

May 8, 1934.

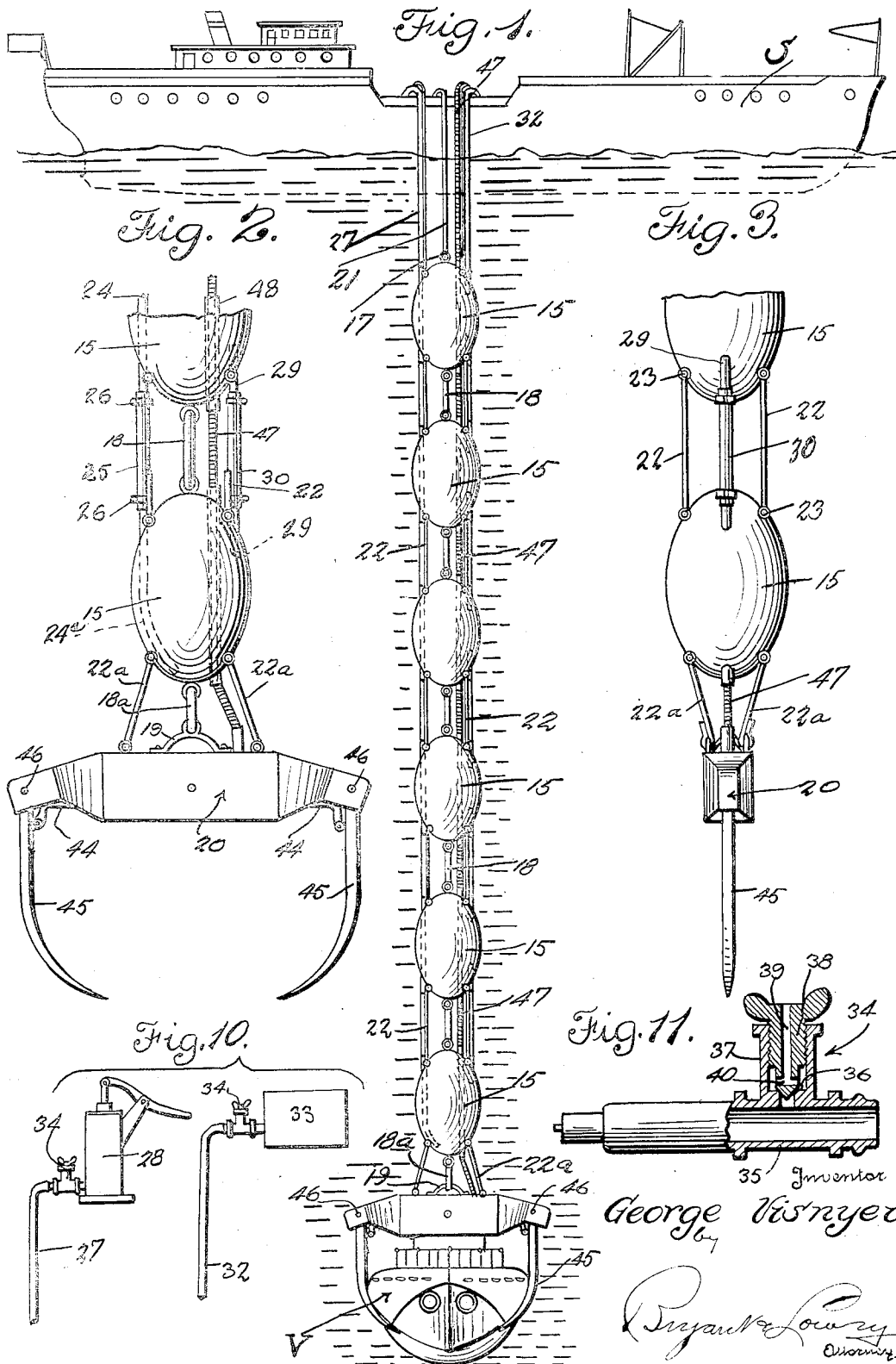
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1,957,622

