

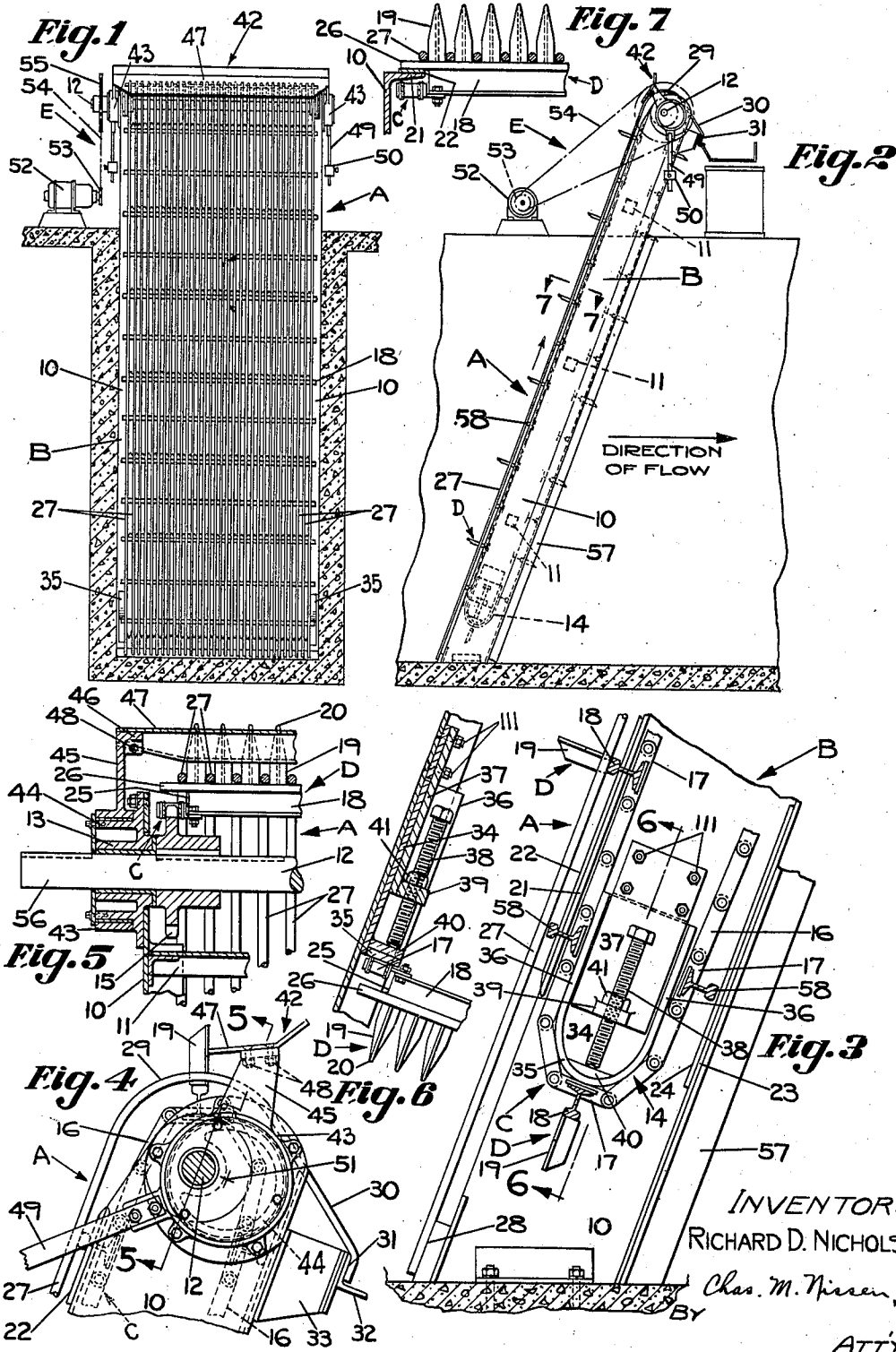
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SCREENING APPARATUS FOR LIQUIDS

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SCREENING APPARATUS FOR LIQUIDS

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1 Claim. (Cl. 210—176)

This invention relates to apparatus for collecting and removing particles of refuse or trash from a flowing stream of water, industrial waste or sewerage.

One object of the invention is to provide in the above-mentioned class of apparatus an improved screen and screen cleaning mechanism that in operation is adapted to collecting and removing from a flow of liquid relatively coarse, heavy solids.

Another object of the invention is to provide a screen and screen cleaning mechanism of sufficiently rugged design to withstand the strains and stresses produced by high rates of flow and large quantities of refuse.

Another object of the invention is to utilize an inexpensive form of screen bar, particularly as to size and shape and yet preclude breakage or clogging under conditions of flow above-mentioned.

Other objects of the invention will appear hereinafter, the novel features and combinations being set forth in the appended claim.

