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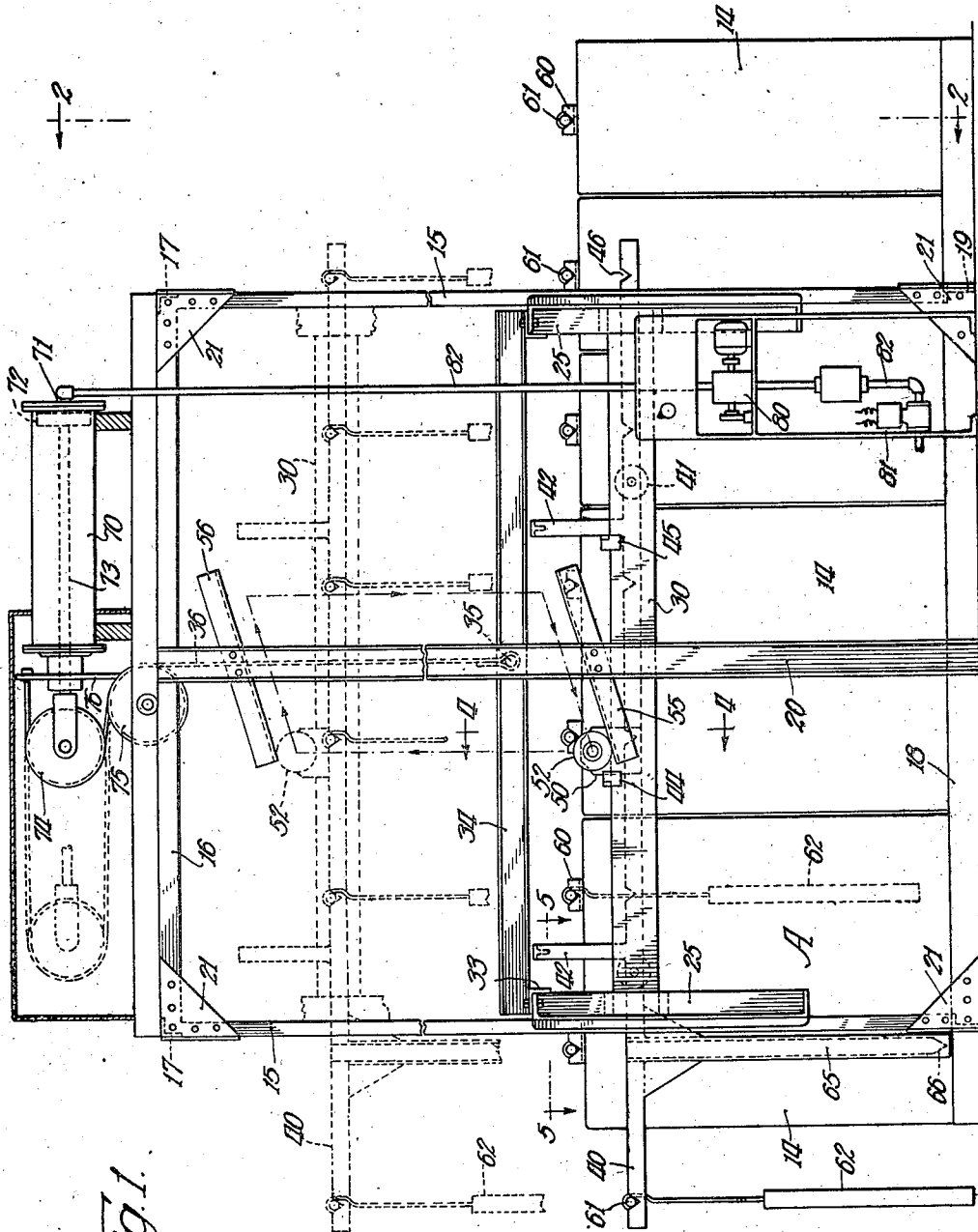
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2,245,673

