

April 8, 1952

J. V. DAVIS
WORK-IMMERSION MACHINE WITH VERTICALLY
AND Laterally MOVABLE RAIL SECTION

2,591,682

Filed March 8, 1950

8 Sheets-Sheet 1

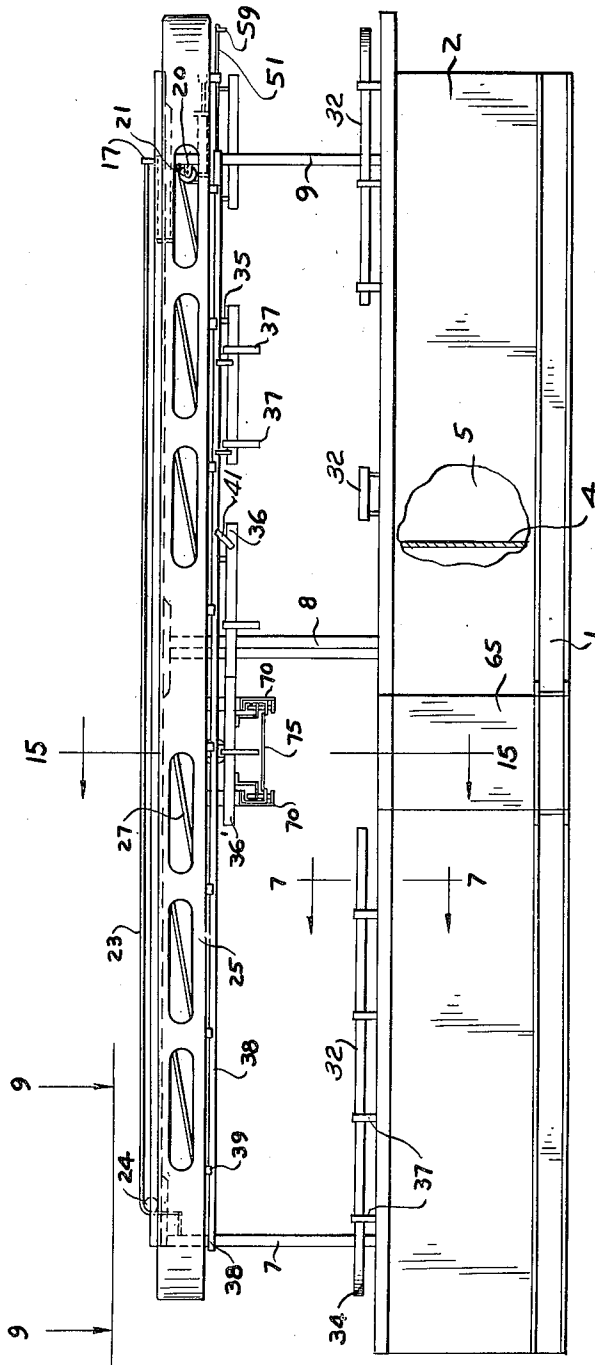


FIG. 1

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FIG. 2.

