July 4, 1939. F. A. HATCH 2,164,710

MEANS FOR ELECTROPLATING

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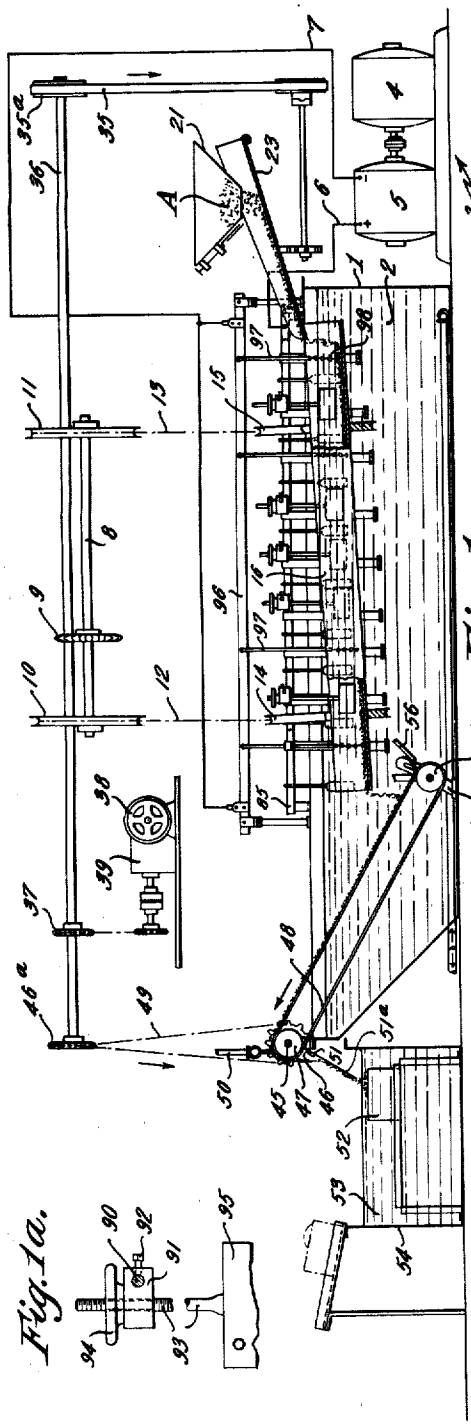


Fig. 1.

Fig. 1a.

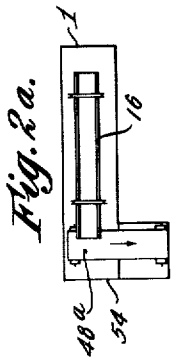


Fig. 2a.

Fig. 2.

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Fig. 3.

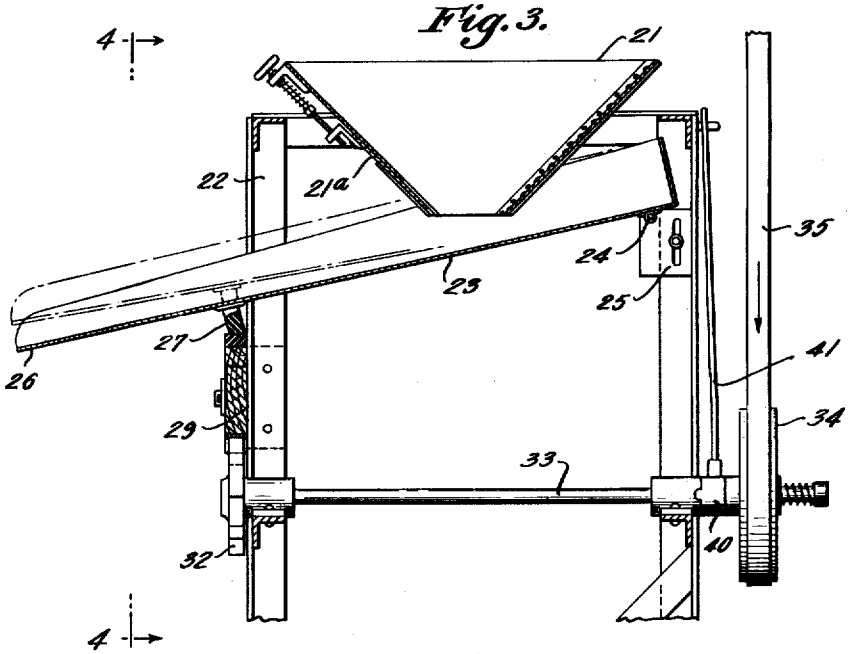
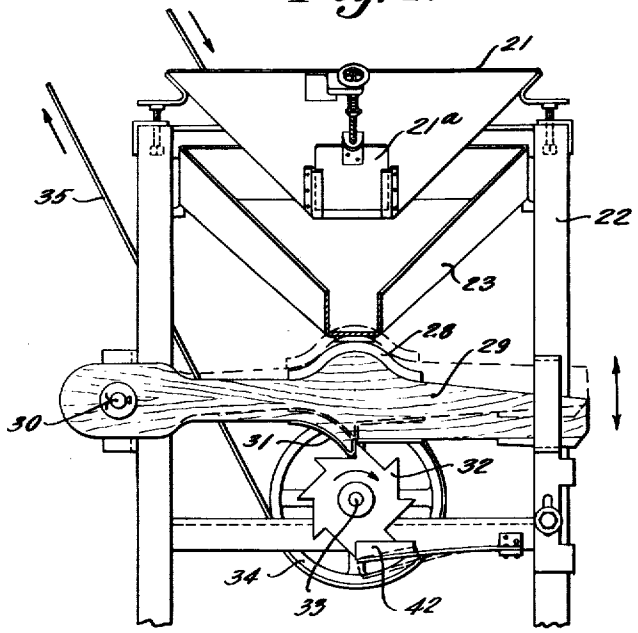