CONVEYER MECHANISM

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4 Sheets-Sheet 1



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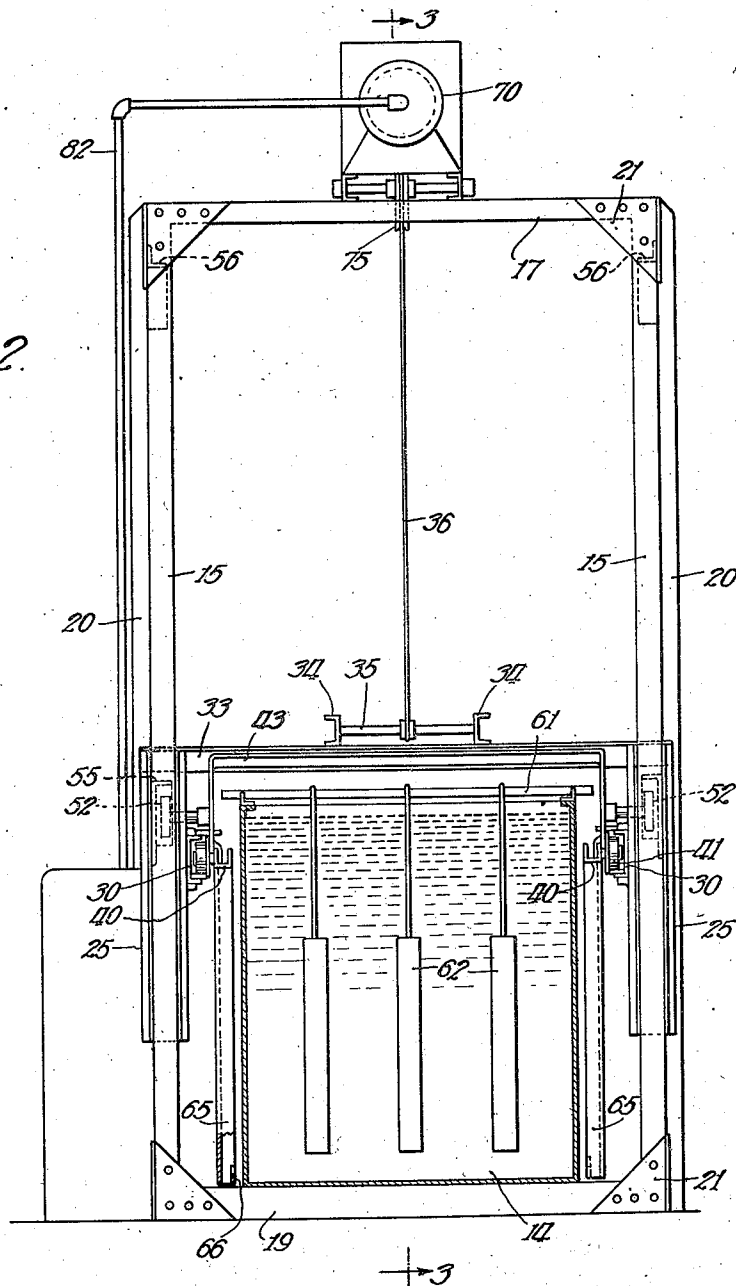
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Fig. 2.



