July 5, 1938. E. W. SWENSON 2,122,965

APPARATUS FOR DISINTEGRATING LARGE SOLIDS CONTAINED IN SEWAGE

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Fig. 1.

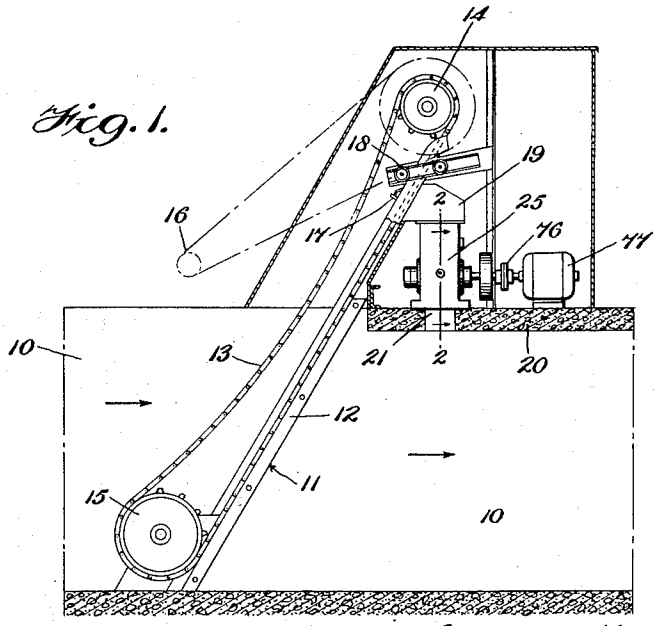
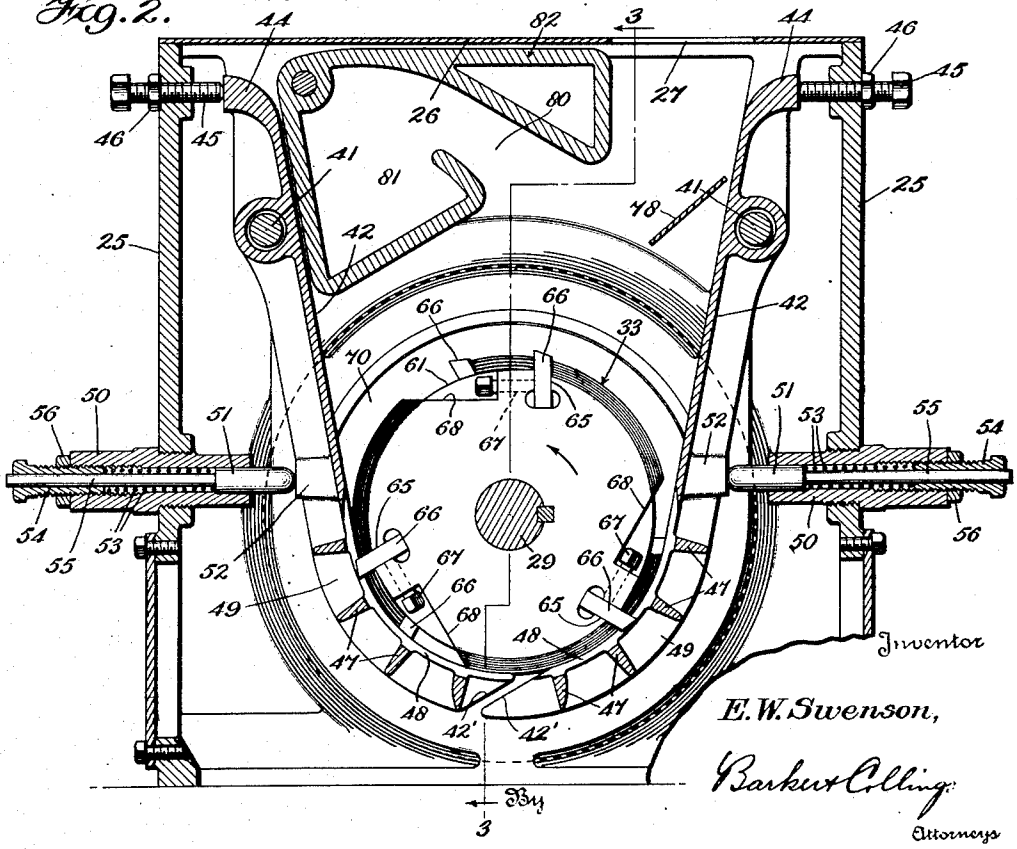


Fig. 2.



