April 14, 1942. G. C. UNGER, JR 2,279,848

APPARATUS FOR DRYING SLUDGE

Filed April 4, 1940 2 Sheets-Sheet 1

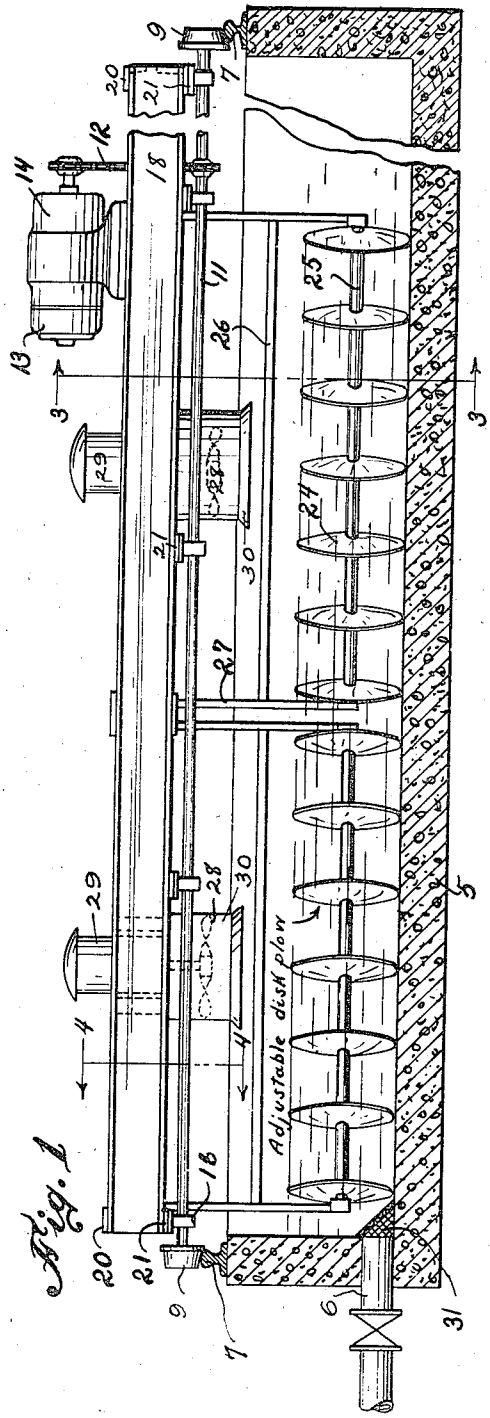


Fig. 1

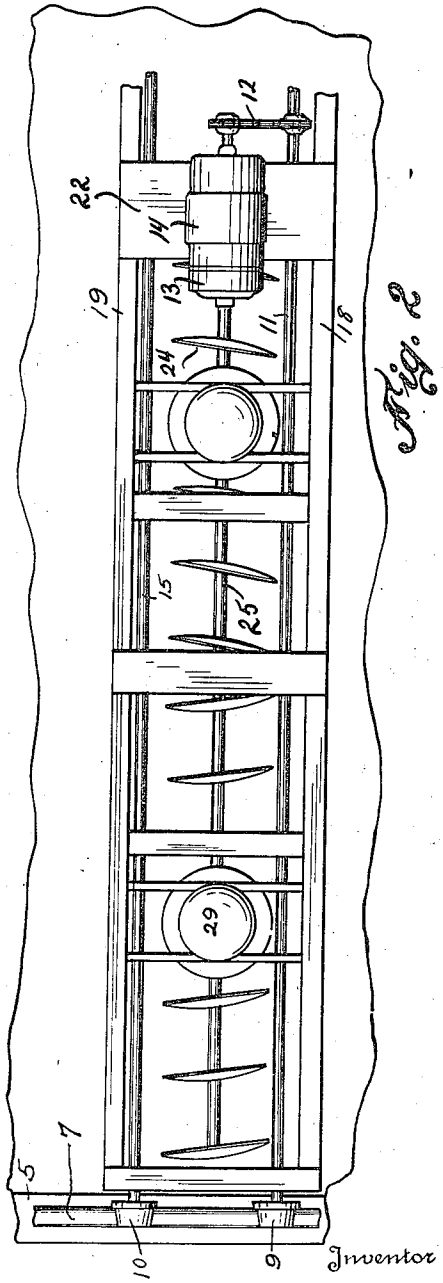


Fig. 2

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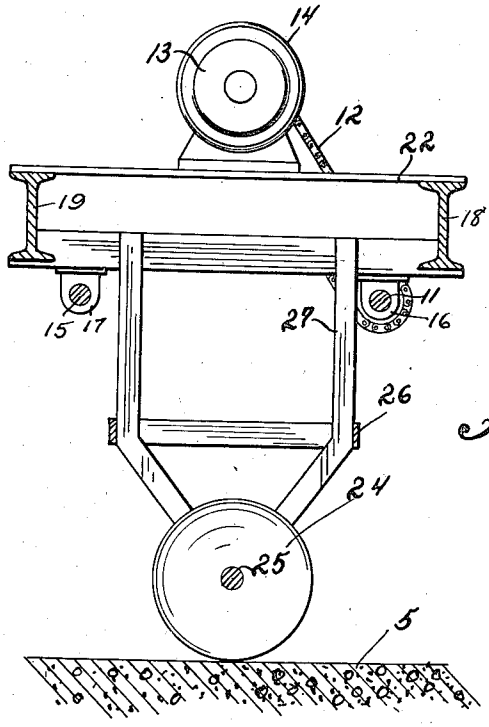


Fig. 3

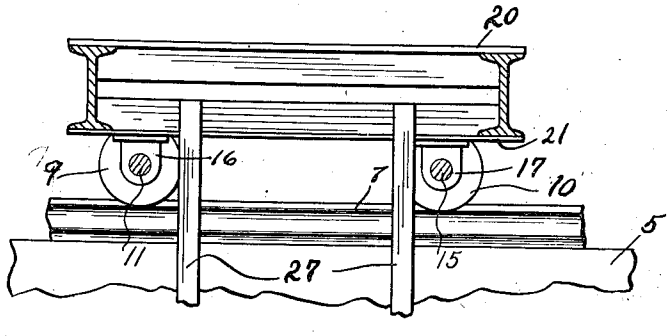


Fig. 4

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UNITED STATES PATENT OFFICE

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APPARATUS FOR DRYING SLUDGE

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Application April 4, 1940, Serial No. 327,909

1 Claim. (Cl. 34—181)

This invention relates primarily to an apparatus for rapidly and economically drying sewage sludge, though it can be utilized to aid in the removal of moisture from, and the drying of other wet materials, to leave substantially dry solids.

Broadly stated, the invention contemplates the repeated mechanical turnover or disturbance of the sludge or other wet materials in a shallow basin or tank, to thereby prevent the formation of a moisture retaining crust, and to continually bring fresh, wet material from the bottom to the surface, so that evaporation by sun and air can take place over a large area. It is also contemplated to associate fans or like air-propelling means with the apparatus, so that evaporation may be further speeded up when desired. It is a further object of the invention to so arrange the instrumentalities by which the foregoing results are achieved, as to easily adapt the mechanisms employed to either large or small installations, and to make it possible to easily add additional agitating units, while employing the same primary driving means.

Further objects and advantages of the invention will be set forth in the detailed description which follows. In the accompanying drawings:

Fig. 1 is a transverse vertical sectional view through one form of apparatus which I may employ in carrying out the invention.

Fig. 2 is a plan view of the structure of Fig. 1.

Fig. 3 is a vertical sectional view upon line 3—3 of Fig. 1.

Fig. 4 is a sectional view upon line 4—4 of Fig. 1.

Like numerals designate corresponding parts in all of the figures of the drawings.

In the drawings, 5 designates a conventional relatively shallow, preferably concrete, sludge tank, into which the sludge left after bacterial sewage disposal processes may be delivered, either gravitally or by pumping. It is sometimes the case that water will collect in tanks of this sort, during periods of disuse, and I provide a valved pipe 6, by which water may be drawn off when desired. Track rails 7, disposed upon the walls of the tank, constitute supporting and guiding means for the track wheels 9 and 10. The wheels 9, are carried by a driven shaft 11, to which rotation may be imparted through a chain drive 12, from electric motor 13. This motor includes a conventional reduction gear, the casing of which is indicated at 14, so that the speed of rotation of the shaft 11 may be made relatively slow. The wheels 10 are mounted upon a shaft 15, said shafts being free to rotate in bearings 16 and 17.