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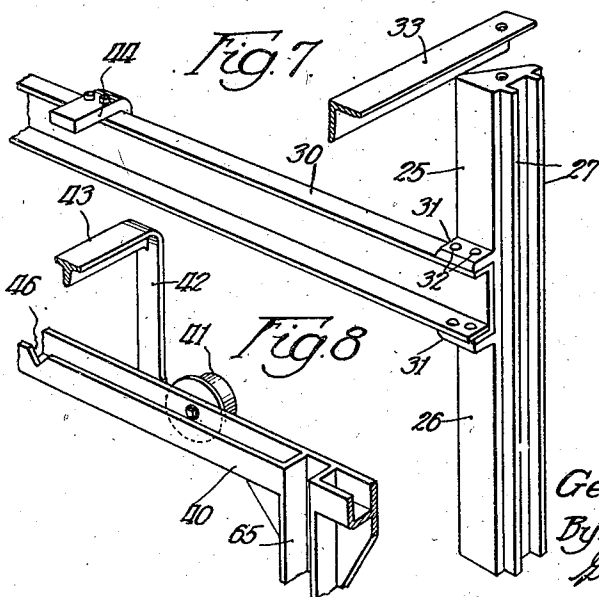
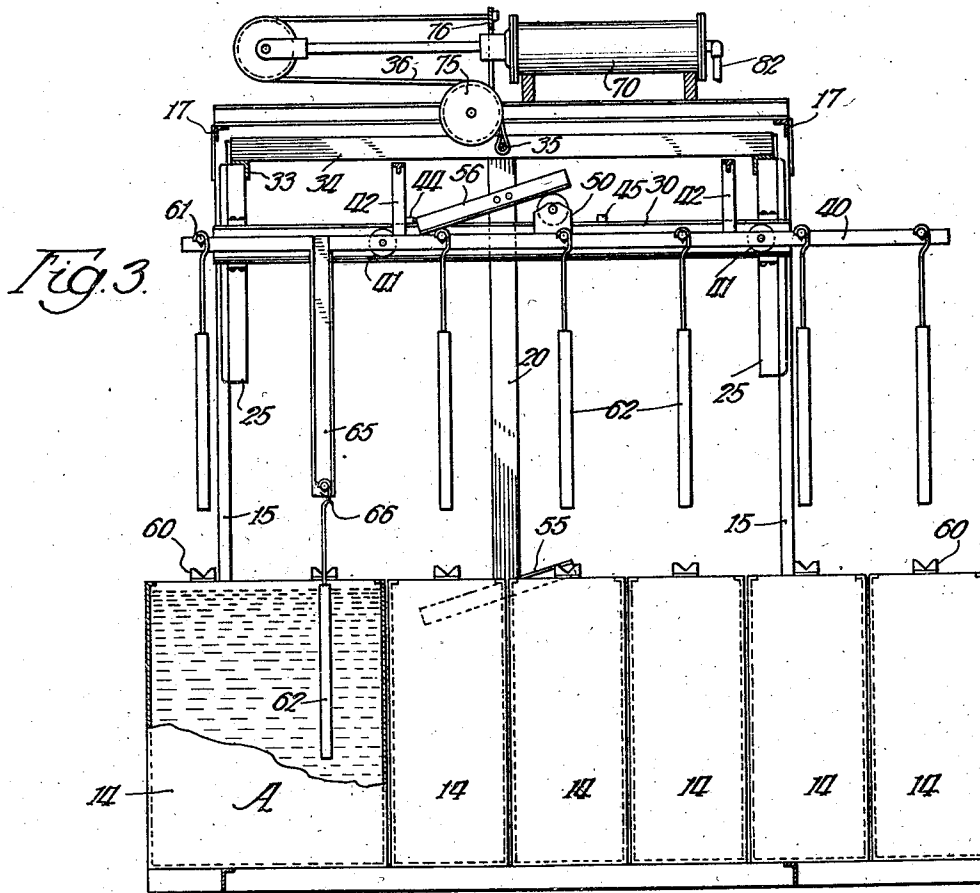
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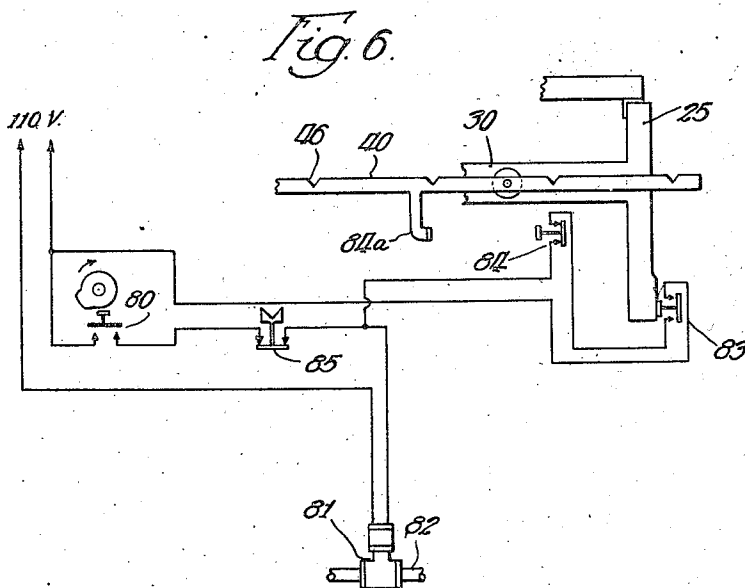
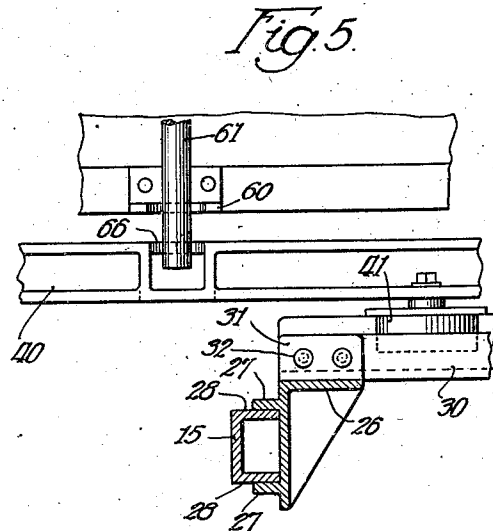
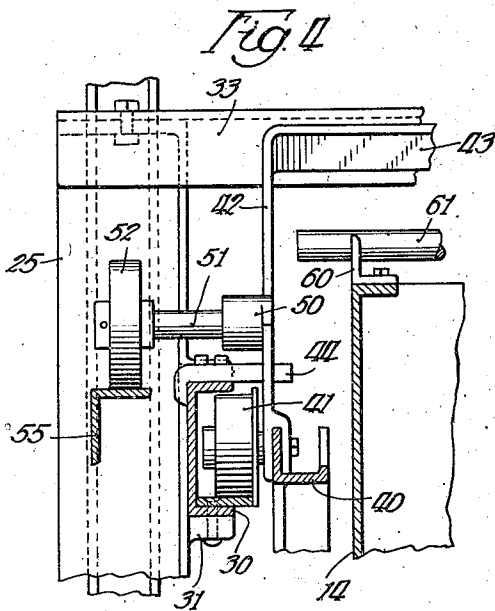
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4 Sheets-Sheet 4



