July 1, 1941. J. F. BOLTON 2,247,433

TRAVERSIBLE CARRIAGE USED IN RECTANGULAR SPRINKLER INSTALLATIONS FOR TREATING SEWAGE

Filed Jan. 18, 1940 3 Sheets-Sheet 1

FIG. 1.

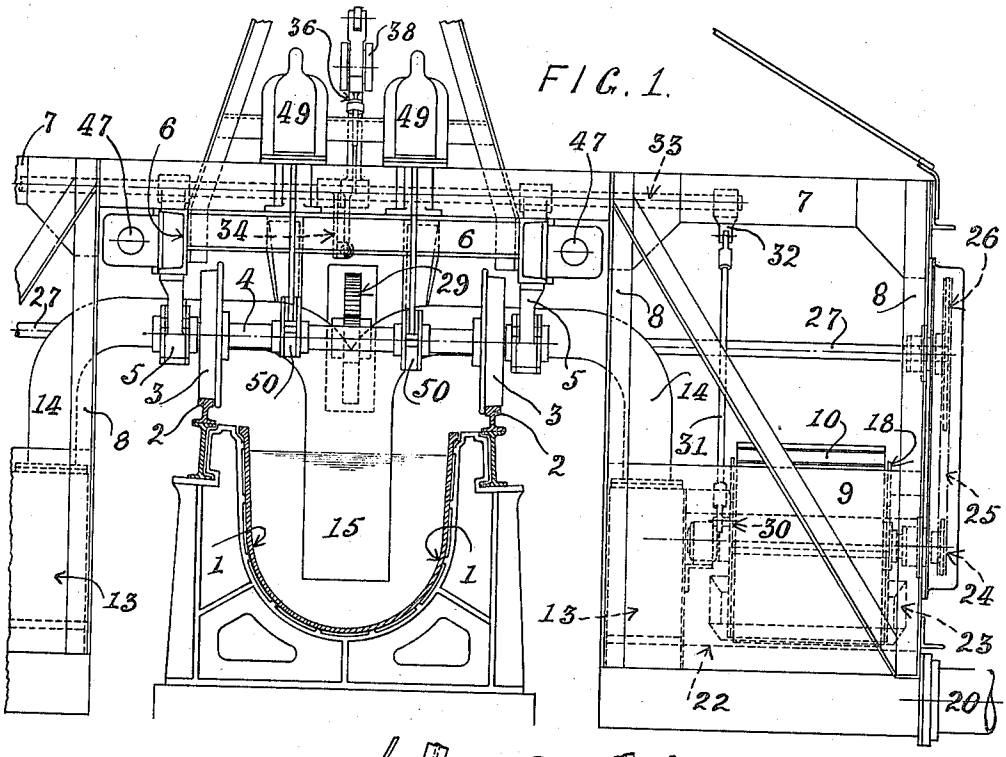
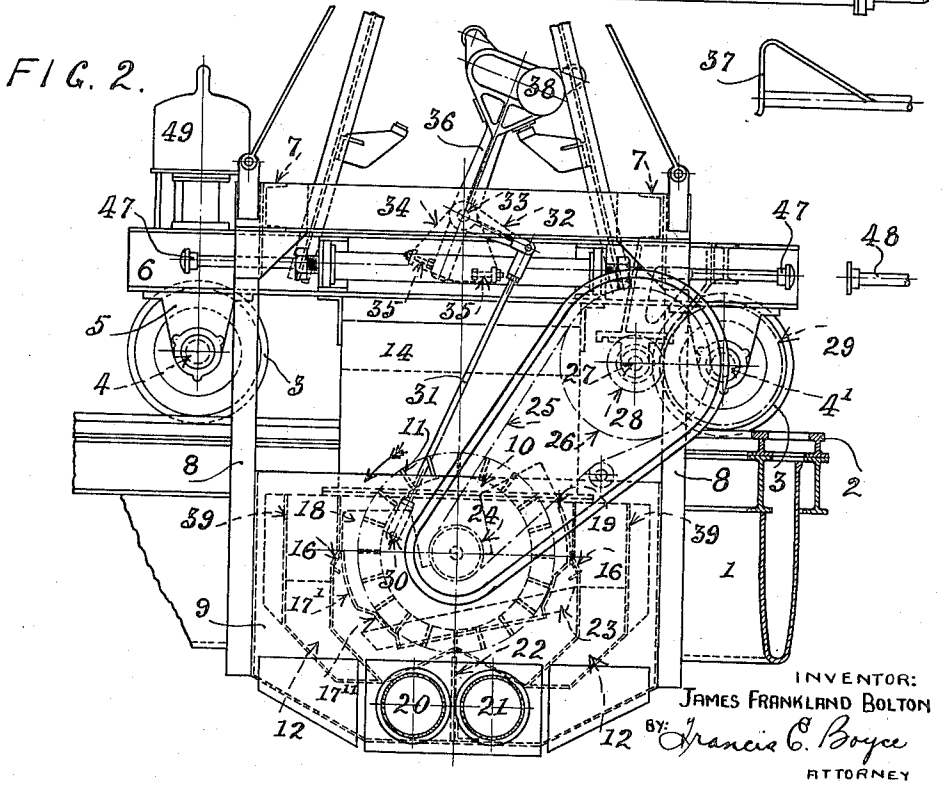


