

May 1, 1923.

1,453,419

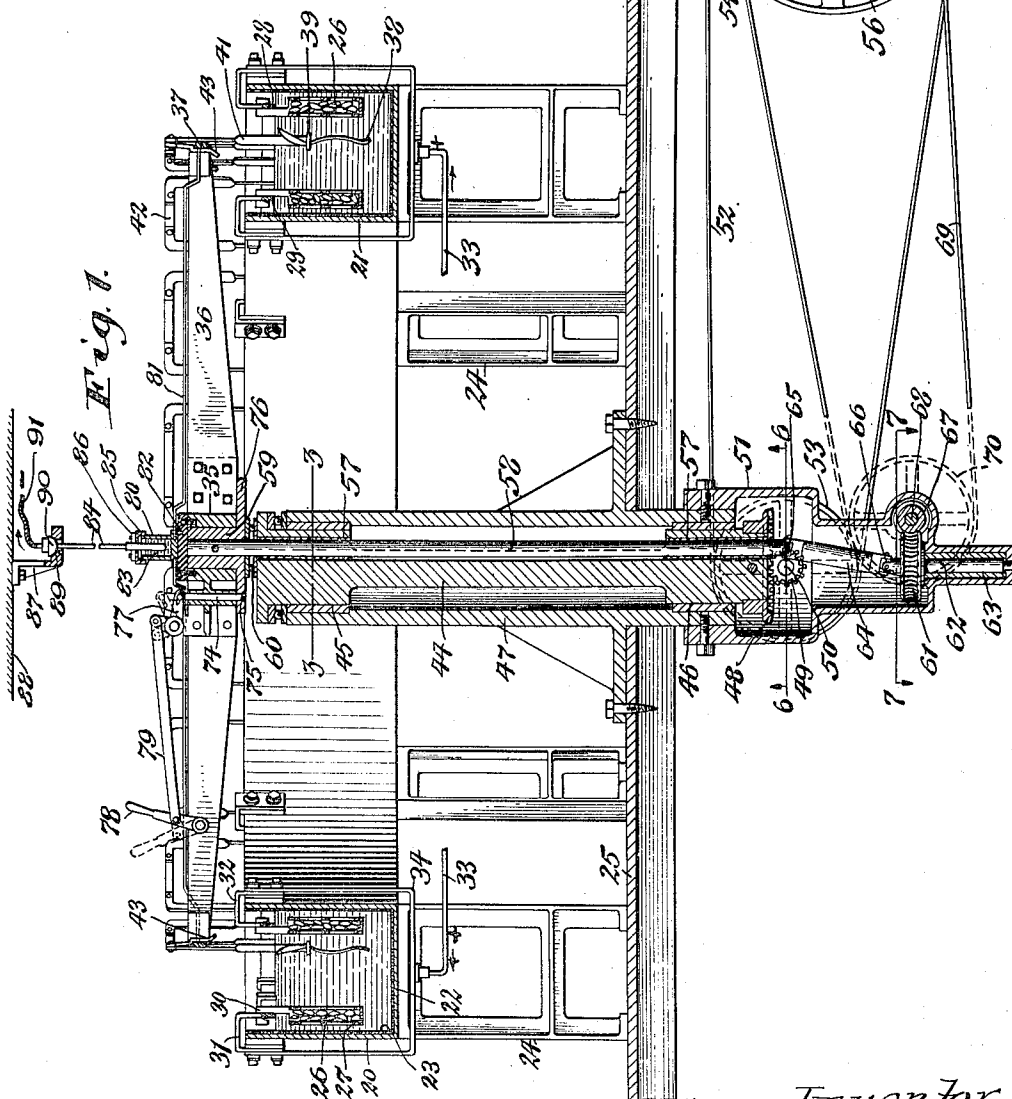
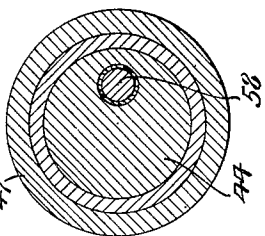
W. THOMPSON ET AL

ELECTROPLATING APPARATUS

Filed Sept. 12, 1921

4 Sheets-Sheet 1

Fig. 3.