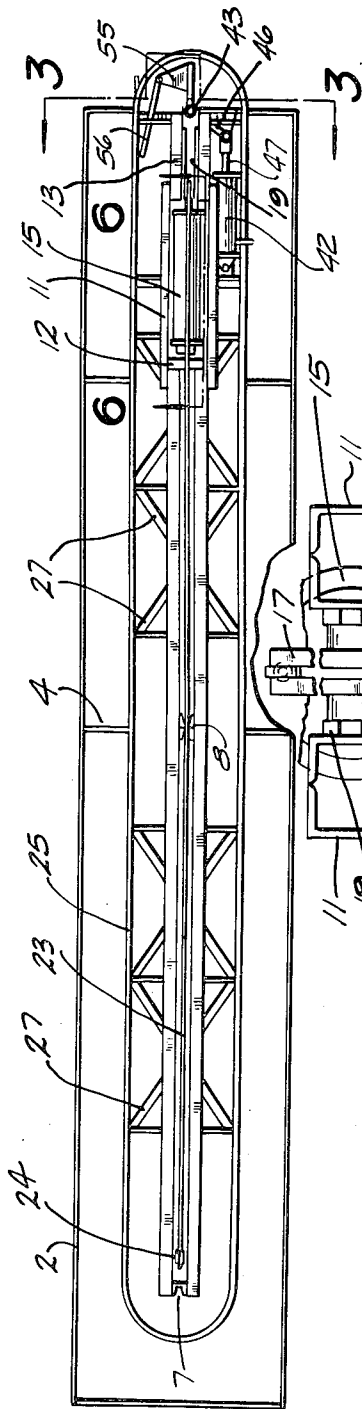
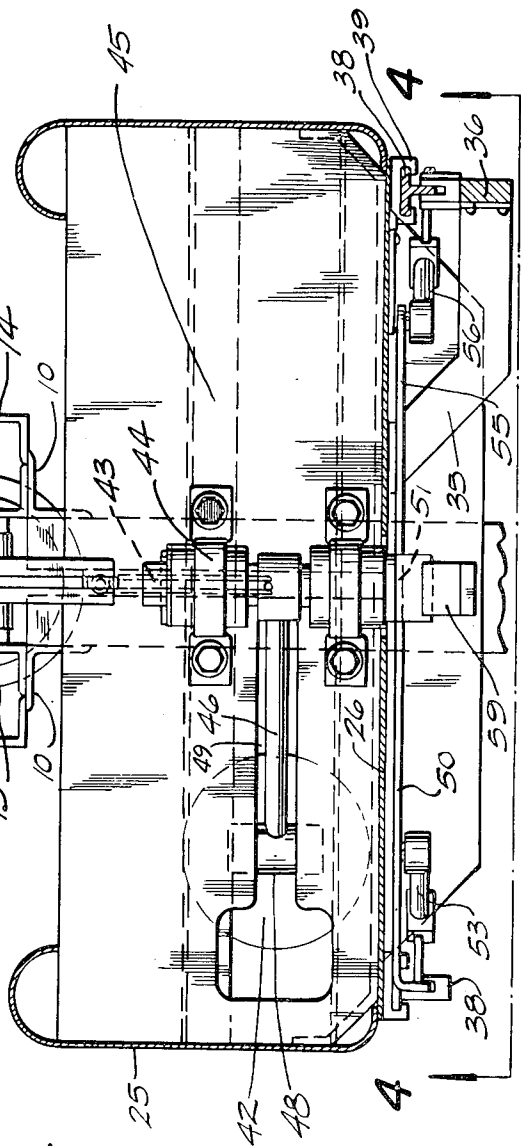


FIG. 3.



