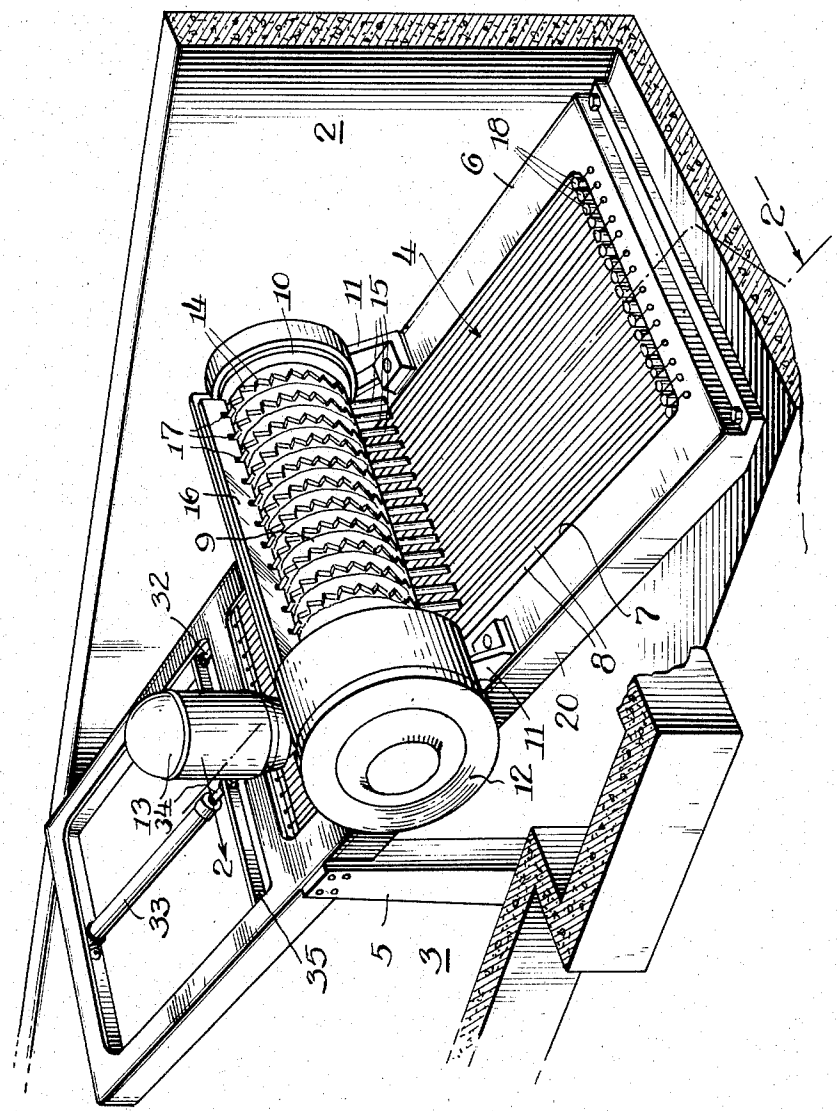
May 12, 1959 W. H. LANNERT 2,886,174

TRANSFER AND COMMINUTING DEVICE

Filed Dec. 27, 1954 3 Sheets-Sheet 1

Fig. 1



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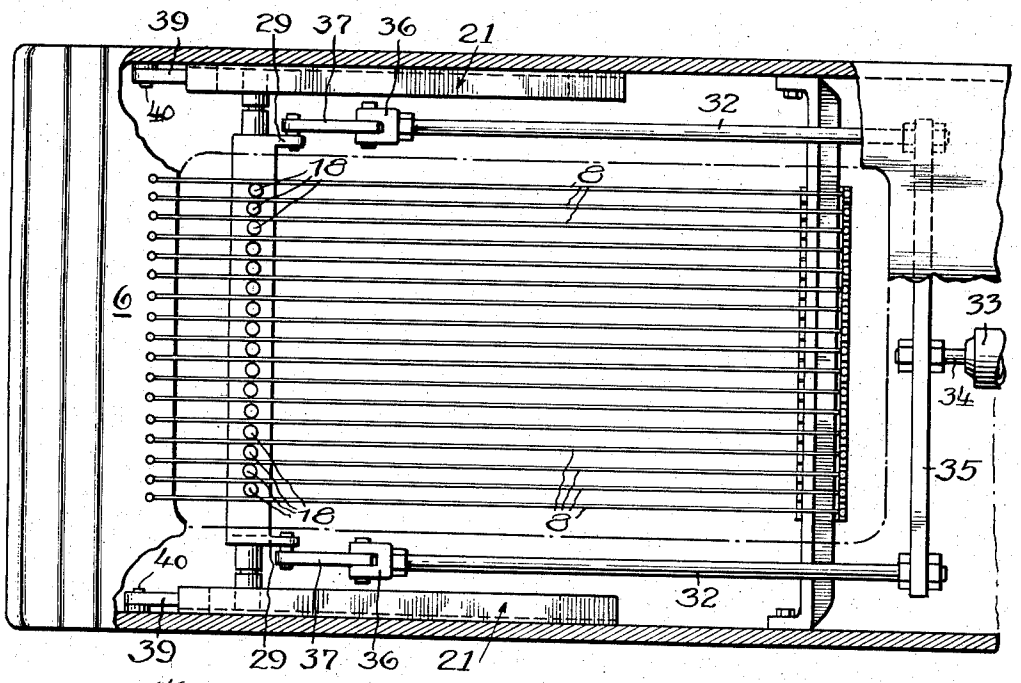


