*Acting Commissioner of Patents.*