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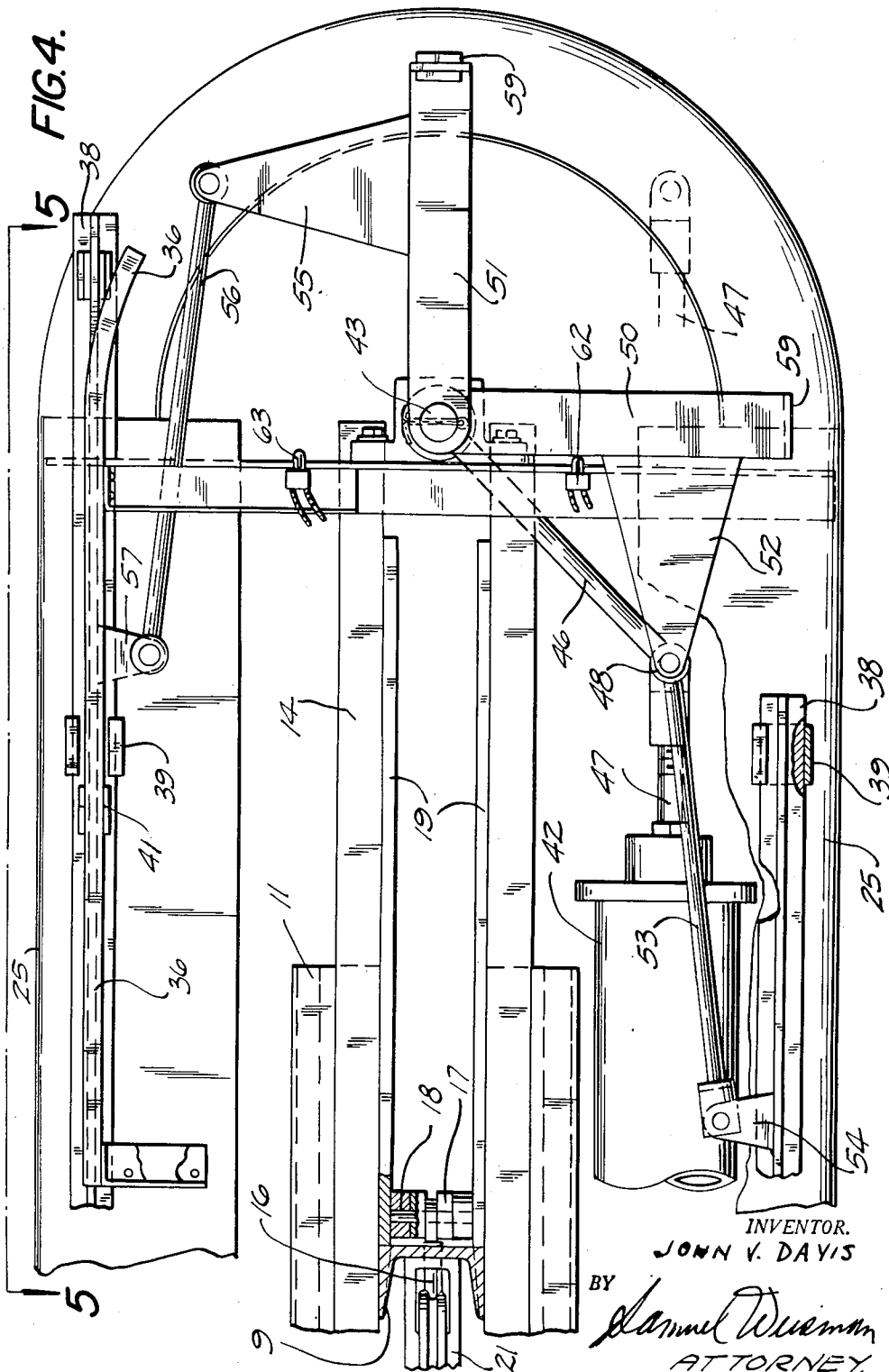
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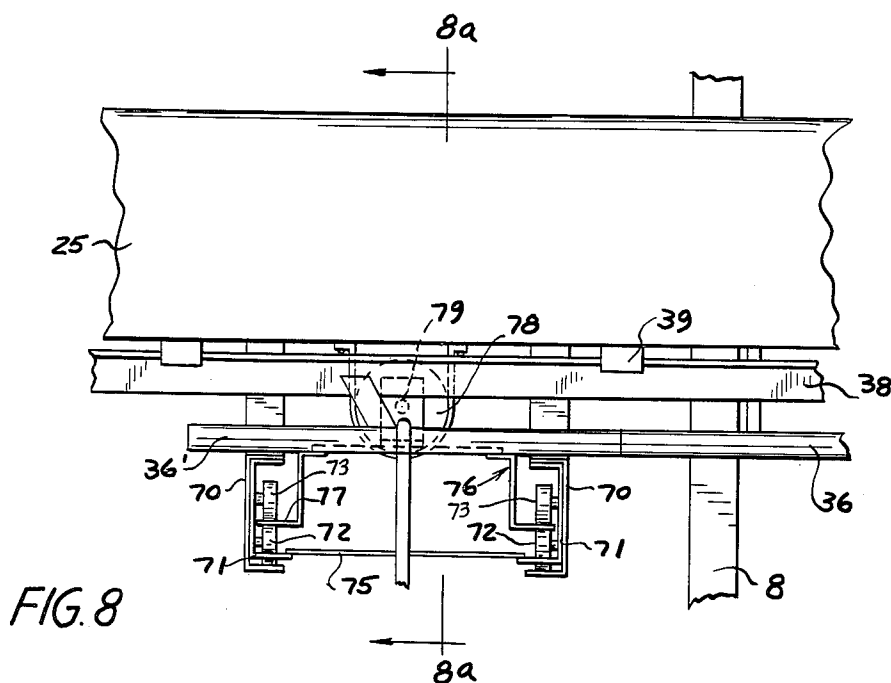
