March 14, 1933. K. T. POTTHOFF 1,901,471

ROTARY CONVEYER SYSTEM AND APPARATUS THEREFOR

Filed Oct. 19, 1928 5 Sheets-Sheet 1

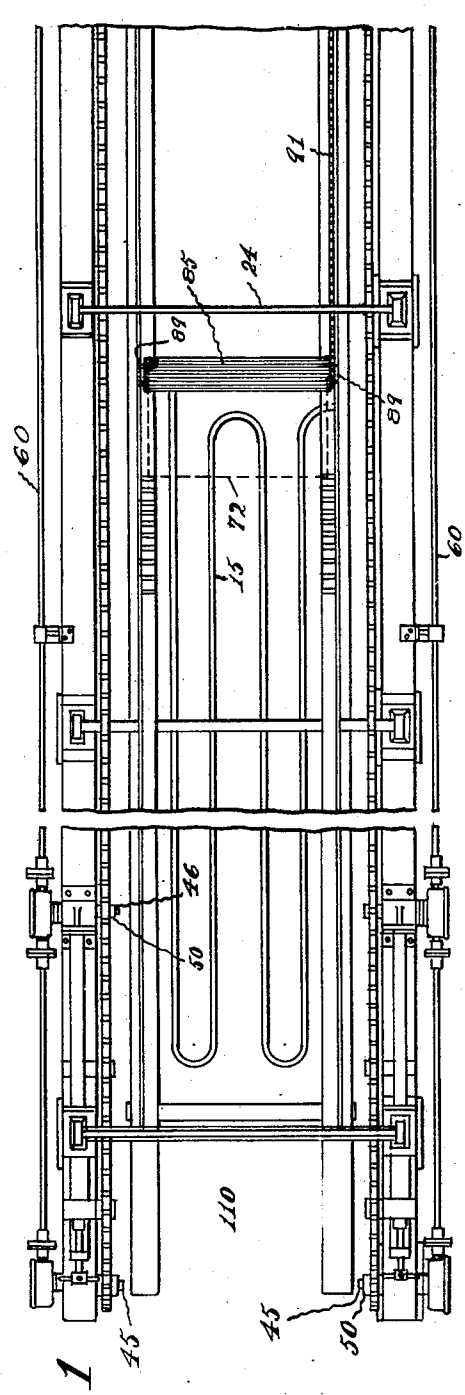


Fig 1

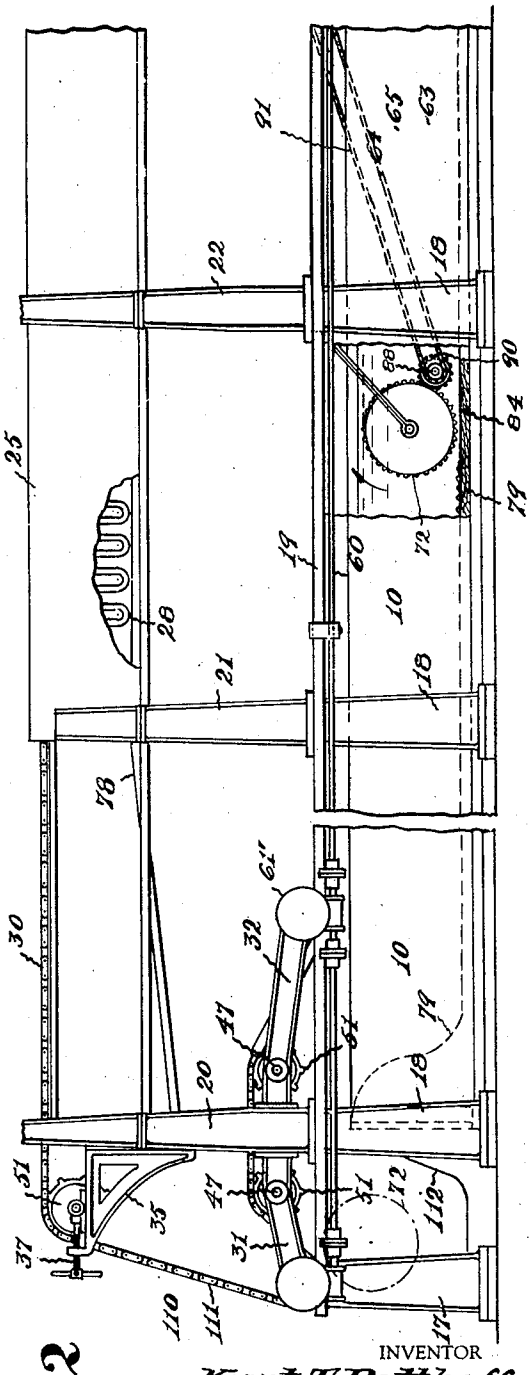


Fig. 2

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ROTARY CONVEYER SYSTEM AND APPARATUS THEREFOR

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Fig. 3

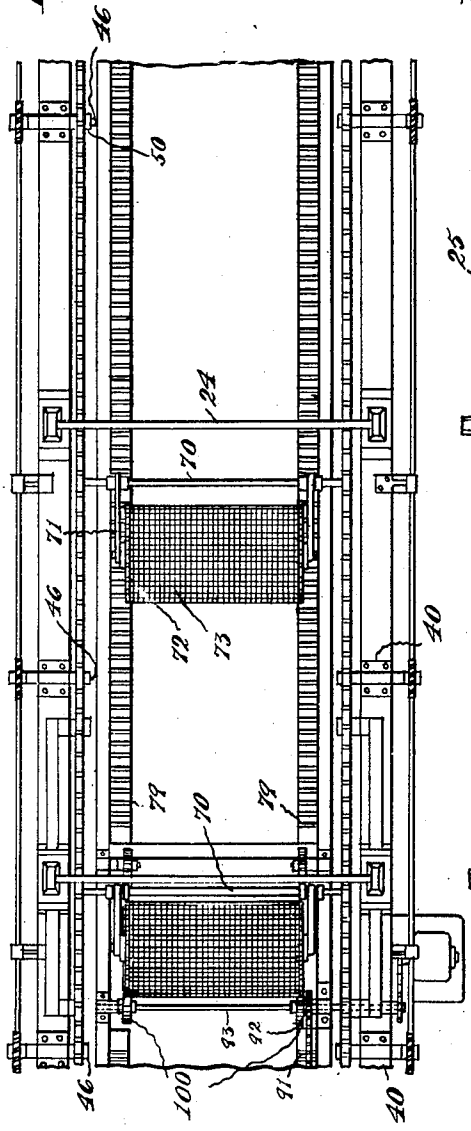
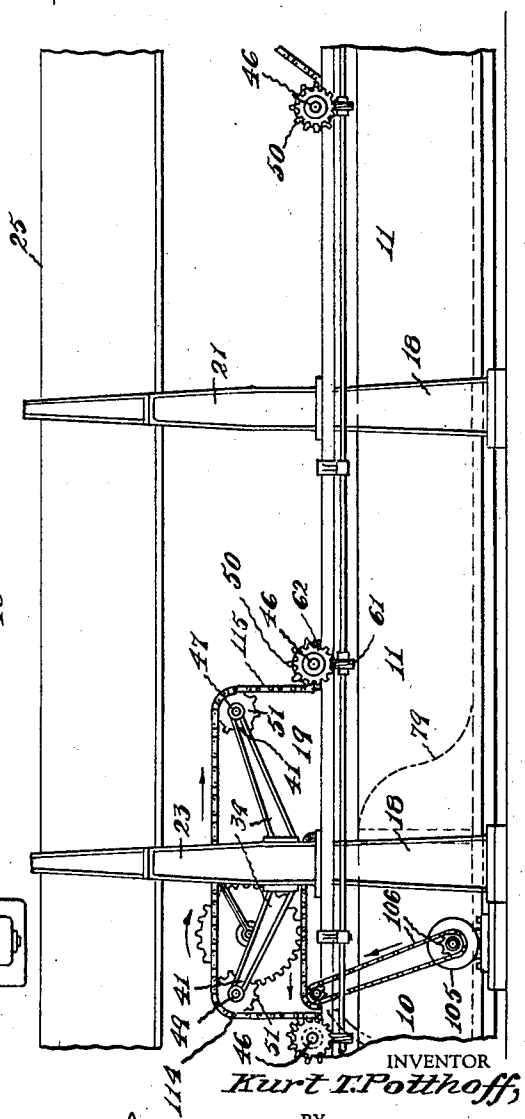


