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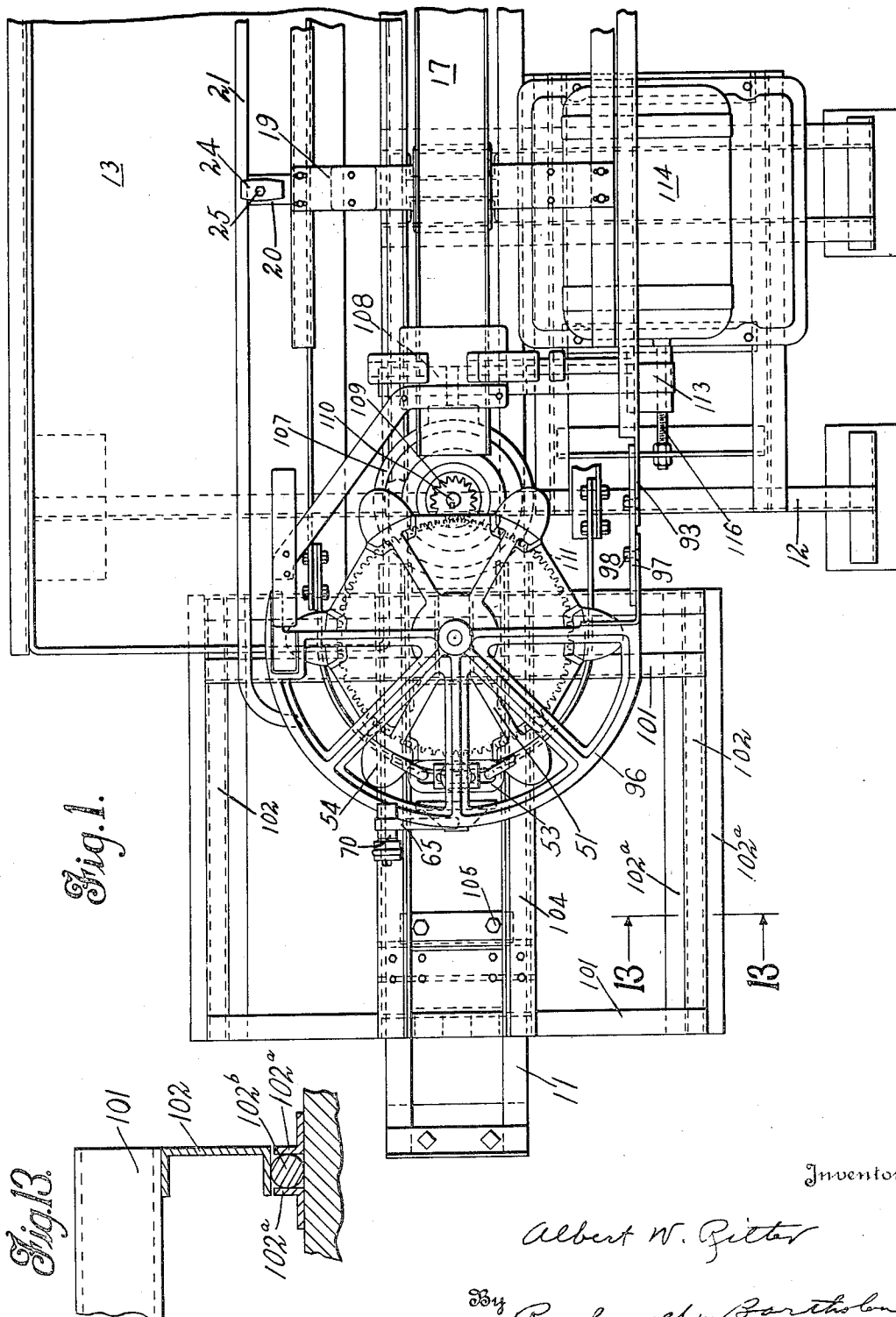
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1,937,359

METAL PLATING MACHINE

Filed July 3, 1930

6 Sheets-Sheet 1



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1,937,359

METAL PLATING MACHINE

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6 Sheets-Sheet 2

Fig. 2.

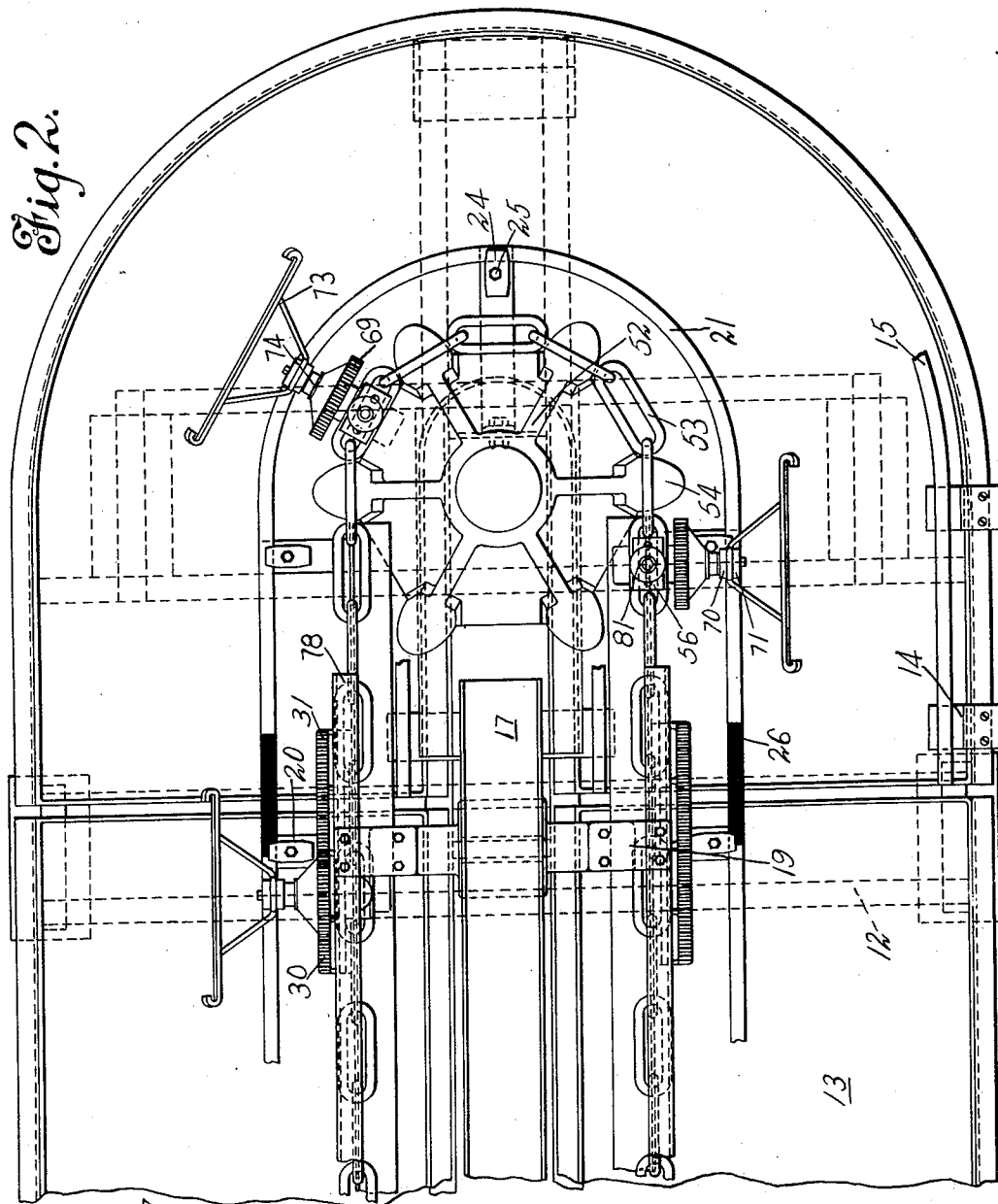
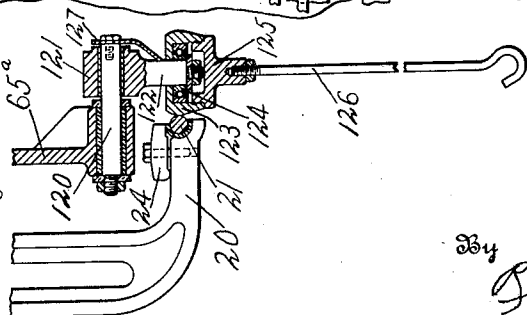


