

March 31, 1936.

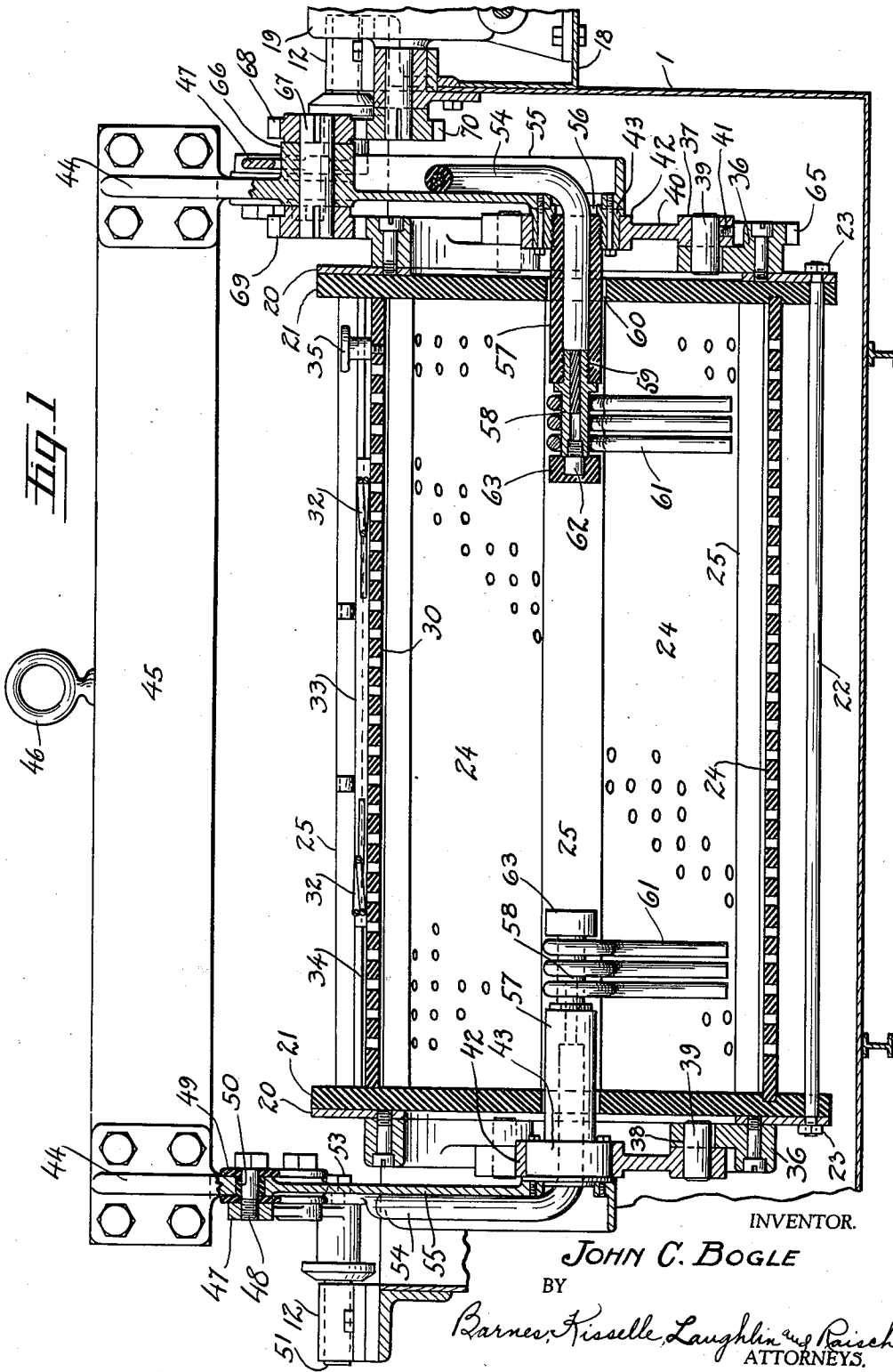
J. C. BOGLE

2,035,633

PLATING MACHINE

Filed Feb. 5, 1935

4 Sheets-Sheet 1



March 31, 1936.

