UNITED STATES PATENT OFFICE.

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PROCESS OF RECOVERING PRECIOUS METALS FROM SOLUTIONS.

SPECIFICATION forming part of Letters Patent No. 555,483, dated February 25, 1896.

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To all whom it may concern:

Be it known that we, THOMAS L. WISWALL and JEROME B. FRANK, citizens of the United States, residing at Denver, in the county of Arapahoe and State of Colorado, have invented certain new and useful Improvements in Processes for the Recovery of Precious Metals from Solutions, of which the following is a specification.

Our invention relates to the preparation and composition of a metallic filtering material in the passage through which the precious metals contained in cyanide and other solutions are precipitated.

The best form into which a metallic precipitating agent can be formed is where it is broken up into fine hair-like threads, thin shavings, turnings or ribbons, denominated in this specification as "filaments," as in this form it supplies the greatest precipitating surface to a given amount of material; but when so broken up as to attain this highest degree of efficiency, unless combined with some other suitable metal into an alloy, it has not sufficient tensile strength to continuously retain the form in which it is deposited in the precipitating-box and consequently disintegrates and yields to the pressure of the percolating solution, by the flow of which it is carried forward and becomes compressed, thus retarding the flow of the solution and prevents by clogging the full utilization of the precipitating agent.

We have discovered that the metallic precipitating agent may be properly combined in alloy with any metal which imparts a greater tensile strength to the individual filaments without practical interference with the precipitating process, thus providing a strong, springy, spongy mass of such filaments, not liable to disintregation or harmful compression, as the interstices between the mass of filaments remain through the entire process without substantial change of form.

While in the preparation and composition of the precipitating filaments we do not confine ourselves to any particular process, for it may be applied to any process for the recovery of precious metals from solutions in which a metallic precipitating agent is used. We here show our method of procedure in the so-called "cyanide process," where the precipitating agent is zinc. This metal when broken up into filaments of the desired fineness is very soft, yielding and plastic. It readily disintegrates and it becomes compressed by the flowing of the solution through it, as it has not sufficient structural strength to resist the pressure of flow and thereupon becomes clogged. The interstices between the individual filaments become much diminished and some of them obliterated, while at other parts of the box spaces appear in which there is no precipitating agent present at all.

Refined zinc from which all the impurities have been removed has been used as a precipitating agent in the so-called "cyanide processes," and commercial zinc which contains about one per cent. of impurities, consisting of one or more of the following metals —namely, cadmium, antimony, arsenic, lead, and bismuth—has also been used as such agent. When finely subdivided so as to obtain the best results commercial zinc does not furnish a mass of filaments which will resist the tendency to compression and clogging which results from the flowing of the solution through it. The small percentage of hardening foreign metal in its composition does not furnish in this form a filtering material of the requisite structural strength, but we have discovered that "spelter," and by that term in this application we mean crude zinc as it comes from the smelter, and containing the same so-called "impurities" as commercial zinc, but in a greater degree, differing of course in different mines and amounting to more than three per cent. of the whole mass, generally possesses without being subjected to any treatment, except that of being divided into filaments, naturally the very quality of strength which is required in order to enable the filaments to withstand the compression of the flowing solution, and is therefore better adapted to the purpose than is pure zinc from which the beneficial impurities have all been removed, or commercial zinc from which they have been substantially removed. In artificially making the alloy we combine pure zinc with lead at about the ratio of twenty to one. We combine commercial zinc by adding to it as an alloy lead and whatever metal the peculiar composition of the commercial zinc may require to impart to the alloy the de-

sired structural strength when it is broken up into filaments, such as antimony, arsenic, bismuth, cadmium, or lead. Where spelter is used we comminute it into threads without previous treatment if, as generally the case, it is a ready-prepared alloy possessing the desired degree of hardness.

We do not claim the use of zinc as a precipitating agent or any particular form into which it may be comminuted.

Another advantage of using an alloy containing zinc, in combination with a greater percentage of foreign metals than is to be found in commercial zinc, is the fact that when the solution comes in contact with the precipitating agent electrolytic action commences, and this action is more energetic where the percentage of foreign metals is greater than in commercial zinc.

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

1. The process of extracting precious metals from cyanide solutions by causing said solutions to flow through a precipitating alloy consisting of a mass of hardened filaments composed of zinc and lead substantially in the proportion of twenty parts of zinc to one of lead substantially as described.

2. The process of extracting precious metals from solutions by causing said solutions to flow through a precipitating alloy, subdivided into a mass of hardened filaments, and composed of zinc, lead and one or more other metals which impart to said filaments a tensile strength sufficient to withstand the compression of the flowing solution, such as arsenic, antimony, cadmium or bismuth, and in which alloy there is present not more than ninety-seven per cent. of zinc, as and for the purpose indicated, substantially as described.

3. The process of extracting precious metals from solutions which consists in taking crude zinc, commonly called spelter, and subdividing it into a mass of filaments, when said crude zinc contains as an alloy, at least three per centum of lead and one or more other metals which impart to said filaments a tensile strength sufficient to enable them to withstand the compression of the solution which flows through them, such as antimony, arsenic, bismuth, or cadmium, and then passing the solutions through said mass of filaments, substantially as described.

In testimony whereof we affix our signatures in presence of two witnesses.

THOMAS L. WISWALL.
JEROME B. FRANK.

Witnesses:
CLIFTON A. WISWALL,
BENJAMIN F. KLEE.