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Fig. 3.

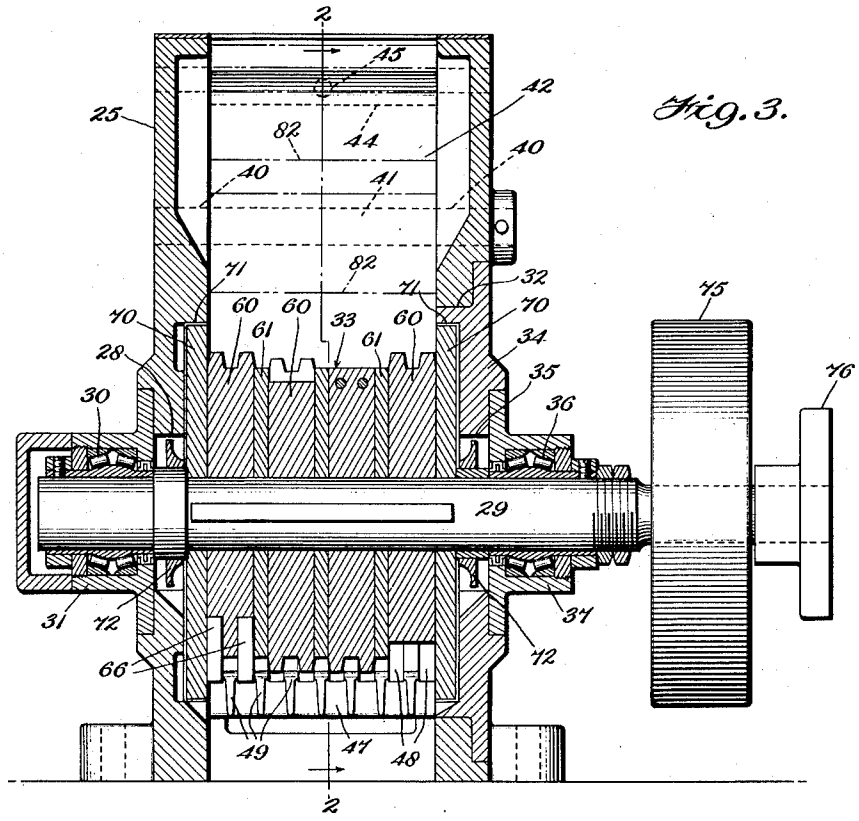


Fig. 4.

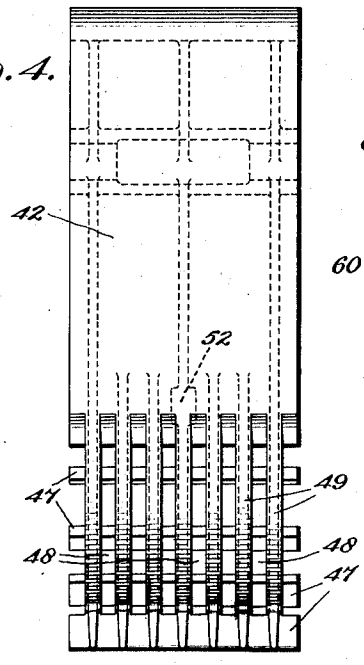
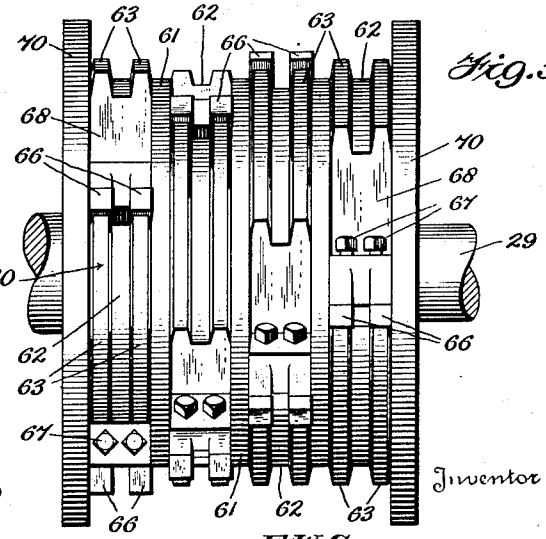


Fig. 5.



