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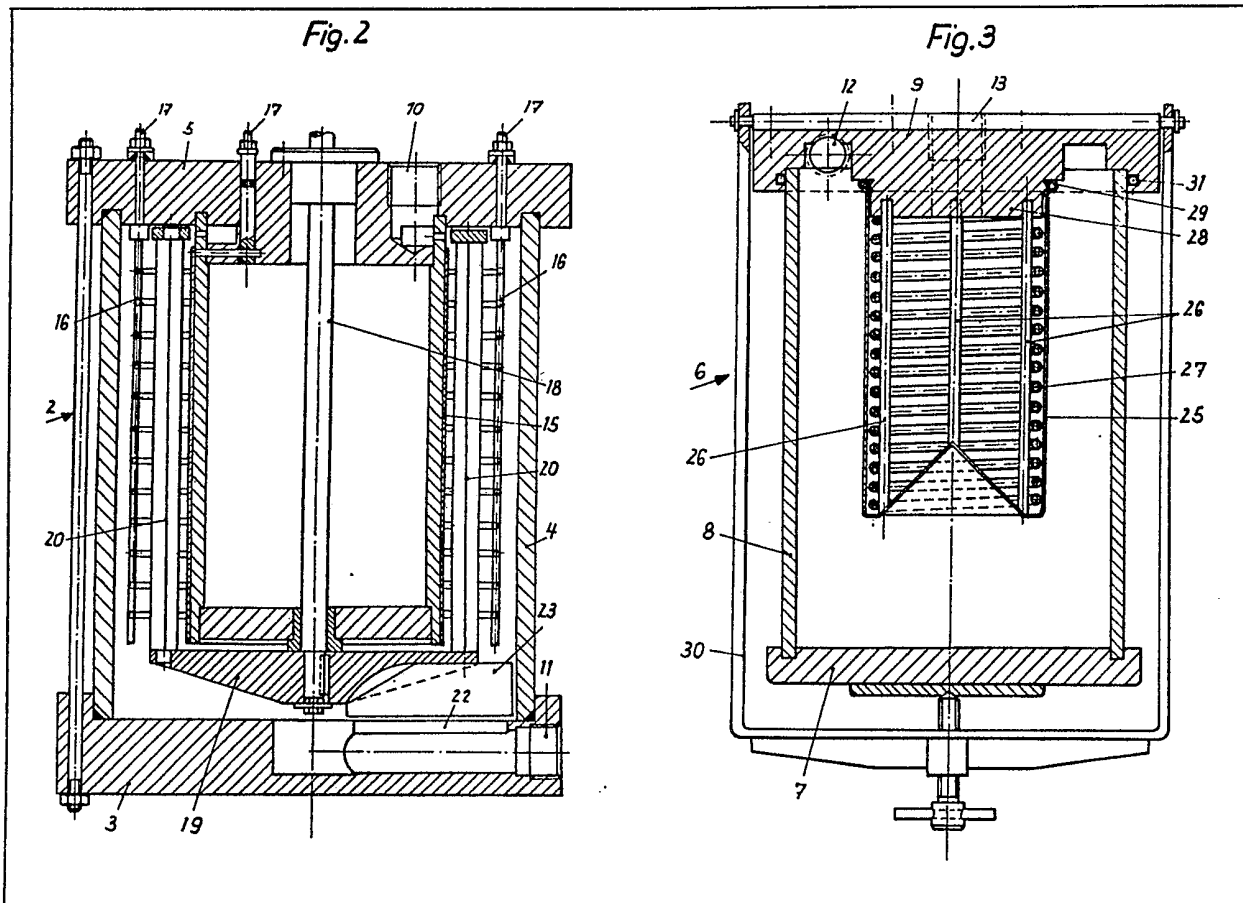
(54) **Electrolytic reclamation of precious metals**