FIG. 2.



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FIG. 3.

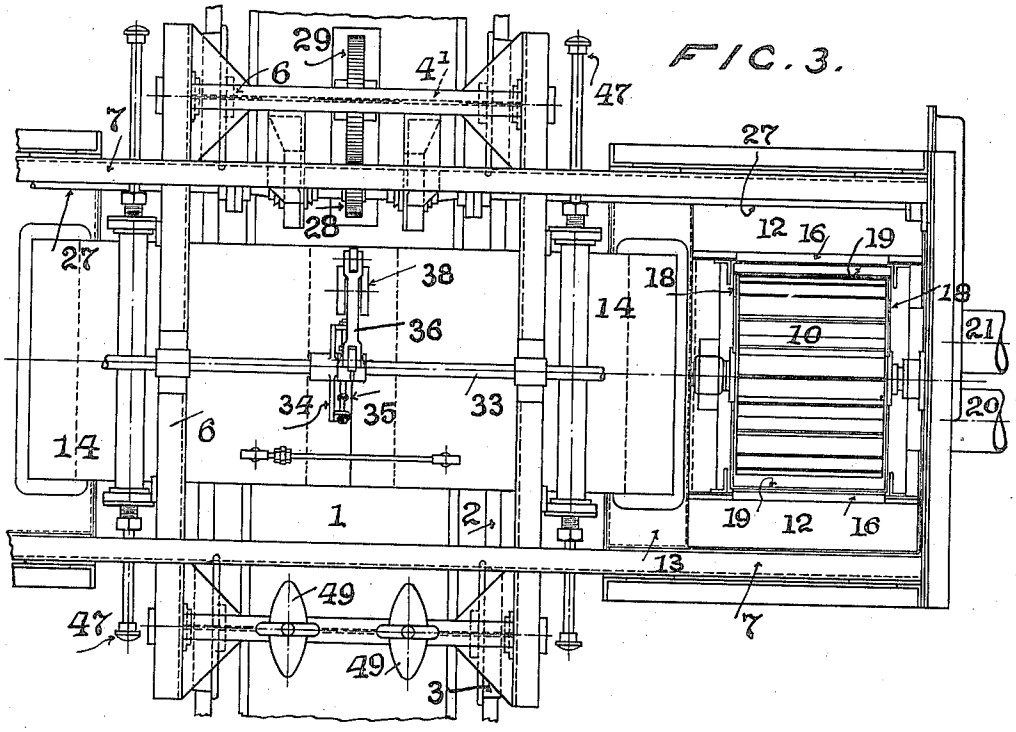
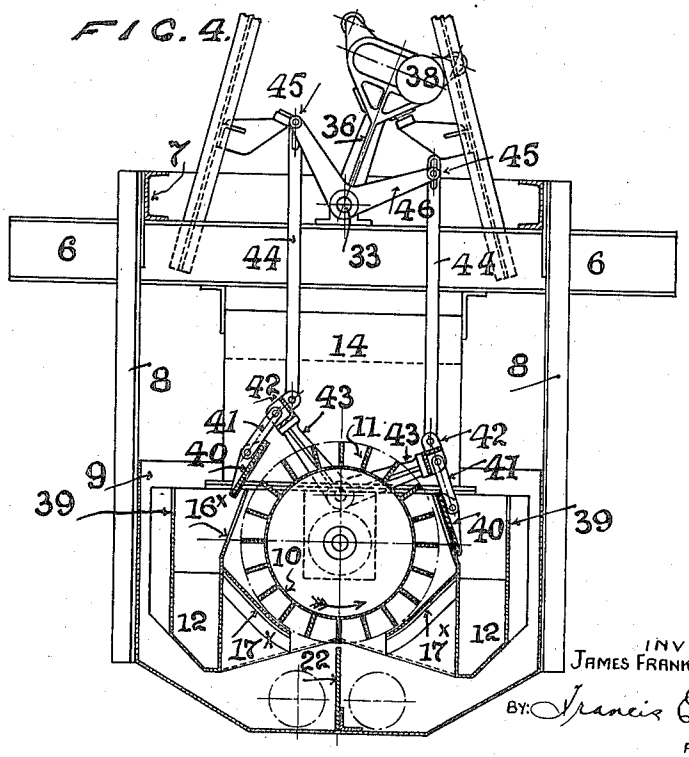


