Aug. 6, 1946. S. H. McKEE 2,405,157

PICKLING APPARATUS

Filed April 29, 1944 3 Sheets-Sheet 1

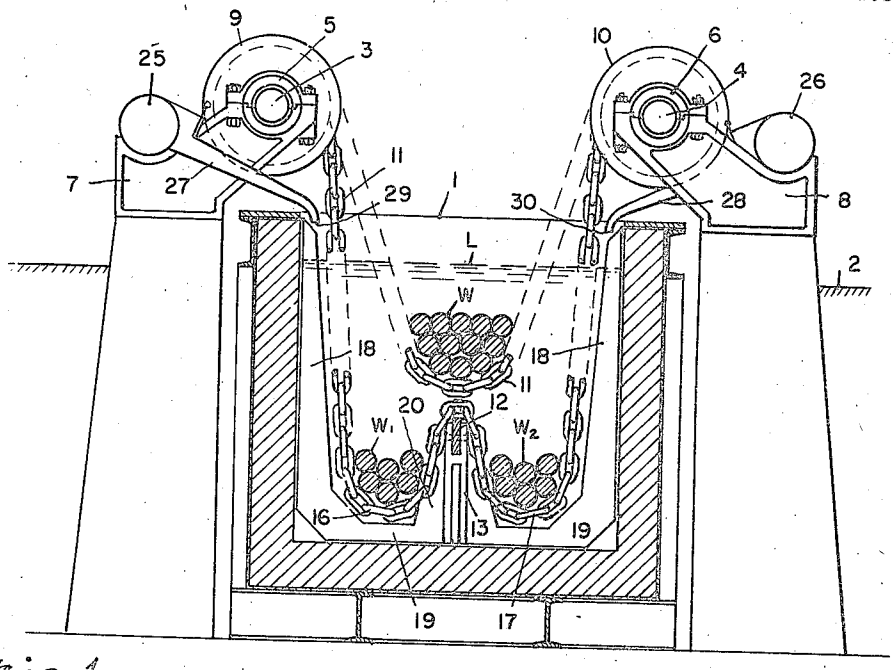


Fig. 1

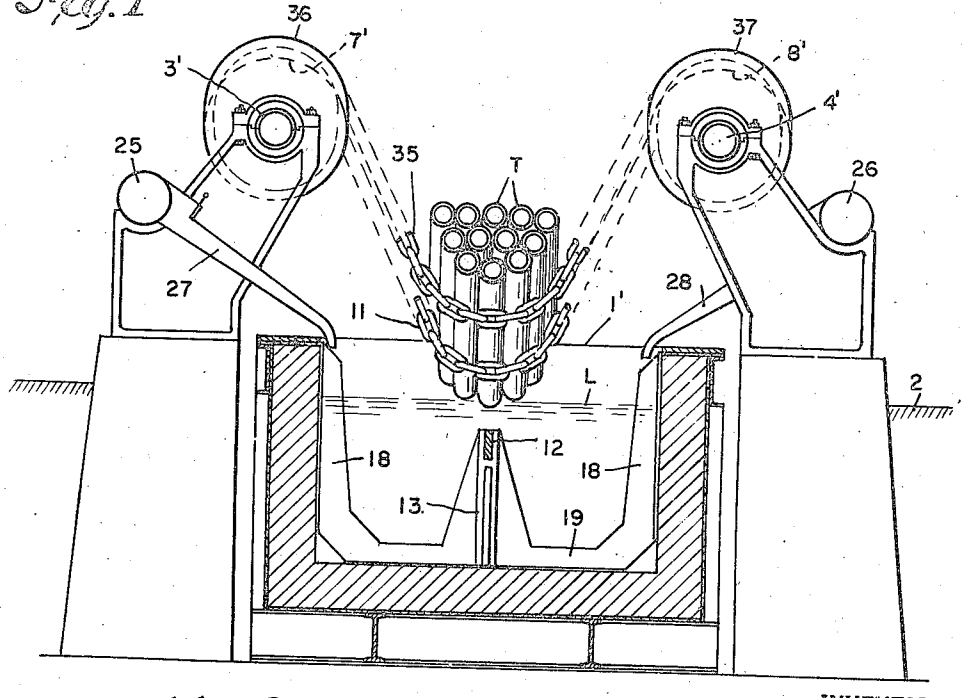


Fig. 2.