Fig. 4.



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Fig. 5.

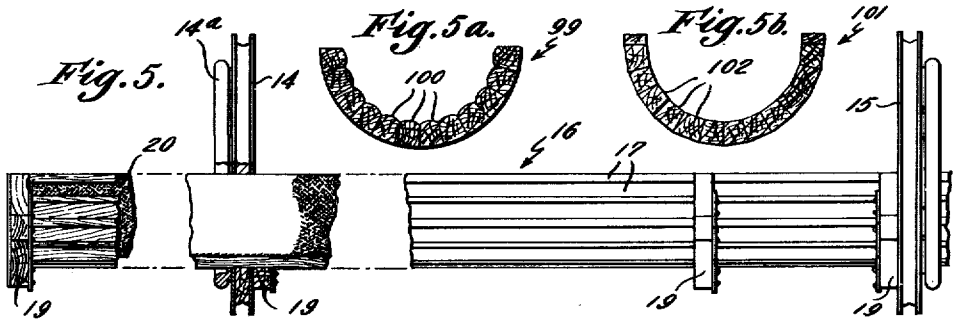


Fig. 5a.

Fig. 5b.

Fig. 8.

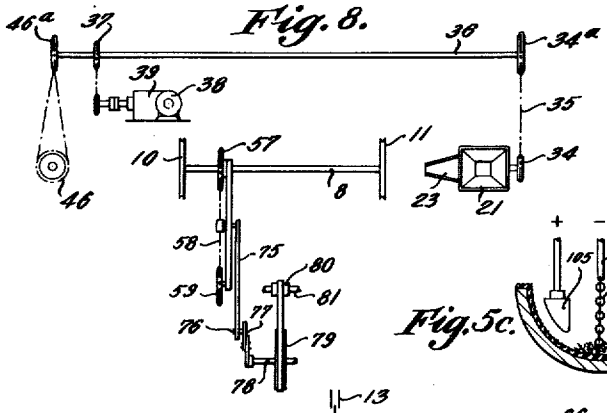


Fig. 5c.

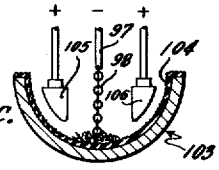


Fig. 6.

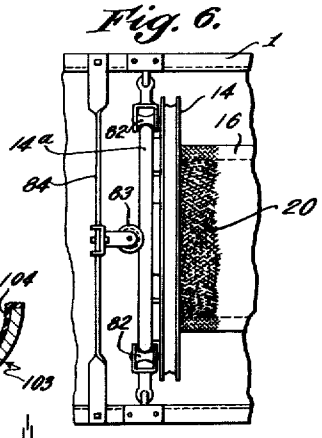
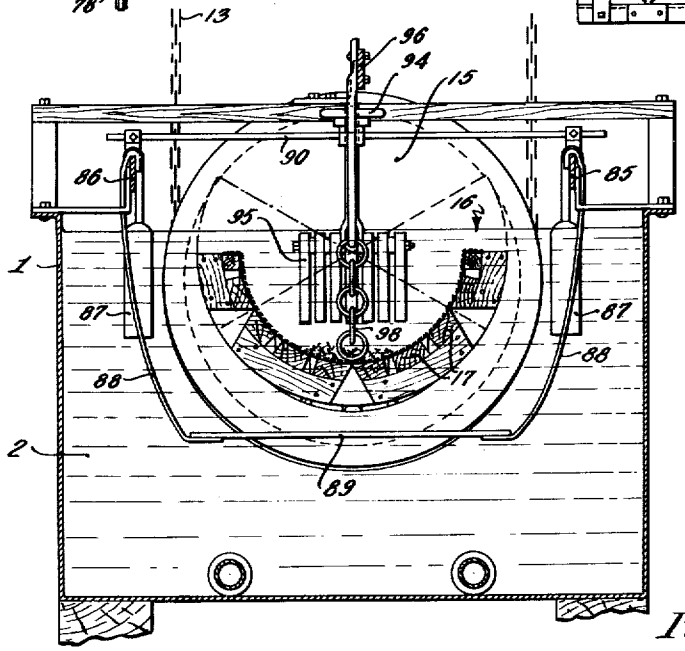


Fig. 7.