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CONVEYER MECHANISM

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9 Claims. (Cl. 214-17)

The present invention relates to automatic plating and processing equipment. It is particularly directed towards a mechanism adapted to convey articles to be processed successively from one processing tank to another. Although my invention will probably find its greatest use in the metal plating field, its use is by no means restricted to actual metal plating. It can be used equally well for cleaning, pickling, rinsing, drying, borderizing and lacquering of metal parts and products; in short, wherever a series of washes, rinses and dips is needed.

The purpose of my invention is to provide an automatic mechanism, supported over a series of processing tanks, which will convey the articles to be processed from tank to tank and allow such articles to remain in each tank a predetermined length of time.

My principal object is to provide a simple, efficient mechanism of this nature which utilizes comparatively few moving parts.

A further object of my invention is to provide means whereby the articles may remain in a particular tank for a period of time longer than in adjacent tanks.

My invention, designed to keep pace with high-speed production, permits a rapid feeding of articles to be processed at one end of a series of tanks, and delivers the processed articles at the other end at the same rate. A timer switch in circuit with the power mechanism allows the user to regulate the length of time the articles are to be dipped in the successive tanks.

In general, my mechanism comprises two movable framework structures, the inner of which is capable of moving horizontally with respect to the outer, and the latter is movable vertically within a third supporting framework, the whole of which is positioned above a series of processing tanks. The articles to be processed are suspended from rods which are placed at one end of the horizontally movable framework, which framework is carried by the vertically movable framework. By means of a compressed air hoisting device, both frameworks are moved upwardly until rollers carried on the horizontally movable framework engage inclined bars mounted on the outer framework structure, whereby the horizontally movable framework is urged horizontally with respect to the latter. When the horizontally movable framework has been moved the distance between two successive tanks, as limited by an arrangement of stops, the hoisting mechanism lowers the two frameworks until the article supporting rod is removed from its support-

ing framework by the top of the first of the series of processing tanks. Thereafter, the rollers carried on the horizontally movable framework engage lower inclined bars and send such framework back to its original position, thereby completing a cycle. Successive cycles carry the article supporting rod from tank to tank, finally delivering it at the end of the conveyer opposite from whence it started.