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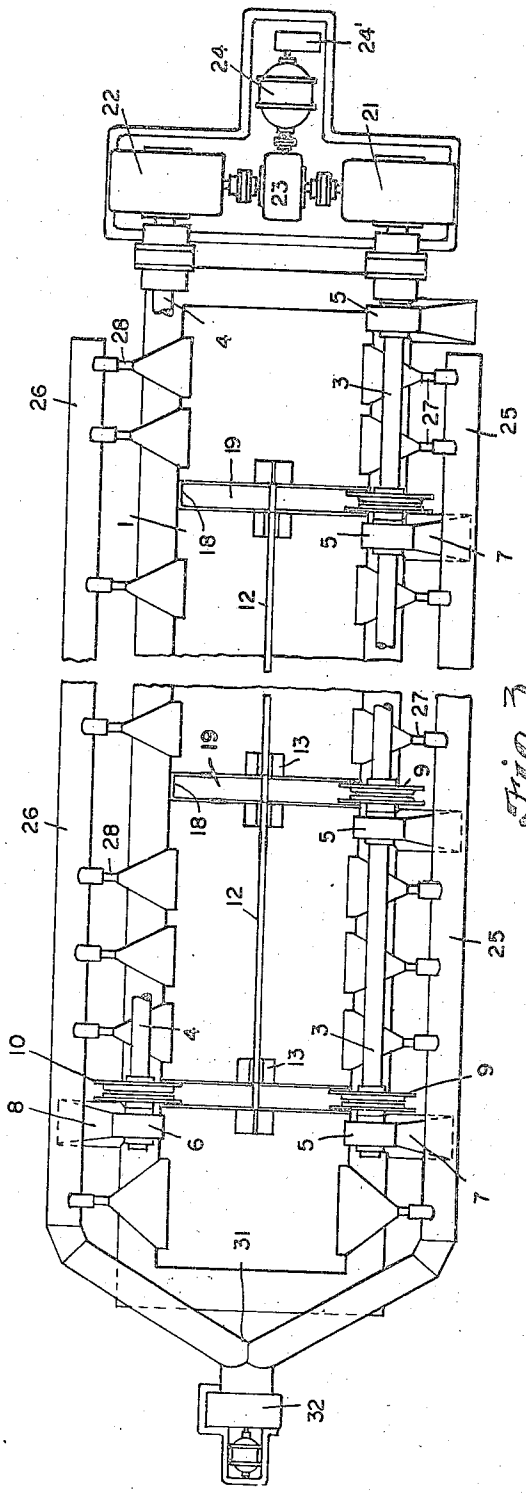


Fig. 3.

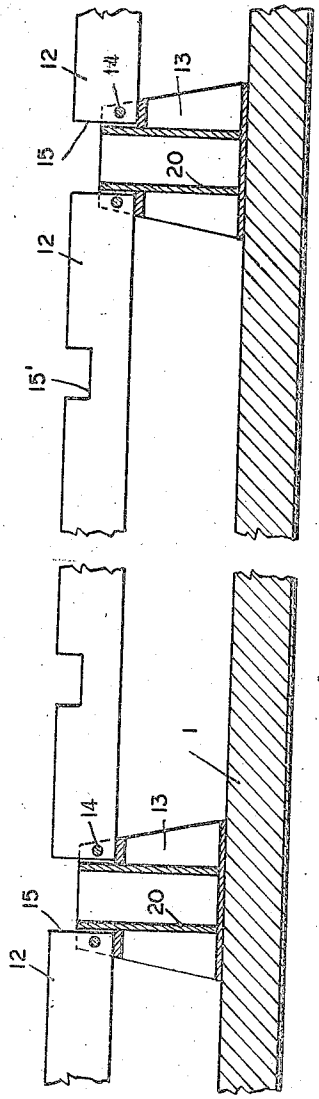


Fig. 4.

