

# UNITED STATES PATENT OFFICE.

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BY DIRECT AND MESNE ASSIGNMENTS, OF ONE-THIRD TO SAMUEL C.  
MACKY AND ARTHUR M. MYERS, OF SAME PLACE.

## METHOD OF EXTRACTING GOLD AND SILVER FROM ORES, &c.

SPECIFICATION forming part of Letters Patent No. 553,115, dated January 14, 1896.

Application filed July 20, 1893. Renewed June 17, 1895. Serial No. 553,153. (No specimens.)

*To all whom it may concern:*

Be it known that I, DAVID RANKEN SHIRREFF GALBRAITH, a subject of the Queen of Great Britain, at present residing in Auckland, New Zealand, have invented a new and Improved Method of Extracting Gold and Silver from Ores, &c., of which the following is a full, clear, and exact description.

The object of the invention is to provide a new and improved process for the treatment of gold and silver ores to rapidly and economically extract the precious metals from the materials containing the same.

The process consists of subjecting the pulverized ore to the action of heat and a molten alloy containing sodium or its equivalent as the active agent.

This process is applicable to a large variety of ores containing precious metals. The ores most suitable, however, are those in which the minimum amount of sulphur exists in metallic combinations other than the precious metals.

Sulphides and tellurides of silver and gold are very rapidly decomposed by this method of extraction and the precious metals secured. In applying the method several mechanical contrivances may be adopted; but for the purpose of illustration I shall adopt a revolvable cylinder made of iron and placed horizontally and suitably supported. This cylinder is lined with fire-clay bricks in the form of rings or of other suitable form admitting of easy replacement. Outside the cylinder is a coating of asbestos or other non-conductor, and which is kept in place by means of a sheet-iron jacket properly hooped. The cylinder may be made of any convenient size, to contain when one-third full from one hundred-weight to a ton of ore, and provided with suitable means of charging and discharging. Into this cylinder I throw sufficient glowing charcoal to heat it up to the melting-point of lead, blowing in air by any suitable means—bellows, for example. When hot enough, I then run in any desired quantity of sodium and lead alloy. I find lead containing about three per cent. of sodium a suitable proportion to use as a constant, adding rich sodium-lead alloy as the sodium becomes consumed by the sulphides, tellurides, chlorides, &c., of the precious metals or by other base sul-

phides which may unavoidably be present in the ore being treated. The proportion of alloy to ore may be about three per cent. or more, as found convenient or advisable. When the alloy has been run into the cylinder, the desired quantity of ore, in powder, is then introduced, (and in the case of the cylinder apparatus the ore should be red hot,) a quantity of glowing charcoal added, as may be required, and the cylinder made air-tight, a small spring-tap being provided at the axis of the cylinder to admit of the adjustment of the outside and inside pressure on the cylinder. The cylinder on being revolved upon its axis insures the contact of the ore and molten alloy, the sodium of the alloy uniting with the sulphur, tellurium, &c., combined with the precious metals, thereby liberating the latter, which immediately alloy with the lead. In an hour or so it will be found that the extraction is completed. The contents of the cylinder is then discharged into water, so that cooling may be quickly effected, when it will be found that part of the alloy is distributed throughout the mass of ore and that particles of lead and ore are here and there adhering. The whole contents of the cylinder as discharged is passed through rolls, which detach the lead and ore, flattening out the former. Then comes concentration, by which the lead alloy containing bullion is separated from the ore, and this, along with the larger pieces of lead, is passed on to the next charge, if not rich enough to cupel at once. When the cylinder has been discharged no time is lost in introducing another charge of ore, so that the heat may be conserved, the heat of the red-hot charge of ore being sufficient to perpetuate the working temperature.

Instead of lead, zinc might be used, if found more suitable, or an alloy of lead and zinc, or any other metal or alloy commending its adoption as an alternative. Potassium might also be used instead of sodium, if ever produced cheaply enough and found to be of equal working value, or an admixture of potassium and sodium, if expedient or of working value.

Instead of charcoal, coal-gas or other suitable gas may be used, the cylinder being provided with a tubular shaft adapted to admit such gas. I do not, however, restrict myself



to any special form of plant, but reserve the right to use any plant I may find most suitable for the purpose of securing contact of ore with alloy in a non-oxidizing atmosphere.

5 Having thus described my invention, I claim as new and desire to secure by Letters Patent—

The herein described process for the treatment of gold and silver ores, consisting in

heating the pulverized ore and subjecting it to the action of a molten alloy containing sodium or its equivalent as the active agent, substantially as described.

D. R. SHIRREFF GALBRAITH.

Witnesses:

JOSEPH JAMES MACKY,

SAMUEL COCHRANE MACKY.