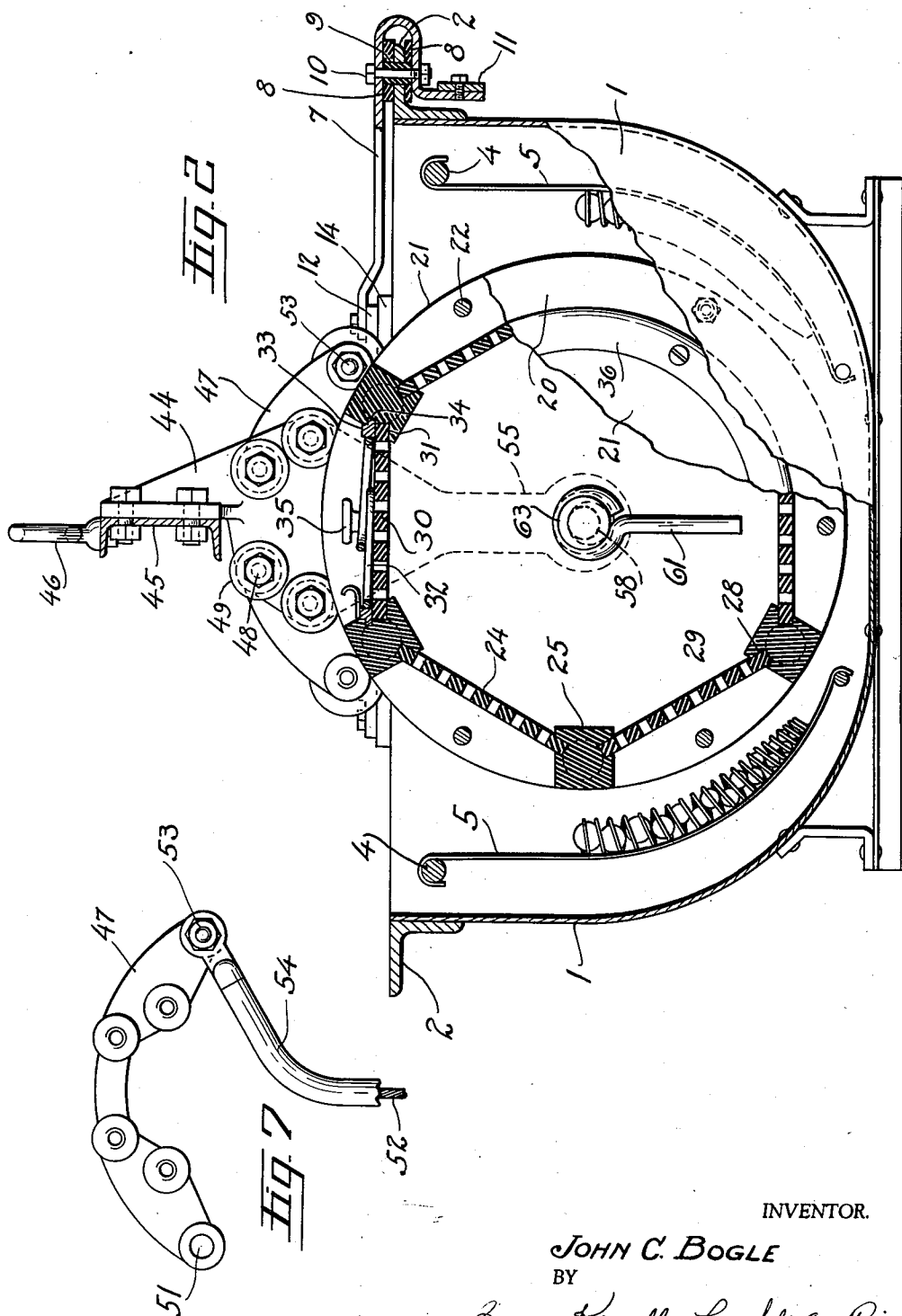
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PLATING MACHINE