The features and advantages of the present invention will appear more fully as the description proceeds, reference being had to the accompanying drawings wherein a preferred form of the invention is shown. It is to be understood, however, that the drawings and description are illustrative only, and are not to be taken as limiting the invention except insofar as it is limited by the claims.

In the drawings,

Fig. 1 is a side elevation view of my invention showing the mechanism in cycle starting position;

Fig. 2 is a sectional view taken on the line 2-2 of Fig. 1;

Fig. 3 is a sectional view taken on the line 3-3 of Fig. 2, showing the position of the mechanism after it has completed the first half of a cycle;

Fig. 4 is a sectional view taken on the line 4-4 of Fig. 1, showing in detail the rollers carried on the horizontally moving framework;

Fig. 5 is a sectional view taken on the line 5-5 of Fig. 1;

Fig. 6 is a diagram of the circuit regulating the cycles;

Fig. 7 is a perspective view showing in detail the shoe and related structure of the vertically moving framework, and

Fig. 8 is a perspective view of a portion of the cooperating horizontally moving framework.

Referring now in detail to the drawings, and in particular to Figs. 1 and 2 thereof, my conveyer mechanism comprises a rigid supporting framework adapted to be disposed in operative relationship with a given series of processing tanks 14. This rectangular shaped supporting framework includes end uprights 15, longitudinal and transverse horizontal members 16 and 17 connecting the upper ends of the end uprights 15, and similar longitudinal and transverse horizontal members 18 and 19 connecting the lower ends of the end uprights 15. Intermediate side uprights 20 connect the upper and lower longitudinal horizontal members 16 and 18 and carry certain inclined members hereinafter

referred to. The end uprights 15 are channel members, the open sides of which face longitudinally inward of the framework so as to constitute a track or guide for an inner vertically movable framework presently to be described. The horizontal members 16, 17, 18 and 19 are desirably angle irons, and the intermediate side uprights are ordinary iron bars. Corner plates 21 serve to strengthen the supporting framework structure.

The vertically movable framework comprises shoe members 25 adapted to slidably engage the end uprights 15. The shoe member 25 is shown in detail in Figs. 5 and 7, wherein an angle iron or casting 26 is provided with spaced ribs 27 on its wider flange, which ribs bear on flanges 28 of the channel end upright 15. Longitudinal channel members 30, which open inwardly of the framework, connect the shoes 25, lugs 31 being provided on the narrow flange of the shoe angle iron 26 to which the members 30 are attached by means of bolts or rivets 32. Transverse angle irons 33 connect the tops of the shoes 25. Running longitudinally of the framework and connecting the angle irons 33 near the midpoint thereof are spaced channel members 34. A rod 35 connects the spaced channel members 34 at their midpoint and receives the cable 36 which raises and lowers the above described vertically movable framework.

Disposed within such framework is a structure designed to move horizontally, and thereby convey the articles to be processed from one tank to the next. This structure comprises upwardly facing channel members 40 extending substantially the length of the given series of processing tanks 14. The two channel members 40 are provided with rollers 41 which engage the lower flanges of the horizontal channel members 30 and are supported thereby. Projecting upwardly from the channel members 40 are spaced bars 42, the respective ends of which are connected by transverse tie rods 43. As can be seen, the unit composed of channel members 40, bars 42 and rods 43 is free to slide horizontally to and fro by means of the rollers riding on the flanges of the channels 30. As it is necessary that the unit move only the length of one tank, or, in other words, move an article from the center of one tank to the center of an adjacent tank, stops 44 and 45 are provided on the horizontal channel members 30 to engage the upstanding spaced bars 42 of the channel members 40. The inner flange of the channel members 40 carries rod supporting notches 46, as hereinafter described.