Fig. 3

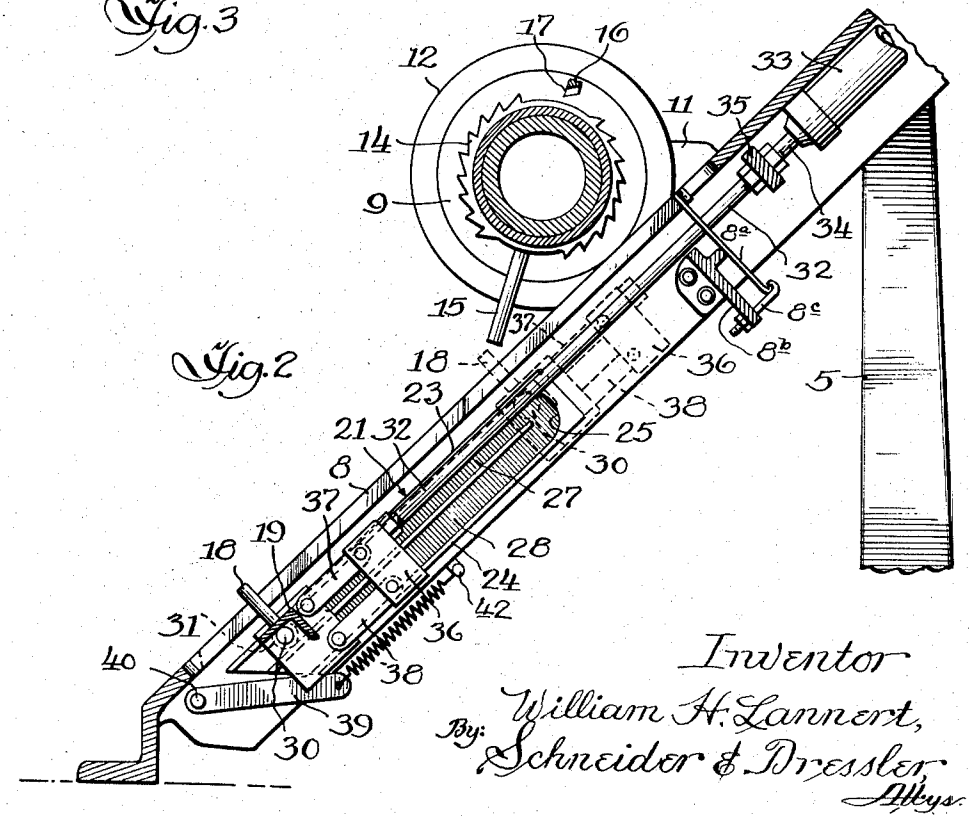


Fig. 2