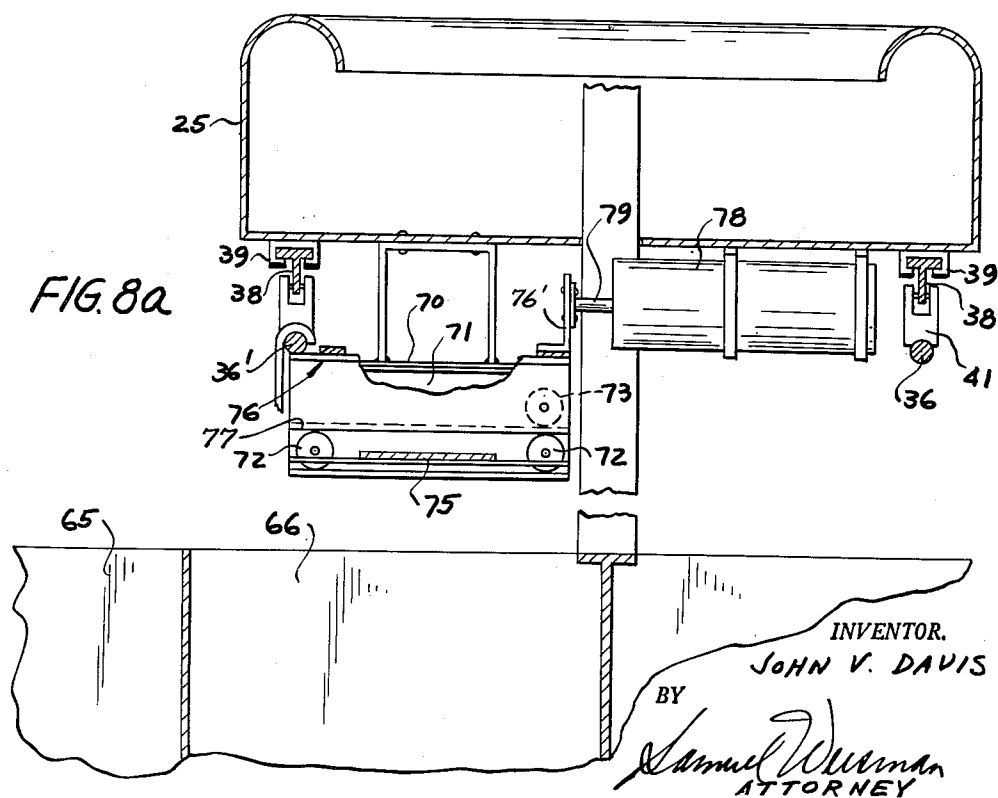
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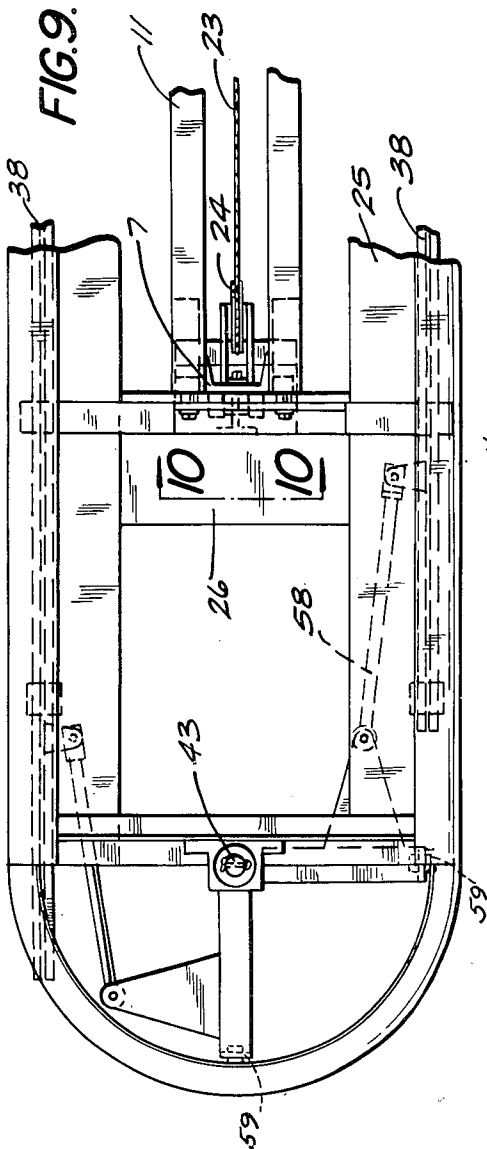
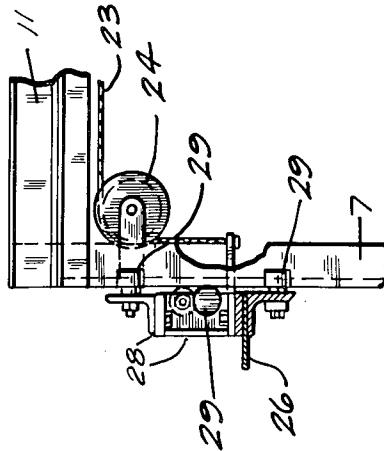
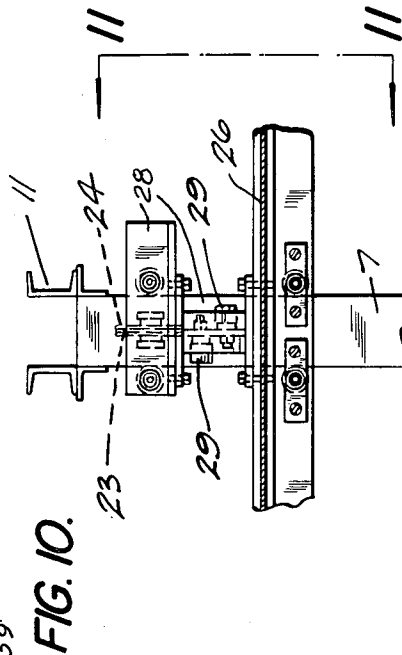


