

June 12, 1945.

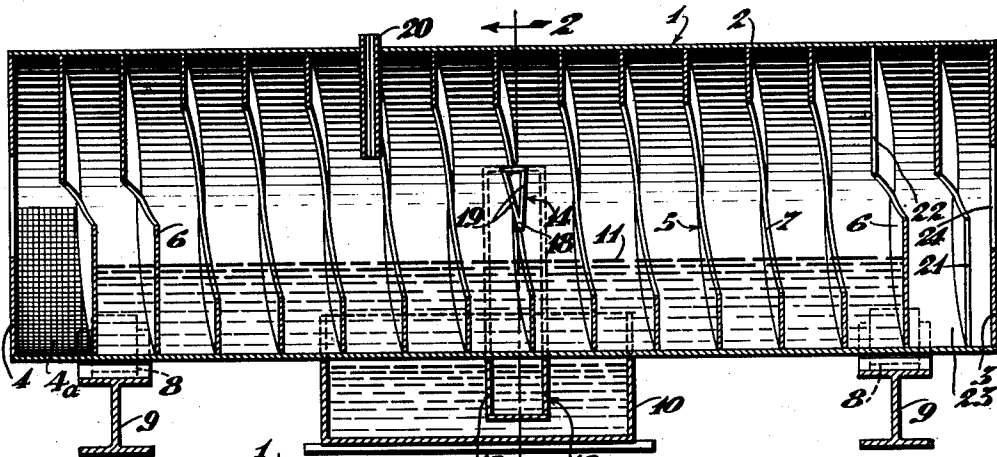
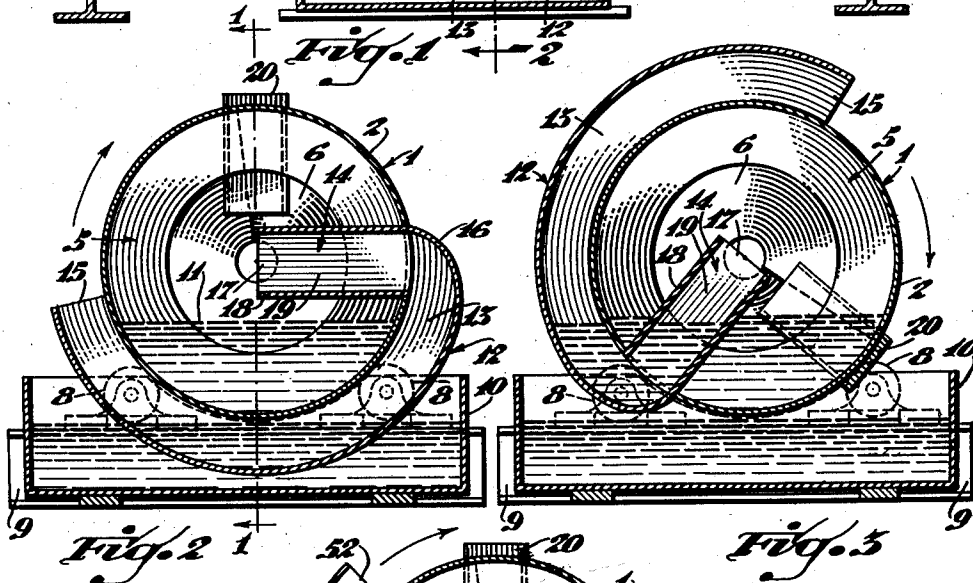
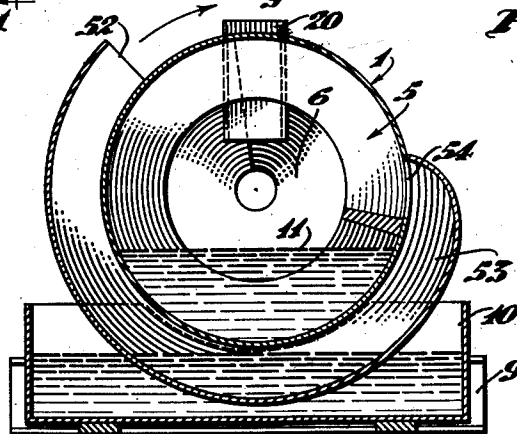
N. RANSOHOFF

2,377,964

TREATING APPARATUS

Filed Aug. 6, 1942

2 Sheets-Sheet 1



INVENTOR.