Each notched channel 40 is provided with an upstanding lug 50, in the upper part of which is housed the end of an axle 51. The axles 51 extend outwardly from the channels 40 and beyond the channels 30, so that as the unit is moved horizontally the outer ends of the axles 51 pass in close proximity to the intermediate side uprights 20 of the supporting framework. Rollers 52 are rotatably mounted on the ends of the axles 51. At a position on the intermediate side uprights 20, near the level of the tops of the tanks 14, are riveted angle irons 55. The irons 55 are inclined at an angle with the horizontal as shown in Fig. 1 and form the bearing surface for the rollers 52 when the vertically movable frame is in its lower position. Near the top of the intermediate side uprights 20 are riveted similarly inclined angle irons 56 which form the bearing surface for the rollers 52 when

the vertically movable frame is at or near its upper position.

Referring now to Fig. 1, the vertically movable framework is in its lower position and the horizontally movable unit is in its left hand position, as limited by the stop 45 in contact with bar 42. The vertically movable channel members 30, and the rolled channel members 40 carried thereby, are substantially below the level of the top of the tanks 14. Rod carrying notched lugs 60 are uniformly spaced on the tops of the tanks 14 whereby an article holding rod 61 is positioned transversely across the top of each tank. Articles 62 to be processed are suspended within the tanks from the rods 61, the ends of which extend beyond the sides of the tanks so they can engage the channel members 40 as the latter move vertically upward. In vertical alignment with the notched lugs 60 are notches 46 on the channel members 40, wherein the rods 61 are to be seated as the vertically moving framework rises to lift the rods from the top of the tanks 14.

In operation, the mechanism starts from the position shown in Fig. 1. The hoisting mechanism, hereinafter described, raises the vertically movable framework together with the horizontally movable unit. As the notched channel members 40 pass the top of the tanks 14, the rods 61 engage the notches 46 and the rods carrying the suspended articles 62 are moved upwardly. As the upper limit is approached, the rollers 52 carried on the notched channels 40 engage the lower ends of the inclined angle irons 56 mounted near the top of the intermediate side uprights 20. Further upward motion of the notched channels 40 is opposed by the inclined angle irons 56, and as a result, the rollers tend to roll up the incline, thereby moving the notched channels 40 in a right-hand direction. The notched channels 40 are free to move longitudinally, with respect to the vertically movable framework carried by the shoes 25, by virtue of the rollers 41 which engage the shoe connecting channel members 30.

When the vertically movable framework has reached its upper limit, the rollers 52 have moved the notched channel unit to the right to a point where the left-hand bars 42 carried on channels 40 engage the stops 44 thereby preventing further longitudinal displacement. At this point, as shown in Fig. 3, the notched channel unit has been moved to the right the distance between the notched lugs 60 atop the tanks 14, so that each article holding rod 61 is now in vertical alignment with the lugs 60 on the tank immediately to the right of the tank from whence the rod was lifted. The hoisting mechanism now lowers the vertically movable framework, and the rods 61 are retained by lugs 60 as the framework moves below the top of the tanks. Thereafter, the rollers 52 carried on the notched channels 40 engage the lower inclined angle irons 55 mounted on the intermediate side uprights 20. The rollers roll down the incline and return the notched channel unit to its original position, the right-hand bars 42 engaging the stops 45.

In my illustrated mechanism, I have provided that the articles shall remain in tank A a double length of time and that they shall remain submerged during the whole period. In order to effect this result, tank A is made twice as long as the other tanks, and is provided with two sets of notched lugs 60 on the top thereof, as shown in Figs. 1 and 3. Referring now to Fig. 1, where the mechanism is in its cycle starting

position, the article to be processed is suspended from rod 61, and the rod is placed in the left-hand notches 46 of the channel members 40. After the mechanism has completed one cycle, the rod 61 will be seated in the left-hand lugs 60 atop tank A. In order to transpose the rod to the right-hand lugs on tank A during the next cycle, without removing the articles from the tank, I have provided the notched channel members 40 with downwardly extending channel members 65 in place of the usual notches, as shown in detail in Fig. 8, so that the rod 61 will not be lifted by the channel members 40, but rather will remain seated until engaged by plates 66 capping the lower ends of channel members 65. The rod 61 is lifted sufficiently to be free of the notched lugs 60 and is transferred to the right-hand position as the mechanism goes through its usual cycle.