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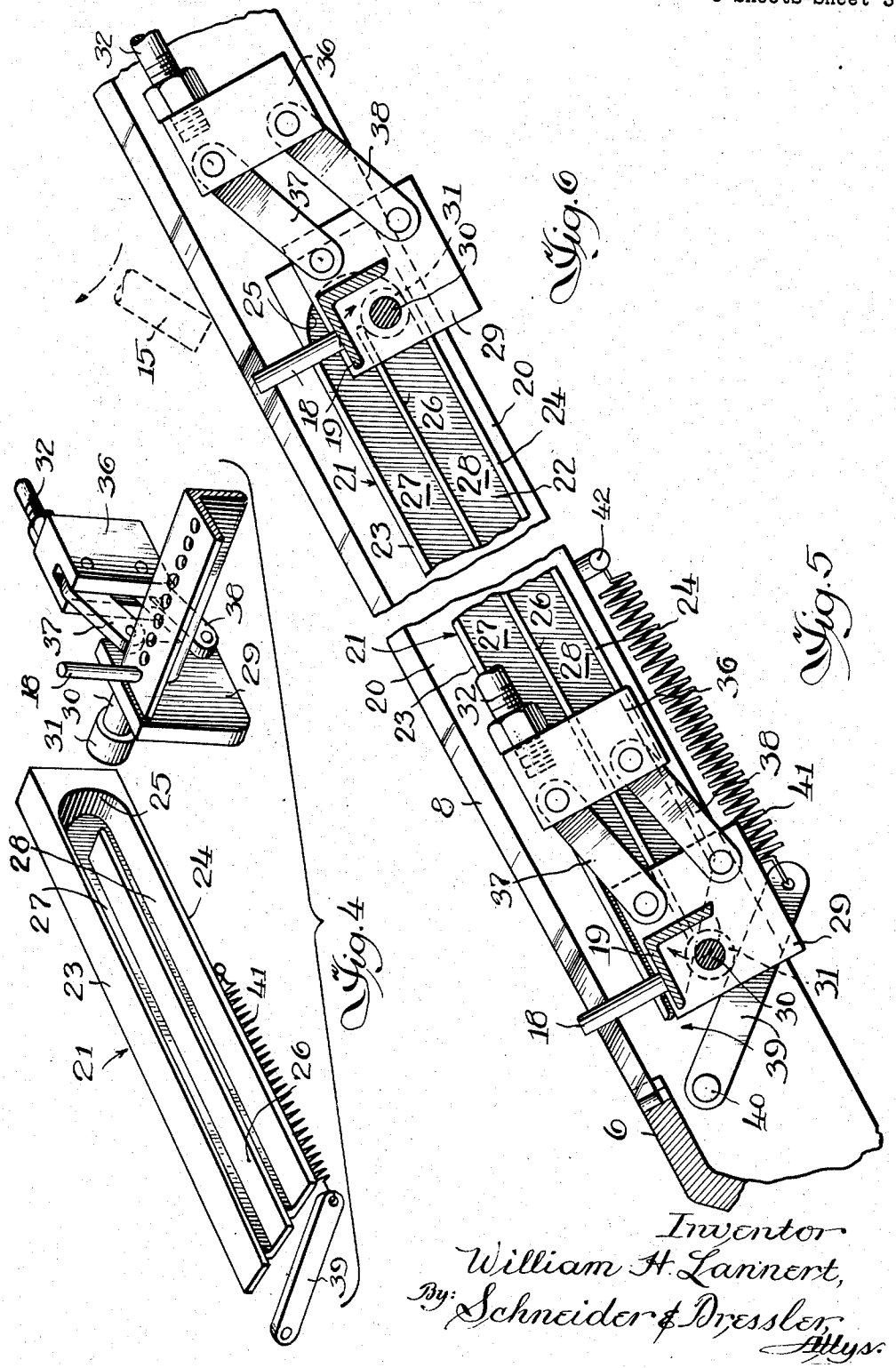