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Fig. 10.

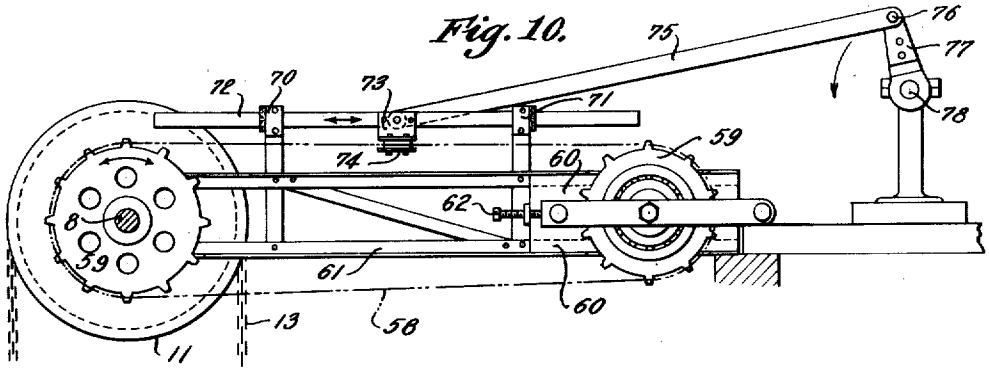


Fig. 11.

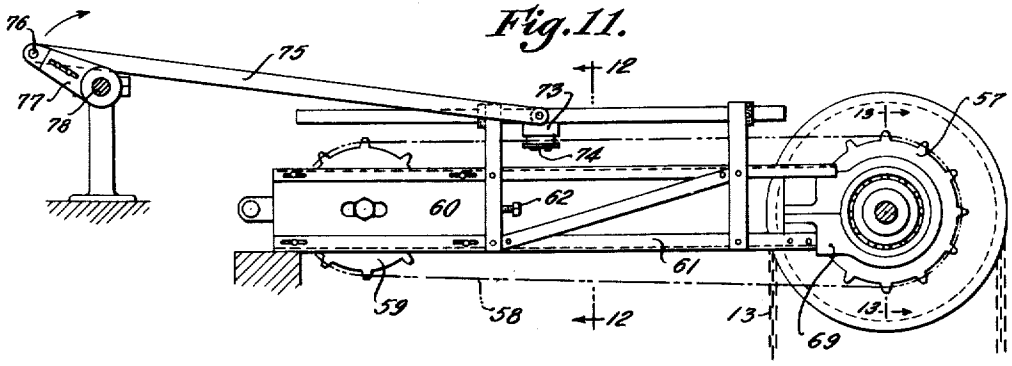


Fig. 9.

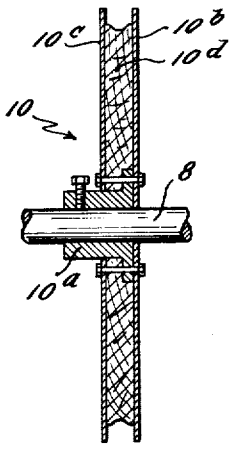


Fig. 12.

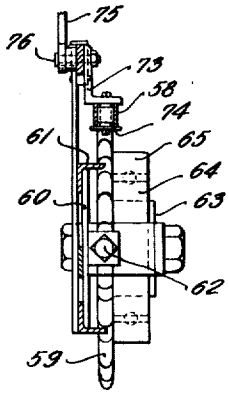
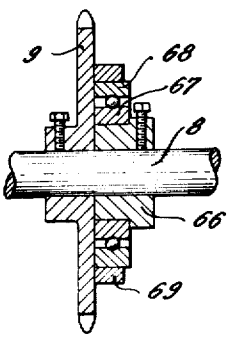


Fig. 13.



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UNITED STATES PATENT OFFICE

2,164,710

MEANS FOR ELECTROPLATING

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Application September 27, 1935, Serial No. 42,487

10 Claims. (Cl. 204—11)

This invention pertains to the manufacture of electroplated articles, for example, tacks, nails, buttons, jewelry or the like, and relates more particularly to an improved apparatus for and method of plating such articles in a continuous operation.

Heretofore one common practice has been to plate such articles in batches—a certain quantity of the articles to be plated being first loaded into an appropriate cage or other receptacle which is then lowered into an electroplating bath. During the plating operation the articles must be constantly agitated to insure a uniform plating action and after the plating is completed the cage or receptacle must be lifted out of the bath and the articles dumped out and a fresh charge introduced. However, this method is very wasteful of time, since the time consumed in loading, lowering, raising, and unloading the cage is all lost so far as the actual plating operation is concerned, and this lost machine time, as well as the cost of almost constant attendance, must be reckoned in counting the cost of production.

