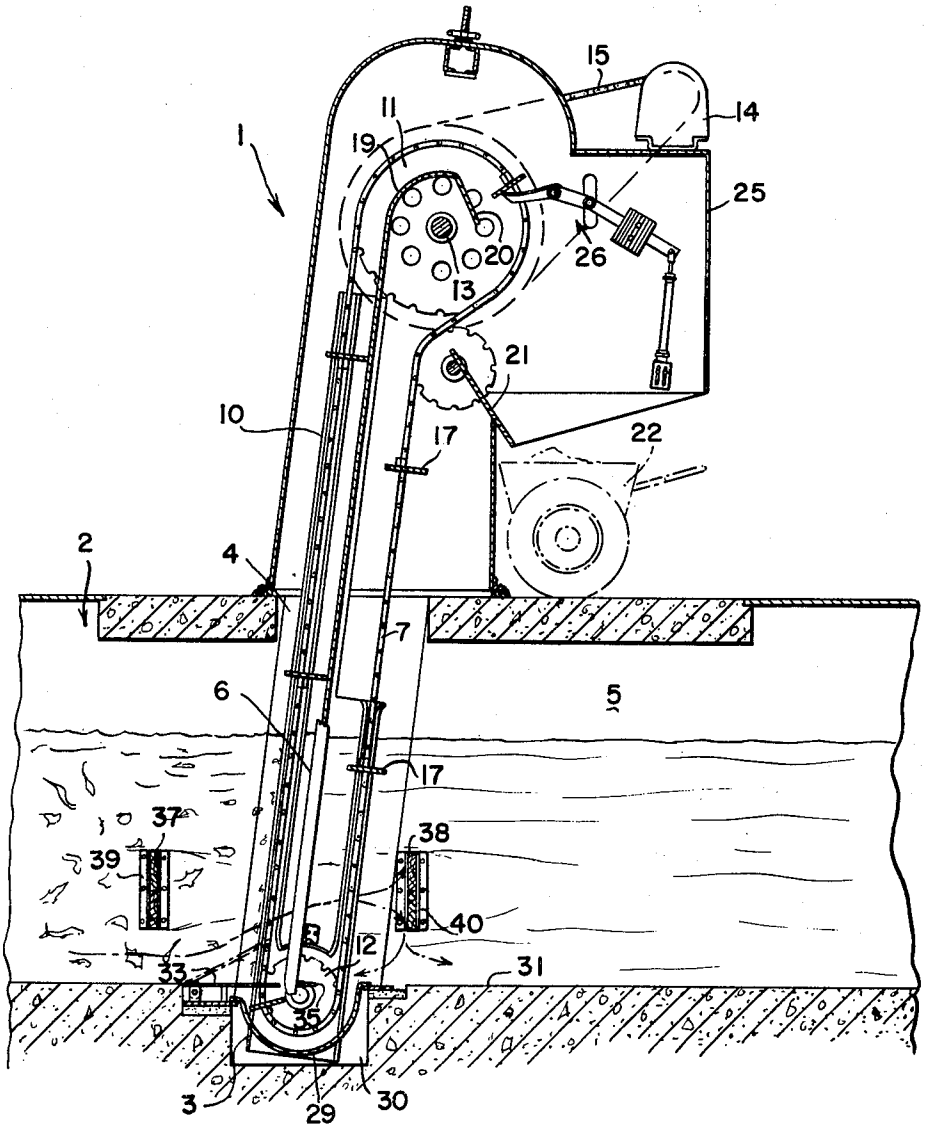
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BAR SCREEN WITH VELOCITY-CONTROL BAFFLES

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BAR SCREEN WITH VELOCITY-CONTROL BAFFLES

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This invention relates to sewage screening apparatus and particularly to the channel in which the screen is disposed. The screen comprises a series of rigid, spaced, parallel bars disposed in the chanel to intercept the debris which is carried with the sewage to the treatment plant. The bars are set nearly vertical so that the debris may be removed mechanically by rakes moving upwardly over the front side of the bars. The preferred mechanism returns the rakes downwardly behind the bars and moves them under the lower ends of the bars to their front side. The floor of the channel in which the screen is set is accordingly recessed to allow the rakes to move under the bars. The recess is preferably closed in front of the bars by a movable plate which is pivoted out of the path of and by each rake as it moves upwardly from the recess. Normally any sand in the recess is removed by each rake. A serious difficulty is frequently presented whenever the recess fills with sand carried with sewage faster than the sand can be removed by the rakes. In most instances such sand is the soil which is carried with the storrm water entering city street catch basins.

