Oct. 3, 1933. W. J. O'NEILL 1,928,949

ELECTROPLATING APPARATUS

Filed May 31, 1930 5 Sheets-Sheet 1

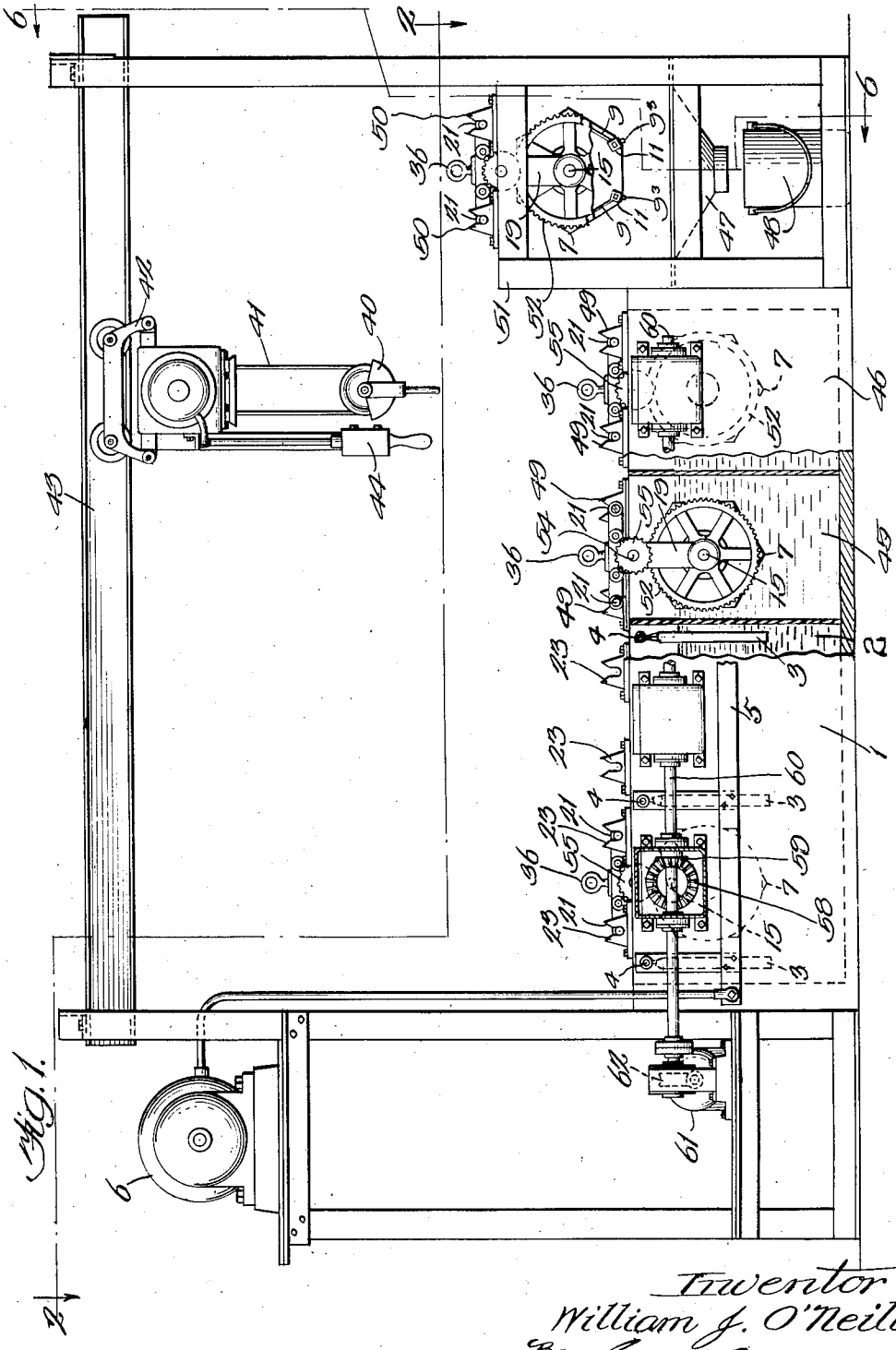

Fig. 1.