It has also previously been proposed to plate such articles in a continuous operation, as by delivering the articles in a substantially uninterrupted stream into one end of a drum immersed or partially immersed in the plating bath—causing the articles to progress longitudinally of the drum while they are being plated, as for example, by the use of an internal helical pusher. Although the mode of procedure just referred to may, in theory, appear desirable, I have found in practice that it also has certain disadvantages. For example, if the plating is done in a cylinder, drum, or other container having a continuous periphery, the articles are entirely hidden from view from the time they enter the drum until they emerge, and are accessible only from the end of the drum if at all, during the plating. Thus the operator is unable to observe the progress of the plating operation, or in the event that the flow of articles from the drum is interrupted, to determine or remedy the cause of such interruption except by stopping the machine and removing the drum from the plating bath. Moreover, it is not altogether easy properly to support the cathode elements within a drum of any substantial length, nor to determine whether the cathode elements are always making proper contact with the articles flowing through the drum. It is also substantially necessary, when using a drum-like container, to arrange all of the anodes outside of the drum by reason of the difficulty of supporting them, together with the cathodes inside of the drum. However, such exterior arrangement of the anodes necessitates the employment of a drum having walls which are pervious to the electrolyte, but this it not altogether easy since the drum surface must also be capable of withstanding the scouring or abrasive action of the moving metallic articles.

With the object of improving upon such prior methods of procedure and of providing apparatus useful in carrying out such improved method, the present invention provides for a substantially continuous plating operation, but at the same time permits the process to be carried out in such a way that the articles are always visible to the operator during plating. In accordance with the invention, the guiding element along which the articles move during the plating, may permissibly be of a material which is impervious to the electrolyte, and thus may easily be made of material of a character appropriate to furnish the desired mechanical strength and resistance to abrasion. Moreover, the anodes and cathodes may readily be disposed in whatever relation experience shows to be best for efficient action. In attaining the above object, the articles to be plated are preferably conveyed or caused to move along an open trough-like container, guideway, or support disposed within the electrolytic bath, such support being of any appropriate material for the purpose. Since the support or guideway is open at its top, the articles are at substantially all times visible and the cathodes and anodes may be suspended from above the guideway if desired so as to depend into the latter to any desired distance and at any desired point. Preferably the support or guideway is inclined so that the articles tend to move by gravity from one end of the guideway to the other, and to facilitate such movement and in particular to agitate the articles while so moving, thereby to insure uniform plating, the support, guideway, or trough is oscillated about a longitudinally extending axis. Further to insure thorough agitation of the articles as the result of such oscillation the inner surface of the guideway or trough may be longitudinally ribbed or corrugated or of faceted or angular peripheral contour.

Other objects and advantages of the invention, together with details of a preferred embodiment thereof may be made manifest in the following description and by reference to the annexed drawings in which

Fig. 1 is a diagrammatic vertical section illustrating one desirable embodiment of apparatus useful in the practice of the present invention;

Fig. 1ª is a fragmentary vertical section showing details of an anode support;

Fig. 2 is a diagrammatic plan view of the apparatus of Fig. 1, with certain parts omitted;

Fig. 2ª is a diagrammatic view similar to Fig. 2, but to much smaller scale, illustrating a slight modification;

Fig. 3 is a vertical section substantially on the same plane as Fig. 1, but to larger scale, and showing details of the mechanism for delivering the articles into the upper end of the guideway trough;

Fig. 4 is an end elevation partly in section on the line 4—4 of Fig. 3;

Fig. 5 is a fragmentary side elevation partly in section, illustrating details of construction of the trough-like guideway;

Figs. 5ª, 5ᵇ and 5ᶜ are sections transversely of such trough-like guideway, illustrating modified constructions;

Fig. 6 is a fragmentary plan view showing the delivery end of the trough-like guideway;

Fig. 7 is a fragmentary vertical section through the tank containing the electrolytic bath, such section being taken substantially on the line 7—7 of Fig. 2;

Fig. 8 is a diagrammatic plan view of the driving connections of the apparatus;

Fig. 9 is a vertical diametrical view of one of the pulley wheels forming a part of the drive mechanism;

Fig. 10 is a fragmentary side elevation illustrating preferred mechanism for oscillating the trough-like guideway;

Fig. 11 is a side elevation of the mechanism of Fig. 10 viewed from the opposite side;

Fig. 12 is a section substantially on the line 12—12 of Fig. 11; and

Fig. 13 is a section, to larger scale, substantially on the line 13—13 of Fig. 11.

Referring to the drawings, the numeral 1 designates a tank or receptacle of any appropriate material and here shown as of substantially rectangular, elongate form designed to contain the electrolytic bath 2. This receptacle is open at the top and is designed to receive the container for the articles to be plated. As here illustrated a motor-generator set 3 comprising the motor 4 and the generator 5 is designed to furnish current for the plating operation—the conductor 6 leading from the positive pole of the generator and the conductor 7 leading from the negative pole.