Attempts to adjust or set the cross-section of the channel to provide a velocity which will somehow lift the sand over the recess have not been satisfactory because the volume of the flow which must pass through the channel and screen varies greatly and the necessary restriction at low flow rates causes too high a head loss at the high flow rates.

When an adjustable baffle is set in front of the screen the flow under the baffle has a sufficiently high velocity and might carry an appreciable portion of the sand over the recess. However, the eddy currents caused by the baffle allows the sand to settle and pile up immediately behind or downstream from the recess. Eventually, the accumulated sand becomes an obstruction to the flow causing the oncoming sand to fill the recess. Where the pivoted plate, referred to, is in use, the severe eddy current caused whenever the plate is raised as described, also sweeps the accumulated sand back into the recess.

The present invention is based upon the discovery that two such baffles will provide the desired velocities where required without involving a head loss significantly greater than that due to a single baffle and will provide some particular, unexpected advantages, as will be described.

According to the present invention the screen is set between two fixed baffles in the channel which cooperate to maintain a high velocity over the recess at all flow rates. The baffles are spaced and set at critical heights from the floor of the channel and sufficiently below the water level at the low flow rate so that at high flow velocities most of the sewage flows over the baffles but an adequate velocity is nonetheless maintained beneath the baffles and the sand is carried over the recess.

The rear baffle is placed as near to the recess as the downward return run of the rakes allows and the baffle prevents the accumulation of sand near the recess. When the hinged plate is raised, the rear baffle is then in the direct line of the flow over the plate and deflects the flow downwardly so that the floor of the channel and the recess are periodically swept by a high velocity current which further aids in keeping the channel free of sand.

The drawing furnished herewith illustrates the best mode

of carrying out the invention as presently contemplated and set forth hereinafter. In the drawing the single figure is a longitudinal section through the channel and bar screen and shows the velocity pattern of the flow against the rear baffle when the hinged plate is in the raised position as shown in broken lines.

The bar screen unit 1 is set in the channel 2 of concrete construction. A side frame member 3 on each side of the screen fits within a corresponding recess 4 in the side wall 5 of channel 2 and is set at a slight angle so that the front side of the screen 6 in the channel flow faces slightly upwardly.

A chain 7 on each side of the screen operates within guide means 10 associated with each frame member 3 and over the aligned upper and lower sprockets 11 and 12, respectively. Each drive sprocket 11 is mounted on the head shaft 13 which is driven by the motor 14 and chain drive 15. The rakes 17 which may be similar to that shown in U.S. Latters Patent No. 2,978,105, for example, are fixed at each end at spaced intervals to a chain 7 and have teeth which enter and fit between the spaced vertical bars comprising the screen 6 as each rake moves beneath the screen around the foot sprockets.

As each rake 17 moves upwardly, it pushes the debris collecting on the screen up to the deadplate 19 which extends upwardly over the drive shaft 13 to the apron 20. The debris falls from apron 20 onto slide 21 and into the cart 22 (shown in broken lines) for transport to a disposal means. The housing 25 is provided particularly to enclose the rake-wiping mechanism 26 which, as shown, is similar to the subject of the patent referred to.

The lower end of screen unit 1 includes the curved boot plate 29 which is shown in section and is set in the recess 30 formed in floor 31 of channel 2. Boot plate 29 is located to provide a fixed and predetermined clearance for each rake 17 moving around lower sprocket 12. The pivot plate 33 is set flush in floor 31 of channel 2 to extend over boot plate 29 up to screen 6 and pivotally secured so that as each rake 17 moves upwardly, the rake can lift the plate upwardly to the position shown in broken lines and out of the way of the rake's path. A second fixed plate 35 rearwardly of screen 6 is desirable to keep some sand and particularly larger objects from entering the boot plate 29 or recess 30. However, this plate cannot interfere with or prevent the downward movement of the rakes 17. The baffles 37 and 38 are located respectively forwardly and rearwardly of the screen unit and may be of any suitable construction. As shown, the baffles comprise wood planks fitting and secured between the iron flanges 39 and 40.