FIG. 4.



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FIG. 5.

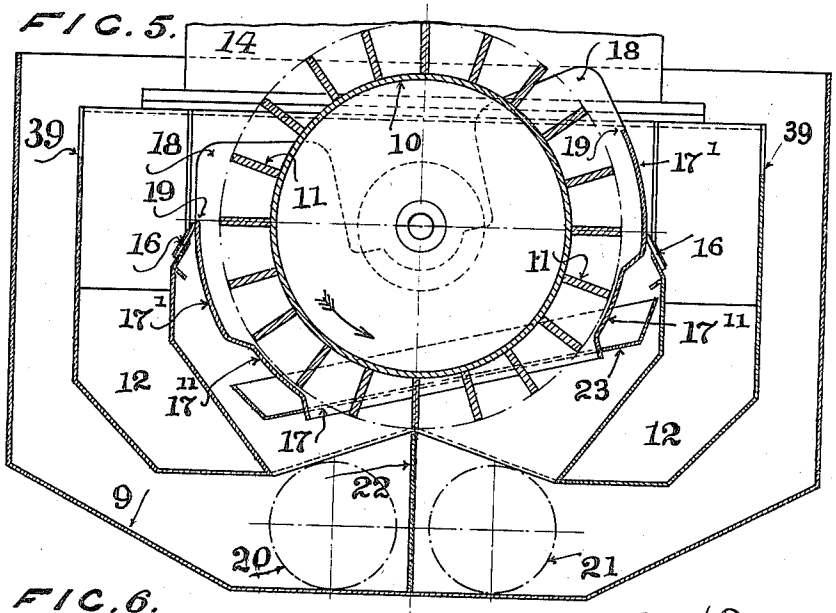
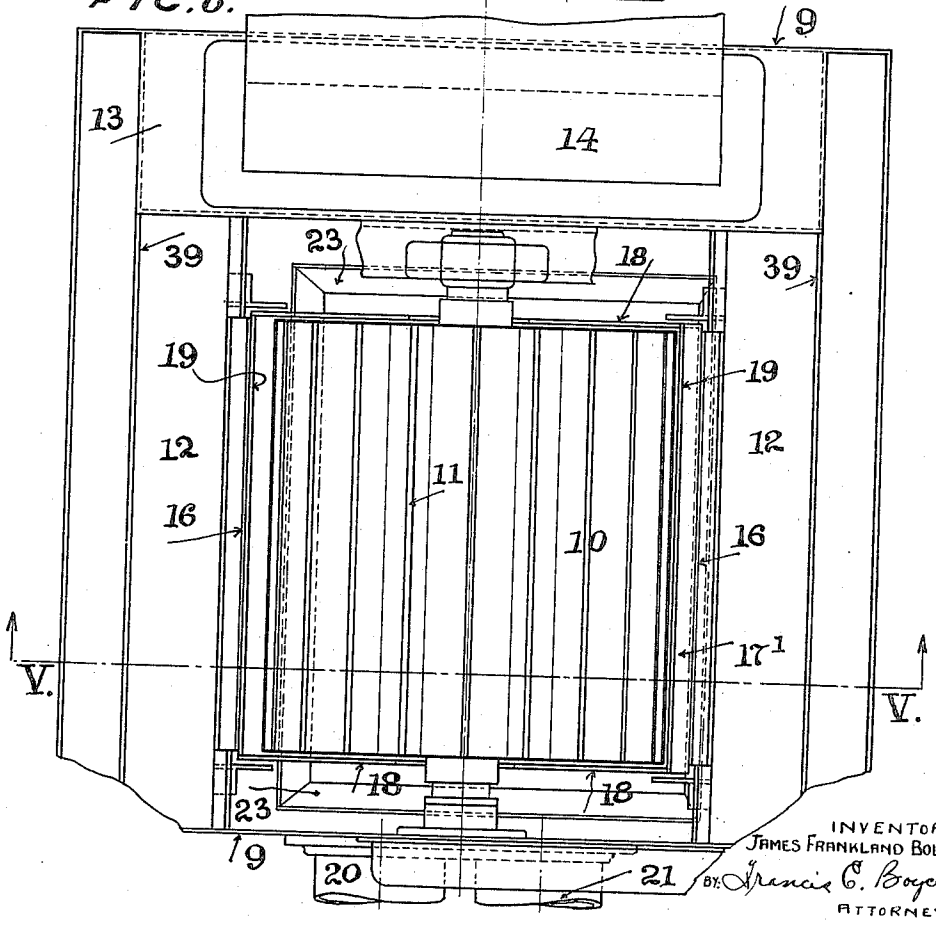