(57) Apparatus for the electrolytic reclamation of precious metals, especially of silver, from aqueous precious-metal salt solutions, comprises an electrolytic vessel 1 which has at the top an inlet 10 and at the bottom an outlet 11 for the precious-metal salt solution to be electrolyzed, and wherein are vertically and concentrically disposed in spaced relationship a cylindrical anode 15 and a cathode 16 with a motor driven stripping equipment 20 concentric to the anode and arranged

to rotate in the space between anode and cathode, and with a filter 6 for collecting the separated precious metal entrained by the electrolyte flow. The filter 6 is situated in a filtering vessel disposed next to the electrolytic vessel. The electrolyte vessel is provided with a pressure limiter or with a breather 14.

A rotatable slide plate 23 is preferably provided near the bottom of the electrolytic vessel to travel with slight clearance across the outlet opening located in the bottom, and is preferably rigidly connected with the stripping equipment.

Preferably the inlet 12 to and the outlet 13 from the filtering vessel are located at the top, the outlet being screened by a filter bag 25 spread out by means of a spreading-out device consisting of several rods 26 encircled by a helical spring 27 and the inlet being outside of the filter bag.



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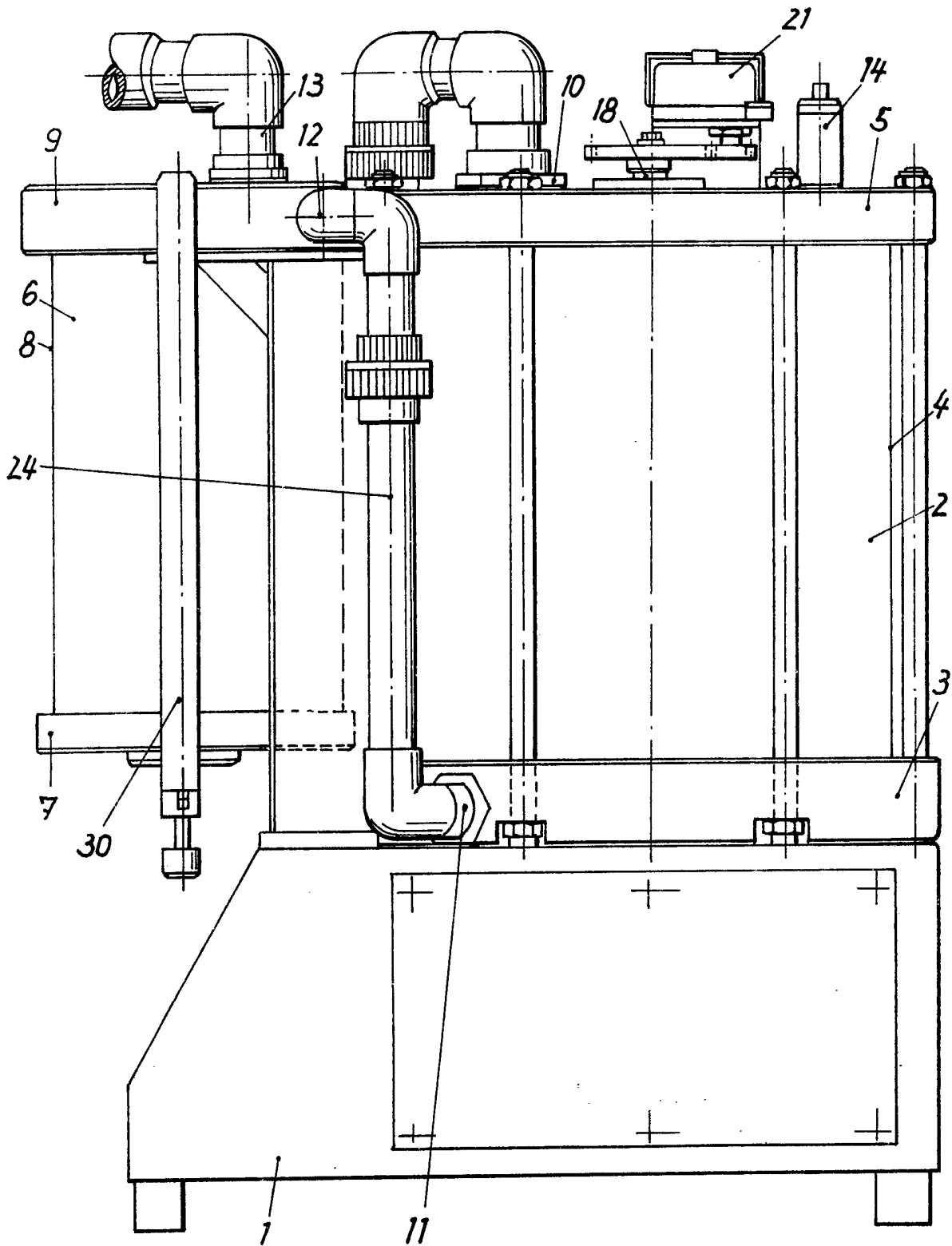
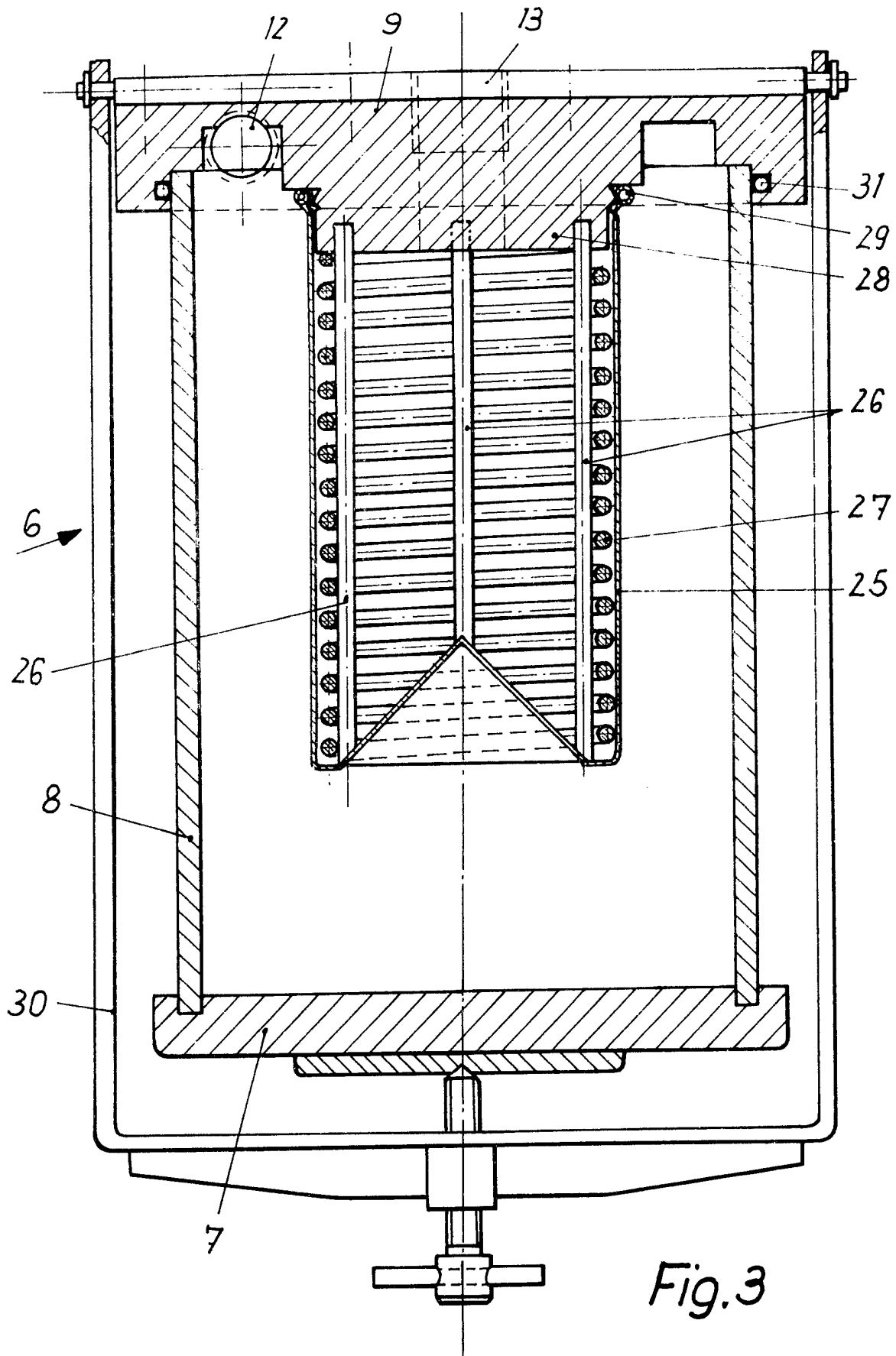


