March 8, 1927. 1,619,850

V. F. CASEY

DREDGING MACHINE

Filed March 12, 1925 3 Sheets-Sheet 1

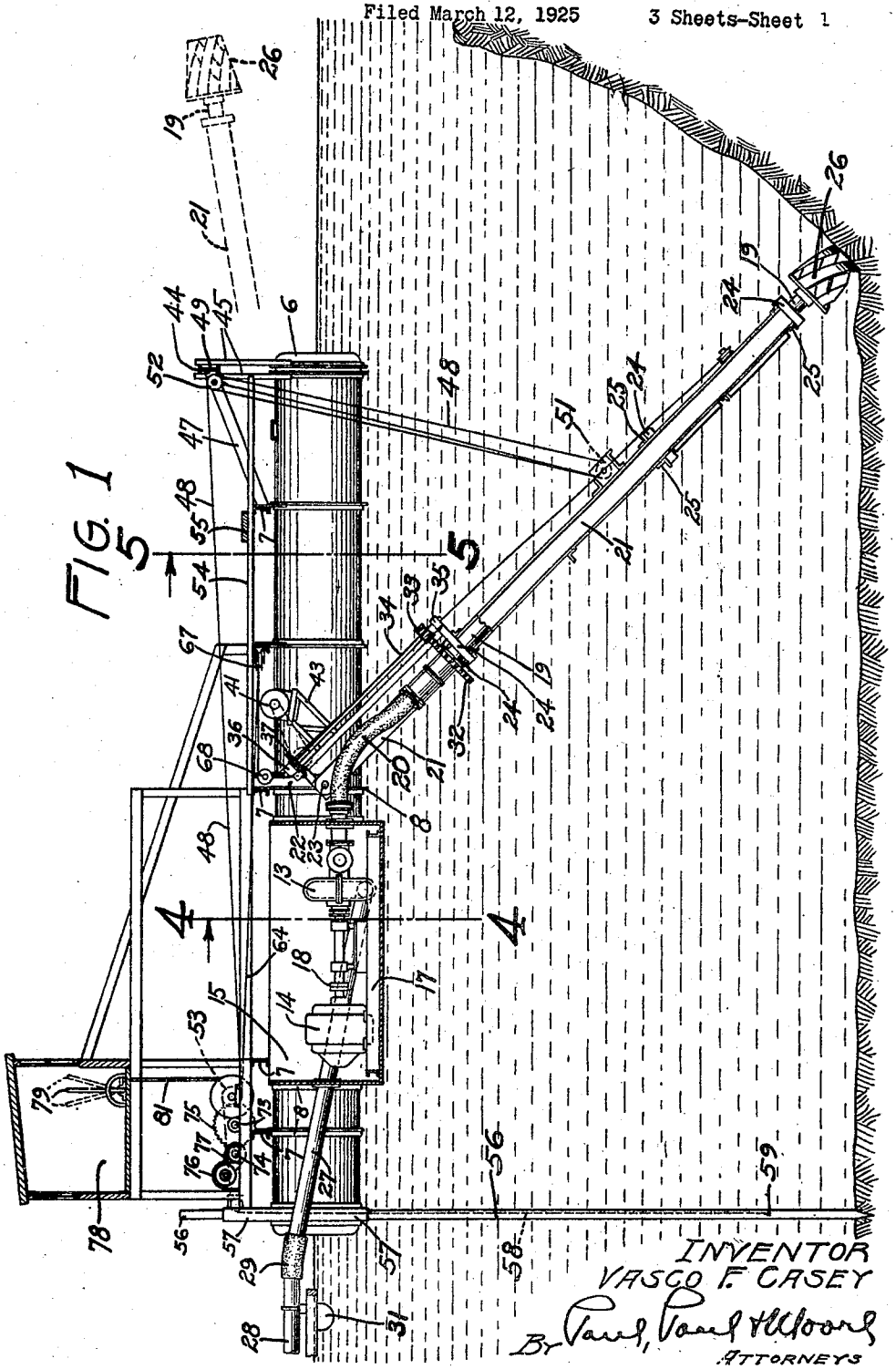


FIG. 1