Fig. 6

BY *Nathan Ranshoff*
Wood, Arey, Kennan & Evans
Attorneys.

June 12, 1945.

N. RANSOHOFF
TREATING APPARATUS

2,377,964

Filed Aug. 6, 1942

2 Sheets-Sheet 2

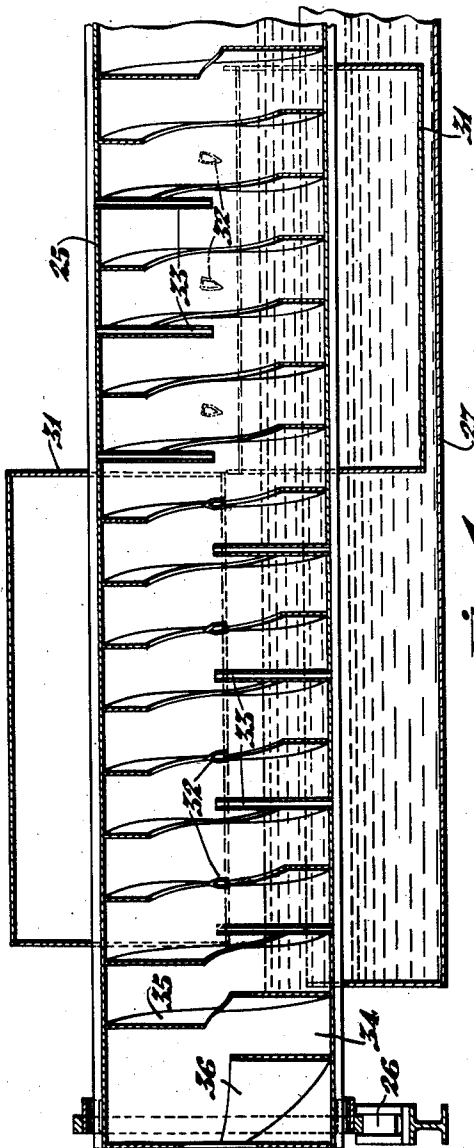


Fig. 4

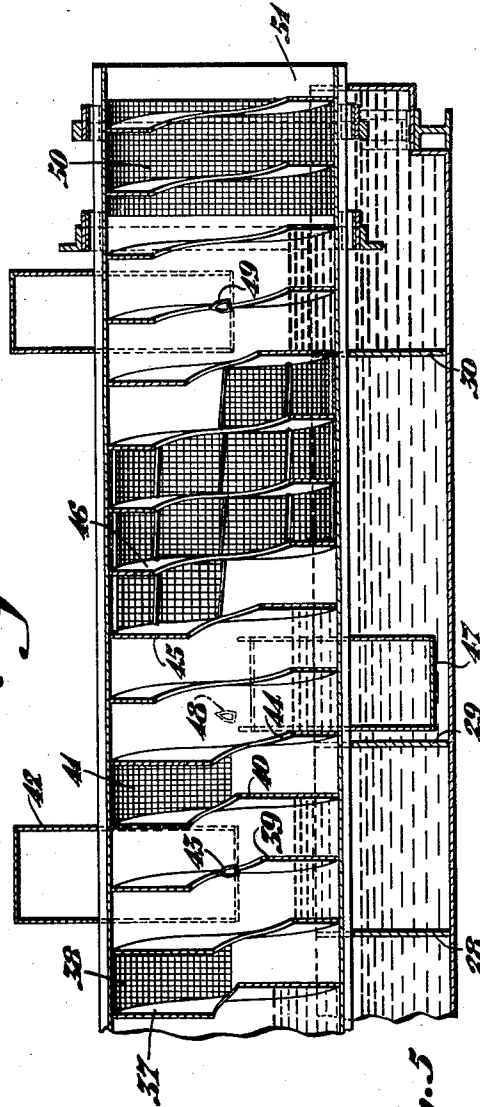


Fig. 5

INVENTOR.

BY *Nathan Ranshoff*
Wood, Gray, Fenner & Evans
Attorneys.