Fig. 4



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ROTARY CONVEYER SYSTEM AND APPARATUS THEREFOR

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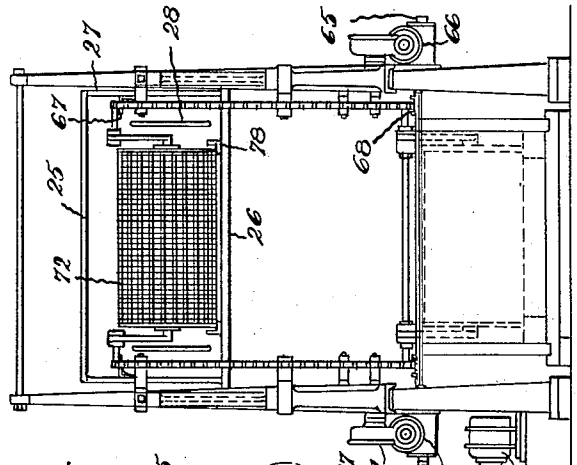


Fig. 7

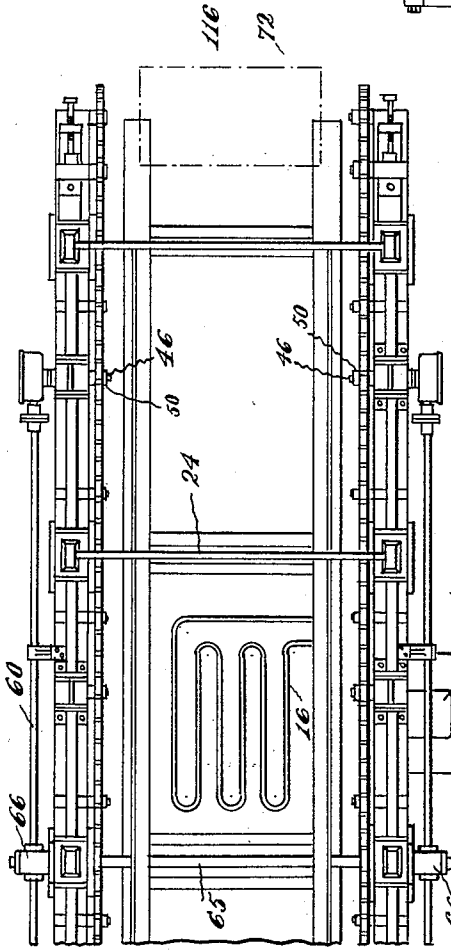


Fig. 5

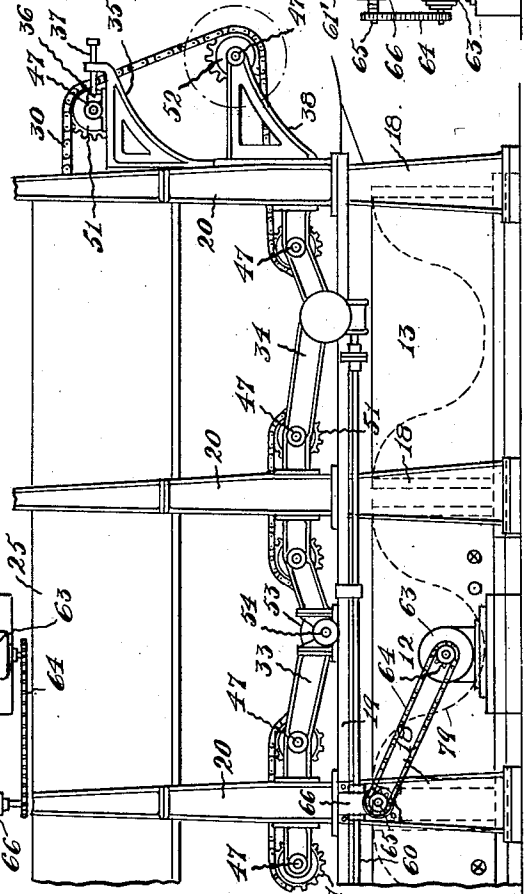


Fig. 6

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ROTARY CONVEYER SYSTEM AND APPARATUS THEREFOR

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Fig. 8

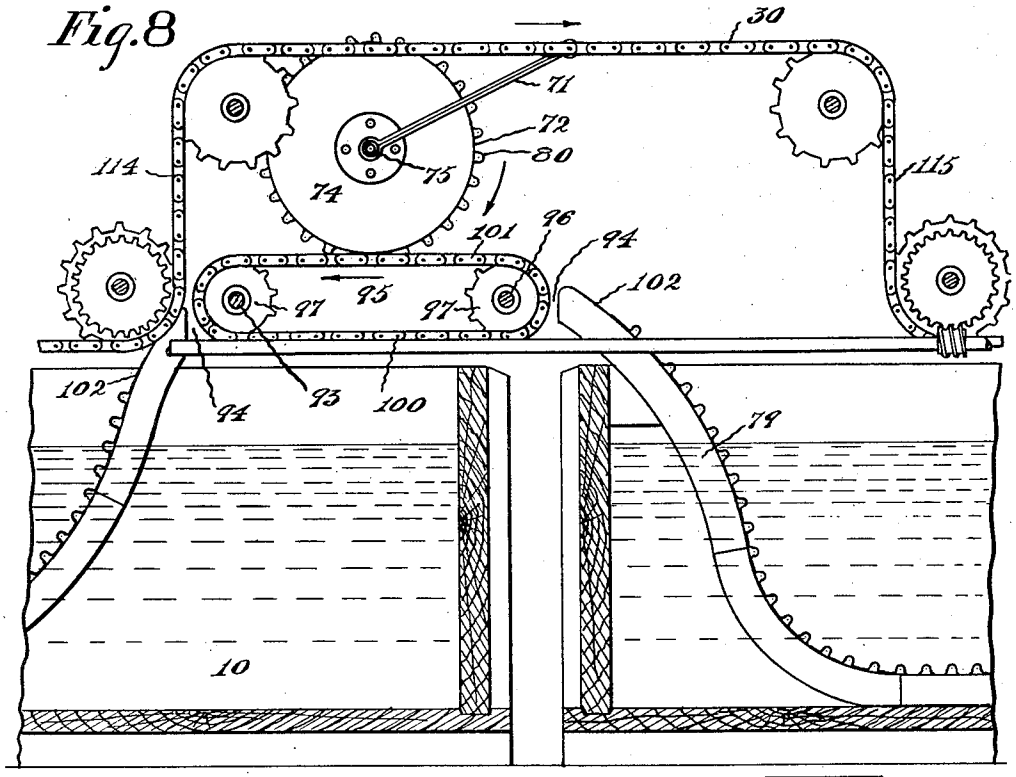