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4 Sheets-Sheet 2



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PLATING MACHINE

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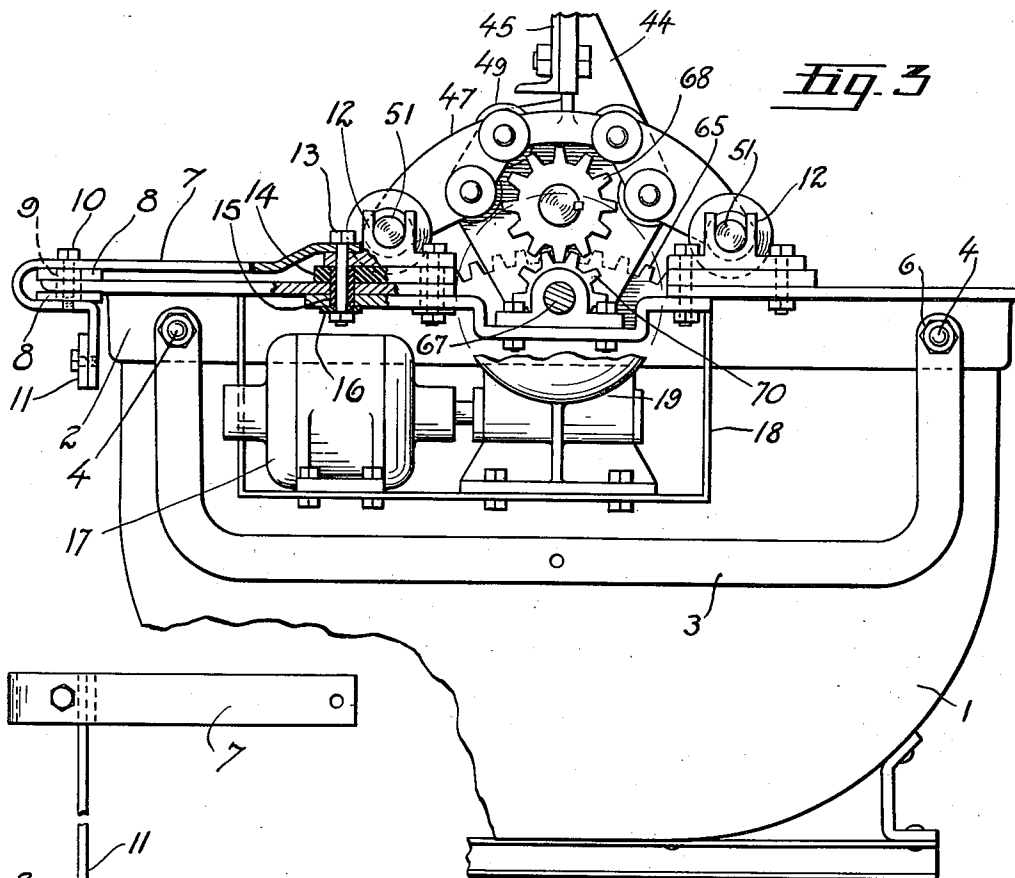
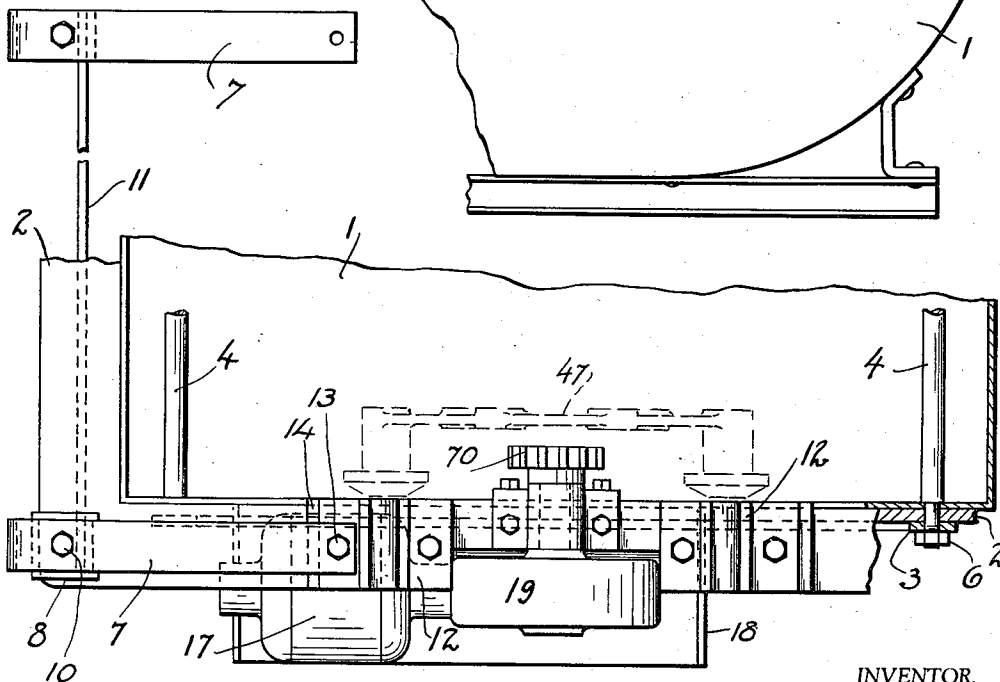