UNITED STATES PATENT OFFICE

2,377,964

TREATING APPARATUS

Nathan Ransohoff, Cincinnati, Ohio

Application August 6, 1942, Serial No. 453,839

13 Claims. (Cl. 91-52)

This invention relates to a machine or apparatus for subjecting a substantially continuous stream or batch of metal parts to chemical treatment in a fluid bath such that the parts may be introduced into one end of the apparatus, treated therein, as they are moved toward a discharge portion of the apparatus at the other end.

The machines of the present invention, while useful in a variety of instances where treatment of this sort is required, have been intended, and are particularly suitable for use in the Parkerizing process wherein a ferrous phosphate coating is formed upon the surfaces of the parts to protect them against rust. The solution must be kept hot but, due to the fact that the parts introduced into it are at room temperature, it is necessary that the solution be circulated freely during the course of treatment so as to equalize temperature variations which would otherwise occur. This circulation also keeps the solution uniform as to chemical composition. It is also desirable to keep the parts being treated immersed in the solution inasmuch as the chemical acts properly upon the parts only when they are fully submerged in it. If the parts or portions of them are exposed to air after they have been wetted with the Parkerizing liquid the coating becomes imperfect or defective.

A principal object of the present invention has been to provide a simple machine capable of satisfying these requirements. Usually a batch of the treating reagent is made up in a tank equipped with heating coils or other means to hold the solution at elevated temperature, and one purpose of this invention has been to provide a drum or treating chamber adapted to be operated in conjunction with the tank so as to withdraw liquid from it and return liquid to it, whereby circulation is established.

A further object of the present invention has been to establish circulation by means operated in conjunction with the drum itself but to arrange the circulating apparatus in such manner that the liquid level within the drum is maintained at a predetermined level well above the parts conveyed through the drum or treating apparatus.

In its simplest aspects the present invention is directed to a rotatable treatment chamber within which circulation is enforced and liquid level is maintained by means of a replenishing conduit which, during rotation of the apparatus, scoops up treating liquid from a bath of treating liquid in a tank and causes it to be discharged into the drum and an outlet conduit or opening

through which treating liquid is discharged from the drum or chamber into the tank, without permitting the treating fluid from dropping below a predetermined liquid level. The inlet apparatus is arranged to prevent back flow of liquid through it in such manner that drainage of liquid from the drum back to the tank is not permitted. A spiral vane is employed for advancing parts through the treating chamber during its rotation, and a further object of the present invention has been to arrange the fluid inlet and discharge means of the drum with respect to the vane so that these elements do not congest or restrict the vane passageway to obstruct the movement of the parts through the treatment chamber.

In the preferred embodiment of the invention a suitable chamber is arranged upon rollers so as to be rotatable about a substantially horizontal axis. A vane extends spirally through the drum in its longitudinal direction. This chamber is arranged above a supply tank within which a supply of the hot treating solution is maintained and a scoop having an open end as its leading end with respect to the direction of rotation extends part way around the drum periphery, while one or a plurality of tubes extending through the wall of the drum communicate with the trailing end of the conduit and extend into the drum to a point adjacent its axis of rotation. The inner ends of these tubes therefore are always above the level of liquid to be maintained within the drum and liquid therefore may flow from the scoop, through the tubes, to be spilled into the drum, but liquid cannot flow in an opposite direction.

Operating in conjunction with this replenishing conduit is one or a plurality of discharge outlets or conduits which extend from the interior of the drum at a distance corresponding to the liquid level to be maintained, outwardly through the drum wall. As these outlet conduits approach the liquid level and, for example, become parallel with it, liquid may flow into them and as rotation continues the liquid within the conduits is discharged back into the tank.

As previously explained, it is desirable that these feeding and discharge tubes within the drum be arranged so as not to obstruct the passageway for parts delineated by the vane. In the preferred embodiment of the invention the inlet and outlet tubes are of triangular cross section and they are positioned within the vanes so that the two walls of the triangle constitute a portion of the vane itself. The apex of the triangle

is its leading edge with respect to the direction of rotation, while the base of the triangle is the trailing edge. The side walls of the triangle thus diverge from the vane at a relatively slight angle such that the movement of parts is not obstructed.

When apparatus is desired for subjecting parts to a series of chemical treatments successively an elongated drum may be employed, with replenishing and discharge conduits of the type described located in groups at given sections of the drum for circulating various fluids from tanks respectively located beneath the given sections. The treating sections, if desirable, may be separated from one another by suitable draining sections at which the drum may be perforated to permit of drainage of liquid from the parts.