Inventor
William J. O'Neill
By L. F. Cragg Atty

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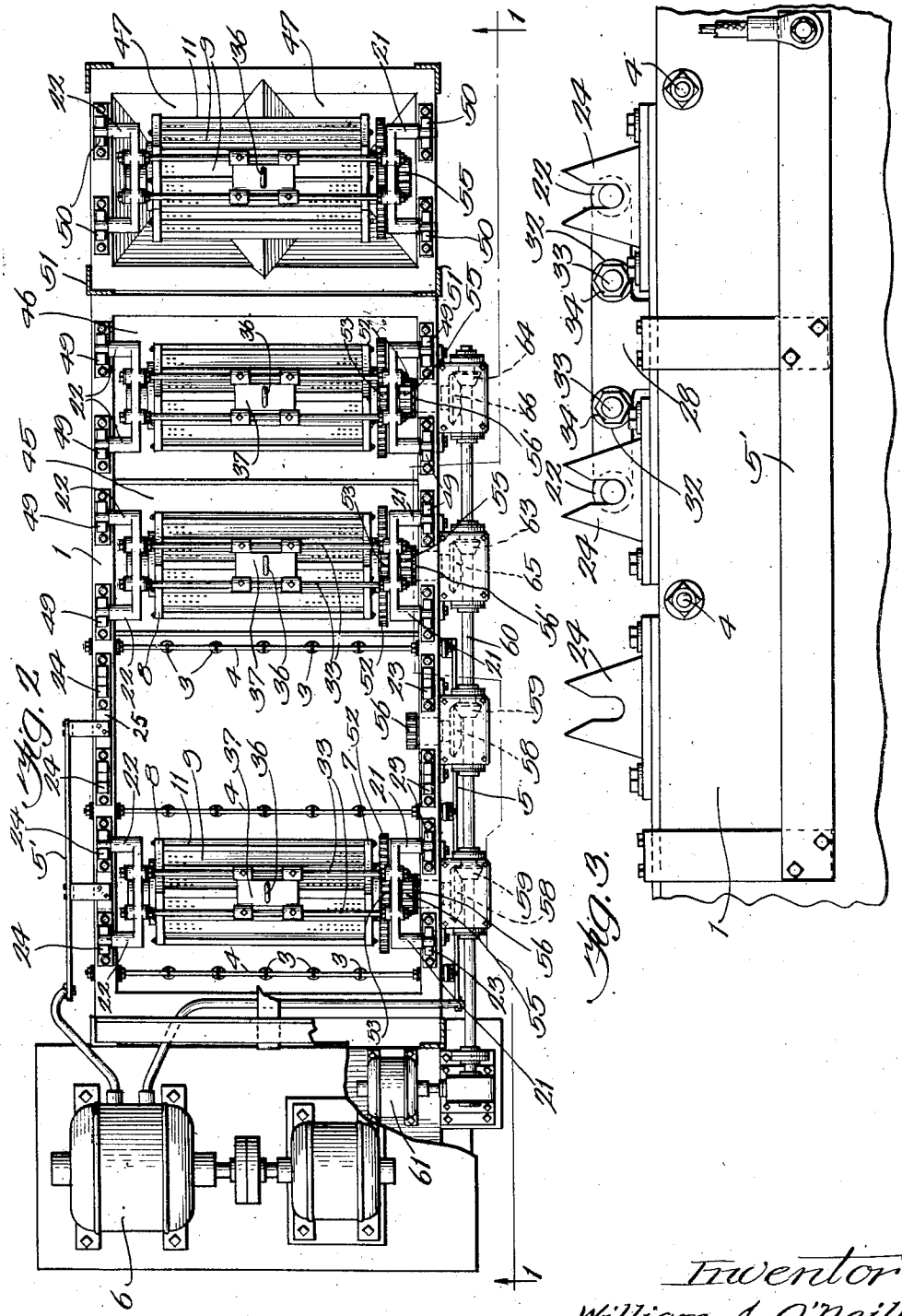

Fig. 2.

Fig. 3.

Inventor:
William J. O'Neill
By L. L. Bragg Atty.