Fig. 12.



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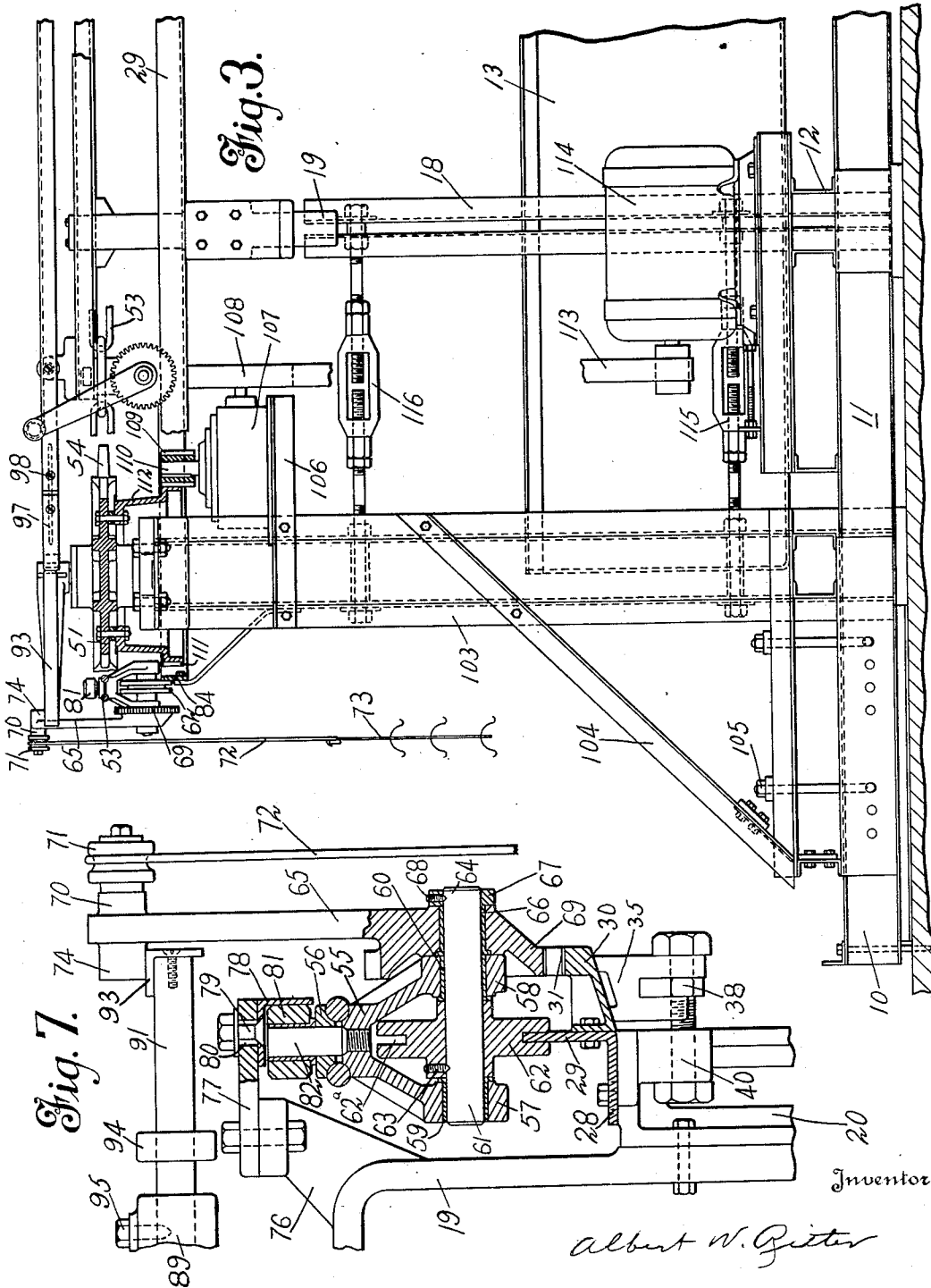
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METAL PLATING MACHINE

