Dec. 14, 1937. B. G. DAW 2,102,308

AUTOMATIC PLATING CONVEYER

Filed March 20, 1936 5 Sheets-Sheet 1

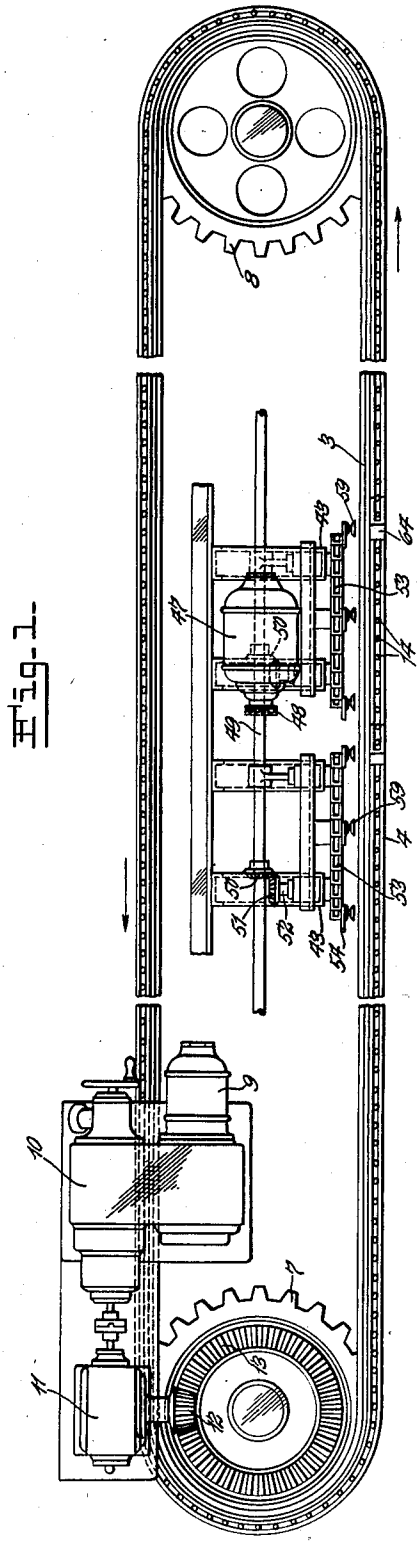


Fig. 1.

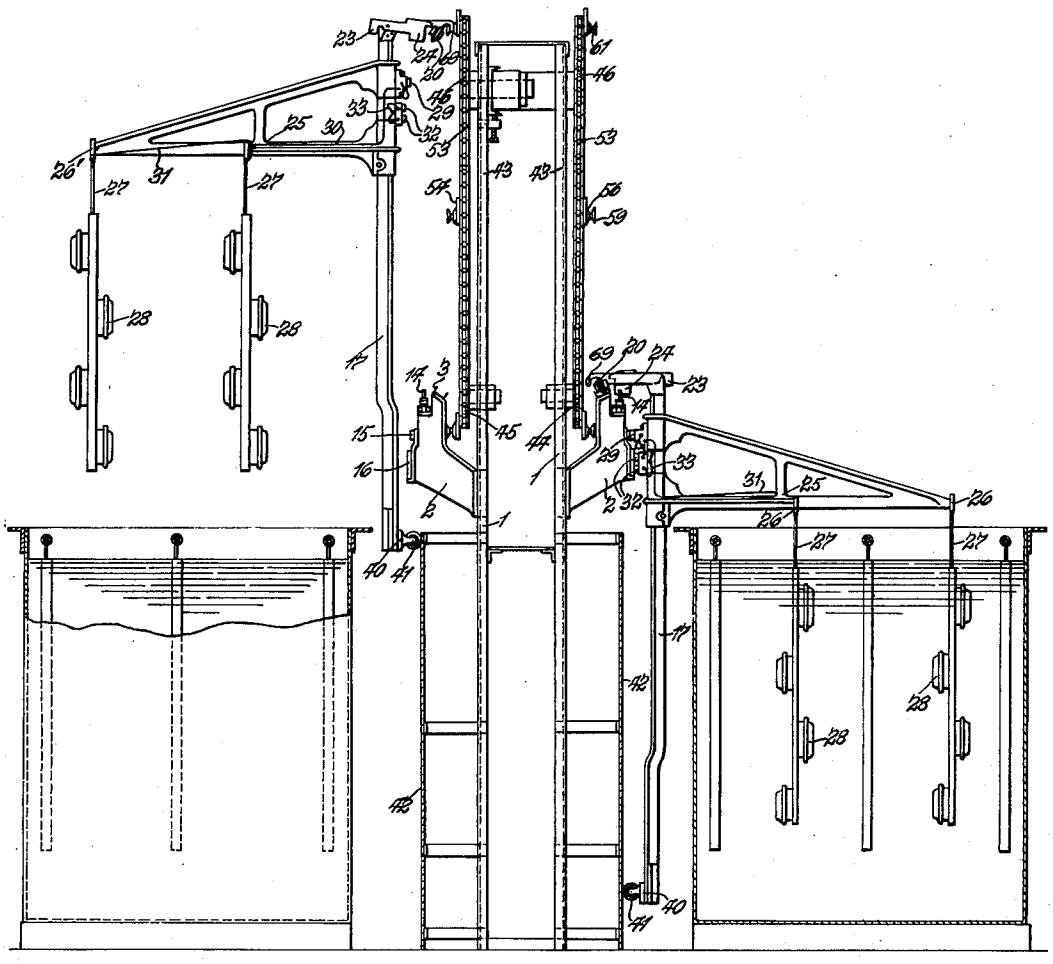
Inventor
Burton G. Daw
by Rippey & Cassidy
His Attorneys.

