This invention relates to the art of cleaning tubes, particularly metal tubes, or other elongated objects having substantially cylindrical outer surfaces such as round bars and kindred objects.

The primary object of the invention is the provision of an improved machine for the purpose stated which is capable of performing the stated function in a more expeditious and economical manner. Another object of the invention is the provision of an improved apparatus which is simple in design, economical to construct and which is capable of cleaning large amounts of tubes in a short time and in a satisfactory manner.

A still further object of the invention is the provision of an improved arrangement for rotatively mounting the brushes so that the brushes are readily adjustable for work on different diameters of tubes or rods and the blasing of such brushes toward the center of the tubes or rods is simplified.

These and other objects and advantages of the invention will become apparent from a consideration of the accompanying drawings and the following detailed specification wherein there is specifically disclosed a preferred embodiment of the invention.

In the drawings:

Figure 1 is a plan view of a machine constructed according to the principles of my invention and operative to carry out my improved method;

Figure 2 is an end elevation of a brushing drum of the machine of Figure 1, the view being taken as indicated at II—II of Figure 1;

Figure 3 is a longitudinal sectional view taken through one of the drums along the line III—III of Figure 2;

Figure 4 is an end view of a modified form of cleaning drum assembly embodying the novel tube cleaning apparatus of my invention; and

Figure 5 is a side view of the apparatus of Figure 4.

The apparatus of the invention, in its preferred embodiment, consists essentially of a plurality of rotating brush holding drums 20, at least one of which is provided with very stiff brushes, preferably of wire, for the purpose of cleaning the pipe or other round object passing through the machine and at least two of the drums carrying brushes for the purpose of smoothing and working the coating material into the outer surface of the pipe or other object, and of means to conduct a quantity of coating ma-

terial onto the pipe or object intermediate the drums. Drums 20, being cylindrical, are rotatably supported between the various sets of wheels 14—18, each set comprising eight wheels for the support of one drum.

The apparatus is mounted on a suitable base 10 upwardly from which extend the plate-like supports 11 each of which is provided with four attached bosses 12 circularly arranged substantially about the center of the support. Each of the plates 11, together with their attached bosses, are identical and when assembled on the base, as indicated in Figure 1, provide for the rotatable support of the shafts 13 upon which the wheels 14—18 are mounted. Each of the four wheels designated 15 of each set is provided with a flange 16 to engage an end of the drum carried by the set to prevent axial movement of the drum in the direction of this end. To prevent axial movement of the drums in their opposite directions each drum is provided with an encircling flange 21 which abuts against the adjacent side edges of the wheels 14 of the sets.

Referring now to Figures 2 and 3 of the drawings, which illustrate in a detailed manner the construction of the drums and the manner in which the brushes are supported thereby, the drums are provided at their ends opposite the ends which engage the flanges 15 with an interior and exterior flange formed by welding or otherwise suitably securing the annular plate 23 to the end of the drum. Extending axially outward from the inner flange provided by plate 23 are the pins 37 on which the brush carrying members 32—34 are adapted to be pivotally mounted. The brush carrying members, of which there are preferably four for each drum, each consists, as shown, of an angle bar section 33 pivotally mounted on a pin 37 and extending radially outward therefrom, a portion 32 secured to the inner end of portion 33 and extending along a chord of a circle passing through the outer ends of the pins 37, and a longitudinally extending portion 34 connected with the outer end of the portion 32 and extending into said drum substantially to the medial plane thereof.

The outer flange provided by the plate 23 is provided with four apertures, circumferentially spaced intermediate the pins 37 for the passage of clamping bolts 61.

A ring 24 having accurate slots 25 and outwardly extending lugs 26 is adapted to be clamped in adjusted position to the plate 23 by the bolts 61. Lugs 26 are arranged in four sets of two each positioned intermediate the four arcuate
slots 25. Threaded rod 27 passing through an aperture in the intermediate brush holder portion 33 spans the lugs of a pair, being held in position by the nuts 28 screw threaded onto the ends of the rod and engaging the outer surfaces of the lugs. Each rod is provided with a second pair of nuts 33 that are screw threaded on the ends of the rod intermediate the lugs 26. Between each of the nuts 33 and the adjacent surface of the angle 33 is a coil spring 30 encircling about the rod 27. The relative expansive forces exerted by the springs 30 are adjustable by rotation of the nuts 33 and with all the parts properly adjusted the four brushes 36, carried by their holders 32–34, will all be equidistant from the axis of rotation of the drum on which they are mounted.

