

UNITED STATES PATENT OFFICE,

OSCAR FRÖLICH, OF BERLIN, GERMANY, ASSIGNOR TO SIEMENS & HALSKE,
OF SAME PLACE.

PROCESS OF EXTRACTING NOBLE METALS FROM ORES.

SPECIFICATION forming part of Letters Patent No. 556,092, dated March 10, 1896.

Application filed August 3, 1895. Serial No. 558,134. (No specimens.)

To all whom it may concern:

Be it known that I, OSCAR FRÖLICH, a citizen of the Swiss Republic, residing at Berlin, in the German Empire, have invented certain
5 new and useful Improvements in Processes of Extracting Noble Metals from Ores; and I do hereby declare the following to be a full, clear, and exact description of the invention, such
10 as will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to the extraction of noble metals from ores, and has for its purpose to obtain those metals free from the other metals present in the ore. If the ore
15 contains besides the noble metals—such as gold, silver, or platina—a considerable amount of other metals, the extracting process is usually carried out in the way that the latter are removed or remain in the residue, so as to
20 obtain a solution of substantially the noble metals, as especially is the case in treating the ores with chlorine. The removing of the ignoble metals frequently is a difficult operation, but was considered necessary on account of the known methods not being capable of allowing the noble metals to be obtained from the final solution separately from
25 other metals contained therein, so that a mixture would have resulted from which the noble metals were to be extracted by a separate process. It is, however, possible to extract by the aid of electrolysis the noble
30 metals from a lye containing also other metals, it being only necessary to so control the tension of the current that the ignoble metals are allowed to remain dissolved, while the noble ones are caused to separate out with practically sufficient speed. When a solution containing several metals is subjected to electrolysis and the tension of the current gradually increased, the metals will be caused to
40 separate out in the order of the places they occupy in the tension series—that is to say, that metal which is most electronegative will be deposited first, then the next one in the series, and so on. Therefrom it results that the noble metals being of the highest electronegative order will first separate out, while the ignoble ones will not be deposited until
45 the tension of the current has sufficiently increased. If, therefore, the electric tension is kept below that limit on which ignoble metals commence separating out, the noble ones

alone are deposited, and when the operation is continued for a sufficient length of time all
55 the amount of the latter will come out. It is obvious that by this way it is also possible to separate the noble metals from each other; but as for this purpose the electric tension would have to be altered within so narrow
60 limits as to make it a rather troublesome operation, and as, on the other hand, it is desired to obtain all the noble metals present, it will practically be sufficient to extract all of them in one operation.

The degree of electric tension to be applied is dependent upon different circumstances—viz., the acids the different metals are combined with, the concentration of the solution, and the nature of the different metals. It is
70 practically sufficient to state by experiments the limits of the electric tension for the lye which is obtained from the metallurgical process, so as to operate within these limits with the result of separating the noble metals. The limits of the electric tension, however, must be determined anew when from any cause the constitution of the lye gets altered. For instance, I mention that in operating on
80 a lye which contains five grains each of chloride of gold, copper, and iron in one pint, and using a lead cathode, a carbon anode and a current density of twelve ampères for each two square yards of cathode-surface, the limits of electric tension were between
85 1.2 and 1.4 volts—viz., mere traces of copper and iron were precipitated within these limits, while gold separated completely and with sufficient speed.

What I claim is—

The process of extracting precious metals from a lye containing also inferior metals, said lye containing substantially five grains of each of the said metals to the pint, which consists in subjecting the said lye to the action of an electric current of substantially
95 twelve ampères for each two square yards of cathode-surface, whereby the gold is separated by electrolysis, substantially as set forth.

In testimony whereof I have affixed my signature in presence of two witnesses.

OSCAR FROLICH.

Witnesses:

JOHN B. JACKSON,
OSCAR BIELEFELD.