

TITLE OF THE INVENTION

SCRAPING DEVICE FOR SLUDGE OR THE LIKE

BACKGROUND OF THE INVENTION

1. FIELD OF THE INVENTION

The present invention relates to a scraping device for sludge or the like, and more particularly to a scraping device for sludge which settles in a treatment pond such as a settling pond.

2. DESCRIPTION OF THE RELATED ART

In a treatment pond such as a settling pond, it is constituted in such a manner that a large number of flights are arranged on chains which move cyclically, so that the flights scrape sludge at the bottom of the pond at the time of traveling through the pond bottom to convey the sludge to a sludge pit. However, since such constitution is not favorable in terms of the cost because of its complicated structure thereof, there has emerged quite recently a sludge scraping device which is constituted in such a manner that a carriage provided with a sludge scraper which moves in a vertical direction is allowed to be driven in a progressive or regressive manner along a guide rail provided on the bottom of the pond. This sludge scraping device has an advantage in that the structure is simple, and the cost is comparatively low.

Such sludge scraping device is constituted in such a manner

that wheels are provided for driving the carriage in a progressive and regressive manner to travel on a guide rail. It is constituted in such a manner that this carriage is allowed to be driven in a progressive and regressive manner with a driving section installed on a pond. So far, a wire drum is provided over the pond, and one end of the wire rope (tow and transmission means) is wound on the drum to be connected to the scraping device while the other end is brought to a surface of the pond to be wound on the drum in an opposite direction. As a consequence, one end side of the wire rope forms a winding up side while the other end forms the feeding out side, thereby establishing a counterbalancing relation with the result that the scraping device is driven in a progressive and regressive manner while the sludge scraper is changed over in a vertical direction with the association thereof.

However, in a method of driving the wire rope with such a drum in the progressive and regressive manner, a structural simplification cannot be attempted in a real manufacture thereof, and a construction and an adjustment become troublesome, so that such effective solution means has been desired.

SUMMARY OF THE INVENTION

The present invention has been made to solve the above problem of the prior art. An object of the present invention is to provide a scraping device for sludge or the like, which enables an attempt of further decreasing the cost by simplifying

the driving system while simplifying construction and adjustment work.

A scraping device according to an aspect of the present invention has the following structure.

The scraping device comprising:

a carriage provided with a sludge scraper and running wheels;

a driving portion which is installed on a treatment pond and which has a driving wheel;

a tow and transmission means which is suspended between the driving wheel and the carriage so that the carriage is towed and driven after the tow and transmission means is suspended between the driving wheel and the carriage attached with the scraper;

characterized in that the carriage has side walls located opposite to each other, and an end wall perpendicular to the side walls, the carriage is installed on the bottom of the treatment pond having a square shape with a pit on one end and is provided so that the carriage can run freely on a guide rail which passes through the center between both side walls, and the carriage is provided in such a manner that the sludge scraper is provided so that the scraper can be vertically rotatably changed over between a lowered scraping state and a risen scraping state;

the driving portion is installed on the pond to be processed

to continuously rotatably driving the drive wheel and change over the rotating direction in a reverse manner;

the tow and transmission means comprises an engaged long member such as a link chain, a chain belt element; and

the drive wheels are such that a single long member winding type engaged long member is associated in an engaging manner.

According to the present invention, there is provided a scraping device for sludge or the like which the drive system is simplified to further decrease the cost while construction and adjustment work is simplified.

Preferably, the guide rail is provided with a lower flange which extends in a right and a left direction on the bottom of the pond, and the right and the left wheel roll on the same flange.

Preferably, the guide rail is constituted in such a manner that the guide rail has a continuous inner space in a longitudinal direction thereof, and a progressing and regressing tow and transmission means is allowed to pass through the inner space while a sliding guide member is provided which guides the tow and transmission means with a low friction.

Further, in accordance with another aspect of the present invention, there is provided a scraping device comprising:

a carriage which is provided with a sludge scraper and running wheels;

a driving portion which is installed on a treatment pond and which has a driving wheel;

tow and transmission means which is suspended between the carriage and the driving portion, and is suspended between the driving wheel and the carriage attached with the scraper to tow and drive the carriage;

characterized in that the carriage has side walls located opposite to each other, and an end wall perpendicular to the side walls, the carriage is installed on the bottom of the treatment pond having a square shape with a pit on one end and is provided so that the carriage can run freely on a guide rail which passes through the center between both side walls, and the carriage is composed of a front and a rear carriage mutually connected with an association member and is connected with the association member between a front and a rear scraper and the posture of the carriage of the front and the rear scraper can be changed over between a scraping state and a retraction state with the progress and the regress of the tow and transmission means in a forward and a backward direction.

In accordance with yet another aspect of the present invention, there is provided a scrapping device comprising:

a carriage which is provided with a sludge scraper and running wheels;

a driving portion which is installed on a treatment pond and has a driving wheel;

a tow and transmission means which is suspended between the carriage and the driving portion, and which is suspended between the driving wheel and the carriage provided with a scraper;

characterized in that the carriage has side walls located opposite to each other and an end wall perpendicular to the side walls, and is installed on the bottom of the pond having a plan rectangular configuration with a pit on one end, and is provided in such a manner that the carriage runs freely on a guide rail which passes through the center between both side walls while the sludge scraper is provided in such a manner that the scraper can be changed over in a vertical rotation between a lowered scraping state and a risen retracted state;

the driving portion is installed on the treatment pond to continuously rotate and drive the driving wheel to change over the rotation direction in mutually opposite directions;

the tow and transmission means has at least the drive wheel, a first relay sieve and a second sieve, and the drive wheel is deviated and located on one of the side

walls from the location corresponding to the upper portion of the central line between the width of the pond on the pond;

the first relay sieve is located on one side of the bottom of the pond corresponding to the lower portion of the drive wheel, and

the second relay sieve is located in the vicinity of the front portion and the rear portion of the guide rail to be hanged via these wheel sieve.

In accordance with a further aspect of the present invention, there is provided a scrapping device comprising:

a carriage which is provided with a sludge scraper and running wheels;

a driving portion which is installed on a treatment pond and has a driving wheel; and

a tow and transmission means which is suspended between the carriage and the driving portion, and which is suspended between the driving wheel and the carriage provided with a scraper;

characterized in that the carriage has side walls located opposite to each other and an end wall perpendicular to the side walls, and is installed on the bottom of the pond having a plan rectangular configuration with a pit on one end, and is provided in such a manner

that the carriage runs freely on a guide rail which passes through the center between both side walls while the sludge scraper is provided in such a manner that the scraper can be changed over in a vertical rotation between a lowered scraping state and a risen retracted state;

the driving portion is installed on the treatment pond to continuously rotate and drive the driving wheel to change over the rotation direction in a mutually opposite direction; and

the scraper is arranged before and after the carriage while a front scraper and a rear scraper are connected with a connection member between the scrapers, a pillar having a scam scraper which can be freely erected and turned down on an upper end thereof while the scam scraper is erected and turned down in correspondence to an association system comprising the sludge scraper and the association member between the scrapers.

In accordance with another aspect of the present invention, there is provided a scrapping device comprising:

a carriage which is provided with a sludge scraper and running wheels and which can progress and regress by allowing the running wheels to run along the guide rail provided in a straight-line manner above the bottom wall of a treatment pond;

tow and transmission means which enables moving the scraper in a vertical direction in response thereto; and

an association mechanism which is constituted between the tow and transmission means and a scraper shaft to transmit the power from the tow and transmission means to the scraper shaft;

characterized in that the carriage is constituted in such a manner that the scraper is provided on a scraper shaft rotatably supported on an axis in a direction perpendicular to the progressing and regressing direction, and the scraper is moved downward to scrape in one direction settled sands and sludge which is detained on the bottom of the treatment pond in a scraping posture, and is retracted in an opposite direction in a risen posture; and

the association mechanism is provided with an association arm which is rotatable around the scraper shaft to constitute between the association arm and the scraper shaft play means for setting the rotation movement of the association arm to a non-transmission state for a portion of a definite angle at the time of the change-over from the scraping state to the retraction state.

In accordance with yet another aspect of the present invention, there is provided a scrapping device comprising:

a carriage which is provided with a sludge scraper and running wheels;

a driving portion which is installed on a treatment pond and has a driving wheel; and

a tow and transmission means which is suspended between the carriage and the driving portion, and which is suspended between the driving wheel and the carriage provided with a scraper;

characterized in that the carriage has side walls located opposite to each other and an end wall perpendicular to the side walls, and is installed on the bottom of the pond having a plan rectangular configuration with a pit on one end, and is provided in such a manner that the carriage runs freely on a guide rail which passes through the center between both side walls while the sludge scraper is provided in such a manner that the scraper can be changed over in a vertical rotation between a lowered scraping state and a risen retracted state; the sludge scraper is provided in a manner rotatable in a vertical direction in the lowered scraping state and in the raised retraction state; and the center of the running wheels becomes the same as the rotation center of the sludge scraper;

the driving portion is installed on the treatment pond and the driving wheel is continuously rotated and

driven so that the rotation direction is changed over in a positive and a negative direction.

In accordance with a further aspect of the present invention, there is provided a scrapping device comprising:

a carriage provided with a sludge scraper and running wheels;

a driving portion which is installed on a treatment pond and has a driving wheel;

tow and transmission means which is suspended between the carriage and the driving portion, and which is suspended between the driving wheel and the carriage provided with the scraper;

characterized in that the carriage has a side wall located opposite to each other and an end wall perpendicular thereto, and is provided on the bottom of the treatment pond having a plan rectangular configuration with a pit on one end thereof, and is provided in a manner freely running on the guide rail which passes through the center of both side walls while the sludge scraper is provided in a manner rotatably changing over between a lowered scraping state and a raised retracted state;

the driving portion is installed on the treatment pond and the driving wheel is continuously rotated and

driven so that the rotation direction is changed over in a positive and a negative direction;

the treatment pond is such that the pond bottom is arranged in two stages; an upper stage and a lower stage to form a two-stage tank, the guide rail is provided on the bottom of each pond so that each of the carriage can be freely progressed and regressed while at the same time

each of the front portions of the upper and the lower carriage and the rear portions there are connected with the tow and traction means so that the upper carriage and the lower carriage can be progressed and regressed in a mutually different directions;

the driving portion associates the tow and transmission means and is provided as a single entity.

In this constitution, it is desirable and convenient that a scraping device settled sands and sludge which prevent the movement of the carriage before the operation of the association mechanism.

BRIEF DESCRIPTION OF THE DRAWINGS

ABSTRACT OF THE DISCLOSURE

SCRAPING DEVICE FOR SLUDGE OR THE LIKE

There is provided a sludge scraping device in which tow and transmission means for towing and driving the carriage after changing over the rotation of the sludge scraper in either of the vertical directions comprises an engaged member such as a link chain and a chain belt while the drive wheel is associated in an engaged manner with a single winding up type engaged member.