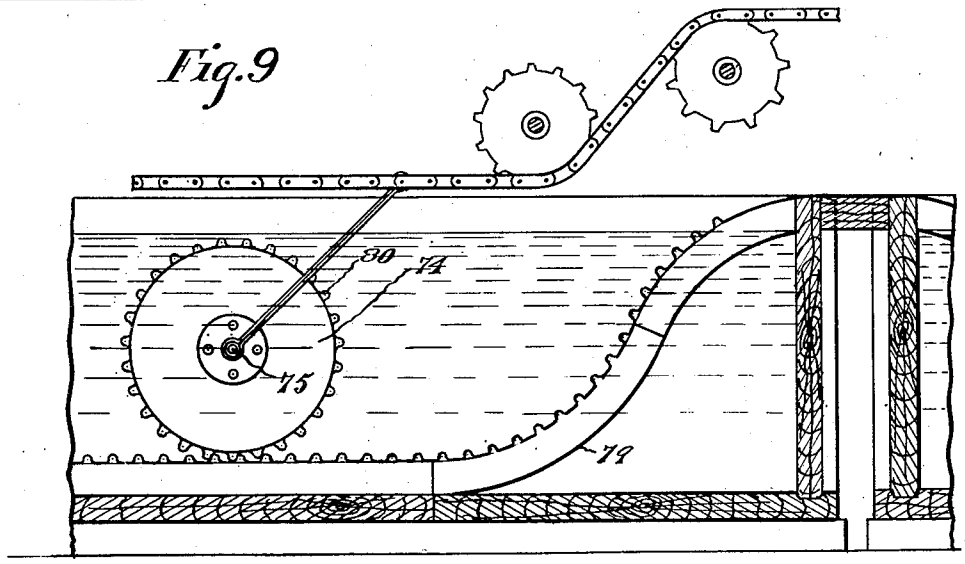


Fig. 9



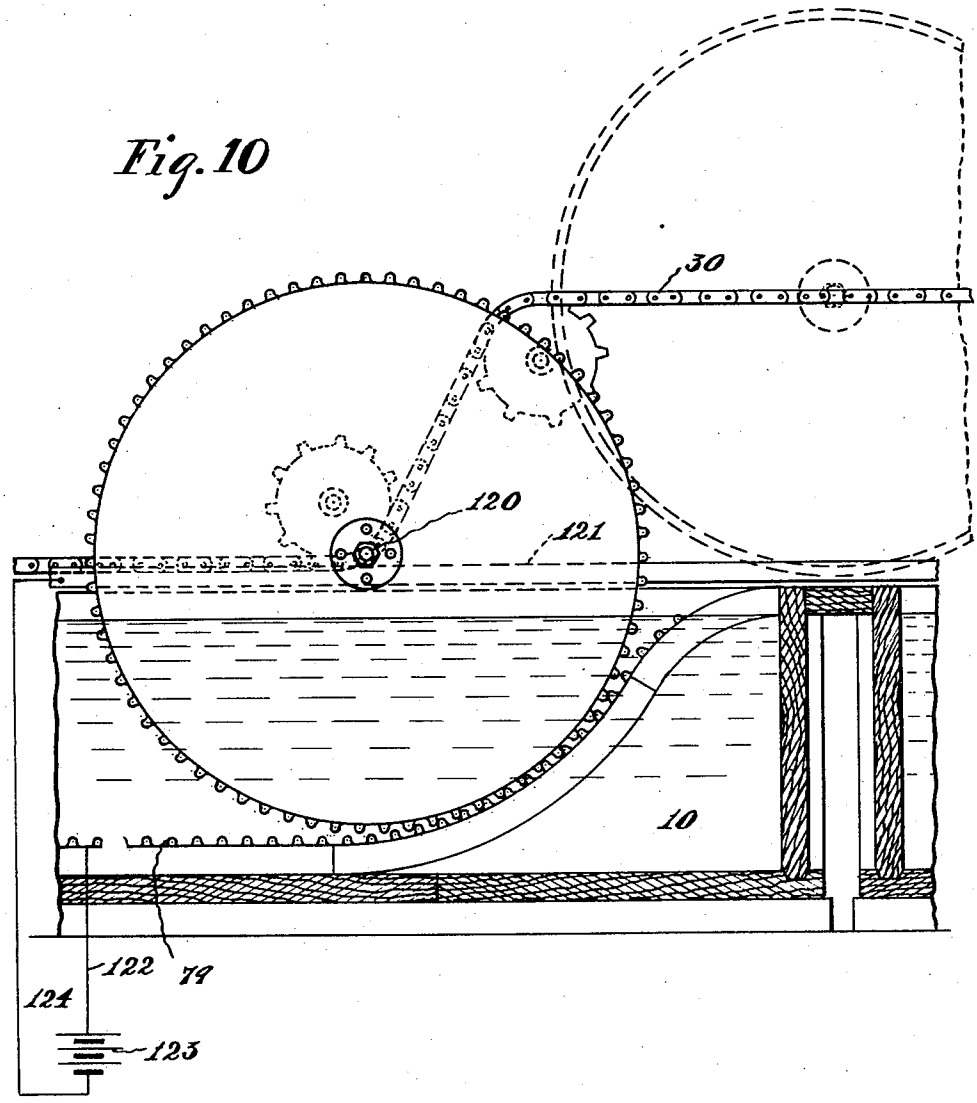
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ROTARY CONVEYER SYSTEM AND APPARATUS THEREFOR

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Fig. 10



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Patented Mar. 14, 1933 1,901,471

UNITED STATES PATENT OFFICE

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ROTARY CONVEYER SYSTEM AND APPARATUS THEREFOR

Application filed October 19, 1928. Serial No. 313,515.