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UNITED STATES PATENT OFFICE

2,122,965

APPARATUS FOR DISINTEGRATING LARGE SOLIDS CONTAINED IN SEWAGE

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Application July 25, 1936, Serial No. 92,619

3 Claims. (Cl. 83—6)

This invention relates to triturating apparatus for disintegrating large solids contained in sewage, garbage, and the like, and has for one of its objects to provide a device of this character which will be relatively simple in construction, comparatively inexpensive to manufacture, install, and operate, and more efficient in use than those which have been heretofore proposed.

In many sewage treatment plants, the first step consists in passing the raw sewage through a primary screen, usually of the bar type, to remove the large organic solids, such as paper, rags, pieces of wood, vegetable peelings, etc., and the disposal of such screenings in a sanitary manner has frequently presented quite a problem. It has been more or less common practice to remove the matter from the screen and either incinerate or bury it; but the first procedure is more or less lengthy and expensive, since the screenings must be at least partially dried before burning, while the second holds the possibility of contamination of surface waters used for drinking and other purposes.

In an effort to solve the problem, a few plants have been recently equipped with a "hammer-mill" type of disintegrator, but such apparatus has not proven economical in the use of power, and rags and other stringy matter in the screenings have tangled with the hammers and other parts of the mill to such an extent as to make it necessary to shut down the apparatus frequently for cleaning purposes. Other known grinding apparatus has also been tried, but without materially greater success.

It is a primary object of the present invention therefore, to provide a triturating apparatus which will effectively handle and disintegrate substantially all large solids which may be screened from sewage and the like, to the end that such solids may be returned to the screened liquid and accorded the same treatment which is customarily given those solids which pass through the primary screen; and to accomplish the desired results with an economical use of power and with a minimum of shut downs for cleaning and repair.

A further object of the invention is to provide a triturator which is not necessarily limited to use in sewage disposal work, but which may, if desired, be effectively employed in the disintegration of the large solids and semi-solids in garbage and the like.

With the above and other objects in view which will appear as the description proceeds, the invention consists in the novel details of construction, and combinations and arrangements of parts more fully hereinafter described and particularly pointed out in the appended claims.

Referring more particularly to the accompanying drawings forming a part of this specification in which like reference characters designate like parts in all the views:—

Figure 1 is a sectional elevational view, more or less diagrammatic, of a typical primary bar screen installation in a sewage treatment plant, having mechanical trash removing means for the screen, and showing a triturator constructed in accordance with the present invention associated therewith;

Fig. 2 is an enlarged transverse vertical sectional view through the triturator, taken approximately on the plane indicated by the lines 2—2 of Figs. 1 and 3;

Fig. 3 is a vertical sectional view at right angles to Fig. 2, taken approximately on the plane indicated by the line 3—3 thereof;

Fig. 4 is a front elevational view of one of the pivoted racks or grids which co-operate with the rotor and its cutting knives to disintegrate the solids; and

Fig. 5 is an enlarged elevational view of the rotor, as seen from the right of Fig. 2.

For purposes of the present disclosure, the invention has been illustrated in Figure 1 in association with the primary screen in the influent conduit of a sewage disposal plant, although as above indicated, it is not necessarily limited to such use.

Referring more particularly to Fig. 1, there is shown a conduit 10 through which raw sewage may flow in the direction indicated by the arrows. This conduit is provided with a primary bar screen 11 composed of a plurality of transversely spaced inclined bars 12 extending from the bottom to the top of the conduit and having associated with it a trash removing mechanism comprising a chain or belt 13 passing around head and foot sprockets 14 and 15 and driven from any suitable source of power diagrammatically indicated at 16. The chain or belt 13 carries a scraper bar 17 and mechanism 18 is provided for removing the solids collected by the bar 17 and depositing them into a chute or pan 19.

Since this showing of the screen and trash removing mechanism therefor is intended to be only typical of such installations, and since the details of the particular mechanism here shown will be found in prior patent to Robert T. Steindorf, 1,912,020, granted May 30, 1933, it is not deemed necessary to describe it in further detail.

The triturator constituting the present invention may be mounted beneath the pan or chute 19 upon the top wall 20 of the conduit 10, which wall may be provided with a passage 21 beneath the triturator through which the disintegrated solids may be returned to the screened liquid in the conduit.