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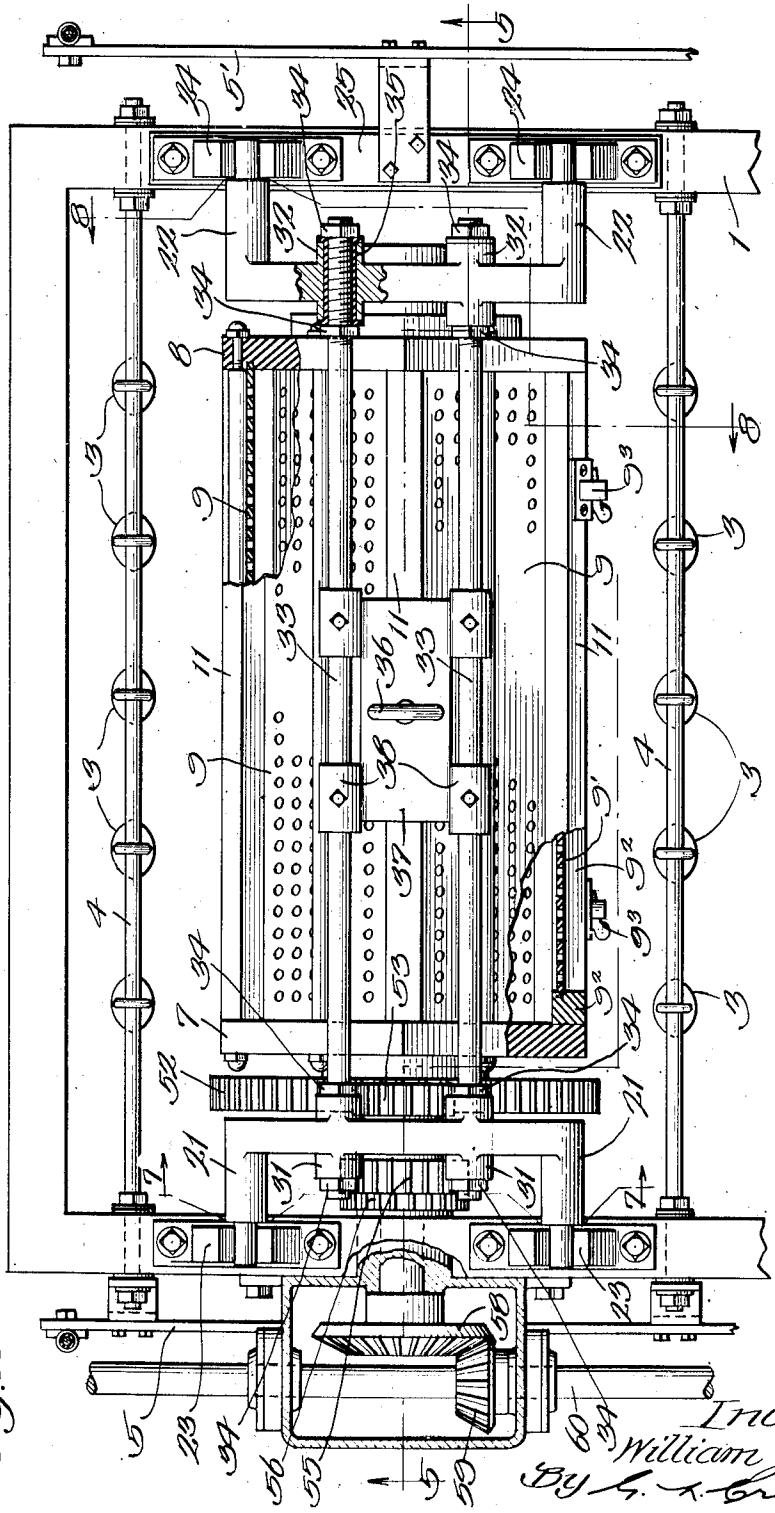

Fig. 4.

Inventor
William J. O'Neill
By L. L. Cragg Atty.

