Dec. 12, 1933. H. C. WILCOX ET AL 1,939,426

MECHANICAL PICKLER

Filed July 17, 1931 4 Sheets-Sheet 1

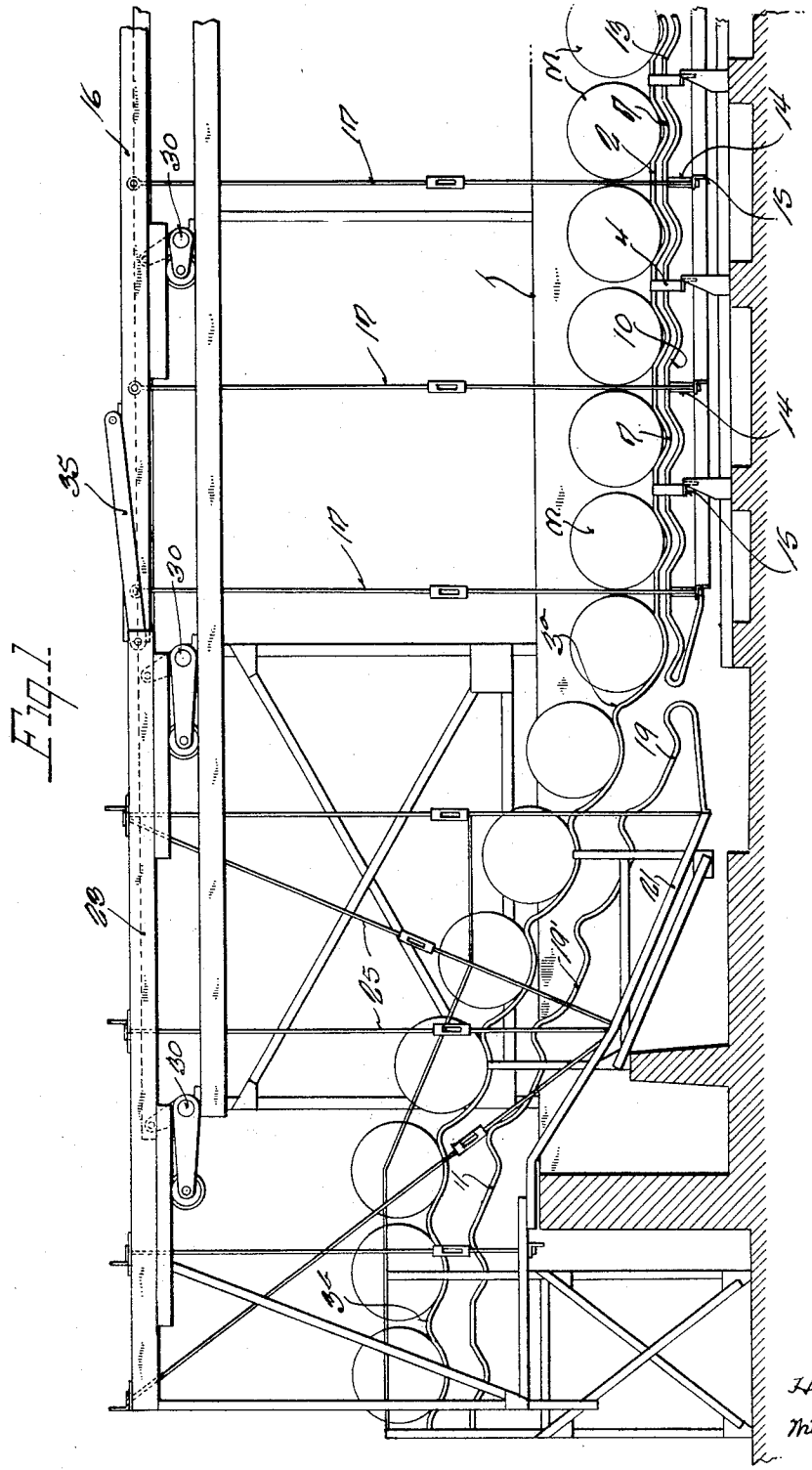


Fig. 1