Fig. 6

Fig. 5

Fig. 4

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2,886,174

TRANSFER AND COMMINUTING DEVICE

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Application December 27, 1954, Serial No. 477,604

5 Claims. (Cl. 210—173)

This invention relates to a transfer and comminuting device, and more particularly to a helper rake for pushing solids intercepted by a screen in a flowing stream of sewage along the surface of the screen to an area from which they may be easily transferred to a comminuting device for comminution.

In accordance with the present invention, an inclined screen extending across an influent channel, through which a stream of sewage flows, intercepts all solids too large to pass therethrough. The screen comprises a plurality of transversely spaced, longitudinally extending parallel screen elements. A cutting cylinder is rotatably mounted above the screen and adjacent the upper end of the screen. The cylinder is provided with a plurality of series of laterally projecting teeth that are aligned transversely with notches provided in one edge of a comb. The teeth cooperate with the notches to comminute the solids that are interengaged by the teeth and comb. The position of the cylinder is fixed relative to the screen and therefore if the cylinder is close enough to the screen for the teeth to engage the spaces between the screen elements they can reach only the solids that have been intercepted by the screen in immediate proximity to the cylinder.

In order to bring the cutting cylinder into engagement with the solids intercepted by the screen throughout the surface area of the screen it has been proposed to have the cutting cylinder reciprocate in a longitudinal or horizontal direction adjacent the screen surface so that the entire surface area of the screen is periodically swept by the cutting cylinder. This type of structure has proved to be satisfactory in operation, but is relatively costly to make, operate and maintain, and is generally not feasible for small operations.

Another method of bringing the cutting cylinder into engagement with the solids intercepted by the screen throughout the surface area of the screen is to provide a hopper beyond and below the upper end of the screen, and to move fingers longitudinally of the screen to push the solids from the surface of the screen into the hopper. The cutting cylinder forms one wall of the hopper and is adapted to pick the solids from the hopper and transfer them to the comminuting zone.

It has also been proposed to provide the cutting cylinder with laterally projecting tines as disclosed and claimed in the copending application of Carl H. Nordell, filed December 17, 1951, under Serial No. 261,973. In this structure tines project from the cutting cylinder and rotate therewith. The tines are extended their maximum distance as they pass upwardly through the screen and are gradually retracted as they approach the comb positioned adjacent the uppermost surface of the cylinder. As the tines pass through the screen they lift solids intercepted by the screen, and these solids move downwardly towards the cutting cylinder by gravity as the tines are rotated upwardly. The necessity of retracting the tines as they pass the comb imposes a limitation on the maximum

length of the tines and, as a consequence, the tines cannot extend far enough to remove solids from the entire surface area of the screen.

The present invention contemplates the provision of means in combination with the screen and cylinder to periodically sweep or rake the screen and transfer the intercepted solids from the remote areas of the screen to the area of the screen within the range of the tines, if tines are provided, or to the range of the teeth of the cylinder, if no tines are provided, so that all the solids intercepted by the screen may be transferred to the cylinder which carries them to the cutting comb for comminution. It will be understood that if the cutting cylinder is not provided with tines it will be positioned close enough to the screen for the teeth to engage the screen surface.