In accordance with these principles of the invention a typical embodiment is shown in the drawings in which:

Figure 1 is a sectional view through a drum constructed in accordance with the present invention and adapted to be arranged as a single treatment apparatus. This view is taken longitudinally of the apparatus as on line I—I of Figure 2.

Figure 2 is a transverse sectional view showing the position of the replenishing conduit just after its leading edge has left the liquid in the tank beneath the drum and liquid is flowing through the conduit toward the drum.

Figure 3 is a view similar to Figure 2 showing the position of the parts while liquid may be spilled from the discharge outlet and just prior to the time that fresh liquid is spilled into the drum from the replenishing conduit.

Figures 4 and 5 are fragmentary views of a single machine in which metal parts may be subjected to a series of successive treatments. These views respectively show the two ends of the machine.

Figure 6 is a view of a modified inlet device constructed in accordance with the present invention.

As shown in Figures 1, 2 and 3, the treatment chamber comprises a cylindrical drum indicated generally at 1 which is made up of the cylinder 2 having end walls 3 and 4 respectively, the end wall 3 constituting the charging end of the apparatus. A spiral vane 5 extends longitudinally through the drum so as to advance parts as the drum rotates. This vane is made up of "high portions" 6 and a low portion 7, the function of which is described at a later point in the specification. The cylinder 2 is mounted upon rollers 8 supported on I beams 9 in the usual manner and operates above a tank indicated generally at 10 within which the chemical treating solution is maintained. As previously explained it is desirable to maintain liquid at the level 11 within the drum, the liquid depth being such that parts passing through are kept in a completely submerged condition.

The fluid inlet apparatus, that is, the means for charging liquid from the tank to the treating chamber is designated 12 and consists of a scoop portion 13 at the outside of the drum and a tubular inlet 14 leading from the back end of the inlet 13 to the drum interior. The scoop, as shown in Figures 2 and 3, preferably extends about half way around the drum periphery although its length is not important except that the volume of liquid contained within the scoop during the rotation of the drum should be sufficient to provide a substantial head pressure for

forcing liquid through the inlet tube 14. The leading edge 15 of the scoop is open and its back edge 16 is bent down to meet the wall of the drum 2. This scoop may be arranged to accommodate one inlet tube 14 or a series of them as shown in connection with Figures 4 and 5, and it is to be noted that the scoop picks up a substantial volume of liquid and during rotation of the apparatus causes it to spill into the drum through the end of the tube 14.

The inlet tube extends from a point adjacent the back end 16 of the scoop 13 into the drum, while the inner end 17 of the inlet 14, in the embodiment shown in Figures 1 to 5, terminates at or adjacent the axis of the drum and preferably well above the liquid level 11 so that at no time during drum rotation does the end 17 become submerged in liquid. In the preferred embodiment, the inlet tube 14 is of triangular configuration as shown in Figure 1, and is located in the plane of configuration of the spiral vane, the apex 18 of the triangle constituting the leading edge so that parts moving through the passageway may move freely along the side wall 19 without becoming obstructed.

At a point within the confines of the wall of the tank 10, one or a series of outlet tubes 20 are provided. These tubes, like the inlet tube 14, are best of triangular configuration and are located in the plane of the spiral vane. The inner ends of the outlet tubes 20 terminate at a distance corresponding generally to the liquid level 11.

During rotation of the treating apparatus in the direction shown by the arrows in Figures 2 and 3, the leading edge 15 of the scoop 13 enters the liquid contained in the tank 10 and as rotation continues a volume of liquid is caught by the scoop and flows through the scoop passageway toward the inlet tube 14. When inlet tube 14 reaches an approximately horizontal position, the liquid caught within the scoop starts to flow through the tube 14 and spill into the drum, this discharge continuing until all of the trapped liquid has flowed into the drum. Meanwhile, the discharge outlet 20 approaches a position at which liquid may flow into and through it from the body of fluid contained within the drum. This discharge flow continues until the outlet 20 has reached a position where its inner end rises above the level of the liquid. By virtue of the extension of the tube 20 into the drum liquid may not drain through it below a predetermined level even if the drum is stopped when the tube is in its lowermost position.

