June 21, 1932. W. C. LAUGHLIN ET AL 1,864,359

SELF CLEANING SCREEN CONVEYER

Filed Feb. 7, 1931 4 Sheets-Sheet 1

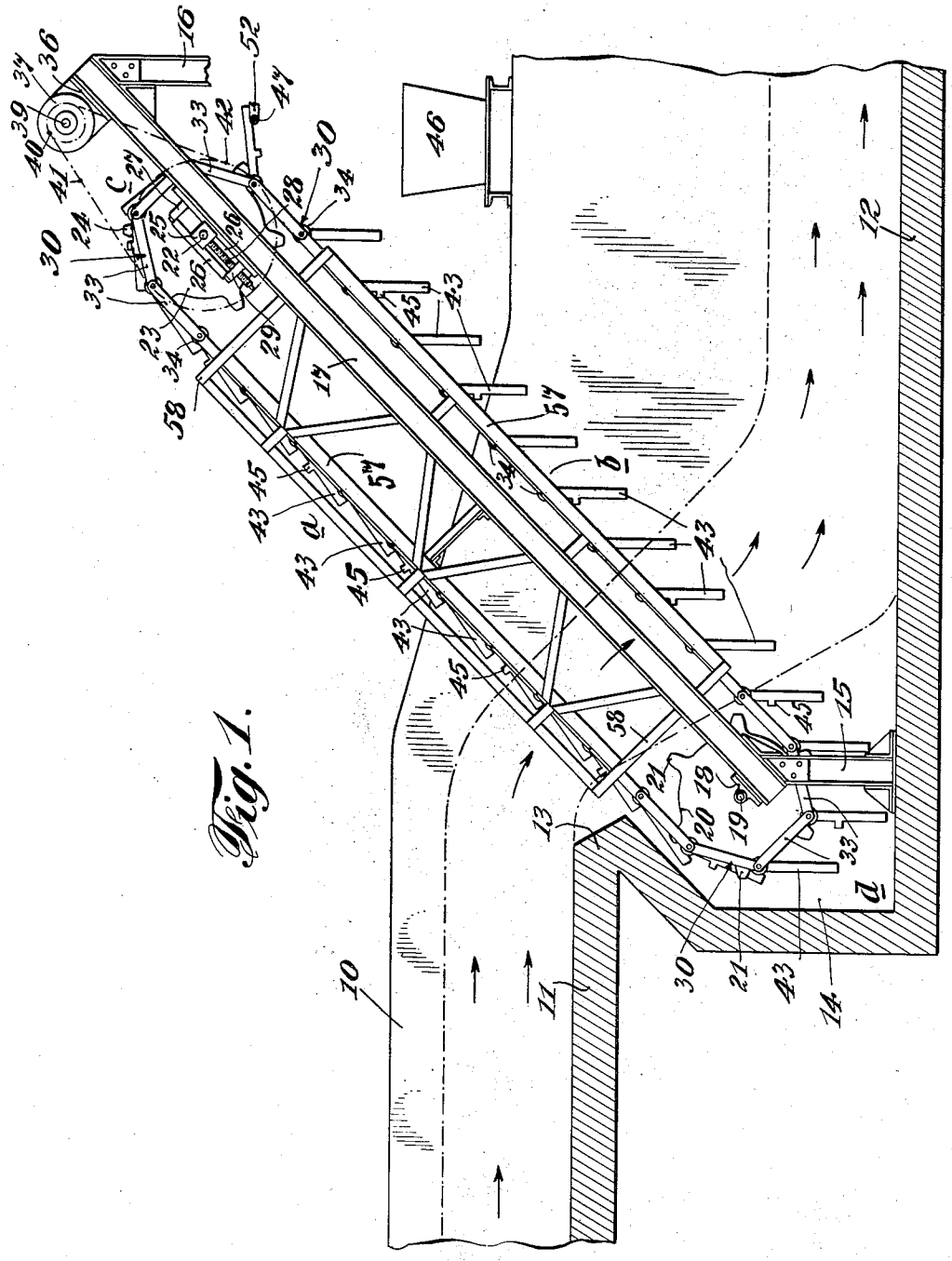


Fig. 1.