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MECHANICAL PICKLER

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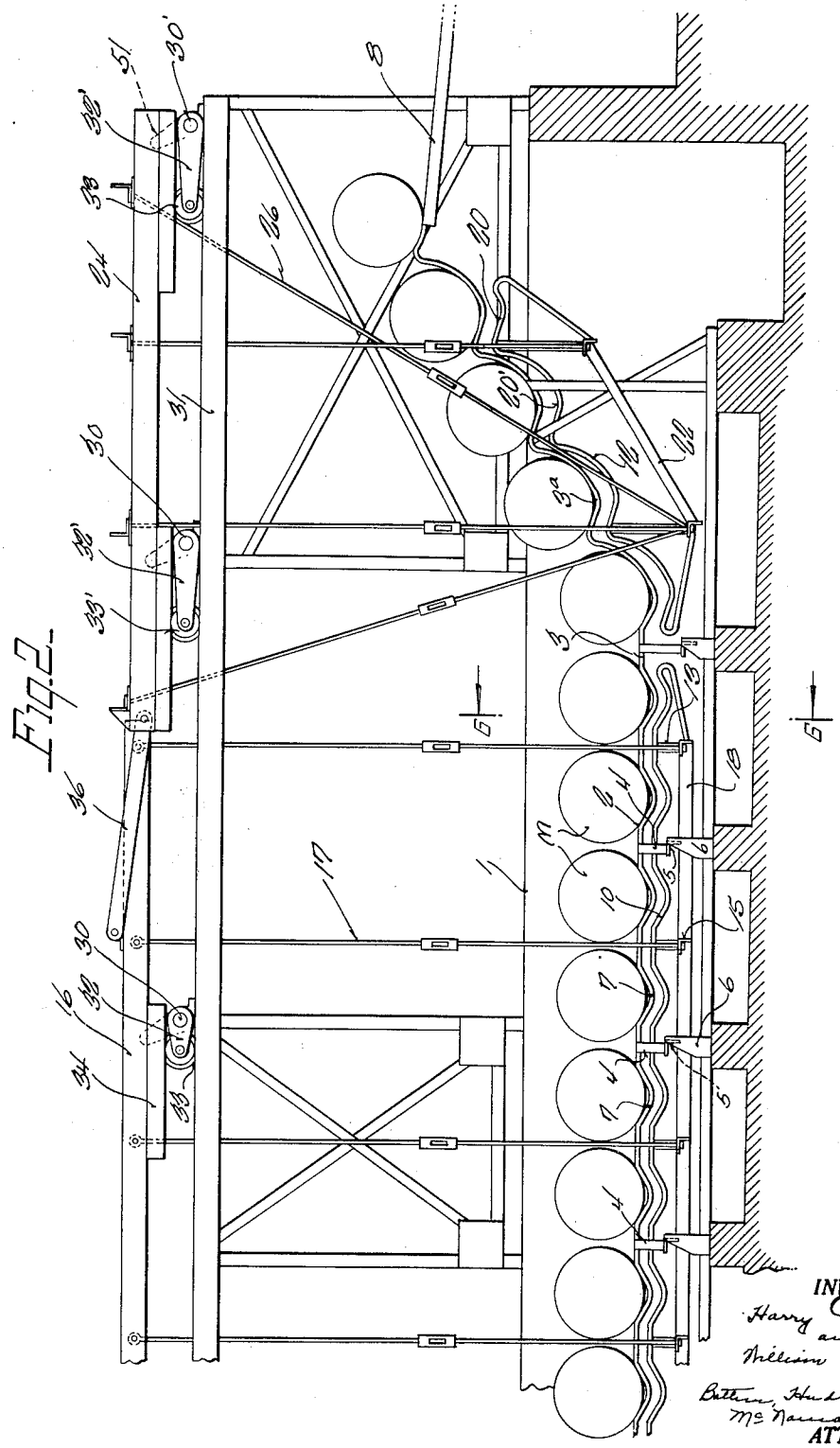


Fig. 2.