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DREDGING MACHINE

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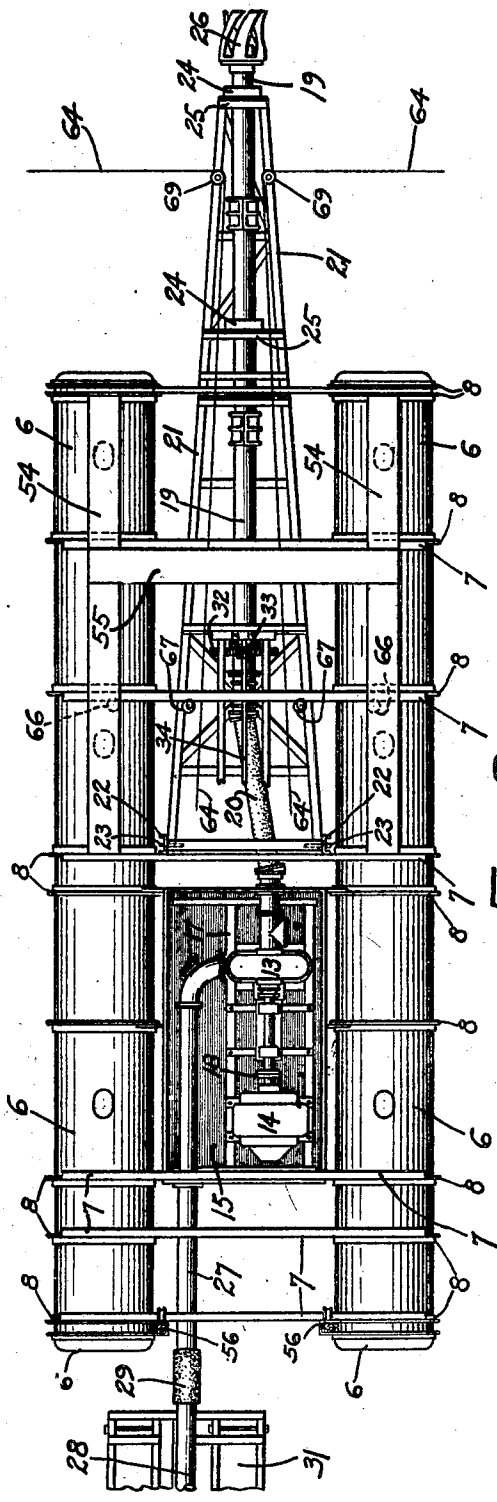