A drive shaft 8 is mounted in suitable bearings directly above the tank or receptacle 1 and with the axis of the shaft substantially in vertical plane of the central longitudinal axis of the receptacle. This shaft 8 is provided with a drive sprocket 9 (which receives a driving chain as hereinafter more fully described) and adjacent to its opposite ends the shaft 8 is provided with pulleys 10 and 11 respectively. These pulleys may, if desired, be of the construction illustrated in Fig. 9 wherein the pulley 10 is shown as comprising the hub 10ª and the spaced side plates 10ᵇ and 10ᶜ having interposed between them a filler 10ᵈ of wood or any other appropriate material. If desired, the side plates 10ᵇ and 10ᶜ may be of an insulating material such as hard rubber, for example, and the filler 10ᵈ may likewise be of insulating character so as to avoid possibility of accidental leakage of electrical current through the driving connections. The filler 10ᵈ is preferably furnished with a groove in its periphery for the reception of an endless drive belt. Endless belts 12 and 13 embrace the pulleys 10 and 11 and support and drive pulleys 14 and 15 respectively, which are fixedly secured to the container 16. The latter constitutes a support, guideway or conveyor for the articles to be plated as they move through the electrolytic bath.

The container or support 16 is of such character that as the articles move along through the electrolytic bath they are substantially always exposed to view, so that the operator may observe at any time the progress of the plating operation and has ready access to the articles for examining them or for making any adjustments or changes necessary to insure an uninterrupted flow of the articles longitudinally of the container or support. Preferably this support, guideway, container or conveyor 16 takes the form of an open topped trough having one end higher than the other so that articles deposited in the higher end tend to move under the action of gravity toward the lower end. Such inclination of the trough-like container is readily obtained by making one of the supporting belts, for example the belt 12, somewhat longer than the other belt.

The trough or container 16 conveniently consists of a series of substantially parallel slats 17 (Fig. 5) held in properly assembled relation by means of headers 19 spaced apart and disposed at desirable points longitudinally of the trough. As illustrated in Fig. 5 the pulleys 14 and 15 are connected to two of these headers 19.

The inner surface or lining of the trough or container preferably consists of a piece of textile fabric 20 (Figs. 5 and 6) such, for example, as canvas, the open nature of the trough proper and the pervious character of the textile liner permitting ready passage of the electrolyte and of the plating current from the outside to the inside of the trough.

Adjacent to that end of the tank or receptacle 1 wherein the receiving end of the trough 16 is located, there is arranged a framework 22 (Figs. 1, 3 and 4) which supports a hopper 21 in which the articles A (Fig. 1) which are to be plated are arranged for automatic delivery to the trough. This hopper 21 may, if desired, be provided with an adjustable valve member or door 21ª (Fig. 4) whereby the size of the delivery opening at the bottom of the hopper may be varied at will. Beneath the hopper 21 there is arranged a shaker 23, here shown as a shallow chute pivotally supported at 24 upon an adjustable bracket 25 carried by the frame 22 and having its delivery end 26 disposed within the receiving or upper end of the trough 16. Near its delivery end the chute 26 may be provided with a cushion member 27 which may, for example, be of rubber or the like, which rests upon a member 28 (also of rubber, if desired) carried by a shaker bar 29 (Fig. 4) pivotally secured at one end upon a pin 30 carried by the frame 22. The other end of the shaker bar is guided in a suitable slot at the opposite side of the frame. At its central part, the shaker bar 29 is provided with a wear-resistant shoe 31 which engages the toothed periphery of a wheel 32 fixed to a shaft 33. This shaft is mounted in bearings in the frame 22, and at the end opposite that which carries the toothed wheel 32 has mounted for free rotation thereon the pulley 34. This pulley

receives a drive belt 35 which embraces a pulley 35a on a drive shaft 36 (Fig. 1) extending longitudinally of the receptacle 1 and above and preferably to one side of the latter. This shaft 36 is provided with a fixed sprocket 37 which receives a sprocket chain passing about a sprocket wheel on a shaft driven by a motor 38 through reduction gearing 39 so that the shaft 36 turns at relatively low speed. A clutch 40 (Fig. 3) provided with an actuating handle 41, is arranged to connect the pulley 34 to the shaft 33 whenever desired, thereby to rotate the toothed wheel 32 and thus vertically oscillate the chute 23, thereby to cause articles which drop into the latter from the hopper to be delivered from the free end of the chute in a substantially continuous stream into the upper end of the trough 16. If desired the toothed wheel 32 may be provided with a click 42 to prevent its reverse rotation.

Within the receptacle 1, at a point adjacent to the lower or delivery end of the trough 16, there is arranged a bracket 43 (Fig. 1) which carries a pulley 44, and upon the upper rim of the tank 1 there is also arranged a bracket provided with bearings for a shaft 45 having fixed thereon a sprocket wheel 46, and a pulley 47 similar to the pulley 44. An inclined conveyor belt 48 embraces the pulleys 44 and 47, the upper run of this belt being disposed so as to catch articles falling from the lower end of the trough 16 and to elevate them and deliver them above the level of the electrolytic bath at a point where they will drop freely from out of the receptacle 1. The sprocket wheel 46 receives a sprocket chain 49 (Fig. 1) which embraces a sprocket wheel 46a on the shaft 36 whereby the conveyor belt 48 is moved slowly in consonance with the feeding of articles into the receiving end of the trough. Preferably a pipe 50 is arranged to convey water under pressure to form a spray designed to wash the articles from off the surface of the conveyor belt 48 as the latter passes down about the outer face of the pulley 47, and to prevent any of the articles which may still cling to the belt from moving back into the tank, a flexible wiper 51 (Fig. 1) is arranged to contact with the belt adjacent to the point where the latter leaves the pulley 47. Preferably an apron 51a (Figs. 1 and 2) extends downwardly in an inclined direction from this wiper so as to guide the articles which are washed or scraped off of the conveyor into a box 52 suitably supported in a washing bath 53 in a receptacle 54. As fast as the boxes 52 are filled they may be lifted out of the washing bath and conveyed away to a drying drum or the like.