Aside from the circulating apparatus just explained, one of the features of the present invention is the provision of a charging end of the drum 2 from which treating liquid is excluded. This arrangement permits a large charging hole to be employed at the charging end of the machine without interfering with the maintenance of the liquid level in the treating section. The arrangement is shown best in Figure 1 and the lock by which the liquid is excluded consists essentially of a section of worm or vane which is of such height that its inner edge is well above the liquid level. The front edge of this worm which is preceded by the dry portion of the cylinder 2 occupies a different radial position than the trailing edge; for example, the worm may consist of one and one-half turns so that whenever the one edge of the worm is submerged, the other is not submerged and vice versa.

Thus, as shown in Figure 1, the forward lead-

ing edge (the edge adjacent the charging end of the apparatus) is designated as 21, the back edge as 22. When the front edge 21 is out of liquid, the escape of liquid to the dry section is blocked by the back section at end 22. On the other hand, when the portion 22 is not submerged, the portion of the vane preceding it acts to sweep liquid out of the high section of worm back toward that portion of the drum in which the liquid level is maintained. In this manner, the volume of liquid caught between the high section of worm simply moves back and forth but never passes into the dry section designated 23. The end wall 3 at the charging end of the drum therefore may have a large opening designated 24, through which the parts may be introduced into the treating apparatus without splashing and without becoming prematurely wetted.

At the opposite or discharge end of the apparatus, a similar dam or baffle arrangement also may be utilized but by virtue of the direction of rotation of the drum with respect to the thread of the spiral vane, that small portion of liquid caught in this vane during each cycle of rotation of the drum passes beyond the high section of the vane but no more liquid passes. The portion of the drum which is beyond the high vane at the discharge end of the apparatus may be perforated as indicated at 4a. In such event the small quantity of liquid passing the high vane and moving toward the drum head 4 passes out through the perforations 4a. This small quantity either may be wasted or may be caught and returned to the tank 10. The high section of worm permits the escape, during each cycle of revolution of the drum, of no more than the small quantity of liquid in the passageways delineated by the high vane. On the other hand perforations need not be employed in which event charges of liquid will pass the high vane until the level adjacent the discharge drum head 4 will be the same as the level of liquid in the remainder of the apparatus. In this case the parts at the discharge end are submerged in liquid through which the operator must reach in order to remove them.

In Figures 4 and 5 a continuous apparatus for subjecting parts to a plurality of chemical treatments is shown. For example, in this apparatus, metal pieces may be subjected to Parkerizing solution, then rinsed, next subjected to a chromic acid bath, and finally to oil. For purposes of illustration, these various steps have been designated as such on the drawings though it is to be understood that other types of chemical reagents or treating solutions and a different sequence of steps may be employed.

The drum of the apparatus shown in Figures 4 and 5 is an elongated cylinder 25 mounted for rotation upon rollers 26, as previously described, above a tank 27 having baffles 28, 29 and 30 extending across it to provide separate chambers for the Parkerizing solution, the rinse water, and the chromic acid and oil baths. At the Parkerizing section of the apparatus, as shown in Figure 4, two scoops 31 are utilized; these preferably are arranged in side by side relationship longitudinally of the drum with their inlet ends diametrically disposed for counterbalancing. A series of inlet tubes 32 extend from the back end of each scoop into the drum and terminate at a point adjacent the axis of the drum, while a plurality of outlets 33 are positioned intermediate the inlets 32. At this Parkerizing section of the

apparatus the liquid level is to be maintained at a substantial depth and the outlet tubes 33 terminate at a position adjacent the axis of the drum, that is, a distance somewhat greater than the actual liquid depth. These tubes, however, are of substantial width so that as the drum rotates the leading edge will at times be lower than the trailing edge, thereby permitting liquid to flow through the tubes even though the liquid level is somewhat less than the height of the outlet tubes themselves.

Preceding the Parkerizing section is a dry end designated 34 constituted by the lock washer 35 made up of a turn and a half, for example, of a vane which is higher than the liquid level to be maintained, with this vane operating in the manner previously described to exclude liquid from the charging end of the apparatus. A deflector plate 36 also is located in the dry end 34 to sweep parts toward the high worm 35 in order that they may be picked up by it and conveyed into the treating solution.