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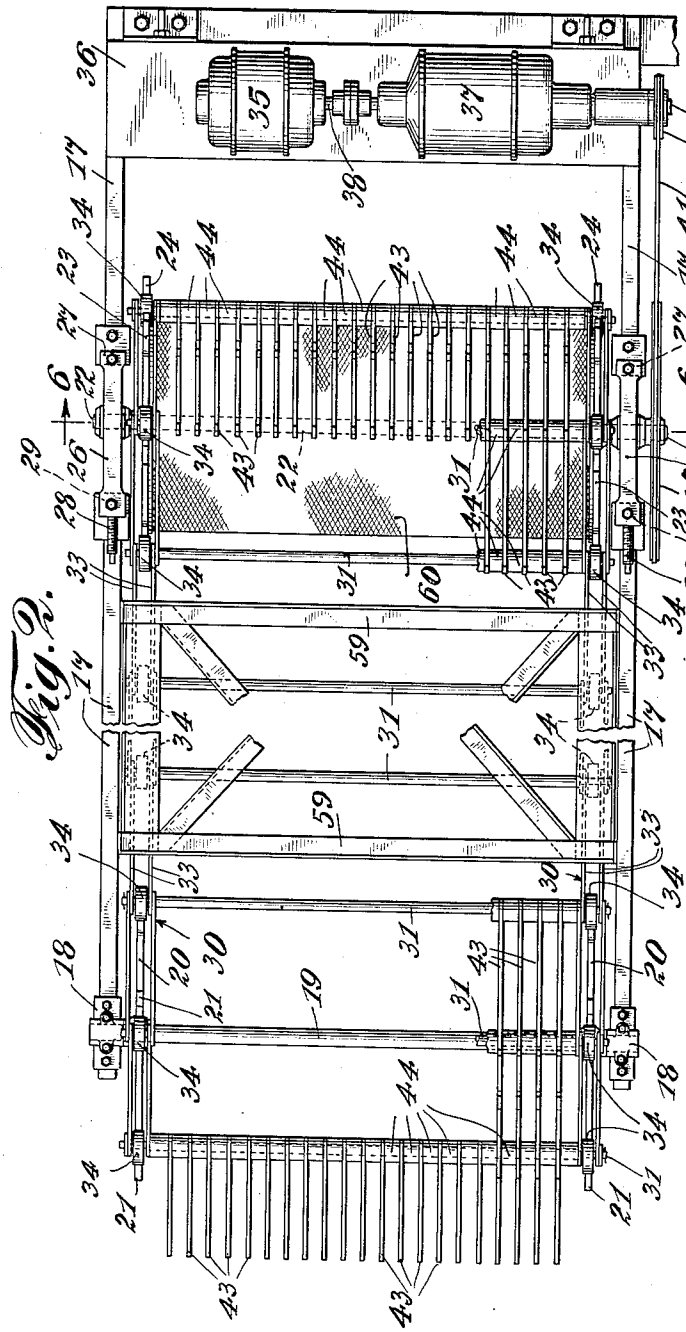


Fig. 2.

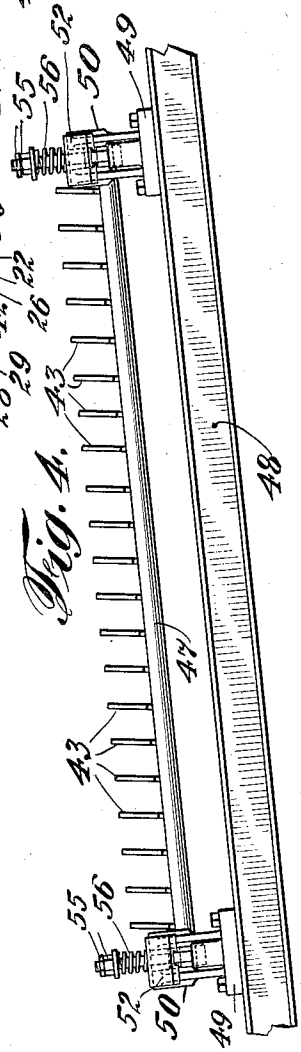


Fig. 4.

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SELF CLEANING SCREEN CONVEYER

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Fig. 3.