Fig 4

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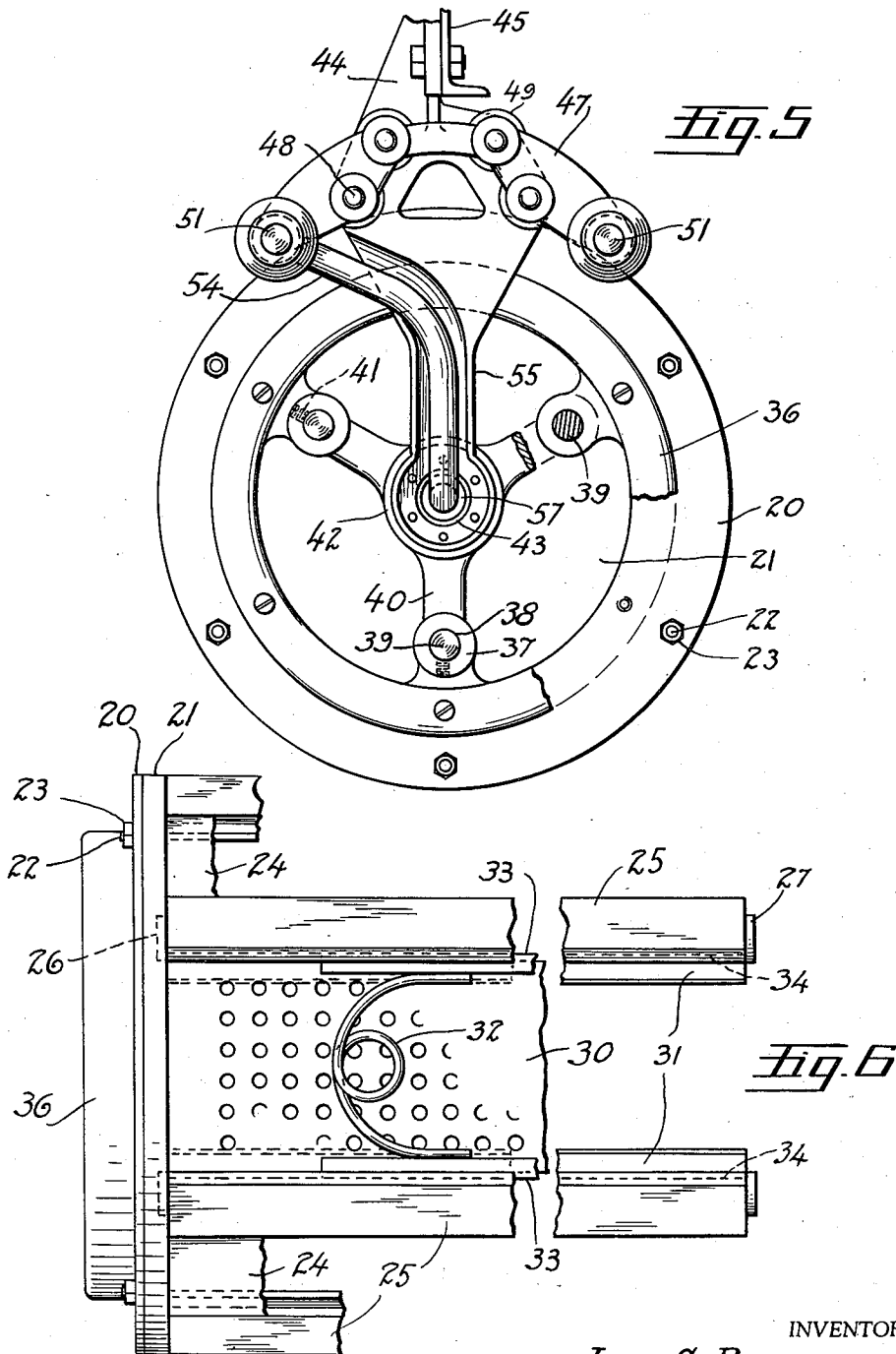
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PLATING MACHINE