Inventor
W. Thompson
Walter R. Jameson
by Elmer A. Hornsby
Attorneys

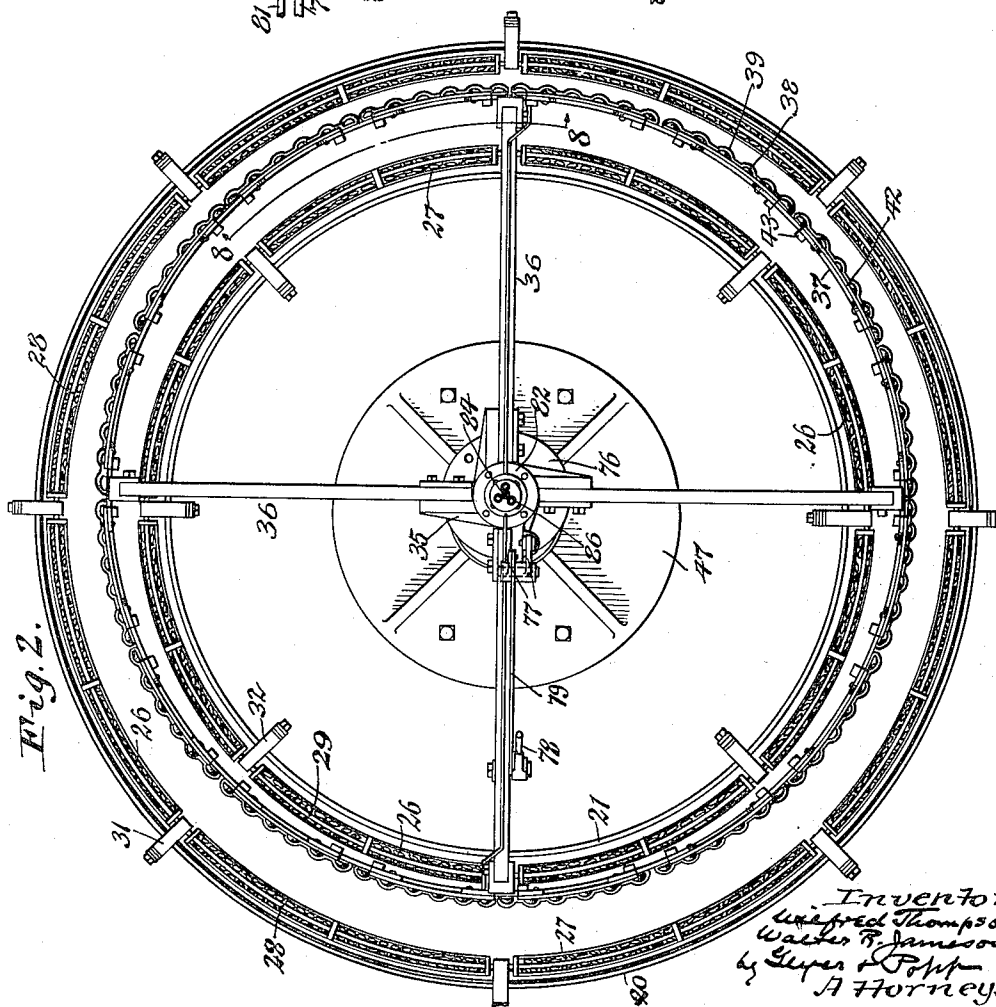
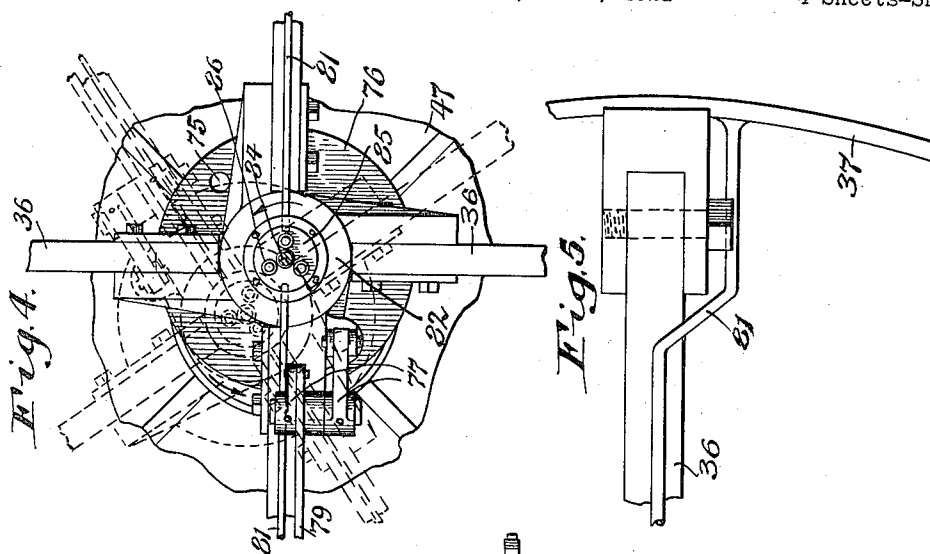
May 1, 1923.

W. THOMPSON ET AL
ELECTROPLATING APPARATUS

1,453,419

Filed Sept. 12, 1921

4 Sheets-Sheet 2



Inventors
Wm. Fred Thompson
Walter B. Jamieson
by *Super & Popham*
Attorneys

May 1, 1923.