Dec. 14, 1937. B. G. DAW 2,102,308

AUTOMATIC PLATING CONVEYER

Filed March 20, 1936 5 Sheets-Sheet 2

Fig. 2.



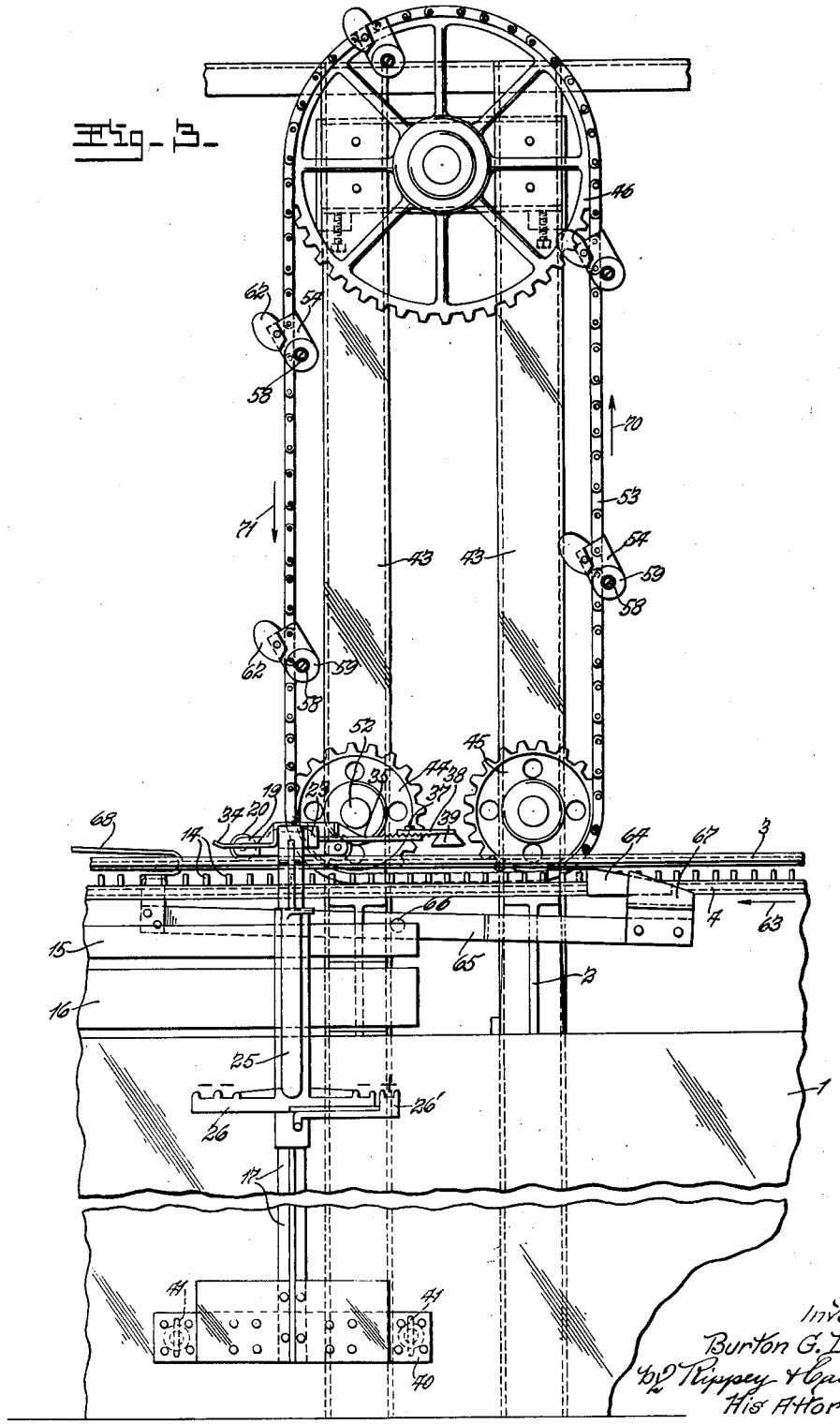
Inventor
Burton G. Daw
by Pippey & Cassidy
His Attorneys.