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4 Sheets-Sheet 4



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UNITED STATES PATENT OFFICE

2,035,633

PLATING MACHINE

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8 Claims. (Cl. 204—11)

This invention relates to a plating machine and more particularly to a plating machine of the rotating barrel type. As is well-known, barrel plating machines necessarily have some of their parts made from materials which are non-conductors of electricity such as bakelite and hard rubber. One of the problems that has arisen is that of preventing destruction of these non-conducting or insulating parts by what is known as "treeing", that is, the metal which is being plated will reach cathodic parts through cracks or joints in the insulation thus building up a deposit which eventually splits the insulation. This destructive treeing also occurs between the slip joints in the cathodic part of the electric circuit. This treeing is also undesirable in that it provides a ready path of travel for the current from the anode back to the cathode bus-bar without passing through the work. This wastage of current increases as the treeing surface spreads.

It is an object of this invention to produce a plating machine in which this destructive treeing is practically prevented. This object has been achieved by completely eliminating all slip joints in the electrical conducting circuit so that the current never has to pass from one member to another member which move one relative to the other. It is also proposed to achieve this result by making all the metal parts which are immersed in the plating bath anodic with the exception of a very small and readily removable cathodic part which contacts with the work to permit passage of the current therethrough.

It is an object of this invention to produce a plating machine that will require a minimum of care and the cathodic elements of which may be readily cleaned.

In the drawings:

Fig. 1 is a vertical longitudinal section through the machine.

Fig. 2 is the vertical transverse section through the machine.

Figs. 3 and 4 are detail views of the driving mechanism.

Fig. 5 is a detail of the hanger for the rotating barrel.

Fig. 6 is a detail of the latch for the removable barrel door panel.

Fig. 7 is a detail of the yoke and the cathode cable.

As is customary with barrel type plating machines, the barrel is arranged to be removed from the tank for loading and unloading purposes. The tank and associated structure which, for

convenience, may be termed the stationary part of the machine, will be described first.

This structure comprises a sheet steel tank 1 for the plating solution when the solution is alkaline. When acid solutions are used, the tank should be lined with either lead or rubber. The upper edge of the tank is provided with an angle iron rim 2. As shown in Figs. 2, 3, and 4, the current is brought into the solution through the anodic portion of the circuit which comprises the anode bus-bar 3, the anode rods 4 and the anodes 5. The rods 4 extend lengthwise of the tank 1 and the ends of these rods project through suitable openings in the end walls of the tank and are connected electrically with the tank. The anode bus-bar 3 is provided with suitable openings at each end and the ends of the bus-bar are passed over the ends of the anode rails secured thereto by the bolts 6 (Fig. 4). The anodes 5 preferably are in the form of ball anodes and helical wire container shown and claimed in the Stewart and Urban Reissue Patent No. 19,328, and the Dubpernell Patent No. 1,868,052.

The cathodic portion of the circuit which is a part of the stationary structure of the machine comprises a cathode bus-bar 7 supported above the ends of the tank and insulated therefrom by suitable insulation such as the rubber blocks 8 and the bushing 9. A bolt 10 may be passed through the bus-bar 7 and the flange 2 of the tank to secure the cathode rail to the tank. The bolt 10 is insulated from the tank by the bushing 9. The bus-bars 7 are connected by a bus-bar 11 extending along the side of the tank. The cathode and anode bus-bars may be made of copper or any other suitable metal.