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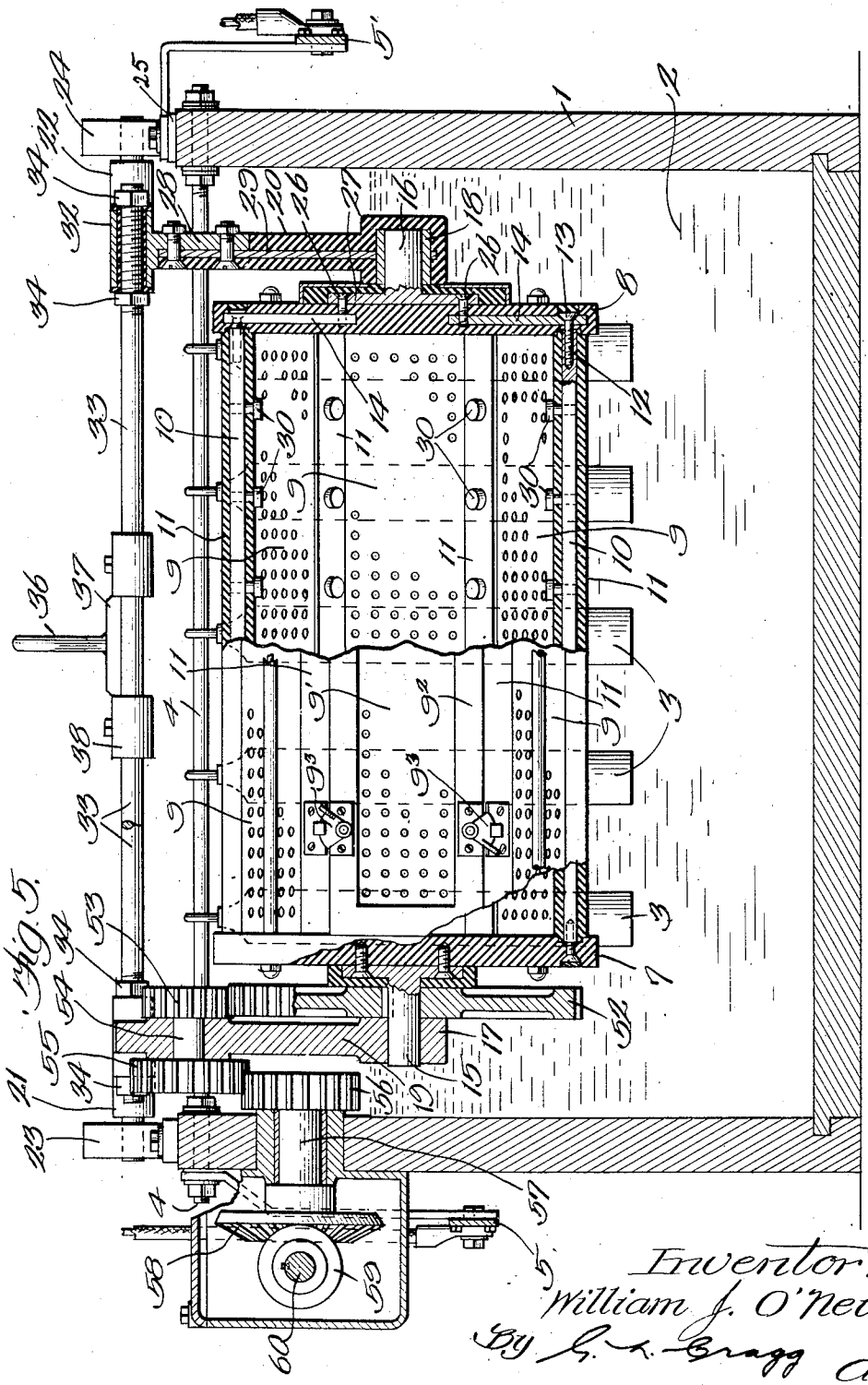

Fig. 5.

Inventor:
William J. O'Neill
By G. L. Bragg Atty.

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Fig. 6.