The Parkerizing section terminates in a high vane designated 37 while a portion of the periphery of the drum following this high vane is perforated as at 38 for drainage purposes. The liquid passing the high vane during drum rotation is drained through the outlets at the portion 38 back into the Parkerizing solution tank.

The next station of the apparatus is a rinse station made up of a low vane 39, a high vane section 40 and a perforated portion of the drum designated 41 which follows the high vane, the perforated portion being similar in function to the perforated portion 4a at Figure 1. At the rinse station, a scoop 42 having an inlet 43 is provided, but inasmuch as this section of the apparatus is followed by a drain 41 no tubular outlet is required.

A chromic acid treatment station follows the rinsing zone. Just beyond the perforated portion 41 of the rinsing station is a low vane 44 which proceeds into the chromic acid treatment zone for a short distance and interconnects with a portion of high vane 45 which, in turn, is followed by a low vane 46 extending through another perforated drainage portion of the drum.

A charging scoop 47 having an inlet 48 is located adjacent the entrance end of the chromic acid station; the scoop 47 causes liquid to flow through the inlet 48 over parts being advanced into the chromic acid section from the rinse zone, with the low vane continuing to advance the parts into the perforated portion of the apparatus to which the chromic acid drains from the parts out through the perforations and back into the chromic acid tank.

The oil treating zone which follows the chromic acid bath is constructed in substantially the same manner and has a scoop equipped with an inlet 49 at one portion of it followed by a draining section 50.

Parts fully Parkerized, rinsed, treated with chromic acid and treated with oil emerge from the discharge end of the apparatus 51. Each section is delineated from an adjacent section of this apparatus by a high vane which has both the function of interconnecting with the preceding vane to maintain the continuity of flow of the parts and the function of preventing the free flow of liquid from one zone to the other. This result is accomplished simply by elevating the height of the vane at the portion which is to constitute the baffle and by radially offsetting the leading and trailing edges of the vane so that

when one is submerged the other is out of liquid and therefore blocks the flow of it. When it is desired to drain the apparatus liquid is removed first from the tanks beneath the various charging scoops so that the scoops may not pick up solution from the tanks when the drum is rotated. After this is done the drum is put into rotation and, as previously described, liquid from the supply maintained within the drums passes out through the high worm at the end of each section. During each cycle of rotation the liquid caught in the high section of the worm is discharged, the drum is rotated and liquid is removed in this manner until all of it is removed from the apparatus.

In Figures 1 to 5 the inlet apparatus consists essentially of a scoop located at the outside of the drum and an inlet tube extending from it to the inside of the drum. In this case the scoop may extend over only a short distance along the periphery of the drum if desired, though as previously described it is preferable that the scoop be of such dimensions that it may collect sufficient volume of liquid to provide a substantial head pressure on the entrapped fluid to force it through the inlet tube.

In a modification shown in Figure 6 the inlet apparatus consists of a scoop 52 at the outside of the drum and an inlet tube 53 which extends around the drum periphery half way or more, terminating in an inlet opening 54 in the drum wall. In both cases the position of the point of discharge from the tube is such relative to the position of the scoop that during drum rotation the liquid at a predetermined level within the drum cannot flow backwardly from the drum through the tube toward the tank in a counterflow direction. Such a flow is prevented by virtue of the fact that whenever the end of the tube is within the confines of the liquid in the drum the tube or scoop nevertheless contains a greater head of liquid within it, thereby maintaining a positive inward flow.

Having described my invention, I claim:

1. An apparatus for subjecting parts to chemical treatment which comprises a drum rotatable about a horizontal axis, a spiral vane for advancing parts through the drum, a tank located beneath the drum for holding treating solution, a scoop at the outside of the drum having a leading edge arranged to scoop through solution contained within the tank during drum rotation, and a tube leading from the scoop to the inside of the drum, the point of discharge from the tube being such relative to the position of the scoop at the outside of the drum that liquid at a predetermined level within the drum cannot flow from the drum through the tube to the scoop.

2. An apparatus of the type described comprising a drum rotatable about a horizontal axis, a tank located beneath the drum for holding a supply of liquid, a scoop carried upon the periphery of said drum and having a leading edge arranged to pass through and collect liquid from said tank when the drum is rotated, the said scoop also having a trailing portion within which liquid flows from the leading edge and a tube leading from the trailing portion of said scoop to the interior of the drum, the point of discharge from said tube being such, relative to the leading edge of said scoop, that liquid collected in said scoop is maintained at a positive head pressure at the point of discharge of said tube during drum rotation such that liquid contained within said drum at a predetermined level

may not flow counterwise from the tube through the scoop and back to the tank.