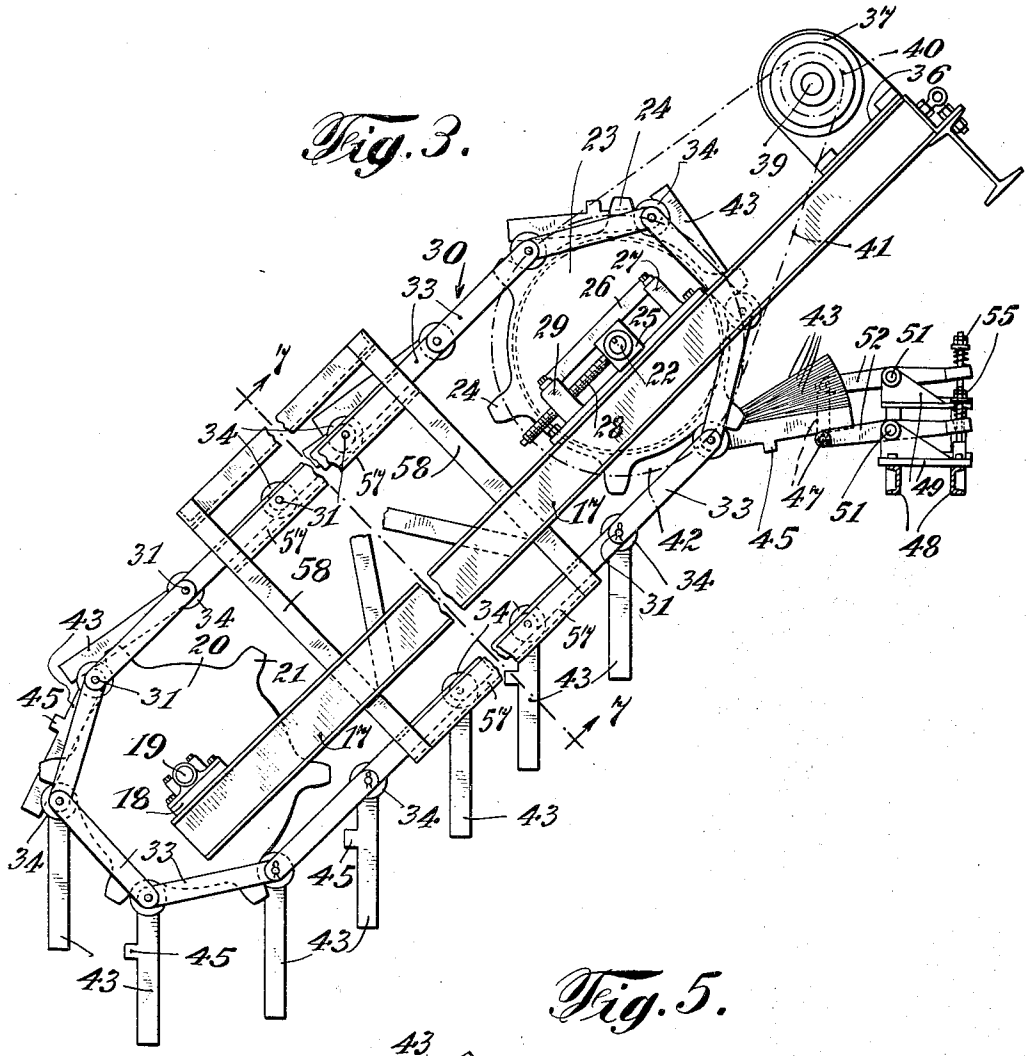
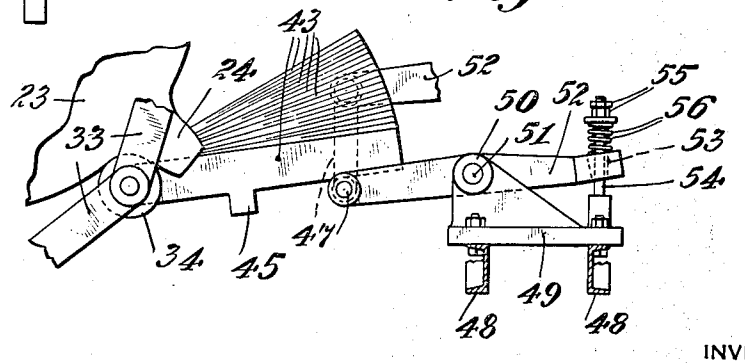


Fig. 5.



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Fig. 6.