Figure 1

Fig. 1 is a vertical side view showing a sludge scraping device according to one embodiment of the present invention;

Fig. 2 is a plan view thereof;

Fig. 3 is an enlarged sectional view taken along line III-III of Fig. 1;

Fig. 4 is an enlarged sectional view taken along line IV-IV of Fig. 1;

Fig. 5 is an enlarged sectional view taken along line V-V of Fig. 1;

Fig. 6 is a vertical sectional view showing another embodiment;

Fig. 7 is a plan view showing a method for connecting a guide rail;

Fig. 8 is a central horizontal sectional view of Fig. 7;

Fig. 9 is a sectional view showing an embodiment of an over-load maintenance device;

Fig. 10 is a front view of Fig. 9;

Fig. 11 is a plan view showing a sludge scraping device according to another embodiment;

Fig. 12 is a side view of Fig. 11;

Fig. 13 is a vertical sectional view of Fig. 12;

Fig. 14 is a sectional view showing an attachment structure of a side roller of Fig. 12;

Fig. 15 is a plan view showing a general example of the flight cyclic type of the sludge scraping device;

Fig. 16 is a side sectional view of Fig. 15;

Fig. 17 is a plan view of Fig. 18;

Fig. 18 is a vertical sectional view of Fig. 17;

Fig. 19 is a perspective view showing embodiments of Figs. 17 and 18;

Fig. 20 is a plan view showing another variation;

Fig. 21 is a plan view showing the sludge scraping device according to another embodiment;

Fig. 22 is a vertical sectional view of Fig. 21;

Fig. 23 is an enlarged sectional view taken along line A-A of Fig. 22;

Fig. 24 is an enlarged sectional view taken along line B-B of Fig. 22;

Fig. 25 is enlarged sectional view taken along line C-C of Fig. 22;

Fig. 26 is a side view showing the sludge scraping device according to another embodiment;

Fig. 27 is a vertical sectional view showing another embodiment;

Fig. 28 is a sectional view taken along line L-L of Fig. 27;

Fig. 29 is a vertical sectional side view showing an embodiment in which a sludge scraping device is provided in a two-stage tank type treatment pond;

Fig. 30 is a sectional view showing another embodiment

in which a sludge scraping device is provided in a two-stage tank type treatment pond;

Fig. 31 is a plan view showing an embodiment in which sludge scraping devices in adjacent ponds to be treated are associated to each other;

Fig. 32 is a vertical side sectional side view of Fig. 31;

Fig. 33 is a schematic diagram of a vertical section in which a clay-like sludge layer on the settled sludge is sectioned;

Fig. 34 is a perspective view showing a state in which a sludge section member is provided on a pillar;

Fig. 35 is a side view showing an embodiment in which a side roller is provided by using a scraper bracket;

Fig. 36 is a vertical sectional schematic diagram showing an embodiment in which a scam removing device is associated by using the movement of the sludge scraping device;

Fig. 37 is an overall view showing a pond of the scraping device according to one embodiment of the present invention;

Fig. 38 is an enlarged side view showing a scraping device of Fig. 37;

Fig. 39 is a front view showing the scraping device of Fig. 38;

Fig. 40 is a front view showing the scraping device of Fig. 38;

Fig. 41 is a side view showing a state in which the details

of the guide rail are broken;

Fig. 42 is a side sectional view showing an example of a slide promotion plate;

Fig. 43 is a front view of Fig. 40;

Fig. 44 is an enlarged half sectional view of an association mechanism;

Fig. 45 is a side view showing an action of the scraping device as a first stage;

Fig. 46 is a side view showing an action of the scraping device as a second stage;

Fig. 47 is a side sectional schematic view showing the drive method according to another embodiment;

Fig. 48 is a side sectional view showing an example of the scam removing device which can be associated with the scraping device;

Fig. 49 is a perspective view shown with an arrow in the direction of X of Fig. 48;

Fig. 50 is a sectional view taken along line Y-Y of Fig. 49;

Fig. 51 is a vertical sectional view showing still another embodiment;

Fig. 52 is a vertical sectional view showing still another embodiment; and

Fig. 53 is a side sectional view showing another the scam removing device according to another embodiment.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Embodiments of a scraping device for sludge or the like according to the present invention will be explained in detail by referring to the drawings.

Figs. 1 through 5 are views showing preferred embodiments of the present invention. These embodiments are such that the sludge scraping device is constituted with a settling pond having a rectangular configuration being set as a target. Incidentally, a part of the drawings shown in each of the upper stage of Figs. 1 and 2 is connected to the left side of lower stages of respective drawings. It is supposed that a definite distance is provided between the drawings on the right and the left side of these drawings.

The settling pond is provided with side walls 1 having configurations opposite to each other both in the right and the left directions as shown in the vertical sectional view of Fig. 1 and in the plan view of Fig. 2. The opposite directions of these side walls 1 are set as the width directions of the pond while the perpendicular directions thereof are set as a longitudinal direction of the pond. The opposite walls in the longitudinal directions are set as end walls 2 and 2 while a commutation portion 3 is provided which allows an inflow of dirty water into the end wall on the shown left end on one end. On one end in the longitudinal direction of the pond, a dented pit (sludge pit) 4 is formed. Then, the pond bottom 5 shown in Fig.

1 has a horizontal surface configuration in the drawings. In actuality, the pond is formed in such a manner that the pond is slightly lowered in the left direction. Incidentally, the settling pond according to this embodiment has a longitudinal direction length of about 30m.

Reference numeral 7 denotes a guide rail. This guide rail 7 is provided in a lengthwise manner from the right end up to the middle on the pit in Fig. 1. This guide rail 7 is mutually connected in a longitudinal direction in an appropriate length as described later.

The guide rail 7 is provided with a lower portion rail 8 (attached with a lower flange) and an upper portion rail 9. In the lower portion rail 8, as shown in Fig. 3, an angle member is used. For example, the guide rail has a scalene triangular configuration. The angle member has a size of 125 mm (horizontal width) $\times$ 75 mm (height) $\times$ 9 mm (thickness) and a pair of such angle members on the right and the left side are horizontally arranged in an opposite manner in a definite distance.

These lower rails 8 and 8 are fixed in a perpendicular manner to the surface of the attachment plate 10 arranged in a definite distance in a longitudinal direction with welding or the like. The attachment plate 10 is fixed to the bottom 5 of the pond with a special anchor 11. The details of the special anchor 11 will be described later.

On an upper portion between the lower portion rails 8 and

8, a plurality of connection seats 12... are fixed in a definite distance in a longitudinal direction. Furthermore, on the lower side between the lower rails 8 and 8, a slide guide plate 13 is fixed. In the slide guide plate 13, ultra high polymer quantity polyethylene (for example, trade name: New Light) used as a material rich in friction endurance is preferably used on a slide surface. The guide plate 13 is provided over the longitudinal direction with an anchor 14. This anchor 14 is designed in such a manner that the head thereof does not come upward.

The upper guide rail 9 is formed of a groove-type material having a long configuration and is provided on the lower portion rail 8 while the upper guide rail 9 is fixed from above with an anchor 15 such as a plate screw or the like. This anchor plate 15 is designed in such a manner that the head thereof does not come upward. Incidentally, the plate like the slide guide plate 13 may be fixed and provided in this upper portion rail 9 in some cases. In this case, this slide guide plate and the upper portion rail 9 can be fastened together to the connection seat 12.

Reference numeral 17 denotes a carriage. A groove-type member having a larger size than the upper portion rail, for example, the groove type member having a size of 150 x 75 x 9t (mm) is used in such a manner that the groove is directed downward by using the groove type member as a long member having a total

length of 15m. On an inner surface of the carriage 17, a contacting member 18 as seen in a cross section shown in Fig. 3. The vibration in the width direction is adjusted by allowing the contacting member 18 to slide in an appropriate contact with the upper portion rail 9. This contacting member 18 may be a slide guide plate such as New Light (trade name). Furthermore, the contacting member 18 has a long plate-like configuration and may have a round rod-like configuration.

On an upper surface of the carriage 17, bearings 19 are fixed in a forward and a backward direction in a definite distance. A running wheel 20 as seen in Fig. 13 is rotatably provided as a main wheel via these bearings 19. Each of a pair of running wheels 20 is provided on the right side and the left side are provided at three locations in the forward and backward directions and at a halfway therebetween. The running wheel 20 can be rotated between the wheel shaft 21 and the bearings 19. The running wheel 20 can be rotated on the wheel shaft and on the bearings 19. Then, in the rotation, either slide bearings or roll bearings are used (the same holds true of the following). The wheel 20 rolls on the horizontal flange 8a on the lower portion rail 8 as shown in Fig. 3.

Reference numeral 23 denotes auxiliary wheels. This auxiliary wheel 23 is constituted in such a manner that the wheel is rotatably supported with a pair of bearings 20 on the right and the left side as shown in Fig. 14 while the auxiliary wheels

rolls within the upper portion rail 9 via an opening 24 provided on an upper surface of the carriage 17. These auxiliary wheels 23... are appropriately arranged between the running wheel 20... as shown in Figs. 1 and 2. Incidentally, these auxiliary wheels 23 and the wheels 20 can be formed of metal, resin, hard rubber or the like.

Reference numeral 26 denotes a float prevention roller. As shown in Fig. 3, the float prevention roller is provided in such a manner that the roller can come into contact with both side bottom surface of the upper portion rail 9 via a bracket 27... appropriately provided on the front and the rear of the carriage 17.

Reference numeral 28 denotes a sludge scraper and the sludge scraper is provided between the front end and the rear end and therebetween. This scraper 28 is rotatably supported on an shaft portion which extends in a right and a left direction of the rotation shaft 29 rotatably supported on a pair of bearings ¹⁹20 on the right and the left side as the details thereof are shown in Fig. 5.

The scraper pipe 30 is formed in a long configuration so that the end is provided a little before the width of the pond in the plan view of Fig. 2. On a lower side of the pipe 30, sludge scrapers 28 are integrally formed respectively. These sludge scrapers 28 are provided integrally on all the scraper pipes 30. Then, these upper portion scraper 31 is provided only

on the front portion and the middle portion of the scraper pipe 30. These front portions are higher while the lower portions are lower.

Incidentally, as shown in Fig. 5, since the attachment plate 10 and the lower portion rail 8 are provided on the sludge scraper 28 as shown in Fig. 5, a notch 33 is formed together with the formation of the stepping 32 in correspondence thereto. It is required that this notch 33 is formed deeply as shown by 33' in the conventional method. That is, since fixing means is constituted with a bolt 34 and a nut 35 embedded on the bottom of the pond as a chemical anchor as shown by an imaginary line, it is required that the head of the bolt 34 is projected upward and is allowed to escape by forming a notch as shown by 33' in correspondence thereto. This is not preferable because the sludge escapes. In the case of the embodiment shown by a solid line, the special anchor 11 is adopted. That is, this anchor 11 is constituted of an assemblage with a main body of the anchor 11 and an anchor 11b attached with a hexagonal through-hole which is screwed from above. With such a constitution, since the head of the anchor 11b ceases to be projected, the notch may be shallow like the notch 33. As a consequence, the escape of the sludge becomes small in amount.

Incidentally, as shown with the imaginary line in Fig. 5, a graft 36 is formed on the bottom 5 of the pond, and a shown rail is provided via an augmented portion. The same thing holds

true of another embodiment.

The sludge scraper 28 may be rotatable by constituting the bearings on the side of this scraper 28.

Fig. 5 is a view showing a sectional structure at a middle position of Fig. 1. On the outer periphery of the rotation shaft 29, an intermediate lever 39 is provided, and a front lever 38 is provided on the circumference of the rotation shaft of the front portion, and on the rotation shaft of the rear portion, a rear lever 40 is provided respectively.

These levers 38, 39 and 40 are connected in an associated manner with an association link via long through-holes 41... and connection shafts 42... These levers 38, 39 and 40 are supported so as to be guided with a slider receiving tube so that the levers are allowed to progress or regress with the same height being held. Incidentally, the levers may be mutually connected without the long through-hole 41. As shown with the imaginary line in Fig. 1, the levers 38, 39 and 40 may be supported so that the levers 38, 39 and 40 may be stably associated with the other lever 44.

The rear lever 40 is not freely associated directly with the scraper 28, and is connected via a direction change-over lever 45. Consequently, the front and the intermediate scraper 28 are rotated in the same direction. The rear sludge scraper 28 shows a movement opposite thereto.

On the other hand, on the surface of the pond, as shown

in Figs. 1 and 2, a driving portion 46 formed of a motor and a decelerator is installed. This driving portion 46 is provided with a first load sieve (driving wheel) 47 for the driving of the link chain. One of the stainless steel-made link chains (engaged member) 48 which are a tow and transmission means wound in a single bundle is connected to the front lever 38 via the second load sieve 49 in the pond while the other stainless steel-made link chain 48 is connected to the rear lever 40 via the fourth and the fifth load sieve 51 and 52 of the rear portion of the pond via the third load sieve 50 in the pond. A portion of the link chain 48 which extends from the third load sieve to the fifth load sieve 51 is guided through the inside of the lower portion rail 8 as shown by a solid line in Fig. 5.