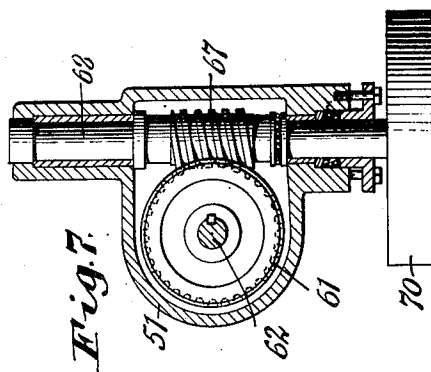
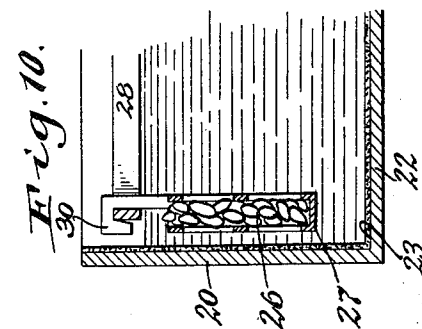
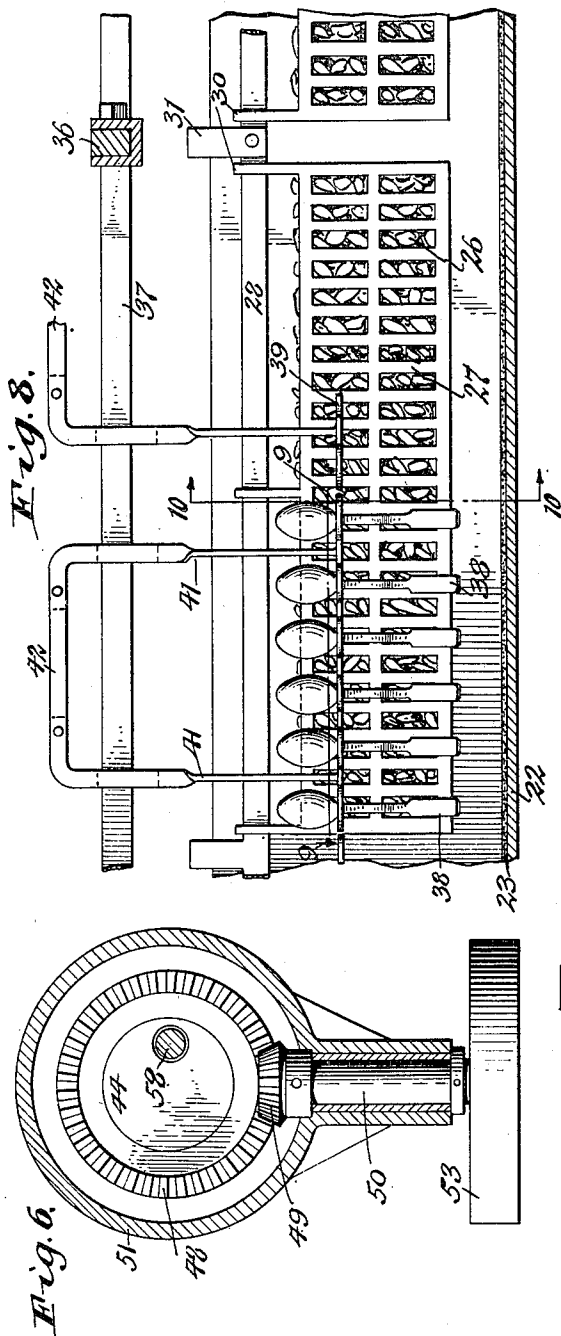
1,453,419

W. THOMPSON ET AL

ELECTROPLATING APPARATUS

Filed Sept. 12, 1921

4 Sheets-Sheet 3



Inventors
 Wilfred Thompson
 Walter R. Jameson
 by *Levy & Popp*
 Attorneys

May 1, 1923.

1,453,419

W. THOMPSON ET AL

ELECTROPLATING APPARATUS

Filed Sept. 12, 1921

4 Sheets-Sheet 4

Fig. 12.