Dec. 14, 1937. B. G. DAW 2,102,308

AUTOMATIC PLATING CONVEYER

Filed March 20, 1936 5 Sheets-Sheet 3

Fig. 3.



Inventor
Burton G. Daw
by Pippey & Cassidy
His Attorneys.

Dec. 14, 1937. B. G. DAW 2,102,308

AUTOMATIC PLATING CONVEYER

Filed March 20, 1936 5 Sheets-Sheet 4

Fig. 5.

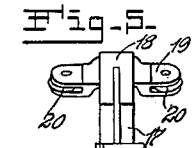


Fig. 4.

Fig. 6.

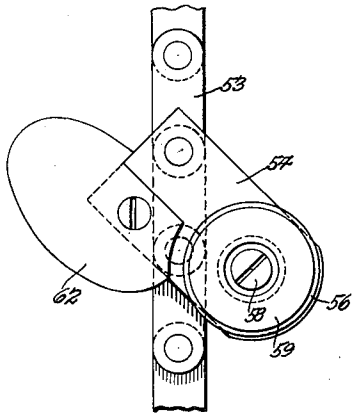
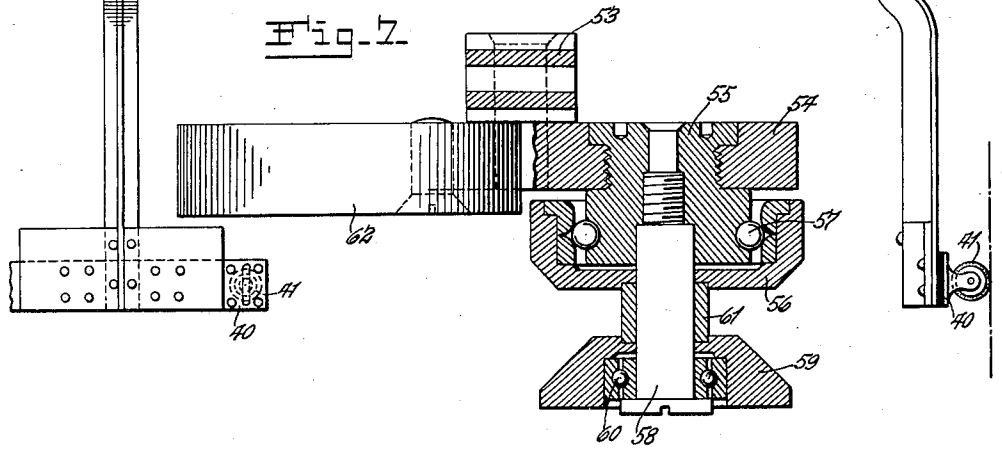


Fig. 7.



Inventor
Burton G. Daw
by Pippey & Cassidy
His Attorneys.

Dec. 14, 1937. B. G. DAW 2,102,308

AUTOMATIC PLATING CONVEYER

Filed March 20, 1936 5 Sheets-Sheet 5

Fig. 8.