Incidentally, as shown with an imaginary line in Fig.1, the link chain 48 may be connected to the levers 38 and 40 so that the link chain 48 becomes the same as the height of the association link 43. The association link 43 may be replaced with a link chain method.

Reference numeral 53 denotes a pillar. As shown in Figs. 1 and 2, the pillar is erected from both sides of the carriage. On an upper end of this pillar 53, a scam scraper 55 is rotatably provided on a circumference of the horizontal shaft 54. This scraper 55 is provided for introducing the scam on the water surface into the scam remover 56. The scraper is provided in association with the sludge scraping device. That is, the scam

remover 56 has a rotatable weir which can move in a vertical direction toward the front side of the trough 57. This movable weir 58 is lowered below the surface of the water to swallow the scam when the association arm attached with the roller is kicked. When the association arm is disengaged, the tank automatically floats above the surface of the water to stop swallowing the scam. Incidentally, the movable weir 58 may be formed in a hollow type and is formed as a floating retraction type. The movable tank may be allowed to be floated and retracted by providing a retraction weight. Both the hollow type and the weight type can be used together.

On the other hand, on the side of the pillar 53, the scam scraper 55 having a reverse V-shaped configuration is rotatably supported in a vertical direction via the horizontal axis 54. An end side of the scam scraper 55 has a plate-like configuration and has a scam scraping function. The side of the base portion constitutes a plurality of lever-like portions. An end of the scraper 55 is provided with a cam roller 60 while the base portion is provided with a float 61. Reference numerals 62 and 62 denote a stopper of the scraper. Then, reference numeral 63 on the upper stage of Fig. 1 forms an erected guide plate of the scraper 55.

Next, an action of the sludge scraping device will be explained.

Figs. 1 and 2 are views showing a state in which the sludge

scraping device is changed over the scraping state after the sludge scraping device is retracted. In this scraping state, the link chain 48 is towed in the direction of an arrow F of Fig.1 and the association link 43 is also towed in the same direction, so that the front and the rear sludge scraper 28.. are set in a vertical state.

In the upper scam scraping device 56, the pillar 53 responds moves the association arm 59 toward the side of the trough at the end of the retraction movement with the result that the movable weir 58 is lowered downward. As a consequence, there is provided a state in which the scam on the surface of the water is swallowed. At this time, the scam scraper 55 is changed over to the turned down state (non-scraping state) of a solid line from the erected state (scam scraping state) shown by an imaginary line of Fig. 1. With the scam scraper 55, the turned down state is ruled out with the stopper 62 on the side of the trough 57 under the action of the float 61.

When the link chain 48 is towed continuously in a direction of an arrow F from such a state, the sludge which settles on the bottom of the pond 5 is scraped up to the pit 4 with the sludge scraper 28. In the meantime, the plurality of running wheels 20 roll on the lower portion rail 8 as shown in Fig. 3 while the auxiliary wheels 23 rolls within the upper portion rail 9. Thus, the body 17 is set in a scraping state in a low posture. Then, the lower round of the link chain 48 is towed

in a reverse direction F of Fig. 1 partly owing to a smooth guide with a slide 13 through a space in the lower rail 8. Incidentally, since the scam scraper 55 progresses in the same direction of F in the turned down state (non-scraping state) of a solid line of Fig. 1, the scam is not scrape back.

In this manner, the end of the sludge scraper progresses nearly onto the pit 4 so that the sludge scraped off with the sludge scraper 28 at the front. At the same time, the intermediate sludge scraper 28 functions so as to scrape the sludge to the front of the sludge scraper 28 at the front end while the sludge scraper at the rear portion functions so as to scrape the sludge at the rear location respectively up to the front position of the intermediate sludge scraper of Fig. 1. In the next scraping cycle, the intermediate sludge scraper 28 scrapes the scraped portion with the sludge scraper 28 at the rear portion while the sludge scraper 28 at the front end scrapes the scraped portion with the intermediate sludge scraper 28 in a forward direction step by step.

When it is detected that the scraping with the detection switch is finished, the driving portion 46 is rotated and controlled in a reverse direction. Accordingly, the link chain 48 is towed and driven in a direction R of Fig. 1 while the link chain 48 which passes through the inside of the lower rail 8 is towed in a backward direction. As a consequence, the rear lever 40 is towed in a backward direction, and other levers 39

and 38 are also towed via the association link 43 with the result that all the sludge scraper 28 is changed over from the vertical state to the horizontal retraction state.

On the other hand, the scam scraper 55 rises over the erected guide plate 63 at the scraped end of the sludge so that the cum roller 60 is changed over from the turned down state to the erected state. As a consequence, the scam scraper 55 scrapes the scam in a direction of the scam removing device 56.

The sludge scraping device is set to the retraction movement in the direction R while the scam scrapers 28... are all held. The driving portion 46 is reversely rotated with the detection of the retraction end with the detection switch. At this time, the link chain 48 is towed and driven in a direction F while the sludge scraper 28... is changed over to the scraping state shown with the solid line of Fig. 1.

On the other hand, the scam scraper 55 comes close to the direction of the scam removing device 56 in the erected state to scrape the scam on the surface of water. Finally, the pillar 53 pressed down the association arm 59 to lower the movable weir 58 with the result that the scam scraper 55 with the movable weir 58 is pressed in the return direction so that the scam scraper 55 is changed over from the erected state to the turned down state. At this time, the turned down state is held with the float 61 and the stopper 62. As this change-over method, a different means may be used.

The link chain 48 may be a normal type chain or an engaged member such as a strong belt or the like. Furthermore, the tow and transmission means of the through-hole device may be constituted with these combinations. For example, the driving with the driving portion 46 is conducted with the link chain 48 so that the assured transmission and the simplification of the constitution is secured while the other tow and transmission portion can be constituted with the other tow and transmission means including a wire rope.

As shown with an imaginary line in Fig. 5, the link chain 48 may be passed through the use of the inside of the upper portion rail 9. In this case, as shown with the imaginary line, the slide guide plate 13 is arranged in the same manner. In this case, the auxiliary wheels 23 is omitted, or the link chain 48 can be passed therethrough as a pair of wheel method on the right and the left side. Furthermore, the link chain 48 is passed in a vertical direction and may be used for the association of the sludge scraper with the link chain 48 which passes through the above portion. In this case, the link chain 48 on the above portion and the rotation shaft 29 are transmitted with a lever.

[Another Embodiment]

(1) Fig. 6 is a view showing an embodiment in which the carriage 65 is formed in an H-shaped cross section. This carriage 65 is such that a notch 66 is formed on a flange on the upper side by directing the groove in a vertical direction and the

wheel shaft 21 supported with the bearings 19 is taken out so that a low wheel 20 is provided. Incidentally, as shown with an imaginary line, a cover 67 having a semi-conical configuration or a roof-like configuration is provided to prevent the intrusion of the settled substance into the groove. This cover 67 is sometimes applied to embodiments, which will be described above or will be described later.

Figs. 7 and 8 are views showing an embodiment showing a method of connecting the lower portion rail 69. In the embodiment, a plurality of lower portion rails 69... having a definite length are mutually connected with a connection member 70 such as a groove member and an anchor 71... to constitute a long lower portion rail.

Figs. 9 and 10 are views showing an embodiment of an over-load maintenance device in the driving portion 46. For example, in the embodiment of Fig. 1, a safety stopper is arranged on the left from the end for securing the safety at the scraping end so that the device is forcibly stopped. At this time, a surplus load is applied to the link chain 48. In such case as well, the surplus load can be avoided in this embodiment. A load sieve (driving wheel) 74 and the driving disc 75 are provided in the output shaft 73 from the driving section 46 so that the disc 75 is rotatably fixed around the output shaft 73 with the fixing means such as a key 76 or the like.

The load sieve 74 is connected to the disc 75 with a share

pin 77... in a rotatable manner around the output shaft 73. As a consequence, at the time of the over-load, this pin 77... is severed so that the motion transmission to the load sieve 74 from the output shaft 73 can be severed. Incidentally, as shown in Fig. 10, the pin through-holes 78... are arranged in a concentric manner. However, as shown with the broken line and the imaginary line, the pin through-holes are arranged in a concentric manner both inside and outside of the device with the result that any of the through-holes 78... can be selected. Then, when the inside is selected, the transmission is severed with a small load. On the other hand, when the outside is selected, the transmission is severed with a large load.

As shown with the imaginary line in Fig. 10, the link chain 48 is attached with an actuator 79, and the switch not shown may be responded and moved. In this case, a guide tube 80 is provided on an external circumference on the orbit of the link chain 48 so that the switch may be provided thereon. It is required that an operator 79 may be provided on other portions of the link chain 48.

As shown with an imaginary line, the special link 81 having an actuator may be combined as a part of the link chain 48.

Furthermore, when water is supplied, the link chain 48 and the load sieve 74 are improved in endurance. Consequently, as shown with the imaginary line, the water supply means 83 is provided. As another method, water may be supplied through a

capillary tube 84. Furthermore, the through-hole device may be covered with a cover 85.

(2) Figs. 11 through 14 are views showing a state in which a H-shaped member is allowed to adhere to each other on the right and left to form a guide rail, and a carriage 90 provided with a running wheel 88 which runs on the guide rail and a side roller 89 which is applied to the side are directed in a forward and a backward direction to be connected with a connection pipe (front and rear connection member) 91. In particular, the carriage 90 is not equal to the height of the shaft of the wheel 88, and has a low height approximately equal to the height of the upper flange of the guide rail 87 thereby enabling a stable run.

The side roller 89 has a groove-like configuration as a cross section thereof is shown in Fig. 14 so that the guide roller 89 comes into contact with the flange of the guide rail 87 to enable the prevention of the deviation to the right or the left, and floating. The prevention of the deviation to the right and the left and floating is enabled with this one roller 89. So far, the prevention of the deviation to the right and the left and floating has been exclusively constituted so that the complicated structure has been invited. However, through the combination of the prevention of the deviation to the right and the left and floating, the number of parts is decreased to a half.

This sludge scraping device is provided with the guide

roller 92... on the carriage 90 and the rear carriage 90 so that the association shaft (association member) 93 which passes through the inside of the connection pipe 91 is guided. To the front end of the connection shaft 93, a front lever 94 is connected. At the rear end, a rear lever 95 is connected. On the front lever 94, a tow and transmission means (wire rope and link chain) 96 from above the pond is connected. On the other hand, the rear lever 95 is also connected to the other end portion of the tow and transmission means. A reference numeral 97 denotes a direction change-over lever, which rotates the rear scraper 99 in a reverse direction with respect to the front scraper 98 with the result that the sludge over the rear end of the pond is scraped in a forward direction when the rear scraper 99 is thrown up in a backward direction with respect to the front scraper 98. A reference numeral 100 denotes a cover, and a reference numeral 101... denotes a balancer. Figs. 11 and 12 are views showing a state in which the scraper is changed over from the retraction state to the scraping state. The scraping device proceeds from this state in a left direction. Then, the sludge scrapers 98 and 99 are raised in a horizontal direction with the tow and drive of the tow and transmission means 96 on the right side at the proceeding end with the result that the sludge scraper 98 and 99 are raised horizontally and the device is set to a retraction state. A reference numeral 102 denotes a pillar for removing the scam. A reference numeral 103 denotes auxiliary

wheels.

Figs. 15 and 16 are views showing a general example of a conventional flight cyclic driving type sludge scraping device. A pit 200 is provided on this settling pond having a rectangular configuration to allow sludge water to flow through the rectifying hole 201... while the settled substance is allowed to settled on the bottom wall 202. A reference numeral 203 denotes a water surface. Above the water surface, an upper wall 204 is formed in integration with the through-hole tank or a part thereof.