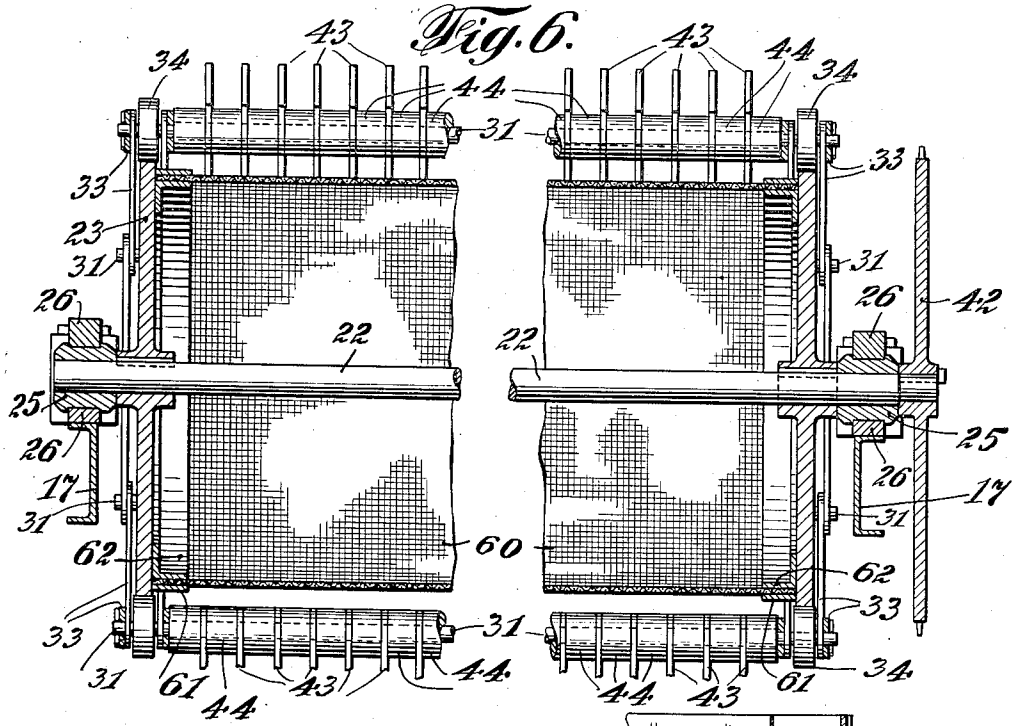


Fig. 8.

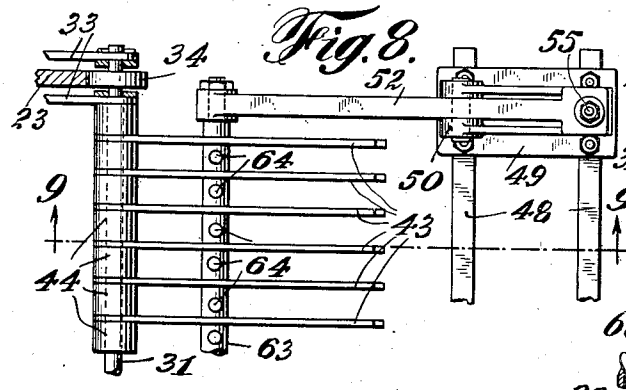


Fig. 7.

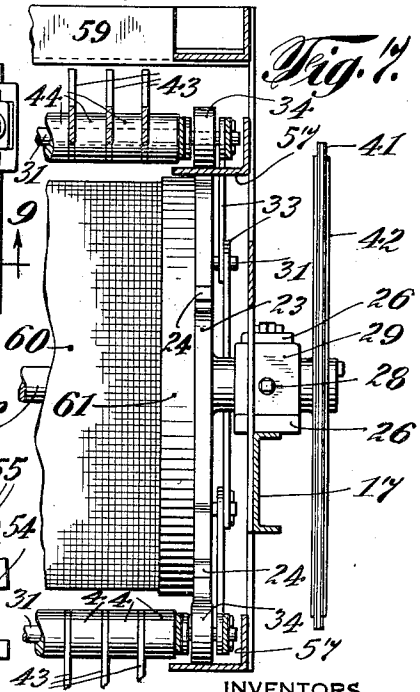
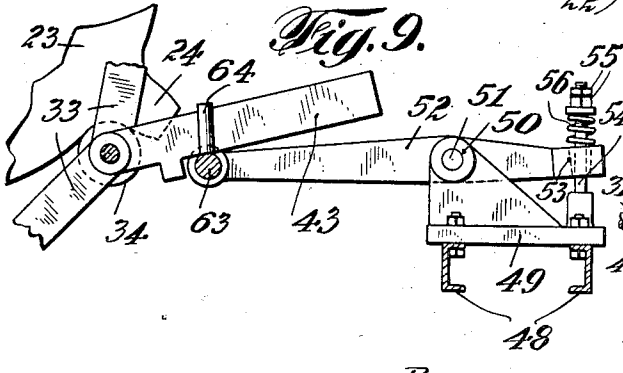


Fig. 9.



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UNITED STATES PATENT OFFICE

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SELF-CLEANING SCREEN CONVEYER

Application filed February 7, 1931. Serial No. 514,188.

Our present invention relates in general to apparatus through the agency of which to remove matter from liquids, the invention being more particularly related to an improved self-cleaning screen conveyer for such use and purpose.

The invention is intended especially for use in separating and removing trash and other more or less solid material from a flowing stream of raw sewage and while, in order to demonstrate the practicability of the invention, we will herein illustrate and describe the same with special reference to sewage, it is to be understood that the invention is not limited to the particular use illustrated and described, but may be used in any place or capacity for which, in practice, it is found adaptable, or advantageous in carrying through separating and conveying operations.

