UNITED STATES PATENT OFFICE.

ANDREW J. POLMETEER, OF WHITEHALL, MONTANA, ASSIGNOR OF TWO-THIRDS TO JOSEPH MITCH AND ALBERTA Q. DYGERT, OF BUTTE, MONTANA.

PROCESS OF PRECIPITATING COPPER FROM WATER.

SPECIFICATION forming part of Letters Patent No. 699,009, dated April 29, 1902.

Application filed January 10, 1902. Serial No. 89,117. (No specimens.)

To all whom it may concern:

Be it known that I, ANDREW J. POLMETEER, a citizen of the United States, residing at Whitehall, in the county of Jefferson and State of Montana, have invented a certain new and useful Process and Preparation for Neutralizing the Acid or Corrosive Effect of Copper-Water and Precipitation and Recovery of Copper Therefrom, of which the following is a specification.

While my invention is not limited to the treatment of any specific solution containing copper salts, it is particularly intended for the treatment of what is commonly termed "copper-water," which comes from copper-bearing geological formations—such, for instance, as the water pumped from copper-mines containing copper sulphate in solution. This copper-water rapidly corrodes and destroys the metal of the pumps and conducting-pipes used in pumping it from mines, and on account of its destructive effect it has heretofore been necessary to line the pumps and conducting-pipes with a non-metallic lining at great expense. Even where such lining is used the copper-water works through it and attacks and corrodes the metal.

One of the principal purposes of my present invention is to avoid the corrosion of the pumps and conducting-pipes by neutralizing the copper-water before it enters the conducting-pipes, so that the copper-water treated according to my invention may be pumped through ordinary metal pipes without injury to the pipes.

The copper-water as pumped from mines or as otherwise issuing from the earth contains in solution copper salts from which the copper has not heretofore been completely recovered. It is the purpose of my invention to completely precipitate the copper from such salts, as well as from those from which the copper has heretofore been recovered, and to thus recover the full metallic values from the copper-water.

The particular point of my invention lies in the fact that I treat the copper-water before it enters the conducting-pipes, precipitating the copper and at the same time neutralizing whatever free acid may be contained in the water, so that the liquid containing the precipitate in suspension enters and passes through the pipes of the pumping system without corrosive effect.

In carrying out my invention I employ as a precipitant a liquor containing compounds of sulfur and lime, as well as hydrate of lime. This liquor is prepared by boiling sulfur and unslaked lime (CaO) in water in the proportions of one part of sulfur to four parts of lime, the mixture of sulfur and lime being in the proportion of about twenty ounces to a gallon of water. By this process the lime and sulfur unite to form a soluble sulfid of calcium, probably calcium penta-sulfid (CaS_5) and calcium thio-sulfate, (CaS_2O_3,) the excess of lime forming calcium hydrate, $Ca(OH)_3$. In order to form these compounds, it is usually necessary to continue the boiling for about one hour, when the liquor is ready for use.

In treating copper-water the precipitant solution is used in different proportions, varying with the percentage of metallic values contained in the water. For instance, where the water contains forty-six thousandths per cent. of metallic values to the ton of the copper-water I use one-half ounce of the precipitant solution to one gallon of the water to be treated. The precipitant is simply poured into the copper-water immediately before it enters the pipes of the pumping system, and when used in approximately the proportions stated it precipitates the metallic values in the form of a precipitate, which is readily held in suspension to such an extent that the liquid may be readily pumped from the mine. The precipitate contains copper, chiefly in the form of cupric sulfid (CuS) in combination with some oxids of iron and other metals usually present in the copper-water and a small proportion of oxid of copper, (CuO.)

The calcium hydrate of the precipitant neutralizes whatever free acid may be present in the water, and thus prevents corrosive action on the metal parts of the pumping system. The water containing the precipitant in suspension is raised to the surface by the pump-

ing system and discharged into tanks, where the precipitate may be permitted to settle or may be separated by filtration. The precipitate thus obtained may be treated by smelting or in any other suitable manner to recover the metallic copper therefrom.

I do not herein claim the precipitant for copper-water above described, such precipitant forming the subject-matter of an application filed in the United States Patent Office on March 31, 1902, Serial No. 100,865.

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

1. The herein-described process for the treatment of copper-water, which consists in adding to such water before it enters the pipes of the pumping system, a precipitant solution containing an excess of alkali.

2. The herein-described process of treating copper-water, which consists in adding to such water a precipitant solution containing an excess of alkali, forcing the water containing the precipitate in suspension through pipes, and subsequently separating the precipitate.

3. The herein-described process of treating copper-water, which consists in adding to such water before it enters the pipes of the pumping system, a precipitant solution containing a calcium sulfid and an excess of calcium hydrate.

The foregoing specification signed this 3d day of January, 1902.

ANDREW J. POLMETEER.

In presence of—

ROY S. ALLEY,

EDGAR N. ALLEY.