In the drawings, there is shown a part of this sludge scraping device. The rotation shaft 205 is arranged in a vertical direction, and a pair of chains 207 and 207 on the right and the left are provided on a sprocket 206 provided thereon to enable a cyclic drive. Then, it is so constituted that a flight 208... is provided on these chains 207 and the settled substance on the bottom of the pond is scraped toward the pit 200 in a cyclic movement while the scam floating on the water surface 203 is scraped in a reverse direction to be removed.

The cyclic drive is conducted with the installation of the driving machine 209 which is a motor attached with a deceleration on the upper wall 204 and with the transmission by the drive chain 212 stretched between the driving sprocket 210 provided on the drive shaft 210 and a following sprocket 211 provided on the rotation shaft 205.

These driving systems are constituted through the upper wall 204 on a side close to one side of the settling pond as shown in Fig. 15. Consequently, in order to allow the passage of the drive chain 212, a chain passage through-hole 213 is opened at the corresponding location.

It is required that such sludge scraping device is replaced with a new one after the lapse of a certain years. In such a case, there is a case in which the same flight cyclic driving sludge scraping device is a replacement or there is a case in which a new type is a replacement. As a new type, preferably more simple and cheap one is adopted. Figs. 17 and 18 shows such replacement.

This sludge scraping device may be such that the guide rail 215 shown in Figs. 1 through Fig. 5 is installed on the bottom of the pond to be extended up to the location above the pit 216 while the carriage 218 provided with the sludge scraper 217 is allowed to progress and regress with the running wheel 219. The vertical movement of the scraper 217 and the progress and regress movement of the carriage 218 are conducted with an engaged member (link chain or the like) 220 so that the engaged member 220 is allowed to progress and regress through the upper stage and the lower stage of the guide rail 215. The progress and regress orbit of the engaged long member 220 is not limited thereto. For example, an embodiment shown in Fig. 1 may be adopted.

In particular, embodiments of Figs. 17 and 18 is such that as the driving machine 209, a preset machine shown in Figs. 15 and 16 is used as it is while the chain through-hole 213 is also used as it is. In the case where the sludge scraping device of the progress and regress type is adopted to constitute the driving system, a through-hole 222 which allows the passage of the wire rope is opened at a location corresponding to the width of the pond on the upper wall 204 and a driving machine 223 is set on a side thereof while the sludge scraping device in the pond is allowed to progress and regress by locating the wire rope 224 rotatably driven by the driving machine 223 in correspondence to the location above the through-hole 222. When such constitution is adopted in this manner, a different driving machine is required, and in addition, it becomes necessary to subject the through-hole to the chipping processing in addition to the provision of the chain through-hole 213. This becomes extremely wasteful in terms of cost and construction.

Then, in this embodiment, the driving machine 209 of the driving system and the chain through-hole 213 are used as they are to constitute another type of the sludge scraping device. Incidentally, the driving machine 209 can be freely replaced with a new one.

The driving system of the sludge scraping device shown in Figs. 17 and 18, as shown in Fig. 19, is provided with a load sieve (drive wheel) 227 for the link chain is provided on an

output shaft 226 of the driving machine 209 so that an engaged member 220 which is a link chain is stretched over the load sieve 227 while this engaged member 220 is guided through the chain through-hole 213.

After the engaged member 220 is allowed to pass through the through-hole 213, the engaged member 220 is guided in a downward direction, the engaged member 220 is guided in a vertical direction and in a pond width direction, so that the engaged members 220 and 220 are constituted which pass through the inside of the guide rail 215 via a pair of second relay sieves 230 and 230 which are fixed to the front end of the guide rail 215. In the first relay sieve 229, the axis of the first relay sieve 229 is directed in the longitudinal direction of the pond while the axis of the second relay sieve 230 is directed in a vertical direction.

The driving machine 209 is of a reversible rotation type. Since dirty water flows out from a commutation through-hole 231 of Fig. 18 so that sludge settles, there is a fear that the sludge falls on the driving transmission portion such as the engaged member 220, and sieves 229 and 230. Consequently, as shown by a broken line in Fig. 19, a cover 232 for covering the driving transmission portion is provided to attempt protection. Such protection cover 232 can be provided at other locations.

Fig. 20 is a view showing another embodiment. In this embodiment, in the same manner as the above embodiment, it is

constituted that the driving machine 234 is used as a preset machine so that the sludge scraping device shown in Figs. 17 and 18 is driven. That is, the broken line on the upper side of Fig. 20 shows the first settling pond, and the broken line on the lower side shows the second settling pond 235 respectively. On an upper wall 237 of each settling ponds 235 and 236, the chain through-hole 238 is opened in correspondence to the corner of the settling pond. Then, it is constituted in such a manner that as the driving device for the flight cyclic driving type up to the change to the new sludge scraping device, the first sprocket of the chain is provided on the driving machine 234 for both ponds while the second sprocket driven with this first sprocket is provided on the outer circumference of the association shaft 240 supported with bearings 239 on the pond, and, at the same time, a third sprocket is provided on both ends of this association shaft 240, so that the chain hanged on the third sprocket is allowed to pass through each of the chain through-holes 138 to allow the following association sprocket in the pond to be associated.

On the other hand, in the driving device for the new sludge scraping device, it is constituted in such a manner that the established drive 234 is used as it is, and the first load sieve 242 is provided on the output shaft while the second load sieve 242 and the third load sieves 242 and 243 are provided around the association shaft 240, so that the first link chain 245 is

hanged between the first and the second load sieves 244 and 244 while the second link chain 246 is hanged on the third load sieves 244 and 244. Thus, it is constituted in such a manner that the sludge scraping device in each pond is driven with the tow and transmission means as shown in Fig. 19. In the same manner as described above, the driving machine 234 can be freely replaced with a new one. In Fig. 20, the tow and transmission means in the pond is constituted respectively as shown in Fig. 19. The tow and transmission means on a side above the side wall 247 in Fig. 20 has a structure symmetric with Fig. 20. The link chain may be a normal chain.

(3) Figs. 21 through 25 are views showing other embodiments of the driving method with the link chain 316.

In these embodiments, reference numeral 317 denotes a guide rail. The guide rail 317, as shown in Fig. 23, a lower portion rail 318 having an L-shaped configuration and a pair of channels on the right and the left, and an upper portion rail 319 having a groove-like configuration. This guide rail 317 is provided on a base plate 320 arranged in a predetermined distance. Between the lower portion rails 318 and inside of the upper portion rail 319, a chain receiver 321 formed of smooth resin like New Light is fixed. Reference numeral 322 denotes a portion which connects the lower portion rails 318 with a connection body and a receiver for fastening the upper side chain receiver 321 with common fastening. The chain receiver 321 on the lower side is fixed

onto the base plate 320 with an anchor.

Reference numeral 323 denotes a carriage formed of metal material such as stainless steel or the like. On the inner side, an inside receiver 324 having a floating prevention projection 324a on a lower end thereof is formed of smooth resin to be spread and attached with the anchor. In the carriage 323, a groove-shaped shaft fixing body 325 is fixed at a plurality of locations in front and at the rear thereof so that wheels are provided via these while the running wheels 327 are rotatably provided. Reference numeral 328 denotes auxiliary wheels. As shown in Fig. 24, the auxiliary wheels 328 are set rotatable around the bearings projectingly provided from both sides of the carriage 323 via a fixing shaft 330 so that the carriage rolls within the upper portion rail 319.

Reference numeral 331 shown in Fig. 25 denotes a chain guide. A plurality of chain guides are arranged in a forward and backward directions via a stay 322 erected on the carriage 322. In this manner, at locations in front of and at a rear of the carriage 322, a scraper 333 is arranged in a manner rotatable in a vertical direction. In some cases, the same scraper 333 is provided between the front and the rear thereof. To the front portion scraper 333, the link chain 316 from the pond surface is connected while an association chain (association member between scrapers) 334 is allowed to pass therethrough via the chain guide 331 with the result that the front and the rear scrapers

are connected to respond and move in the same direction. The link chain from the rear portion scraper 333 passes over the chain receiver 321 in the lower portion rail 318 via the rear sieve 335 to be guided onto the pond. On the wheel shaft 326 described above, as shown in Fig. 23, a pillar 336 is erected and a scam scraper 337 is provided on the upper portion thereof which moves in a vertical direction.

Fig. 22 is a view showing the scraping state. The link chain 316 on the lower circumference is driven in a reverse direction after the carriage 323 progresses in a left direction, so that the scraper 333... is raised and lifted to be changed over to the retraction movement while the link chain 316 on the lower circumference is towed in the left direction while the link chain 316 on the upper portion circumference is towed in the right direction.

The scam scraper 337 conducts a change-over movement in a vertical direction by the association of the driving sieve 339 with an association chain 334 which detours a pillar 336 with the sieve 338 for the direction change.

As shown in Fig. 36, the scam scraper 341 may be associated in a freely erecting and turning down manner with the lower portion link 343 and the upper portion link 344 which rotate with the front and the rear association shaft (association member between scrapers) 342 and the association link 345 which connects the upper portion link 343 and the lower portion link 344.

Incidentally, the association shaft 342 is supported in a manner so that the movement in a forward and a backward direction free from deviation to the right and the left with the shaft receiver 346 having a long oblong-shaped through-hole.

In Fig. 26, one end of the chain may be connected to the association shaft 342 so that the link chain 348 slides on the upper surface of the resin-made chain receiver in the upper portion rail 347. The scraper 350 in this case is connected to the front end of the association shaft 342. In the above embodiment, the scraper 333 is risen in at a front portion thereof at the time of the retraction, but the scraper 333 may be risen at the rear portion thereof.

(4) The embodiments shown in Figs. 27 and 28 are such that a treatment tank (settling pond) is formed of a vertical two-stage tank type having an upper layer water channel 539 and a lower layer water channel 540.

A view showing the upper stage in Fig. 27 is connected to the left side of the view on the lower stage as it is. This treatment tank is such that the water surface 541 is set on the lower layer water channel 540 and the water surface 542 is also set on the upper layer water channel 539 in the same manner. Then, in the treatment tank, a flow commutation portion 544 is provided so that the dirty water flows thereinto respectively as shown by an arrow.

On the bottom of the ponds 545 and 546 of each of the upper

and the lower water channel 539 and 540, the guide rail 501 is provided respectively. Since this embodiment is the device having approximately the same structure as the above embodiments, the same reference numerals are attached thereto. The sludge scraping device as shown in the above embodiment is provided in such a manner that the device progresses and regresses on each of these guide rails 501.

With respect to the upper and lower scraping device shown in Fig. 27, the solid line shows a state in which the device is set at a timing at which the device is brought back to the original state to be changed over to the original state while the imaginary line shows that the device is set at a timing at which the scraping is finished so that the device is retracted to the original state. The carriage 510 is provided with main running wheels in front thereof, at a rear thereof, and at an intermediate position therebetween while an appropriate number of intermediate wheels 516 are arranged. The scraper 522 is arranged at three locations; in front thereof, at a rear thereof and at an intermediate position therebetween. These scrapers 522 are all associated to each other.

Reference numerals 547 and 548 denote drive sources which are arranged on the pond. The tow and transmission means 533 hanged on the driving wheel which is a load sieve of the drive source 547 is respectively connected to the upper and the lower slider via two sieves provided on the bit side in the upper layer

water channel 539. On the other hand, the tow and transmission means 533 hanged on the driving wheel 550 of the drive source 548 is connected to the upper and the lower slider respectively via two sieves 552 provided on the side of the pit in the lower layer water channel 540. With these tow and transmission means 533, the sludge scraper 522 is set in a vertical direction in the same manner as the above embodiment so that the sludge scraper 522 conducts a scraping movement in a direction of an arrow shown with the solid line. In the meantime, the scraper is raised horizontally when the scraper comes to the pit side so that the retraction movement is conducted in a direction of an arrow shown with the imaginary line.