These bearings are secured to an elongated carriage comprising stout channel or I beams 18 and 19. These beams together with transverse angles 20 and 21, constitute a support for the motor 13, said motor being mounted upon a transverse plate 22, which spans the space between, and rests upon, the beams 18 and 19. Thus as the motor is operated, the carriage, motor and shafts will be caused to travel bodily along the track rails 7, or in other words, will be caused to move lengthwise of the tank 5.

It is well-known engineering practice to provide limit switches for electric motors used to reciprocate carriages of this sort, and it is contemplated to employ this well-known method of causing the carriage to travel back and forth along the tank.

I contemplate the use of one or more harrow or plow-like assemblies, as the means for continually bringing fresh layers of moist material to the surface of the sludge bed. In practice, the sludge will, at the beginning of the drying operation, be filled into the tank to a point slightly above the disc plows 24. These are merely conventionally shown in the accompanying drawings as being supported from shafts 25, that are carried by frames 26. Suitable hangers 27 support the frames 26 from the carriage.

Merely for purposes of explanation and illustration, I have chosen to show two of the plow or harrow units, each unit consisting of one of the frames 26, and its associated parts. However, the number of units employed will be determined by the width of the tank 5. In some installations employing relatively narrow tanks, the harrow unit may be made wide enough so that only one unit need be employed. However, the use of separate units renders the matter of installation more flexible, in that additional units may be added as additional drying capacity is required, without disturbing the driving means for said units, to wit, the carriage. This can be accomplished by making the carriage long enough to take the maximum number of units ever to be used, but utilizing, in the beginning, less than the full number of plows capable of being moved by said carriage.

I preferably associate with each of the plow assemblies an electric motor-driven fan 28, the motors thereof being indicated at 29. These fans are preferably disposed in the hoods 30, and they function to direct strong blasts of air downwardly upon the material that is to be dried. It

is to be understood that the showing of the disc plows is merely diagrammatic. It is common practice in agricultural implements to mount discs of this nature for angular adjustment.

Under the commonly employed methods with which I am familiar, drying is effected by turning the sludge into shallow tanks, located either in the open or under open sheds, and relying upon natural evaporation under the influence of sun and/or air or wind. Such procedure is necessarily slow, because, not only does a protective crust form over the surface of the sludge, which crust protects the underlying layers, but even in the absence of such crust, only the upper layers are contacted by the drying agencies. Consequently, the bringing to the surface of the wettest layers serves the two-fold purpose of exposing these layers to the drying influences, and of preventing the formation of the protective crust. The use of open top, relatively shallow tanks of considerable area facilitates the drying of large quantities of sludge or other waste material. Tanks of this nature permit the ready entry of the sun's rays and air to the material to be dried. However, while the most rapid drying can be had when the sun is shining, it is clear that some evaporative action will go on all the time, even on cloudy days. This is especially true where fans such as those indicated at **28** are provided to maintain a circulation of air.

Any moisture, fluid enough to be drained off through pipe **6**, is gotten rid of at that point, and to prevent the escape of solids through the pipe, I may dispose a screen **31** over the mouth thereof.

While I have shown the tank as having straight side walls, I may, if desired, mount the structure in an annular or circular tank, it being manifest that the shape of the tank is immaterial insofar as the broader aspects of the invention are concerned.

It is to be understood that the invention is not limited to the precise construction set forth, but that it includes within its purview whatever changes fairly come within either the terms or the spirit of the appended claim.

Having described my invention, what I claim is:

In combination, a tank adapted to receive sludge to be dried, an elongated carriage spanning said tank, means for guiding the carriage along the walls of the tank, power means for reciprocating the carriage along the tank, and a plurality of independent plow units suspended from said carriage, each comprising a plurality of plow discs, said tank being open at its top to the free entry of air and air propelling means mounted upon the carriage above each of the plow units acting to discharge air forcibly upon the surface of the material being upturned by its associated plow unit.

GILBERT C. UNGER, JR.