One of the objects of the invention is the provision of an apparatus of the kind described having simple and effective means whereby to separate and remove from a sewage stream any trash borne thereby, such for instance as tin cans and other metallic articles, sticks, pieces of wood or furniture, rags, clothing, and the like, so that the stream will be entirely freed of all such clogging refuse before the grit is permitted to settle in the grit basin and before handling by the pumps.

The separation and removal of the trash is accomplished by means of a screen-like conveyer which is arranged at an angle with respect to a falling stream of sewage, with the lower portion of the conveyer intersecting the falling stream so as to screen out the refuse borne thereby and transfer the screenings to a trash receptacle arranged to receive the same, the conveyer itself comprising an endless revoluble construction equipped with courses of individually oscillable screen bars or fingers whereby the refuse is collected and wherefrom it is discharged at the proper time to fall into the trash receptacle. According to a feature of our improvements, at the place where the refuse is to be discarded into the trash receptacle, means are provided in cooperation with the screen bars for positively effecting the removal of discharge of the trash therefrom. The means to this end may consist of a simple bumper device with which the screen bars are forcibly engaged for dislodging and removing the refuse; or it may include in its construction a combing device by means of which rags and articles, difficult to remove, are seized and drawn from the screen bars.

A still further object of the invention is the provision of an apparatus of the character described which is simple in its construction and arrangement and may be operated by an electric motor as the source of power, and one in which the parts are so constructed and arranged that when the structure may be inclined along the sewer stream there will be no discharge back into the stream of any of the collected refuse.

With the above and other objects in view, the invention consists in the improved self-cleaning screen conveyer, and in the form, construction, and relative arrangement of its several parts, as will be hereinafter more fully described and claimed.

For the purpose of explaining the invention, its mode of operation and the preferred construction and arrangement of its parts, an example embodying the invention has been shown in the accompanying drawings in which similar reference characters designate corresponding parts throughout the several views, and in which:—

Figure 1 represents a side elevational view of an apparatus made in accordance with our invention, the same being here illustrated in association with a longitudinal sectional view through a sewer conduit constructed with a precipice to provide a fall for the sewage stream;

Fig. 2 represents a fragmentary plan view of the apparatus separate from the sewage conduit and looking at the front of the apparatus in a direction substantially at right angles to its longitudinal axis as it appears in the inclined position shown in Fig. 1;

Fig. 3 represents a fragmentary side elevation of the apparatus on a larger scale;

Fig. 4 represents a view in rear elevation of the bumper device;

Fig. 5 represents an enlarged side elevational view of the bumper device;

Fig. 6 represents a fragmentary vertical cross section on a larger scale, taken on the line 6—6 of Fig. 2;

Fig. 7 is a partial cross section on a larger scale, taken on the line 7—7 of Fig. 3;

Fig. 8 is a fragmentary plan view, showing a modification in the construction of the bumper device; and

Fig. 9 is a longitudinal section taken on the line 9—9 of Fig. 8.

In referring with more particularity to the accompanying drawings, and first to Fig. 1, the reference character 10 denotes a sewer conduit structure which is made with an upper level or flow channel 11 and a lower lever or grit channel 12, there being a precipice between the two levels consisting of an overhanging ledge 13 over which the sewage stream flows or cascades to fall into the grit channel or basin. Due to this construction, a space 14 in communication with the grit channel or basin, is provided underneath the overhanging ledge 13.

For carrying out our invention in a simple way, we provide a skeleton rectangular framework for the support of the screen conveyer apparatus; and this framework is inclined at an angle, preferably at an angle of about 45° from the vertical and in such position that the lower portion of the framework is situated in the space 14 beneath the overhanging ledge with the body of the framework inclining upwardly above the grit channel or basin 12. The upper portion of the framework preferably extends well above the sewer conduit. In the present embodiment, the framework is represented as including lower and upper pillars 15 and 16 (there being of course a similar pair for each side of the structure), which are anchored at their lower ends in any suitable way upon any suitable foundation. At each side of the structure, the pillars 15 and 16 support a beam 17; and in practice the beams may be connected by any suitable arrangement of cross pieces so as to provide a rigid skeleton structure of rectangular form.