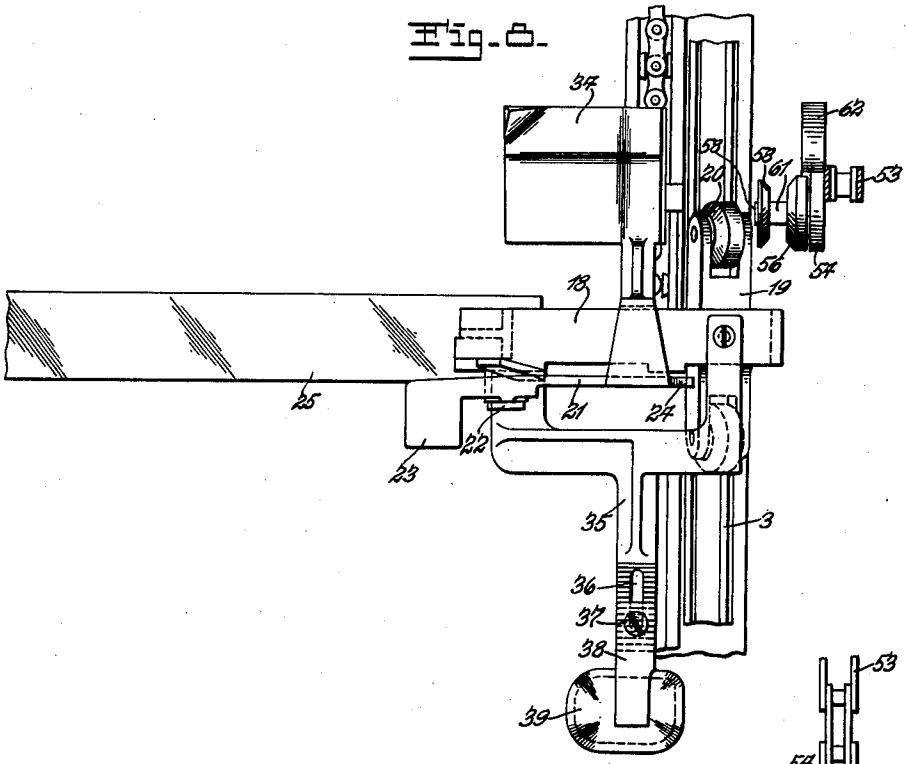
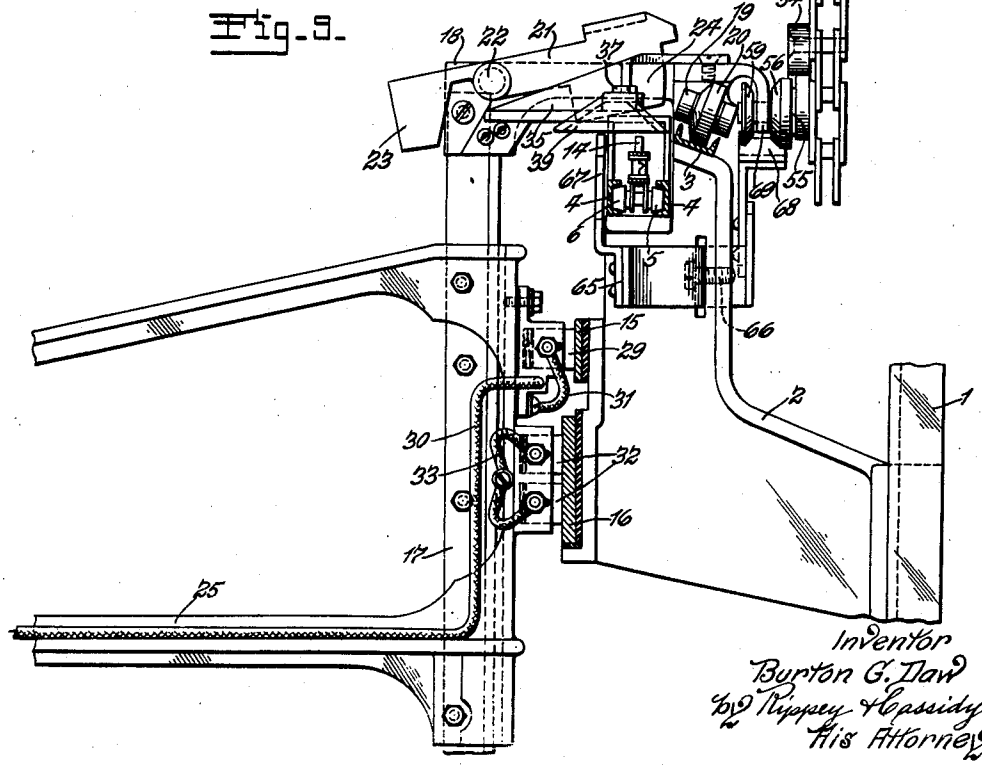


Fig. 9.



Inventor
Burton G. Daw
by Rippey & Cassidy
His Attorneys.

Patented Dec. 14, 1937 2,102,308

UNITED STATES PATENT OFFICE

2,102,308

AUTOMATIC PLATING CONVEYER

Burton G. Daw, Webster Groves, Mo.

Application March 20, 1936, Serial No. 69,909

13 Claims. (Cl. 204—5)

This invention relates to automatic plating conveyers, and has special reference to conveyers including mechanisms for conveying articles or work to be plated successively through different tanks containing electrolytic solutions.