In the case of this embodiment, the support frame 514 is erected at an intermediate position in front of and at a rear of the carriage 510 (In the case of the present embodiment in which the progress and regress stroke of the device is long, the support frame 514 may be secondarily erected at the front end as shown in Fig. 28 with the imaginary line). At the upper end, the upper scam scraper 553 and the lower scam scraper 554 as shown in Fig. 28 are provided in a manner rotatable in a forward and a backward direction. Both scam scrapers 553 and 554 are not turned down to scrape the scam but only scrape the scam only in the right direction.

Although the upper scam scraper 553 scrapes the scam floating on the water surface 541. However, in the case of the

lower scam scraper 554, the lower scam scraper is formed in a configuration which follows the ceiling 555 of the lower layer water channel 540 to scrape the scam all over this ceiling 555.

In the upper layer water channel 538 according to this embodiment, it is constituted in such a manner that an action arm 557 provided with the receiving cam 556 which is pressed up with the upper scam scraper 553 is provided in a seesaw manner with the result that the scam is swallowed into the trough 558 by pressing down the tank 559 on the front side of the fixing type trough 558 in association therewith.

It is constituted so that in the lower layer water channel 540, the action arm 561 provided with a receiving cam 560 having a bent bar-like configuration which is pressed up with the device which is retracted is provided at a location at a little upper side of the bottom of the pond, and the association rod 562 which can freely rise and fall in a vertical direction in association with the action arm 561 is pulled down as a tow and transmission means. It is constituted so that with this movement the tank 564 before the trough 563 is pulled down so that the scam on the water surface 541 is swallowed.

The embodiment shown in Fig. 29 is such that a long type sludge scraping device is provided on the bottom of the pond of each layer of the settling treatment pond of the upper and the lower tank type. In particular, the embodiment is concerned with the driving method.

The treatment pond according to this embodiment comprises a first stage tank 600 on the upper side and a second stage tank 601 on the lower side. The pond is provided with an upper wall 602, an upper bottom wall 603 and a lower bottom wall 604. At the same time, from the rear end of each bottom walls 603 and 604, the first rear wall 605 and the second rear wall 606 are integrally erected and provided.

At the left end shown of the second stage tank 601, a pit 607 for temporarily detaining the scraped sludge is formed and gradually discharged with and an exhaust pump 608 provided in this pit 607 to be brought back to the next steam tank (not shown). Reference numeral 609 denotes water surface.

On the upper bottom surface wall 603 and the lower surface wall 604 of each of the stage tanks 601 and 602, the sludge scraping devices 610A and 610B of the front and the rear connection type shown in Figs. 11 and 12 are constituted. The device 610A on the upper side and the device 610B on the lower side are basically of the same type. It is constituted in such a manner that the device 610A on the upper side is shorter while the device 610B on the lower side is longer.

That is, when the upper device and the lower device are explained by using the same reference numeral, reference numeral 612 denotes a guide rail which has a sectional configuration shown in Fig. 13. Both respect to the upper device 610A and the lower device 610B, one end is allowed to face the upper portion

of the pit 607 while the rear end which is the other end is extended to the first rear wall 605 and the second rear wall 606. Each of these guide rails 612 are fixed through the center of the width of the pond.

On each of the guide rail 612, the front carriage 614 and the rear carriage 615 provided with the running wheel 613 respectively are arranged in freely running manner in a separated manner in the forward and the rear direction while the front carriage 610A and the rear carriage 610B are connected with the connection pipe 616 so that the front carriage 610A and the rear carriage 610B progress or regress at the same time. The connection pipe 616 is formed in such a manner that the upper side is longer while the lower side is shorter. On the front side of the front carriage 614 the front scraper 618 is provided so as to be raised in a forward direction. On the rear side of the rear carriage 615, the rear scraper 619 is provided so as to be raised in a backward direction. On the front scraper 620, the front lever 620 is erected while the rear lever 621 is rotatably provided for associating the rear scraper 619 around the wheel shaft of the running wheel 613 on the rear side. An association shaft 622 for connecting the rear lever 620 and 621 with a long through-hole is set to be freely progressing and regressing through the inside of the connection pipe 616. On the front scraper 618, the front lever 620 is erected while around the wheel shaft of the running wheel 613 on the rear side, the rear

lever 621 is rotatably provided for associating the rear scraper 619. The association shaft 622 for connecting the front lever and the rear lever 620 and 621 with a long through-hole is set to be progressively and regressively associated through the inside of the connection pipe 616. On the connection pipe 616 on the upper side of one sheet of the intermediate scraper 623 is supported on a stay while on the connection pipe on the lower side two sheets of intermediate scrapers 623 are supported on a stay in a freely associating manner with the association shaft 622. However, the number of scrapers is not particularly limited thereto.

It is the tow and transmission means (wire rope, link chain, brake chain or the like) 624 which progressively and regressively drives these levers 620 and 621 and the association shaft 622 in a forward and backward direction. This tow and transmission means 624 is constituted in such a manner that the upper and the lower devices are driven in different directions by allowing the upper and the lower device are operated in a different directions as can be seen from the fact that there are available a method shown with a solid line of Fig. 29 and a method shown with an imaginary line of Fig. 30.

The method shown with the solid line is such that the drive source 626 and the drive sieve 627 are newly provided. That is, above the central line of the width of the pond, the driving sieve 627 is provided in correspondence thereto. This is called

here a method of installation in correspondence to the center between the width of the pond. At a location separated from the front and the rear of the sludge scraping devices 610A and 610B, the upper portion front sieve 629, the upper portion rear sieve 630, the lower portion front sieve 631, and the lower portion rear sieve 629 are arranged. The upper portion rear sieve 630 is located at the rear of the first rear wall 605. On the first rear wall 605 in front of the sieve 630, a through-hole 633 is provided for allowing the passage of the tow and transmission means 624.

In this manner, the tow and transmission means 624 is connected to the upper end of the front lever 620 of the upper portion device 610A via the upper portion sieve 629 from the circumference of the driving sieve 627. Furthermore, the tow and transmission means 624 connected to the rear lever 610A of the upper device 610A is connected to the rear lever 621 of the lower device 610B via the upper portion rear sieve 630 and the lower portion rear sieve 632. The tow and transmission means 624 connected to the front lever 620 of the lower portion device 610B is hanged around the driving sieve 627 from the lower portion front sieve 631. Incidentally, a reference numeral 634 denotes a tightener of the partial dangling roller type.

The state shown with the solid line in Fig. 29 is a state in which the device of the upper portion is changed over and a state in which the lower portion device 610B is set in a state

of being changed over to the scraping state at the end of the retraction. When the rotation of the driving sieve 627 is changed over in the right direction, the lower portion device 610B is towed in the direction F while the upper portion device 610A is towed in the direction R. As a consequence, in the lower portion device 610B, the front lever 620 is towed and the rear lever 621 is also towed in the direction F via the association shaft with the result that each of the scrapers 618, 619 and 623 are also set into the vertical scraping state as shown by an arrow. In the upper portion device 610A, the rear lever 621 is towed in a backward direction while the front lever 620 is towed in the direction R via the association shaft 622 with the result that the scrapers 618, 619 and 623 are raised to be retracted to the original state.

After each of the scrapers is changed over as described above, the upper portion device 610A is retracted to the direction R while the lower portion device 610B progresses in the direction F for scraping. The upper and the lower devices 610A and 610B move in the same quantity. For example, the lower portion device 610B progresses in a quantity larger than the interval of the front and the rear scraper while the upper portion device 610A also regresses larger than the interval between the front and the rear scraper. As a consequence, the sludge which settles with the repetition is dropped in the pit 607.

As a method for hanging the tow and transmission means

624, the method shown with an imaginary line can be conducted. That is, in many cases, the state in the pond before the installation of the devices 610A and 610B is constituted in such a manner that the settled sludge is scraped by allowing the chain 637 attached with the flight 636 to circulate. In such a case, the drive source 638 and the sprocket 639 are arranged in a deviated manner to one of the pond width as shown in Figs. 15 and 16. In the case where the above method is discarded and the method is changed over to the solid line method of Fig. 29, it is required to discard the chain 63, the association sprocket 640, and the association chain 641. However, as described above, even when the method of newly installing the drive source 627, it is effective to allow the established drive source 638 and the sprocket 639 to remain as they are to be used for the devices 610A and 610B. Additionally, the drive source 638 and the sprocket 639 are deviated to one of the pond width. On the other hand, since the devices 610A and 610B are located in the center of the pond width, the tow and transmission means 624 is located at a separate location, which is unfavorable.

Consequently, as shown in Figs. 17 and 18, it is required to guide the tow and transmission means by making use of the detour sieve. Although the drawing of the detailed method is omitted here, the means is constituted in accordance with the method shown in Figs. 17 through 19. Fig. 29 shows a state in which the lower end is bent. Incidentally, in the two-stage

tank method, generally, a through-hole is drilled on the upper wall bottom to guide the means in the two-stage tank 601 through the association chain 641 associated with the sieve 639. Then, in the case where the device 610B is driven, the tow and transmission means 624 can be guided by using the through-hole.

Since the scam remover is constituted in the device 610A in the same manner as shown in Fig. 29, the explanation is omitted here. In the two-stage tank 601, since the scam is detained on the bottom surface of the upper bottom wall 603 in some cases, a device for guiding the scam to the side of the lower portion device 610B in the right direction of Fig. 29 may be erected in the device 610B. Furthermore, the sludge scraping device may be formed in a long configuration integrally in a configuration in which the carriages are separated in a forward and a backward direction. The driving of the pump 608 can be started when the device 610A comes to the position of S or to a location in front of the position P. When such constitution is adopted, there is no fear that the fallen sludge covers as shown by an arrow W.

(5) Fig. 30 is a view showing another installation example of the drive source 626 and the drive sieve 627. The drive source 626 and the drive sieve 627 can be installed on an upper surface deviated to the second rear wall 606 as shown by an imaginary line. Incidentally, symbols in Fig. 29 are affixed thereto as they are.

In such settling pond, in normal examples, the treatment ponds 643 and 643 are mutually arranged as shown in Fig. 31. In such examples, a through-hole 645 is drilled at a lower portion of the rear end of the side wall 644 for partition. The tow and transmission means (a wire rope, a link chain or the like) 646 is allowed to pass through the through-hole 645, so that the adjacent sludge scraping devices 647 and 647 can be associated in such a manner that the devices are operated in a reverse direction.

That is, in the first stage tank 648 and the second stage tank 649, the forward and backward lengths are different from each other respectively, the sludge scraping devices 647 and 647 can be progressed or regressed on the guide rail 650. On each of the devices 647, there is provided a long machine body in which a plurality of running wheels 651 which can freely roll on the guide rail 650 are arranged in a forward and a backward direction. On this machine body 652, a plurality of scrapers 653 which can be changed over between the vertical state and the horizontal state are constituted in a manner that the scrapers can be associated in a vertical direction in a state in which the association shaft 655 is connected between the levers 654.

On the upper wall 657, a drive source 658 is installed, and a pair of drums 659 and 659 on the right and the left which are driven with the drive source 658 are provided so that the drums are rotated in the same direction. The drum 659 is of

a central corresponding installation type. In this type of the drum 659, the tow and transmission means 646 is hanged on one drum 659 and the other drum 659 in different directions to be connected to the lever 654 at the front end of the device 647 which progresses and regresses in a two-stage tank 649. Another transmission means 646 connected to the rear lever 654 is connected to the rear lever 654 off the adjacent device via the rear sieve 661 separated toward the adjacent location through the through-hole 645 via the rear sieve 661 through having a vertical shaft-like configuration. The tow and transmission means 646 connected to the front lever 660 of the adjacent device 647 is hanged on the other drum 659. With respect to the device of the first stage tank 648, the tow and transmission means 646 is constituted in a freely associating manner between adjacent devices so that the tow and transmission means 646 can be freely associated through the hanging of the means by commonly using the drum 659.