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MECHANICAL PICKLER

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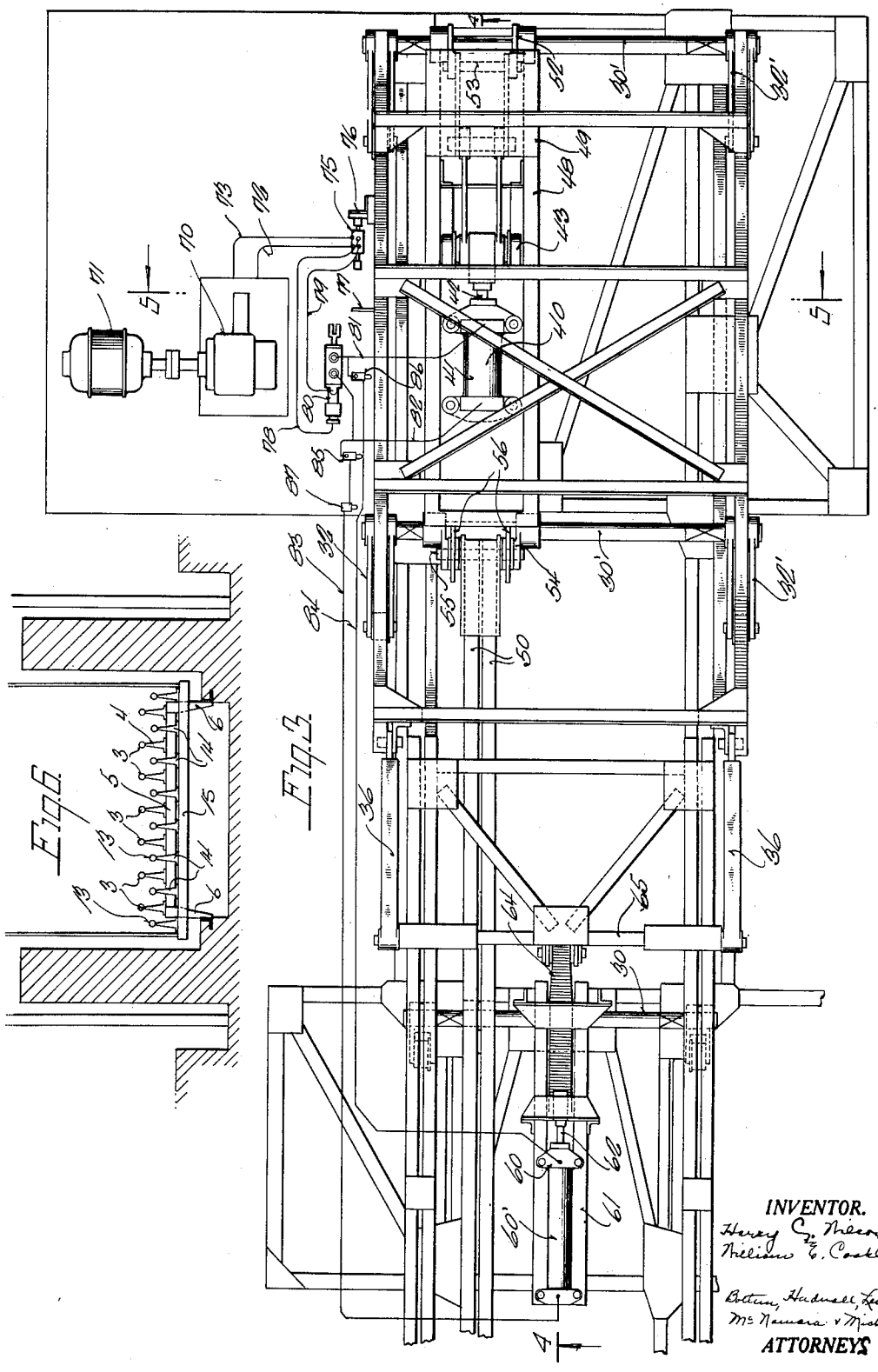