Fig. 1





## SPECIFICATION

**Apparatus for the electrolytic reclamation of precious metals**

5 This invention relates to apparatus for the electrolytic reclamation of precious metals.

There has hitherto been proposed apparatus for the purpose aforesaid which comprises essentially an electrolytic vessel through which, in operation, a precious-metal salt solution flows from the top downwards and in which as cathode a ring of rods is arranged in a circle concentric to the anode. Between the anode and the cathode rods rotates a turbine wheel driven through reaction of the flow in the electrolytic vessel. The turbine wheel is connected with stripping equipment which consists of several vertically extending arms provided with bristles. The precious metal powder deposited on the cathode rods is stripped off by the bristles and carried downwardly with the flow, where it is trapped directly below the electrodes by a filter also arranged in the electrolytic vessel. As soon as the filter, a bag, is fully loaded, the electrolytic vessel is opened from above and the electrodes, the stripping equipment and the turbine wheel thereof are lifted out; the filter is then exposed and can be removed.

This hitherto-proposed apparatus has several disadvantages. On the one hand the emptying of the filter is irksome and time-consuming as, for that purpose, the assembly disposed above the filter and comprising electrodes, stripping equipment and turbine wheel, must be dismantled, cleaned, and on assemblage be re-sealed. Moreover, the numerous cathode rods must be placed in position individually, secured, and be connected with one another through a ring conduit for coupling up electrically. Finally, there is the danger of operating troubles through gap bridging of the deposited precious metal between cathode and anode. As the stripping equipment is driven by the flow of the precious-metal salt solution in the electrolytic vessel, this flow may not be too quick for the achievement of as complete a separation as possible, and it is possible that the stripping equipment will stop because of the frictional resistance or is caught on depositions of precious metal without stripping these off.

The object of the present invention is so to develop said hitherto-proposed apparatus that it is reliable in operation and easier to manipulate.

According to the present invention, we provide apparatus for the electrolytic reclamation of precious metals, especially of silver, from aqueous precious-metal salt solutions, comprising an electrolytic vessel which is provided with a pressure limiter or with a breather and has at the top an inlet and at the bottom an outlet for a precious-metal salt solution to be electrolyzed, and wherein are concentrically and vertically disposed a cylindrical anode and a cathode spaced therefrom and consisting of a cage, gauze, net, screen or the like element provided with perforations, stripping equipment concentric with

65 the anode, a prime mover for driving the stripping equipment to rotate in the space between the anode and the cathode, and a filtering vessel disposed next to the electrolytic vessel, and having therein a filter for collecting the separated precious metal entrained by the electrolyte flow.

70 As the filter is located in a filtering vessel outside of the electrolytic vessel, the filter is easily accessible and the electrolytic vessel itself need not be opened for clearing out the filter. This is of particular significance as the solutions, from which precious metals are reclaimed, are frequently highly toxic. Contrary to the opinion expressed in Federal German Offenlegungsschrift No. 25 43 600, it has been shown that the powdery precious metals can be discharged very well by the liquid flow out of the electrolytic vessel into a separate filter.