This invention relates to article conveying machines or apparatus and more particularly to methods and means for passing articles through liquids, as before, during or after electro-plating though it is noted that the invention is not limited to plating nor in some respects to liquid treating.

One object of the invention is to provide conveying apparatus of this kind which will at intervals bring the carrier for the articles to rest as for instance, when the article is to be loaded or unloaded, when it is in the liquid or when it has just left the liquid.

Another object of the invention is to provide an improved method and apparatus of this kind in which the article when at rest or traveling in or out of the liquid is rotated to facilitate treatment by the liquid or draining.

Another object of the invention is to provide an apparatus of this kind having efficient drying means, and an improved arrangement to facilitate loading and unloading by an operator.

Other objects of the invention are to improve generally the simplicity and efficiency of such methods and apparatus and to provide an apparatus of this kind which is economical, durable and reliable in operation, and economical to manufacture.

Still other objects of the invention will appear as the description proceeds; and while herein details of the invention are described and claimed, the invention is not limited to these, since many and various changes may be made without departing from the scope of the invention as claimed in the broader claims.

The inventive features for the accomplishment of these and other objects are shown herein in connection with an improved apparatus which, briefly stated, includes a drying chamber above a series of tanks, and intermittently driven conveyer chains disposed at opposite sides of the tanks and guided downwardly intermediately of the ends of the tanks and upwardly near and over the ends of the tanks, and then through the drying chamber, conveying rotary article-carrying baskets or containers down into the tanks, up and out at the discharge end of the tanks, and through the drying chamber. The intermittent drive brings the basket to rest when thus lowered and raised. Main feautures of the invention are a pair of auxiliary or supplemental rotating means for rotating the containers when thus brought to rest by the intermittent drive for giving the liquid good access to the articles while in the liquid without undue lengthening of the tank, and facilitating the draining of liquid from the articles back into the tank.

In the accompanying drawings showing, by way of example, one of many possible embodiments of the invention,

Fig. 1 is a fragmental plan showing the loading end of the apparatus, the drying chamber being removed;

Fig. 2 is a fragmental side elevation of loading end;

Figs. 3 and 4 show a similar fragmental plan and side elevation of an intermediate part of the apparatus;

Figs. 5 and 6 are similar views of the opposite end;

Fig. 7 is an end elevation of the apparatus;

Figs. 8 and 9 are somewhat diagrammatic fragmental side elevation of parts of the two supplemental rotating means, the shafts and tanks being shown in section; and

Fig. 10 is a view similar to Fig. 9, showing a modified form of container with its axis above the level of the liquid in the tanks.

My improved conveying apparatus is shown in combination with a series of tanks 10, 11, 12, 13 disposed end for end in a straight line and including a long acid pickling tank 10 at the loading end, a cold rinse tank 11, a neutralizing tank (not shown) another cold rinse tank 12 and a soap solution tank 13 at the emerging end of the series; though it is noted that the invention is in no way limited to the use, number and sequence of the tanks. Pipe coils 15 and 16 (Figs. 1 and 5) are shown on the bottom of the pickling and last cold rinse tanks for controlling the temperature therein.

The conveying system is carried on a frame

comprising base pedestals 17, 18 arranged along the sides of the series at the ends of the tanks and intermediately of the sides of the acid pickling tank and also just beyond the outer or loading end of the acid pickling tank and supporting a horizontal beam 19 on each side of the series tanks, which beams in turn support upper pedestals 20, 21, 22, 23 mounted on said beams respectively over the base pedestals except the loading end base pedestal 17. Tie rods 24 connect the upper ends of opposite upper pedestals.

A drying chamber 25 open at both ends is disposed above the tanks between the upper part of opposite upper pedestals and has a floor 26 (Fig. 7) extending laterally to the pedestals, side walls 27 disposed near the standards, and heating coils 28 (Fig. 2) on the side walls.

The conveyers comprise endless chains 30 carried on sprockets carried on bearing brackets now to be described.

Slanting brackets 31, 32, 33, 34 have their upper ends mounted against the faces of said upper pedestals 20 at both ends of the tanks, and have their lower ends mounted on said beams 19 a distance from the pedestals. Upper brackets 35 on the upper part of the end faces of the end upper pedestals 20 have bearing blocks 36 adjustable thereon longitudinally of the tanks by means of screws 37. There are also lower brackets 38 (Fig. 6) on the lower part of the end face of the upper pedestal 20 at the emerging end, upwardly inclined brackets 39 (Fig. 4) on the front and rear faces of the pedestal 23 at the discharge end of the pickling tank and intermediate brackets 40 (Fig. 3) on the top face of said beam approximately under the bearing ends 41 of said upwardly inclined brackets 39.

Inwardly pointing short drive shafts 45 (Fig. 1) at the loading end of the machine are rotatably mounted in the lower ends of the slanting brackets 31 at that end; inwardly pointing short drive shafts 46 are rotatably mounted in the intermediate brackets 40 and lower ends of the slanting brackets 31, 32 and 34; and non-rotating inwardly pointing short shafts 47 are fast in said bearing blocks 36, said lower brackets 38, said bearing ends 41 at the upper ends of said inclined brackets 39, and the upper ends of the slanting brackets 31, 32, 33 and 34.

The drive sprockets 50 are carried fast on said drive shafts 45 and 46, while idle sprockets 51, 52, 53 are loose on said short shafts 47 and shaft 54. The endless conveyer chains 30 are movable in vertical planes at opposite sides of the machine and pass under all of said drive sprockets 50, the sprockets 52 and 53 and over the other idle sprockets 51.

Main drive shafts 60 rotatably mounted longitudinally of the beams 19 carry worms 61 disposed in gear housings 61′ and engaging worm wheels 62 in said housings and fast on the drive shafts 45, 46. An intermittently operated motor 63 (Fig. 6) is connected by a chain and sprocket connection 64 to a cross drive shaft 65 disposed between the ends of adjacent tanks under the high parts of the tracks 79 and rotatably mounted in opposite pedestals 20. This cross drive shaft 65 is in turn connected by reducing worm gears 66 to both main shafts 60, thereby to intermittently drive said main shafts and consequently the chains 30.