FIG. 2

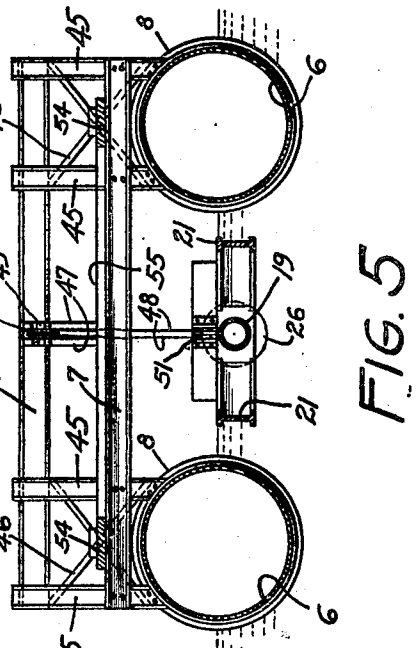


FIG. 5

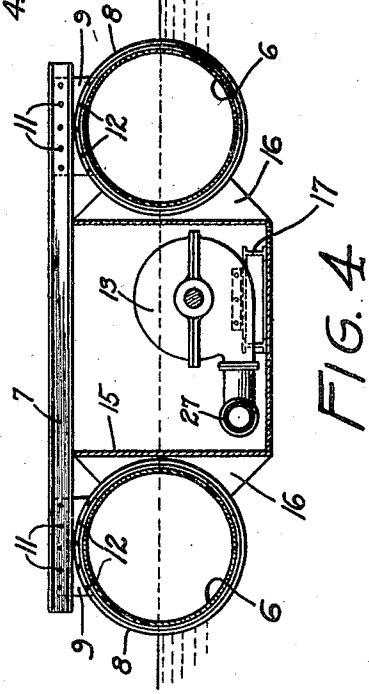


FIG. 4

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DREDGING MACHINE

Filed March 12, 1925 3 Sheets-Sheet 3

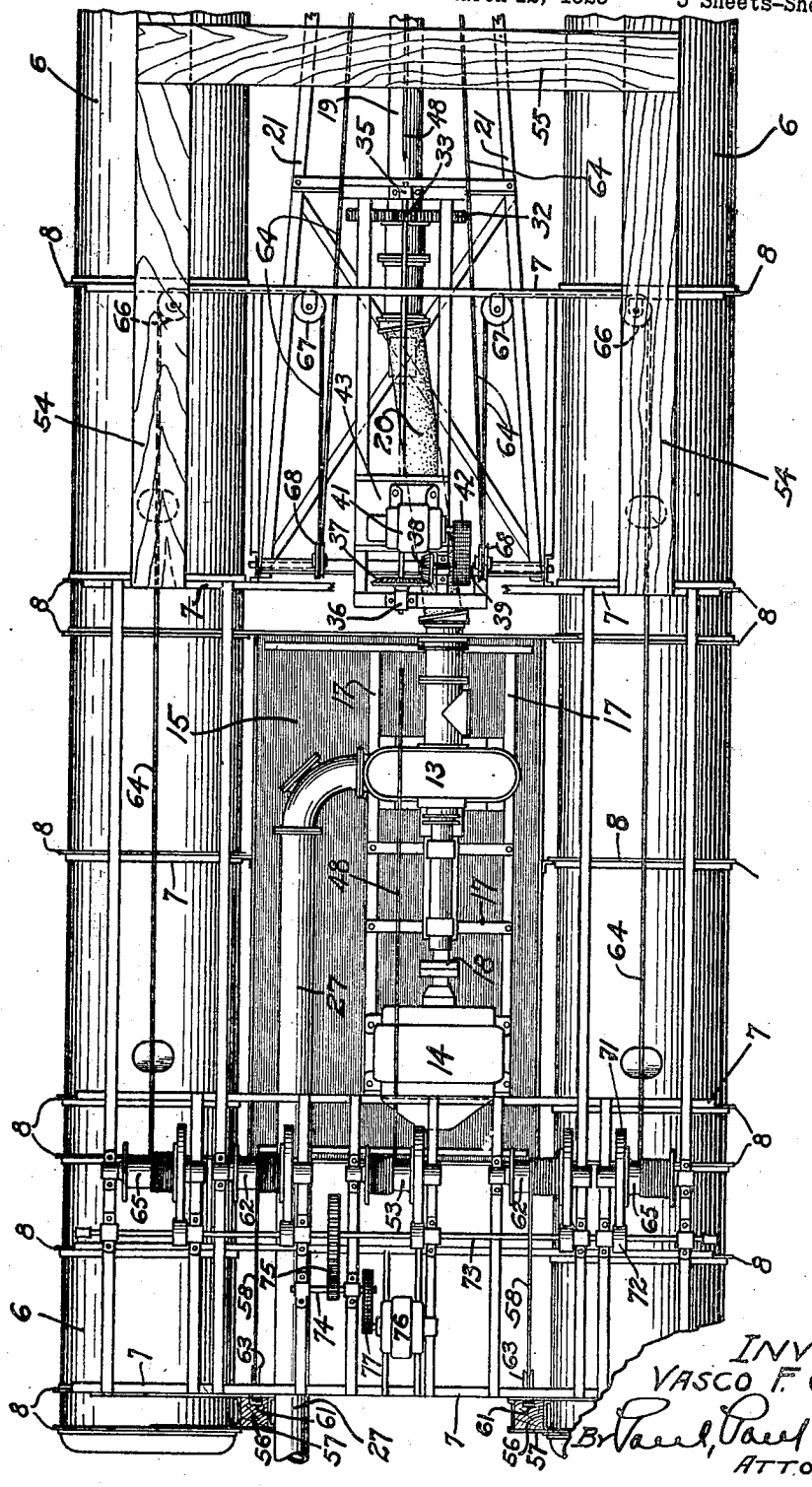


FIG. 3

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Patented Mar. 8, 1927. 1,619,850

UNITED STATES PATENT OFFICE.

VASCO F. CASEY, OF MINNEAPOLIS, MINNESOTA, ASSIGNOR TO MINNEAPOLIS DREDGING CO., OF MINNEAPOLIS, MINNESOTA, A COPARTNERSHIP COMPOSED OF BERNARD W. HARRIS, LEO B. HARRIS, VASCO F. CASEY, AND HENRY L. MEYERS.

DREDGING MACHINE.

Application filed March 12, 1925. Serial No. 15,016.

This invention relates to improvements in dredging machines and more particularly to the hydraulic type employing a suction pump for lifting or removing the material from its source and discharging it through a suitable discharge pipe at the desired destination.

Hydraulic dredges such as are in common use at the present time, usually employ a suction or dredging pump having a suitable suction tube or pipe connected therewith, which is provided at its suction end with a revolving cutter or agitator adapted to engage and loosen the material so that it may be drawn into the suction tube together with the water. This pump and its power means, which may be either steam, electric current or an internal combustion engine, are mounted upon a hull together with the necessary control mechanism for operating the dredge.

The suction tube is usually supported by a ladder or boom which, generally, is pivotally mounted adjacent the forward end of the hull and is provided with suitable hoisting means for lowering and raising it into and out of the water. In mounting and supporting the suction tube and its associated parts on one end of the dredge, the size and length thereof must be maintained within a certain limit to avoid overloading the forward end of the dredge, resulting from the excessive overhanging of the end of the suction tube. As the depth to which a dredge can excavate is governed substantially by the length of its suction tube, or the depth to which the revolving cutter or agitator thereof