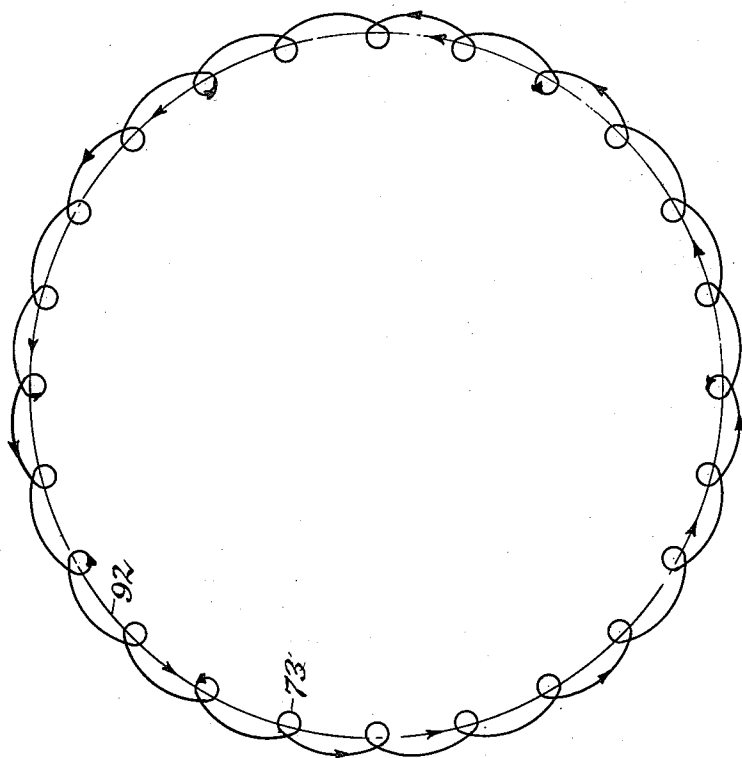
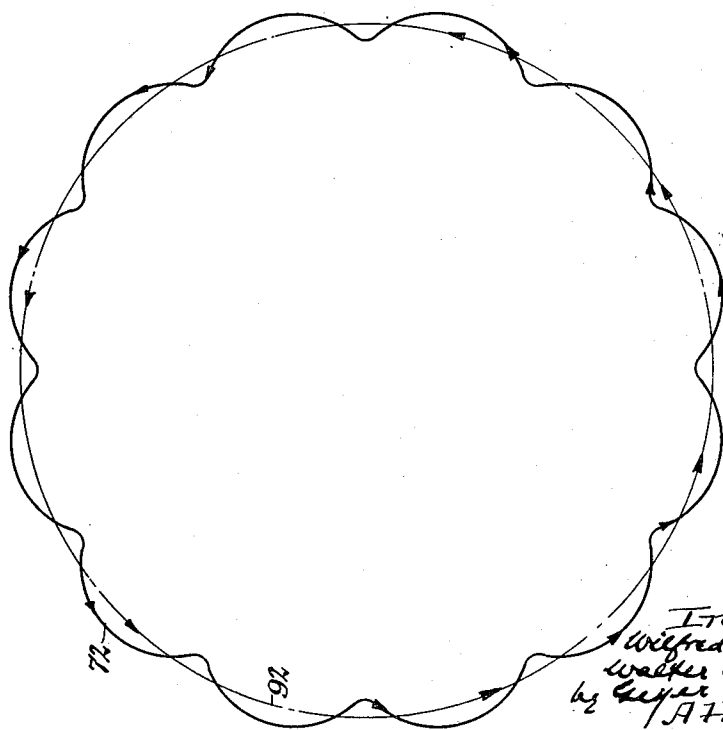


Fig. 11.



Inventors
Wilfred Thompson
Walker R. Jamieson
by *Geyer & Papp*
Attorneys

UNITED STATES PATENT OFFICE.

WILFRED THOMPSON AND WALTER R. JAMESON, OF NIAGARA FALLS, NEW YORK,
ASSIGNORS TO WM. A. ROGERS, LIMITED, OF NIAGARA FALLS, NEW YORK, A
CORPORATION OF CANADA.

ELECTROPLATING APPARATUS.

Application filed September 12, 1921. Serial No. 499,977.

To all whom it may concern:

Be it known that we, WILFRED THOMPSON and WALTER R. JAMESON, citizens of the United States, residing in Niagara Falls, in the county of Niagara and State of New York, have invented new and useful Improvements in Electroplating Apparatus, of which the following is a specification.

This invention relates to an electroplating apparatus and more particularly to an apparatus whereby electroplating of articles may be effected on a large scale, as for instance in the manufacture of knives, forks, spoons, and the like.

This invention has among its objects, to provide a machine whereby it is possible not only to secure a very large output of plated articles within a given time, but the work can be accomplished in less space and with the expenditure of less power and also enable the attendant to load and unload the apparatus more conveniently and with greater facility.

The prime object of this machine, however, is to so organize the same that each of the articles to be plated is passed through different parts of the tank containing the electroplating solution and past the several anodes in such manner that all of the articles are subjected to the same electroplating conditions and thereby permit of effecting a considerable economy as well as a superior product, inasmuch as this permits of distributing the metal to be deposited over the surface of each article, so that the same is of uniform thickness in its several parts and thus requires less metal than has been necessary heretofore.

In the accompanying drawings:

Figure 1 is a vertical section of the preferred embodiment of our invention. Figure 2 is a top plan view thereof showing the upper electric conductor rod in section. Figure 3 is a horizontal section, on an enlarged scale, taken on line 3—3, Fig. 1. Figure 4 is a fragmentary top plan view, on an enlarged scale, of the central part of the turret and adjacent parts of the machine. Figure 5 is a similar view of a part of the periphery of the turret. Figures 6 and 7 are horizontal sections, on an enlarged scale, taken on the correspondingly numbered lines in Fig. 1. Figure 8 is a fragmentary longitudinal section, on an enlarged scale, taken

on line 8—8, Fig. 2. Figure 9 is a horizontal section, taken on line 9—9, Fig. 8, showing the one form of rack bar for supporting the articles to be electroplated in the tank containing the electrolyte. Figure 10 is a fragmentary cross section, taken on line 10—10, Fig. 8. Figures 11 and 12 are diagrammatic views showing two forms of movements which can be taken by the articles in the electroplating tank during the operation of plating the same.