SALVAGING APPARATUS

Filed March 24, 1933

2 Sheets-Sheet 1



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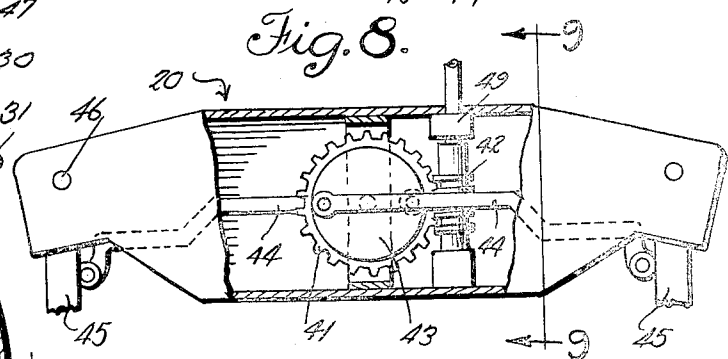
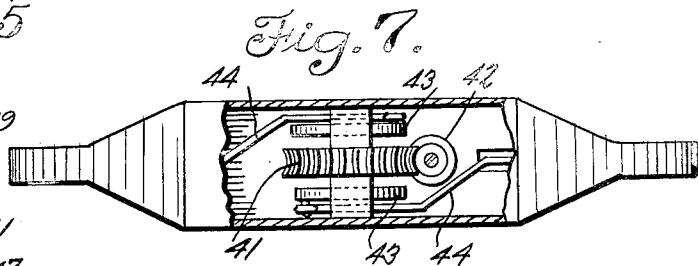
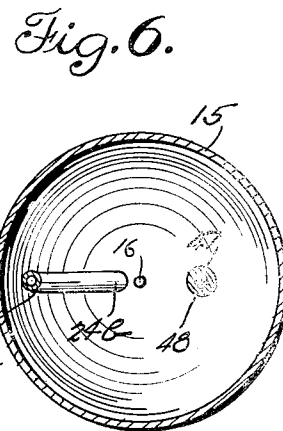
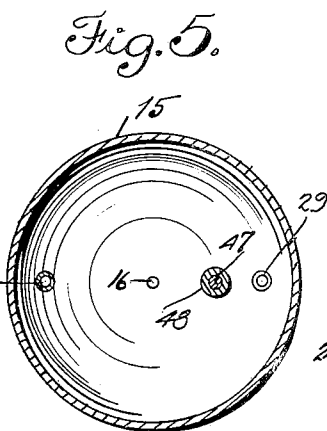
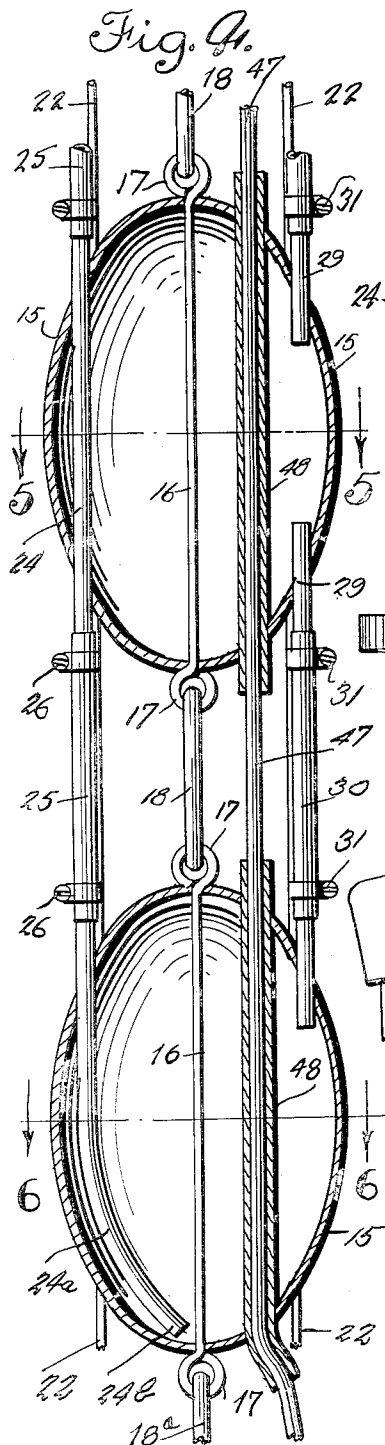
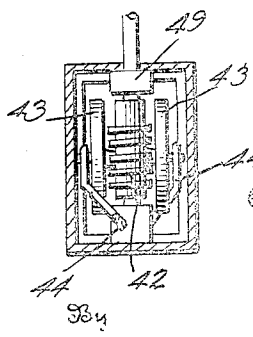