Tracks 67, 68 (Fig. 7) respectively mounted on the inner face of the drying chamber and along the upper edges of the tanks under the chains slidably support long horizontal courses of the chains 30.

Horizontal cross bars 70 (Fig. 3) connecting opposite links of the respective chains 30 and disposed perpendicular to the chains support links 71 pivotally connected to opposite ends of said cross bars and adapted to be rearwardly inclined therefrom and carry rotating cylindrical baskets 72 having reticulated sides 73, peripherally toothed heads 74 (Fig. 8) each provided with a central shaft 75 rotatively received in the free ends of said links. The sides of the baskets are provided with suitable doors (not shown) for access to the interior.

Toothed tracks 78 (Fig. 7) on opposite sides of the floor of the drying chamber and downwardly slanting at the discharge end of the chamber and tracks 79 on the bottom of said tanks and upwardly inclined to and over the ends of the tanks are engageable by the teeth 80 of said heads for supporting and rotating the baskets as the chains move, for exposing different surfaces of the articles to the liquids and the drying air.

Said tracks 79 are at opposite points in the long tank 10 provided with untoothed portions 84 (Fig. 2) against which the heads are simultaneously drawn out of mesh with the toothed tracks; and a long rod-tooth gear 85 (Fig. 1) disposed across the tank just over said untoothed portions are provided with side rods forming gear members engageable with the teeth 80 of said heads as the basket is drawn over the untooth position to the gear, thereby to raise the basket. Said gear 85 has heads provided with a central shaft 88 rotatable in bearing blocks 89 mounted in the lower part of the tank against the walls. One of said gear heads has a sprocket 90 fast thereon engaged by an inclined chain 91 near the wall of the tank and engaging at the upper end with a sprocket 92 on a transverse shaft 93 continuously rotated in a manner presently to be explained.

The periods of said intermittent motor are

timed to bring the heads of the basket to rest when engaged and supported by the rod-tooth gear 85, whereby the basket is kept submerged and rotated, thereby to agitate the articles in the basket to remove all air bubbles and entrapped air and gases and to permit the liquid to act upon all parts of the articles.

Said tracks 79 are interrupted between said intermediate bearings 40 (Fig. 3) to form gaps 94 (Fig. 8) to which said heads are simultaneously drawn, there to meet a supplemental rotating means 95 comprising the shaft 93 and an other parallel transverse shaft 96 at the same level, said shafts carrying sprockets 97 in the vertical plane of the main chains 30 respectively. Said sprockets carrying short chains 100 in said gaps 94 respectively having their upper courses 101 forming continuations of the tracks 79, the tracks being untoothed as at 102 adjacent to the short chains to unmesh the teeth 80 from the tracks before meshing them with the short chains. A continuous drive means for rotating the shaft 93 and therefore the gear 85 and short chains 100 includes a motor 105 (Fig. 4) and a sprocket and chain connection 106 between the motor and the transverse shaft 93.

The periods of said intermittent motor 63 are timed to bring the conveyer chains 30 to rest when the basket heads have been drawn into mesh with the short chains 100, whereby the basket is held over the tank and rotated long enough to drain, back into the tank, the greater portion of fluid adhering to the articles.

The lengths of the main conveyer chains 30, the distance between the loading end 110 (Fig. 1) of the apparatus and the supplemental rotating gear 85 and chains 100, the distance between said baskets 72 and the timing of the intermittent drive motor 63 are all so related that the conveyor chains are brought to rest wherever a basket is on said supplemental rotating gear 85 or short chains, or at the loading end 110 for reloading the baskets of articles to be treated and unloading the baskets of articles which have been treated and dried in the drying chamber.

The operation is simple and obvious from the foregoing. The operator stands at the loading end 110 (Fig. 2) and as the intermittent drive, if used, brings the basket to rest at said end, the operator places the articles therein.

As the rod 70 passes down the nearly vertical slanting course 111 the basket heads engage the inclined tracks 112 and as the links carrying the rod are carried over the sprockets 51 the basket is drawn over the end of the tank into engagement with the track 79 and is rolled along the track to cause the articles to be agitated to cause the bubbles to pass out. The baskets pass along the tracks 79 until they engage the gear 85 and during a pause in the drive are rotated by the motor 105 to cause all bubbles to pass out and so agitate the articles that the liquid reaches all parts thereof as well and quickly as it would if a much longer tank were used.

The rod 70 is next drawn up the vertical course 114 (Fig. 4) and the basket next passes to, and pauses on, intermediate parts of the short chains 100 (Fig. 8) and is there rotated by said chains until the liquid on the articles thoroughly drains back into the tank. The rod 70 then passes on to the downward course 115 of the chain 30 and draws the basket down the track 79 into the next tank.

In like manner the basket passes over the ends of, and into, the other tanks, but is not given supplemental rotations unless means similar to the gear 85 and short chains 100 of the long tank 10 are also provided for additional tanks. When the articles emerge from the tank 13 at the end 116 (Fig. 3), the chain 30 passing under the sprocket 52 and over the end sprocket 51, carries the bar 70 along the upper horizontal course of the chains on the tracks 67 (Fig. 7) and rolls the baskets with the articles thereon on the tracks 78 through the drying chamber back to the loading end 110, where the articles are removed by the operator during the pause of the intermittent drive. The rolling of the basket through the drying chamber causes all parts of the articles to be exposed to the drying action.

While only a few rotating baskets are shown, it is understood that these may be as many as the chain can accommodate

While important features of the invention are the rotating means, the drying chamber and the conveyer, the intermittent conveyer-drive has advantages of general application as follows:

It facilitates loading and unloading.

It intensifies the action of the solution when the material is stationary.

It intensifies washing action, since it necessitates moving the carrier faster while moving through the bath in order to have the material remain in solution for the same period of time.

When treating small work in bulk the intermittent drive permits action on exposed surfaces which are not in contact with one another as cylinder remains inactive. This is repeated as the relative position of the articles is changed by the intermittent motion.

The intermittent drive permits the reduction in size of the various tanks and the drying chamber, in some instances as much as 50%, with consequent saving in cost of equipment, floor space and the like.

It permits proper draining of solution,

thereby eliminating consequent contamination of the succeeding baths.

It permits the application of separate supplemental means for rotating cylindrical carriers when in the draining position in order to properly drain hollow bodies.

The intermittent drive is applicable to plating machines and when used in plating machines it removes more thoroughly gases formed on the articles caused by the plating action, since it will be necessary for the material to travel through the bath faster in a given time than will be required without intermittent motion.