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Filed April 29, 1944 3 Sheets-Sheet 3

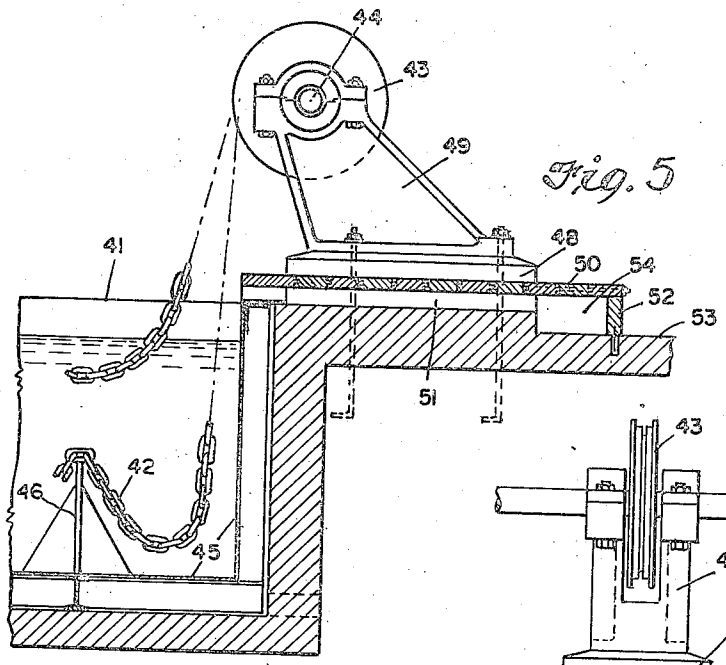


Fig. 5

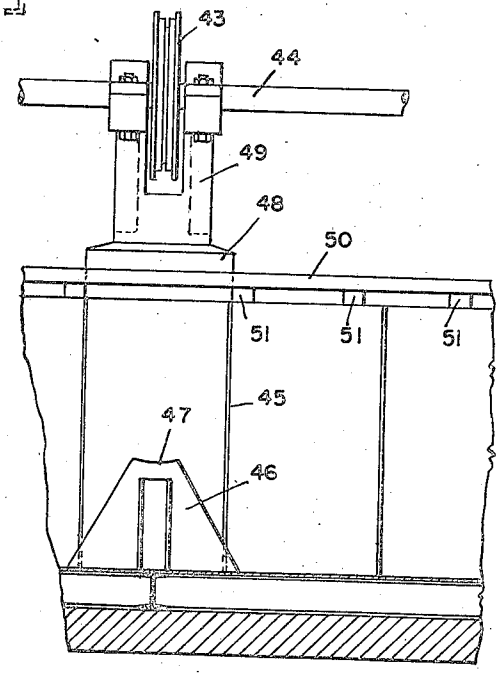


Fig. 7

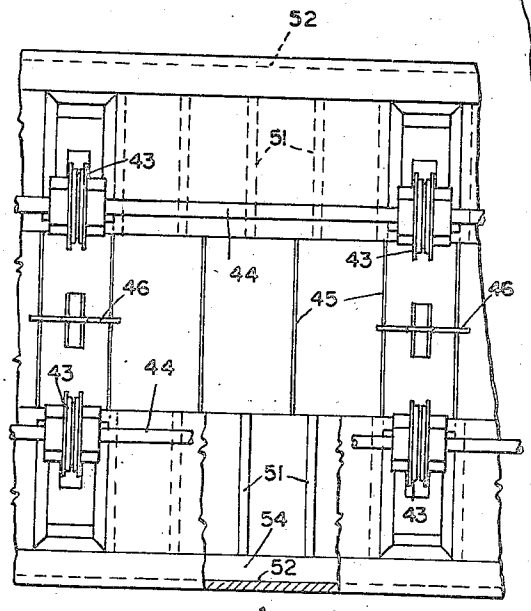


Fig. 6

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UNITED STATES PATENT OFFICE

2,405,157

PICKLING APPARATUS

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Application April 29, 1944, Serial No. 533,302

14 Claims. (Cl. 51—163)

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The present invention, relating as indicated to a pickling apparatus, has more particular reference to a device for immersing elongated metal workpieces such as rods, bars, tubes and the like in a pickling bath.