can be lowered, it will readily be understood that in order to excavate or dredge a deep canal or excavation, the suction tube must of necessity, be of considerable length, which, as above stated, is objectionable in present types of dredges. It is therefore desirable that means be provided whereby the overall length of the suction tube may be considerably increased without adding excessive weight to either end of the dredge, and in such a manner that the weight of the tube and its operating parts will be equally distributed substantially upon the hull or supporting means of the dredge.

The novel dredging machine featured in this invention is designed to meet the above requirements, as will be readily seen and understood by reference to the accompanying drawings. The construction of this novel dredge is such that the suction tube and boom are mounted and carried substantially upon the center of the dredge, thereby eliminating the objectionable feature of the ladder overhanging one end of the dredge and the use of a supporting means for the end of the boom and also distributing the weight evenly upon the supporting tanks of the dredge.

Another feature of the invention resides in the novel mounting of the power means or motor and also the suction pump, in an open tank mounted between and secured to a pair of main supporting tanks, preferably arranged in spaced parallel relation and rigidly secured together by a structural framework. The control mechanism is preferably mounted at the rear of the dredge at a point above the operating mechanism so that the operator will have a clear vision on all sides to watch the operation of the motors and pump, and also so that he may readily and conveniently watch the movement of the dredge when moving from place to place.

Another important feature consists in mounting the boom and preferably the pump and motor in a low down position between the tanks near or below the water line so that a boom of the ordinary length will have a more effective reach and can be used in deeper water than usual in dredges of this type.

The particular object of the invention, therefore, is to provide an improved dredging machine.