Any convenient means for periodically raising and lowering the framework may be employed. I have found as especially satisfactory a compressed air mechanism which is mounted on top of the supporting framework. This mechanism comprises a cylinder 70 having an air inlet 71. Within the cylinder 70 is a piston 72 having a connecting rod 73 projecting outside the cylinder. On the outer end of the connecting rod 73 is mounted a pulley 74, as best shown in Fig. 1. In a vertical plane with pulley 74, pulley 75 is mounted on the supporting framework in such a position that said pulley may be engaged by the vertical cable 36 attached to the vertically movable framework. The cable 36 extends partially around each pulley as shown in Fig. 1 and has its free end anchored to fixed member 76. As can be readily seen, such an arrangement effects a 2:1 ratio between the lifting distance and piston displacement.

Fig. 6 is a diagram of the electric circuit used on my invention. A timer switch 80 is connected in series with a solenoid valve 81 on the compressed air pipe 82. A normally closed lower limit switch 83 and a normally closed upper limit switch 84 are provided and function as hereinafter described. The solenoid valve 81 is of a two way type wherein the energization of the solenoid opens the valve and permits a flow of compressed air through the pipe 82 to the inlet 71 of the cylinder 70. The deenergization of the solenoid allows the air pressure to close the solenoid operated valve to cut off the air supply in the pipe 82. In a closed condition, the valve provides an exhaust opening from the pipe 82 to atmosphere. The size of this exhaust opening is adjustable to more or less cushion the return of the piston 72 to its original position under the weight of the framework and its load.

A cycle is started when the timer switch 80 closes the circuit to the solenoid valve 81, thereby closing the valve and allowing air to displace the piston 72 in the cylinder 70. The timer switch 80 holds the circuit until the shoe 25 is raised sufficiently to close the lower limit switch 83 carried on the supporting framework, which, in point of time, is sometime after the rods are picked up from the tops of the tanks. The switch 83 keeps the circuit closed until the completion of the upper horizontal movement of the article carrying framework, at which time the upper limit switch 84 is struck and opened. The switch 84 is carried by the channel 38 of the vertically movable framework and is struck open by a member 84a projecting from the horizontally movable

framework. As switch 84 is in series with switch 83, the circuit is opened and the solenoid valve 81 is thereby deenergized. This permits the vertically moving framework to drop. The upper limit switch 84 is adapted to remain open until the lower switch 83 is opened, thereby keeping the valve 81 deenergized until the lower limit of the vertical motion is reached. A succeeding cycle commences when the timer switch 80 again closes the circuit to energize the solenoid of the solenoid valve.

It may be desirable to provide that a new cycle cannot start until the article carrying rod 61 has been removed from its position atop the last tank of the series. Such a feature may be incorporated readily by providing a switch 85, in series with the solenoid valve, adapted to close when the rod is removed.

Although I have shown only one unit of my invention, and contemplate that the last article carrying rod 61 is to be manually removed from the last tank, it is obvious that a second unit may be placed in line with the first which will pick up the rods 61 and convey them along a second series of processing tanks.

It is believed that the construction and advantages of my automatic conveyer mechanism described herein will be readily apparent to those skilled in this art. Having thus described my invention, what I claim, as new and desire to secure by Letters Patent is:

1. In a conveyer mechanism disposed in operative relationship with a series of tanks, and adapted to convey articles successively from tank to tank, a supporting structure, a vertically moving framework therein, a longitudinally movable article carrying framework, rollers mounted on said latter framework, inclined bars carried on said supporting structure cooperating with said rollers to utilize the vertical motion to longitudinally move said article carrying framework the length of one unit tank in one direction when said vertically moving framework approaches its upper limit, and in the opposite direction when said vertically moving framework approaches its lower limit.

2. A conveyer mechanism comprising a supporting structure including end uprights, a vertically movable framework including shoe members which slidably engage said end uprights and longitudinal members connecting said shoe members, an article carrying framework slidably supported on said longitudinal members, means for periodically raising and lowering said vertically movable framework and conjunctionally operable means for longitudinally moving said article carrying framework whereby said framework engages, lifts, displaces and lowers articles from one point to another and then returns to its cycle starting position to engage the next successive article, said latter means comprising inclined bars mounted on said supporting structure and rollers cooperating therewith mounted on said article carrying framework.