Similar characters of reference refer to like parts throughout the several views.

In its general organization the electroplating apparatus comprises a tank adapted to contain the electrolyte, anodes arranged within the tank and means for supporting the articles to be electroplated within the tank and moving the same therein.

In the preferred construction the tank has the form of an annular trough which is opened at the top and provided with circular outer and inner upright walls 20, 21 and a horizontal bottom 22 connecting the lower edges of these walls. This tank may be constructed of any suitable material, but preferably consists of metal which is provided on its inner side with a lining 23 of pitch or other material which prevents corrosion or is acid and alkali resistant.

This tank is preferably supported on its under side at suitable intervals by means of legs 24 which rest on the floor 25, so as to raise the tank to a height where the operator may conveniently load and unload the machine and manipulate the parts associated therewith.

The anodes 26 are preferably arranged in two annular rows along the inner side of the outer and inner walls of the tank and may be of any suitable construction, shape or form, but in the present instance these anodes are represented as of granular form, a plurality of batches of this granular material being held within a plurality of metal baskets 27, each of which is of skeleton form so that the electrolyte in which the baskets are suspended, is free to act upon the anode within the respective basket. Each of these baskets is preferably curved substantially concentric with the adjacent upright wall of the tank so as to conform therewith and leave the annular space in the central part of the tank between the two rows of anodes

of maximum width throughout the circular path within the tank.

Any suitable means may be provided for supporting these electrode carrying baskets within the tank and conducting the electric current thereto. This however, is preferably accomplished by means of outer and inner supporting rings 28 and 29 which are arranged in the upper part of the tank adjacent to the outer and inner walls thereof and detachably engaged by means of hooks 30 arranged at the upper ends of the anode baskets. The anode supporting rings 28 and 29 are supported by means of brackets 31, 32 which extend over the upper edges of the outer and inner walls of the tank and are connected with their depending inner ends to the supporting rings while the depending outer ends are secured to the outer sides of the tank walls, but insulated therefrom.

The electric current may be conducted to these anodes in any approved manner, for instance by means of a wire 33 connecting the positive side of an electric generator with a plurality of pairs of distributing connections 34 leading to the supporting brackets of the rings which carry the outer and inner anodes.

Above the tank are arranged the means whereby the articles to be electroplated are suspended so that they are submerged in the electrolyte contained between the inner and outer anodes and moved relatively thereto. These supporting means comprise a turret which in its preferred form consists of a central metallic hub 35, a plurality of wooden sweeps or arms 36 secured at their inner ends to this hub and extending radially outward therefrom, and a supporting ring 37 of metal connected with the outer ends of the sweeps 36 and arranged over the opened upper end of the electrolyte tank. The several articles 38 to be electroplated, which in the present instance are represented as spoons, are preferably suspended in batches or groups in an annular row on the supporting bar 37 so as to form a practically continuous row of articles to be plated while in the electroplating tank and thus utilize to the maximum extent the electroplating capacity of the apparatus.

In the present instance the means supporting each group of articles 38 to be plated, are constructed so that they can readily be attached to and detached from the supporting ring 37 for convenience in loading and unloading the machine and in the preferred form of these racks, each consists of a lower rack bar 39 which is provided with a plurality of openings 40 in each of which the handle of the spoon is passed downwardly until its bowl rests upon the rack bar and is supported thereby, two upright hanger bars 41 secured at the lower ends to the rack bar 39, at oppo-

site ends thereof, an upper horizontal cross bar 42 connected with the upper end of the hanger bars 41 and forming a handle therefor, and two downwardly projecting hooks 43 arranged on the upper parts of the hanger bars 41 and detachably engaging over a part of the supporting bar 37.

By means of a rack of this character, the spoons or similar articles may be quickly assembled in batches and introduced into the tank as well as removed therefrom and thus facilitate the movement of the articles during the process of electroplating the same. In order to secure as much clearance as possible between the articles which are being electroplated and the anodes on opposite sides of the path, each of the rack bars 39 is curved concentrically or substantially so, relative to the axis of the tank and the anodes, as shown in Figs. 2 and 9, so that each batch of articles is substantially concentric and at all times will be adjacent the anodes and is capable of moving laterally, as well as lengthwise within the tank without the liability of the articles, which are to be plated and form the cathodes, from coming in contact with the anode supporting baskets.