FIG. 11.



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FIG. 12.

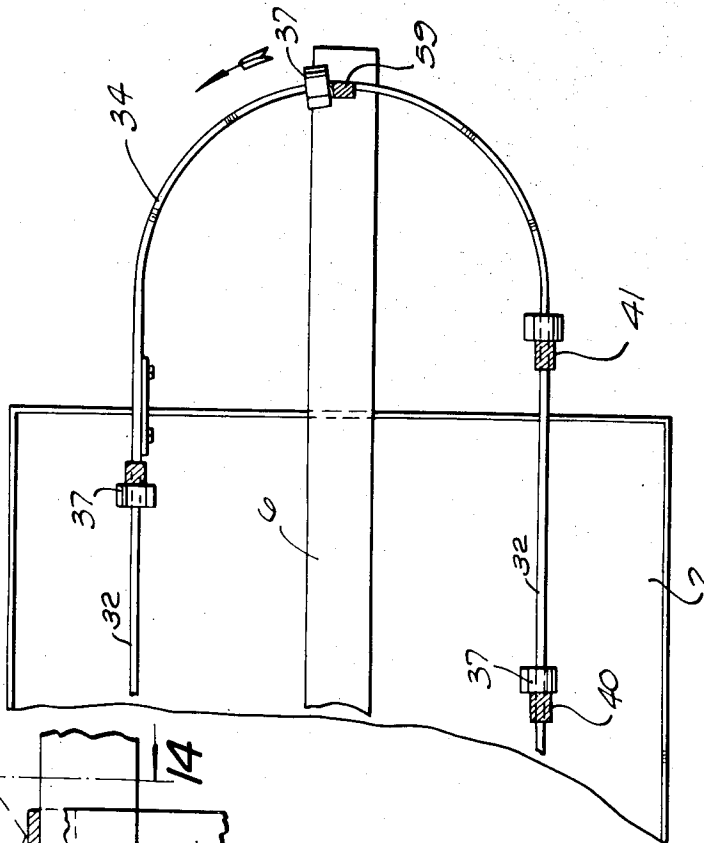


FIG. 13.

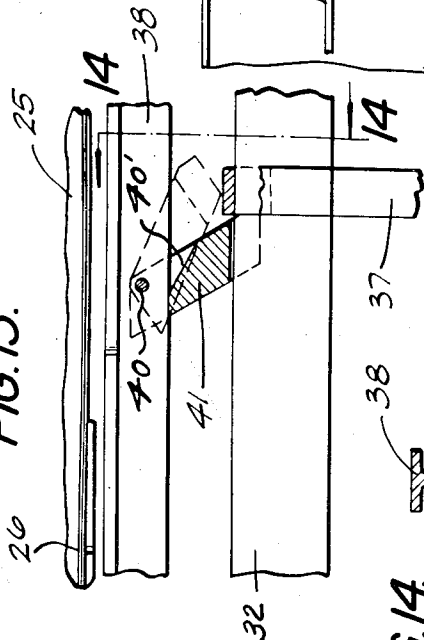
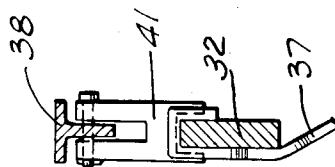


FIG. 14.



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UNITED STATES PATENT OFFICE

2,591,682

WORK-IMMERSION MACHINE WITH VERTICALLY AND laterally MOVABLE RAIL SECTION

John V. Davis, Detroit, Mich., assignor to The Udyllite Corporation, Detroit, Mich., a corporation of Delaware

Application March 8, 1950, Serial No. 148,436

6 Claims. (Cl. 134-77)

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The present invention pertains to a novel work-immersion machine and particularly to such a machine for use in the plating industry, although other uses will readily be suggested. The machine is of the general type shown in my United States Patent No. 2,479,322 of August 16, 1949, to the extent that the work is moved along aligned rail sections and one or more of these sections are lifted vertically at times for transfer of the work from one tank to the next.

The principal object is to provide an alternative tank in a series of tanks or receptacles in such a machine, whereby the work may be dipped in the alternative tank to the exclusion of one of the usual tanks which, in a sense, becomes eliminated. For example, it may be desired to substitute brass plating solution for chromic acid in the usual series, for some of the work without emptying the chromic acid solution.

The substituted solution is contained in an auxiliary tank positioned laterally of the tank containing the solution to be eliminated, in this case the chromic acid. One of the rail sections is adapted to rise over the chromic acid tank, as in the aforementioned patent, and to be moved laterally to a position over the alternative tank when such operation is desired. The rail section is then lowered to dip the work into the alternative tank.

The laterally slidable rail section is suitably mounted on a carriage supported by the rail elevating structure or chassis. The carriage with its rail section is projected and retracted by an independent timed and controlled means such as a hydraulic cylinder with an automatically operated valve system.