Fixed upon the lower portions of the beams 17 are bearings or pillow blocks 18 in aligned relation and in which is mounted for rotation a transversely extending shaft or axle 19. Suitably keyed or otherwise secured upon the shaft 19 so as to rotate therewith are a pair of sprocket wheels 20, 20 provided with suitable sprocket teeth 21. The sprocket wheels are located upon the shaft near the opposite ends thereof but inside the beams 17. Near the upper end of the framework is mounted for rotation another shaft or axle 22 which carries a pair of sprocket wheels 23, 23 equipped with sprocket teeth 24. In the present instance, the shaft 22 is mounted upon the beams for adjustment relatively towards and away from the first-mentioned shaft 19; the mode of mounting the said shaft 22 as herein illustrated, consisting in the provision of bearing blocks 25 in which the ends of the shafts are mounted for rotation. These bearing blocks have sliding fit between opposing parallel guide rails 26 which constitute parts of framing structures 27 suitably mounted upon the beams. With each of the bearing blocks 25 is associated an adjusting screw 28 which is threaded for adjustment in one end 29 of the framing. Manifestly, under this construction, by adjusting the screws 28 the shaft or axle 22 with the sprocket wheels carried thereby may be adjusted in the desired position relatively to the shaft 19.

The lower and upper sprocket wheels 20 and 23 at each side of the framework are connected by a sprocket chain 30 so that the lower sprocket wheels 20 will be operated in conjunction with the operation of the upper sprocket wheels 23. The two sprocket chains are connected by transverse rods 31 which are speced apart to provide spaces between them. According to a constructional feature, these rods constitute the pivotal connections between the relatively long links 33 which make up the sprocket chains, and these rods carry rollers 34 for turning on the peripheries of the sprocket wheels and for engagement by the sprocket teeth. In this way we provide by preference an endless skeleton conveyer having an upper run *a*, a lower run *b*, an upper transition *c* from the upper run to the lower run around the upper sprocket wheels 23, and a lower transition *d* from the lower run *b* to the upper run *a* around the lower sprocket wheels 20.

For the operation of the skeleton conveyer, power may be transmitted from any suitable source. In the present exemplification we show as a source of power an electric motor 35 which is mounted upon a cross plate 36 adjustably arranged upon the upper portion of the framework. In conjunction with the electric motor we may provide, and preferably do provide, a reduction gear box 37, the gearing in which (not shown) is arranged in any suitable or approved manner adapted to operate from the motor shaft 38 for driving the shaft 39 at reduced speed. Any suitable change speed clutch mechanism may be associated with the gears in the gear box 37. The driving shaft 39 carries a driving pinion 40 which is connected through a transmission element 41 with a driven wheel 42 secured to one end of the shaft or axle 22.

The screening means associated with the endless skeleton conveyer consists in accordance with our invention of the provision of successive rows of screen bars or fingers 43 which are adapted to span or bridge the spaces intervening between the spaced transverse rods 31. A row of the screen bars is provided in conjunction with each of the transverse rods 31, the bars being mounted

at one end thereof upon their rod for oscillation thereon and being of a length sufficient to extend from the rod to which they are attached to the next succeeding rod so that during the period of the upper run the screen bars will be supported by two transverse rods and constitute a screening section for the space between such rods. The screen bars of each row are kept in proper spaced relation by means of spacing washers 44 suitably mounted between them and upon the rod to which the bars are attached. In this way we provide successive rows or sections of screen bars throughout the entire length of the endless conveyer. As the bars pass around the lower transition end *d* and approach the upper run *a*, they fall by their own weight into substantially prone positions so that during the entire course of the upper run a screen is provided; and the structure is so arranged, as illustrated in Fig. 1, that the screen of the upper run is constantly moving through the stream of sewage cascading over the ledge 13. Any trash, refuse or rubbish, such as tin cans, sticks, rags, and articles of clothing, which may be carried along by the sewage stream, are encountered by the upwardly moving screen conveyer and thereby separated from the liquid of the stream which falls through the interstices between the screen bars and through the open framework into the grit basin 12. According to a feature of our invention, certain of the screen bars, herein shown to be the bars of every other row, are provided with upwardly projecting catch lugs 45 with which the collected trash is engaged so as not to move reversely or fall backwardly into the falling stream. The separated trash and refuse are carried upwardly upon the upper run and as the screen bars move and turn upon their rods while moving through the transition *c*, they are inverted so that their trash carrying faces face downwardly for dumping the collected trash into a trash receptacle 46 which is placed or built in proper position for receiving the dumped trash. As the fingers are carried about the transition *c*, they suddenly swing downwardly by their own weight so as to occupy pendant positions during the course of the lower run *b*.

Means are provided for positively knocking from the screen fingers any material which may adhere thereto; and this means consists in the provision of a bumper device including a bumper bar 47 transversely and obliquely arranged in a position in which the screen fingers, upon swinging downwardly in passing around the transition *c*, will sharply knock upon the bumper bar. For the support of the bumper bar we may provide a transverse beam 48 whereon are mounted brackets 49 having bearings 50 in which are received pins 51 projecting from rocker bars 52. The rear ends of the rocker bars 52 are holed at 53 for the reception of guide pins 54; and imprisoned upon the guide pins 54 between the rocker bars and suitable nut members 55 upon the guide pins, are cushioning springs 56 which more or less take up the shocks of the bumping actions. The bumping bar 47 is supported between the forward end portions of the rocker bars 52. It is to be noted in this connection that the bumper bar 47 is not supported in a horizontal position, but in an inclined position, so that the members constituting a row of the screen bars will knock upon the bumper bar successively one after the other. In this way, articles carried by the screen fingers will be bumped about upon a descending plane so as to be discharged from the row of screen bars.

