allowed for the various reactions to take place, and these may be hastened by causing the shaft in the first-mentioned tank to revolve. After the lapse of a sufficient period (generally about one hour) the reactions are complete, and the liquid matter is drawn off from the powdered ore or other compound which has been under treatment by means of a cock, and run into a fourth tank, so constructed that its contents may be heated if desired by means of a steam coil or otherwise. After the liquid matter has been run off, the treated pulverised ore or compound is well washed with water, the washing being effected by water being run into the first-mentioned tank, and by causing the shaft in it to revolve. This water is next run off, and added to the liquid in the fourth tank.

The precipitation of the gold, along with other matter, is then effected by adding a sufficiency of stannous chloride. This precipitation may be hastened and perfected by heat, but heat is not necessary to be applied if a reasonable time is allowed for complete precipitation, say, twelve hours. The precipitate is collected, washed with water, dried, calcined or cupelled to get rid of foreign matter, and the gold in it is then melted and run into bars, and will be found, if the operations have been properly conducted, practically chemically pure.

The ore or other compound from which the said extraction of gold has been made still contains its silver, which, being in the form of chloride of silver, has not been dissolved out by either the chlorous solution or the water, but it is recoverable by using any of the known solutions in which chloride of silver dissolves in, and then proceeding according to known means to procure it in its metallic condition.

It is manifest that the operation which has been described can be varied, and similar results obtained in a variety of ways—namely, the order of saturation with the solutions may be reversed, the oxalic acid and the hypochlorite of lime, one or both, may be mixed with the pulverised or other compound in a dry, or partially dry, condition, and the reactions necessary to be obtained by saturation with water.

The drawing shows the apparatus I employ. A is the tank into which the pulverised ore is introduced, and B is a stirrer in it fixed on the axis $B^1$, which is caused to slowly revolve. The bottom bar of the stirrer is armed with brushes C, acting upon the horsehair filter-cloth D. E is a cock by which the liquid is discharged into the tank; F and G is a cock for emptying and cleaning; H H are two tanks, one for the oxalic acid, and the other for the hypochlorite, each being provided with a stirrer $H^1$ and a cock and pipe J, leading the liquid into the tank A.

If upward filtration is desired, the pipe J leads to the bottom of the tank A, as shown in dotted lines. K K are the test-cock.

Having now particularly described and ascertained the nature of my said invention, and in what manner the same is to be performed, I declare that what I claim is,—

1. In obtaining gold and silver from ores and other compounds, the use of oxalic acid as a preliminary treatment to existing processes, substantially as described.

2. In obtaining gold and silver from ores and other compounds, the use of oxalic acid and a hypochlorite, substantially as described.

3. Precipitating gold from solutions containing oxalates and chlorides by means of stannous chloride, substantially as described.

4. Obtaining gold and silver from ores and other compounds, substantially as described.

5. The apparatus for obtaining gold and silver from ores and other compounds, substantially as described and shown in the drawings.

Dated this 30th day of March, 1894. JAMES NICHOLAS.

IMPROVEMENTS IN, AND IN CONNECTION WITH, THE EXTRACTION OF GOLD AND SILVER FROM ORES OR COMPOUNDS CONTAINING THE SAME, AND IN THEIR RECOVERY FROM SOLUTIONS.

I, John Cunninghame Montgomerie, of Dalmore, Stair, in the County of Ayr, Scotland, Justice of the Peace, do hereby declare that the nature of my invention for "Improvements in, and in Connection with, the Extraction of Gold and Silver from Ores or Compounds containing the same, and in their Recovery from Solutions," and the manner in which the same is to be used, are particularly described and ascertained in and by the following statement:—

This invention relates, first, to the treatment of auriferous and argentiferous ores or compounds for the purpose of separating and collecting the gold or silver contained therein; secondly, to means for rendering the filtering solution comparatively free from muddy particles; thirdly, to means for regenerating the precipitating agent used during the process of extracting the said metal or metals from the solvent solutions; and, fourthly, to the separation from the water of the cyanide of potassium or other cyanide when such solvent agent is employed.

In applying my invention to the treatment of ores containing gold or silver, or gold and silver, I crush or grind the ore sufficiently fine to admit of its passing through a sieve of from forty to ninety meshes to the lineal inch, according to the nature of the ore. The pulverised ore is subsequently treated in a barrel or vessel along with water in sufficient quantity to render the mixture of the consistency of cream or very thin mud. The water is put into the barrel or vessel, and the following chemicals added thereto: Cyanide of potassium or of sodium or other cyanide or a mixture of cyanides, sodium-oxide or its hydrate (caustic soda) or other alkaline oxide, and nitrate of soda or of potash or of ammonia or other suitable equivalent nitrate or a nitrite. To the ore I add from ½lb. to 2lb. or more, as circumstances demand, of sodium-dioxide or other alkaline dioxide, and immediately charge the same into the barrel and close the inlet. The barrel is then revolved for a short time in order to thoroughly mix its contents. I prefer to let the chemicals dissolve before introducing them to the barrel; the sodium-dioxide being, however, mixed in a solid state with the ore. The barrel is then charged with air—oxygenated air or oxygen—to a pressure of from 50lb. to 100lb. per square inch. When oxygen is used, sodium-dioxide is not required; with some ores, air or oxygen under pressure is not needed when sodium-dioxide is employed, in which