Means are provided which permit of rotating the turret so that the articles move lengthwise in a circular path through the tank and also moving this turret laterally or radially with reference to the axis of the tank, so that the articles also move crosswise relatively to the tank, which means in their preferred form shown in the drawings are constructed as follows:

44 represents an upright auxiliary shaft which is arranged centrally with reference to the tank and journaled at its upper and lower ends in bearings 45, 46 formed on the upper and lower parts of a standard or pedestal 47 which is secured in its lower part to the floor 25 and has its upper end arranged in the space within the inner wall of the tank. This auxiliary shaft may be rotated at a relatively high speed by motion from any suitable source. As shown in Fig. 1, this is accomplished by a bevel gear wheel 48 secured to the lower end of the auxiliary shaft, a bevel gear pinion 49 meshing with the bevel gear wheel 48, an upper counter shaft 50 carrying the bevel pinion 49 and journaled in suitable bearings formed in a gear case 51 which constitutes a downward extension of the standard 47 and a driving belt 52 passing around a driven pulley 53 on the upper counter shaft 50 and also around a driving pulley 54 which is secured to a driving shaft 55. The latter is journaled in bearings 56 suspended from the underside of the floor 25 and may receive power from a prime mover of any suitable construction or from any other suitable source. The auxiliary shaft 44 is provided on one side of its center with eccentric bearings 57 which are arranged parallel with

the axis of the auxiliary shaft and in these eccentric bearings is journaled an upright main shaft 58 which latter is not only capable of turning in the bearings 57 of the auxiliary shaft, but is also carried bodily by the latter around the axis of the same during the rotary movement of the auxiliary shaft. At its upper end the main shaft is provided with a bearing sleeve 59 which rests by means of a ball thrust bearing 60 on the upper end of the auxiliary shaft. The hub 35 of the turret is mounted on this sleeve 59 and normally turns with the same and the main shaft 58 and also moves bodily with a planetary movement around the axis of the auxiliary shaft.

In order to permit of rotating the main shaft 58 and still enable the same to move bodily around the axis of the auxiliary shaft a driving mechanism for the main shaft is provided which in its most approved form is constructed as follows:

61 represents a worm wheel arranged below the lower end of the auxiliary shaft and journaled concentrically therewith by means of a short spindle 62 projecting downwardly from this worm wheel and turning in a bearing 63 in the lower part of the gear casing 51.

An intermediate shaft 64 is connected at its upper end by means of a universal joint 65 with the lower end of the main shaft 58 while its lower end is connected by means of a universal joint 66 with the upper side of the worm wheel 61. A worm 67 meshes with the worm wheel and worm shaft 68 carrying the worm wheel and journaled in a bearing on the side of the gear casing 51, and a belt 69 passes with its inner turn around a pulley 70 on the worm shaft 68 and with its outer turn around a pulley 71 on the main power shaft 55. By this means a comparatively slow rotary motion is imparted to the main shaft 58 and the turret mounted thereon which carries the articles 38 which are to be plated, as compared with the relatively rapid rotary movement of the auxiliary shaft 44 upon which the main shaft 58 is journaled eccentrically.

As a result of this rotary motion of the turret or carrier about the axis of the main driving shaft 58 upon which the same is mounted directly and the bodily movement of this turret or carrier about the axis of the auxiliary shaft 44 upon which the same is mounted indirectly, two distinct movements are imparted to the articles which are under treatment, that resulting from the rotation of the shaft 58 causing the articles to be moved lengthwise in a circular or annular path through the electrolyte in the tank between the two rows of anodes, and the other due to the rotation of the auxiliary shaft 44 causing these articles to be moved laterally or crosswise in the tank with an

oscillating or vibratory motion. The resultant path which the articles to be plated take, due to this combined movement varies according to the relative speed of the main and auxiliary shafts 58 and 44. If the main shaft 58 turns comparatively rapid and the auxiliary shaft 44 comparatively slow, the line of travel of the articles with reference to a true circular path around the tank would approximately form a series of scallops. Said circular path is indicated at 92 and the scalloped shaped path is indicated by 72 in Fig. 11. If the speed of the rotary shaft is reduced considerably, so as to permit the articles which are being electroplated to lag behind momentarily between the end of each vibration and the beginning of the next vibration, a loop 73 will be formed in the line of travel of each article between the successive vibrations, as indicated in Fig. 12. The particular formation of this path of travel of the articles which are being plated may be varied as best suits the article which is being plated, the character of the solutions and other conditions, by changing the relative speed at which the main shaft 58 and the auxiliary shaft 44 are turned.

By thus imparting to the articles both a longitudinal movement through the tank and also a vibratory movement crosswise of the tank throughout the entire length of the latter, each of the articles under treatment is subjected to the varying conditions existing throughout the different parts of the tank, such as the difference in density of the electrolyte, the position of the article relative to the several electrodes, and the varying strengths of the electric current passing through different parts of the electrolyte, with the result that all of the several articles receive a uniform electroplated coating which is of the same thickness throughout the entire surface of each of the articles. This, therefore, permits of properly electroplating the entire surface of the article without making the same unduly thick in any part thereof, in order to ensure applying a coat of minimum thickness to any part thereof, thereby not only effecting a considerable economy in the use of anodes but also expediting the electroplating process and securing greater output from the machine within a given length of time.