80 Furthermore, the cathode arrangement is considerably simplified. The number and size of the perforations in the cathode should be so selected that the cathode surface is as small as possible and consequently the current density which can be achieved is as high as possible.

85 As the stripping equipment is driven by a prime mover, it is ensured that no short-circuiting bridges are set up between cathode and anode since the rotation of the stripping equipment is effected independently of the speed of flow in the electrolytic vessel. Consequently the rotation can also be effected considerably more quickly than in the case of the previously-proposed apparatus. The turbulence of the liquid in the electrolytic vessel brought about by the quicker rotation is sufficient to strip the separated precious metal powder from the cathode without there being required for this purpose bristles or the like which brush over the cathode and bring about a progressive attrition thereof.

90 The pressure limiter or breather increases the operating reliability of the apparatus as it permits the controlled escape of the gas mixture formed during the electrolytic process.

95 A rotatable slide plate is preferably provided near the bottom of the electrolytic vessel and can travel with slight clearance across the outlet opening located in the bottom. The slide plate assists the flushing out of the separated precious metal powder which has fallen from the cathode, as it sweeps it into the outlet opening in the bottom of the electrolytic vessel.

100 Preferably the slide plate is rigidly connected with the stripping equipment and therefore does not require a separate drive.

105 Preferably also, the inlet to and the outlet from the filtering vessel are located at the top, the outlet being screened by a filter bag spread out by means of a spreading-out device, and the inlet being outside of the filter bag. This feature makes it possible, without particularly stressing the filter bag, to have a large filtering volume with a relatively small filter bag.

110 An apparatus for the reclamation of silver is represented diagrammatically and by way of example in the accompanying drawings, wherein:

Fig. 1 shows a general view of the apparatus;  
 Fig. 2 shows the electrolytic vessel in vertical  
 section through the longitudinal axis; and  
 Fig. 3 shows the filtering vessel in vertical  
 5 section through the longitudinal axis.

Referring now to the drawings, there stands  
 upright on a stationary base 1, within which is  
 located a pump for feeding a silver salt solution, a  
 cylindrical electrolytic vessel 2 whereof the  
 10 bottom 3, peripheral wall 4 and cover 5 are of  
 plastics material. Next to the electrolytic vessel 2  
 there is attached to the base 1 a filtering vessel 6  
 the peripheral wall 7 of which is of transparent  
 plastics material, so that visual inspection of the  
 15 separated quantity of silver is possible. The inlet  
 10 and the outlet 11 for the silver salt solution are,  
 respectively, at the top and bottom of the  
 electrolytic vessel 1, whereas in the case of the  
 filtering vessel 6 both the inlet 12 and the outlet  
 20 13 are at the top. On the electrolytic vessel 2 there  
 is, moreover, for reasons of safety, a vent valve 14  
 through which the gas mixture formed during the  
 electrolysis can escape. Within the electrolytic  
 vessel 2 is disposed a cylindrical anode 15, for  
 25 example of expanded metal form, preferably of  
 platinum-plate titanium. The anode 15 is  
 concentrically surrounded by a cathode 16 of  
 refined steel in the form of a grid or cage. The  
 connection contacts 17 of the cathode 16 and  
 30 anode 15 are arranged on the cover 5 and  
 simultaneously serve for attachment of the  
 cathode 16 and anode 15 to the cover 9.

A shaft 18 rotatably supported through the  
 cover 5 of the electrolytic vessel 2, supports at its  
 35 lower end at least two horizontal supporting arms  
 19 arranged axially symmetrically and from which  
 stirrers 20 extend vertically upwards into the  
 space between cathode 16 and anode 15. The  
 shaft 18 is driven by a small electric motor 21  
 40 attached on to the cover 5.