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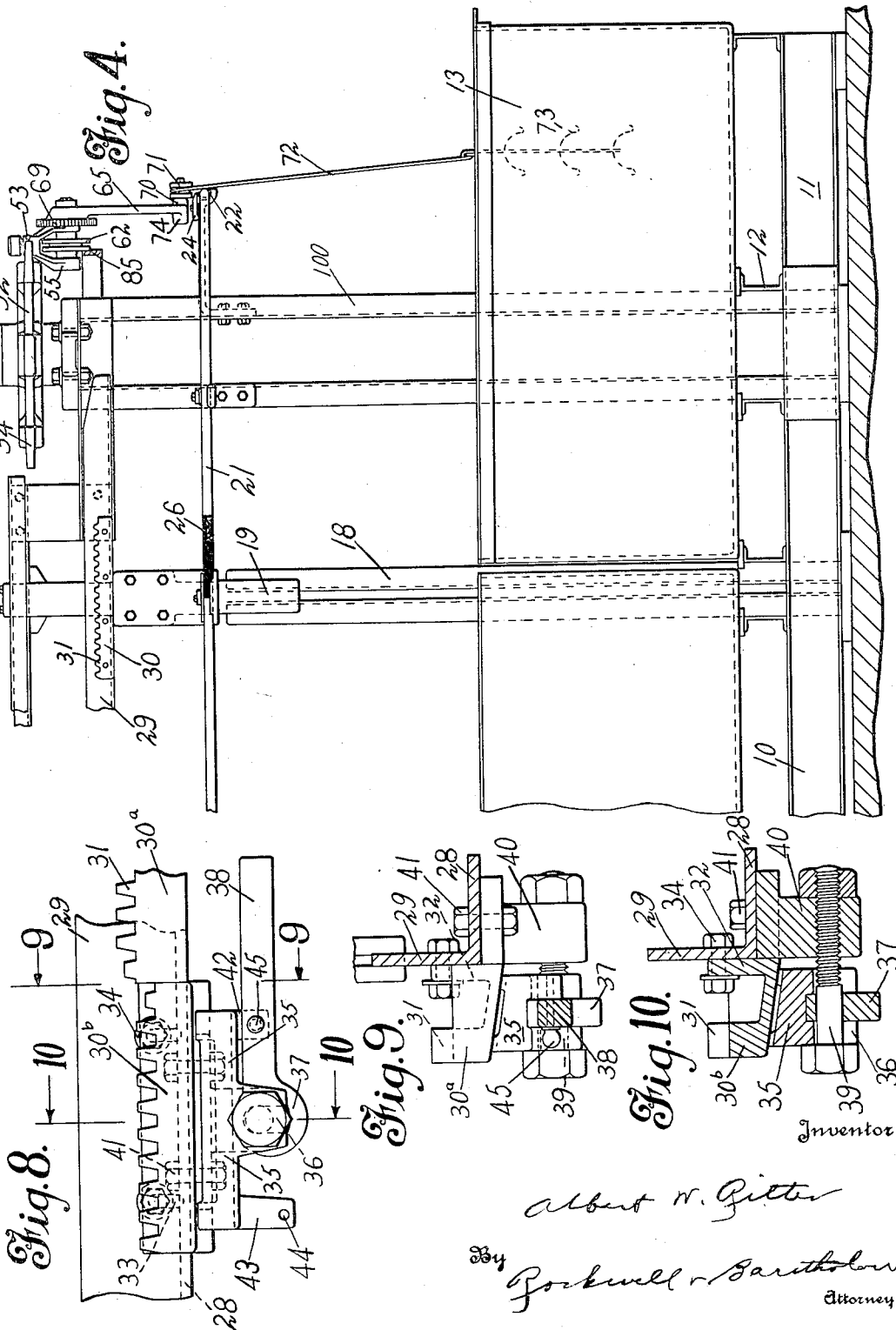
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METAL PLATING MACHINE

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METAL PLATING MACHINE

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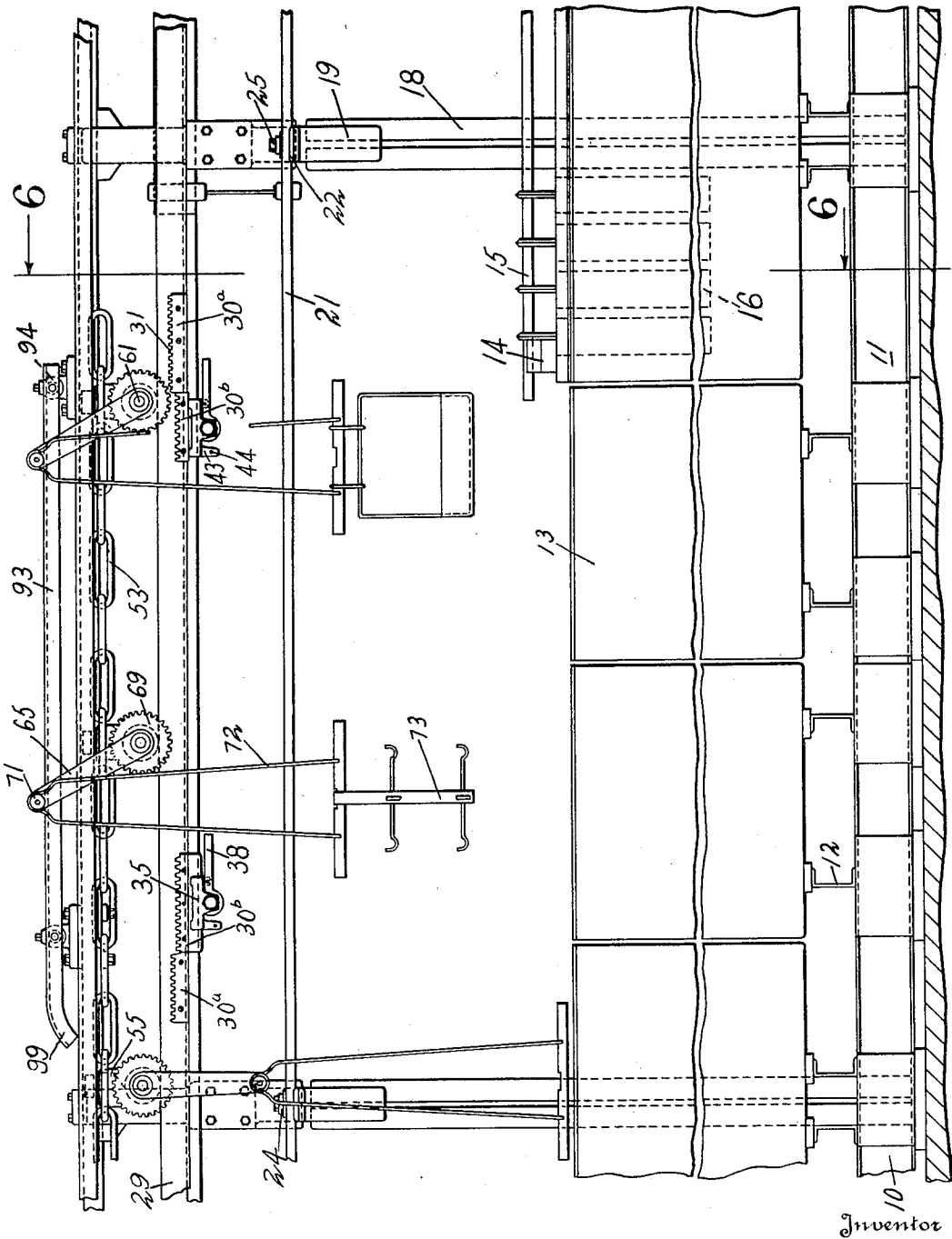