When the machine is in operation the turret is positively connected with the main shaft 58 so as to turn therewith. For convenience in loading and unloading the turret, means are provided whereby the turret may be conveniently connected with and disconnected from this driving shaft 58. The locking means for this purpose which are shown in the drawings comprise a vertically movable locking or coupling bolt 74 guided for vertical movement on the hub 35 and adapted to engage with or disengage from a

locking opening 75 formed in a flange 76 at the lower end of the supporting sleeve 59, an intermediate lever 77 pivoted on the top of the turret and having its inner arm connected with the upper end of the locking bolt 74, a hand lever 78 pivoted on the outer part of one of the supporting sweeps or arms within convenient reach of the attendant when the latter stands on the outside of the tank, and a connecting rod or bar 79 connected at its outer end with the hand lever 78 and connected at its inner end with the other arm of the intermediate lever 77, as shown in Figs. 1, 2 and 4.

When the coupling or locking bolt 74 is withdrawn from the supporting sleeve 59, the turret may be turned freely by hand independently of the shafts 58 and 44 for bringing different parts of the supporting ring 37 before the operator where he can conveniently apply a loaded article rack or remove a rack therefrom containing a batch of plated articles. After a series of racks containing plated articles have been replaced by a series of racks containing unplated articles, the hand lever 78 is operated so as to re-engage the locking bolt 74 with the supporting sleeve 59 and thus permit the operation of electroplating to be performed in the method previously described.

For the purpose of forming an electric connection with the article to be plated and still permit the same to be subjected to the rotary and vibratory action referred to, the following means are provided for maintaining this electrical connection:

80 represents a metal cup which is mounted on the top of the turret and electrically disconnected from its hub, this being preferably effected by securing this cup at its lower end to an insulating block 82 which latter is in turn secured to the upper side of the turret hub 35 in any suitable manner. This cup has its lower end connected by means of wires 81 with the metal supporting ring 37 on which are mounted the metal racks carrying the articles to be plated. Within the cup is placed a quantity of mercury 83 into which the lower end of an upright metal conductor rod 84 is adapted to dip. This rod is preferably held at its lower end concentrically within the mercury cup by means of a cover 85 secured to the upper end of the cup and provided at its center with a hole through which the conductor rod 84 extends and a plurality of guide rollers 86 arranged in a circumferential row around this rod on the cover. 87 represents an overhead bracket secured to the ceiling 88 or other stationary overhead part of the room or building and provided with a semi-spherical socket 89 in which turns a semispherical knuckle 90 arranged in the upper end of the conductor rod 84.

To the upper end of this rod the negative side of the electric generator is connected by means of a cable or line 91. As the turret rotates and also vibrates, the conductor rod 84 by reason of its pivotal connection with the bracket 87 and the guide on the mercury cup follows the movement of the turret and under all circumstances maintains an electric connection with the cathode and the negative side of the electric source.

This apparatus not only permits of securing plating of uniform thickness throughout the entire surface of the several articles and thus effecting an equal distribution of the amount of metal used for this purpose, but it permits of doing this work much more rapidly than has been possible heretofore and also by the use of less attention and a reduction in the amount of space heretofore necessary for accomplishing the amount of work.

Furthermore, by the use of this apparatus it is possible to electroplate articles with a much smaller quantity of electrolyte than has been possible heretofore, thereby materially reducing the cost of operation.

We claim as our invention:

1. An electroplating apparatus comprising a tank adapted to contain an electrolyte, a support upon which the articles to be plated are suspended in said electrolyte, and means for moving said support lengthwise and also crosswise relative to said tank.

2. An electroplating apparatus comprising a circular tank adapted to contain an electrolyte, a support upon which the articles to be plated are suspended in said electrolyte, and means for moving said support circumferentially about the axis of said tank and also laterally relatively thereto.

3. An electroplating apparatus comprising a circular tank adapted to contain an electrolyte, a turret arranged above the tank and adapted to support in said tank the articles to be electroplated, and means for imparting a rotary and a laterally oscillating motion to said turret.

4. An electroplating apparatus comprising a circular tank adapted to contain an electrolyte, a turret arranged above the tank and adapted to support in said tank the articles to be electroplated, and means for imparting a rotary and a laterally oscillating motion to said turret comprising a main upright shaft which supports said turret, and an auxiliary upright shaft having eccentrically arranged bearings in which said main shaft is journaled.

5. An electroplating apparatus comprising a circular tank adapted to contain an electrolyte, a turret arranged above the tank and adapted to support in said tank the articles to be electroplated, and means for imparting a rotary and a laterally oscillating

motion to said turret comprising a main upright shaft which supports said turret, an auxiliary upright shaft having eccentrically arranged bearings in which said main shaft is journaled, and means for turning said shafts independently of each other.

6. An electroplating apparatus comprising a circular tank adapted to contain an electrolyte, a turret arranged above the tank and adapted to support in said tank the articles to be electroplated, and means for imparting a rotary and a laterally oscillating motion to said turret comprising a main upright shaft which supports said turret, an auxiliary upright shaft having eccentrically arranged bearings in which said main shaft is journaled, and means for turning said shafts independently of each other comprising a gear wheel arranged on the lower end of the auxiliary shaft, an upper counter-shaft provided with a gear pinion meshing with said gear wheel, a worm wheel journaled concentrically with said auxiliary shaft, an intermediate shaft connected at its opposite ends by universal joints with said main shaft and worm wheel, and a lower counter shaft provided with a worm meshing with said worm wheel.