FIG. 6.



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UNITED STATES PATENT OFFICE

2,247,433

TRAVERSIBLE CARRIAGE USED IN RECTANGULAR SPRINKLER INSTALLATIONS FOR TREATING SEWAGE

James Frankland Bolton, Heywood, England

Application January 18, 1940, Serial No. 314,492
In Great Britain January 26, 1939

7 Claims. (Cl. 299—52)

This invention relates to the traversible carriages used in rectangular sprinkler installations for treating liquid sewage or the effluent from preceding sewage treating installations, such liquid being hereafter referred to as "water."

The improvements are concerned with a known kind of carriage which runs on a comparatively narrow gauge track extending along the centre of the rectangular bed, such carriage supporting on either side a chamber or box with water-wheel adapted to be driven by the flow of water and so as to traverse the carriage, the water passing thence along a sprinkler pipe or pipes extending over the filter bed and supported from the carriage. In carriages of this kind the water-wheels have been rotated in one direction only, and reversal of travel of the carriage has been obtained automatically by a movable lever or the like on the carriage striking an abutment device at the end of each travel and so actuating a clutch in connection with transmission gearing to give a drive in the opposite direction.

By the present improvements such a clutch contrivance and much of the transmission gearing can be dispensed with. According to the invention there is provided a traversible carriage of the kind above set forth wherein the direction of travel of the carriage is automatically reversed by reversing the direction of rotation of each water-wheel through means automatically actuated at the end of each travel. This is done by taking water from the longitudinal feed trough beneath the track and directing it on to either side of each water-wheel (according to the direction of travel) under the control of valve or weir contrivances automatically actuated at the end of each travel by contact of a reversing lever or like device on the carriage with a buffer or abutment mounted in connection with the track. Such an arrangement allows of a simplification of the driving transmission mechanism, and other features of the invention relate to the construction of the water-wheels and their co-operating casings, the weir boxes from which the water flows on to the water-wheels, and the reversing valve or weir contrivances and their operating mechanism.