Fig. 5

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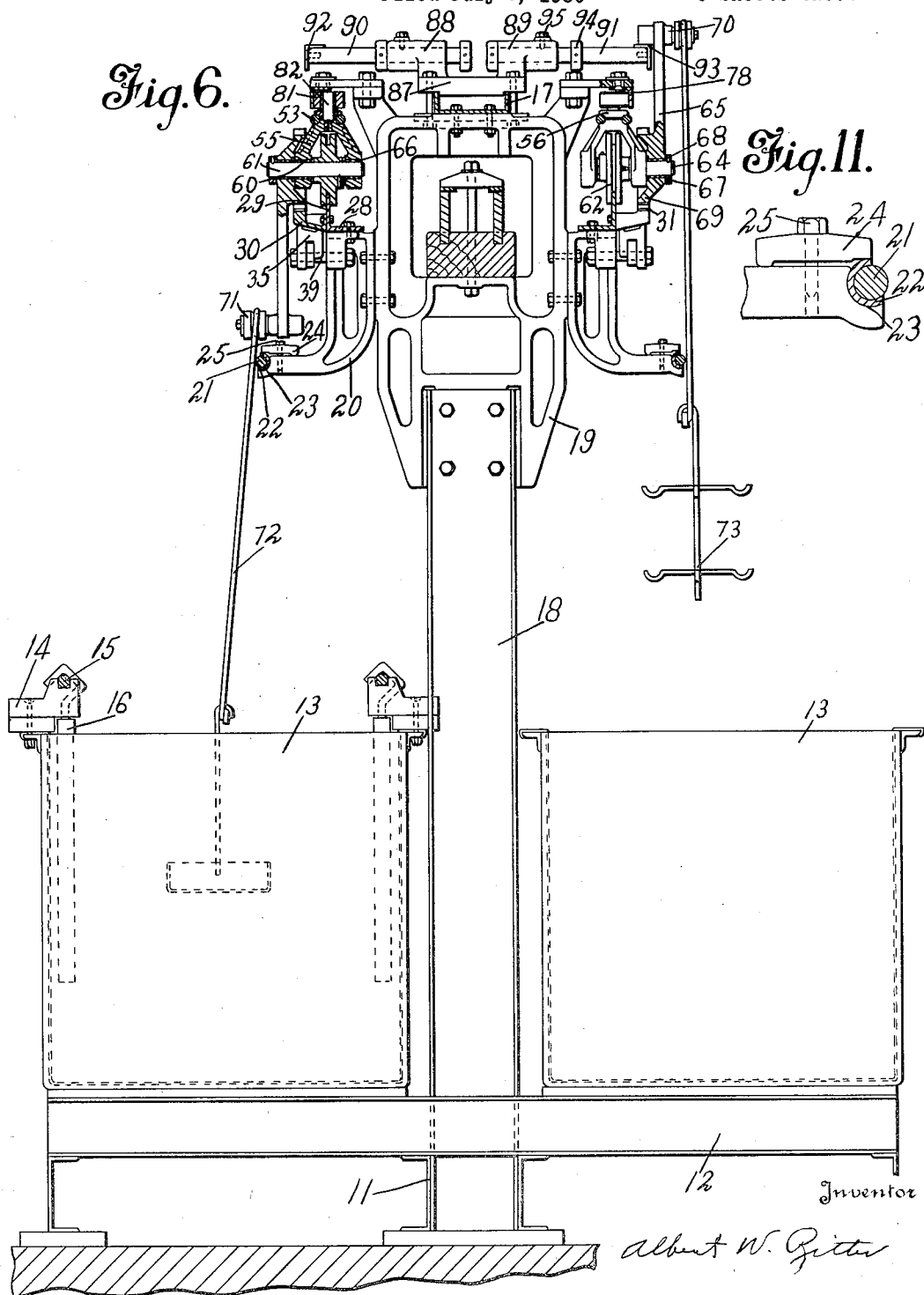
METAL PLATING MACHINE

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Fig. 6.

Fig. 11.



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UNITED STATES PATENT OFFICE

1,937,359

METAL PLATING MACHINE

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Application July 3, 1930. Serial No. 465,625

23 Claims. (Cl. 204—5)

This invention relates to metal plating machines and more especially to a device comprising a support or framework upon which may be supported a number of tanks containing the plating solutions and provided above these tanks with a carrying mechanism designed to transport the articles to be plated through the tanks, to automatically raise them from one tank and immerse them into a solution in the following tank, or to hold them in raised positions so that any given tank or tanks may be skipped or passed over as desired. The traveling mechanism as shown is supported on suitable frames carried by upright standards rising from the support or base so that the device is a complete self-contained unit.

The device disclosed in the present application is arranged particularly for use in electroplating operations, and represents improvements over and additions to the plating mechanism shown in Patent No. 963,817 granted to John H. Shaw, July 12, 1910, and is adapted to be used for the same general purposes as the machine shown in that patent.

One object of my invention is the production of a simple and efficient electro-plating machine for automatically immersing the articles to be electro-plated in the various baths, transporting them through the baths and extracting them therefrom for transfer to other baths.