Objects of the invention are to provide an improved automatic plating conveyer having carriers for the articles or work to be plated of novel construction and arrangement; to provide mechanism for operating the carriers in spaced relationship and in an approximately horizontal plane during movement of the articles through the electrolytic solutions; to provide improved supports along which said carriers are moved during the time that they are passing the articles or work to be plated through the electrolytic solutions; to provide improved means for maintaining the carriers in properly spaced relationship; to provide mechanism for moving the carriers rapidly from one tank to another, including mechanism for raising the carriers from one tank and lowering the carriers at an adjacent tank; and to provide improved devices for coupling the carriers with and uncoupling them from the operating mechanism.

Other objects and advantages will be readily apparent from the following description, reference being made to the annexed drawings, in which—

Fig. 1 is a broken plan view of a part of the machine, the carriers and associated parts being omitted in order to show more clearly the operating mechanism for the carriers.

Fig. 2 is an end elevation of the machine with parts shown in section.

Fig. 3 is an enlarged view of a portion of the machine, illustrating one of the mechanisms for raising and lowering the carriers when the work or articles are moved from one tank to another.

Fig. 4 is a side elevation of one of the carriers detached from the machine.

Fig. 5 is an outer end elevation of the carrier that is shown in Fig. 4.

Fig. 6 is an enlarged detail view of one of the supports for the carriers when the carriers are raised from one tank and lowered at another tank.

Fig. 7 is an enlarged detail sectional view of one of said supports.

Fig. 8 is an enlaged top plan view of a portion of one of the carriers and the supporting rail therefor.

Fig. 9 is a side elevation of the mechanism that is shown in Fig. 8.

My improved machine comprises a supporting frame 1 having attached thereto at spaced intervals brackets 2 upon which is secured an endless channel rail 3 (Figs. 2, 8 and 9). As should be understood by reference to the diagrammatic plan (Fig. 1), the rail 3 extends along both sides of the machine and curves around both ends of the machine. The brackets 2 also support two parallel channel rails 4 at each side of the machine having their channels in their adjacent sides and receiving supporting rollers 5 for an endless sprocket chain 6. The sprocket chain 6 engages a driving sprocket wheel 7 at one end of the machine and an idler sprocket wheel 8 at the opposite end of the machine, and said sprocket wheels support the chain at the ends of the machine while the chain is passing from the rails 4 at one side of the machine to similar rails 4 at the opposite side of the machine. The sprocket wheel 7 is driven by connections from a motor 9 operating through conventional mechanism 10 and speed reducer mechanism 11 to rotate a pinion 12 meshing with a gear 13 attached to the sprocket wheel 7. The chain 6 supports at closely spaced intervals a series of upwardly extended arms or posts 14.

The brackets 2 at both sides of the machine support an anode bus bar 15 and a cathode bus bar 16 (Fig. 9), which are insulated from each other and from the brackets 2.

Each carrier comprises a movable supporting frame including a vertical bar 17 having attached to its upper end an inwardly extended arm 18 to which a cross-head 19 is secured. The cross-head 19 is above the rail 3 and has a roller 20 connected with each end and operating in the channel rail 3, and thereby supporting the carrier. A lever 21 is supported in connection with the arm 18 by a pivot 22 and has a counterweight 23 on its outer end. The inner end of the lever 21 has a depending arm 24 extending across the chain 6 in position to be engaged by any one of the arms or posts 14 when the inner end of the lever 21 is depressed. Thus, the carriers will be moved along and around the machine by the continuously moving chain 6. However, such movement of the carriers by the chain 6 is intermittent, as described later in this specification.

Each carrier further comprises an outwardly extended arm 25 attached to and insulated from the frame bar 17. Hanger arms 26 and 26' are attached to the arm 25 to support the hangers 27 for the work or articles 28 to be plated (Fig. 2). An anode brush 29 is supported by and insulated from the arm 25 in position to operate against the anode bus bar 15. An electric cir-

cuit wire 30 from the brush 29 extends to connection with the hanger arm 26, and an electric circuit wire 31 from said brush 29 extends to connection with the hanger arm 26'. Cathode brushes 32 operate against the cathode bus bar 16 and have electrical connection 33 with the arm 25 (Fig. 9). The bus bars 15 and 16 are in communication with a source of electrical energy.