The present invention contemplates the provision of a simple, inexpensive rake capable of engaging solids intercepted by the screen outside the range covered by the tines of the cylinder, or by the teeth, if no tines are provided, and moving the solids upwardly along the upper surface of the screen into the area which is reached by the tines or by the teeth. The tines or the teeth pick up the solids intercepted by the screen within the area reached by them, and the solids moved into such area by the rake. If tines are provided, their upward rotation causes these solids to move downwardly by gravity into engagement with the cutting cylinder. The teeth of the cutting cylinder carry the solids to the area adjacent the comb, and cooperate with notches in the comb to comminute the solids. The device of the present invention is particularly suitable for use in sewage operations in small cities and towns where the amounts of sewage to be treated are relatively small.

The structure by which the above mentioned and other advantages of the invention are attained will be described in the following specification, taken in conjunction with the accompanying drawings, showing a preferred illustrative embodiment of the invention, in which:

Figure 1 is a fragmentary perspective view of a channel through which a stream of sewage flows, an inclined screen extending across the channel with its screen elements spaced transversely, a rake having fingers extending between the screen elements, and a comminuting device mounted adjacent the upper end of the screen all in accordance with the present invention;

Fig. 2 is a longitudinal sectional view, taken along the line 2—2 of Fig. 1, showing the rake and the means for moving it along the screen to push solids intercepted by the screen in the area remote from the tines from such remote area to the area reached by the tines which project laterally from the cutting cylinder;

Fig. 3 is a top plan view of the screen, with parts broken away to show the means for reciprocating the rake longitudinally of the screen;

Fig. 4 is a fragmentary perspective view of one side of the rake and the guide channel in which it moves;

Fig. 5 is a fragmentary side view, partly in elevation and partly in section; showing the rake adjacent the lower end of the screen just before starting to move towards the cylinder; and

Fig. 6 is a view, similar to Fig. 5, showing the rake adjacent the upper end of the screen at the start of its movement away from the cylinder.

In the drawings, reference numeral 2 indicates an influent channel through which flows unscreened sewage carrying solids, and 3 indicates the effluent channel through which the screened sewage flows, along with the solids that are comminuted adjacent the upper end of the screen on which they accumulate. Channels 2 and 3 are parts of a single structure, preferably made of concrete.

A screen 4 is supported in inclined position in channel

2 by means of a pair of standards 5 extending upwardly from the bottom of the channel. Any form of screen may be used. The illustrative embodiment of the screen shown in the drawings comprises a plurality of flat metal ribbons disposed edgewise and held in parallel transversely spaced relationship. Suitable supports extending laterally from the side walls of the channel can be used instead of standards 5, to support the upper end of screen 4, if desired. The lower end of the screen can be secured to the bottom of channel 2 in any suitable manner. The screen is illustrated as being inclined at approximately thirty degrees, but it will be understood that this angle may be varied, as desired.

Screen 4 comprises a frame 6 the outer edges of which are flush against the walls of influent channel 2. Frame 6 is provided with a centrally disposed opening 7 across which a plurality of individual screen elements 8 extend. These screen elements are disposed edgewise and longitudinally of the screen, and are transversely spaced across the space between the longitudinal edges of frame 6. The screen elements are held under tension by any suitable means, such as the tensioning device described and claimed in the copending application of Carl H. Nordell filed March 26, 1954, under Serial No. 418,944, which issued December 20, 1955 as Patent No. 2,727,627. The tensioning device includes a plurality of individual leaf springs 8*a* each holding the upper end of a screen element and held against a ribbed plate 8*b* by a bolt 8*c*. The edgewise disposition of individual screen elements in a screen is claimed in the copending application of Carl H. Nordell, filed August 20, 1954, under Serial No. 451,130, which issued June 17, 1958, as Patent No. 2,839,197.