A further object of the invention is the provision of a new and improved plating apparatus having means for supporting the tubs containing the plating solutions and means for transporting the articles through these solutions.

A still further object of the invention is the provision of means to automatically extract the articles from the bath by raising them above the level of the solution and to hold them in raised position for a predetermined time so that any given bath or baths may be passed over without dipping the articles therein or to maintain the article holders in raised position so that the articles to be plated may be conveniently placed upon or removed from the holders.

A still further object of the invention is the provision of an adjustable end section of the apparatus whereby the carrying chain may be kept in taut condition.

Still other features reside in the construction of the skipping mechanism whereby it may be brought into or thrown out of action readily and conveniently, in an improved track mechanism upon which the work holders are supported,

in an improved work-holding arm and other features which will appear as the description proceeds.

To these and other ends, the invention consists in the novel features and combinations of parts to be hereinafter described and claimed.

In the drawings:

Fig. 1 is a top plan view of the driving end of my improved plating machine;

Fig. 2 is a similar view of the driven end of the machine;

Fig. 3 is a side elevational view of the parts shown in Fig. 1;

Fig. 4 is a side elevational view of the parts shown in Fig. 2;

Fig. 5 is a side elevational view of a portion of the machine between the ends thereof;

Fig. 6 is a transverse sectional view on lines 6—6 of Fig. 5;

Fig. 7 is an enlarged view partly in section of the transporting and skipping mechanism;

Fig. 8 is a detailed view showing the racks for raising and lowering the work carriers;

Fig. 9 is a sectional view on lines 9—9 of Fig. 8;

Fig. 10 is a sectional view on lines 10—10 of Fig. 8;

Fig. 11 is an enlarged view of the cathode bus bar and the clamp for the same;

Fig. 12 is a sectional view showing a modified form of work-carrying arm, and

Fig. 13 is an enlarged sectional view on lines 13—13 of Fig. 1.

The device which I have selected to illustrate and describe as a preferred embodiment of my invention comprises a lower base or support 10 which may conveniently be formed of spaced angle irons 11, upon which are mounted to extend in transverse direction a number of supporting members 12 such as angle irons or the like which, as shown in Fig. 6, extend outwardly from the center of the machine to support the tubs or vats 13 designed to contain the plating solution.

Upon these tubs or vats are mounted clamps 14 to support the anode bus bars 15 from which are suspended anodes 16 which extend into the solution in the tubs. It will be understood that the anodes 16 are sectional, the sections being substantially the length of the tubs or vats and the adjacent ends of the sections are connected together so that they may readily be detached. Any one or more of the tubs may, therefore, be pulled out of place if it is not desired to use them, by simply disconnecting the ends of the

sections of the anode bus bars. It will also be understood that separate electrical connections are made to each of the sections so that one vat may be removed without interrupting the current through the others and also in order that the individual control of the electric current through the various baths may be provided. Rising upwardly from the base portion of the machine along the center line thereof, are a number of standards 18, upon the upper ends of which are mounted suitable frames 19 designed to support the transporting mechanism which will be described hereinafter. These frames 19 are also connected together by means of a channel iron or other runner 17 which extends longitudinally of the machine adjacent the upper part thereof so as to secure the frames 19 and standards 18 rigidly together.

At each side of each of the frames 19 is secured a bracket or arm 20, the end of each of these arms projecting outwardly and supporting the cathode bus bars 21 which as shown in Figs. 1, 2 and 5 extend continuously along both sides and about one end of the machine. This bus bar is insulated from the arms 20 by pieces of insulation 22, the bar and insulation being clamped in the seat 23 at the end of the arm 20 by means of the clamping jaw 24, held in place by the screw 25. The bus bar 21 is circular in cross-section and like the anode bar 15 is made up of a number of sections, the sections being insulated from each other as shown at 26 so that the quantity of current passing through each section may be regulated.

Upon the brackets 20 is supported a suitable track consisting of an angle iron member having a horizontal portion 28 secured to the bracket and a vertical portion 29 designed to support sheaves or rollers carried by the transporting mechanism. It will be apparent by referring to Figs. 1 and 2, that these tracks terminate at the end sections of the machine, that is, they do not extend around the curved ends of the device, the carrier mechanism being supported and guided by other means at these points.

Secured at spaced points along the vertical portion 29 of the track member are rack members 30 having rack teeth 31. These rack members may be and preferably are divided into two sections, as shown, for example, in Figs. 5 and 8, one of these sections 30^a being secured to the track and the other of the sections 30^b being vertically adjustable with relation to the track for a purpose to be hereinafter described. This adjustment of the rack members 30^b is obtained in the following manner: The rack members themselves are provided with a web section 32 to abut the portion 29 of the track, this web being provided with slots 33 to receive the clamping bolts 34 passing through the track section 29. At its lower portion the rack section 30^b rests upon a block 35 provided with a central slot 36 within which is disposed a cam member 37 carried by a lever 38, the lever being pivoted on a bolt 39 secured in a block 40 secured to the track portion 28, by means of the bolts 41. A pair of depending ears 42 and 43 are secured to the block 35, these ears being provided with openings 44 to receive a pin 45 mounted in the lever 38 to secure this lever in adjusted position.

It will be apparent from reference to Figs. 3 to 10 inclusive, that when the lever 38 is in the position shown in Fig. 8, the large portion

of the cam will be disposed below the pivot 39 and the rack portion 30^b will be in its lower position as shown in this figure with its teeth below those of the adjacent rack section 30^a. If it is desired to raise the section 30^b so that it will form a continuous rack with the section 30^a, the pin 45 is removed from the opening 44 and the lever 38 revolved in a clockwise direction as viewed in Fig. 8 through an angle of 180°, the pin 45 then entering the opening 44 in the ear 43. The large portion of the cam is now above the pivot 39 and the block 35 will have been raised, thereby raising the section 30^b to the level of the adjacent rack section. It will be understood, of course, that prior to the manipulation of the lever 38, the nuts of the clamping bolts 34 will be loosened so as to permit the rack section to be moved upwardly on these bolts and after the operation is completed the nuts will be again tightened.

Upon the end sections of the machine as shown in Figs. 1, 2, 3 and 4, are mounted sprocket wheels 51 and 52 around which is trained a carrier chain 53, the sprocket wheels having teeth 54 which in this instance enter into the alternate links of the chain. Upon the links of this chain 53 are carried at intervals a number of work-supporting arms which are designed to carry racks or the like upon which the work or articles to be plated may be carried. The number of these arms and the associated supporting mechanism will, of course, be varied as desired, and as the structure of all is identical, one only will be described.