One of the objects of my invention is to provide means for immersing a bundle or a plural number of such workpieces into the pickling bath in such a manner that a rolling and tumbling action is imparted to the individual workpieces in order to secure a more complete and efficient contact of their surfaces with the chemical solution; and to accomplish such rolling and tumbling action by the simple expedient of raising and lowering the bundle of workpieces when supported in flexible slings. My invention accomplishing this objective has the further advantage in that a substantial reduction in driving power for raising and lowering the flexible slings is made possible.

Another object of my invention is to provide a lifting means on the flexible supporting slings whereby the bundle of workpieces is automatically tilted at an angle to the horizontal so that excess pickling solution adhering to and trapped by the workpieces (particularly in the case of tubes) is permitted to drain back into the pickling bath tank.

Another object of my invention is to provide means for withdrawing fumes arising from the pickling bath, and with a minimum amount of obstruction of the space above the pickling tank.

Additional objects and advantages of the invention shall become apparent as the following description proceeds.

To the accomplishment of the foregoing and related ends, said invention, then, consists of the steps hereinafter fully described and particularly pointed out in the claims.

The annexed drawings and the following description set forth in detail one approved method of carrying out the invention, such disclosed method, however, constituting but one of the various ways in which the principle of the invention may be used.

Fig. 1 is a vertical, sectional view of a pickling apparatus embodying the principle of my invention;

Fig. 2 is a vertical, sectional view of a modified form of the apparatus showing the means for effecting the automatic horizontal tilting of the workpieces as they are lifted from the pickling bath;

Fig. 3 is a top plan view, with portions broken away of the apparatus of Fig. 1;

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Fig. 4 is an enlarged detail of the sling contacting support mounted within the pickling tank;

Fig. 5 is a partial vertical sectional view showing another modified form of construction;

Fig. 6 is a partial top plan view of the construction shown in Fig. 5; and

Fig. 7 is an elevational view taken from the inside of the pickling tank.

Now referring more particularly to Figs. 1 and 3, there is shown therein a pickling tank 1 which is of relatively large length compared to its width and depth, in order to accommodate lengths of elongated workpieces, such as the bars indicated at W. The tank 1 is preferably installed in such a manner that its top edge is slightly above the level of the workshop floor 2. Parallel shafts 3 and 4 are mounted on opposite sides of the tank 1 and are supported in the longitudinally spaced bearings 5 and 6, respectively, which are in turn carried by the mounting blocks or pedestals 7 and 8.

Drum type pulley wheels 9 and 10 are mounted upon the shafts 3 and 4, and are located in side to side alignment with each other. The periphery of the wheels 9 and 10 project slightly inwardly of the plane of the inside vertical walls of the tank 1. Each end of the chain slings or loops 11 are attached to the pulleys 9 and 10.

A horizontal rail 12 is supported above the bottom of the tank 1 by means of the vertical stanchions 13. The stanchions 13 have a supporting shoulder, as best indicated in Fig. 4, in which the ends of adjacent rails 12 are secured by means of the bolts or rivets 14, thus presenting a slot or gap 15 for the reception of a sling chain 11.

Where it might be desirable to mount a sling across the shafts 3 and 4 at a longitudinal point which is not in transverse alignment with one of the stanchions 13 or slots 15, a slot 15' is provided in the top side of the rail 12.