The invention is illustrated in the accompanying drawings, wherein:

Fig. 1 is a front elevation of a traversible carriage according to the invention shown mounted on its track above the filter bed, a portion at one side being broken away.

Fig. 2 is a side elevation looking on the right hand side of Fig. 1.

Fig. 3 is a plan view corresponding to Fig. 1 with a portion of the reversing mechanism broken away.

Fig. 4 is a partial side elevation with the lower part shown in section, showing an alternative form of reversing valve or weir contrivance.

Figs. 5 and 6 show on a larger scale one of the water-wheel chambers and its contents with the positions of the parts the same as in Fig. 2, Fig. 6 being a plan view and Fig. 5 a sectional view taken on the line V—V in Fig. 6.

Referring now particularly to Figs. 1 to 3 of the drawings, there is shown a central feed trough 1 which may extend for the length of the filter bed and into which the "water" is led, and this supports rails 2 on which the wheels 3 of the traversible carriage run. These wheels 3 are fixed upon axles 4, 4^1 mounted in brackets 5 upon which the chassis 6 of the carriage is supported. Upon this chassis 6 are fixed long transverse members 7 which project on each side and support in pendent frames 8 the water-wheel chambers 9. It will be clear that the following description of one water-wheel chamber and its associated parts applies equally to that on the other side of the carriage, such carriages generally carrying sprinkler pipes on both sides of the trough.

The water-wheel chamber 9 contains the reversible water-wheel 10 which has around its periphery a number of radially projecting longitudinally disposed vanes 11 arranged so as to form pockets, the wheel being adapted to be turned in one or the other direction by water entering the pockets on one side or the other. On each side of the water-wheel there is a weir box 12 (see particularly Figs. 5 and 6) closed at the bottom and a little longer than the water-wheel, and the inner ends of these weir boxes communicate with the enlarged lower end 13 of one leg of a syphon pipe 14 which is suspended from the chassis 6 with its common central leg 15 dipping into the water in the feed trough 1. Each weir box 12 has a stationary valve seating or packing consisting of a strip 16 of rubber or the like, and with this there co-operates a movable undercasing structure 17 which extends along each side of the wheel 10 between end plates 18 pivoted about the axle of such wheel. This undercasing structure 17 has on each side a weir 19 so that the weirs are coupled in pairs, and the undercasing structure can be rocked to raise one weir and lower the

other or vice versa with respect to the seatings 16 and thereby to permit the flow of water over only one seating 16 into the water wheel.

The undercasing 17 at 17^1 is well spaced from the vanes 11 of the water-wheel for a short distance below the weir 19 and then approaches close to such vanes at 17^{11}, leaving below the centre part of the wheel 10 a full length gap through which water escapes from the water wheel into the bottom of the chamber 9. This chamber is shown as communicating with two sprinkler pipes 20, 21 supported therefrom, and an upright plate 22 extends the length of the chamber 9 with its upper edge close to the vanes 11 of the water-wheel so as to form a partition dividing the lower part of the chamber 9 into two compartments served respectively by the pipes 20, 21. The object of shaping the undercasing 17 as described is to enable water to enter more than one of the pockets of the water-wheel at a time, that is, those opposite the portion 17^1, so that a good pressure is obtained due to the weight of water in these several pockets. This is particularly useful for starting the rotation of the wheel, which is made difficult by the shaping of the vanes 11 necessary to enable the wheel to operate efficiently in either direction.

To the lower part of the undercasing 17 there is fixed a tray 23 of hollow rectangular form which collects any water escaping at the ends and at the sealed or closed side of the water-wheel and directs this to the compartment of the chamber 9 then in use, the tray tilting as the undercasing is rocked.

The carriage is traversed by the rotation of the water-wheel 10 which has fixed on its axle a chain-wheel 24 driving by a chain 25 a chain-wheel 26 fixed on a long shaft 27 which is similarly driven by the other water-wheel. On the shaft 27 is fixed a spur pinion 28 engaging a spur wheel 29 fixed on the axle 4^1 of the carriage, which is thereby traversed to and fro according to the direction of rotation of the water-wheel. Any other simple form of drive transmission could be used.