The invention is fully disclosed by way of example in the following description and in the accompanying drawings in which:

Figure 1 is an elevation of the device with certain rail sections in elevated position;

Figure 2 is a top plan view;

Figure 3 is a section on the line 3-3 of Figure 2;

Figure 4 is a bottom plan view on the line 4-4 of Figure 3;

Figure 5 is a detailed side elevation on the line 5-5 of Figure 4;

Figure 6 is a section on the line 6-6 of Figure 2;

Figure 7 is a section on the line 7-7 of Figure 1;

Figure 8 is a detail side elevation;

Figure 8a is a section on the line 8a-8a of Figure 8;

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Figure 9 is a detail plan view on the line 9-9 of Figure 1;

Figure 10 is a section on the line 10-10 of Figure 9;

Figure 11 is a section on the line 11-11 of Figure 10;

Figure 12 is a section on the line 12-12 of Figure 8;

Figure 13 is a detail section in a plane parallel to that of Figure 5;

Figure 14 is a section on the line 14-14 of Figure 13;

Figure 15 is a detail elevation similar to Figure 8, on the line 15-15 of Figure 1 showing the laterally movable rail section projected, and

Figure 16 is a plan view on the line 16-16 of Figure 15.

Reference to these views will now be made by use of like characters which are employed to designate corresponding parts throughout.

The machine is built on a base 1 on which is erected an elongated tank structure 2 consisting preferably of metal plate. The structure is divided by a longitudinal partition 3 and further by a number of suitably spaced partitions 4 forming two parallel rows of compartments 5. Upon the partition 3 is secured a longitudinal I-beam 6 to support a superstructure as will presently be described. At the ends and at the center of the beam 6 are mounted vertical columns 7, 8 and 9 as shown in Figure 1. To the upper ends of the columns are secured angle-irons 10 on which are mounted horizontal connecting channels 11 which brace the columns for the load to be carried by them. Actually there are two pairs of channels, the members of each pair being joined face to face to form a box-beam. The beams 11 terminate somewhat short of the end column 9 and have their ends joined by a bracket 12 for a purpose that will presently be described. The members 11 are then extended somewhat beyond the column 9 by means 13 secured to the outer lateral surfaces thereof, and the means 13 are further extended horizontally in the same direction by channels 14 secured to their inner surfaces and also to the column 9. The members 14 are substantially aligned with the beams 11, and a wider spacing is formed between the members 13.

The bracket 12 serves for the pivotal attachment of the closed ends of a fluid cylinder 15 that extends approximately to the column 9. The piston rod 16 extending through this end of the cylinder carries a crosshead 17 pivotally attached thereto by a horizontal pin 18. The

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ends of the latter ride between spaced horizontal guide rails 19 fastened on the mutually facing surfaces of the channels 14. A bracket 20 is mounted on the upper end of the column 9 and carries a sheave 21. Cables 22 and 23 are fastened to the ends of the crosshead 17. The cable 22 passes over the sheave 21, and the cable 23 is passed over a pulley 24 mounted at the opposite end of the beam structure 11.

The cables 22 and 23 suspend a vertically movable structure comprising an enclosing wall 25 substantially as long as the series of tanks and about as wide. The wall 25 carries a floor consisting of open plates 26 and is braced by diagonal cross-bars 27. Roller frames 28 are secured to the floor and carry rollers 29 riding on three surfaces of the several vertical columns to guide the chassis 25, 26 in its up and down movement.

Transverse supporting bars 30 are secured across the fixed beam 6 and have longitudinal plates 31 secured across their ends for supporting fixed and spaced rail sections 32, with insulation 33 inserted between the parts 31 and 32. The sections 32 are aligned along both rows of compartments, and included in the fixed rail construction is a semi-circular connecting piece 34 at each end of the apparatus. The tank structure is open at one end to constitute a loading and unloading station. One of the compartments at this end may be open and may constitute a drying station on the outcoming side of the curved section. Brackets 35 on the bottom of the chassis 25, 26 carry movable rail sections 36 adapted to enter and fill the spaces between the fixed sections 32 to form a continuous work carrying rail when the chassis is lowered. Current is applied to the rail in any manner well known in the art, and work carriers 37 are suspended from the several rail sections in any approved manner.

A pair of longitudinal shoes 39 are carried by the bottom of the chassis and support a pair of pusher bars 38 of T-section over the two aligned series of rail sections at opposite sides of the partition 3. Pushers 41 straddle the webs of the bars 38 and are pivotally suspended therefrom by pins 40. The pushers engage the carriers 37 to advance them on the rails. The bottom of the slot in the upper portion of each pusher has a portion thereof sloped downward at 40' in the direction of work movement. In this movement the unsloped portion bears against the bottom of the bar 38 as a stop. In the retracting movement of the pusher bar, presently to be described, the slope 40' permits the pusher to swing upward in passing over the carrier 37 which it is to push on the next forward stroke.