The inlet 10 in the cover 5 discharges into the  
 space between anode 15 and cathode 16. The  
 outlet 11 is located in the bottom 3 and has the  
 form of a radially-extending duct which is open to  
 45 the interior of the electrolytic vessel 2 through a  
 slot 22. The silver powder which has fallen from  
 the cathode 16 is washed into this slot 22, the  
 flushing out being accelerated by a slide plate 23  
 which is fastened to one of the supporting arms  
 50 19, extends in the radial direction, and rotates  
 with the shaft 18. The lower edge of the slide  
 plate 23 has only a slight clearance from the  
 bottom 3 of the electrolytic vessel 2.

The stirrers 20 rotating between the cathode  
 55 16 and anode 15 prevent the formation of short-  
 circuiting bridges between cathode and anode.  
 The turbulence of the silver salt solution caused by  
 the stirrers 20 leads moreover to a partial  
 detachment from the cathode 16 of the silver  
 60 powder which thereupon sinks on to the bottom 3.

The liquid laden with silver powder leaves the  
 electrolytic vessel 2 through the outlet 11 and is

conveyed upwards through a conduit 24 to the  
 inlet 12 at the side in the cover 9 of the filtering  
 65 vessel 6. The outlet 13 from the filtering vessel is  
 located centrally of the cover 9. The outlet 13 is  
 screened by a filter bag 25 which is turned inside  
 out over a spreading device. The spreading device  
 70 consists of several rods 26 disposed in a circle  
 and attached to the cover 9, the rods 26  
 being encircled by a helical spring 27. The edge of  
 the filter bag 26 is turned inside out over a stub 28  
 of the cover 9 and is there clamped by an elastic  
 75 ring 29, the outlet 13 passing through the stub  
 28. The silver powder is consequently held back  
 outside the filter bag 25 and collects in the vessel  
 formed by the bottom 7 and peripheral wall 8. To  
 remove the silver powder, disconnection is  
 80 effected of the strap 30 which connects the cover  
 9 with the lower part 7, 8 of the filtering vessel  
 securely and, because of an O-ring 31 in the cover,  
 in a sealed manner. The lower part formed by the  
 bottom 7 and peripheral wall 8 can then be  
 85 withdrawn downwardly and emptied. Moreover,  
 the filter bag 25, while accessible, may also be  
 cleaned and, if necessary, replaced.

#### CLAIMS

1. Apparatus for the electrolytic reclamation of  
 precious metals, especially of silver, from aqueous  
 90 precious-metal salt solutions, comprising an  
 electrolytic vessel which is provided with a  
 pressure limiter or with a breather and has at the  
 top an inlet and at the bottom an outlet for a  
 precious-metal salt solution to be electrolyzed,  
 95 and wherein are concentrically and vertically  
 disposed a cylindrical anode and cathode spaced  
 therefrom and consisting of a cage, gauze, net,  
 screen or the like element provided with  
 perforations, stripping equipment concentric with  
 100 the anode, a prime mover for driving the stripping  
 equipment to rotate in the space between the  
 anode and the cathode, and a filtering vessel  
 disposed next to the electrolytic vessel, and having  
 therein a filter for collecting the separated  
 105 precious metal entrained by the electrolyte flow.

2. Apparatus according to claim 1, in which a  
 rotatable slide plate is provided near the bottom of  
 the electrolytic vessel and can travel with slight  
 clearance across the outlet opening located in the  
 110 bottom.

3. Apparatus according to claim 2, in which the  
 slide plate is rigidly connected with the stripping  
 equipment.

4. Apparatus according to any one of the  
 115 preceding claims, in which an inlet to and an  
 outlet from the filtering vessel are located at the  
 top, the outlet being screened by a filter bag  
 spread out by means of a spreading-out device,  
 and the inlet being outside of the filter bag.

5. Apparatus for the electrolytic reclamation of  
 120 precious metals, especially of silver, substantially  
 as hereinbefore described with reference to the  
 accompanying drawings.