

# UNITED STATES PATENT OFFICE.

GEORGE JONES ATKINS, OF LONDON, ENGLAND.

## CHLOROCYANID SALTS AND PROCESS OF MAKING SAME.

SPECIFICATION forming part of Letters Patent No. 578,908, dated March 16, 1897.

Application filed October 3, 1896. Serial No. 807,763. (No specimens.) Patented in England April 17, 1894, No. 7,648; in France April 10, 1895, No. 246,546; in Belgium April 10, 1895, No. 114,994; in Germany April 11, 1895, No. 86,098; in Victoria January 9, 1896, No. 12,801; in South Australia January 10, 1896, No. 3,115; in New South Wales January 11, 1896, No. 6,326; in Tasmania January 13, 1896, No. 1,547; in New Zealand January 27, 1896, No. 8,220, and in Western Australia September 24, 1896, No. 747.

*To all whom it may concern:*

Be it known that I, GEORGE JONES ATKINS, metallurgist, a subject of the Queen of Great Britain, residing at 35 East Bank, Stamford Hill, London, in the county of Middlesex, England, have invented certain new or Improved Chlorocyanid Salts or Compounds, (for which I have obtained Letters Patent in Great Britain, dated April 17, 1894, No. 7,648; in France, dated April 10, 1895, No. 246,546; in Belgium, dated April 10, 1895, No. 114,994; in Germany, dated April 11, 1895, No. 86,098; in Victoria, dated January 9, 1896, No. 12,801; in New South Wales, dated January 11, 1896, No. 6,326; in South Australia, dated January 10, 1896, No. 3,115; in Western Australia, dated September 24, 1896, No. 747; in Tasmania, dated January 13, 1896, No. 1,547, and in New Zealand, dated January 27, 1896, No. 8,220,) of which the following is a specification.

It is well known that chlorin and cyanogen are solvents of the metals, especially gold and silver, for example; but I have found that compounds of those bodies with alkaline metals or earths are very efficient agents for dissolving or leaching metals; and my present invention consists in the production of such compounds for use in dissolving and recovering or separating metals from their ores and from other substances with which they may be found combined or associated and for other purposes. For this purpose I fuse together a chlorid of an alkali and a compound of cyanogen with one or more alkaline or other bases, one at least of which is electropositive to the metal to be dissolved. This makes a fixed chlorocyanid salt or compound consisting of chlorin and cyanogen with one or more bases, which salt when dissolved in water makes a good solvent of the metals, especially of gold and silver.

The above-mentioned fixed chlorocyanid salt or compound is very stable and does not readily oxidize or split up when in solution. It is capable of being stored and of being transported from place to place with great fa-

cility, as it is less hygroscopic than potassium cyanid. It can be produced very cheaply.

The ingredients for forming the chlorocyanid salt or compound, which may be regarded as a double salt of chlorin and cyanogen, may be varied very considerably so long as they comprise on the one hand a chlorid of an alkali and on the other a compound of cyanogen with one or more alkaline or other bases, one at least of which is electropositive to the metal to be dissolved. The proportions of the ingredients may also be varied very considerably, according to circumstances. I have, however, obtained good results by using one part by weight of ferrocyanid of an alkali, such as potassium ferrocyanid, for example, to two parts by weight of chlorid of an alkali, such as sodium chlorid, for example. I divide these ingredients into small pieces by crushing, grinding, or otherwise, then thoroughly dry and mix them together, and then place them in a crucible, retort, or other suitable vessel and subject them to fusion at as low a temperature as possible consistent with obtaining perfect fusion of the ingredients. The temperature should be kept as low as possible in order to minimize loss by volatilization. When completely fused, the mass may be poured into molds or be otherwise prepared for use. I sometimes add a small quantity of carbon to the ingredients before or during the fusion to prevent splitting up of the cyanogen.

I have found sodium chlorid and potassium ferrocyanid most suitable for the purpose on account of their cheapness; but it is obvious that the analogues of those substances may be employed. For example, potassium chlorid may be substituted for sodium chlorid and sodium ferrocyanid for potassium ferrocyanid, &c.

The metal after being dissolved by a solution of the above compound can be recovered therefrom by electrolysis, or by precipitation or substitution, or by any other suitable known means, but preferably by such means as will enable the active solvent to be re-



tained for use again and again. For example, when the metal is deposited electrically from this solution the active solvent is liberated in the electrolytic cell in a condition to be used again, after being brought up to the required strength to dissolve more metal.

I am aware that solutions of potassium cyanid and of mixtures of solutions of sodium chlorid and potassium cyanid, and in some cases of these salts mixed with others, have been used for dissolving gold, silver, and other metals; but these are simply solutions of the salt or mixtures of solutions of definite known salts, and I make no claim to such solutions or mixtures of solutions.

I am also aware that the simple mixture of a solution of ferrocyanid of potassium with a solution of sodium chlorid, for example, is not a solvent of gold or silver; but the same salts compounded by fusion, as above described, and then dissolved in water form an excellent solvent for those and other metals.

The above-described compound salt is also useful for photographic purposes as a fixing agent. It is also useful for electrolytic purposes as an electrolyte in electrometallurgy. I claim—

1. The herein-described process of forming chlorocyanid salts or compounds consisting in fusing together a chlorid of an alkali and a compound of cyanogen with one or more bases, substantially as described. 30

2. The herein-described process of forming chlorocyanid salts or compounds consisting in fusing together ferrocyanid of an alkali such as potassium ferrocyanid and chlorid of an alkali such as sodium chlorid, substantially as described. 35

3. The improved chlorocyanid salts or compound consisting of a chlorid of an alkali and a compound of cyanogen fused together with one or more bases, one of which is electropositive to the metal to be dissolved. 40

4. The improved chlorocyanid salt or compound consisting of ferrocyanid of an alkali such as potassium ferrocyanid and chlorid of an alkali such as sodium chlorid fused together, substantially as described. 45

In witness whereof I have hereunto set my hand in presence of two witnesses.

GEORGE JONES ATKINS.

Witnesses:

STEPHEN EDWARD GUNYON,  
FRED. C. HARRIS.