Fig. 9.



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UNITED STATES PATENT OFFICE

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SALVAGING APPARATUS

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10 Claims. (Cl. 114—51)

This invention relates to certain new and useful improvements in salvaging apparatus.

The primary object of the invention is to provide salvaging apparatus especially designed for the raising of sunken ships or the like and comprising a series of inter-connected pontoons chargeable with ballast water to effect lowering movement thereof in water with means for forcing the ballast water from the pontoons and supplying air thereto under pressure for producing buoyancy in the pontoons whereby the same float to the surface of water for the raising of a sunken ship or the like.

A further object of the invention is to provide ship salvaging apparatus of the foregoing character embodying a series of inter-connected pontoons with grapple hooks at the outer end of the series of pontoons with motor means for the operation of the grapple hooks operable from the salvaging ship on the surface of the water for forcibly placing the grapple hooks in engagement with the sunken ship or other object to be raised.

It is a further object of the invention to provide ship salvaging apparatus comprising a plurality of pontoons with connecting means therebetween including water and air supply means for the pontoons with the water supply means in the form of a conduit extending through the series of pontoons and in communication with the lowermost pontoon while the air supply means includes conduit connections between adjacent pontoons terminating inwardly of the pontoons adjacent the walls entered thereby so that air under pressure is initially admitted to the uppermost pontoon for forcing water downwardly through the several connected pontoons and upwardly out of the water supply conduit.

With the above and other objects in view that will become apparent as the nature of the invention is better understood, the same consists in the novel form, combination and arrangement of parts hereinafter more fully described, shown in the accompanying drawings and claimed.

In the drawings:—

Figure 1 is a side elevational view showing the salvaging apparatus in operative position and suspended from the salvage ship floating on the surface of the water with the grapple hooks engaged with a sunken vessel;

Figure 2 is a fragmentary side elevational view of the lower end of the salvaging apparatus showing the power operated flexible shaft extending through tubular guides carried by the pontoons for the operation of the grapple hooks;

Figure 3 is a fragmentary side elevational view

taken at right angles to the showing in Figure 2;

Figure 4 is an enlarged longitudinal sectional view of the lowermost and adjacent pontoon showing the haul or lift sectional rod extending axially of the pontoon for relieving strains on the latter, the guides for the power shaft for the operation of the grapples and the water and air feed conduits;

Figure 5 is a cross-sectional view taken on line 5—5 of Figure 4;

Figure 6 is a cross-sectional view taken on line 6—6 of Figure 4;

Figure 7 is a top plan view, partly broken away and shown in section of the grapple head and showing the operating devices for the grapple hooks;

Figure 8 is a side elevational view, partly broken away and shown in section of the grapple head;

Figure 9 is a cross-sectional view taken on line 9—9 of Figure 8;

Figure 10 diagrammatically illustrates a water pump and air compressor for the supply of water and air to the pontoons; and

Figure 11 is a fragmentary detail sectional view of the vent valve for the water and air feed line.