Fig. 6

Fig. 5

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Dec. 12, 1933. H. C. WILCOX ET AL 1,939,426

MECHANICAL PICKLER

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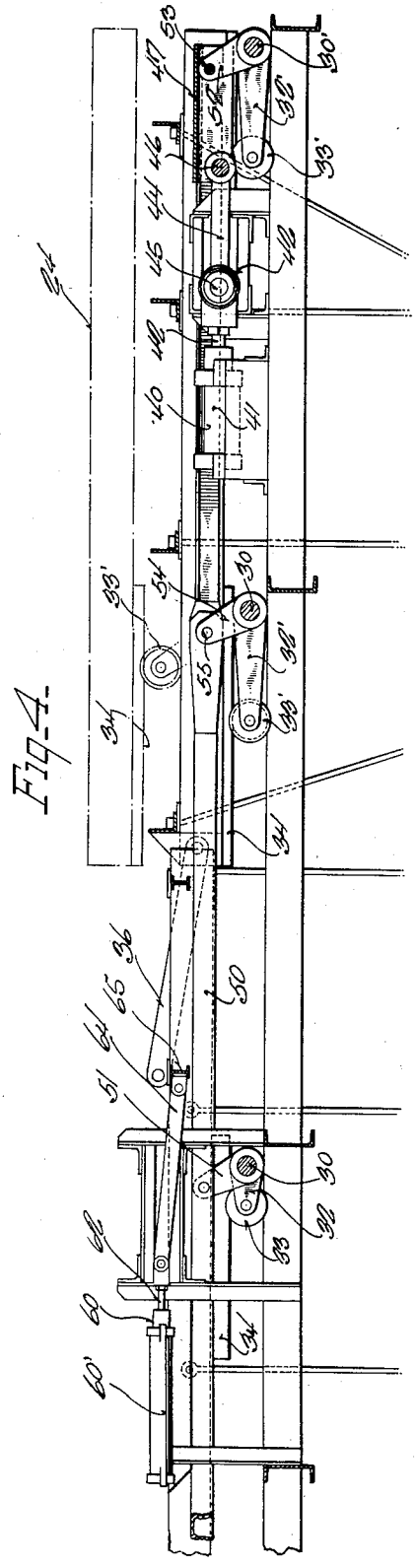