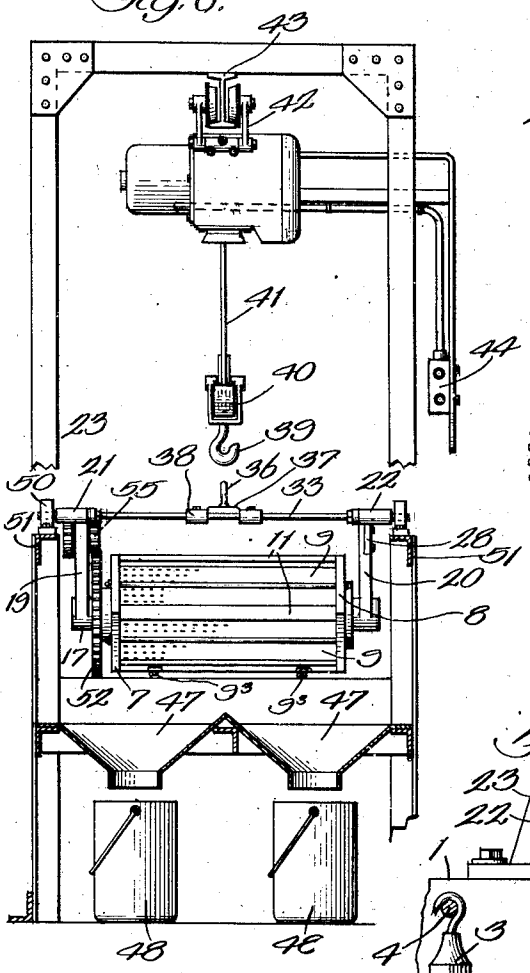


Fig. 7.

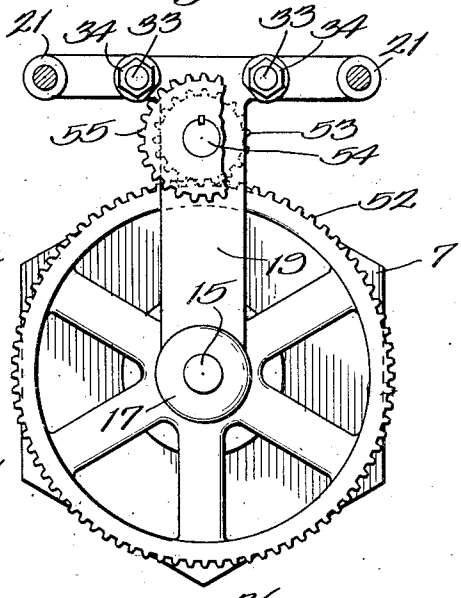
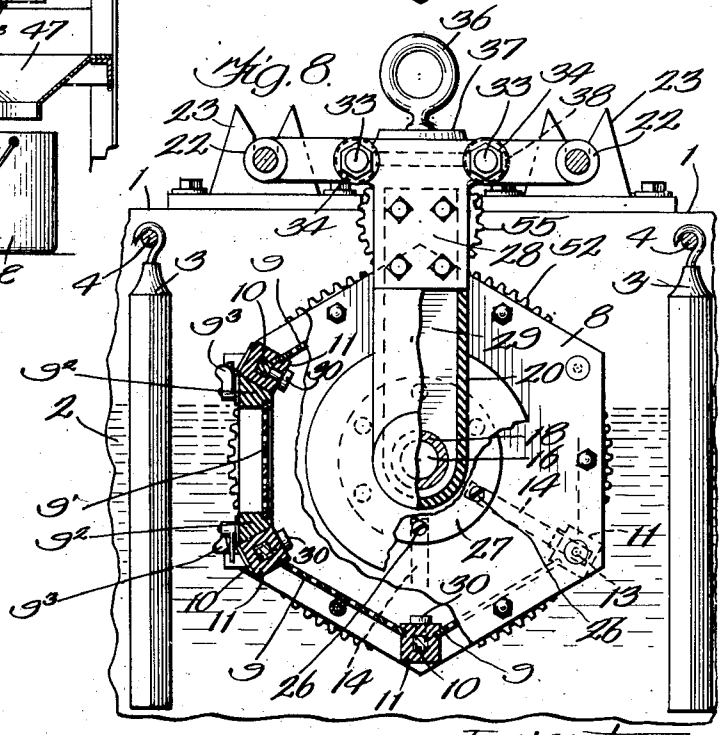


Fig. 8.



Inventor
William J. O'Neill
By L. L. Bragg Atty.