7. An electroplating apparatus comprising a circular tank adapted to contain an electrolyte, a turret arranged above the tank and adapted to support the articles to be plated in said tank and comprising a hub arranged centrally relatively to the tank, sweeps extending radially outward from said hub, and a ring connected with the outer ends of said sweeps and arranged over said tank.

8. An electroplating apparatus comprising a circular tank adapted to contain an electrolyte, a turret arranged above the tank and adapted to support the articles to be plated in said tank, a rotatable sleeve on which said hub is journaled, and means for connecting and disconnecting said sleeve and hub.

9. An electroplating apparatus comprising a circular tank adapted to contain an electrolyte, a turret arranged above the tank and adapted to support the articles to be plated in said tank, a rotatable sleeve on which said hub is journaled, and means for connecting and disconnecting said sleeve and hub, comprising a coupling bolt mounted on said hub and adapted to be engaged with and disengaged from said sleeve, an intermediate lever pivoted on said turret and having one arm connected with said bolt, a hand lever pivoted on the turret, and a rod connecting said hand lever with the other arm of said intermediate lever.

10. An electroplating apparatus comprising a circular tank adapted to contain an electrolyte, a turret arranged above the tank and adapted to support the articles to be

plated in said tank and having a circular supporting ring arranged over the tank, and means for suspending the articles to be plated in said tank from said ring.

11. An electroplating apparatus comprising a circular tank adapted to contain an electrolyte, a turret arranged above the tank and adapted to support the articles to be plated in said tank and having a circular supporting ring arranged over the tank, and means for suspending the articles to be plated in said tank from said ring comprising a horizontal rack bar provided with a longitudinal row of openings for receiving the articles to be plated, hanger bars connected at their lower ends with said rack bar, and hooks arranged on said hanger bars and engaging detachably over said ring.

12. An electroplating apparatus comprising a circular tank adapted to contain an electrolyte, a turret arranged above the tank and adapted to support the articles to be plated in said tank and having a circular supporting ring arranged over the tank, and means for suspending the articles to be plated in said tank from said ring comprising a horizontal rack bar provided with a longitudinal row of openings for receiving the articles to be plated, hanger bars connected at their lower ends with said rack bar, hooks arranged on said hanger bars and engaging detachably over said ring, and a cross bar connecting the upper ends of said hanger bars.

13. An electroplating apparatus comprising a tank having the form of an annular trough which is open at the top and adapted to contain an electrolyte, a supporting ring arranged in said tank and mounted thereon, and anodes suspended in the electrolyte from said ring.

14. An electroplating apparatus comprising a tank having the form of an annular trough which is open at the top and adapted to contain an electrolyte, a supporting ring arranged in said tank and mounted thereon, and an open work basket adapted to contain a sectional anode and provided at its upper end with hooks which detachably engage over said ring.

15. An electroplating apparatus comprising a circular tank adapted to contain an electrolyte, a turret arranged above the tank and adapted to support the articles to be plated in said tank, and means for electrically connecting said articles with the electric circuit comprising a cup mounted centrally on said turret and adapted to contain mercury, an upright conductor rod dipping at its lower end into said mercury and an overhead support upon which the upper end of said rod is swiveled.

16. An electroplating apparatus comprising a circular tank adapted to contain an electrolyte, a turret arranged above the tank

and adapted to support the articles to be plated in said tank, and means for electrically connecting said articles with the electric circuit comprising a cup mounted centrally on said turret and adapted to contain mercury, an upright conductor rod dipping at its lower end into said mercury, a stationary overhead bracket provided with a semi-spherical socket, and a semi-spherical knuckle arranged on said rod and journaled in said socket.

17. An electroplating apparatus comprising a circular tank adapted to contain an electrolyte, a turret arranged above the tank and adapted to support the articles to be plated in said tank, and means for electrically connecting said articles with the electric circuit comprising a cup mounted centrally on said turret and adapted to contain mercury, an upright conductor rod dipping at its lower end into said mercury, and an annular row of guide rollers which are

mounted on said cup and receive between them said rod.

18. An electroplating apparatus comprising a circular trough shaped tank adapted to contain an electrolyte, anodes curved concentrically with the walls of said tank and arranged adjacent to the inner sides of the same, and means for moving the articles to be plated through the electrolyte comprising rack bars which are adapted to support the articles and which are curved concentrically with the walls of said tank.

19. An electroplating apparatus comprising a circular trough shaped tank adapted to contain anodes and an electrolyte, and means for supporting the articles to be plated comprising a rack bar movable through said electrolyte and curved concentrically with the walls of said tank.

WILFRED THOMPSON.
WALTER R. JAMESON.