Fig. 4

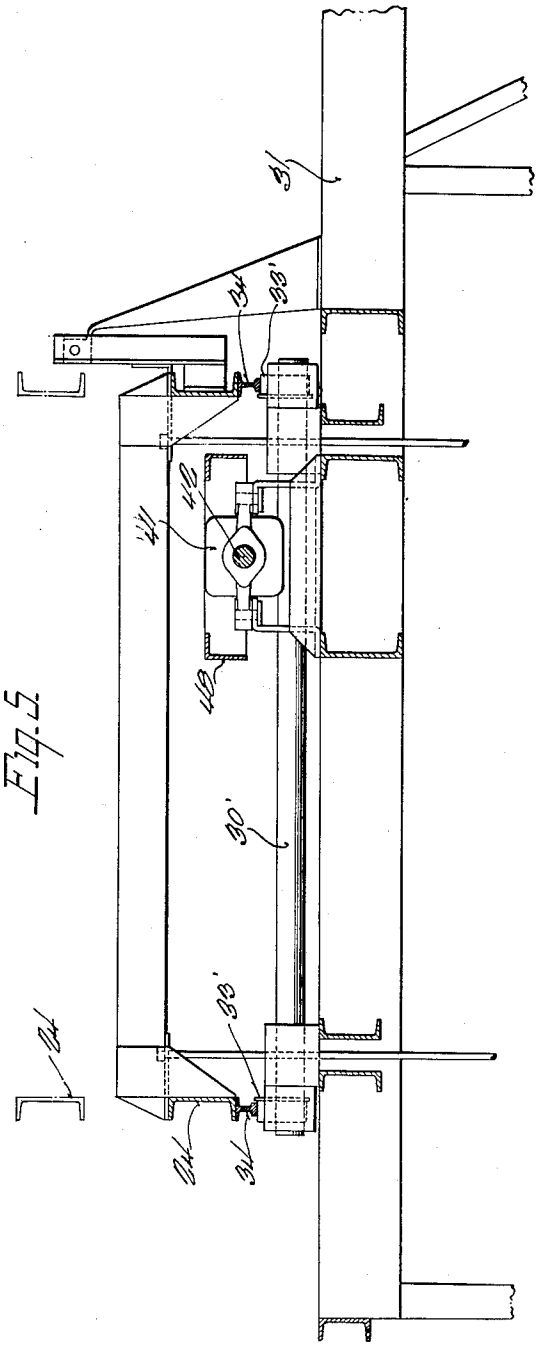


Fig. 5

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UNITED STATES PATENT OFFICE

1,939,426

MECHANICAL PICKLER

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Application July 17, 1931. Serial No. 551,330

6 Claims. (Cl. 266—7)

This invention relates to an apparatus for pickling metallic articles.

One of the principal objects of the invention is to provide a simple, durable and reliable means for mechanically carrying the articles through the pickling solution and for so moving the articles during their immersion in the solution and so regulating the time for their immersion as to insure proper pickling. The apparatus is automatic in its action and is so constituted that such moving parts as have contact with the acid pickling solution are resistant to corrosion and are not subjected to wearing contact.

Other objects and advantages reside in certain novel features of the construction, arrangement and combination of parts which will be hereinafter more fully described and particularly pointed out in the appended claims, reference being had to the accompanying drawings, forming a part of this specification, and in which:

Figure 1 is a fragmentary view partly in side elevation and partly in vertical section showing the apparatus as constituted at the inlet end to the pickling vat or tank;

Figure 2 is a similar view of the apparatus at the discharge end of the pickling vat;

Figure 3 is a fragmentary view in top plan of the apparatus at the discharge end of the pickling vat and showing the motors and driving connections for actuating the moving parts of the apparatus;

Figure 4 is a view in vertical section taken on line 4—4 of Figure 3, and parts being shown in elevation for the sake of simplicity in illustration;

Figure 5 is a view in transverse vertical section taken on line 5—5 of Figure 3 with parts shown in elevation for the sake of simplicity in illustration; and

Figure 6 is a fragmentary sectional view taken on line 6—6 of Figure 2.

Referring to the drawings, it will be seen that the present invention proposes the use of an elongated pickling vat or tank designated at 1. Within the tank 1, a fixed or stationary rack, designated generally at 2, is provided. The rack 2 is constituted of a plurality of longitudinally extending and transversely spaced rods 3 which are supported at spaced points by standards or brackets 4 secured to cross members 5, the latter being supported by brackets 6 which are fastened to and upstand from the bottom of the tank (see Figure 6). At spaced points the rods 3 have depressed portions or seats 7 adapted to receive and releasably hold or support the metal articles designated at M. The main portion of the rack 2 is located near the bottom of the tank so as to support the articles M submerged in the pickling solution. At the inlet end of the tank shown in Figure 1 the rods 3 are provided with upwardly extending inclined portions 3^a and with an elevated horizontally disposed receiving portion 3^b. Similarly, at the discharge end of the tank shown in Figure 2, each rod 3 has an inclined portion 3^d which leads up to a discharge deck or chute 8. It will be understood from the foregoing that the rods 3 and all portions thereof are parallel and that the pockets or depressions 7 are transversely alined.