The above described construction provides an arrangement whereby each of the brushes of the drum may be simultaneously and uniformly moved toward or away from the axis of rotation of the drum and this is effected by loosening the bolts 61 and rotating the ring 24 relative to the plate 23. Arcuate slots 28 in plate 24 allow such adjustment to take place and as the ring is rotated relative to the plate the angles 23 will be rotated about the pins 37 due to the tendency of the springs 30 on either side of the angles 33 to balance their expansive forces exerted. Upon completion of the adjustment the ring 24 may be locked in position relatively to plate 23 by tightening the bolts 61. This arrangement provides for the rapid readjustment of the machine to accommodate tubes or other round objects of different diameters and provides a satisfactory arrangement for varying the pressure of the brushes 36 on the pipe or tube collectively and individually.

Supports 11 and consequently drums 23 are preferably located on the base in the relative positions shown in Figure 1, i.e., with one drum at the material entering end of the machine and two drums at the material leaving end of the machine and means intermediate the single drum and pair of drums to deposit coating material on the object. The latter means may consist simply of a reservoir 51 conveniently supported from a plate 41 utilized in the support of the single drum and a valved outlet 52 communicating with the lower portion of reservoir 51, the outlet being positioned directly over the pipe or other object passing through the machine. The brushes carried by the single drum 20 at the entering end of the machine are very stiff, being preferably constructed of wire, to remove scale and other loose foreign matter which may be on the pipe or other object. While the brushes carried by the two drums at the leaving end of the machine are softer for the purpose of suitably smoothing the coating material deposited on the pipe and working the material into the irregularities and crevasses of the surfaces of the pipe.

Brush carrying drums 20 are intended to be continuously rotated during operation of the machine and for this purpose the drive now to be described is provided. Suitably mounted in bearing blocks 41 supported by the base 10 is a shaft 10 having keyed thereon a pulley 42 driven by motor 44 through a belt system 43. A second pulley 45 is keyed on shaft 40 and a belt 46 is arranged to interconnect pulley 45 with a pulley 22 on the single drum 20. By referring to Figure 3, it is apparent that the pulley 22 consists simply of an outer grooved ring which may be slid over an end of the drum and fastened to the drum by welding or other suitable means. A third pulley 49 is keyed to shaft 40 and is connected with pulley 22 of one of the coated brushing drums 20 by the belt 50.

I have found it very desirable to utilize two revolving brush assemblies for smoothing and working the material into the surface of the pipe being coated and to rotate the two assemblies in opposite directions and, therefore, in accordance with the present invention, the two brush carrying drums at the leaving end of the apparatus specifically disclosed are arranged to be rotated in opposite directions. This is accomplished by providing a pair of spur gears, indicated generally at 47, one of which is keyed to the shaft 40 and the other of which is keyed to shaft 51 on which is fastened the pulley 52. A belt 53 interconnects pulley 52 and the pulley 47 on the adjacent drum and it should be obvious that since gears 47 reverse the rotation of the shaft 40, the shaft 51, and consequently its connected drum, will rotate in a direction opposite to that in which the shaft 40 and the drum connected with shaft 40 will rotate. Pulley 49 will rotate larger in diameter than pulley 49 to provide a greater speed of rotation for the cleaning drum than for the first paint smoothing drum. If reduction is secured in gears 47, as illustrated, pulley 52 may be of larger diameter than pulley 49 to compensate for the speed ratio between shafts 40 and 51 whereby the two paint smoothing drums will rotate at approximately the same speed.

The operation of the apparatus described above should be fairly apparent. The adapter 48, or other round material to be primed or coated, is conveyed to the machine by suitable conveyors leading to adjacent the machine and the pipe or material first passes through the rapidly revolving cleaning drum, the stiff wire brushes of which are operative to remove loose scale and other foreign matter adhering to the outer surface of the material and as the material passes below outlet 52 of reservoir 51 a quantity of priming or coating material will flow thereon and be carried along with the material into the paint distributing and brushing drums 20. Where the priming or other material previously deposited on the pipe will be distributed evenly over the outer surface of the pipe and thoroughly worked into all irregularities and crevices existent on the surface of the pipe.

By employing the pair of drums rotatable in opposite directions the formation of spiral ridges and other unevenness in the distribution of the paint on the surface of the pipe will be obviated and, if the set of brushes of the first drum fails to thoroughly work the paint into the ridges or irregularities of the pipe, as may occur due to the particular direction of depth which such ridges or irregularities might have, the set of brushes carried by the second drum and rotatable in the opposite direction will correct such deficiency and insure the very thorough and uniform coating of the pipe. Because of the unitary and self-contained nature of the apparatus employed to carry out my method of treating pipe, the apparatus is readily transportable from place to place to treat pipes and other round objects at different miles or other locations. The alignment of the various drums is permanently fixed and therefore the installation of the machine in connection with existent pipe handling apparatus is facilitated. The brush sets in any particular drum are readily interchanged simply by remov-
ing the retaining pins in the outer ends of the pivot pins 31 and unfastening bolts 61, which operations will allow the entire brush supporting and biasing assembly to be withdrawn from the drum. In addition, the brush adjusting means previously described allows ready adjustment to compensate for wear of the brushes or for different conditions of material encountered as well as provided for the handling of stock of varying diameters.