Patented Oct. 3, 1933

1,928,949

UNITED STATES PATENT OFFICE

1,928,949

ELECTROPLATING APPARATUS

William J. O'Neill, River Forest, Ill., assignor to Mercil Plating Equipment Company, Chicago, Ill., a corporation of Illinois

Application May 31, 1930. Serial No. 457,829

2 Claims. (Cl. 204—11)

My invention relates to electroplating apparatus of a kind employing stationary electrolyte containing tanks and tumbler barrels which are removably located in the tanks. Such apparatus is inclusive of means for rotating the barrels while within the tanks. My invention has for its prime object the provision of motion transmitting gearing by which the barrels may be revolved and which is inclusive of two co-acting revoluble gear members which are separable to permit the removal of the corresponding barrel and which are engageable when the barrel is inserted within the corresponding tank and without the necessity of any careful adjustment of the barrel. These two gear elements are desirably intermeshing spur gear wheels, though the invention is not to be thus restricted. Switching mechanism is desirably also associated with the barrel and is governed by its position, the barrel serving to operate the switching mechanism to close the circuit when the barrel is fully located within the tank and to open the circuit when the barrel is withdrawn.

The invention has for another object the provision of improved means for rinsing the barrel and its contents following the completion of the plating operation and for adjusting the barrels into discharging position.

The invention will be more fully explained in connection with the accompanying drawings in which Fig. 1 is a side elevation of the preferred form of equipment, parts shown in section, this figure being taken generally on line 1—1 of Fig. 2; Fig. 2 is a sectional view on line 2—2 of Fig. 1; Fig. 3 is a view, on a larger scale, of a part of the structure as it appears in Fig. 1; Fig. 4 is a plan view with portions broken away and shown in section; Fig. 5 is a sectional view on line 5—5 of Fig. 4; Fig. 6 is a sectional view on line 6—6 of Fig. 1; Fig. 7 is a sectional view on line 7—7 of Fig. 4; and Fig. 8 is a sectional view on line 8—8 of Fig. 4.

A stationary electroplating tank 1, made of insulating material, contains any suitable form of liquid electrolyte 2. There are three rows of anodes 3 which are to supply metal or material to the objects to be plated. These anodes are hung upon the three metallic bus rods 4 that are supported upon the tank in position to permit the anodes to be sufficiently immersed within the electrolyte. These bus rods are in electrical connection with the anodes and are connected in parallel between the conducting bars 5 which are respectively connected with the poles of a suitable source of current such as the direct current generator 6. The invention is not to be limited to the employment of direct current as it is obvious that the electrolytic cell itself may be adapted to the rectification of alternating current.

Each of the electroplating barrels illustrated is rotatable within the electrolyte and is inclusive of end walls 7 and 8, formed of suitable insulating material, and six thin wall portions or perforated panels 9, 9', also formed of suitable insulating material. Panels 9 are received at their ends within grooves formed upon the inner faces of said end walls. Said end walls are assembled with the aid of metallic rods 10 which pass through the distance preserving insulating bars 11 that, together with the aforesaid end walls, constitute frames for the five apertured panels 9. Panel 9' is desirably provided with a frame 9^2 which is directly seated against and between adjacent insulating bars 11 and against the barrel end walls 7 and 8. This panel 9' and its frame 9^2 constitute a removable closure or lid which is taken from the barrel when objects are to be inserted within or withdrawn from the barrel. Catches 9^3 hold the lid in place. The assembly of the end walls is completed by means of the threaded metallic rods or bolts 12 having heads or shoulders 13 thereon. These rods or bolts are screwed into the rods 10 and said shoulders or heads serve to clamp the end walls against the rods 10 and the distance preserving bars 11. The threaded rods 12 at the right hand end of the barrel, shown in Fig. 5, also pass through the radially disposed conductors 14. The end walls carry metallic stub shafts 15 and 16 which are coaxial with the barrels and are journaled within bearings 17 and 18. These bearings are provided at the lower ends of hangers 19 and 20. These hangers are T-shaped, the heads of the T's being uppermost and respectively carrying ears 21, 21; 22, 22. These ears project outwardly at the respective ends of the barrel and are reduced at their outer ends to be receivable within open sockets, sockets 23 receiving the reduced extensions of the ears 21 and sockets 24 receiving the reduced extensions of ears 22. The sockets 23 are mounted directly upon the top of the tank 1 of insulating material and are, therefore, not included in circuit, this being also true of the hanger 19, the bearing 17 and the shaft 15. The sockets 24, on the other hand, constitute switch contacts to which the ears 22, of metal, are complemental. These sockets are mounted upon a metallic plate 25 with which the metallic current conducting bar 5' is electrically and mechanically connected. The plating tank is shown as being adapted for the reception of two plating barrels