In traversing the upper and lower runs, the endless conveyer is suitably supported in operative position through the provision of guide or track members 57 whereon the rollers are adapted to turn. These guide or track members 57 are supported by a suitable framing 58 which is carried by the beams 17. Preferably as shown, the framing of each side rises to a height well above the upper run where suitable reinforcing cross pieces 59 are provided between the framings of the two sides and in a position where they will clear the trash carried by the upper run.

With the upper sprocket wheels 23, there is preferably associated a cylindrical screen 60 which surrounds the shaft 22. This cylindrical screen extends between the sprocket wheels 23, and in the present instance it is represented as being supported in position to rotate with said wheels by mounting the outer ends of the cylindrical screen between outer and inner ring members 61 and 62 which are secured to the inner faces of said sprocket wheels. Due to the provision of this cylindrical screen any of the trash which may fall from or between the screen fingers during the movement thereof around the transition *c*, will be caught and directed into the trash receptacle 46. This cylindrical screen has, therefore, for its object to prevent trash from falling into the grit channel 12.

In Figs. 8 and 9, the bumper device is represented as being provided with combing means whereby to comb and tear materials, for instance, rags or clothing, from the screen bars. In this instance, the bumper bar 63 is provided with upwardly projecting teeth 64 in such local positions that the screen bars will fall between the teeth and strike upon the bumper bar 63. Any rags or similar articles which become entangled between the screen bars will be engaged by the teeth 64 and be thereby drawn from the screen bars as the latter are drawn along and downwardly under the rotary movement of the endless conveyer.

The apparatus of our invention evidences in its simplest form a self-cleaning screen conveyer for separating articles or solid materials from the stream of liquid while permitting passage of the liquid, and for transporting and depositing the separated articles or solid materials at a predetermined place, in a receptacle or otherwise. The apparatus is simple in construction and by reason of its self-cleaning characteristics, it can be operated continuously in conjunction with the flowing stream to eliminate all trash or solid matter from the stream. The apparatus of our invention may be used to advantage in capacities other than that of screening out trash and refuse. For instance, if the screen bars are placed relatively close together so as to provide only relatively small interstices between them, the apparatus may be employed for the purpose of removing from the raw sewage stream, the sewage solids in case it may be desired to digest, activate or otherwise treat the sewage solids separately from the sewage liquid.

While the invention has been illustrated and described with some degree of particularity, it is realized that in practice various changes and alterations may be made therein, and further that the invention is capable of embodiment in many different conveyer constructions. It has been sought herein to illustrate such embodiments as will suffice to exhibit the character of the invention. Reservation is, therefore, made to the right or privilege of changing the form of the details of construction or otherwise altering the arrangement of parts without departing from the spirit or scope of the invention or the scope of the appended claims.

We claim:—

1. In apparatus for collecting trash from sewage, an inclined endless traveling conveyer having spaced cross rods forming open spaces between the same, a row of finger members attached at one end to each rod with gaps between the members, said members being attached for individual swinging movement and adapted, during one period of the conveyer's travel, to function collectively as trash-collecting grating at the open spaces between the rows, and at another period of the conveyer's travel, to function as separately and independently swingable parts to cause the discharge of the collected trash.

2. In apparatus for collecting trash from sewage, an inclined endless traveling conveyer having spaced cross rods forming open spaces between the same, a row of finger members attached at one end to each rod with gaps between the members, lateral projections on certain of the members to engage the trash, said members being attached for individual swinging movement and adapted, during one period of the conveyer's travel, to function collectively as trash-collecting means at the open spaces between the rows, and at another period of the conveyer's travel, to function as separately and independently swingable parts to cause the discharge of the collected trash.

3. Apparatus of the kind described comprising, in combination, a framework, an endless skeleton conveyer frame mounted to travel about the framework, rows of finger members carried by the conveyer frame for screening and carrying material from a liquid while permitting passage of the liquid, the members of the rows being mounted to the conveyer frame for individual oscillating movement relatively to each other and to the movement of the conveyer frame whereby to stroke off conveyed material, means arranged to be engaged by said members to positively oscillate the same and to cause adhering material to be shaken therefrom, and means for combing material from between the oscillating members.