A cutting cylinder 9, disposed horizontally relative to the screen, is rotatably mounted in bearings 10 supported on brackets 11 secured to the upper surface of frame 6. The cutting cylinder is provided at one end with a housing 12 which contains gears (not shown) operatively connected to a motor 13 for rotating the cylinder. Cylinder 9 is provided with a plurality of series of laterally extending teeth 14 and retractable tines 15. The tines are spaced longitudinally of the cylinder to coincide with the spacing between individual screen elements so that they enter the spaces between adjacent screen elements 8 as the cylinder rotates. As described in Patent No. 2,750,044, the tines pass through the spaces between adjacent screen elements when they are in extended position, and are retracted automatically as the rotation of the cylinder moves them upwardly. If the cylinder is not provided with tines, teeth 14 are spaced to coincide with the spacing between adjacent screen elements.

A stationary comb 16, secured to housing 12, extends parallel to the longitudinal axis of cutting cylinder 9 and is positioned adjacent the peripheral surface of the cylinder along a line spaced radially from a corresponding line along the surface of said cylinder closest to screen elements 8. Comb 16 is provided with longitudinally spaced notches or recesses 17 aligned with teeth 14 which cooperate therewith to comminute solids carried by the teeth as they pass through the notches. The tines are retracted so that they are entirely within the cutting cylinder as they pass comb 16.

The solids that are intercepted by the screen within the area reached by tines 15 are engaged by the tines and lifted by them until they fall by gravity into contact with the cutting cylinder. These solids are then engaged by teeth 14 and carried by said teeth along the portion of the periphery of cutting cylinder 9 to the comb. The solids remain against the comb until they are forced through notches 17. In being so forced the solids are comminuted, and pass through the screen and into effluent channel 3 along with the flowing sewage stream that also passes through the screen.

A transfer device or rake, adapted to be reciprocated longitudinally of the screen, is provided for the purpose of pushing solids that are intercepted by the portion of the screen out of the range of tines 15, or out of the range of teeth 14 if no tines are provided, upwardly along the surface of the screen into the range of the tines or the teeth. The transfer device comprises a plurality of short fingers 18 rigidly secured in transversely spaced relationship to a bar 19. In the embodiment illustrated bar 19 is in the form of an angle iron, but it will be understood that it may be of any desired shape. Each finger is positioned between adjacent screen elements 8 and is of substantially the same thickness as the distance between adjacent screen elements so that the fingers will wipe the screen elements clean as the rake is moved longitudinally of the screen towards cylinder 9.

The structure at opposite longitudinal edges of screen frame 6 is the same, and therefore the structure on only one side will be described. The longitudinal edge of screen frame 6 is provided with a downwardly extending flange 20 fitting against the walls of channel 2. A guide member 21 is rigidly secured to flange 20 with its side wall 22 fitting against the inner surface of the flange. Guide member 21 has a top wall 23 and a bottom wall 24 extending inwardly at right angles to side wall 22. The space between top and bottom walls 23 and 24 is closed at the upper end of the guide member by a curved end wall 25. No end wall is provided at the lower end of guide member 21 for a reason hereinafter disclosed. A flange 26, extending parallel to walls 23 and 24, and spaced equally from each of them, divides the space between them into two guide channels 27 and 28. Flange 26 terminates short of end wall 25 a distance approximately equal to the height of either channel 27 or 28. The opposite end of flange 26 terminates about the same distance short of the adjacent end of top wall 23. It will be obvious that members 23, 24 and 26 may be formed separately, and secured, in properly spaced relationship, to flange 20 in any suitable manner.

A flat plate 29 is rigidly secured to each end of bar 19 at right angles thereto. A rod 30 projecting outwardly from plate 29 is provided with a roller 31 rotatably mounted on its outer end. Each roller 31 is adapted to fit into either channel 27 or 28, and the position of rake fingers 18 relative to screen elements 8 is determined by the position of rollers 31 relative to guide member 21. In other words, the upper ends of fingers 18 project above the upper surface of screen elements 8 when roller 31 is positioned in channel 27 and are below the upper surface of the screen elements when roller 31 is in channel 28.