When the drum 659 is driven in the same direction in the two-stage tank 649, the adjacent devices 647 and 647 are associated in a mutually reverse direction. In this case, the adjacent devices 647 and 647 area associated with the tow and transmission means 646 which passes through the through-hole 645.

The front sieve 660 is all set to a manner of freely rotating around the horizontal axis. In the plan view in Fig. 31, the

tow and transmission means is cyclically driven so as to trace a square route in the plan view of Fig. 31. Then, it is constituted that one of the front sieve 660 and the rear sieve 661 can be freely driven on the drive shaft of the vertical shaft so that the sieve can be driven with the drive source. In this case, the first-stage tank and the second-stage tank can be conducted with the common driving shaft. The sludge scraping device shown in Figs. 31 and 32 may be formed in a configuration in which the carriages are separated in a forward and backward directions and the carriages to be connected with a connection pipe.

(6) In the embodiment shown in Fig. 33, the sludge scraping device 684 of any type is allowed to progress and regress along the guide rail 685 and a scraper 686 is provided on the sludge scraping device 684 while a pillar 688 is erected on the carriage 687 and a scam scraper 689 is provided on the upper end thereof in such a manner that the scraper 689 can be freely changed over between the erected state and turned down state. In particular, as shown in Fig. 34, the location of the pillar 688 deviated in a downward direction is used so that the sludge cut member 690 is provided in a manner projecting in a vertical or a horizontal direction (or in a slanted direction). With such constitution, the viscous sludge detained on the original upper layer which is detained on the pond bottom is cut at the time of progress or regress so that the settling action is heightened.

The sludge cut member 690 is formed in a knife-like

configuration and an inside hollow configuration by separating two sheets of punching metals (resin will do as well) in a definite distance and microbes may be housed in a freely exchangeable manner. Incidentally, the sludge cut member 690 may be constituted in such a manner that the member is vibrated in a vertical direction on a horizontal boundary in the same manner as the scam scraper 689.

(7) The embodiment shown in Fig. 35 is a sludge scraping device in which the carriages 692 are connected with a connection pipe so that the carriages freely run on the guide rail 694 while the association shaft 695 is inserted in a progressive or regressive manner through the connection pipe 693, the side roller 696 for the prevention of the floating which has been provided on the carriages 692 is also provided on the lower portion of the connection pipe 693. That is, the bracket 697 is projectingly provided from the connection pipe 693 and the intermediate ring 698 and the scraper 699 are provided so that the progress and regress movement from the association shaft 695 via the intermediate lever 700 are changed over to the vertical movement of the scraper 699 while the roller bracket 701 for the side roller 696 is projectingly provided for the side roller 696. Reference numeral 702 denotes a stopper of the scraper 699. Reference numeral 703 denotes a long through-hole for the connection pipe 693.

(8) In the embodiment shown in Fig. 36, there is shown another

example in which the tank 707 of the scam removing device 706 is associated with the movement of the sludge scraping device 705. The sludge scraping device 705 is constituted in such a manner that the carriage 709 provided with the running wheel 708 is allowed to run on the guide rail 710 and the connection pipe 711 and the association shaft 712 are provided between the rear carriages. On the rear portion of the front carriage 709, the roller bracket 713 is projectingly provided and the roller 714 is provided on an upper end thereof while the scam remover 706 is provided with the bracket 717 at the rear portion of the trough 716 to conduct a seesaw movement while the association lever 718 and the weir 70 are connected with the connection rod 719. Then through the rear portion through-hole 720 of the association lever 718, a vertical shaft 721 is inserted through the rear portion through-hole 720 of the association lever 718 so that the contact 722 of the upper end is engaged onto the lever 718 while the copying member 724 which rotates around the rotation shaft 723 of the fixed point at the lower end of the vertical shaft 721.

This copying member 724 is suspended in the shown state with the stopper 725 the weir 707 is raised in the shown state with the weight 726 provided on the vertical shaft 721 and the association lever 718 so that the weir 707 is banked up while maintaining the shown state. Reference numeral 727 shows a weir of water level following movable type. Even when the water level

moves by providing floats on both ends of the weir plate so that the upper end thereof maintains at all times a state lowered by a definite quantity, only a definite quantity of water constantly acts on the weir 707.

When the sludge scraping device 705 regresses in the right direction, the roller 714 raises the copying member 724 and the vertical shaft 721 is raised against the weight 726 while the association lever 718 is rotated in the left direction. As a consequence, the scam on the water surface flows into the trough 716 with the lowering of the weir 707. The copying member 724 has a projection portion and a recessed portion at two locations at a forward and a backward position which are projected in a downward direction, it is constituted in such a manner that the weir 707 is temporarily lowered to be raised followed by being lowered again to such the scam. The state shown with the imaginary line is shown as a state in which the roller 714 is provided on the side of the pillar 728 erected from the carriage 709 so that the copying member 724 is associated. In this case, as shown with the imaginary line, the association lever 718 is provided before the trough while the vertical shaft 721 is also guided to the side of the pond through the front side.

(8) Figs. 37 through 46 are views further showing different embodiments. Figs. 37 through 40 shows a scraping state. Fig. 45 is a view showing the first stage at which the scraping device is set into the retraction state from the scraping state while

Fig. 46 is a view showing a state in which the device is changed over to the retraction state, respectively.

In the beginning, the scraping device of the present invention will be explained referring to Figs. 5 through 8 on the basis of the scraping state shown from Figs. 37 through 40. Referencenumeral 801 in Fig. 37 is a view showing the through-hole sandpond. On this sandpond 801, the scraping device is provided with other treatment pond such as settling pond, an aeration tank being set as a target.

Within this settled sand pond 801, dirty water 802 including human waste flows in from the left direction of Fig. 37 at the shown average level. Reference numeral 803 denotes a dust filter screen which may be of an electromotive type. Reference numeral 804 denotes a bottom wall of the pond bottom. Reference numeral 805 denotes an upper wall. On the downstream side from the dust filter screen of the bottom wall 804, the pit 804 is formed while a sucking pump 807 for sucking dirty sands is installed in correspondence thereto.

On the bottom wall 804 a guide rail 808 is installed and one end thereof faces the pit 806. The guide rail 808 is connected from the side of the pit 806 in an order of the first rail 809, the second rail 810 and the third rail 811 to constitute a single rail. The details of these rails are shown in Fig. 41. Each of the rails 809, 810, and 811 is such that a pair of ribs on the right and the left are integrally formed between the upper

web and the lower web as shown by a sectional view in Fig. 39 while a pair of the roll receiving bands 812 and 812 are integrated with welding on an upper surface of the upper web. Incidentally, in this embodiment, except for the case in which a particular reference is made, stainless steel is used.

On the first rail 809, as shown in Fig. 41, while the front portion seat plate 813 is provided on the end portion which constitutes the side of the pit while, as shown in an enlarged view, the roll receiving bands 812 are separated from each other in a definite size so that the lock groove 814 is formed on the upper web. When the groove 814 is changed over from the scraping state to the retraction state, the running wheel is dropped to prevent the prior movement of the carriage. The groove is also formed on the side of the rear portion on the third rail 811.

On the end portion of the first rail 809, as shown in Fig. 41, the roll receiving band 812 in the front portion seat plate 813 is projectingly provided. This roll receiving band rides on and is hanged on the second rail 810 to be set in the connection state with the roll receiving band 812. In a similar manner, at the end portion of the second rail 810, the roll receiving band 812 is projectingly provided and rides on the upper surface of the third rail 811. At the rear portion end, a slantingly risen portion 816 provided with the rear portion seat plate 815 is integrally provided. On each of these rails 809, 810, and 811, as shown in the second rail 810, an appropriate number of

bolt through-holes are provided, so that the through-hole guide rail 808 is fastened and fixed with the anchor bolt on the bottom wall surface via these bolt through-holes. Incidentally, on the slanted wall (hunch) 818 at the end of the rear portion pond, as shown in Figs. 42 and 43, a pair of slide promotion plate 819 is fixed with an anchor 820 so as to be arranged in a right and a left direction from the center of the width of the pond. This plate 819 is constituted in such a manner that only one surface facing the inside of the pond is coated with Teflon (trade name of ethylene tetrafluoride resin) to become slidable with the result that sludge or the like forms a viscous piled-up mountain or the like with the result that the sludge can be easily removed with water spray even when the sludge is settled and fixed over the upper surface thereof.

On the upper portion receiving plate 813, a front sieve receiving portion 821 which has a reverse L-shaped configuration is fixed and erected while on the lower portion receiving plate 815, the rear sieve 822 is fixed and erected. On the front sieve receiving portion 821, the first sieve 823 and the second sieve 824 are provided in a vertical direction. On the rear sieve receiving portion 822, the rear sieve 825 is provided. On the rear sieve receiving portion 822, the rear sieve 825 is provided. On the rear sieve 822, a tensioner 827 of the weight type is provided in a freely swinging manner via the bracket. Then, the wire rope (tow and transmission means) 829 wound around the

driving drum 828 installed on the upper wall 805 is hanged via these sieves 823, 824 and 825.

The whole scraping device according to the present invention as is shown in Figs. 38 through 40 in an enlarged manner. That is, reference numeral 831 denotes a carriage, which is provided with a pair of side frames on the right and the left which frame comprise a C-type channel. Therebetween, a central base 833 is integrally provided in a forward and a backward direction while the end portion plate 834 is integrated in front of and at a rear of the side frame 832. On the end portion plate 834, a front and a rear scraper 835 is provided for removing the sludge detained on the guide rail 808. From the bottom surface between the front and the rear of the side frame 832, a bracket 836 is projectingly provided so that a scraper 837 inside of the side groove of the guide rail 808 is provided via the bracket 836. Furthermore, as shown in Fig. 40, a receiving plate 838 is provided between the side frames 832. An intermediate scraper 839 is attached via this receiving plate 838 to remove sludge sands or the like on the guide rail 808 by arranging the sludge sand on the right and the left. Incidentally, reference numeral 830 denotes a floating prevention roller.

On the side frame 832, a notch 841 is formed in downward opening configuration in front thereof and at the rear thereof. A central scraper shaft 842 having a round pipe-like

configuration is rotatably supported. The details thereof will be shown in Fig. 44. Around the shaft 842, a pair of spherical bearing 843 on the right and the left is fit. This bearing 843 is fixed to the seat body 844 while one of them is fixed to the side frame 832 so that the shaft 842 is supported thereon.

The central scraper shaft 842 is made a little shorter as shown in Fig. 39 so that the end portion scraper shaft 845 forms a pair on the right and the left is fit and fixed as an extension portion thereof. On the end portion scraper shaft 845, a scraper arm 836 is vertically provided so as to form a V-shaped cross section having a forwardly projecting configuration. Since the scraper arm 846 ... has a projecting configuration in a forward direction, the scraper arm can progress while cutting the detained substance such as sludge or the like. Furthermore, as an auxiliary portion thereof, on the lower end front portion of the scraper arm 846, a cutting plate 848 like a triangular plate as shown in Fig. 38 is provided. Since the lower end opening of the scraper arm 846 is shielded with the bottom plate 849, the rear surface of the upper half portion is also shielded with the rear plate 850 with the result that the through-hole scraper arm 846 forms a hollow body together with the main body of the scraper 847. Reference numeral 851 denotes a main plate of the scraper.

At a location a little separated from the center of the longitudinal direction of the central scraper shaft 842 to the

right and the left, a pair of running wheels 852 are provided in a manner rotatable in a manner opposite to each other. These running wheels 852 comprise a hollow body integrally welded with the combination of an inner ring 853, an outer ring 854, an external plate 855, and an inner plate 856 so that the running wheels 852 are rotatably fit into an inner circumference around the scraper shaft 842 via an oil-less type bush 857, a dust seal 858, and a press plate 859 while the running wheels are set so as to correspond to the roll receiving band 812 with an half-cut type anchor 860.