The intermittent motion will tend to alter the character of the plating deposit, and has a tendency toward reducing porosity of coating; in other words, it gives more of a cross-graining effect on the deposit.

The weight of the basket, or other suitable means, causes the basket to sink; and the level of the liquid may be such as to partially or entirely submerge the basket and material as desired.

As the basket may be entirely submerged, it is suitable for entirely submerging and treating articles which might otherwise float, such as shells closed at one or both ends; and the rotation of the basket while thus submerged serves not only for the above stated advantages, but for releasing all of the air which might otherwise be trapped in the articles.

In Fig. 10, however, I show a rotating container which is not submerged, but which has its axis of rotation above the level of the liquid.

This is desirable in some plating, deplating and other machinery, in which it is desirable that the shaft 120 of the container be above the level of the liquid for receiving current from a bus bar 121 at the side of the tank, whereby the shaft 120 may become, for instance, the anode bar for carrying anode material, the sides of the container being of conducting material in electrical contact with the articles resting therein, and insulated from the shaft by the heads of the container, and connected by a conductor 122 to the source 123 of current through the metallic track 79, the other pole of the source being shown connected to the bus bar as at 124.

In this case the shaft 120 is similar to the cross bar 70 and connected to the chains 30 directly rather than by links 71, though the absence of the links is not necessary, and the shaft may be two stub shafts or one long shaft.

While herein, in the specification and claims I mention tanks in which the articles are immersed rather than spraying or treating stations or zones where the articles may be sprayed or otherwise treated, it is understood that such stations may sometimes be substituted for tanks, and the claims herein are to be construed as covering such treating stations when the substitution is possible.

I claim as my invention:

1. In combination, a tank for liquid; a closed basket; intermittent means for conveying the basket downwardly into the liquid of the tank and upwardly out of the liquid near the discharge end of the tank; the intermittent means coming to rest after the basket is thus raised; and means for rotating the basket when thus brought to rest.

2. In combination, a series of tanks for liquids; endless conveyer chains at opposite sides; means for guiding said chains upwardly and downwardly over the inner ends of the tanks, downwardly and upwardly intermediately of the ends of the tanks; baskets drawn by the chains; means for intermittently driving said chains for bringing the basket to rest over the liquid at the discharge end of one of the tanks; and auxiliary rotating means for rotating the basket when the intermittent means brings the basket to rest over said discharge end.

3. In combination, a series of tanks; conveyer means at opposite sides of the tanks movable upwardly and downwardly over the inner ends of the tanks, and downwardly and upwardly intermediately of the ends of the tanks; means for intermittently driving said conveyer means; baskets drawn by the chains and having peripherally toothed heads; toothed tracks in said tanks and inclined upwardly over the ends of the tanks and engageable by the teeth of said heads; and supplemental rotating means for rotating the basket when the intermittent means brings the basket to rest over one of said inner ends.

4. In combination, a series of tanks; a conveyer means at opposite sides of the tanks movable longitudinally thereof and upwardly and then horizontally and then downwardly at the inner discharge end of one of the tanks means for intermittently driving said conveyer means; baskets drawn by the conveyer means and having peripherally toothed heads, toothed tracks in said tanks and inclined upwardly over the ends of the tanks and engaged by the teeth of said heads; said tracks being interrupted at said discharge end to form gaps; supplemental rotating means in said gaps comprising transverse shafts; sprockets thereon; short chains on said sprockets having their upper courses forming continuations of the tracks and adapted to mesh with said heads; a continuous drive means for the rotating means; the intermittent means being timed to bring the conveyer chains to rest when the basket heads have been drawn into mesh with the short chains.

5. In combination; a tank for liquid; a closed basket; intermittent means for con-

veying the basket downwardly into the liquid of the tank and upwardly out of the liquid; the intermittent means coming to rest after the basket is thus lowered; and means for rotating the basket when thus brought to rest.

6. In combination, a series of tanks; conveyer means at opposite sides of the tanks movable longitudinally thereof; means for intermittently driving said conveyer means; baskets drawn by the conveyer means and having peripherally toothed heads, toothed tracks in said tanks and inclined upwardly over the ends of the tanks and engaged by the teeth of said heads and having opposite untoothed portions intermediately of the ends of one of the tanks; a long gear across the tank over said untoothed portion engageable with said teeth as the basket is drawn thereto; and means whereby said gear is continuously rotated; said intermittent drive being timed to bring the heads of the basket to rest when engaged by said long gear.

7. In combination, a series of tanks; conveyer means at opposite sides of the tanks movable upwardly and downwardly over the ends of the tanks, and downwardly and upwardly intermediately of the ends of the tanks; means for intermittently driving said conveyer means; baskets drawn by the chains and having peripherally toothed heads; toothed tracks in said tanks and inclined upwardly over the ends of the tanks and engageable by the teeth of said heads; a continuously rotated gear member in the lower part of one of the tanks engaged by said heads when the basket is brought to rest by the intermittent means; said tracks being interrupted over the discharge end of one of the tanks; and supplemental rotating means for rotating the basket when the intermittent means brings the basket to rest over said inner end.

8. In combination, a series of tanks; conveyer means at opposite sides of the tanks movable longitudinally thereof; means for intermittently driving said conveyer means; baskets drawn by the conveyer means and having peripherally toothed heads, toothed tracks in said tanks and inclined upwardly over the ends of the tanks and engaged by the teeth of said heads; a long gear across one of the tanks in the lower part thereof; said tracks interrupted over the inner end of the long tank to form gaps; supplemental rotating means comprising continuously rotated sprockets; and short chains on said sprockets forming continuations of the tracks; a drive means for continuously rotating said gear and sprockets; the intermittent means bringing the conveyer chains to rest when the heads mesh with the long gear and said short chains.

9. In combination; a tank; chain conveyers at opposite sides of the tank movable downwardly intermediately of the ends of the tank; a cylindrical basket rotatable between opposite links of the chains and having toothed heads; and toothed tracks on the bottom of said tanks engaged by the teeth of said heads.

10. In combination, a tank; conveyers at opposite sides of the tank; a cylindrical basket rotatably drawn between opposite parts of the conveyers and having toothed heads; and toothed tracks on the bottom of said tank and downwardly inclined at the receiving ends of the tank and engageable by the teeth of said heads.

11. In combination; a tank; conveyer chains at opposite sides of the tank; means for guiding said chains upwardly near the discharge end of the tank; a cylindrical basket rotatable between opposite links of the chains and having toothed heads; and toothed tracks on the bottom of said tank and upwardly inclined at the discharge end of the tank and engageable by the teeth of said heads.