each having the four sockets 23, 24, the sockets 24 pertaining to both barrel receiving spaces being connected with each other by the plates 25 and the bar 5', as illustrated most clearly in Fig. 2. The metallic ears 22 pertaining to each tumbler barrel are electrically connected with the conductors 14 and the bars 10 of such barrel by means of metallic screws 26 which electrically and mechanically unite the flange 27 of the shaft 16 of such barrel with the conductors 14, the bearing 18 being metallic and in electrical engagement with the shaft 16, said bearing being electrically connected with the metallic ears 22 of the barrel on the hanger 20 by conductors 29 encased by the hanger. The hanger 20 is of insulation substantially throughout, this hanger being inclusive of a metallic portion 28 which is bolted to the insulating portion of the hanger and which metallic portion is integral with the contiguous ears 22. The plating circuit is inclusive of the bus rods 4 connected in multiple by the bar 5 with one terminal of the generator and the bars 10 that are connected in multiple with the other terminal of the generator, the conductors 14, 26, 27, 16, 18, the conductors 29 housed in the hangers 20, the ears 22, the sockets 24 and the bar 5', the conductor 29 being in direct mechanical and electrical connection with the bearing 18 and with said ears. The metallic rods 10 constitute cathode conductors whose connection with the electrolyte is effected by cathode terminal screws 30 which are passed through the insulating distance preserving bars 11 into threaded electrical connection with said bars. Approximately the lower third of each barrel is immersed in the electrolyte in the tank 1, this electrolyte passing into the barrels through the perforations in the barrel panels.

The heads from which the ears 21, 22 spring are formed with sleeves 31, 31; and 32, 32, each sleeve 31 having one sleeve 32 aligned therewith longitudinally of the corresponding barrel. Rods 33 pass through the aligned sleeves, these rods being threaded at their ends to receive suitable nuts 34 between which said sleeves are clamped. Liners 35 of insulation electrically separate the rods 33 and the contiguous nuts 34 from the contiguous ears 22. Eyes 36 are assembled with the rods 33 at midlength of the barrels, these rods being provided upon assembling plates or blocks 37 carrying said eyes and having sleeves 38 through which the rods 33 pass, these sleeves being bolted to said rods. The eyes 36 are provided for the reception of a lifting hook 39 carried by the sheave 40 which is received in the bight of a cable 41, the parts 40 and 41 being part of an electrical hoist of any well known or suitable construction and herein shown as being carried upon a truck 42 which rides upon a rail 43 that is arranged crosswise of the barrels and directly above the eyes 36. The electrical hoist has suitable manually operable controlling mechanism generally illustrated at 44 by which the sheave may be raised or lowered and caused to travel upon said rail. As the barrels are independently connectible in the plating circuit either one may be lifted from the plating tank by the hoisting mechanism without interfering with the electroplating process that may be going on within the other barrel. When the plating process has been concluded in each barrel such barrel is lifted from the plating tank and transferred to the first rinsing tank 45 within which the barrel is turned to rinse the plated objects therein. After the first rinsing the barrel is lifted from the rinsing tank 45 and is transferred to the rinsing tank 46 where the barrel is again turned to complete the rinsing process. After the objects within the barrel have been given their second rinsing, the barrel is transferred to a location above the hoppers 47 which discharge into removable containers 48. Sockets 49 are provided upon the rinsing tanks and sockets 50 are provided above the hoppers within which the ears 21, 22 pertaining to the barrels may be received. The framework 51 which supports the sockets 50 also supports the hoppers. When the barrel is supported in the sockets 50, the lid 9', 9^2 is removed whereafter the barrel is turned to a discharging position to permit the passage of the plated objects therefrom into the hoppers. After the barrel has been emptied it is placed with the lid opening in the barrel uppermost, whereafter a fresh lot of objects that are to be plated may be located within the barrel, whereafter the lid is applied. The barrels are placed in the plating tank in succession and are so handled that plating, rinsing, loading and unloading are being substantially constantly carried on.