Referring now more particularly to the remaining figures of the drawings, the triturator comprises a casing 25 which may take the form of a hollow substantially oblong casing open at both ends but having the top opening partially closed by a plate 26 having a feed opening 27 through which the solids may be received from the pan 19. One side wall of the casing is apertured as at 28 to accommodate a rotatable shaft 29 passing therethrough and journalled in a roller or other anti-friction bearing 30 mounted in a housing 31 carried by the side wall of the said casing 25. The opposite side wall of the casing is provided with an aperture 32 of sufficient diameter to permit of the insertion therethrough of the rotor assembly 33 carried by the shaft 29, and this aperture 32 is normally closed by a plate 34 fitted therein and having an aperture 35 through which the shaft 29 passes. This end of the shaft is likewise journalled in roller or anti-friction bearing 36 carried by a housing 37 rigidly secured to the closure plate 34, all as will be clearly seen from Fig. 3.

The oppositely disposed side walls of the casing 25 are further apertured as at 40 for the reception of the spaced shafts 41 upon which are pivotally mounted the oppositely disposed rack or grid members 42. As best shown in Figs. 2 and 4 these grid members may take the form of elongated plate-like castings, the upper ends of which are curved backwardly as at 44 to provide abutments adapted to engage stop screws 45 threaded into the end walls of the casing 25 and provided with lock nuts 46 whereby they may be locked in any desired adjusted position and serve as stops to limit the swinging movements of the grids 42, as will be readily understood.

The lower portions of the grid members 42 are curved forwardly and their ends preferably leveled and overlapped as indicated at 42' to provide a substantially semi-circular grid embracing the lower portion of the rotor 33. The said lower portions are provided with a plurality of transversely extending ribs 47 and with a plurality of longitudinally extending slots 48, which in turn provide a plurality of longitudinally extending ribs or fingers 49 spaced from one another, as best shown in Fig. 4. The ribs 47 and 49 are preferably tapered outwardly, as clearly shown in Figs. 2, 3, and 4, to provide relief for the disintegrated material passing between them. The slots 48 extend into the transverse ribs 47 so that their inner surfaces are below the inner surfaces of the longitudinal ribs 49.

Hollow thimbles 50 are threaded into the end walls of the casing 25, see Fig. 2, and have slidably mounted therein the pins or plungers 51, the projecting inner ends of which engage with the lugs 52 formed on the back face of the grid members 42. Compression springs 53 are mounted in the bores of the thimbles 50 and urge the plungers 51 into resilient contact with the bosses 52 and the force exerted by such springs may be varied by means of the threaded sleeves 54 carried by the outer ends of the thimbles 50 and serving also as guides for the stems 55 of the plungers 51. Lock nuts 56 may be provided for locking the sleeves 54 in adjusted position. The grid members 42 are thus resiliently urged inwardly toward one another and into embracing relationship with the rotor 33, it being understood, however, that the stop screws 45 are so adjusted as to normally prevent actual contact between the surfaces of the grids and the rotor.

As best shown in Figs. 2, 3, and 5, the rotor 33 which is carried by the shaft 29 comprises a plurality of relatively thick discs 60 separated by thinner spacing discs 61. Each of the discs 60 is preferably provided with a medial circumferential groove 62 providing each disc with a pair of circumferentially extending ribs 63. The parts are so proportioned and constructed that the circumferential grooves 62 align with the ribs 49 of the grid members 42, while the ribs 63 of the rotor discs align with the slots 48 of the said grids, as will be understood from Fig. 3.

Each disc 60 is provided with a plurality of recesses 65 for the reception of the insertable hardened cutters or blades 66 which may be retained in position by means of set screws 67 threaded into the disc bodies. The discs are further cut away as at 68 to accommodate these set screws so that their heads will be located in the recesses thus formed and below the periphery of the discs. The cutters 66 are preferably arranged in pairs and are aligned with the projecting ribs 63 of the rotor discs so that they may be received in the slots 48 of the grid members, as clearly shown in Fig. 2.

At each end of the rotor disc assembly there is provided a sealing plate 70 preferably of somewhat larger diameter than that of the rotor 33, which plates are received in circular recesses 71 formed respectively in the side wall of the casing and the closure disc 34 thereof, as will be clear from Fig. 2. The said discs 70 have a nice running fit with the recesses 71 and serve to prevent rags and other stringy material from winding about the rotor and building up between it and the casing. They, of course, also tend to prevent the escape of liquid from the interior of the casing toward the bearings 30 and 36, and in order to further protect these bearings it is preferred to provide the shaft 29 beyond the discs or plates 70 with the water-slinging discs 72 running in the apertures 28 and 35 respectively, as clearly shown in Fig. 3.

Beyond the bearing 36 the shaft 29 may carry a flywheel 75 which serves to equalize the load upon the motor when screenings are being fed to the machine, and the said shaft may be connected by means of a suitable shaft coupling 76 to an electric motor 77, or other suitable source of power.