3. A conveyer mechanism comprising a supporting structure including end uprights, a vertically movable framework including shoe members which slidably engage said end uprights and longitudinal members connecting said shoe members, an article carrying framework slidably supported on said longitudinal members, means for periodically raising and lowering said vertically movable framework and conjunctionally operable means for longitudinally moving said article

carrying framework whereby said framework engages, lifts, displaces and lowers articles from one point to another and then returns to its cycle starting position to engage the next successive article, said latter means comprising inclined bars mounted on said supporting structure and rollers cooperating therewith mounted on said article carrying framework, stops being provided to limit the longitudinal displacement of said framework.

4. In combination with a series of tanks having article carrying rods extending across the tops thereof, a conveyer mechanism comprising a vertically movable framework including longitudinal members, a longitudinally movable framework slidably supported on said members, said latter framework being adapted to engage, lift and displace said rods the length of one unit tank and to reseat said rods on the tops of adjacent tanks, whereupon said framework is moved back to its cycle starting position, and means for periodically raising, lowering and moving longitudinally said respective frameworks, said means for longitudinally moving said latter framework comprising rollers mounted on said frameworks and cooperating inclined bars carried on said supporting structure.

5. A conveyer mechanism comprising a supporting structure including end uprights, a vertically moving framework including shoes which slidably engage said uprights and longitudinal members connecting said shoes, and article carrying framework slidably carried by said members rollers projecting from said latter framework and cooperating inclined bars carried by said supporting structure whereby to impart longitudinal reciprocal motion to said article carrying framework as the two frameworks reciprocate vertically.

6. In combination with a series of tanks having article carrying rods across the tops thereof, the ends of which project beyond the sides of said tanks, a conveyer mechanism comprising a vertically movable framework, a longitudinally movable framework slidably supported within the former, said latter framework being adapted to engage, raise and longitudinally move said article carrying rods and replace them across the tops of adjacent tanks at periodic intervals, a means whereby articles may remain in a tank during more than one cycle of the conveyer, said means comprising a tank of more than one unit length, channel members projecting downwardly from said longitudinally movable framework, and rod engaging caps on the lower ends of said channel members.

7. In combination with a series of tanks having article carrying rods across the tops thereof, the ends of which project beyond the sides of said tanks, a conveyer mechanism comprising a vertically movable framework, a longitudinally movable framework slidably supported within the former, said latter framework being adapted to engage, raise and longitudinally move said article carrying rods and replace them across the tops of adjacent tanks at periodic intervals, a means whereby articles may remain in a tank during more than one cycle of the conveyer, said means comprising a tank of more than one unit length, channel members projecting downwardly from said longitudinally movable framework, and rod engaging caps on the lower ends of said channel members, the length of said channel members being somewhat less than the vertical displacement of said frameworks.

8. In combination with a series of tanks having article carrying rods projecting beyond the sides thereof, a conveyer mechanism comprising a supporting structure including uprights, a vertically movable framework engaging said uprights, said framework including horizontally disposed channel members, a longitudinally movable framework slidably supported by said channel members, said last named framework including horizontally disposed members extending in close proximity to the sides of said tanks and underlying the ends of said article carrying rods, means for raising said frameworks whereby said rods are lifted from said tanks, means for moving said longitudinally movable framework a predetermined distance, means for lowering said frameworks whereby said rods are resealed on said tanks, and means for returning said horizontally movable framework to its cycle starting position.

9. In combination with a series of tanks having article carrying rods projecting beyond the sides thereof, a conveyer mechanism comprising a vertically movable framework carried by a supporting structure, a longitudinally movable framework slidably supported on said first named framework, said longitudinally movable framework including horizontal members disposed in close proximity to said tanks and underlying the ends of said rods, means for raising said frameworks whereby said rods are elevated, means for moving said longitudinally movable framework a predetermined distance, means for lowering said frameworks whereby the rods are seated on the tanks, and means for returning said horizontally movable framework to its cycle starting position.

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