The rake is reciprocated longitudinally of screen 4 by a pair of rods 32 positioned adjacent opposite sides of frame 6. A cylinder 33, mounted centrally of the upper portion of frame 6 and disposed longitudinally there of is provided with a piston rod 34 secured at its other end to a transverse crosshead 35. One end of each rod 32 is secured to an end of crosshead 35 so that both rods 32 are reciprocated uniformly by reciprocation of piston rod 34. If desired, a cylinder may be mounted adjacent each side of the frame. In such event, the piston rod of each cylinder would take the place of one of the rods 32, and the cross head would be eliminated. The other end of each rod 32 is secured to a sliding block 36. A pair of parallel links 37 and 38 each pivotally secured at one end to block 36, are pivotally secured at their opposite ends to plate 29. Rollers 31 are positioned in channel 27 when rods 32 are being moved upwardly so that during the movement of the rake towards cylinder 9 fingers 18 project above the upper surface of the screen. Rollers 31 engage the end wall 25 of their respective guide members 21 when the rake reaches its uppermost position, and the weight of the rake causes rollers 31 to drop through the space between the end of flange 26 and end wall 25, thereby retracting rake fingers 18 below the upper surface of the screen. Rollers 31 remain in channel 28 as the

rake is moved downwardly away from cylinder 9 by rods 32. As shown in Fig. 6, the upper ends of rake fingers 18 are positioned above the lower surface of the screen when rollers 31 are positioned in channel 28.

Each roller 31 engages the edge of a link 39 at the lower end of channel 28. Link 39 is pivoted at one end to flange 20, as indicated at 40, and its other end is secured to a spring 41. The other end of spring 41 is secured to a stud 42 projecting from flange 20. Spring 41 exerts a constant force on link 39 pulling its lower end towards the end of channel 28. As roller 31 engages link 39 it is forced upwardly by the inclination of the link, and the action of spring 41 forces it into channel 27 as it passes the end of flange 26 and the piston rod starts moving the rake towards the cylinder.

The stroke of piston rod 34 is regulated so that the upward movement of the rake is stopped when rake fingers 18 are in proximity to the periphery of the area reached by tines 15 when the tines pass upwardly through the spaces between adjacent screen elements, if cylinder 9 is provided with tines, and in proximity to the periphery of the area reached by teeth 14 if the cylinder is not provided with tines. Rake fingers 18 wipe the surfaces of screen elements 8 clean and push the solids intercepted by the screen upwardly along the surface of the screen to the area reached by either the tines or the teeth as the rake is moved upwardly. During the downward movement of the rake the rake fingers do not disturb the solids that have been intercepted by the screen in areas behind the rake fingers while the rake has been moving upwardly towards the cylinder.

While I have described a preferred embodiment of my invention in considerable detail, it will be understood that the description thereof is intended to be illustrative, rather than restrictive, as many details may be modified or changed without departing from the spirit or scope of the invention. Accordingly, I do not desire to be restricted to the exact construction described.

I claim:

1. In combination with an inclined screen having a plurality of longitudinally extending screen elements, a guide member comprising inwardly extending upper and lower channels extending parallel to said screen adjacent each longitudinal edge thereof, the channels of each guide member being parallel to each other throughout their length, a rake positioned below said screen and extending transversely thereof, said rake having a plurality of fingers extending upwardly between said screen elements, a rod extending outwardly from each end of said rake, each of said rods being positioned in one of said guide members, the upper ends of said fingers projecting above the upper surface of said screen when said rods are positioned in the upper channels of said guide members and retracted to a position below said upper surface and above the lower surface of said screen when said rods are positioned in the lower channels of said guide members, means to reciprocate said rake longitudinally of said screen, and means for moving said rods from one channel into the other at one end of the longitudinal movement of said rake.