Referring more in detail to the accompanying drawings, the ship salvaging apparatus is illustrated in Figure 1 as suspended from the surface salvaging ship S floating on the surface of the water with the grapple hooks at the lower end of the salvaging apparatus engaged with a sunken ship or vessel V. The salvaging apparatus comprises a series of interconnected metallic pontoons 15 of substantially oval formation and arranged end to end in spaced relation, six of these pontoons being illustrated in Figure 1, but it is to be understood that any number of pontoons desired may be employed and the sizes and materials entering into the construction thereof may be varied to meet different conditions. A direct haul, lift or pull line for the grapple hooks extends axially through the series of pontoons in a manner to relieve strain on the pontoons and as shown in detail in Figure 4, a rod 16 extends axially through said pontoons with an eye 17 formed on each projecting end thereof, a flexible link 18 connecting the eyes 17 of adjacent pontoon rods 16. The lower pontoon 15 has a flexible link connection 18a as shown in Figure 2 with a strap 19 carried by the top wall of the grapple head 20 that carries grapple hooks. As shown in Figure 1, a flexible cable 21 extends from the upper rod eye 17 to the ship S, the haul or lift

cable constituting the supporting means for the salvaging apparatus and is especially employed during the lowering movement of the pontoons to obtain a "feel" between the grapple tongues or hooks and the sunken vessel V. Adjacent ends of the pontoons 15 are further connected by equidistantly spaced flexible links 22 attached at their ends as at 23 to the pontoons, preferably four of these flexible links 22 being employed which act to eliminate relative twisting movement between the pontoons.

It is intended to introduce water into the pontoons to aid in the sinking thereof for placing the grapple hooks in engagement with the sunken vessel and also to introduce air under pressure to the pontoons and exhaust water therefrom to add buoyancy thereto for raising the sunken vessel to the surface of the water, the water supply means for the pontoons as shown more clearly in Figure 4 comprising a rigid pipe 24 extending longitudinally through each pontoon 15 adjacent one side thereof with the adjacent projecting ends of the pipe 24 connected by a flexible tube 25 secured thereto in a water-tight manner by the clamps 26. The pipe 24a associated with the lower pontoon 15 has a curvature incident to the curvature of the adjacent side wall of the pontoon with the lower end 24b thereof terminating adjacent the lower end of the bottom pontoon so that water introduced through the supply pipe 24 including the flexible connections 26 is delivered to said pipes and discharged at the bottom of the lower pontoon 15 to rise upwardly therein and to flow into the upper pontoon in a manner to be described, so that the lower pontoon first receives ballast water for the weighting thereof. The pipe section 24 associated with the uppermost pontoon 15 as shown in Figures 1 and 10 has a flexible conduit connection 27 with a water pump 28. The means for supplying air under pressure to the pontoons 15 as shown more clearly in Figures 1, 4 and 10 includes a relatively short pipe section 29 extending longitudinally of the pontoon at the side thereof opposite the water pipe 24, a pipe section 29 being associated with each pontoon in the upper and lower ends thereof with the exception of the lowermost pontoon that only has the pipe section 29 entering the upper end thereof as shown in Figure 4. The projecting ends of the pipe sections 29 outwardly of the pontoons 15 are connected by flexible tubes 30 clamped thereto as at 31 to form a water and airtight connection. The upper pipe section 29 associated with the uppermost pontoon 15 has a flexible conduit connection 32 with an air compressor 33 diagrammatically illustrated in Figure 1, the pump 28 and air compressor 33, each carrying a vent relief valve 34 of similar construction and shown in detail in Figure 11.

The vent valve 34 as shown in Figure 11 includes a T-fitting 35 having a side opening therein providing a valve seat 36 surrounded by a tubular boss 37 which is internally threaded for the reception of the valve plug 38 having a conical end engaging the valve seat 36 with communicating axial and transverse bores 39 and 40 respectively for purposes hereinafter to appear in the description of the operation of the salvaging apparatus.