It will thus be seen that as the chain slings 11, supporting the bundles of workpieces W (such as bars, rods or tubes) are lowered down into the tank 1, the mid-portion of the chain slings 11 contacts with and rests upon the rail sections 12, whereupon on further lowering of the chains 11, the latter fall down into the loops 16 and 17 on each side of the rail 12, thus dividing the original single bundle of workpieces into the two bundles W_1 and W_2. As the workpieces go from their position as indicated at W in Fig. 1 to the positions as indicated at W_1 and W_2, they are given a combined rolling and tumbling action. Thus, the surfaces of the workpieces not only have an increased move-

ment through the pickling solution in the tank 1, constantly presenting themselves to new portions of the solution, but they also have a tumbling movement with respect to each other which aids in the removal of the more tenaciously adhering portions of scale or surface dirt, and also prevents individual workpieces from remaining in contact with each other at the same line or surface of contact.

Chain guide channels 18 are provided on the vertical side walls of the tank 1 and in alignment with the pulleys 9 and 10 and each sling chain 11. The chain guides 18 continue across the bottom of the tank 1 as indicated at 19 and up to a converging point on both sides of the rail 12, as indicated at 20. These chain guides present a trough or opening which is slightly wider than the width of the chains 11, for maintaining the latter in unkinked and properly aligned position, as well as preventing damaging or improper contacting of the chains with the inside walls of the tank 1.

The shafts 3 and 4 are connected through the worm gear reduction units 21 and 22 to the common, double ended shaft worm gear reduction unit 23. A drive motor 24 is connected to the gear unit 23. A suitable brake, such as a solenoid operated brake, as indicated at 24', is connected to the motor 24. In operation, the motor 24 is driven in one direction to lower the chain slings 11 to the lowermost position as shown in Fig. 1, then stopped and reversed to raise them to the uppermost position. The wheels 9 and 10 are of such diameter as to require less than one revolution to effect such raising and lowering of the chain slings 11. This operation is, of course, repeated as many times as found necessary to complete the desired amount of pickling.

It will thus be seen, that by reason of supporting substantially one-half of the workpiece load on the rail 12, that correspondingly only about one-half of the power is required in lifting the bundles W_1 and W_2 from the bottommost position as shown in Fig. 1, to the point where the sling chains 11 move out of contact with the rail 12 thus permitting a substantial savings in the cost of operating power for the apparatus.

A pair of exhaust fume manifold ducts 25 and 26 are also supported upon the pedestals 7 and 8 and in parallel relationship with respect to the shafts 3 and 4. Intake headers 27 and 28 extend laterally from the manifold ducts 25 and 26, respectively, and inwardly through the spaces between the pedestals 7 and 8. The intake ends 29 and 30 of the headers 27 and 28 are located around the inside top marginal edge of the tank 1, and as best seen in Fig. 1 at a point between the normal liquid level L of the pickling bath and the top of the tank. The manifold ducts 25 and 26 join in the Y connection at one end of the tank 1, as indicated at 31 where they are connected to the exhaust fan 32.

In the form of construction shown in Fig. 2, means are provided for horizontally tilting one end of the workpieces such as the bundle of tubes T as they are lifted to a position above the liquid level L of the bath in the tank 1'. In this case, one of the sling chains 11 is carried by circular wheels 7' and 8', similar to those previously described. However, another sling chain 35 near the opposite end of the tubes T is carried by the non-circular or cam shaped wheels 36 and 37. Thus, as the shafts 3' and 4' are rotatably driven, the wheels 36 and 37 have a greater lifting rate as the chain 35 is wound up upon their larger diameter portion, so that the end of the tubes T

which such chains support is tilted above the end supported by the chain 11. This permits the interior of the tubes or pipes T to drain excess solution back into the tank 1 and to permit fresh pickling solution to run back into them on the next submersion or lowering of the bundle of tubes down into the tank 1'.

In the modified form of construction shown in Figs. 5, 6 and 7, the exhaust fume manifold duct leading from the top inner edge of the tank 41 is made in the form of a combined floor platform and exhaust duct system. In addition, a modified form of sling chain contacting stanchion is also shown.

The sling chains 42 are supported on the wheels 43 which are carried by the oppositely driven shafts 44, in the same manner as previously described in connection with Figs. 1 and 3. The walls of the tank 41 may be fabricated from acid resistant metal plate or sheet, or its interior may be lined with a metallic sheathing, such as Monel metal sheets as indicated at 45. Individual chain contacting stanchions 46 are mounted on the bottom of the tank 41 in alignment with the chains 42. The top edge of the stanchions 46 are concavely curved, as indicated as 47, to provide a seat or saddle for each chain 42.