Coacting with the fixed rack 2 is a movable rack having a main section designated generally at 10 and end sections designated generally at 11 and 12. The main section 10 of the movable rack is also constituted of longitudinally extending and transversely spaced rods 13, the rods 13 being supported by standards 14 on transverse bars 15. The bars 15 are longitudinally spaced from the bars 5 of the fixed rack and the rods 13 are transversely spaced between the rods 3 of the fixed rack. Seats or depressions 13' corresponding to the seats 7 are provided in the rods 13 of the movable rack. The main section 10 of the movable rack is suspended from an overhead frame section 16 by means of hanger rods 17 secured at their upper ends to the said frame and at their lower ends to the cross bars 15 of the movable rack. The cross bars of the movable rack are connected by longitudinally extending angle arms or structural members 18.

The end sections 11 and 12 are similarly constructed in that they are constituted of parallel transversely spaced rods designated at 19 and 20, respectively, the rods 19 and 20 being supported on suitable framing structure 21 and 22 constituted of angle irons and supported respectively from overhead frame sections 23 and 24 by means of hanger rods 25 and 26. Seats or depressions 19' and 20' are provided in rods 19 and 20 of the end sections of the movable rack.

While it is not essential that the movable rack and the overhead frame be made up of main sections and end sections this is preferable in order that the end sections may be raised and lowered through a greater distance during each cycle of operation whereby to speed up the travel of the articles down into the pickling solution at the inlet end of the tank and their discharge from the apparatus at the discharge end.

To support the overhead frame section 16 for back and forth movement and to facilitate rais-

ing and lowering thereof, a plurality of transversely extending rock shafts 30 are journaled in bearings provided therefor along a stationary frame 31. The stationary frame 31 underlies the movable or overhead frame and is built up from the walls of the tank or vat. At each end of each rock shaft 30, a rocker arm 32 is keyed thereto and the outer end of each rocker arm is bifurcated and pivotally connected to a flanged roller 33. The rollers 33 are engaged with rails 34 securely fastened to the underside of the side members of the movable frame.

The end sections 23 and 24 of the movable frame are similarly supported and raised and lowered, rock shafts 30', rocker arms designated at 32' and rollers designated at 33' being provided for this purpose. The only difference in the structure is in the length of the rocker arms 32' which are made somewhat longer to raise and lower the end sections to a greater degree than the main section. The rock shafts 30' are also slightly longer to take care of the slightly increased transverse extent of the end frame sections 23 and 24.

The main section of the movable frame and the end sections are constrained to move together horizontally or longitudinally while being left free to move relative to each vertically by means of link connections 35 and 36, these link connections being of similar construction and the link connection 35 having its links pivotally connected to the inlet end section 23 and the adjacent end of the main section while the link connections 36 are provided between the discharge end section 24 and the adjacent end of the main section 16.

All of the rock shafts 30 and 30' are rocked first in one direction and then in the other direction from a single motor designated at 40. In the embodiment illustrated, the motor 40 is a hydraulic motor and has its cylinder 41 securely bolted to supporting structure provided therefor on the stationary frame 31. The piston rod 42 of the motor projects exteriorly of the cylinder and is connected to a crosshead or roller guide 43. Links 44 are pivotally connected at one end to the axis of the roller guide or cross head 43 and are pivotally connected at their other ends as illustrated at 46 to the depending flanges of angle irons 47. The angle irons 47 are fastened to a longitudinally shiftable beam structure 48 which extends the full length of the apparatus. This beam structure is transversely enlarged as at 49 at the discharge end in order to straddle motor 40, but beyond the motor its structure is simplified and it is constituted simply of a pair of elongated angle irons 50 suitably connected together and pivotally connected at points along the machine to crank arms 51 provided on each of the rock shafts 30 underlying the angle irons 50. In this way all of the rock shafts except the two at the discharge end of the machine are connected to the portion of the actuating beam constituted by the angle irons 50. These remaining two shafts 30' are also connected to the actuating beam, the rearward shaft 30' having a pair of crank arms 52 pivotally connected as at 53 with the angle irons 47 and the forward rock shaft 30' of the two having crank arms 54 pivotally interfitted with the pin 55 which also serves to connect the narrowed portion 50 of the beam with attaching brackets 56 provided on the widened portion 49 of the beam.