With reference to Figs. 2, 6 and 7, it will be apparent that the sprocket wheels 51 and 52 are of the proper diameter to support the chain in a position substantially directly over the track sections 29. A yoke member 55 is secured at the under side of one of the links of the chain by means of a clamping plate 56 which spans the sides of the link above the same and is secured to the yoke. This yoke is provided with journals 57 and 58 within which are mounted oilless graphite impregnated bearing sleeves 59 and 60. A shaft 61 is rotatably mounted within these sleeves and a sheave or roller 62 is fixedly secured to this shaft by means of the set screw 63. One end of this shaft is extended and shown at 64 and upon this extended end a work support arm 65 is rotatably mounted by means of an oilless graphite impregnated bearing sleeve 66. A collar 67 secured upon the shaft by a set screw 68 serves to hold the arm in place. Formed integrally with the arm 65 is a pinion 69, this pinion being disposed in the proper plane so that its teeth will mesh with those of the racks 30.

The arm 65 upon its free end is provided with a transverse pin or lug 70 upon one end of which is mounted a grooved roller 71 to carry the work-supporting member 72 to the end of which may be secured the work rack 73. The pin or lug 70 also projects from the other or inside of the arm 65 as shown at 74, the purpose of which will be described hereinafter.

The sheave or roller 62 is provided with a peripheral groove 62^a within which is received the track portion 29 so that the sheave will ride upon and be supported and guided by the track. It will be noted that this sheave is secured to the shaft 61 which rotates within the yoke 55 and that the arm 65 is rotatably supported upon the shaft so that the latter rotates independently of arm 65.

Projecting from the upper corners of the brackets 19, are lugs 76 to which are secured plates 77, which plates in turn carry angle iron guides 78 secured to the plates by means of bolts 79. The bolts 79 pass through elongated slots 80 in the plates so that the guides 78 may be adjusted within limits transversely of the machine. Rollers 81 are rotatably mounted upon pins 82, which pins are secured in the yokes 55, these rollers bearing against the vertical portion of the angle iron guides 78. Referring to Fig. 6 it will be observed that the work-carrying members 72 bear against the cathode bus bars 21 to carry the current through the work. As these bus bars are usually made of copper or brass and are therefore relatively soft and subject to wear, it is desirable that the friction between these bars and the members 72 be adjusted so that while good contact is made the wear on the bars will not be excessive. This adjustment is made possible by the provision of adjustment for the guides 78, as the movement of this guide in or out with relation to the bracket 19 tends to swing the yoke 55 and shaft 61 about a horizontal axis, and therefore moves the roller 71 outwardly or inwardly with respect to the bus bar 21. The member 72 is suspended loosely from the roller 71 so that it is always maintained in a depending position regardless of the position of the arm 65, the member 72 tending to hang vertically from the roller. The guides 78 extend entirely along the sides of the machine but terminate short of the rounded ends thereof as do the track members 29.

At the driving and driven ends of the machine where the work carriers are turned through an angle of 180° around the sprockets 51 and 52, the tracks 29 and guides 78 are omitted as has already been described and the carrier chain is at these points supported by its engagement with the teeth of the sprocket wheels. The carrier yokes are, however, guided so as to be maintained in the proper positions with respect to a vertical plane by means of arcuate guides 84 and 85 secured to the machine frame. These guides bear against the side faces of the rollers or sheaves 62. Under ordinary conditions the sheaves do not turn in their travel about the ends of the machine but merely slide along the outer surfaces of the guides 84 and 85.

As shown more especially in Figs. 6 and 7, a support 87 is secured at the upper portion of certain of the brackets 19, these supports carrying horizontal sleeves 88 and 89, within which are slidably mounted pins 90 and 91, these pins being provided on their outer ends with elongated rests or supports 92 and 93 (see Fig. 5), which supports when in extended position as shown in Fig. 7, and at the right of Fig. 6, lie in the plane of the projecting end 74 of the pin 70. The pins 90 and 91 are adjustable in the sleeves 88 and 89 and are provided with stops 94 to limit this adjustment. Set screws 95 are provided to secure the pins in adjusted position. When they are at their inner positions as shown at the left hand side of Fig. 6, the elongated rest or supports 92 and 93 are no longer in position to engage the ends 74 and these rests are at that time inoperative. These rests may be placed wherever desired upon the machine and due to the fact that they are adjustable to an inoperative position, they may be substantially continuous, although they may, if desired, only be used at such places at which it is desirable to skip or pass over a vat or tank or where, for other reasons, it is desirable to hold the work in elevated position. This

is usually desirable about the driving end of the machine where ordinarily the finished work will be removed from the work holders and new racks carrying articles to be plated will be placed thereupon. For this purpose, therefore, a rest or support 96 substantially semi-circular in shape is provided at the driving end of the machine as shown in Fig. 1, this rest being adjustably secured to the rest 92 by means of the slotted plate 97 and bolts 98. The racks 92 and 93 are provided with downwardly curved discharge ends 99 to guide the work-carrying arms as they are being lowered.

The driven sprocket 52 as shown in Fig. 4 is rotatably mounted upon a fixed standard 100 at the driven end of the machine, while the driving sprocket 51 as shown in Figs. 1 and 3 is mounted upon an end frame adjustable with respect to the lower base stringers 11. This frame comprises a lower substantially rectangular portion, having transverse members 101 and longitudinal members 102, an upright standard 103 secured to the rectangular portion and held in place by braces 104, the rectangular base being slidable upon the stringers 11 and secured thereto by bolts 105. At the upper end of the standard 103 is a shelf 106 upon which is mounted a gear box 107 within which is mounted suitable reduction gearing (not shown) between the shaft of a pulley 108 and a pinion 109 secured to a vertical shaft 110 extending upwardly from the gear box. The teeth of the pinion 110 are in mesh with a gear 111 provided on the external periphery of a skirt or apron 112 secured at the lower side of the driving sprocket 51 which is rotatably mounted at the upper end of standard 103. The pulley 108 is driven by a belt 113 from a motor 114 supported by certain of the transverse angle irons 12. Between the standard 103 and the adjacent standard 13 are mounted turn buckles 115 and 116 by means of which the standard 103 may be drawn toward or moved away from the adjacent standard 13, when the bolts 105 have been loosened to permit such movement.