Other objects of the invention will appear from the following description, and the accompanying drawings, and will be pointed out in the annexed claims.

In the accompanying drawings there has been disclosed a structure designed to carry out the various objects of the invention, but it is to be understood that the invention is not confined to the exact features shown, as various changes may be made within the scope of the claims which follow.

In the accompanying drawings forming part of this specification,

Figure 1 is a view in sectional elevation showing the novel mounting of the suction tube and ladder and also the open tank in

which the pump and its motor are mounted;

Figure 2 is a plan view of Figure 1 showing the ladder and suction tube in substantially horizontal position, the upper portion of the dredge being omitted to more clearly show the parts;

Figure 3 is an enlarged plan view of the rear end of the dredge showing the arrangement of the winding drums thereon, and the driving means therefor;

Figure 4 is a cross sectional view on the line 4—4 of Figure 1; and

Figure 5 is a similar view on the line 5—5 of Figure 1.

The novel dredging machine shown in the accompanying drawings preferably comprises a pair of main supporting pontoon tanks 6, upon which the superstructure is mounted as will hereinafter be described. The supporting tanks 6 are watertight preferably secured together in spaced parallel relation by means of a plurality of cross-beams 7 preferably of channel iron. The interior of the tanks is preferably provided with a series of water-tight bulkheads forming a series of water-tight chambers. Angle iron hoops or bands 8 are preferably provided on the tanks 6 to provide a reinforcing means therefor and also to provide means whereby the beam 7 may be rigidly secured thereto. As shown in Figure 4, the beams 7 are secured to the hoops 8 by means of gusset plates 9 which are secured to the beams 7 by rivets 11 and have their lower portions arcuately cut and formed to fit the peripheries of the tanks so that they may be secured to the outwardly projecting flanges of the hoops 8 by means of rivets 12 as shown.

As shown in the drawings, particularly Figures 1 and 4, the means provided for supporting the suction pump 13 and the drive motor 14 therefor, preferably consists of an open tank 15, mounted between the two cylindrical tanks 6 and is suitably secured thereto by means of gusset plates 16, shown in Figure 4. A structural frame 17 is preferably mounted in the tank 15 and provides a supporting means for the pump 13 and the motor 14. The pump 13 is directly coupled to the motor 14 by means of a coupling 18, of ordinary construction.

An important feature of this invention resides in the novel mounting of the suction tube and the supporting means therefor. As shown in Figures 1 and 2, the suction tube or pipe 19 is rotatably mounted in a structural frame or boom 21, which is pivotally connected to a pair of upright posts 22 by means of suitable pivot pins 23 between the supporting tanks 6. The upright posts 22 are suitably secured to one of the transverse beams 7 adjacent the open tank 15, and depend therefrom to a point preferably slightly below the axes of the two main supporting tanks 6, as shown in Figure 1. Diagonal braces (not shown) are preferably provided between the posts 22 to securely brace them and to retain them substantially in parallel relation. The pump and motor and the boom are positioned between the tanks near or below the water line and adapt the boom for working in a greater depth of water than usual in dredges having booms of this length.

In structures of this type the suction tube 19 is usually rotatably mounted in suitable bearings 24 secured to the boom by such means as the angle bars 25. These bearings are of ordinary construction and are therefore not shown in detail. The upper end of the suction tube 19 is connected to the suction side of the pump by means of a flexible connection 20 which provides free up and down movement of the tube. The coupling or union between the suction tube and the flexible connection 20 is also so designed as to permit the tube to relatively rotate with reference to the connection 20. This connection is of ordinary construction and therefore need not be shown in detail. A cutter or agitator 26 is preferably mounted on the lower or suction end of the tube 19 and functions to engage and loosen the material so that it may readily be upwardly drawn into the tube to the pump, from whence it is discharged through a discharge pipe 27. The discharge pipe 27 is preferably connected to a pipe 28 by means of a flexible coupling 29. The pipe 28 may be supported on pontoons 31 and is preferably built up in sections so that it may reach a considerable distance, or the desired destination at which the material is to be discharged. The pipe 28 and the pontoons 31 are of ordinary construction and form no part of the present invention.