3. An apparatus of the type described comprising a drum rotatable about a horizontal axis, a tank located beneath the drum for containing a supply of liquid, a scoop positioned on the periphery of the drum and having a leading edge arranged to dip within liquid contained within said tank and isolated from the liquid in the tank, the said scoop having a trailing portion extending therefrom peripherally of the tank and a tube leading from the trailing portion of the scoop and extending into the tank a distance such that the discharge end of said tube within the tank is located adjacent the axis of rotation of the tank such that liquid contained at a predetermined level within the tank may not flow counterwise through the tube back through the tank.

4. An apparatus of the class described comprising a drum rotatable about a horizontal axis, a tank arranged beneath said drum and adapted to contain a supply of liquid, a vane extending spirally through said drum, a scoop located at the periphery of the drum and having a leading edge arranged to dip within liquid contained within said tank, a tube leading from a trailing portion of said scoop through the wall of said drum and into said drum a distance such that the end of the tube terminates at a point adjacent the axis of rotation of the drum, the said tube being located within the drum in the plane of configuration of said vane such that parts conveyed through the drum by the vane are not obstructed by the projection of the tube into the drum.

5. A machine of the class described comprising a drum rotatable about a horizontal axis, a tank arranged beneath said drum and adapted to contain a supply of liquid, a scoop located at the periphery of the drum and having a leading edge arranged to scoop up liquid contained within the tank, a vane extending spirally within the drum for urging parts therethrough and a tube which is of triangular configuration in cross section having its one end communicating with the trailing portion of said scoop and having its other end projecting substantially into the drum, the said tube being positioned in the plane of configuration of said vane with an apex of the triangle constituting its leading edge with respect to the direction of rotation of the drum, and the sides of the triangle diverging gradually from the vane such that the projection of the tube within the drum does not obstruct the passageway for parts delineated by the vane.

6. An apparatus of the class described comprising a drum rotatable about a horizontal axis, a tank arranged beneath the drum and adapted to contain a supply of liquid, a scoop located at the periphery of the drum and having a leading edge adapted to scoop up liquid contained within the tank as the drum is rotated, a tube having its one end communicating with the trailing portion of said scoop and having its other end projecting substantially into the drum, an outlet tube having its one end communicating with the outside of the drum and having its other end projecting substantially into the drum such that liquid below a predetermined level in said drum may not flow through said outlet tube.

7. An apparatus of the class described comprising a drum rotatable about a horizontal axis, a tank arranged beneath the drum and adapted to contain a supply of liquid, a scoop located at the periphery of the drum and having a leading edge

adapted to scoop up liquid contained within the tank as the drum is rotated, a tube having its one end communicating with the trailing portion of said scoop and having its other end projecting substantially into the drum, an outlet tube having its one end communicating with the outside of the drum and having its other end projecting substantially into the drum such that liquid below a predetermined level in said drum may not flow through said outlet tube, the said drum having a spiral vane extending longitudinally through it and the said inlet and outlet tubes being located in the plane of configuration of said vane.

8. An apparatus of the class described comprising a drum rotatable about a horizontal axis, a tank arranged beneath the drum and adapted to contain a supply of liquid, a scoop located at the periphery of the drum and having a leading edge adapted to scoop up liquid contained within the tank as the drum is rotated, a tube having its one end communicating with the trailing portion of said scoop and having its other end projecting substantially into the drum, an outlet tube having its one end communicating with the outside of the drum and having its other end projecting substantially into the drum such that liquid below a predetermined level in said drum may not flow through said outlet tube, the said drum having a spiral vane extending longitudinally through it and the said inlet and outlet tubes being located in the plane of configuration of said vane, the said tubes being of triangular configuration in cross section with the apexes of the triangles constituting the leading edges of the tubes with respect to the direction of rotation of the drum, whereby the projection of the tubes into the drum does not obstruct the passageway for the parts delineated by the vane.