The lever 21 supports a forwardly extending arm 34. A rearwardly extended arm 35 is rigid with the inwardly extended arm 18 and has in its rear end a slot 36 receiving a clamping screw 37 passing through an arm 38 that seats upon the arm 35. Thus, the arm 38 may be secured in different adjusted positions along the arm 35. The rear end of the arm 38 supports a cam 39 (Fig. 8). Should it happen that one carrier becomes stopped for any reason, which would happen if the lever arm 24 became disengaged from the arms or posts 14, the arm 34 of the next following carrier will ride upon the cam 39 of the forward carrier that had stopped and thereby raise the lever 21 and disengage the attached depending arm 24 from the arms or posts 14, and thereby stop said following carrier.

The lower end of the bar 17 supports a crosshead 40 which is insulated from said bar 17. The crosshead 40 supports a pair of rollers 41 (Figs. 3 and 4) that engage against the sides of the machine casing 42 (Fig. 1), move laterally along said casing when the carriers are moving forwardly, and roll upwardly along said casing during upward and downward movement of said carriers.

Series of upwardly extended frames 43 are in rigid connection with the frame 1. At spaced intervals, said frames support sprocket wheels 44, 45 and 46, of which one, such as the sprocket wheel 44, is a driving wheel. The driving wheel is driven by connections operated by a motor 47 (Fig. 1), said connections including gearing 48 driving a shaft 49 having thereon at spaced intervals pinions 50 meshing, respectively, with pinions 51 attached to shafts 52 to which the sprocket wheels 44 are attached. Thus, all of the sprocket wheels 44 are driven by the one motor 47 at uniform speed. A sprocket chain 53 (Fig. 3) is mounted upon each set of three sprocket wheels 44, 45 and 46 and is operated much faster than the chain 6. At equally spaced intervals the chain 53 pivotally supports arms 54. One end of each arm 54 supports a bearing member 55 (Fig. 7) on which a roller 56 is supported by anti-friction bearings 57. An axle member 58 is supported by the bearing 55 and projects outwardly therefrom through the roller 56 and on its outer end supports a roller 59 by anti-friction bearings 60. The roller 59 is held apart from the roller 56 by a spacer 61. A counter-balance weight 62 is attached to each arm 54 and cooperates with the structure just described to sustain the arm 54 in an effective position. An effective position is illustrated in Figs. 3 and 4 wherein the arms 54 is inclined and the roller elements thereon are supported laterally from and at the approach side of the chain 53. This means that the roller elements are supported beyond the chain 53 in the direction from which the carriers approach; and the carriers approach in the direction of the arrow 63 (Fig. 3).

Cams 64 are rigidly supported by the rails 4 (Fig. 3). A lever 65, composed of attached parts, is mounted on a pivot 66 adjacent to each driving sprocket wheel 44, extends laterally from the outside to the inside of the frame 1, has a cam 67 on its outer end toward the approach 63, and has a resilient contact element 68 on its forward end beyond the point at which the carrier is released from the raising and lowering device comprising the chain 53.

The inner end of the arm 18 has a depending fork 69 to be engaged between the rollers 56 and 59 so that the lifting device comprising the chain 53 will raise the carrier rapidly to lift the articles or work from one tank and lower them into an adjacent tank, through which they will be moved by reengagement of the arm 24 with one of the arms or posts 14.

In operation, the spaced carriers are moved slowly in the direction of the arrow 63 (Fig. 3). When the arm 24 rides upon the cam 67 the approach end of the lever 65 is depressed when no weight is upon the resilient element 68 at the opposite end of said lever 65. When the arm 24 rides upon the cam 64, which is rigid, said arm 24 and the lever 21 are pushed upwardly until the arm 24 is disengaged from the arms or posts 14. The carrier then stops and remains stationary although the chain 6 continues to move. In this stationary position of the carrier, the fork 69 is in position to engage between the rollers 56 and 59 of an ascending lifting device. The carrier is thereby moved upwardly in the direction of the arrow 70 (Fig. 3), lifting the articles or work 28 approximately to the height shown at the left of Fig. 2, and then moving the carrier laterally to the descending side of the chain 53 and thence downwardly as indicated by the arrow 71 until the articles or work are immersed in the electrolytic solution in an adjacent tank. The movement of the chain 53 is rapid in comparison with the movement of the chain 6, so that it is possible for one carrier to be shifted from one tank to another and reengaged with the chain 6 in approximately the same spaced relationship to the adjacent carriers that it occupied before it was transferred from one tank to another.

When the carrier is lowered, and about the time that the rollers 20 are again seated upon the rail 3, continued downward movement of the chain 53 disengages the lifting device from the fork 69. The lifting device is disengaged from the fork 69 before the arm 24 is engaged by an arm or post 14, so that the lifting chain does not conflict with the chain 6.