As shown in Figs. 3 and 4, the tank has mounted upon the upper edge of its end walls a pair of saddles 12. These saddles (Figs. 3 and 4) are secured to the rim of the tank by bolts 13. Suitable insulation is provided between the saddles 12 and the tank. This insulation may take the form of the rubber block 14, the rubber bushing 15 which surrounds the bolt 13, and the fiber washer 16. The cathode bus-bars 7 are in electrical conducting contact with the saddles 12. The anode bus-bar 3 may be connected to the positive or anodic side of the generator and the cathode bus-bars 7 and 11 connected to the negative or cathodic side of the generator in the usual manner.

The stationary portion of the machine is also provided with a suitable driving mechanism for rotating the barrel. This driving mechanism consists of an electric motor 17 supported upon

a platform 18 and provided with a suitable gear reduction arrangement 19.

It is proposed to make the removable rotating work barrel with a steel skeleton which is insoluble in alkaline baths. If the plating bath is acid, then the skeleton may be made of lead alloy or any other suitable metal insoluble in the acid bath. This will insure a barrel that is strong and durable. In the following description the materials mentioned are suitable for alkaline solutions. The barrel comprises a pair of circular steel ends 20, the inner faces of which are lined by the rubber discs 21. The end plates 20 are secured together at spaced points about their circumference by the steel rods 22, the threaded ends of which carry the nuts 23. The sides of the barrel comprise six foraminated hard rubber panels 24, the edges of which are fitted into the hard rubber rails 25 which extend between, and are secured to, the hard rubber end walls 21. The end walls 21 are provided with circular recesses 26 into which are fitted the reduced ends 27 of the rubber panel rails 25. The rubber wall panels fit into suitable grooves 28 provided in the rails 25 and into suitable recesses 29 provided in the rubber end wall linings 21.

Although this skeletonized steel construction of the barrel provides an unusually strong barrel, it gives rise to the problem of preventing accumulation of plate on one part of the steel skeleton and corrosion action of the plating bath on another portion of the skeleton. This problem has been solved by maintaining the skeleton at an anodic potential. The anodic potential at which the skeleton and hangers are maintained is such that they do not receive any plate nor carry any perceptible current into the plating bath.

Access to the inside of the barrel may be made through the removable door panel 30. The door panel may be retained in position by a very easily and quickly operated form of latch which takes the form of a pair of spaced bars 31 yieldably held in spaced relation by the spring 32. The bars 31 are provided with a rabbet 33 which engages an undercut groove 34 in the adjoining side wall of the rail 25. The panel may be very easily and quickly removed by drawing one of the latch bars 31 toward the other against the tension of the spring 32 which permits the latch bars to be withdrawn and thus free the door panel 30 for ready removal by the handle 35. To permit greater manufacturing tolerances both in the hanger arrangement by which the rotating barrel is supported and in the barrel, it is proposed to mount the barrel in a novel manner upon its hanger. This mounting for each end of the barrel takes the form of a circular steel rim 36 which is bolted to the outer face of the end plate 20. This circular rim is provided with a plurality of lugs 37 each of which has an opening 38 for reception of the pins 39 carried by the spider 40. The pins 39 are held in the spider by the set screws 41. The openings 38 are made slightly larger, preferably one thirty-secondth of an inch greater in diameter than the pins 39. This gives the pins 39 a floating or flexible connection with the lugs 36 for purposes described below. The spider 40 is provided with a hub 42. The hub 42 is rotatably mounted upon the bearing 43 fixed to the lower end of the hanger 44.

A hanger is provided for each end of the rotating barrel. The hangers are connected by a cross beam 45 provided with an eye bolt 46 by

means of which the removable barrel mechanism may be lifted from the tank.

To support the hangers 44 on the tank, each of the hangers has bolted to the upper end a yoke 47, as shown in Fig. 1. The bolts 48 which secure the yoke 47 to the hanger 44 and the hanger 47 are insulated from the hanger 44 by the fiber washers 49 and the rubber bushing 50. This insulation is important because the hanger 44 is anodic whereas the yoke 47 is cathodic. The yoke 47 carries at each end a pin 51 which seats in the saddles 12 to removably support the barrel in the tank.