With this construction, when fluid under pressure is admitted to the left hand end of the cylinder as viewed in Figures 3 and 4 and the piston rod 42 is consequently moved to the right as viewed in Figure 4 the beam 48 will be shifted to the right and consequently the crank arms 51, 52 and 54 will all be rotated in a clockwise direction as shown in Figures 1 to 4 of the drawings whereby the rocker arms 32 and 32' will be similarly rotated and the rollers 33 thereof in swinging upward and riding along the rails 34 will lift the main section and the end sections of the overhead frame and acting through the hanger rods 17, 25 and 26 and correspondingly elevate the sections of the movable rack.

When the sections of the movable rack are elevated in this manner, they pick up the metallic articles from the fixed rack and carry them up above the fixed rack for a short distance. The next phase of the operation is the movement of the movable frame and consequently of the movable rack to the right as viewed in Figures 1 and 2 whereby to advance the articles along the tank from the inlet to the discharge end. Preferably, the advance is equal to the distance between the depressions or seats 7 of the rods of the fixed rack. This advancing movement occurs while the movable rack and movable frame remain elevated and is effected from a motor such as hydraulic motor indicated at 60, the cylinder 60' of which is securely fastened to supporting structure 61 provided therefor on the fixed frame 31 and the piston rod 62 of which connects by a link 64 with a braced cross member 65 incorporated in the main section of the movable frame. After the advancing movement is completed the movable overhead frame and consequently the movable rack are lowered to deposit the advanced articles in the seats of the fixed rack. The movable rack is lowered slightly beyond the point where it transfers the articles to the fixed rack and in its lowermost position it is moved rearwardly or from the discharge toward the intake end of the tank so as to be repositioned for the next cycle. This lowering of the movable frame and rack is effected by admitting fluid under pressure to the right hand end of the cylinder 41 as viewed in Figure 3 which pulls the beam 48 from right to left as viewed in Figures 1, 2 and 3 thereby swinging the rocker arms from an elevated to a lowered position as will be understood from the full and dotted line showing of Figure 4.

The motors 40 and 60 are supplied with fluid under pressure from a pump 70 driven by an electric motor 71 and having supply and return lines designated at 72 and 73 connected to a four-way double stem pilot valve 75 actuated from trips 76 and 77 on the movable frame and connected by pipe lines 78 and 79 with a four-way hydraulic mechanical valve 80. The valve 80 is connected by pipe lines 81 and 82 with the opposite ends of the cylinder 41 and from these lines 81 and 82 pipe lines 83 and 84 lead to the opposite ends of the cylinder 60. Foot valves 85 and 86 are incorporated in the pipe lines 83 and 84 and in the line 83 an adjustable choke 87 may be incorporated. The valves are shown diagrammatically and only briefly described as they are commercial equipment well known and widely used and no claim is made in this application for the specific valve structure or the specific valve organization, it being sufficient for the purposes of the present invention to understand that suitable trips on movable frames actuate valve mechanism to appropriately actuate the motors 40 and 60 at the proper times or more particularly that the trips 76 and 77 alternately shift valve 75 to cause it to connect the pressure line with either pipe line 81 or 82 and the return line to the other.

Other trips (not shown) actuate the foot valves 85 and 86 to regulate the communication of pipe lines 83 and 84 with the pipe lines 81 and 82.

With an apparatus embodying the present invention, the parts immersed in the acid solution and handling the articles to be pickled are not in wearing contact and the necessity of lubricating or minimizing wear between relatively movable and engaging surfaces is eliminated. The material constituting the movable rack and fixed rack and all through the hanger rods and other structure with which the acid contacts is largely acid resistant but even if some slight corrosion occurs the operability and efficiency of the apparatus is not impaired. Another advantage resides in the fact that the movable rack, partaking as it does of an upward, then forward, then downward, then backward movement during each cycle, will maintain the articles to be pickled in the solution for the proper length of time and will insure sufficient agitation of the solution and change the position of the articles therein to provide for a very effective pickling action. Finally, the structure lends itself to embodiment in an apparatus having ample capacity for even large plants.