In the drawing:

Fig. 1 is a front elevational view of the device embodying my invention illustrating the chamber or channel in section.

Fig. 2 is a side elevation of the device of Fig. 1.

Fig. 3 is an enlarged detail sectional view showing the foot or bottom end of the screen and cleaning mechanism.

Fig. 4 is an enlarged detail view showing the head or top end of the screen and cleaning mechanism.

Fig. 5 is an enlarged cross sectional view looking in the direction of the arrows 5—5, Fig. 4.

Fig. 6 is a cross sectional view looking in the direction of the arrows 6—6, Fig. 3.

Fig. 7 is a cross sectional view looking in the direction of the arrows 7—7, Fig. 2.

Referring particularly to Figs. 1 and 2 of the drawing, the apparatus comprises a screen A mounted on a main frame B and adapted to be partially submerged in a chamber or channel through which the liquid under treatment is to pass for removal of relatively coarse solids. The main frame B is provided with suitable cross members to form a rigid box like structure and has at the top end a drive shaft and at the bottom end guides for a draft element C to which are attached rakes D adapted to interleave with the bars of the screen A, said rakes, in operation, scraping the screen and elevating collected solids to a point of discharge over the head shaft. A drive mechanism E is connected to the head or

drive shaft in such manner as to cause travel of the draft element C and rakes D.

The main frame B comprises a pair of side members 10, made of standard structural shapes or built up of plates and angles, held in spaced relation by cross supports 11 of any structural shape to form a box-like rigid frame. At the top or head end of the frame is a head shaft 12 mounted in bearings 13 bolted or riveted to the side plate of the members 10. At the foot or bottom of the frame B are positioned U-shaped guides 14 adjustable for the purpose hereinafter referred to. Trained about the sprockets 15 mounted on the head shaft 12 and the U-shaped guides 14 are the two endless strands of the draft element C, to which are attached the rakes D.

The draft element C comprises a series of plain chain links 16 and attachment links 17 connected by pintles in such manner as to provide an endless chain. The rakes D are relatively heavy steel members 18 shown in the drawing as T rails to which are attached the rake teeth 19, which may be made, as shown, of T bars and having the upper flanges sheared to form a relatively sharp point 20. The members 18 are attached to the attachment links 17 by bolts or rivets and therefore form spacing members for the chain as well as rakes. Upon the upper side of the flange 21 of the side members 10 are fixed wearing strips 22; also on the upper or inside of the lower flange 23 are wearing strips 24. The members 18 are cut away as indicated at 25 so that the ball of the T rail forms an extension 26 which rides upon the wearing strips 22 during upward movement and on the wearing strips 24 during return travel.

The screen A comprises a plurality of spaced parallel bars 27 held at the foot end of the frame B as indicated at 28 and at the top they are formed in an arcuate shape 29, the radii of which is coincident with the axis of the headshaft 12. The bars 27 are tangentially extended from the arcuate form 29, as indicated at 30, Fig. 4, to a point of attachment 31 on the cross member 32 held in spaced relation to the frame B by brackets 33. This is to allow the passage of the teeth 19 through the spaces of the bars 27 on their return travel.

It is desirable to provide means to tension the draft element C and for this purpose the U-shaped foot guides 14 are made of a flat back plate 34 with an outwardly extending flange 35 shaped at the bottom of the U to provide a guide of substantially the same radii as the pitch line

of the sprockets 15 on the head shaft, and vertical flanges 36. Fixed to the side members 10, as by bolts 111, are plates 37 the lower portion of which forms a slot adapted to receive the plate 34 of the guide 14. The U shaped guide 14 is prevented from moving laterally or from tilting movement by the plate 37 engaging the back plate 34 and/or the flanges 36. Screws 38 extend through threaded apertures of the lugs 39 fixed to the lower end of the plates 37 and engage bosses 40 in the bottom of the U-shaped members 14. Rotation of the screw 38 in one direction causes longitudinal movement of the guide 14 relative to the plate 37 to tension the chain. A lock nut 41 fixes the guide 14 in any adjusted position.

To remove the screenings carried by the rakes D there is provided a wiper generally indicated at 42, Fig. 2. This wiper comprises supporting rings 43 journaled on hubs 44, Fig. 5, of the head shaft bearings 13 and having radial arms 45 terminating in flanges 46 to which the wiper blade 47 may be attached for example by means of bolts 48. Opposite the radial arms 45 are positioned counterweight arms 49 carrying counterweights 50 the purpose of which is to return the wiper to the position shown in Fig. 2 each time it is released by the rakes D. The arms 49 are located on opposite sides of the main frame B.

