case the ore may be treated in tanks, with or without agitation. When there is no agitation it is preferable to allow the solvent liquid to percolate through the mass of ore repeatedly; the liquid as it passes away being fed back to the surface of the ore until the precious metals are sufficiently dissolved. Under such procedure the sodium-dioxide, instead of being mixed with the ore, may be dissolved in the solvent solution in very small quantities at a time, so as to prevent any violent action or great loss of oxygen occurring. By way of example, a refractory ore of a muddy character, containing 8oz. of gold and 50oz. of silver per ton, may be treated with 10lb. of cyanide of potassium, 10lb. of caustic soda, and 7lb. of nitrate of soda, with 1½lb. of sodium-dioxide added to the ore. These proportions should, however, be varied considerably with different descriptions of ore; the most suitable proportions being readily determined by experiment. Should the other chemicals mentioned be employed, the same proportions may be used. The barrel is then again revolved and maintained in motion until the precious metals are dissolved; with average ores the time occupied being from four to six hours. The barrel is thereupon emptied, the contents filtered and washed, and the solution treated in any known manner for the separation of the precious metals; an important advantage, resulting from the use of a nitrate or nitrite as hereinbefore described, is that the liquid filtered from the tailings is tolerably free from muddy particles, any matter left in suspension settling quickly, so that charcoal used as precipitant is not liable to become choked by sediment. I have found with many ores that, when cyanide alone is used, the liquid is very muddy, and takes weeks or even months to settle; whereas a solvent solution containing a nitrate or nitrite becomes fairly clear in a day or so after filtration from the tailings.

In treating the liquid received from the filters, and containing the precious metals in solution, as also the unused solvent and other chemical agents employed, I pass the said liquid through a filter containing charcoal, preferably wood charcoal, or through a series of such filters, the construction of which is hereinafter more particularly referred to. When dealing with a chlorine gold solution it has hitherto been the practice to burn the charcoal when it fails in its precipitating action, and forthwith to proceed with the recovery of the precious metals therefrom. Instead of following this course I place the charcoal in a retort, and distill off any moisture or volatisable matter it may contain, bringing it, if necessary, to a red heat or nearly so. After having been allowed to cool, the charcoal, still containing the precious metals, is returned to the filter, and re-used for the precipitation of a further quantity of the precious metals.

Instead of removing the charcoal from the filter and charging the same into retorts for the purpose of regeneration it may be treated *in situ* by passing there through superheated steam, air, carbonic acid gas or nitrogen, or other suitable gas, at such a temperature as to drive off the water and other volatilisable matter; in order to cool the charcoal quickly for re-use, I pass air or other gas in a cool state through the filter. When air or other gas capable of supporting combustion is employed care must be taken not to apply the same at such a temperature, or whilst the charcoal is at such a temperature, as would result in combustion.

The above-described process of regeneration in retort or by superheated steam, air, or other gas is repeated whenever the charcoal fails to perform its functions, and until it becomes so charged with the precious metals that it is no longer capable of acting satisfactorily as a precipitant; whereupon it may be used as fuel for heating the retorts or the steam, air, or gas heaters. The carbonic acid yielded at this stage may be applied to the purpose hereinbefore referred to. Finally, the ashes are collected and the gold and silver extracted therefrom by smelting or by amalgamation.

In constructing a charcoal filter adapted for use in my improved process, I employ an iron vessel containing wood charcoal in a powdered or granulated state (capable of passing through a ⅜in.-mesh sieve) about 2ft. thick and lightly rammed. The vessel is provided with a false bottom covered with asbestos or other non-combustible fabric or material. A sheet of asbestos cloth or perforated iron is also placed upon the top of the charcoal to prevent it from floating, and to protect it against disturbance. The filter is closed with a removable top, and is furnished with pipe-connections for the liquid, and for the gas admitted for regenerative purposes. No claim is, however, made in respect of this construction or of the particular details.

Where, owing to the presence of much fine ore in the solution, there is a tendency for the filter to clog, the solution may, prior to its arrival in the charcoal filter, be passed through a mechanical filter of any suitable description, or the solution may be run into tanks and allowed to stand till the matter in suspension is precipitated.

If it be desired to extract substantially the whole of the cyanide as well as the precious metals, percolation should be allowed to take place slowly through a dense mass of charcoal. Under such circumstances the effluent is rendered fit for discharge to a watercourse. Two or more filters may be used in succession. If it be required to save the cyanide, a less dense filter is employed and more rapid action permitted, in which case the water escaping from the filter contains cyanide in solution. Such cyanide solution may be re-used in washing tailings, or, after fortification with cyanide, in the treatment of ore.

By the hereinbefore described method of dealing with auriferous and argentiferous solutions in charcoal filters, and by the repeated regeneration of the charcoal without extracting the precious metals contained therein, the contamination of the said metals which takes place when a zinc percolator is employed is avoided, the action is more expeditious, and the cyanide can either be removed altogether from the liquid or to a large extent saved for further use.

Having now particularly described and explained the nature of my said invention, and in what manner the same is to be performed, I would have it known that I do not claim any exclusive right to the employment in the extraction of the precious metals of cyanide of potassium or other cyanogen-yielding agent, or alkali or alkaline oxide, or nitrate or nitrite; neither do I claim the exclusive use of charcoal as a precipitating agent; nor do I claim the treatment of the mixture of ore and solvent in the presence of oxygen or of air under pressure; but I declare that what I claim is,—