During resumed forward movement of the carrier, the fork 69 engages the resilient element 68 and thereby depresses the forward end of the lever 65 and raises the rear end thereof, moving the cam 67 upwardly and supporting said cam 67 in its upward position, so that the arm 24 of the following carrier will be thereby disengaged from the chain 6 and will be stopped temporarily until the fork 69 moves beyond the resilient element 68. Then the approach or rear end of the lever 65 will lower, permitting the arm 24 of the succeeding carrier to reengage an arm or post 14 to resume forward movement of said succeeding carrier. Continued forward movement of the succeeding carrier causes its arm 24 to ride upon the rigid cam 64 and be thereby disengaged from the arm or post 14, whereupon said succeeding carrier will stop. When said succeeding carrier is stopped in this manner, its fork 69 is in proper position to be engaged between ascending rollers 56 and 59 and moved in the directions of the arrows 70 and 71 to transfer the articles or work from one tank to another.

As before indicated, if one carrier is stopped, the arm 34 of the following carrier will ride upon

the cam 39 of the carrier that had stopped, and thereby the succeeding carrier will be disengaged from the arm or post 14 and will also stop. In this manner, all carriers will be stopped without damage to any of the machine parts, when any carrier becomes permanently stopped.

The speed at which the actuator chain 6 is moved may be varied with respect to the speed of movement of the chains 53, and vice versa, since these chains are driven by different motors. As before stated, the chains 53 operate much faster than does the chain 6. When any carrier is transferred from one tank to another and again placed upon the rail 3, said carrier stops. As shown, the transfer devices comprising the axle member 58 are pivoted and extend obliquely when out of engagement with the carriers (Fig. 6). Therefore, the rollers 59 of devices following that one that had moved out of engagement with the carrier that had been deposited will pass the fork 69 and will not strike said fork. The two rollers 41 on each carrier, by engaging and operating against the wall 42, prevent the carriers from twisting.

From the foregoing, it is clear enough that this invention attains all of its intended objects and purposes efficiently and satifactorily. The invention, the elements composing it and their association and relationship may be varied within the scope of equivalent limits without departure from the nature and principle of the invention as defined by the appended claims.

I claim:—

1. In a machine of the character described, a plurality of carriers for the articles to be plated, an actuator for engaging and moving said carriers horizontally while the articles are immersed in an electrolytic solution, means operated by each carrier for disengaging the next succeeding carrier from said actuator for a short interval only, other means for thereafter disengaging said carriers successively from said actuator and stopping said carriers, a vertical actuator for transferring the carriers from one tank to another successively, and a series of pivoted supports on said vertical actuator for engaging and supporting the carriers during transfer operations.

2. In a machine of the character described, a plurality of carriers for the articles to be plated, an actuator for engaging and moving said carriers horizontally while the articles are immersed in an electrolytic solution, means operated by each carrier for disengaging the next succeeding carrier from said actuator for a short interval only, other means for thereafter disengaging said carriers successively from said actuator and stopping said carriers, a vertical actuator for transferring the carriers from one tank to another successively, a series of pivoted supports on said vertical actuator for engaging and supporting the carriers during transfer operations, and means for subjecting the articles to electrical energy while they are in the electrolytic solution.

3. An automatic plating conveyer comprising carriers for the articles to be plated, a rail for supporting said carriers, a continuously moving actuator for engaging and moving said carriers horizontally while the articles are immersed in an electrolytic solution, means operated by each carrier for disengaging the next succeeding carrier from said actuator, and a separate actuator for lifting, moving laterally and lowering the carrier onto said rail in transferring the articles from one tank to another and reengaging said carrier with said first actuator.

4. An automatic plating conveyer comprising a number of carriers for the articles to be plated, a continuously moving actuator for engaging and moving said carriers horizontally while the articles are immersed in an electrolytic solution, means for disengaging said carriers successively from said actuator, a separate actuator for lifting, moving laterally and lowering the carriers to transfer the articles successively into different tanks and for reengaging said carriers with said first actuator, and means controlled by each carrier for preventing the next following carrier from moving too close to the next preceding carrier that has been raised and lowered as aforesaid.

5. An automatic plating conveyer comprising a number of carriers for the articles to be plated, a continuously moving actuator for engaging and moving said carriers horizontally while the articles are immersed in an electrolytic solution, means for disengaging said carriers successively from said actuator, mechanism for lifting, moving laterally and lowering the carriers successively to transfer the articles supported by said carriers, respectively, into different tanks and for reengaging said carriers with said first actuator, and means controlled by one carrier for disengaging the next following carrier from said first actuator.