Between the masonry or concrete bases 48 upon which the pedestals 49 are mounted, there is built a wooden platform comprising the tongue and groove flooring 50 and the transverse joists or screeds 51. The flooring 50 runs out beyond the outer edge of the pedestal bases 48 to the vertical side wall 52 which rests upon the surface of the shop floor 53. The spaces between the screeds 51 and the underside of the flooring 50 thus provide the exhaust fume header ducts which lead in from the inside top marginal edge of the tank 41 to the space 54 which in turn serves as the main exhaust duct or manifold. As in the case with respect to Fig. 3, the ducts 54 on opposite sides of the tank 41 are connected to a common exhaust fan at one end of the tank. The latter construction is not here further shown or described in detail, as its construction will be readily understood by those skilled in the art.

Other modes of applying the principle of the invention may be employed, change being made as regards the details described, provided the features stated in any of the following claims or the equivalent of such be employed.

I therefore particularly point out and distinctly claim as my invention:

1. A pickling apparatus for bars, rods, tubes and the like, comprising a tank, flexible slings for suspending a plurality of such pieces to be treated in such tank, and means for diverting said slings without holding such pieces, including a fixed member in said tank presenting an upper horizontal bearing edge adapted to be contacted by said slings, whereby the latter, on being lowered beyond the top of said bearing edge, are caused to fall into loops on each side thereof.

2. A pickling apparatus for bars, rods, tubes and the like, comprising a tank, open-ended flexible slings for suspending a plurality of such pieces to be treated in such tank, a fixed member in said tank presenting an upper horizontal bearing edge adapted to be contacted by said slings, whereby the latter, on being lowered beyond the top of said edge, are caused to fall into two open-ended loops on each side of said edge, and guide channels to maintain the slings in unkinked position.

3. A pickling apparatus for bars, rods, tubes

and the like, comprising a tank, flexible slings for suspending a plurality of said pieces to be treated in such tank, and means for diverting said slings without holding such pieces, including a horizontal rail in said tank disposed transversely to said slings, said rail having its top edge located below the top of said tank and adapted to be contacted by such slings, whereby the latter on being lowered below said rail are caused to fall into loops on each side thereof.

4. A pickling apparatus for bars, rods, tubes and the like, comprising a tank, flexible slings for suspending a plurality of said pieces to be treated in such tank, a horizontal rail supported on the bottom of said tank mid-way of the sides thereof and extending transversely with respect to said slings, said rail having its top edge located below the top of said tank and adapted to be contacted by said slings, whereby the latter, on being lowered below said rail, are caused to fall into loops on each side thereof, and guide channels to maintain the slings in unkinked position.

5. A pickling apparatus for bars, rods, tubes and the like, comprising a tank, flexible slings for suspending a plurality of pieces to be treated in said tank, and means for diverting said slings without holding such pieces, including uprights mounted on the bottom of said tank in alignment with each of said slings, the top of said uprights being located below the top of said tank and adapted to be contacted by said slings, whereby the latter on being lowered below said uprights are caused to fall into loops on each side thereof.

6. A pickling apparatus for bars, rods, tubes and the like, comprising a tank, rotatable shafts mounted on opposite sides of said tank, flexible slings having each of their ends carried by each of said shafts, driving means for turning said shafts in opposite directions with respect to each other to raise and lower said slings in said tank, and a supporting element mounted above the bottom of said tank for contacting said slings at their mid-point, whereby said slings are divided into loops on each side of said supporting element on being lowered below it.

7. A pickling apparatus for bars, rods, tubes and the like, comprising a tank, rotatable shafts mounted on opposite sides of said tank, longitudinally spaced wheels on said shafts, sling chains having each end attached to opposite wheels on each of said shafts, driving means for turning said shafts in opposite directions with respect to each other to raise and lower said slings in said tank, and a horizontal rail mounted above the bottom of said tank for contacting said slings at their mid-point, whereby said slings are divided into loops on each side of said rail on being lowered below it.