9. A machine for performing a Parkerizing operation comprising a drum rotatable about a horizontal axis, means for maintaining liquid at a predetermined substantial depth within said drum, said means comprising a tank located beneath the drum and adapted to hold a supply of liquid, a scoop positioned at the periphery of the drum and having a leading edge adapted to extend into the liquid contained within the tank and scoop it up as the drum is rotated, a conduit extending from a trailing portion of the scoop into the drum for discharge of liquid from the scoop to the drum, the point of discharge from the conduit being located with respect to the leading edge of the scoop such that liquid is discharged into the drum under positive head pressure as the drum rotates and liquid carried at a predetermined level within the drum may not flow counterwise through the conduit toward the scoop, and an outlet conduit having one end open at the outside of the drum above the tank and having its other end located at a point within the tank corresponding substantially to the liquid level to be maintained therein.

10. An apparatus of the class described comprising a drum rotatable about a horizontal axis and having a spiral vane extending longitudinally through it, the said drum having at its one end a wall having an opening in it of substantial size, with the spiral vane terminating at a point spaced inwardly from the said wall, means for maintaining a predetermined level of liquid within said drum and means for excluding liquid from the chamber intermediate the terminus of said spiral vane and said end wall, said means comprising a high portion of vane having its inner edge located above the liquid level which is maintained within

said drum, the said high portion of vane comprising at least one full turn and an additional portion of a turn sufficient that the leading edge of the high portion of the vane is offset radially from the trailing portion of the vane such that one edge or the other of the vane always blocks the flow of liquid to the charging end of the apparatus.

11. An apparatus of the class described comprising a drum rotatable about a horizontal axis, a spiral vane extending longitudinally through the drum, means for maintaining liquid at a predetermined level within the drum, the said vane at the discharge portion of the apparatus being of such height that its inner edge is above the liquid level to be maintained within said drum with the said high portion of the vane being comprised of at least one full turn of vane and sufficient additional portion of a turn to permit the forward edge of the high portion of the vane to be offset radially with respect to the back edge of the vane, whereby only that liquid which is caught within the high portion of the vane is permitted to flow beyond the vane as the drum rotates, while the balance of the liquid in the drum is blocked against escape.

12. An apparatus of the class described comprising a drum rotatable about a horizontal axis, a spiral vane extending longitudinally through the drum, means for maintaining liquid at a predetermined level within the drum, the said vane at the discharge portion of the apparatus being of such height that its inner edge is above the liquid level to be maintained within said drum with the said high portion of the vane being comprised of at least one full turn of vane and sufficient additional portion of a turn to permit the forward edge of the high portion of the vane to be offset radially with respect to the back edge of the vane, whereby only that liquid which is caught within the high portion of the vane is permitted to flow beyond the vane as the drum rotates, while the balance of the liquid in the drum is blocked against escape, the said drum being perforated at its periphery beyond said high vane.

13. An apparatus of the class described comprising a drum rotatable about a horizontal axis, a plurality of tanks located beneath the drum at respective sections thereof for respectively containing Parkerizing solution, rinse water, chromic acid bath and oil, the said drum having a vane extending longitudinally through it for conveyance of parts to be treated therethrough, whereby the parts are subjected to respective Parkerizing, rinse, chromic acid and oil treatments, the drum above each tank having a scoop positioned on its periphery with the scoop having a leading edge adapted to dip within liquid contained in the tank beneath it and scoop up liquid therefrom, conduits leading from said scoops into the drum such that liquid collected by the scoops is discharged into the drum, with the point of discharge from said conduits being positioned relative to the leading edges of said scoops such that liquid maintained at a predetermined level within said drum may not flow counterwise through said drum to said tanks, the said Parkerizing section of said drum additionally having outlet tubes communicating at one end with the outside of the drum above the tank holding Parkerizing solution and terminating at the inside of the drum at a point corresponding substantially to the liquid level to be maintained therein, with the vane at the end of each section of the drum being suffi-

ciently high that its inner edge extends above the liquid level, and such high portions of the vane being made up of at least one full turn and sufficient additional part of a turn to dispose the forward edge of each high vane in radially offset relationship to its back edge, whereby the front or the back portion of the high vane blocks the

5 flow of liquid maintained in the section preceding it, the said portions of the drum succeeding the rinsing, chromic acid and oil treatments being perforated to permit of drainage of liquid from the parts after they have been subjected to such operations.

NATHAN RANSOHOFF.