The reversing of the water-wheel is effected automatically as follows. One end plate 18 of the undercasing 17 has pivotally connected at 30 a rod 31 which is also pivoted to an arm 32 fixed on a shaft 33 similarly connected to the undercasing of the other water-wheel and mounted in brackets on the chassis 6. Centrally fixed on the shaft 33 is a segment 34 with adjustable abutment studs 35 which can be acted upon by the foot of a reversing lever 36 freely pivoted on the shaft 33. The action of this mechanism and the rest of the apparatus can be seen from Fig. 2 in which the water-wheel is shown as rotating in the direction indicated by the arrow to drive the carriage to the right. The water syphoned from the trough 1 flows into both weir boxes 12 but owing to the position of the undercasing 17 it can only flow over the left-hand weir 19 which is level with the corresponding valve seating 16, and so the water rotates the water-wheel and then passes into the sprinkler pipe 20. When the carriage reaches the end of its traverse the reversing lever 36 engages an abutment device 37 mounted above the track and is thereby pushed over to the other position, the foot of the lever 36 actuating the segment 34 as soon as the lever has passed over its central position and the rolling weight 38 has moved across. Thus the undercasing 17 is rocked to raise the left-hand weir 19 and lower the right-hand one, and so the rotation of the water-wheel is reversed.

In Fig. 4 there is shown an alternative arrangement of reversing valve or weir contrivances which is in effect an inversion of that above described, the weirs proper being stationary and being opened or closed by movable valves. In this arrangement, the undercasing $17^\times$ is fixed, and its upper part on each side abuts against the wall of the weir box 12 and is spaced well away from the vanes 11 of the water-wheel, but as it inclines downwardly it comes closer to the vanes until it almost touches them, thus enabling several pockets of the water-wheel to be filled to give easy starting as explained above. Each weir box 12 has a fixed front weir $16^\times$, and with this there co-operates a movable valve in the form of a long plate 40 capable of fitting over and closing the weir $16^\times$. This plate valve 40 is loosely carried on two arms 41 pivoted to a cross bar 42 supported by arms 43 pivoted to supports in the chamber 9, and each cross bar 42 is connected by a rod 44 through a pin-and-slot connection 45 to one arm of a bell-cranked lever 46. This lever 46 is fixed on the shaft 33 and actuated directly by the reversing lever 36 which is fixed on such shaft. Thus, the movement of the reversing lever 36 at the end of each traverse of the carriage actuates the moveable valve plates 40 to close one weir $16^\times$ and open the other, whereby the rotation of the water-wheel is reversed. The lost-motion connection 45 serves the same purpose as the segment and loose lever arrangement in Fig. 2, and the movable valve plates 40 are coupled together in pairs.

Each weir box 12 is provided with a back weir 39 a little higher than the fixed valve seating 16 or front weir $16^\times$, so that when an extra large flow of water occurs the surplus can escape over these back weirs 39 into the surrounding chamber 9 and so to both sprinkler pipes 20, 21, with the result that the surplus is rapidly disposed of.

It will be understood that where the sprinkler pipes are in pairs the intention is that one should act to sprinkle water on the part of the bed near to the centre trough 1 only and the other to sprinkle water on the part of the bed further from the centre trough, according to the direction of travel of the carriage, as is known. If a single pipe is used, this could sprinkle water on both traverses of the carriage, and the partition plate 22 could be dispensed with, as also the tray 23.

The carriage is shown fitted with hydraulic, pneumatic or spring buffers 47 of known type arranged to contact with stationary buffers or abutments 48 at the end of each traverse to lessen the shock of reversal and assist the action of the mechanism. There are also shown oil dash-pot or like brakes 49 operated by eccentrics 50 on the axle 4 of the carriage and serving as is known, to prevent the carriage from over-speeding when blown by a high wind.