8. A pickling apparatus for bars, rods, tubes and the like, comprising a tank, rotatable shafts mounted on opposite sides of said tank, longitudinally spaced wheels on said shafts, sling chains having each end attached to opposite wheels on each of said shafts, driving means for turning said shafts in opposite directions with respect to each other to raise and lower said slings in said tank, a horizontal rail mounted above the bottom of said tank for contacting said slings at their mid-point, whereby said slings are divided into loops on each side of said rail on being lowered below it, and channel members in alignment with each of said sling chains, said channel members having an open side of greater width than that of said chains and extending down the sides of said tank, along the bottom thereof and up to the top of said rail.

9. A pickling apparatus for bars, rods, tubes and the like, comprising a tank, rotatable shafts mounted on opposite sides of said tank, driving means for turning said shafts in opposite directions with respect to each other, longitudinally spaced wheels on said shafts, and flexible slings attached to said wheels for suspending a plurality of such pieces to be treated in said tank, the wheels adjacent one end of said shafts having a circular periphery and the wheels adjacent the other end of said shafts having a non-circular, cam shaped periphery, whereby said slings attached to said non-circular wheels are raised and lowered at a different rate than that of the slings attached to said circular wheels.

10. A pickling apparatus for bars, rods, tubes and the like, comprising a tank, rotatable shafts mounted on opposite sides of said tank, driving means for turning said shafts in opposite directions with respect to each other, longitudinally spaced wheels on said shafts, flexible slings attached to said wheels for suspending a plurality of such pieces to be treated in said tank, the wheels adjacent one end of said shafts having a circular periphery and the wheels adjacent the other end of said shafts having a non-circular, cam shaped periphery, whereby said slings attached to said non-circular wheels are raised and lowered at a different rate than that of the slings attached to said circular wheels, and a supporting element mounted above the bottom of said tank for contacting said slings, whereby the latter are caused to fall into loops on each side of said supporting element on being lowered below it.

11. A pickling apparatus for bars, rods, tubes and the like, comprising an open topped tank adapted to contain a pickling bath, fume exhausting manifold ducts disposed along the top sides of said tank, and intake headers in said ducts having their intake ends located at the inside margin of said tank between the top edge thereof and the liquid level of said bath.

12. A pickling apparatus for bars, rods, tubes and the like, comprising an open topped tank adapted to contain a pickling bath, rotatable shafts mounted parallel to the top sides of said tank, flexible slings having their opposite ends carried by said shafts, supporting pedestals for said shafts and longitudinally spaced with respect thereto, manifold ducts parallel to said shafts and positioned on the outside of said pedestals with respect to said tank, and intake headers extending transversely with respect to said ducts in the space between said pedestals and having their intake ends located at the inside margin of said tank between the top edge thereof and the liquid level of the bath.

13. A pickling tank structure comprising a tank having its top edge spaced slightly above the surrounding floor level, a wooden platform contiguous to the inside wall of said tank, supporting members under said platform extending at right angles to the inside wall of said tank, vertical wall members closing the outer edge of said platform with respect to the floor surface, the space beneath said platform between said supporting members forming lateral fume exhaust ducts leading from the top inside wall of said tank, and the space beneath said platform adjacent said vertical wall members forming a manifold duct connected to such lateral exhaust ducts.

14. A pickling apparatus for bars, rods, tubes and the like, comprising an open topped tank

adapted to contain a pickling bath, rotatable shafts mounted parallel to the top sides of said tank, flexible slings having their opposite ends carried by said shafts, supporting pedestals for said shafts and longitudinally spaced with respect thereto, a wooden platform filling the spaces between said pedestals and extending from the inside wall of said tank to a point outwardly beyond said pedestals, said platform being spaced

above the floor adjacent the top of said tank, the space beneath said platform between said pedestals forming lateral fume exhaust ducts leading from the top inside wall of said tank, and the space beneath said platform beyond said pedestals forming a manifold duct connected to said lateral exhaust ducts.

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