A cathode cable 52 is bolted in electrical conducting relation with the yoke 47 at 53. The cable 52 is provided with an insulating cover 54 of rubber or any other suitable insulation. This cable passes downwardly between the flanges 55 of the hanger 44 and then passes inwardly through an opening 56 in the bearing 43 at the bottom of the hanger 44. The opening 56 in the bearing 43 is threaded. A bakelite bushing 57 having a threaded end is screwed into the bearing opening 56. The insulated cable 52 passes through the bakelite bushing 57 where it is pressed into the end of a chromium plated arbor 58 and in electrical conducting relation therewith. The arbor 58 has a threaded fit with the inner end of the bakelite bushing 57 as at 59. The rubber head plate lining 21 is provided with a suitable opening 60 through which the bakelite bushing 57 is passed. The opening 60 is slightly larger than the bakelite bushing 57 to provide a small clearance to prevent frictional engagement between the bushing 57 and the rubber facing 21 when the barrel is rotated. A set of three steel danglers 61, each of which is provided with a loop at its upper end, is passed over the arbor 58. The danglers are retained upon the arbor by the screw 62 having a hard rubber head or coating 63. In view of the above it will be seen that the only cathodic surface exposed to the plating bath is the chromium plated surface of the arbor 58 and that of the danglers 61.

For rotating the barrel upon the hangers 44 the cast iron rim 36, adjacent the motor, may be provided with external gear teeth 65 along its outer circumference. The hanger 44 has a bearing 66 in which is rotatably mounted the drive shaft 67. Gears 68 and 69 are fixed on opposite ends of the drive shaft. The gear 69 meshes with the gear teeth 65 and the gear 68 meshes with the upper gear 70 of the reduction gear arrangement 19 thus effecting a drive between the motor and the barrel.

When it is desired to remove the removable barrel portion of the machine from the tank a hook connected with a block and tackle may be passed through the loop 46. Upon raising the removable barrel portion of the machine the pins 51 will lift out of the saddles 12 and gear 68 will separate from gear 70 of the power reduction mechanism.

The path of the current may be noted as follows: The current is fed from the positive or outgoing side of the generator to the anode bus-bar 3. The current travels along the anode rods 4 down the anodes 5 into the solution, thence to the work. From the work the current travels through the danglers 61 to the arbor 58, along the cathode cable 52 to the yoke 47, through the pins 51 to the saddles 12, then into the bus-bars 7 and 11 and thence into the negative or incoming side of the generator. Current also travels from the anode bus-bars 3 along the tank and the

gear drive to the steel barrel skeleton. By this arrangement it will be noted that not only the tank 1 is anodic but also the barrel ends 20, rods 22, rims 36, spiders 42, hangers 44, in fact every part of the machine which is submerged or brought into contact with the plating bath, with the exception of dangles 61 and the arbor 58. The anodic potential of all of these parts is sufficiently high so that none of the metal will be deposited thereon and yet at the same time the anodic potential is low enough so that no perceptible current is conducted into the solution. I claim:

1. A plating machine comprising a metal plating tank for the plating solution, a rotatable work barrel comprising an outer skeleton of electrically conducting parts freely exposed to the plating solution and insoluble in the plating solution and an insulating lining within the electrically conducting skeleton forming a container for the work, and an electrically conducting circuit comprising an anodic portion adapted to conduct current into the solution and a stationary cathodic portion adapted to conduct current out of the solution, said anodic portion of the circuit being in electrically conducting relation with the skeleton of the work barrel to thereby maintain these parts at an anodic potential, an opening in one of the walls of the barrel through which the stationary cathode projects into electrically conducting relation with the work within the barrel.

2. A plating machine comprising in combination a metal plating tank, a rotatable work barrel comprising electrically conducting parts insoluble in the plating solution, an electrically conducting hanger supported by the tank in electrically conducting relation therewith for rotatably supporting the work barrel, the said hanger being in electrically conducting relation with the electrically conducting parts of the work barrel, and an electrically conducting circuit comprising an anodic portion adapted to conduct current into the solution and a cathodic portion adapted to conduct current out of the solution, the said anodic portion of the circuit being in electrically conducting relation with the tank, hanger and work barrel to maintain the same at an anodic potential sufficiently large to prevent plating on these members but insufficient to transmit any perceptible current into the solution.