Figures 4 and 5 illustrate a modified form of apparatus for cleaning the tubes preparatory to their coating, which apparatus may be substituted for the stiff brush carrying drum in the apparatus of Figure 1. The modified form of cleaning device may, in its preferred embodiment, consist of arms indicated generally at 70 pivotally mounted on the pins 37 in place of the arms 32—34 of the form first described. Arms 70 each consist of an outwardly extending portion 72 and an inwardly extending portion 71 and a portion 73 extending from the inner end of the portion 71 wherein a line parallel with the axis of rotation of the drum 20. Journelled in each of the arm portions 73 is a shaft 75 on which may be loosely mounted a plurality of spaced cutting wheels 76, the latter being preferably toothed or knurled to provide cutting edges for engagement with the tubes being cleaned. Shafts 74 extend outwardly from the free end of the portion 73 and on the extending ends the shafts 74 so provided a conical shaped cutter 76 may be provided.

Extending laterally outward from the end of each of the arm portions 72 is an arm 77 carrying at its outer end a weight 78. Inasmuch as the arms 70 are mounted similarly to the arms 32—34 of the first form specifically described manipulation of the nut 68 and the action of the springs 30 will tend to keep the engaging cutters on equal radii and in engagement with the outer sides of the tube being cleaned in the manner described above in connection with the brush holding arrangement. The apparatus of Figures 4 and 5, however, provides for further inwardly directed force on the outer surface of the tube being cleaned and this is accomplished by the centrifugal forces exerted by the weight 78 as the drum is rotated during operation of the machine. The force exerted will be proportional to the speed of rotation of the drum.

The brush or cutter carrying arrangement specifically described above enables the brushes and/or the cutters to be positioned either within or without the drum to which they are pivotally mounted and the shape of the arms 32—34 and 70 is such that with the brushes or cutters positioned inside the drums a considerably smaller diameter tube can be processed than would be the case if the arms were reversed in position to place the brushes or cutters outside of the drums.

The above specifically described embodiment of the invention should be considered as illustrative only as obviously many changes may be made therein without departing from the spirit or scope of the invention the extent of which is indicated in the subjoined claims.

What I claim is:

1. Apparatus of the character described comprising a base, a plurality of longitudinally aligned laterally extending supports on said base, longitudinally aligned apertures in said supports, longitudinally extending shafts circumferentially spaced about the axis of said apertures and carried by said supports, wheels carried by said shafts adjacent each support, a plurality of longitudinally aligned drums rotatably mounted within said apertures between said wheels, said drums being supported on and laterally confined by said wheels, brushes carried interiorly of said drums to engage the tubes or other objects passing therethrough, and means to rotate said drums.

2. Apparatus according to claim 1 further including flanges on certain of said wheels to engage one end of each of said drums to prevent axial movement of said drums in one direction.

3. In apparatus of the character described, means to rotate said drums and a plurality of inwardly directed circumferentially spaced brushes for rotation about an axis passing through the geometric center of the pattern of said brushes comprising an annular member mounted for rotation about said axis, a plurality of pivot pins parallel with said axis mounted on the inner portion of said annular member, a ring mounted on the outer portion of said annular member, inwardly extending brush carrying arms pivoted on said pins and having resilient connection at their outer ends with said ring, and means to clamp said ring to said annular member in adjusted angular relation.

4. Apparatus of the character described comprising a rotatable member, a plurality of circumferentially spaced pivots carried by said member, an arm carried intermediate its end on each of said pivots, a cleaning tool carried by the inner end of each of said arms, a counterweight carried at the outer end of each of said arms, a ring on said member, means to secure said ring in an adjusted rotational position relative to said member, threaded rods chordally mounted on said ring, an aperture in each of said arms intermediate its pivot and counterweight through which one of said rods passes, a pair of coil springs on each of said rods, one on either side of the adjacent arm, and a nut threaded on each of said rods at the outer end of each of said springs.

5. Apparatus of the character described comprising a rotatable member, a plurality of circumferentially spaced pivots carried by said member, an arm carried intermediate its end on each of said pivots, a cleaning tool carried by the inner end of each of said arms, a counterweight carried at the outer end of each of said arms whereby said tools will be urged into engagement with a round object positioned centrally of said member upon rotation of said member, resilient means to oppose the centrifugal forces exerted by said counterweights, and means to vary the effectiveness of said first mentioned means.

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