12. In combination; a series of tanks; conveyer chains at opposite sides of the tanks; means for guiding said chains upwardly near the discharge end of the tanks and downwardly intermediately of the ends of the tanks; a cylindrical basket rotatable between opposite links of the chains and having circular heads; and tracks on the bottom of said tanks and inclined over the ends of the tanks and engageable by said heads.

13. In combination, a series of tanks having a loading end; an upper treating chamber; intermittently driven endless conveyer chains at opposite sides of the tanks; means for guiding said chains downwardly over the tanks, over the ends of the tanks, and through the upper treating chamber; and a carrier drawn by the chains and lowered into the tank, raised at the discharge end of the tanks and drawn through the upper treating chamber to said loading end; the intermittent drive bringing the carrier to rest when at the loading end.

14. In combination, a series of tanks, intermittently driven conveyer chains at opposite sides of the tanks; means for guiding said chains downwardly into the tanks; upwardly intermediately near and over the ends of the tanks; horizontal cross bars connecting opposite links of the respective chains; links pivoted to opposite ends of said bars; a cylindrical basket having peripherally toothed heads each having a central shaft in the free ends of said links; and toothed tracks on the bottom of said tanks and upwardly inclined over the ends of the tanks engageable by the teeth of said heads for rotating the baskets as the chains move.

15. In combination; a conveyer; links piv-

oted to conveyer; a cylindrical basket having foraminous sides, and peripherally toothed heads each having a central shaft in the free ends of said links respectively; and toothed tracks engaged by the teeth of said heads, the diameter of the toothed periphery of the heads being as large as the diameter of the basket.

16. In combination; a tank; a pair of conveyers movable at opposite sides of the tank and upwardly near the discharge end of the tank and downwardly intermediately of the ends of the tank; a rotary cylindrical basket drawn by opposite parts of the respective conveyers and having peripherally toothed heads; and toothed tracks in said tanks and engaged by the teeth of said heads, the diameter of the toothed periphery of the heads being as large as the diameter of the basket.

17. In combination; a tank; a pair of conveyers movable at opposite sides of the tank and upwardly near the discharge end of the tank and downwardly intermediately of the ends of the tank; horizontal cross bars connecting opposite parts of the respective conveyers; links pivoted to opposite ends of said bars; a cylindrical basket having circular heads each having a central shaft in the free ends of said links; and tracks on the bottom of said tanks and engaged by the heads.

18. In combination, a series of tanks including a long tank; inwardly pointing drive shafts at one end of the series; drive-shafts intermediately of the ends of the tanks; short shafts mounted above the level of the drive-shafts and near the ends of the tanks; drive sprockets fast on the drive shafts and idle sprockets loose on the other shafts; conveyer chains at opposite sides of the tanks passing under said drive sprockets and over the idle sprockets; means for intermittently driving said drive shafts; and article carriers drawn by said chains through the tanks.

19. In combination, a series of tanks including a long tank; inwardly pointing drive shafts at one end of the machine; drive-shafts intermediately of the ends of the tanks; short shafts mounted above the level of the drive-shafts and near the ends of the tanks; drive sprockets fast on the drive shafts and idle sprockets loose on the other shafts; conveyer chains at opposite sides of the tanks passing under said drive sprockets and over the idle sprockets and through the drying chamber; main drive shafts rotatably mounted longitudinally of said series; worms fast on said main shafts; worm wheels fast on the other drive shafts engaged by said worms; a cross drive shaft disposed between the ends of the adjacent tanks and connected to both of said main drive shafts by a reducing gear; a motor; a chain and sprocket connection between said motor and said last named cross shaft for driving said main shafts and consequently the sprockets and chains; cross bars connecting opposite chains; and article carriers carried by the cross bars.

20. In combination, a series of tanks disposed end to end; conveyers at opposite sides of the series; carriers drawn by the conveyers; a cross drive shaft disposed between the ends of adjacent tanks below the upper parts thereof and operatively connected to said conveyors respectively to drive the conveyers; and a motor driving said shaft.

21. An apparatus comprising a treating compartment; conveyer means for conveying an article into the compartment, automatically removing it from the compartment and then automatically causing it to pause; and means for automatically rotating the article during said pause.

22. An apparatus comprising a basket; a tank for liquid; conveyer means for conveying the basket into the liquid, automatically raising it and automatically causing it to pause over the liquid; and means for automatically rotating the basket during said pause.

23. An apparatus comprising a treating compartment; conveyer means for conveying an article into the compartment, automatically causing it to pause therein and automatically removing it; and means for automatically rotating the article during said pause.

24. An apparatus comprising a basket; a tank for liquid; conveyer means for conveying basket into the liquid, automatically causing it to pause therein and then automatically raising it; and means for automatically rotating the basket during said pause.

25. An apparatus comprising a treating compartment; a basket; a conveyer means for conveying the basket into the compartment and automatically causing the conveyer means to pause while the basket is in the compartment; and means for automatically rotating the basket during said pause, while the conveyer is stationary.

26. An apparatus comprising a treating compartment; a basket; conveyer means for conveying the basket into the compartment, and removing the basket from the compartment and then automatically causing the conveyer means to pause; and means for automatically rotating the basket during said pause, while the conveyer means is stationary.

27. In combination, conveyer means; means for intermittently driving said conveyer means and automatically causing the conveyer means to pause and restart; and a basket secured to the conveyer means; and means separate and distinct from the con-

veyer means for automatically rotating the basket during the pause.

28. In combination, a conveyer means; a pair of tracks having an interruption therein; a basket drawn by the conveyer means and having supporting means supported by said tracks; and means for rotating the basket at the interruption.

29. In combination, a conveyer means; a pair of tracks; a basket drawn by the conveyer means and rolling on said tracks; said tracks being interrupted; and means for receiving the basket from the track at the interruption and rotating the basket.

30. In combination, a conveyer means; a basket drawn by the conveyer means; and means separate and independent from the conveyer means for receiving the basket and rotating the basket.

31. In combination, a compartment having floor tracks on the floor; conveyer means movable along the compartment; and a basket drawn by the conveyer means and having heads having their peripheries supported on said tracks, whereby the baskets are supported substantially by the floor, while being drawn by the conveyer means.

32. In combination, a tank having liquid therein; conveyer means exterior to the liquid movable along the tank; tracks submerged in said liquid and extending upwardly over an end of the tank; and a basket drawn by the conveyer means and having heads having their peripheries engaged with said tracks.

33. In combination, a tank having liquid therein; conveyer means exterior to the liquid movable along the tank; and a basket drawn by the conveyer means and having heads having their peripheries supported by the bottom of the tank, whereby the basket is substantially free of support by the conveyer.