This adjustment is facilitated by the provision of angle plates 102^a mounted upon the floor or other support, as shown in Fig. 13. Between these angle plates is placed a circular rod 102^b of hardened steel upon which slides the lower portion of the angle iron 102, which forms the longitudinally extending portion of the rectangular end frame of the driving sprocket.

The object of this adjustment is to adjust the chain 53 to the proper tension, and it may be necessary to make such adjustment from time to time, due to the wear of the parts under operating conditions.

In Fig. 12 of the drawings I have shown another form of work support which has been found to be particularly desirable in certain instances. In this case the arm 65^a which is used instead of the arm 65, shown in the other figures of the drawings, is provided at its lower end with a pin 120 upon which is rotatably mounted an arm support 121 having depending therefrom a pin 122. Upon the lower end of this pin is rotatably mounted a collar 123 by means of a ball or like bearing 124, the collar 123 being open at its lower end so as to threadedly receive a holder 125 for a work-supporting hook 126. Upon the end of the pin 120 is mounted a leaf spring 127, the free end of which bears against the pin 122 to resiliently urge the collar 123 against the cathode bus bar 21.

As a result of this construction it will be seen that the collar 123 is free to rotate upon the bear-

ing 124 relatively to the pin 122 and the movement of this collar along the bus bar 21 by the chain 53 will effect the rotation of this collar and thereby effect the rotation of the work or articles to be plated within the bath. This continual movement of the work will result in the application of a more nearly even coat of material.

The operation of my device is as follows:

It will be obvious that when the motor 114 is placed in operation, the chain 53 is put in motion by the driving sprocket 51. This causes the yokes 55 to be carried about the tracks 29 and to move with them the work-carrying arms 65. If these work-carrying arms are in the lower position shown at the left of Fig. 6, the work or articles to be plated will be dipped into the plating solution and the current being completed by the work-carrying members 72 contacting with the cathode bus bars 21, the plating operation will begin. When the material reaches the end of one vat or tank or the partition between two adjacent tanks, the teeth of the gear 69 will mesh with those of a rack 30 which has been properly positioned with relation to the tanks. If this rack 30 is a continuous one as shown in Fig. 4, or if it comprises a pair of racks 30^a and 30^b as shown in Fig. 5, the teeth of which, however, have been placed in alignment to constitute one rack, the gear 69 will be rotated through substantially a complete revolution raising the arm 65 and the work-carrying member 72, so that the work is removed from the solution and carried above the partition between the tanks after which it will be lowered into the next tank. It will be seen that the direction of the work at the beginning and at the end of the rotating movement is opposite to that of the movement of the chain 53 so that the work will be permitted to travel through substantially the full length of a preceding tank and will be lowered into the adjacent end of the succeeding tank so as to travel substantially through the full length of this tank.

If, however, it is desired to hold the work elevated for any reason such as to skip one or more of the tanks, one of the track members 92 or 93 is moved outwardly through its sleeve 88 or 89 into the position shown at the right hand side of Fig. 6 and the section 30^b of the track is dropped to inoperative position as shown at the right hand side of Fig. 5. The gear 69 will no longer be rotated through a complete revolution as the number of teeth on the rack section 30^a are sufficient only to move it into such a position that the projecting portion 74 of the pin 70 on the end of the arm 65 will engage and ride upon the rest 93 as shown in Figs. 5 and 7 and at the right hand side of Fig. 6.

The work will now be carried in this position until the teeth of the gear 69 mesh with the teeth of the next rack section 30^a which will be properly positioned with respect to the partition between two adjacent tanks and with respect to the end 99 of the rest 93 so that the work will again be lowered so as to be immersed in the plating solution or rinsing solution as the case may be.

It will, of course, be obvious that, if it is not desired to skip any of the tanks, a full length rack 30 may be used as shown in Fig. 4. It is desirable, however, to have the racks formed sectionally as shown in Fig. 5, particularly in view of the fact that one of the two sections of each rack may be placed in or out of operative position so that it may act as a full length rack simply to raise the work holder over the end of the tank and immerse the work into the next

tank, or as a rack section to raise the work arm to the position in which it will be caught by the rest 93 and carried along above the tanks.

It has been observed that a rest 96 of semi-circular form is provided at the driving end of the machine. It is convenient to station the operator at this point to remove the plated articles from the work holders and place new ones thereon. This operation will be carried out much more conveniently when the work holders are in raised position and hence it has been found desirable to maintain them in this position as they are traveling about the end of the machine and usually no plating will be done at this point.

While I have shown and described a preferred embodiment of my invention, it will be understood that it is not to be limited to all of the details shown, but is capable of modification and variation within the spirit of the invention and within the scope of the appended claims.

What I claim is:

1. A metal plating machine comprising a frame, standards on said frame, a track supported by said standards and extending lengthwise of the machine, article-carrying means mounted on said track comprising a yoke member, a shaft mounted in the arms thereof, a roller mounted on said shaft and having flanges embracing the sides of the track, and a swingable arm carried by said shaft, means to move said article-carrying means along said track, a vertically disposed shaft on said yoke member, a roller on said shaft, and a guiding flange on the frame to cooperate with the roller and adjustable transversely of the frame.

2. A metal plating machine comprising a frame, a track supported upon the frame, an article-carrying member mounted to move along said track, a swingable arm supported by said member to support the work to be plated, a guide member above the track, and a roller mounted on a vertical axis on said article-carrying member to cooperate with said guide member in maintaining the article-carrying member in proper position.

3. A metal plating machine comprising a frame, a track supported upon the frame, an article-carrying member mounted to move along said track, a swingable arm supported by said member to support the work to be plated, a guide member above the track, and means secured to said article-carrying member to cooperate with said guide member in maintaining the article-carrying member in proper position, said guide member being adjustable transversely of the machine to vary the position of the work-carrying arm.

4. A metal plating machine comprising a frame, standards rising from the frame at spaced points therealong, brackets carried by said standards at each side thereof, tracks supported by said brackets at each side of the standards, sprocket wheels at each end of the frame and having an endless chain trained thereover to move above said tracks, article-carrying means carried by said chain, and rollers carried by said means supported from said tracks below the chain, and guiding means above said chain to maintain the upper portion of said carrying means in proper position, said guiding means comprising a roller mounted on a vertical axis on said article-carrying means, and a guide flange cooperating with the roller.