4. In apparatus for collecting trash from sewage, an inclined endless traveling conveyer having spaced cross rods, a row of finger members attached at one end to each rod with gaps between the members, said members being attached for individual oscillatory movement and adapted, during one period of the conveyer's travel, to function collectively as trash-collecting grating, and during another period of the conveyer's travel, to oscillate separately and independently for the discharge of the collected trash, and means engageable in the gaps between the members to loosen and facilitate the discharge of the trash.

5. Apparatus of the kind described comprising, in combination, a framework, an endless skeleton conveyer frame mounted thereon to provide two runs traveling in opposite directions, individually oscillatory fingers on the conveyer frame adapted, at one run, to swing into cooperative relation to form a grating for screening and carrying material from a liquid while permitting passage of the liquid and adapted, at the other run, to swing relatively with respect to each other and with respect to the conveyer frame into dumping position for dumping the material carried thereby.

6. Apparatus of the kind described comprising in combination, a framework, an endless skeleton conveyer frame mounted thereon to provide two runs and a transitional shift traverse the framework between the runs, groups of individually oscillatory screen bars carried by said frame and adapted, on one run, to assume substantially prone positions to form a grating for screening out and carrying material and adapted, on the other run, to assume substantially pendant positions, said bars being individually pivoted adjacent one end thereof and free at the opposite end to make the transitional shift by moving separately and independent-

ly and turning on their individual pivots from substantially prone positions in which they carry the material to substantially pendant positions in which they effect the dumping of the material carried thereby.

7. In combination, a framework, an endless skeleton conveyer frame mounted to travel thereon first in one direction and then in a reverse direction during travel through each cycle, said conveyer frame including spaced cross members spaced apart to provide open spaces, individual bars mounted adjacent one end thereof to the cross members to oscillate separately and independently thereon and having a length to extend from the attaching cross member to the next succeeding cross member so as to be supported upon the latter, said bars being adapted, on the travel of the frame in one direction, to form collectively a grating for screening and carrying material, and also adapted, in passing for movement with said frame to the reverse direction, to move and turn separately and independently on the cross members to assume substantially pendant positions for dumping the material carried thereby, and means to engage and positively oscillate the bars separately and independently as they move and turn to assume pendant positions.

8. In apparatus for collecting trash from sewage, the combination with an endless conveyer, of spaced cross rods on the conveyer defining an open space between them, a row of finger members attached at one end to one cross rod and of a length to span the open space and find support on the other cross rod, said finger members being attached for individual swinging movement and adapted, when moving with the conveyer as the upper run thereof, to function collectively as grating at the open space between the rows to collect the trash, and further adapted, when moving with the conveyer as the lower run, to function as pendant parts freely oscillatory separately and independently with respect to each other and with respect to the travel of the conveyer to effect the discharge of the collected trash.

9. In apparatus for collecting trash from sewage, an inclined endless traveling conveyer with upper and lower runs, its construction including spaced-apart cross rods forming open spaces between same, a row of finger members attached at one end to each rod with gaps between the members of each row, said members being of a length sufficient to span the open space between the attaching rod and the next succeeding rod and adapted, while traveling with the upper run, to find support on the next succeeding rod to act as grating means for collecting trash from the sewage, the members of each row being attached for individual swinging movement and adapted, while crossing from the upper to lower run and while traveling with the lower run, to oscillate separately and independently of one another whereby to effect the discharge of the collected trash.

10. In apparatus of the kind described, the combination with a framework and an endless skeleton conveyer frame mounted to travel thereon, of finger members individually pivotally united with the conveyer frame to travel therewith and so as to have relative individual turning movement independently of their travel with the conveyer frame, said members being adapted in one course of travel of the conveyer frame, to move and turn into a grating assemblage in a plane of symmetry whereby to screen and carry material from a liquid, and also adapted, in another course of travel of the conveyer frame, to move and turn individually into dumping position for dumping the material carried thereby, and mechanical means to afford a knocking engagement with the members to oscillate them while they are moving and turning to dumping position.

11. Apparatus of the character described comprising an obliquely located frame, transverse shafts journaled in the frame in lower and upper portions thereof, sprocket wheels mounted on the shafts, endless chains trained over the sprocket wheels to operate in oblique courses lengthwise of the frame, rods between the chains, said rods having bars individually pivoted at one end thereon, said bars being of a length sufficient to extend from the rods whereon they are pivoted to adjacent rods to find support at their opposite ends on the adjacent rods and to thereby lie in substantially prone positions when the chains move along one oblique course, and adapted when the chains pass to the other oblique course to swing individually and separately on the attached rods from substantially prone positions to substantially pendant positions.

In testimony that we claim the foregoing as our invention, we have signed our names hereto.

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