2. In combination with an inclined screen having a plurality of longitudinally extending screen elements, a guide member comprising inwardly extending upper and lower channels extending parallel to said screen adjacent each longitudinal edge thereof, the channels of each guide member being parallel to each other throughout their length, the lower ends of said channels being open, a rake positioned below said screen and extending transversely thereof, said rake having a plurality of fingers extending upwardly between said screen elements, a rod extending outwardly from each end of said rake, each of said rods being positioned in one of said guide members, the upper ends of said fingers projecting above the upper surface of said screen when said rods are positioned in the upper channels of said guide members and retracted to a position between the upper and lower surfaces of said screen when said rods are positioned in the lower channels of said guide members, means to reciprocate said rake longitudinally of said screen, and means positioned beyond the lower end of said guide member and engageable with said rods to guide them from the lower channel into the upper channel as said rake approaches the lower limit of its longitudinal movement.

3. In combination with an inclined screen comprising a frame and a plurality of longitudinally extending parallel screen elements spaced uniformly transversely of said frame, said frame having longitudinal edge portions each provided with a longitudinally extending guide member, each of said guide members comprising an upper channel and a lower channel parallel to each other throughout their length, said upper channel having a bottom wall to separate the upper channel from the lower channel, a rake comprising a bar extending transversely of said screen and a plurality of fingers extending upwardly from said bar, a rod projecting outwardly from opposite ends of said bar, said rods being movable into said upper channel to project the upper ends of said rake fingers above the upper surface of said screen and into said lower channel to retract said rake fingers to position their upper ends in a plane between the upper and lower surfaces of the screen, and means for reciprocating said rake longitudinally of said screen, the upper end of said bottom wall terminating short of the adjacent end of said guide member to provide a space through which said rod moves downwardly into said lower channel by gravity at the upper limit of longitudinal travel of said rake.

4. In combination with an inclined screen comprising a frame and a plurality of longitudinally extending parallel screen elements spaced uniformly transversely of said frame, said frame having longitudinal edge portions each provided with a longitudinally extending guide member, each of said guide members comprising an upper channel and a lower channel parallel to each other throughout their length, a rake comprising a bar extending transversely of said screen and a plurality of fingers extending upwardly from said bar, a rod projecting outwardly from opposite ends of said bar, said rods being movable into said upper channel to project the upper ends of said rake fingers above the upper surface of said screen and into said lower channel to retract said rake fingers to position their upper ends in a plane between the upper and lower surfaces of the screen, means for reciprocating said rake longitudinally of said screen, and a spring pressed link adjacent the lower end of said guide member, said link being pivoted to said frame beyond the lower end of said guide member and engaging said rod as said rake approaches the lower limit of its longitudinal travel to guide said rod into the upper channel for its longitudinal movement in the upward direction.

5. In combination with an inclined screen comprising a frame and a plurality of longitudinally extending parallel screen elements spaced uniformly transversely of said frame, said frame having longitudinal edge portions each provided with a longitudinally extending guide member, each of said guide members comprising an upper channel and a lower channel parallel to each other throughout their length, said upper channel having a bottom wall separating the upper channel from the lower channel, a rake comprising a bar extending transversely of said screen and a plurality of fingers extending upwardly from said bar, a rod projecting outwardly from opposite ends of said bar, said rods being movable into said upper channel to project the upper ends of said rake fingers above the upper surface of said screen and into said lower channel to retract said rake fingers to position their upper ends in a plane between the upper and lower surfaces of the screen, means for reciprocating said rake longitudinally of said screen, a link pivoted at one end

to said frame adjacent the lower end of said upper channel, and a spring urging the other end of said link toward the lower end of said lower channel, said link engaging said rod as said rake approaches the lower limit of its longitudinal travel and guiding said rod into the upper channel for its longitudinal movement in the upward direction, the upper end of said bottom wall terminating short of the adjacent end of said guide member to provide a space through which said rod moves downwardly into said lower channel by gravity at the upper limit of longitudinal travel of said rake.

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