3. A plating machine comprising in combination a metal plating tank for the plating solution, a rotatable work barrel comprising a pair of metal end plates freely exposed to the plating solution and insoluble in the plating solution, a non-conducting lining for the inner face of each of the end plates, a plurality of metal rods secured to the end plates for tying the same together in spaced relation, a foraminated wall of non-conducting material mounted between the end plates and defining a work receiving space, a pair of hangers in electrically conducting relation with the end plates for rotatably supporting the barrel, and an electrically conducting circuit comprising an anodic portion adapted to conduct current into the solution and a cathodic portion adapted to conduct current out of the solution, the said anodic portion of the circuit being connected in electrically conducting relation with the hanger, end plates and tie rods of the work barrel to maintain these portions at an anodic potential.

4. A plating machine comprising in combination a metal plating tank for the plating solution, a rotatable work barrel comprising a pair of

metal end plates freely exposed to the plating solution and insoluble in the plating solution, a non-conducting lining for the inner face of each of the end plates, a plurality of metal rods secured to the end plates for tying the same together in spaced relation, a foraminated wall of non-conducting material mounted between linings for the end plates to define a work receiving space, a pair of hangers in electrically conducting relation with the end plates for rotatably supporting the barrel, and an electrically conducting circuit comprising an anodic portion adapted to conduct current into the solution and a cathodic portion adapted to conduct current out of the solution, the said anodic portion of the circuit being connected in electrically conducting relation with the hanger, end plates and tie rods of the work barrel to maintain these portions at an anodic potential, and openings in the end walls of the barrel at the axis of rotation of the barrel, the cathodic portion of the circuit being in the form of a stationary insulated cable projecting inwardly through the openings in the end walls of the barrel, and cathodes supported at the inner end of the cable in electrically conducting relation therewith for contacting with the work.

5. A plating machine comprising in combination a metal plating tank for the plating solution, a rotatable work barrel comprising electrically conducting parts freely exposed to the plating solution and insoluble in the plating solution, a pair of hangers having a rotatable connection with the ends of the barrel for rotatably supporting the same in the tank, an electrically conducting circuit comprising an anodic portion adapted to conduct current into the solution and a cathodic portion adapted to conduct current out of the solution, the anodic portion of the circuit being connected in electrically conducting relation with the electrically conducting parts of the work barrel and hangers to maintain the same at an anodic potential, one of the said hangers and an adjacent end of the barrel having aligned openings, the cathodic portion of the circuit being passed through the opening in the hanger in non-rotatable relation therewith and through the opening in the end plate of the barrel, and an electrical insulating cover for insulating the cathodic portion of the circuit from the hanger and barrel.

6. A plating machine comprising in combination a metal plating tank for the plating solution, a rotatable work barrel comprising electrically conducting parts insoluble in the plating solution, a pair of hangers having a rotatable connection with the ends of the barrel for rotatably supporting the same in the tank, an electrically conducting circuit comprising an anodic portion adapted to conduct current into the solution and a cathodic portion adapted to conduct current out of the solution, the anodic portion of the circuit being connected in electrically conducting relation with the electrically conducting parts of the work barrel and hangers to maintain the same at an anodic potential, one of the said hangers and an adjacent end of the barrel having aligned openings, the cathodic portion of the circuit being passed through the opening in the hanger in non-rotatable relation therewith and through the opening in the end plate of the barrel, an electrical insulating cover for insulating the cathodic portion of the circuit from the hanger and barrel, and a plurality of dangles in electrically conducting relation with the cathodic

portion of the circuit within the work barrel and adapted to make an electrically conducting contact with the work.

5 7. A plating machine comprising in combination a metal tank for the plating solution, a rotatable barrel, a pair of hangers supported by the tank, a spider rotatably mounted upon each of said hangers, and a floating connection between the spiders and the ends of the barrel in the
10 form of adjacent openings in the spider and the end of the barrel, and a pin fixed in one of the openings and having a clearance in the other opening.

15 8. A plating apparatus comprising in combination a metal tank for the plating solution, the said

metal tank being normally insoluble in the plating solution, and an electrically conducting circuit comprising an anodic portion including soluble anode material adapted to conduct current into the solution and a cathodic portion adapted to conduct current out of the solution, the said anodic portion of the circuit and the plating tank being connected in electrically conducting parallel relation whereby the plating tank is maintained at an anodic potential insufficient to transmit any perceptible current into the solution and practically all the current passes into the solution through the soluble anode material.

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