6. An automatic plating conveyer comprising a number of carriers for the articles to be plated, a continuously moving actuator for engaging and moving said carriers horizontally while the articles are immersed in an electrolytic solution, means for disengaging said carriers successively from said actuator, mechanism for lifting, moving laterally and lowering the carriers successively to transfer the articles supported by said carriers, respectively, into different tanks and for reengaging said carriers with said first actuator, and means operated by one carrier for disengaging the next succeeding carrier from said first actuator when said one carrier stops and the next succeeding carrier approaches.

7. An automatic plating conveyer comprising a number of carriers for the articles to be plated, a continuously moving actuator for engaging and moving said carriers horizontally while the articles are immersed in an electrolytic solution, means for disengaging said carriers successively from said actuator, mechanism for lifting, moving laterally and lowering the carriers successively to transfer the articles supported by said carriers, respectively, into different tanks and for reengaging said carriers with said first actuator, and a device operated by each carrier after being lowered as aforesaid for disengaging the next succeeding carrier from said first actuator.

8. An automatic plating conveyer comprising a number of carriers for the articles to be plated, a rail supporting said carriers for horizontal movement, an actuator between said carriers and said rail for engaging and moving said carriers horizontally while the articles are immersed in an electrolytic solution, a separate actuator for lifting, moving laterally and lowering the carriers successively to transfer the articles successively into different tanks and for reengaging said carriers with said first actuator, and mechanism controlled by said carriers successively after they have been lowered and reengaged with said first actuator as aforesaid for disengaging the next following carrier from said first actuator.

9. An automatic plating conveyer comprising a

series of carriers for the articles to be plated, an actuator for moving all of said carriers horizontally while the articles supported thereby are immersed in an electrolytic solution, mechanism for lifting, moving laterally and lowering said carriers to transfer the articles successively into different tanks and for reengaging said carriers with said first actuator, and means controlled by each carrier after it has been lowered and reengaged with said first actuator as aforesaid for disengaging the next succeeding carrier from said first actuator.

10. An automatic plating conveyer comprising a series of carriers for the articles to be plated, an actuator for moving all of said carriers horizontally while the articles supported thereby are immersed in an electrolytic solution, mechanism for lifting, moving laterally and lowering said carriers to transfer the articles successively into different tanks and for reengaging said carriers with said first actuator, means controlled by each carrier after it has been lowered and reengaged with said first actuator as aforesaid for disengaging the next succeeding carrier from said first actuator and after an interval of forward movement leaving said following carrier free to engage said first actuator, and means supported by each carrier for disengaging the next succeeding carrier from said first actuator.

11. In a machine of the character described, an approximately vertical wall, a carrier frame, a rail for supporting said carrier frame, rollers on said carrier frame operating on said rail and against said wall respectively, for guiding said frame horizontally and vertically, respectively, a continuously moving actuator for engaging and moving said frame horizontally when the articles are immersed in an electrolytic solution, a separate actuator for engaging, lifting, moving laterally and lowering said carrier frame to place certain of said rollers thereon on said rail in transferring the articles from one tank to another while others of said rollers operate against said wall, and mechanisms for operating said actuators, respectively.

12. In a machine of the character described, a rail, an approximately vertical wall below said rail, a carrier frame movable horizontally and vertically, rollers near the upper end of said carrier frame operating on said rail and supporting said frame during horizontal movement thereof, other rollers on said carrier frame below said rail operating against said wall for guiding said frame during both horizontal and vertical movements, an outwardly extended arm attached to said carrier frame for supporting articles to be plated, a continuously moving actuator for engaging and moving said carrier frame horizontally when the articles are immersed in an electrolytic solution, and mechanism for moving said frame vertically for transfer movements from one electrolytic solution to another.

13. In a machine of the character described, a rail, an approximately vertical wall below said rail, a carrier frame movable horizontally and vertically, rollers near the upper end of said carrier frame operating on said rail and supporting said frame during horizontal movement of said frame, other rollers on said carrier frame below said rail operating against said wall during both horizontal and vertical movements of said frame, an outwardly extended arm attached to said carrier frame for supporting articles to be plated, a continuously moving actuator for engaging and moving said carrier frame horizontally when the articles are immersed in an electrolytic solution, a separate actuator for engaging, lifting, moving laterally and lowering said carrier frame in transferring the articles from one tank to another, and mechanisms for actuating said actuators, respectively.

BURTON G. DAW.