The pusher bars are actuated from a drive or pusher cylinder 42 mounted on the chassis 25, 26 adjacent to and longitudinally of one of the bars. At each end of the chassis is mounted a vertical shaft 43 concentric with the adjacent curved rail section and passing through the bottom of the chassis. Each shaft is held in suitable bearings 44 attached to partitions 45 carried by the chassis. The shaft 43 nearer the cylinder 42 has a link 46 pivotally connected to the exposed end of the piston rod 47 by a suitable swivel 48. The partition 45 carrying the bearings 44 is formed with an opening 49 to permit passage of the link 46 and the piston rod 47 therethrough. In other respects the assembly at each end of the rail is similar, and only one assembly need be described in detail.

Beneath the bottom of the chassis, the shaft 43

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carries a pair of fixed arms 50, 51 at a right angle to each other. From the arm 50 a lug 52 extends toward the cylinder 42 and is joined by a link 53 to an ear 54 on the adjacent pusher bar, the link having its ends swiveled to the parts 52 and 54. The forward stroke of the piston rod 47 is such as to swing the link 46 and turn the shaft through an angle of 90 degrees, swinging the arm 50 and pulling the adjacent pusher bar 38 by means of the parts 52, 53.

A lug 55 extending from the arm 51 is joined by a link 56 to an ear 57 extending from the other pusher bar 38, so that the aforementioned motion of the shaft 43 slides the last named bar 38 simultaneously in the direction opposite to that of the first named bar. At the other end of the apparatus, the bar 38 nearer the cylinder 42 is connected to the arm 50 by a link 58. The free ends of the arms 50, 51 carry pushers 59 that propel the work 90 degrees on the end sections 34 on each 90 degree movement of the shafts 43. The closed end of the cylinder 42 is pivotally mounted to accommodate the arcuate movement of the swivel 48.

The superstructure carries limit switches 60 and 61 at opposite sides of the crosshead 17 and engageable thereby for timed control of the lifting cylinder 15 and the drive cylinder 42 in proper sequence. For the same purpose the partition 45 carries limit switches 62 and 63 engageable by the arms 50 and 51 at the ends of their respective movements.

One of the vertically movable rail sections, indicated by the numeral 36', is mounted to be moved laterally out of the usual rail system to a position over an alternative tank 65. For example, the section 36' normally lies over a particular tank 66 in the usual series of tanks or compartments, and the alternative tank 65 is laterally opposite the tank 66. The lateral movement of the section 36' is utilized when, in some operations, it is desired to dip the work in the tank 65 rather than in the tank 66 which contains a different solution. As an illustrative case, the tank 66 may contain chromic acid solution while the tank 65 may contain a brass plating solution. To carry the illustration further, it may be desired to plate a certain number of work pieces with brass rather than with chromium at this phase of the operation, and yet the number of such pieces may not be sufficient to warrant emptying the tank 66 of chromic acid solution and filling it with brass plating solution.

The mechanism for guiding the rail section 36' laterally may take any desired suitable form. The example here illustrated includes a pair of fixed channel members 70 carried by the chassis 25 and facing each other. In each member 70 is slidably mounted another channel 71 with rollers 72 mounted therein and projecting through the lower flange of the channel 71 to ride on the lower flange of the channel 70. Over the rear roller 72 is a similar roller 73 spaced slightly therefrom for a purpose that will presently be described. The opposed channels 71 are joined by one or more bars 75 to form an extension slide or carriage.

Another carriage structure 76, which carries the rail section 36', has a pair of lateral flanges 77 that ride on the rollers 72 and extend beneath the rollers 73. In line with the path of the carriage 76 a hydraulic cylinder 78 is suitably supported by the chassis 25. The piston rod 79 thereof is attached to the carriage 76 by a bracket 76' and carries a stop member 80 inside

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the cylinder for engaging the forward end of the cylinder to limit the outward movement of the carriage. It will be understood that suitable timed controls for the actuation of the piston rod in both directions are provided.

As shown in Figure 16, the rail section 36' may be longer than the alternative tank 65 to permit transfer of work off and on. The rail section could be of the same length as the tank 65, if sufficient for the stated purpose, but a shorter length is not recommended. After the section 36' has been projected laterally as described, the entire chassis is lowered and with it the section 36', thereby dipping the work into the tank 65.

At this time there is no work pusher in operative relation with the section 36'. The pushers may be operated on the remainder of the work while the section 36' is projected and may be adjusted in such a manner as to move no work into the gap left by the section 36'. This adjustment may be made in the spacing of the pushers 40 or by rendering them temporarily inoperative on the approach side of the gap. A timed cam mechanism may be provided for this purpose.

When the work on the section 36' has remained in the tank 65 the desired length of time, the chassis is raised and the carriage 76 is retracted by operation of the cylinder 78. While the continuous rail system is in the elevated position, the treated work is transferred off the section 36' and other work is transferred to it. The cycle previously described is now repeated.