5. In a metal plating mechanism, a work holder, a travelling rotary member adapted to raise

and lower the holder upon the rotation of said member, and means to retain said member in raised position during its travel, said means being adjustable into and out of operative position.

through which said arm is rotated, and means to support said arm for horizontal travel when rotated through a predetermined angle.

14. In a dipping mechanism, a frame, a travelling carrier on the frame, a rotary work-carrying arm associated with said carrier for horizontal travel, means to effect rotation of said arm, said means being divided into sections, and certain of said sections being movable to inoperative position to vary the angle through which the arm is rotated.

15. In a dipping mechanism, a frame, a travelling carrier on the frame, a rotary work-carrying arm associated with said carrier for horizontal travel, means to effect rotation of said arm, said means comprising a pinion on said arm, and a rack on the frame, the effective length of said rack being variable to vary the angle through which the arm is rotated.

16. In a dipping mechanism, a frame, a travelling carrier associated with said frame, work-holding arms rotatably carried by said carrier for horizontal and rotary movements, means to rotate said arms through a partial revolution, a support above said carrier, and means on said rotatable arms engaging said support to maintain the arms in raised position, while being moved horizontally by the carrier.

17. In a dipping mechanism, a frame, a travelling carrier thereon, work-holding arms movably associated with said carrier for horizontal travelling movement, and for rotation in a vertical plane, a series of tanks below the carrier, and means for moving said arms to dip the work in said tanks or to transport it thereover as desired, said means comprising pinions on said arms and sectional racks on the frame to cooperate therewith, and said rack sections being adjustable to effect complete or partial rotation of the arms.

18. In a dipping mechanism, a frame, a travelling carrier on said frame, a work-holding member associated with said carrier for travelling movement, a current-carrying member supported by the frame and making contact with said work-holding member, and a two part clamp member partially embracing said current-carrying member to support the same whereby a part of said current-carrying member is exposed to contact with the work-holding member and is rotatable in its support to vary the point of contact.

19. In a dipping mechanism, a frame, a travelling carrier associated with the frame, a work-holding member associated with said carrier, a current-carrying member supported by the frame and designed to make contact with said work-holding member, said current-carrying member being circular in cross-section and being rotatable in its supporting means to vary the point of contact, and a releasable clamping device for holding said current-carrying member in adjusted position with a part thereof exposed to engage the work-holding member.

20. In a dipping device, a travelling carrier, rotary work-supporting members associated with said carrier and adapted to be moved vertically to raise and lower the work, supporting means extending longitudinally of the carrier to engage said members and hold them in raised position, and said supporting means being adjustable transversely of the carrier into and out of operative position.

21. In a dipping device, a travelling carrier, rotary work-supporting members associated with

6. In a plating mechanism, a work holder, a rotary member adapted to travel horizontally above a bath and upon its rotation to raise or lower said work holder, and means to engage below a part of said rotary member when the latter is in raised position and retain it in such position during the horizontal travel of said member.

7. In a dipping mechanism, a travelling carrier, a rotary member carried thereby, a work holder carried by said rotary member, said rotary member being adapted to raise and lower the work holder during its rotation, means to effect a partial rotation of said rotary member to move the work holder to raised position, means to retain the latter in said position, and means to effect the completion of the rotation of the work holder to lower the work when the holder is released by the retaining means.

8. In a dipping mechanism, a travelling carrier, a series of rotating members associated with said carrier, work holders carried by said rotary members and designed to be raised and lowered thereby, means to effect the rotation of said rotary members individually to raise and lower the work holders, means to retain certain of said work holders in raised position, comprising a member engaging below a part of the work holder and said member being movable transversely of the mechanism to non-engaging position.

9. In a dipping mechanism, a travelling carrier, a series of rotating members associated with said carrier, work holders carried by said rotary members and designed to be raised and lowered thereby, means to effect the rotation of said rotary members individually to raise and lower the work holders, means to retain certain of said work holders in raised position, and said means being adjustable into and out of operative position.

10. In a dipping mechanism, a travelling carrier, a work holder, a member movably associated with said carrier and adapted to raise and lower the work holder, and means on the frame cooperating with said movable member to effect the movement thereof, said means being adjustable to effect either raising movement only of said holder or both raising and lowering movements thereof.

11. In a dipping mechanism, a travelling carrier, a work-carrying arm rotatably associated therewith, and a work holder carried by said arm, means to partially rotate said arm to raise the work holder and maintain it in raised position, and means to thereafter effect the completion of the rotation of the arm to lower the work holder to its initial position.

12. In a dipping mechanism, a frame, a travelling carrier on the frame, a rotary work-supporting arm associated therewith, means at one point on the frame to effect a partial rotation of said arm to raised position, means to maintain said arm in raised position during the travel of the carrier, and means at a point on the frame spaced from said first named point to engage the arm and effect continued rotation thereof to lower the work into the bath.

13. In a dipping mechanism, a frame, a travelling carrier on the frame, a rotary work-carrying arm associated with said carrier for horizontal travel, means to effect rotation of said arm, and said means being adjustable to vary the angle

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- said carrier and adapted to be moved to raise and lower the work, supporting means extending longitudinally of the carrier to engage said members and hold them in raised position, said supporting means being adjustable transversely of the carrier into and out of operative position, and said supporting means also being adjustable longitudinally of the carrier to extend the effective length of said means.
22. In a dipping mechanism, a frame, an endless travelling carrier supported on the frame, work-holding members movably associated with said carrier and adapted to be moved to raise and lower the work during the travel thereof, supporting members mounted on the frame lengthwise of the carrier to engage the work-holding members and support them in raised position, and said supporting members extending around an end of the frame and being adjustable longitudinally.
23. In a dipping mechanism, a frame, a travelling carrier on said frame, a work-holding member associated with said carrier for travelling movement, a current-carrying member supported by the frame and making frictional contact with said work-holding member, one of said members being rotatable to vary the point of contact, and means for adjusting the position of the work-holding member toward and from the current-carrying member to vary the frictional contact therebetween.
- ALBERT WILLIAM RITTER.

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25	100
30	105
35	110
40	115
45	120
50	125
55	130
60	135
65	140
70	145
75	150