

provided on the covers CC^2 and the body A , so as to permit of the bolts being readily removed and replaced and the covers detached and fixed, rings of india-rubber or other suitable packing-rings g being interposed between the flanges to render the joints fluid-tight. The pipes ee^2 in the covers CC^2 communicate (when the covers are fixed in position on the body of the vat) by passages ii^2 in the flanges h with pipes kk^2 connected to one of the trunnions on which the vat turns. This trunnion, as shown in the enlarged section Figure 4, consists of two parts DD^2 , the part D being fixed to the vat A and fitted to turn on the part D^2 , which is held stationary by the bracket k^3 , through which pass the pipes mm^2 entering the part D^2 . The trunnions D , E , are mounted in bearings F carried on standards G , at a suitable height to admit of the vat being turned upon its trunnions. The part D of the trunnion shown in Figure 4 is provided with passages dd^1 , with which the pipes kk^2 communicate, and in the part D^2 of the trunnion are passages d^2d^3 which communicate with the passages dd^1 . Into the passages d^2d^3 are screwed pipes mm^2 , which pass through a gland l fitted into the outer end of the part D . To the outer end of the pipe m^2 is secured a tube p^2 leading to the delivery end of a force-pump N or other device, by means of which the leaching liquor can be forced into the vat A . A pipe p is connected to the pipe m communicating with the vat containing the solution. The vat A being charged with the ore to be treated, leaching liquor is forced upward through the said vat by the pump N , the said liquor being conducted by the pipes p^2 and m^2 and passage d^3 in the part D^2 of the trunnion into the passage d^1 , and by the pipe k connected to the part D of the trunnion, and to the pipe e fixed to the cover C of the vat. The liquor enters the space d^4 between the cover C and the filter B , and passes thence through the filter B and upward through the ore in the vat. It then passes through the upper filter B^2 into the space D^5 between the said filter and the cover C^2 , and out therefrom by the pipe e^2 into the pipe p^2 , by which it is conducted into the passage d in the part D of the trunnion, and passes thence by the passage d^2 and pipe m in the part D^2 of the trunnion into the pipe p , by which it can be conducted back to the vessel Q from which it was drawn.

"An upwardly-forced circulation of the leaching-solution through the ore contained in the vat A is thus effected, and this circulation may be maintained for any desired length of time. After a time the vat A may be turned on its trunnions upside down so as to reverse the passages; the passage d in the part D of the trunnion then communicating with the passage d^3 in the part D^2 , and the passage d^1 in the part D communicating with the passage d^2 in the part D^2 . The liquor passes through the ore in the same direction as before, but as the filter B^2 which is shown in the drawing uppermost is now lowermost, and the filter B which is shown lowermost is now uppermost, a clear, or comparatively clear, filter is presented at top, and the lower filter becomes clear of matter which may have clogged it.

"The turning or reversing of the vat A may be effected by a pulley on an extension of its trunnion, or by any other suitable means; for instance, as shown, by means of a worm-wheel E^3 fast on the trunion E of the vat, with which worm-wheel gears a worm H on a spindle carried in bearings I .

"The spindle of the worm H may be provided with a hand-wheel or a pulley, to which power is applied, by means of which the worm H may be rotated, and, through the wheel E^2 , give a semi-rotation to the vat as required. For raising the lids or covers CC^2 when unfastened from the body A , I may use an overhead crane, or the like, attached to eyes in the cover by chains, so as to raise the cover from the body, and then the crane, together with the cover, may be run along rails from over the body A ; or I may use a device like a ship's davits to swing between two vats. To insure the covers being properly placed in position, they may be provided with projections which enter sockets formed in or attached to the body A of the vat.

"The solution of cyanide of potassium and of sodium salt, or of cyanide of potassium alone, is first mixed in a vessel such as is shown at Q , and the pump draws it therefrom and passes it at greater atmospheric pressure into the ore-vat, through the inlet under the lowermost filter, and up through the ore in the vat, and maintains a circulation of the solution through the vat for any desired time, as hereinbefore explained.

"The circulation of the solution is continued until the precious metals are in solution, and then the pipe p , being connected to the precipitator R , the solution containing the said metals is forced from the vat A , and passed upwards through the precipitator R , which contains an alloy of zinc, with any suitable electro-positive metal (such as sodium or potassium), cut into shavings, or otherwise divided. A suitable alloy consists of zinc, with about $2\frac{1}{2}$ per cent. of sodium, and a trace of cadmium may be added to the alloy if desired. The precipitator shown consists of a vessel with an inlet at bottom and a filter R^2 at the upper part, above which is the outlet R^3 . The said solution may be caused to circulate any desired number of times through the precipitator by connecting the suction-pipe of a pump to the outlet R^3 , and the delivery of the said pump to the pipe p . The solution is passed away from the precipitator by the outlet pipe R^3 for regeneration and re-use if desirable, the precious metals having been taken up by the alloy, from which it may be obtained in any suitable or well-known way. After the solution has been drawn from the vat A , water may be passed (preferably upwards) through the ore in the vat to wash it of all remaining traces of chemicals and metal, and this water is passed through the precipitator to obtain the metal.

"The vat A^2 is worked in a similar manner to that hereinbefore described with reference to the vat A , a separate pump N^2 being preferably provided as shown, and may then be run away to any suitable place by the pipe R^3 . The aforesaid operations are repeated with each charge of ore.

"To obtain the gold from the zinc-alloy the said zinc-alloy, which has become coated with gold, is introduced into the cylinder S , which has a periphery of wire-netting, or the like (fine enough to prevent the passage of the particles of zinc-alloy). The said cylinder S is revolved in water contained in the vessel T , until, by friction of the particles, the precious metals fall through the periphery of the cylinder S into the bottom of the vessel T , and from it they are collected and melted down.