On the intermediate outer circumference in the longitudinal direction of the central scraper shaft 842, either the second association arm 862 or the second association arm 863 are projectingly provided by welding to the base portion so that the arms can be rotated together with the scraper shaft 842. As shown in Fig. 36, the second association arm 862 is a plate which is erected in an approximately L-shaped configuration having at a base portion a through-hole 864 for allowing the passage of the central scraper shaft 842. In front of and at a rear of the portion having a fan-shaped configuration at the upper end thereof, contact plates 865 and 865 are provided. These contact plates 865 and 865 are constituted in such a manner that the contact plates 865 comes into contact with the stoppers 866 and 866 on the side of the carriage 831 when the second association arm 862 is rotation reacted in a forward and a backward

direction, these contact plates 865 and 865 comes into contact with the stoppers 866 and 866 on the side of the carriage 831. Incidentally, it is constituted in such a manner that the contact timing of the stopper 866 can be changed with adjustment.

Between the front and the rear of the fan-shaped configuration of the previous second association arm 862, a long through-hole 867 which is directed in a circumferential direction is formed.

The second association arm 863 is, in the same manner, welded and fixed via the through-hole 864 on the circumference of the central scraper shaft 842. On this arm 863, only the contact plate 865 is provided on the front side of the fan-shaped portion at the upper end, and on the side of the carriage 831 corresponding thereto, a stopper 866 is provided.

Around each of the front and the rear central scrapers, the front first association arm 869 or the second association arm 870 is provided in a mutually rotatably provided.

The details thereof are shown in Fig. 44. Reference numeral 871 denotes a base portion tube. Reference numeral 872 denotes a bush. Each of the first association arms 869 and 870 respectively comprises a pair of plates on the right and the left. Between the right and the left, a connection shaft 874 is connected. On the external circumference thereof, a right and a left spacer 875 and 876 and a central collars 876 and 876 are fit. The collars 876 and 876 can be moved freely in the

long through-hole 867. Incidentally, in Fig. 38, for simplification, there is shown in the drawing, the connection shaft 874 directly moves in the long through-hole 867.

On each of the upper ends of the front and the rear first association arms 869 and 870, vertical longitudinal through-holes 878 are formed. In this long through-hole 878, an association shaft 881 provided at the front and the rear end portion of the association lever 880 provided for connecting the front and the rear arms 869 and 870 are inserted so that the shaft 881 can be freely moved. In actuality, as shown in Fig. 4, this association shaft 881 passes through the inside of the tube body 882 projectingly provided on the association shaft 880 and passes through the inside of the long through-hole 878 via the collar 883. Fig. 38 is a view showing a simplification of such a structure.

The association lever 880 is a square-shaped tub. The front and the rear end portion are closed with the closing plate 884 so that the inside thereof is formed of a hollow configuration which does not allow the infiltration of dirty sands or the like. This association lever 880 is received with a receiver 886 having a U-shaped configuration fixed to the receiving base 885 erected on the central base 833 of the carriage 831 (refer to Fig. 39). In this receiving rail 886, smooth resin such as high polymer polyethylene or the like is used. However, the invention is not limited thereto.

On the connection lever 880, a weight 887 for the posture stabilization is provided.

On the front and the rear receiving plate 888 projectingly provided on this weight 887, both ends of the wire ropes 829 are fixed with the connection member 889 as shown in Fig. 38. Incidentally, as shown in Fig. 38, the weight W is provided on the front arm 869 so that the change-over operation can be favorably conducted.

On the central base 833 of the carriage 831, as shown in Fig. 39, a pillar 890 connecting the right and the left with a pair of the right is erected and a stay 891 is erected which is extended in a direction of one side direction. On the end portion of this stay 891, an attacker 892 is provided. On the side of the upper wall, as shown in Fig. 37, an actuator 894 from the front and the rear limit switch 893 for suspending and reversely controlling the drive source of the drum 828 faces in a downward direction with respect to this attacker 892. Incidentally, reference numeral 895 in Fig. 38 denotes a mechanism cover.

A solid line in Fig. 37 as well as Figs. 38 through 40 denote a scraping state.

In the scraping state, the drive drum 828 in Fig. 37 is rotated in a right direction at an extremely slow speed while the wire rope hanged via the sieves 823, 824 and 825 are driven in a direction of an arrow with a solid line. Here, the tow

force of the wire rope 829 hanged via the sieves 823, 824 and 825 acts so that the association lever 880 is pushed out in a left direction via the weight 887. As a consequence, the first association arms 869 and 870 are turned down in a forward direction. As shown in Fig. 38, this turning down is engaged with the front end of the long through-hole 867 and the front and the rear second association arms 862 and the front and the rear second association arms 862 and 863 are rotated in a forward direction so that the contact plate 865 on the front side comes into contact with the stopper 866 thereby providing limitation. Then, the scraper arm 846 and the main body of the scraper 847 are regulated at an angle somewhat risen from the shown vertical position. Then, it is ruled out that a scraping state is provided and a scraping movement in the left direction is conducted. At this time, even when settled substances such as dirty sands, sludge or the like have a rather strong viscosity, the settled substances can be cut open. In addition, since the scraper arm 846 itself has a triangular cross section, the scraper arm 846 acts in a manner of cutting in an upward direction along the front surface of the main body 847 of the scraper arm. Incidentally, the main body 847 of the scraper arm or the like is accompanied with a certain degree of vibration during the scraping operation, the vibration of the main body 847 of the scraper is suppressed with the action of the tow force, and the gravity of the weight 887 so that a stable scraping state can be provided.

In this scraping state, the device progresses up to the left of the imaginary line of Fig. 37, and the scraped substance is dropped into the pit 806. Then, the attacker 892 kicks the actuator 894 so that the drive source is changed over to the reverse rotation through the limit switch 893. As a consequence, the wire rope 829 is set in a tow state in the direction of Y of the imaginary line shown by an arrow, so that the wire rope acts so as to raise the scraper.

However, this change-over acts in two stages; the first stage shown in Fig. 45 and a second stage. At the outset of the change-over, as shown in Fig. 45, even when the wire rope 829 acts, the lower portion system from the second association arms 862 and 863 up to the scraper arm 846 does not move up to a definite location. That is, even when the wire rope 829 acts and the association lever 880 from the weight 887 responds and moves in the same direction of Y, so that the first association arms 869 and 870 are rotated in correspondence thereto, the connection shaft 874 of the association arms 869 and 870 are allowed to remain as they are. This action is conducted only for the portion of a definite angle of Fig. 45.

Thereafter, the tow and action of the wire rope continues. However, when the connection shaft 874 comes into contact with the end portion of the rear portion of the long through-hole 867, the second association arms 862 and 863 are allowed to move in reaction thereto. From this point of time, the end portion

scraper shaft 845 is allowed to respond and move from the central scraper shaft 842 directly connected to the second association arms 862 and 863, so that the scraper 846 and the main body 847 of the scraper being to be raised. As shown in Fig. 46, the contact plate 865 on the rear side of the second association arm 862 and 863 comes into contact with the stopper 866 with the result that the main body 847 of the scraper is locked to the retraction state in a sufficiently raised state. In this retraction state, as well, the load from the weight 887 acts so that the vibration accompanying the running is also suppressed, and a stable retraction state is provided.

Consequently, as described above, since the main body 847 of the scraper is dangled in the turned down state in a forward direction in the scraping state, the action of the wire rope 829 is applied to these arms 869 and 870, and the main body 847 of the scraper at the same time, a large load is applied at the same time. However, like this embodiment, the first association arms 869 and 870 are allowed to act in the rising direction, and the side of the scraper is acted with a time difference with the result that these systems are moved as a result when a light force is acted. As a consequence, at the time of the change-over from the scraping state to the retraction state, the force in the retraction direction of the carriage 831 can be small and the erroneous operation such as the movement of the carriage 831 prior to the association mechanism ceases to be conducted.

Incidentally, it is constituted in such a manner that in order to secure such operation, a lock groove 814 is temporarily formed on the guider rail 808 and the running wheels 852 drop at the time of the change-over thereof, so that the previous movement of the carriage 831 is prevented.

In the retraction state, the device is retracted as shown on the right of the imaginary line of Fig. 37. However, at the end, the device is reversely controlled with the limit switch 893 and the wire rope 829 is towed and driven in the direction of X of the arrow. As a consequence, the first association arms 869 and 870 and the main body 847 of the scraper are rotated in a left direction at the same time and the contact plate 865 on the front side comes into contact with the stopper 866 with the result that the lower portion system of the second association arms 862 and the 863 and the main body 847 of the scraper are suspended and locked. Thereafter, the connection shaft 874 is played inside of the long through-hole 867 to be retracted to the scraping state of Fig. 38.

The guide rail 808 may be installed at a position a little higher than the bottom of the pond. Any type of play may be created between the first association arms 869 and 870 and the second association arms 862 and 863. The invention is not limited to the long through-hole 867.

(9) The embodiment shown in Fig. 47 is such that a scraper 982 is provided in front of and at a rear of the carriage 891 attached

with the running wheels 890 so as to progress and regress on the guide rail 893. It is constituted in such a manner that the tow and transmission means is allowed to conduct scraping and retraction alternately and independently via the tow and transmission means respectively.

(10) The embodiment shown in Fig. 48 is provided with a flight cyclic driving type of sludge scraping device inside of the settling pond 900. In particular, the embodiment is concerned with a constitution in which a part of the constitution of the scam scraping device associated with the particular structure of the sludge scraping device 901.

In the beginning, the settling pond 900 is provided with a side wall (denoted with Reference numeral 903 of Fig. 49) having an opposite configuration on the front side and the opposite side of Fig. 48 while the settling pond has an end wall 904 so as to stand perpendicular to these side walls 903. On one of the end wall 904 (on the left side of Fig. 48), a commutation through-hole 905 into which dirty water flows is opened while a sludge pit 906 is formed below the end wall 904. Subsequent to this pit 906, a bottom wall 907 is provided.

A little in front of each side wall 903 of the bottom wall 907, a lower portion guide rail 908 is provided in a lengthwise manner. On the other hand, on the height a little lower than the water surface 909, the upper portion guide rail 910 is fixed. This upper portion guide rail 910 is fixed along the side wall

903 in such a manner that one end portion thereof can be seen in Fig. 49.

The flight cyclic driving type of sludge scraping device 901 is provided with the first to the fourth sprockets 911 through 914. These sprockets 911 through 914 forms a pair respectively one by one on the side of one of the side walls 903 and on the side of the other side walls 903. When one of them is cited as an example, the pair is a little separated from the side wall to the side of the inside of the pond as one can see when looking at the second sprocket 912 shown in Fig. 49.

The flight 916 is formed with a length shorter than the size between the upper portion guide rails on the right and the left with a length longer than the size between the right and the left of the lower portion guide rail 908. On both ends of this flight 916, as shown in Fig. 49, the lower circumference guide shoe is located at a location a little separated to the side of the inside of the pond from the side wall 903.

The flight 916 is formed in a size a little shorter than the size between the upper portion guide rails 910 on the right and the left and in a size longer than the size between the right and the left of the guide rail 908. On both ends of this flight 916, as shown in Fig. 49, the lower circumference guide shoe 917 is attached which slides on the lower portion guide rail 908 while the bracket 918 is attached in such a manner that the bracket 918 is projected toward the side from the height between

the upper and the lower locations of the flight 916. On this bracket 916, a receiving chain 919 and the upper circumference guide shoe 920 are fixed as a member fixed on the side of the lower surface on the upper circumference. The receiving chain 919 is arranged in such a manner that the guide shoe 920 comes to the outside sliding on the upper portion guide rail 910. A slit S between the shoe 920 and the side wall 903 has a size of about several centimeters.