34. In combination, a tank having liquid therein; conveyer means at opposite sides of the tank above the liquid and movable along such sides; toothed tracks submerged in said liquid; and baskets having shafts secured to the conveyer means respectively, sand baskets having supporting means and having toothed peripheries engaged with said tracks the diameter of said toothed peripheries being large enough to prevent lag of heavy articles in the drum from forcing the teeth of the peripheries out of mesh with the teeth of the tracks.

35. In combination, a tank having liquid therein; conveyer means at opposite sides of the tank and movable along such sides; toothed tracks submerged in said liquid; baskets secured to the conveyer means respectively and having heads having toothed peripheries engaged with said tracks respectively the diameters of said peripheries being more than half as large as the diameter of the basket.

36. In combination, conveyer means; toothed tracks; and baskets secured to the conveyer means and having heads closing the ends of the basket and having toothed peripheries engaged with said tracks respectively the diameters of said peripheries being more than half as large as the diameters of the basket.

37. In combination, a compartment; conveyer means at opposite sides of the compartment; baskets having shafts rotatably suspended from the conveyer means and movable into the compartment; and means additional to and separate from the shafts for supporting the basket independently of the shafts while traveling in the compartment.

38. In combination, a tank having liquid therein; conveyer means at opposite sides of the tank and movable along such sides; supporting devices secured to the conveyer; baskets having heads and shafts fast on the heads journalled in the supporting devices; and means separate and distinct from the shafts and said supporting devices for supporting the baskets independently of the shafts while traveling.

39. In combination, a tank having liquid therein; conveyer means at opposite sides of the tank and movable along such sides; means for driving said conveyer means; toothed tracks submerged in said liquid and extending upwardly over an end of the tank; and baskets secured to the conveyer means respectively and having toothed peripheries engaged with said tracks respectively.

40. In combination, a compartment having a floor; conveyer means at opposite sides of the compartment and movable along such sides; toothed tracks on the floor of the compartment and extending to the ends of the compartment; links secured to the conveyer means respectively; and a basket having heads, the peripheries of the heads being toothed and meshed with said tracks respectively and shafts on the heads journalled to the links.

41. In conveying apparatus having a receiving end, endless conveyer chains guided at opposite sides of the apparatus from the receiving end to the other and then up and back to the receiving end; short drive shafts respectively at opposite sides of the apparatus at the receiving end; drive sprockets fast on the drive shafts and respectively engaging the over chains; drive means for driving said drive shafts; and article carriers suspended from and between opposite chains and passing between the short drive shafts.

42. In combination, a series of tanks; conveyer chains guided at opposite sides of the

tanks; a plurality of drive-shafts; sprockets fast on the drive shafts and engaging said chains; main drive shafts rotatably mounted longitudinally of said series and connected to drive the other drive shafts; a cross drive shaft disposed between the ends of adjacent tanks and connected to drive both of said main drive shafts; means to drive said last named cross shaft; and article carriers carried by opposite chains.

43. An apparatus comprising a treating compartment; conveying means for conveying an article into the compartment and causing it to pause at a place therein and then removing the article from the compartment; and means for automatically rotating the article when it reaches said place and during said pause.

44. An apparatus comprising a treating compartment; conveying means including an article carrier for conveying an article into the compartment and causing it to pause therein and removing it; and a constantly moving device for automatically engaging said carrier for rotating the article during said pause.

45. An apparatus comprising a treating compartment; conveying means for conveying an article into the compartment, causing movement of the article along the compartment, causing it to pause in the compartment, and then removing it; and separate means for automatically rotating the carrier during said movement and pause respectively.

46. In combination, a tank having a liquid therein; inclined supporting means extending downwardly and forwardly into the liquid of the tank; conveyer means above the liquid and movable over the inclined means and the tank; a carrier adapted to engage with said inclined means; backwardly and downwardly extending links secured to the conveyer means and said carrier; the links forming means entirely intermediately stiff between said conveyer means and carrier for holding back the carrier when it is passing down the inclined supporting means.

47. In combination, a tank having a liquid therein; conveyer means above the liquid and movable over the tank; inclined supporting means extending downwardly over the receiving end of the tank into the liquid of the tank; baskets adapted to engage with said inclined means; backwardly and downwardly extending links secured to the conveyer means and having ends rotatably engaged with the ends of said basket; the links forming entirely intermediately stiff means between said conveyer means and basket for holding back the basket when it is passing down the inclined supporting means.

48. In combination, a tank having a loading end and having a liquid therein; endless conveyer chains; means for moving the conveyer chains from the loading end above the liquid and over the tank and then upwardly and back to the loading end; baskets adapted to pass through said liquid; links secured to the chains and having ends rotatably engaged with the ends of said basket; the links downwardly extending from the chains at all times and forming a permanent connection between said chains, means and basket for holding the basket on the chains during all of the movements of the chain.

49. In combination, a tank having liquid therein; conveyer means at opposite sides of the tank and movable along such sides; a bus bar at the side of the tank; means for driving said conveyer means; toothed tracks submerged in said liquid and extending up over an end of the tank; a basket having toothed peripheries engaged with said tracks respectively and having a conducting shaft of conducting material at all times above the level of said liquid and engageable with said bus bar when the basket is on the lower part of the tracks; said basket being secured to said conveyer means, whereby when the conveyer means moves the basket on a higher part of the track, the shaft is lifted out of contact with the bus bar and the basket is lifted from the liquid; and means for electrically charging the liquid and bus bar.

50. In combination, a tank having liquid therein; conveyer means movable along the tank; a bus bar at the side of the tank; tracks submerged in said liquid and extending up over an end of the tank; a basket secured to said conveyer means having peripheries engaged with said tracks respectively and having a shaft of conducting material at all times above the level of said liquid and engageable with said bus bar when the basket is on the lower part of the tracks; and means for electrically charging the liquid and bus bar.

51. In combination, a tank having liquid therein; conveyer means; a basket drawn through the liquid by said conveyer means and having a shaft of conducting material above the level of said liquid; means for rotating the basket when the conveyer means moves the basket through the liquid; and means for electrically charging the liquid and shaft while the basket travels through the liquid.

52. In combination, a tank having liquid therein; conveyer means movable along the tank; a bus bar at the side of the tank; toothed tracks submerged in said liquid; a cylindrical basket having toothed peripheries as large in diameter as the basket and engaged with said tracks respectively and having a shaft of conducting material above the level of said liquid and engageable with said bus bar; said basket being

secured to said conveyer means, whereby when the conveyer means moves the basket on the track, the basket rotates and the shaft contacts with the bus bar; and means for electrically charging the liquid and bus bar.

Signed at New York in the county of New York and State of New York this 18th day of October, A. D. 1928.

KURT T. POTTHOFF.