The grapple head 20 is in the form of a casing rectangular in cross-section and open at opposite ends and having bearings therein for the support of a centrally disposed worm wheel 41 po-

sitioned with opposite sides parallel with the side walls of the grapple head casing, the worm wheel meshing with a perpendicular worm 42 journaled in bearings in the top and bottom wall of the grapple head casing. The cross shaft supporting the worm wheel 21 also carries a disk 43 at each side of the worm wheel and each disk 43 has an eccentric link connection 44 with grapple hooks 45 pivotally mounted on cross-pins 46 in the ends of the grapple head casing 20. The operating means for the grapple hooks, worm wheel and worm include a motor operated flexible shaft 47 extending through guide tubes 48 carried by each pontoon 15 with the lower end of the flexible drive shaft 47 connected as at 49 to the worm 42, the upper end of the flexible drive shaft extending into the salvage ship S to be motor operated.

The appurtenances of each pontoon have air and water-tight connections therewith. In submerging the salvaging apparatus in the water for grappling engagement with a sunken vessel, the pontoons 15 free of water and air under pressure move downwardly by their own weight and external water pressures are overcome by the introduction into the pontoons of water by means of the pump 28. When water is delivered to the pontoons, the vent valve 34 associated with the air line 32 is opened and the valve associated with the water line 27 is closed. Water from the pump 28 is delivered through the pipes 24 to the lowermost pontoon 15 to rise therein and force air upwardly through the air line 32 which escapes by way of the vented valve 34 of the air line. The water is admitted first to the lowermost pontoon 15 for the weighting of the lower end of the salvaging apparatus or series of pontoons which acts as a stabilizer for the apparatus. During positioning of the connected pontoons in the water, relative twisting movements thereof are prevented by the several connections between the pontoons and also the flexible link connections 22a between the lowermost pontoon and the grapple head casing 20. The water rising in the lowermost pontoon 15 passes upwardly through the pipe connections 29 and 30 with the adjacent pontoon 15 wherein the operation is repeated until the pontoons of the salvaging apparatus have been sufficiently weighted by ballast water to effect submergence in the water. By manipulating the haul line 21, the "feel" of the sunken vessel V can be obtained as to the length of beam thereof for the engagement of grapple hooks 45 therewith. When the grapple hooks 45 have been correctly positioned relative to the sunken vessel, the motor operated flexible shaft 47 is then placed in operation for the forceful closing of the grapple hook 45 through the medium of the worm and worm wheel devices shown in detail in Figures 7 and 8 and said grapple hooks may be either placed in enclosing relation with a sunken vessel or cause to pierce walls thereof for locking engagement therewith. When the grapple hooks have been engaged with the sunken vessel, the vent valve 34 associated with the water line 27 is then opened while the vent valve 34 associated with the air line 32 is closed, air from the compressor 33 being delivered downwardly through the air line 32 and pipe and tube connections 29 and 30 for exhausting water from the pontoons 15 by causing the water to flow downwardly through the pipe and tube connections 29 and 30 and upwardly through the pipe sections 34 to be exhausted by way of the vent valve 34 in the water line 27. At this

time, sufficient buoyancy is given the pontoons 15 to effect rise thereof in the water and the floating of the sunken vessel V.

From the above detailed description of the invention, it is believed that the construction and operation thereof will at once be apparent, and while there is herein shown and described the preferred embodiment of the invention, it is nevertheless to be understood that minor changes 10 may be made therein without departing from the spirit and scope of the invention as claimed.

I claim:—

1. In salvaging apparatus, a series of pontoons, a haul line extending axially through the pontoons and a grapple head connected directly to the lower end of the haul line, an unbroken water line extending through the pontoons and opening at the bottom of the lowermost pontoon and sectional air line pipes connecting adjacent 20 pontoons.