By means of my inventon the barrels may be passed downwardly into the plating and rinsing tanks with but little, if any, manipulation to couple them with the gearing that is to turn them. To this end, the gearing employed is desirably inclusive of spur gears. Each barrel is shown as being provided with a spur gear wheel 52 fixed in connection with the stub shaft of such barrel. This spur gear wheel is in permanent mesh with the spur pinion 53 whose shaft 54 is journaled in the upper end of the hanger 19. The gear wheel 52 is coaxial with and fixed with respect to the corresponding barrel but the composite gear 53, 55, although permanently assembled with the corresponding barrel is rotatable with respect thereto. The gear wheel 55 is separably in mesh with the gear wheel or pinion 56 whose shaft 57 is permanently journaled apart from the barrel and preferably within the contiguous side wall of the tank. This shaft carries a bevel gear wheel 58 which is permanently in mesh with a bevel pinion 59. The shaft 60 upon which the pinion 59 is fixed is driven by a prime mover, preferably an electric motor 61, through the intermediation of any suitable power transmitting mechanism 62. The shaft 60 extends longitudinally along one side of the plating tank and carries two bevel pinions 59 that are respectively in engagement with the contiguous gears 58 for rotating the barrels while within the plating tank and also carries two bevel pinions 63, 64 that are located at the rinsing tanks and which are in mesh with the bevel gears 65, 66 at these tanks for rotating the barrels when within such tanks. It may be assumed that the shaft 60 is being constantly driven to constantly drive the pinions or gear wheels 56 that are in the plating tank, but above the electrolyte, and the gears 56' that are in the rinsing tanks, but preferably above the rinsing liquid. The pinions or gear wheels 55 are engageable with the gear wheels 56, 56' at the tops of these latter gear wheels so that gear elements 55 carried by the barrels may be lifted out of mesh with the gear wheels 56 when the barrels are raised and whereby the engagement of the said rotatable gear elements 55 with the gear wheels 56 56' may readily be established when the barrels are lowered. If the crowns of the teeth of the gear wheels 55 should initially engage the crowns of the teeth of the gear wheels 56, 56' as the barrels are being lowered, it is obvious that such engage-

ment will be speedily broken due to the constant rotation of the latter gear wheels, full intermeshing of these gears following, so that no careful positioning of the barrels is required as they are being lowered into place in order that they may be coupled with the prime mover that is to turn them.

Changes may be made without departing from the invention.

Having thus described my invention, I claim:

1. In electroplating apparatus, the combination with a tank; of a revoluble barrel; a gear wheel fixed with respect to the barrel and coaxial therewith; a composite gear permanently assembled with the barrel above the fixed gear wheel and rotatable with respect to the barrel, one of the gears of the composite gear being in mesh with the fixed gear and the other gear of the composite gear being offset therefrom away from the barrel but closely adjacent thereto; a driving gear wheel mounted upon and within the tank apart from the barrel and with which the offset gear has separable engagement; and means including a T-shape hanger having a pair of ears one of which is spaced on each side of the axis of the composite gears for supporting the barrel within the tank to permit engagement of the driving and offset gears, whereby all of said gears are within the tank.

2. In electroplating apparatus, the combination with a liquid containing tank; of a plurality of revoluble barrels each disposed transversely of the tank; a plurality of bevel gears journaled in the walls of the tank above the level of the liquid and spaced apart longitudinally of the tank; a driving shaft extending longitudinally of the tank and carrying bevel pinions engaging the bevel gears; a driving gear coaxial with each bevel gear within the tank and driven thereby; a gear wheel fixed with respect to each barrel and coaxial therewith; a composite gear permanently assembled with the barrel above the fixed gear wheel and rotatable with respect to the barrel, one of the gears of the composite gear being in mesh with the fixed gear and the other gear of the composite gear being offset therefrom away from the barrel to engage the said driving gear; and means for supportng each barrel within the tank in the vicinity of each bevel gear to permit engagement of the offset gear of each barrel with one of the driving gears.

WILLIAM J. O'NEILL.