In the operation of the screen at a high flow which would be in the range of three feet per second, the designed water depth may be anywhere from five feet to ninety feet. Baffles 37 and 38 should be about one foot from the floor 31 of the channel and for the water depths mentioned would need to be, very approximately, between one and one-half feet and three feet in height. The actual dimensions would depend, of course, on the conditions of channel flow when the greatest accumulations of grit might occur.

The baffles should be as close together as possible, and normally would not need to be more than about four feet apart in the largest installations.

At low flows, much less grit is included but a minimum velocity of the flow at around two feet per second is necessary or desirable and is readily provided by the baffles over the floor and recess therebetween. Each time a rake 17 lifts plate 33 to the position shown in broken lines the flow is deflected upwardly and strikes the rear baffle 38 to provide a very different flow pattern as shown and some scouring of the recess 30 or boot plate 29. The periodi-

cally altered flow pattern also helps to keep the lower mechanism clear of grit.

At high flow rates the same scouring action is provided and the velocity of the flow over recess **30** or boot plate **29** is normally between two and three feet per second. The flow along the floor is maintained at or near this velocity up to the screen. The velocity through the screen is necessarily increased by the restrictions of the bar of the screen. According to the invention, the velocity at the floor is similarly increased ahead of and immediately behind the screen so that the grit is carried over the recess and accumulation of sand on floor **31** of the channel near recess **30** is thus also prevented.

In some channels the floor **31** behind or downstream from the screen may be lower than the floor of the channel extending up to or upstream from the screen. In such a construction the step as formed has the same location as recess **30** respecting the screen and the path of the rakes **17** may be similarly obstructed by excessive accumulations of grit at the step which is the equivalent of a recess.

Various modes of carrying out the invention are contemplated as within the scope of the following claims particularly pointing out and distinctly claiming the subject matter which is regarded as the invention.

We claim:

1. In combination with a bar screen and means defining a channel to direct flow through the screen, said channel means including a floor having a recess extending across the channel, said screen including rakes having means for moving the same around the lower end of the screen to a position in front of the screen for subsequent upward movement to remove the debris from the screen and the channel, said channel further including means which partially close said recess in its normal position and which is movable to a second position allowing for said movement of said rakes; first and second vertical baffles extending across the channel respectively and directly in front of said means and directly behind said recess and bar screen, said baffles being spaced from each other and below the level of the flow and from the floor of the channel so that at any given channel flow and velocity the flow beneath and between the baffles is of sufficient velocity to transport at least most of the sand over said recess irrespective of the rate of flow over the baffles.

2. The invention of claim **1** wherein the means for partially closing said recess includes a pivot plate set in the floor of the channel and extending over the recess up to the screen, said plate being pivotally secured so as to be movable out of the path of and by each rake moving upwardly in front of the screen.

3. The invention defined in claim **2** wherein the pivoted plate when moved out of the path of and by each rake moving upwardly in front of the screen directs the flow beneath said first baffle against the second baffle which second baffle deflects the flow downwardly so that the floor of the channel and the recess are periodically swept by a high velocity downward current which further aids in keeping the recess free of sand.

4. In combination with a bar screen and means defining a channel to direct the flow through the screen from the front side thereof to the rear thereof, said bar screen including rakes having means for moving the same around the lower end of the screen to a position in front of the screen for subsequent upward movement to remove the debris from the screen and the channel, said channel having a floor including in front of said screen normally extending up to the lower ends of the screen and movable to allow for said movement of said rakes; first and second vertical baffles extending across the channel respectively and directly in front of said means and directly behind said screen, said baffles being spaced from each other and below the level of the flow and from the floor of the channel so that at any given channel flow and velocity the flow beneath and between the baffles is of a higher velocity to correspond with the increase in velocity effected by the screen and thereby provide a minimum adequate velocity to prevent the excessive settling and accumulation of grit on the floor of the channel immediately behind the screen and in the path of said rakes and irrespective of the rate of flow over said baffles.

5. The invention of claim **4** wherein said floor means comprises a pivoted plate which is flush with the floor of the channel in front of the screen and is pivotally secured in the channel along the forward edge of the plate respecting the channel flow so as to be movable by and out of the path of each rake as the rake moves upwardly in front of the screen to clean the same.

6. The invention of claim **5** wherein a plate extends over the recess between the screen and the downward return path of the rakes and at the level of said forward plate.

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