This invention relates to rotary ore, stone or gravel washers or scrubbers and to a method of scrubbing such materials, and is particularly adapted for the removal of adherent clayey material from various gravels or ores.

Among the objects of this invention are to provide a rotary scrubber for efficiently scrubbing gravel and ore; to provide a scrubber with countercurrent flow of ore and washing liquid and in which the ore at the feed end of the drum projects upward beyond the level of the liquid at the feed end; to provide a scrubber in which lifting ribs are utilized to raise the ore and shower it down to impact other ore which projects upward beyond the level of the fluid; and to provide a method involving the maintenance of ore at a higher level than the liquid at the feed end of a countercurrent rotary scrubber, while showering ore on the projecting mass of ore.

Other objects will appear from the following description taken in conjunction with the drawing, wherein Fig. 1 is a central vertical section of a scrubber constructed in accordance with this invention; and Fig. 2 is a sectional view taken along line II—II of Fig. 1.

The scrubber of this invention comprises a rotary drum 10 which may be lined as shown at 11. The drum 10 is shown as being supported on two end trunnions 12, 13, and may be rotated by any known means, not shown. Interiorly of the drum and adjacent the feed end are arranged a plurality of helical ribs 15 which may extend throughout the length of the drum. In the particular structure disclosed, the helical ribs are limited to the feed end of the drum, the remainder of the drum being provided with longitudinal ribs 16. The ore, gravel, stone, etc., hereinafter referred to as "ore," is conducted into the drum at the feed end by spout 17 which passes through feed trunnion 12. The feed trunnion is provided with an annular grate or grid 18 for retaining a desired level of ore at the feed end of the drum while permitting discharge of washing fluid therethrough. The discharge end of the drum is provided with a central opening 19, the diameter of which is intermediate the diameter of the feed trunnion opening and the central aperture 20 in grid 18.

A cylindrical screen or trommel 22 is carried by the discharge trunnion 13, the material passing through the cylindrical screen entering hopper 26, while the oversize passes into duct 24. A pipe 25 carrying water or other washing liquid passes through trunnion 13 and discharges washing fluid within the cylindrical screen and within the drum adjacent the discharge end thereof.

As illustrated, rotary drum 10 is substantially horizontal. Since the inner edge of grid 18, determined by aperture 10, is at a higher elevation than the edge of opening 19 at the discharge end of the drum, a gradient of ore within the drum is established, and the ore gradually passes from the feed end to the discharge end, being scrubbed of its adherent material as it passes through the drum. While grid 18 retains the ore at the feed end of the drum, it permits water to pass therethrough. Since the opening in the feed trunnion 12 is larger in diameter than the discharge opening 18, washing fluid or water will flow countercurrent to the path of the material and will be discharged at the feed end of the drum, where it is carried away by launder 26.

Due to the presence of grid 18 at the feed end of the drum, the level of ore within the drum at the feed end is higher than the water level therein, which is determined by the periphery of the grid. Therefore, material which is elevated by ribs 15 and showered down during rotation of the drum is caused to fall on and impact the projecting bed of ore without its fall being broken by liquid in the drum. This aids in separating the adherent material from the ore. The lifting ribs 15 are shown as being helical adjacent the feed end in order to expedite the removal of the material from the feed trunnion. It is usually not necessary to make the lifting ribs helical throughout the length of the drum, since the ore should be permitted to remain within the drum long enough to be washed of its adherent clay. During its passage through the body of the drum, the ore is thoroughly separated from the material adhering thereto. While some ore at the feed end projects beyond the level of the liquid in the drum, the scrubber of the invention insures the presence of a minimum amount of washing fluid within the drum at all times.

While a specific embodiment has been disclosed, it is obvious that the method may be practiced with any other structure provided that the level of ore at the feed end of the mill is maintained at a higher elevation than the level of water passing through the ore countercurrent to the flow of the ore. Preferably some means should be provided for lifting and showering some of the ore upon that portion of the ore projecting out of the liquid.

It is claimed and desired to secure by Letters Patent:

1. A scrubber comprising a rotatable substan-
tially horizontal imperforate drum having a feed end and a discharge end, means at said feed end limiting the maximum level of ore therein and preventing the discharge of ore at said feed end, a second means at said feed end for maintaining the level of liquid therein above the bottom of said drum, said maximum liquid level being lower than said maximum ore level, and a third means at said discharge end for determining the maximum level of both ore and liquid therein, said discharge end maximum level being intermediate the maximum liquid and ore levels at said feed end.

2. A scrubber comprising a substantially horizontal rotatable imperforate drum having a feed end and a discharge end, means for feeding ore into the drum at said feed end, gravity overflow means for discharging treated material from said discharge end, means for maintaining a gradient of ore sloping downward from the feed end to the discharge end, means for admitting washing liquid into said drum adjacent the discharge end, means for discharging said washing liquid adjacent said feed end and at a level spaced from the lowest portion of said drum at said feed end, and means for maintaining the normal level of ore adjacent the feed end above the maximum liquid level at said feed end and preventing the discharge of ore at said feed end.

3. A scrubber comprising an imperforate rotatable drum having a feed end and a discharge end, a central aperture adjacent the feed end, an annular grid extending inward within said aperture and provided with a central passage; and a central aperture adjacent said discharge end, the diameter of said discharge aperture being intermediate the diameter of said feed end aperture and said grid passage; hollow lifting ribs within said drum adjacent said feed end, and longitudinal lifting ribs within the intermediate portion of said drum.

4. A scrubber comprising an imperforate rotatable drum having a feed end and a discharge end, an imperforate wall adjacent the feed end provided with a central aperture, an annular grid extending inward within said aperture and provided with a central passage; and an imperforate wall adjacent said discharge end provided with a central aperture, the diameter of said discharge aperture being intermediate the diameter of said feed end aperture and said grid passage, and lifting ribs within said drum adjacent said feed end.

5. A scrubber comprising an imperforate rotatable drum having a feed end and a discharge end, an imperforate wall adjacent the feed end provided with a central aperture, an annular grid within said aperture and provided with a central passage; and an imperforate wall adjacent said discharge end provided with a central aperture, the diameter of said discharge aperture being intermediate the diameter of said feed end aperture and said grid passage.

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