The invention claimed is:

1. An apparatus for advancing articles through a pickling vat comprising a fixed rack consisting of longitudinally extending rods, means coacting with spaced portions of the rods to support them in position, a similar movable rack having its rods movable up and down and back and forth in between the rods of the fixed rack, an overhead frame, hanger rods between the overhead frame and the movable rack, means for supporting the overhead frame for up and down and back and forth movement and comprising a plurality of transversely extending rock shafts provided at spaced points below the overhead frame, rocker arms fixed to the rock shafts, said shafts being provided at their outer ends with rollers, rails on the movable frame engageable with the rollers, crank arms on said rock shafts, a longitudinally extending beam connected to said crank arms, a motor for moving said beam back and forth, and motor driven means for shifting said overhead frame forwardly at the end of a raising movement and rearwardly at the end of a lowering movement.

2. An apparatus for carrying metallic articles through a pickling tank and comprising a fixed rack having a main portion extending longitudinally of the vat adjacent the bottom thereof and provided with inclined portions at its ends, one inclined portion leading down into the inlet end and the other leading up out of the outlet end, a movable rack cooperable with the fixed rack and including a main section and separate end sections, means for moving said rack sections back and forth as a unit while leaving them free for relative vertical movement, and means for raising and lowering the main rack section and also raising and lowering the end rack sections to a greater distance than the main rack section.

3. An apparatus for carrying metallic articles through a pickling tank and comprising a fixed rack having a main portion extending longitudinally of the vat adjacent the bottom thereof and provided with inclined portions at its ends, one inclined portion leading down into the inlet end and the other leading up out of the outlet end, a movable rack cooperable with the fixed rack and including a main section and separate end sections, an overhead frame including a main section connected to the main rack section, and end sections connected to the end rack sections, links connecting the overhead frame sections to constrain them to move back and forth together while leaving them free to partake of relative vertical movement, means for moving the overhead frame back and forth and means for moving the main section of the overhead frame section up and down and the end sections up and down through a greater vertical distance.

4. An apparatus for carrying metallic articles through a pickling tank and comprising a fixed rack having a main portion extending longitudinally of the vat adjacent the bottom thereof and provided with inclined portions at its ends, one inclined portion leading down into the inlet end and the other leading up out of the outlet end, a movable rack cooperable with the fixed rack and including a main section and separate end sections, and means for moving the sections of the movable rack back and forth and up and down.

5. An apparatus for carrying metallic articles through a pickling tank and comprising a fixed rack having a main portion extending longitudinally of the vat adjacent the bottom thereof and provided with inclined portions at its ends, one inclined portion leading down into the inlet end and the other leading up out of the outlet end, a movable rack cooperable with the fixed rack and including a main section and separate end sections, an overhead frame including a main section connected to the main rack section, and end sections connected to the end rack sections, means constraining the overhead frame sections to move back and forth together while leaving them free to partake of relative vertical movement, means for moving the overhead frame back and forth and means for moving the main section of the overhead frame section up and down and the end sections up and down through a greater vertical distance, and comprising motor actuated swinging rollers cooperable with the frame sections, swinging rollers of the end frame sections swinging on a greater radius than those of the main frame.

6. An apparatus for advancing articles to be pickled through a pickling solution in a pickling vat and comprising means for supporting the articles at spaced points along the vat and submerged in the pickling solution, a rack movable up and down and back and forth relative to said means, an overhead frame, hanger rods connecting said overhead frame and said movable rack, a plurality of transversely extending rock shafts at spaced points along the overhead frame, means supporting the rock shafts for rocking movement, rocker arms fixed to the rock shafts and having rollers at their outer ends cooperable with the overhead frame, means for rocking said rock shafts to raise and lower the overhead frame and the movable rack, and means for moving the movable rack in one direction when elevated and in a reverse direction when lowered.

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