I claim:

1. A traversible carriage for use in rectangular sprinkler installations in the treatment of sewage, and having a reversible water wheel, and distinguished in that the water wheel chamber from which the water is delivered has combined therewith weir boxes disposed one on either side of the water wheel and communicating permanently with a syphon which draws water from a feed trough, said chamber having an undercasing structure partly surrounding the water wheel

and adjacent the vanes thereof, said undercasing structure having outlet provision at the base, and also having alternatively operative weirs, the said undercasing structure co-operating with the water wheel to permit alternate functioning of the alternatively operative weirs, and reversing mechanism for controlling the latter.

2. A traversible carriage for use in rectangular sprinkler installations in the treatment of sewage, comprising a wheeled chassis arranged to travel to and fro above a feed trough containing the water to be purified, support members mounted on said chassis and supporting a water-wheel chamber, a reversible water-wheel carried in said chamber, simple driving mechanism arranged to transmit the drive from said water-wheel to said wheeled chassis to traverse the whole carriage, a weir box on each side of said water-wheel and within said chamber, a syphon with one leg in the feed trough and the other communicating permanently with both sides of the water-wheel through said weir boxes, a sprinkler pipe communicating permanently with said water-wheel chamber, and means to reverse the direction of travel of the carriage automatically by reversing the direction of rotation of the water-wheel, said means comprising a pair of movable control contrivances arranged to co-operate each with one of the weir boxes between the front of said weir box and the water wheel to direct the water on to either side of the water-wheel from the corresponding weir box (according to the direction of travel) and automatically actuated at the end of each travel by contact of a movable reversing device on the carriage with an abutment mounted in connection with the track.

3. A traversible carriage for use in rectangular sprinkler installations in the treatment of sewage, comprising a wheeled chassis arranged to travel to and fro above a feed trough containing the water to be purified, support members mounted on said chassis and supporting a water-wheel chamber, a reversible water-wheel carried in said chamber, simple driving mechanism arranged to transmit the drive from said water-wheel to said wheeled chassis to traverse the whole carriage, a weir box on each side of said water wheel and within said chamber, a syphon with one leg in the feed trough and the other communicating permanently with both sides of the water-wheel through said weir boxes, two sprinkler pipes communicating permanently with said water-wheel chamber, a partition arranged longitudinally below said water-wheel almost touching same and dividing the lower part of the water-wheel chamber into two compartments each served by one of said sprinkler pipes, and means to reverse the direction of travel of the carriage automatically by reversing the direction of rotation of the water-wheel, said means comprising a pair of movable control contrivances arranged to co-operate each with one of the weir boxes between the front of said weir box and the water-wheel to direct the water on to either side of the water-wheel (according to the direction of travel) and automatically actuated at the end of each travel by contact of a movable reversing device on the carriage with an abutment mounted in connection with the track.

4. A combination as claimed in claim 2, including a stationary seating surface at the front of each such weir box and over which water flows on to the water-wheel, a rockable undercasing partly surrounding the lower portion of the water-wheel and having on each side of such wheel a weir surface arranged to co-operate with the stationary seating surface on the corresponding weir box, and connections between the movable reversing device and said undercasing to rock the latter at the end of each travel of the carriage.

5. A combination as claimed in claim 2, including an undercasing partly surrounding the lower portion of the water-wheel, said undercasing being spaced away from said wheel near the part of each weir box over which water flows to the wheel but almost touching the wheel lower down, whereby water can flow into more than one pocket of the water-wheel even when this is stationary.

6. A combination as claimed in claim 3, including a stationary seating surface at the front of each such weir box and over which water flows on to the water-wheel, a rockable undercasing partly surrounding the lower portion of the water-wheel and having on each side of such wheel a weir surface arranged to co-operate with the stationary seating surface on the corresponding weir box, connections between the movable reversing device and said undercasing to rock the latter at the end of each travel of the carriage, and a tray fixed to the lower part of said undercasing and arranged to tilt when said undercasing is rocked and to collect any escaping water and direct same to the appropriate compartment of the water-wheel chamber.

7. A combination as claimed in claim 3, including a back weir in connection with each such weir box and over both of which surplus water can overflow and escape through both sprinkler pipes.

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