Referring to Fig. 4 it will be noted that the pivot 51 of the wiper 42 is offset from the axis of the head shaft 12. In operation the rakes D move upwardly along the screen bars 27 and pass around the head shaft 12, in their travel they engage the bottom edge of the wiper blade 47 and move said blade and the supporting arms 45 about the pivot point 51 which causes the wiper blade to move outwardly over the rake teeth 19 to clear them of their load of screenings. When the rakes D have reached a point in their travel about the head shaft 12 such that the wiper blade 47 passes over the end of the teeth, the counterweights act to return the wiper to the position shown in Fig. 2 where it is ready to wipe the next rake. The teeth 19 pass through the bar spacings and go to the bottom guide 24 in an endless path for completion of another cycle.

The drive may be of any type that will cause relatively slow rotation of the head shaft; it is shown herein as a motorized gear reducer 52 having a sprocket 53 fixed to its extension shaft and connected by a chain 54 to a sprocket 55 mounted on an extension 56 of the head shaft 12.

For the screening of sewerage flows that may contain large quantities of large and/or heavy particles it is necessary to provide relatively closely spaced supports for the screen bars. The bars 27 are generally one half inch to one inch in diameter; therefore they are not sufficiently rigid to withstand the bending occasioned by wide differences in water level unless cross supports are provided at relatively close spacing. The rakes D perform two functions in this design; they not only remove the solids collected by the screen but by contact with the bars 18 provide a backing for the screen thereby preventing undue bending of the bars 27 in the direction of flow. By projecting the teeth 19 through the spaces of bars 27 from the back side of the screen, looking in the direction of flow, the teeth 19 of the rake 18 become spacers for the bars 27 and keep them in proper alinement thereby maintaining a substantially definite spacing al-

though using an inexpensive inherently flexible member for the screen bars.

This screen except for the drive may be completely assembled at the factory and shipped as a unitary structure. Installation consists merely of placing the angles 57 or like members on the inner side walls of the channel and sliding the screen into position for resting on the members 57 after which the unit is connected with the power as above noted. The unit is installed, as shown in the drawing, Fig. 2, with the screen bars at the front or nearest the influent end of the channel. The rakes in passage about their orbital path enter the screen bar spacings from the back and in travel along the screen pick up screenings deposited on or in front of the screen, elevating them and finally discharging them as the rakes pass the head shaft.

It will be noted that the bars 27 cannot be tied together or supported by means fixed to the frame at points other than at each end. An unsupported bar of a length of say twelve feet designed to withstand the enormous bending stresses developed by water pressure which builds up with clogging of the screen would have to be of rectangular cross section about five-eighths inch thick and three inches wide and set edge-wise so that the five-eighths inch face is presented to the flow. Utilizing the novel feature of construction herein shown, a round bar so small as one half inch in diameter may be employed under the same conditions. This bar is inherently flexible; therefore the invention includes the use of the traveling rakes to form a backing supporting the round bars at relatively close spacing and thereby gaining the effect of a substantially rigid bar. Also the teeth on the rakes that are interleaved with the screen bars form spacers which maintain alinement of the bars and coincidentally uniform spacing of said bars irrespective of the load of accumulated solids on the screen.

It is not necessary under all conditions of use to operate the screen cleaning mechanism continuously. During low flow or when the amount of screenings being carried by the liquid will not clog the screen and cause a differential head from influent to effluent side of the screen the rakes may be allowed to stand idle. When the screen has accumulated an amount of screenings that will cause a rise of the liquid level on the influent side of the screen of said three feet or more over the level of the liquid on the effluent side, the cleaning mechanism is started and permitted to operate until the screen is substantially clean after which said cleaning mechanism is again shut down. The control of the operation may be either manual or automatic by use of differential float operated switches such as is employed with other type screens.

In some installations it may be desirable to interpose traveling screen bar supports or T rails 58 between the rakes and in addition to the T rails 18 of the rakes. The use of the additional supports depends upon the number and spacing of the toothed rakes 18 and the quantity of screenings it is expected will be contained in the flow. All of such T rails have extensions 26 at their ends for sliding along the wear strips 22 on the flanges 21. The side members of the frame 10 therefore brace the cross-rails 18 and 58 to serve as abutments for the screen bars when the latter tend to be bent by the current or flow.

Obviously those skilled in the art may make various changes in the details and arrangement of

parts without departing from the spirit and scope of the invention as defined by the claim hereto appended, and I wish therefore not to be restricted to the precise construction herein disclosed.

Having thus described and shown an embodiment of my invention, what I desire to secure by Letters Patent of the United States is:

In apparatus for screening liquid, the combination with a screen, of cleaning mechanism there-

for comprising a rake operatively connected to draft mechanism including a driving shaft at the head end of the screen, a wiper eccentrically mounted for rotation on the axis of said shaft when engaged by said rake, and means for rotating said shaft to effect operation of said rake to clean the screen and to engage said wiper to cause the latter to clean the rake of adhering material.

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