If desired, the shaft 45 which drives the conveyor belt 48, may have clutch means interposed between it and the sprocket 46 so that the drive of the belt may be stopped, for example, while a full box 52 is being removed and an empty box put in its place. Thus as indicated in Fig. 2, the shaft 45 may be provided with a clutch 55 actuated by means of a treadle 56 or other convenient device.

The mechanism for actuating the drive shaft 8 is of such character as to impart an oscillatory movement to said shaft and consequently a movement of oscillation to the drum 16. This drive mechanism preferably comprises the sprocket wheel 9 above referred to, which is fixed to the shaft 8 and which is embraced by a sprocket chain 58 (Figs. 10 and 11), which also embraces a sprocket wheel 59. The sprocket wheel 59 is supported by a horizontally sliding carriage 60 mounted in guides 61 forming part of a fixed supporting frame, the carriage being adjustable longitudinally of the guide rails 61 by means of an adjusting screw 62, thereby permitting the sprocket chain 58 to be tightened or loosened as desired. Preferably the sprocket wheel 59 is provided with an elongate hub 63 (Fig. 12) which is mounted within the inner ring 64 of a ball bearing comprising the outer ring 65 between which and the inner ring 64 a series of bearing balls is arranged. The outer ring 65 is fixed to the annular sprocket 59 so that the latter turns very freely and without substantial friction.

The shaft 8 is also supported by the fixed frame comprising the rails 61, such shaft having fixed thereto the collar 66 (Fig. 13) which fits within the inner member 67 of a ball bearing whose outer ring 68 is fixed within a bracket 69 secured between the rails 61.

The supporting frame also provides a pair of bearings 70 and 71 (Fig. 10) in which slides a rod 72 to which is secured a cross head 73 attached by means of a clamp 74 to the upper run of the sprocket chain 58. A connecting rod 75 unites the cross head 73 to a crank pin 76 carried by a crank 77 fixed to a rotating shaft 78. This shaft 78 (Fig. 8) carries a pulley 79 (Fig. 8) which receives an endless belt embracing a pulley 80 on a drive shaft 81 which may receive power from any suitable source, and which is continuously driven in one direction. Preferably the crank arm 77 is of adjustable length whereby the travel of the cross head 73 may be varied at will.

If desired, one or both of the pulleys 14 and 15, forming the driving and suspension means for the trough 16, may be furnished with a coaxial annulus 14a (Figs. 5 and 6) preferably of circular cross section, the periphery of which bears against antifriction rolls 82 supported at opposite sides of the tank 1, thereby to prevent side sway of the drum 16. Likewise, to prevent endwise movement of the drum, an anti-friction abutment roller 83 may engage the end face of the annulus 14a, such anti-friction abutment being carried by a suitable transverse strut 84. However, the members 14a with the abutment and limiting rolls may be omitted, if desired.

The positive conductor 6 from the generator 5 is connected to bus-bars 85 and 86 (Fig. 2) disposed adjacent to opposite sides of the receptacle 1 and insulated therefrom. From these bus-bars heavy anodes 87 (Fig. 7) are suspended at suitable intervals so as to depend into the electrolyte at opposite sides of the trough 16. If desired, and in order to provide more anode material, particularly directly below the stream of articles moving along the drum, suspension members 88 may be hooked over the bars 85 and 86 and at the lower ends support transverse anode bars 89. Furthermore, in accordance with the present invention, it is proposed to connect the bus-bars 85 and 86 by means of bridge members 90 (Figs. 2, 7 and 1a) extending transversely across and above the top of the drum, and these bridge members support brackets 91 (Fig. 1a) which may be adjusted lengthwise of the bars 90 and held in adjusted position by means of set screws 92. These brackets have vertical holes for the reception of anode suspension rods 93 which are adjustable vertically by means of hand nuts 94 engaging screw threads on the upper parts of the rods and at their lower ends support anodes 95 arranged within the trough 16. Preferably, as shown in Fig. 7, these anodes 95 each consists of a plurality of heavy plates bolted

together in spaced relation so as to provide a large surface for contact with the electrolyte.