In operation the solids which are collected by the bar screen 11 and removed therefrom by the trash removing mechanism 17 and 18 are deposited in the pan or chute 19, whence they pass through the feed opening 27 into the disintegrator. In some instances it is desirable to deflect them toward the left, as viewed in Fig. 2, towards the down-going side of the rotor, by means of a deflector plate 78 positioned in the upper portion of the casing, while in other cases, this plate may be omitted. The cutter members 66 of the rotor engage the solids and disintegrate them through the shearing action of their side faces cooperating with the complementary faces of the longitudinal ribs 48 of the grid and also through the shearing action of their leading edge with the transverse ribs 47 of the grid. By the time the solids have been subjected to these shearing actions through the travel of the knives through the lower half of their path of revolution

they are sufficiently disintegrated that they may drop through the grid openings and the open bottom of the casing to the passage 21 of the top wall 20 of the sewage conduit and thus be returned to the screened liquid for such treatment as is ordinarily given to this liquid and the solids therein which have passed through the bar screen.

Should a large piece of solid material such for example as tramp iron or a piece of wood too heavy to be disintegrated by the cutters enter the triturator, the spring pressed grid members 42 will yield and it will be carried around by the rotor and discharged through the throat or passage 80 into the chamber 81 of a "tramp metal" catcher 82, mounted in the upper portion of the casing 25.

The screenings ordinarily contain considerable water, but if desired, additional water may be supplied to the interior of the triturator from any suitable pipe or hose, not shown.

While one form of the invention has been illustrated and described it is obvious that those skilled in the art may vary the details of construction as well as the precise arrangement of parts without departing from the spirit of the invention and therefore it is not wished to be limited to the above disclosure except as may be required by the claims.

What is claimed is:

1. In apparatus for reducing large organic solids in sewage, garbage and the like to a shredded condition, a casing; a rotor journalled in said casing, provided with a plurality of axially and peripherally spaced cutter members projecting a uniform distance from the periphery thereof, and having side and end shearing edges; a pair of grid members pendulously hung in said casing in symmetrical relation upon opposite sides of said rotor, said grid members having imperforate planar upper portions and curved lower portions arranged to embrace a portion of said periphery, said lower portions comprising axially spaced longitudinal ribs and peripherally spaced transverse ribs rigid therewith and forming a grid, said ribs being respectively provided with longitudinal and transverse shearing edges arranged to coact with the side and end shearing edges respectively of said cutter members to shear the solids and reduce them to a shredded condition; and means for yieldingly maintaining said grid members in shearing relationship with said cutter members.

2. In apparatus for reducing large organic solids in sewage, garbage and the like to a shredded condition, a casing; a rotor journalled in said casing, provided with a plurality of axially spaced sets of cutter members of uniform cross section projecting a uniform distance from the periphery thereof, and having side and end shearing edges; and a pair of grid members pivotally mounted in said casing upon opposite sides of said rotor, said grid members having imperforate planar upper portions disposed tangentially to the periphery of said rotor, and curved lower portions embracing the lower half of said rotor periphery, said lower portions being provided with axially spaced longitudinally extending slots in alinement with said cutter members for receiving the latter and providing axially spaced longitudinal ribs having side shearing edges arranged to coact with the side shearing edges of said cutter members to shred the solids longitudinally, said curved grid member portions also having arcuately spaced transverse ribs provided with transverse shearing edges at substantially the bottoms of said longitudinal slots for shearing coaction with the end shearing edges of said cutter member to shear the solids transversely.

3. In apparatus for reducing large organic solids in sewage, garbage and the like to a shredded condition, a casing; a rotor journalled in said casing, provided with a plurality of axially spaced sets of cutter members projecting a uniform distance from the periphery thereof, and having side and end shearing edges; and a pair of plate-like members pivotally mounted in said casing upon opposite sides of said rotor, said members having imperforate planar portions disposed tangentially to the periphery of said rotor, and curved portions embracing a portion of said rotor periphery, said curved portions being slotted completely through the plate in alinement with said cutter members to accommodate the latter and to provide axially spaced longitudinally extending ribs intermediate said cutters having smooth side shearing edges arranged to coact with the side shearing edges of said cutters to shred the solids longitudinally, said curved portions being further provided with a plurality of arcuately spaced transverse shearing members bridging said slots and having smooth shearing edges disposed substantially at the bottoms of the slots for coaction with the end shearing edges of said cutter members to shear the solids transversely.

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