What I claim is:

1. In a work-immersion apparatus, a series of bath receptacles, an aligned series of spaced rail sections fixedly supported over said receptacles, a chassis movably mounted over said receptacles, timer-controlled means for moving said chassis up and down over said receptacles, a series of spaced rail sections carried by said chassis and adapted to fit in the spaces between the first named sections, in the lower position of the chassis, a laterally slidable carriage carried by said chassis, one of the second named spaced rail sections being mounted on said carriage, timer-controlled means for projecting and retracting said carriage while in the raised position, an alternative receptacle laterally opposite one of the first named receptacles, and positioned to receive work suspended from the last named rail section, and work-advancing means carried by said chassis for moving work on said rail sections.

2. In a work-immersion apparatus, a series of bath receptacles, an aligned series of spaced rail sections fixedly supported over said receptacles, a chassis movably mounted over said receptacles, timer-controlled means for moving said chassis up and down over said receptacles, a series of spaced rail sections carried by said chassis and adapted to fit in the spaces between the first named sections, in the lower position of the chassis, a laterally slidable carriage carried by said chassis, one of the second named spaced rail sections being mounted on said carriage, a timer-controlled cylinder and piston rod for projecting and retracting said carriage while in the raised position, an alternative receptacle laterally opposite one of the first named receptacles and positioned to receive work suspended from the last named rail section, and work-advancing means carried by said chassis for moving work on said rail sections.

3. In a work-immersion apparatus, a series of bath receptacles, an aligned series of spaced rail sections fixedly supported over said receptacles,

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a chassis movably mounted over said receptacles, timer-controlled means for moving said chassis up and down over said receptacles, a series of spaced rail sections carried by said chassis and adapted to fit in the spaces between the first named sections, in the lower position of the chassis, a laterally slidable carriage carried by said chassis, one of the second named spaced rail sections being mounted on said carriage, timer-controlled means for projecting and retracting said carriage while in the raised position, an alternative receptacle laterally opposite one of the first named receptacles, and positioned to receive work suspended from the last named rail section, slidably mounted pusher bars carried by said chassis, pushers carried by said bars and adapted to engage work on the several rail sections, and timer-controlled means for sliding said bars alternately in opposite directions.

4. In a work-immersion apparatus, a series of bath receptacles, an aligned series of spaced rail sections fixedly supported over said receptacles, a chassis movably mounted over said receptacles, timer-controlled means for moving said chassis up and down over said receptacles, a series of spaced rail sections carried by said chassis and adapted to fit in the spaces between the first named sections, in the lower position of the chassis, a laterally slidable carriage carried by said chassis, one of the second named spaced rail sections being mounted on said carriage, a timer-controlled cylinder and piston rod for projecting and retracting said carriage while in the raised position, an alternative receptacle laterally opposite one of the first named receptacles and positioned to receive work suspended from the last named rail section, slidably mounted pusher bars carried by said chassis, pushers carried by said bars and adapted to engage work on the several rail sections, and timer-controlled means for sliding said bars alternately in opposite directions.

5. In a work-immersion apparatus, a series of receptacles, an aligned series of spaced rail sections fixedly supported over said receptacles, a chassis movably mounted over said receptacles, timer-controlled means for moving said chassis up and down over said receptacles, a series of spaced rail sections carried by said chassis and adapted to fit in the spaces between the first named sections, in the lower position of the chassis, a laterally slidable carriage carried by said chassis, one of the second named spaced rail sections being mounted on said carriage, timer-controlled means for projecting and retracting said carriage while in the raised position, an alternative receptacle laterally opposite one of the first named receptacles, and positioned to receive work suspended from the last named rail section, slidably mounted pusher bars carried by said chassis, pushers carried by said bars and adapted to engage work on the several rail sections, and timer-controlled means for sliding said bars alternately in opposite directions, certain of said pushers being pivotally mounted to swing over obstructions while moving in the non-pushing direction.

6. In a work-immersion apparatus, a series of bath receptacles, an aligned series of spaced rail sections fixedly supported over said receptacles, a chassis movably mounted over said receptacles, timer-controlled means for moving said chassis up and down over said receptacles, a series of spaced rail sections carried by said chassis and adapted to fit in the spaces between the first named sections, in the lower position of the

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chassis, a laterally slidable carriage carried by said chassis, one of the second named spaced rail sections being mounted on said carriage, a timer-controlled cylinder and piston rod for projecting and retracting said carriage while in the raised position, an alternative receptacle laterally opposite one of the first named receptacles and positioned to receive work suspended from the last named rail section, slidably mounted pusher bars carried by said chassis, pushers carried by said bars and adapted to engage work on the several rail sections, and timer-controlled means for sliding said bars alternately in opposite directions, certain of said pushers being piv-

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otally mounted to swing over obstructions while moving in the non-pushing direction.

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REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
1,478,396	Pownall	Dec. 25, 1923
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