On these first and the fourth sprockets 911 through 914, a pair of chains 921 on the right and the left are cyclically drivably hanged with a chain 921 connecting the receiving chains 919 of the flight 916 arranged in a definite interval, and are driven with the driving sprocket 922 and the driving chain 923 on the pond as shown in Fig. 48.

On the other hand, as shown in Fig. 49, the scam removing device 902 is provided with a fixing type trough 926 between the communication trough 925 having a square-like configuration fixed through each of the right and the left side walls 903 as shown in Fig. 49, so that the front side of this trough 926 is made lower and the rear side is made higher. On the front side of the trough 926, the base portion supports a weir 927 which has a rotatable base portion and which can be moved in the vertical direction. When the upper portion of this weir 927 rises in a slanted manner toward the inside of the trough, the upper portion comes above the water surface 909 to suspend the swallowing of

the scam on the water surface while the weir 927 is lowered to swallow the scam on the water surface. As a device for the vertical movement, there is available an L-shaped pressing arm 929 rotatable around the front bracket projecting from the trough 926. Thus, it is constituted in such a manner that the weir 927 is pressed down via a connection rod 930 on this arm 929. Reference numeral 931 denotes a right and left tuning shaft which is rotated together with the arm 929. Then, as a device for moving the right and left tuning shaft, a copying arm 932 shown on the side of the pond bottom of Fig. 48, a fulcrum shaft 933, an association member 934 which moves in a vertical direction of the pond, and a lever 934 on the pond connecting the association member 934 and the right and left tuning shaft 931 are constituted.

The copying arm 932 is lowered in the state shown in Fig. 48, and the flight 916 progresses as shown by an arrow, and the association member 934 is raised by kicking up this copying arm 932 so that the association member 934 is raised and pressing arm 929 is lowered with the result that the weir 927 is pressed down.

The association member is formed of a long rod and is allowed to pass through a location adjacent to one of the side walls 903 in the pond. This is a constitution which is allowed in the case where the flight 916 and the side wall 903 have a considerable size. As shown by a symbol S in Fig. 49, in the case where the bracket 918 is projected from the flight 916 and

the slit is extremely small, the flight 918 interferes with the association rod 930 when lowered down as they are from the state of Fig. 49.

Then, a part of the association rod 930 is formed in a recessed configuration to constitute a bent portion 936. On the side of the side wall 903, a dent 937 is formed which allows the movement of this bent portion 936. The state is shown in Fig. 50. Incidentally, in Fig. 50, the imaginary line shows a state in which the bent portion 936 moves not only in the vertical direction, but also in a forward and backward direction depending upon the movement convenience of the arms or the like. The dent 937 also has a excessive width in a forward and backward direction depending on the movement thereof.

Incidentally, in the embodiment of Fig. 48, the scam removing device of the flight cyclic driving type is associated with the flight cyclic driving type of the sludge scraping device. The device may be associated with the progress and regress of the running wheel type of the sludge scraping device shown in Fig. 36.

In the embodiment shown in Fig. 49 or the like, the bent portion 936 is integrally bent and formed. As shown in Fig. 51, a band plate may be bent and formed with respect to the other rod portion.

Furthermore, as shown in Fig. 52, the side wall 903 is recessed and a bent guide pipe 941 is embedded therein in a

longitudinal direction and a wire rope which is a connection member 942 may be allowed to slidably pass through the pipe 941. In this case, there is a case in which a wire rope is used vertically over the whole member as the association member 942,. There is also a case in which only the wire rope is used only overt part of the member such as a portion between the upper portion and the lower portion while the residual portion is formed of the rod.

The embodiment shown in Fig. 53 is such that the vertical movement of the weir 947 is enabled via rubber-made support seal plate 946 on the front side of the trough. In such embodiment, it is constituted in such a manner that an operation arm 948 supporting the intermediate is provided, and the rear end is raised with the winding up means 949 so that the weir 947 is lowered from the shown constitution. Reference numeral 950 denotes a clutch, and the weir 947 is allowed to independently follow the movement of the water surface in the state in which the weir 947 floats with the result that transmission is conducted from the arm 948 to the weir 947 only when the clutch is pressed down.

We claim:

1. A scraping device comprising:

a carriage provided with a sludge scraper and running wheels;

a driving portion which is installed on a treatment pond and which has a driving wheel;

a tow and transmission means which is suspended between the driving wheel and the carriage so that the carriage is towed and driven after the tow and transmission means is suspended between the driving wheel and the carriage attached with the scraper;

characterized in that the carriage has side walls located opposite to each other, and an end wall perpendicular to the side walls, the carriage is installed on the bottom of the treatment pond having a square shape with a pit on one end and is provided so that the carriage can run freely on a guide rail which passes through the center between both side walls, and the carriage is provided in such a manner that the sludge scraper is provided so that the scraper can be vertically rotatably changed over between a lowered scraping state a risen scraping state;

the driving portion is installed on the pond to be processed to continuously rotatably drive the driving wheel and change over the rotating direction in a reverse manner;

the tow and transmission means comprises an engaged long member such as a link chain, a chain belt element; and

the drive wheels are such that a single long member winding type engaged long member is associated in an engaging manner.

2. The scraping device according to claim 1, characterized in that the guide rail is provided with a lower flange which extends in the right and the left direction on the bottom of the pond, and both the right and the left wheels roll on the same flange.

3. The scraping device according to claim 1 or 2, characterized in that the guide rail has a continuous inner space in a longitudinal direction thereof, the progressing and regressing tow and transmission means is allowed to pass through the inside of the inner space while in the inner space a slide guide member is provided which guides the tow and transmission means with a low friction.

4. A scraping device comprising:

a carriage which is provided with a sludge scraper and running wheels;

a driving portion which is installed on a treatment pond and which has a driving wheel;

tow and transmission means which is suspended between the carriage and the driving portion, and is suspended between the driving wheel and the carriage attached with the scraper to tow and drive the carriage;

characterized in that the carriage has side walls located opposite to each other, and an end wall perpendicular to the side walls, the carriage is installed on the bottom of the treatment pond having a square shape with a pit on one end and is provided so that the carriage can run freely on a guide rail which passes through the center between both side walls, and the carriage is composed of a front and a rear carriage mutually connected with an association member and is connected with the association member between a front and a rear scraper and

the posture of the carriage of the front and the rear scraper can be changed over between a scraping state and a retraction state with the progress and the regress of the tow and transmission means in a forward and a backward direction.

5. The scraping device according to claim 4, wherein the front and the rear connected member have a pipe-like configuration and allows the passage of the association member.

6. A scraping device comprising:

a carriage which is provided with a sludge scraper and running wheels;

a driving portion which is installed on a treatment pond and has a driving wheel;

a tow and transmission means which is suspended between the carriage and the driving portion, and which is suspended between the driving wheel and the carriage provided with a scraper;

characterized in that the carriage has side walls located opposite to each other and an end wall perpendicular to the side walls, and is installed on the bottom of the pond having a plan rectangular configuration with a pit on one end, and is provided in such a manner that the carriage runs freely on a guide rail which passes through the center between both side walls while the sludge scraper is provided in such a manner that the scraper can be changed over in a vertical rotation between a lowered scraping state and a risen retracted state;

the driving portion is installed on the treatment pond to continuously rotate and drive the driving wheel to

change over the rotation direction in mutually opposite directions;

the tow and transmission means has at least the drive wheel, a first relay sieve and a second sieve, and the drive wheel is deviated and located on one of the side walls from the location corresponding to the upper portion of the central line between the width of the pond on the pond;

the first relay sieve is located on one side of the bottom of the pond corresponding to the lower portion of the drive wheel, and

the second relay sieve is located in the vicinity of the front portion and the rear portion of the guide rail to be hanged via these wheel sieve.

7. A scraping device comprising:

a carriage which is provided with a sludge scraper and running wheels;

a driving portion which is installed on a treatment pond and has a driving wheel; and

a tow and transmission means which is suspended between the carriage and the driving portion, and which is suspended between the driving wheel and the carriage provided with a scraper;

characterized in that the carriage has side walls located opposite to each other and an end wall perpendicular to the side walls, and is installed on the bottom of the pond having a plan rectangular configuration with a pit on one end, and is provided in such a manner that the carriage runs freely on a guide rail which passes through the center between both side walls while the sludge scraper is provided in such a manner that the scraper can

be changed over in a vertical rotation between a lowered scraping state and a risen retracted state;

the driving portion is installed on the treatment pond to continuously rotate and drive the driving wheel to change over the rotation direction in a mutually opposite direction; and

the scraper is arranged before and after the carriage while a front scraper and a rear scraper are connected with a connection member between the scrapers, a pillar having a scam scraper which can be freely erected and turned down on an upper end thereof while the scam scraper is erected and turned down in correspondence to an association system comprising the sludge scraper and the association member between the scrapers.

8. A scraping device comprising:

a carriage which is provided with a sludge scraper and running wheels and which can progress and regress by allowing the running wheels to run along the guide rail provided in a straight-line manner above the bottom wall of a treatment pond;

tow and transmission means which enables moving the scraper in a vertical direction in response thereto; and

an association mechanism which is constituted between the tow and transmission means and a scraper shaft to transmit the power from the tow and transmission means to the scraper shaft;

characterized in that the carriage is constituted in such a manner that the scraper is provided on a scraper shaft rotatably supported on an axis in a direction perpendicular to the progressing and regressing direction, and the scraper is moved downward to scrape in one direction settled sands and sludge which is detained on the

bottom of the treatment pond in a scraping posture, and is retracted in an opposite direction in a risen posture; and

the association mechanism is provided with an association arm which is rotatable around the scraper shaft to constitute between the association arm and the scraper shaft play means for setting the rotation movement of the association arm to a non-transmission state for a portion of a definite angle at the time of the change-over from the scraping state to the retraction state.

9. A scraping device comprising:

a carriage which is provided with a sludge scraper and running wheels;

a driving portion which is installed on a treatment pond and has a driving wheel; and

a tow and transmission means which is suspended between the carriage and the driving portion, and which is suspended between the driving wheel and the carriage provided with a scraper;

characterized in that the carriage has side walls located opposite to each other and an end wall perpendicular to the side walls, and is installed on the bottom of the pond having a plan rectangular configuration with a pit on one end, and is provided in such a manner that the carriage runs freely on a guide rail which passes through the center between both side walls while the sludge scraper is provided in such a manner that the scraper can be changed over in a vertical rotation between a lowered scraping state and a risen retracted state; the sludge scraper is provided in a manner rotatable in a vertical direction in the lowered scraping state and in the raised retraction state; and the center of the running wheels

becomes the same as the rotation center of the sludge scraper;

the driving portion is installed on the treatment pond and the driving wheel is continuously rotated and driven so that the rotation direction is changed over in a positive and a negative direction.

10. A scraping device comprising:

a carriage provided with a sludge scraper and running wheels;

a driving portion which is installed on a treatment pond and has a driving wheel;

tow and transmission means which is suspended between the carriage and the driving portion, and which is suspended between the driving wheel and the carriage provided with the scraper;

characterized in that the carriage has a side wall located opposite to each other and an end wall perpendicular thereto, and is provided on the bottom of the treatment pond having a plan rectangular configuration with a pit on one end thereof, and is provided in a manner freely running on the guide rail which passes through the center of both side walls while the sludge scraper is provided in a manner rotatably changing over between a lowered scraping state and a raised retracted state;

the driving portion is installed on the treatment pond and the driving wheel is continuously rotated and driven so that the rotation direction is changed over in a positive and a negative direction;

the treatment pond is such that the pond bottom is arranged in two stages; an upper stage and a lower stage to form a two-stage tank, the guide rail is provided on the

bottom of each pond so that each of the carriage can be freely progressed and regressed while at the same time

each of the front portions of the upper and the lower carriage and the rear portions there are connected with the tow and traction means so that the upper carriage and the lower carriage can be progressed and regressed in a mutually different directions;

the driving portion associates the tow and transmission means and is provided as a single entity.