The negative conductor 7 is connected to a bus-bar 96 (Fig. 2) supported by and insulated from the receptacle 1 and in a position substantially above the longitudinal axis of the trough 16. From this bus-bar 96 suspension members 97 (Fig. 1) extend downwardly into the trough and at their lower ends carry flexible contact members such as the chains 98 constituting the cathode elements of the electroplating system, such chain resting upon the stream of articles flowing along the trough and always making electrical contact therewith.

While the trough construction above described is desirable, it is contemplated that the trough may be made in other ways, for example, as illustrated in Figs. 5ª, 5ᵇ and 5ᶜ, respectively. Thus as shown in Fig. 5ª the trough 99 consists of a series of wooden bars or bars of other material, pervious to the electrolyte and to the electric current, arranged in close juxtaposition and having their inner surfaces individually curved on short arcs so as to produce a longitudinally ribbed effect, as indicated at 100. When such a trough is rocked or oscillated, the articles are acted upon by these longitudinal ribs so that they are agitated and caused to roll back and forth one on the other thereby exposing fresh surfaces to the electrolyte.

In Fig. 5ᵇ another construction is illustrated wherein the trough 101, instead of being substantially cylindrical externally, like the trough 99, is of polygonal contour both externally and internally, so that its interior surface consists of a series of longitudinally extending flat faces or facets 102. This trough likewise, when oscillated, causes the articles to be agitated as they pass from one flat face to another across the angles of intersection between the faces.

In Fig. 5ᶜ another construction is illustrated wherein the trough 103 has a body portion which may be of any suitable impervious material such, for example, as hard rubber, synthetic resin or the like, and which has a lining 104 which may, for example, be of soft rubber or other material which is highly resistant to mechanical abrasion. This lining 104 may, if desired, be provided with longitudinally extending corrugations or ribs to assist in agitating articles in the trough. Since the electrolyte can not pass through the walls of this trough, the anodes 105 and 106 are all arranged within the trough, preferably at opposite sides of the cathodes 98, and as close to the stream of articles flowing through the trough as experience shows to be desirable.

Whatever form of trough employed, the oscillation of the trough tends to agitate the articles and cause them to move back and forth transversely across their general path of travel longitudinally of the trough. In the construction illustrated in Figs. 1 and 2 the anodes 95 are disposed within the trough, with cathodes 98 at opposite sides of the endmost anodes, and with a group of anodes close together at about the center of the lengths of the trough. Other arrangements of the electrical elements, as well as changes in the mechanical construction involving the employment of equivalent elements, the substitution of materials and the rearrangement of parts are to be regarded as within the scope of the invention as set forth in the appended claims.

I claim:

1. Apparatus for use in electroplating articles, said apparatus comprising a receptacle for electrolyte, an elongate trough disposed within the receptacle, the interior of said trough being substantially unobstructed from end to end, the trough being freely open at its top to expose to view its contents, power driven means for rocking the trough about a longitudinally extending axis, and means for delivering articles into one end of the trough and for receiving articles from the other end of the trough and delivering them from out the receptacle characterized in that the trough is inclined downwardly from the receiving end toward its delivery end whereby the articles are caused to travel longitudinally of the trough under the action of gravity, the trough consisting of a series of parallel bars arranged in such close juxtaposition as to prevent the articles being plated from entering the crevices between them, the inner surfaces of said bars being independently curved on short transverse arcs so as to provide a ribbed surface whereby as the trough is rocked, the articles are caused to move back and forth transversely of the trough.

2. Apparatus for use in electroplating articles, said apparatus comprising a receptacle for electrolyte, means for delivering the articles substantially continuously into the electrolyte in the receptacle, an elongate, open-topped inclined trough of substantially cylindrical cross-sectional contour, into the upper end of which the articles are delivered and along which the articles move in a substantially uninterrupted continuous stream toward the lower end of the trough, a pulley coaxial with said trough and secured to the latter, a driving belt embracing said pulley, means for moving the belt first in one direction and then in the other thereby to oscillate the trough, and means for causing plating current to flow through the articles in the trough.

3. Apparatus for use in electroplating articles, said apparatus comprising a receptacle for electrolyte, means for delivering the articles into the electrolyte in the receptacle, an elongate, open-topped trough disposed within the receptacle and into one end of which the articles are delivered and along which the articles move in a substantially uninterrupted continuous stream toward the other end of the trough, a pair of pulleys secured to the trough adjacent to its opposite ends respectively, belts embracing the pulleys and thereby supporting the trough, and means for moving the belts first in one direction and then in the other.

4. Apparatus for use in electroplating articles, said apparatus comprising a receptacle for electrolyte, means for delivering the articles into the electrolyte in the receptacle, an elongate, open-ended container disposed within the receptacle and into one end of which the articles are delivered and along which the articles to be plated move in a substantially uninterrupted continuous stream toward its other end, a pair of pulleys secured to the container at spaced points respectively, a drive shaft above the receptacle, spaced electrically insulated pulleys on the drive shaft, endless belts each embracing one of the pulleys on the drive shaft and one of the pulleys on the container, said belts constituting the sole supporting means for the container, and means for actuating the drive shaft.

