or becomes present, a sulphide soluble therein which retards and objectionably affects the action of the cyanide on the precious metals.

Our invention consists in removing or rendering inert such sulphide by adding to the solution of cyanide, or to the ore, or to the mixture of ore and cyanide solution, a suitable salt or compound of a metal which will form with the sulphur of the sulphide a sulphide which is practically insoluble or inert in the cyanide solution, or which will materially diminish the objectionable action.

In carrying out our invention, we may use any one or more of various metallic salts or compounds, of which the following may be mentioned by way of example, preference being given to them in the order in which they are noted, namely: Salts or compounds of lead, such as plumbates; carbonate, acetate, or sulphate of lead; or salts or compounds of other metals, such as sulphate or chloride of manganese, zincates, oxide or chloride of mercury, and ferric hydrate or oxide. The proportion to be used in any case will depend on the proportion of soluble sulphide which has to be dealt with in the cyanide solution applied to the particular ore, and is easily and most conveniently ascertained by trials of a few small samples in each case. In the case of some ores containing sulphur, we find that the addition of salts or compounds, as and for the purpose hereinbefore referred to, and especially those of lead and mercury, increases the percentage of precious metals obtained.

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

1. In the Macarthur-Forrest process for extracting gold and silver from ores and the like, the addition to the cyanide solution, or to the ore, or to the mixture of ore and cyanide, of salts or compounds of lead, substantially as and for the purposes hereinbefore described.

2. In the Macarthur-Forrest process for extracting gold and silver from ores and the like, the addition to the cyanide solution, or to the ore, or to the mixture of ore and cyanide, of any one or more of the metallic salts or compounds hereinbefore indicated, and capable of forming insoluble sulphides, as and for the purposes hereinbefore described.

JOHN STEWART MACARTHUR.
CHARLES JAMES ELLIS.

Dated 29th June, 1893.

AN IMPROVED METHOD OF, AND APPARATUS FOR, DISSOLVING, LEACHING, AND FILTERING.

We, John Storer, of Sydney, in the Colony of New South Wales, consulting chemist, and Benjamin Thomas Lacy, of San Francisco, California, one of the United States of America, mining engineer, do hereby declare the nature of our invention for an improved method of, and apparatus for, dissolving, leaching, and filtering, and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

This invention relates to an improved method of, and apparatus for, dissolving, leaching, and filtering various substances or mixtures—as, for instance, in the treatment of ores and minerals for the extraction of their metal contents by "wet methods," in the production of chemical substances, in the treatment of the refuse of industrial works, in the treatment of sewage, and in other treatment of other materials or mixtures requiring to be dissolved, leached, or filtered. By this invention economy in working and greater speed are effected in the solution, leaching, and filtration of all substances or materials requiring to be so treated, or to separately undergo each such process.

This improved method of dissolving, leaching, and filtering consists in the forced circulation in closed vessels, by means of direct steam or gaseous pressure, of the solvent or leaching liquid, or material to be filtered, as the case may be; and the improved apparatus consists of specially-devised closed vessels, and of special combinations and arrangement of said vessels, with valves and connections, by means of which such method may be carried into practical effect.

But, in order that this invention may be clearly understood, reference will now be made to the drawings herewith, in which Fig. 1 is an elevation partly in section of an improved apparatus for carrying out the improved method or process of dissolving, leaching, and filtering; and Fig. 2 an enlarged sectional elevation of a steam-distributor.

A A^1 are vessels or tanks into which the material to be operated on is charged. Each tank is preferably cylindrical, with ends B B^1 B^2 tapered as shown. These ends, like the body of the tanks, are flanged and fixed to the body in any convenient way. The bottoms B^1 are hinged at C to permit of easy emptying. For that purpose the bottoms are lowered by chains worked over pulleys D D^1 from the winches F F^1, or from other suitable hoisting and lowering gear. After emptying, the bottoms are hoisted back into position and bolted. They are then ready for a fresh charge. Fixed near the top of the ends B^1 are false bottoms G G^1, such as are used in lixiviation or filtering, prepared as is customary, and covered with any desired cloth, sacking, or other suitable filtering medium. E E^1 are cylindrical vessels or tanks fitted with tops H H^1, preferably tapering 75° from the horizontal, as shown.

It is to be understood that one or more perforated plates might be used to act also as distributors of steam over the surface of the contents of the tanks. These may be fitted or rest upon internal flanges on the inner periphery of said tanks in any desired positions. An inverted cone J (as shown enlarged in Fig. 2), having also preferably a taper of 75°, as above, is fitted at the top of each tank H H^1. Each cone serves, in conjunction with the tops H H^1, as a "distributor" and equaliser of the steam pressure upon the surface of the liquid contents of the tanks E E^1. Steam is admitted into the "distributor" from the steam-pipes L L^1, and thence passed through inlets K (say three, equidistant from one another) into the tanks. The taper of 75° from the horizontal is that which in practice has been found to produce the best and most economical working-result, although we do not confine ourselves to that exact angle.

By using steam direct from a steam boiler, the arrangement detailed above is found to work in such a manner that, whatever the steam pressure from the steam boiler employed may be, a working equivalent result is obtained in the tanks E E^1, and therefrom by the connecting-pipes M M^1 to tanks A A^1.