2. In salvaging apparatus, a series of pontoons, a haul line extending axially through the pontoons and a grapple head connected directly to the lower end of the haul line, and flexible connections between adjacent pontoons and the lowermost pontoon and grapple head to prevent relative twisting movements between the pontoons, an unbroken water line extending through the pontoons and opening at the bottom of the lowermost pontoon and sectional air line pipes connecting adjacent pontoons. 25 30

3. In salvaging apparatus, a series of pontoons, a haul line extending axially through the pontoons and a grapple head connected directly to the lower end of the haul line, pivotally mounted grapple hooks carried by the grapple head a guide tube extending lengthwise of each pontoon and a motor operated flexible shaft extending through the guide tubes for the operation of the grapple hooks. 35 40

4. In salvaging apparatus, a series of pontoons, a haul line extending axially through the pontoons and a grapple head connected directly to the lower end of the haul line, and circumferentially spaced flexible connections between adjacent pontoons and the lowermost pontoon and grapple head to prevent relative twisting movements between the pontoons, pivotally mounted grapple hooks carried by the grapple head a guide tube extending lengthwise of each pontoon and a motor operated flexible shaft extending through the guide tubes for the operation of the grapple hooks. 45 50

5. In salvaging apparatus, a series of pontoons, a haul line extending axially through the pontoons and a grapple head connected directly to the lower end of the haul line, an unbroken water line extending through the pontoons and opening at the bottom of the lowermost pontoon and sectional air line pipes connecting adjacent pontoons, pivotally mounted grapple hooks carried by the grapple head and a motor operated flexible shaft for the grapple hooks extending through the pontoons. 55 60

6. In salvaging apparatus, a series of pontoons, a haul line extending axially through the pontoons and a grapple head connected directly to the lower end of the haul line, and flexible connections between adjacent pontoons and the lowermost pontoon and grapple head to prevent relative twisting movements between the pontoons, an unbroken water line extending through the 75

pontoons and opening at the bottom of the lowermost pontoon and sectional air line pipes connecting adjacent pontoons, pivotally mounted grapple hooks carried by the grapple head and a motor operated flexible shaft for the grapple hooks extending through the pontoons. 80

7. In salvaging apparatus, a series of pontoons, a haul line extending axially through the pontoons and a grapple head connected directly to the lower end of the haul line, an unbroken water line extending through the pontoons and opening at the bottom of the lowermost pontoon and sectional air line pipes connecting adjacent pontoons, grapple hooks carried by the grapple head, a worm and cooperating worm wheel journaled in the grapple head, eccentric link connections between the worm wheel and grapple arms and a motor operated flexible shaft extending through the pontoons and engaged with the worm. 85 90

8. In salvaging apparatus, a series of pontoons, a haul line extending axially through the pontoons and a grapple head connected directly to the lower end of the haul line, and flexible connections between adjacent pontoons and the lowermost pontoon and grapple head to prevent relative twisting movements between the pontoons, an unbroken water line extending through the pontoons and opening at the bottom of the lowermost pontoon and sectional air line pipes connecting adjacent pontoons, grapple hooks carried by the grapple head, a worm and cooperating worm wheel journaled in the grapple head, eccentric link connections between the worm wheel and grapple arms and a motor operated flexible shaft extending through the pontoons and engaged with the worm. 95 100 105

9. In salvaging apparatus, a series of pontoons, a haul line extending axially through the pontoons and a grapple head connected directly to the lower end of the haul line, an unbroken water line extending through the pontoons and opening at the bottom of the lowermost pontoon and sectional air line pipes connecting adjacent pontoons, grapple hooks carried by the grapple head, a worm and cooperating worm wheel journaled in the grapple head, eccentric link connections between the worm wheel and grapple arms and a motor operated flexible shaft extending through the pontoons and engaged with the worm, and guide bearing tubes extending through the pontoons for the flexible shaft. 110 115 120 125

10. In salvaging apparatus, a series of pontoons, a haul line extending axially through the pontoons and a grapple head connected directly to the lower end of the haul line, and flexible connections between adjacent pontoons and the lowermost pontoon and grapple head to prevent relative twisting movements between the pontoons, an unbroken water line extending through the pontoons and opening at the bottom of the lowermost pontoon and sectional air line pipes connecting adjacent pontoons, grapple hooks carried by the grapple head, a worm and cooperating worm wheel journaled in the grapple head, eccentric link connections between the worm wheel and grapple arms and a motor operated flexible shaft extending through the pontoons and engaged with the worm, and guide bearing tubes extending through the pontoons for the flexible shaft. 130 135 140 145

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