5. Apparatus for use in electroplating small articles, said apparatus comprising a receptacle for electrolyte, means for delivering the articles substantially continuously into the electrolyte in the receptacle, an elongate, open-topped inclined trough into one end of which the articles are

delivered and along which they are caused to move solely by the action of gravity in a substantially uninterrupted continuous stream toward the other end of the trough, a cathode having electrical contact with the articles in the trough, a bridge member extending transversely across the top of the trough, a bracket carried by the bridge member, and a vertically adjustable anode support carried by the bracket.

6. Apparatus for use in electroplating articles, said apparatus comprising a receptacle for electrolyte, means for delivering the articles into the electrolyte in the receptacle, an elongate, open-topped container into one end of which the articles are delivered and along which they are caused to move solely by the action of gravity toward the other end of the container, a cathode having electrical contact with the articles moving along the container, a fixed elongate member bridging the top of the container, a bracket adjustable along the bridge member transversely of the container, a vertically adjustable anode support carried by the bracket, and an anode suspended from the support at a point within the container.

7. Apparatus for use in electroplating articles, said apparatus comprising a receptacle for electrolyte, means for delivering the articles substantially continuously into the electrolyte in the receptacle, an elongate, open-topped, inclined trough into the upper end of which the articles are delivered and along which the articles move in a substantially uninterrupted continuous stream in response to the action of gravity, a pulley secured to the trough, a belt embracing said pulley, an electrically insulated drive pulley also embraced by the belt, a constantly rotating crank, and drive connections operative to transmit movement from the crank to the drive pulley thereby to oscillate the belt first in one direction and then in the other.

8. Apparatus for use in electroplating articles, said apparatus comprising a receptacle for electrolyte, means for delivering the articles into the electrolyte in the receptacle, an elongate, open-topped trough into one end of which the articles are delivered, a pulley secured to the trough, a belt embracing the pulley, a drive pulley also embraced by the belt, a rotary crank, a reciprocating cross head, a connecting rod uniting the crank to the cross head, and motion transmitting means operative to translate reciprocating movement of the cross head into oscillatory movement of the drive pulley.

9. Apparatus for use in electroplating articles, said apparatus comprising a receptacle for electrolyte, means for delivering the articles into the electrolyte in the receptacle, an elongate, open-topped, inclined trough into the upper end of which the articles are delivered, a pulley secured to the trough, a belt embracing the pulley, a drive pulley also embraced by the belt, a rotary crank, a drive sprocket coaxial with and fixed to turn with the drive pulley, an idler sprocket spaced from the drive sprocket, a sprocket chain embracing the sprockets, a reciprocating cross head, means attaching the cross head to the chain, and a connecting rod uniting the crank and cross head.

10. Apparatus for use in electroplating small articles, said apparatus comprising a receptacle for electrolyte, means for delivering the articles into the electrolyte in the receptacle, an elongate, open-ended container within the receptacle, a pair of spaced pulleys secured to the container, endless belts embracing the respective pulleys and constituting supports for the container, one of said belts being longer than the other whereby the container is supported in an inclined position, an anti-friction abutment for the lower end of the container, and means for moving the belts thereby to turn the container.

FRANK A. HATCH.

CERTIFICATE OF CORRECTION.

Patent No. 2,164,710. July 4, 1939.

FRANK A. HATCH.

It is hereby certified that the name of the assignee in the above numbered patent was erroneously described and specified as "D. A. Gurney Company" whereas said name should have been described and specified as D. B. Gurney Company, of Whitman, Massachusetts, a corporation of Massachusetts, as shown by the record of assignments in this office; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 22nd day of August, A. D. 1939.

Leslie Frazer

(Seal)

Acting Commissioner of Patents.

delivered and along which they are caused to move solely by the action of gravity in a substantially uninterrupted continuous stream toward the other end of the trough, a cathode having electrical contact with the articles in the trough, a bridge member extending transversely across the top of the trough, a bracket carried by the bridge member, and a vertically adjustable anode support carried by the bracket.

6. Apparatus for use in electroplating articles, said apparatus comprising a receptacle for electrolyte, means for delivering the articles into the electrolyte in the receptacle, an elongate, open-topped container into one end of which the articles are delivered and along which they are caused to move solely by the action of gravity toward the other end of the container, a cathode having electrical contact with the articles moving along the container, a fixed elongate member bridging the top of the container, a bracket adjustable along the bridge member transversely of the container, a vertically adjustable anode support carried by the bracket, and an anode suspended from the support at a point within the container.

7. Apparatus for use in electroplating articles, said apparatus comprising a receptacle for electrolyte, means for delivering the articles substantially continuously into the electrolyte in the receptacle, an elongate, open-topped, inclined trough into the upper end of which the articles are delivered and along which the articles move in a substantially uninterrupted continuous stream in response to the action of gravity, a pulley secured to the trough, a belt embracing said pulley, an electrically insulated drive pulley also embraced by the belt, a constantly rotating crank, and drive connections operative to transmit movement from the crank to the drive pulley thereby to oscillate the belt first in one direction and then in the other.

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