The means provided for rotating the suction pipe or tube 19 comprises a gear 32 secured to the tube and which is operable by means of a pinion 33 mounted on a shaft 34 arranged above the suction pipe. The shaft 34 is mounted in bearings 35 and 36 secured to the frame of the boom 21. A beveled gear 37 is mounted on the opposite end of the shaft 34 and meshes with a pinion 38 mounted on a short shaft 39, which is driven from a motor 41 by such means as a silent chain drive 42. The motor 41 is preferably mounted on an elevated frame structure 43 above the shaft 34 and suction tube 19 (see Figure 1).

The means provided for raising and lowering the boom 21 and therefore the suction tube 19, preferably consists of a hoisting mechanism mounted at the forward end of the dredge. Referring to Figure 5 it will be noted that the forward ends of the two supporting tanks 6 are suitably secured together by means of a transverse frame struc-

ture comprising the upper beam 44 and the upright posts 45, which have their lower ends shaped to conform to the peripheries of the tanks 6 and which ends are suitably secured thereto. Diagonal braces 46 are preferably provided between each pair of upright posts 45 to securely brace them together, and rearwardly extending braces 47 are also provided which have their upper ends secured to the horizontal beam 44 and their lower ends to the adjacent cross beam 7. The purpose of spacing the horizontal beam 44 from the tanks 6, as shown in Figure 5, is to provide clearance for the ladder and suction tube when raised to the dotted line position shown in Figure 1.

A hoisting cable 48 has one end secured to a bracket 49 mounted on the horizontal beam 44. This cable is adapted to engage a pair of sheaves 51 mounted on the boom 21 and also a pair of similar sheaves 52 preferably carried by the bracket 49. From one of the sheaves 52 the cable rearwardly extends and has its end secured to a winding drum 53 mounted adjacent the rear end of the dredge. This drum and hoisting cable 48 function to raise and lower the boom in the operation of the machine. The hoisting mechanism may be of any suitable type, and is here shown as being similar in construction to an ordinary double block and tackle, it being understood that there are two sheaves 51 and also two sheaves 52. A deck or walk 54 is preferably provided on each side of the boom as shown in Figures 2 and 3, and these two decks may be connected by means of a cross walk 55 as shown. The decks 54 are mounted on the cross beams 7, as is clearly shown in Figure 1. The mounting of the boom near the center of the dredge not only distributes the load more evenly but eliminates the necessity of providing a projecting frame at the front of the dredge to support the boom when raised.

The rear end of the dredge is provided with a pair of spuds 56, which are slidably mounted on vertical guides 57 secured to the tanks 6 and to the rear cross beam 7. The function of these two spuds is to provide means for anchoring the dredge when in use and also to assist in moving it about from place to place in the water. Each spud is preferably provided with a cable 58 which has its lower end secured thereto by means of a pin or bolt 59, as shown in Figure 1. A recess or groove 61 is provided in each spud to receive the cable 58, as shown in Figure 3. The other end of each cable is secured to a winding drum 62 and is adapted to be wound thereon as shown in Figure 3. Sheaves 63 are provided to guide the cables to the two winding drums 62.

I prefer to connect the lifting cables of the spuds or legs to the lower portions thereof so that the legs can be easily raised and lowered on the dredge and the winding mechanism therefor located in the lower portion of the dredge near the water line. Generally, in dredge construction, a skeleton frame projecting a considerable distance above the dredge is required when the hoisting cables are connected to the upper portion of the legs. My connection to the lower portion of the legs permits me to dispense with this elevated frame.

Means are provided for laterally swinging the forward end of the dredge from side to side. Such means preferably resides in the provision of a pair of cables 64, which are preferably arranged one on each side of the dredge substantially over the two supporting tanks 6. These cables have their rear ends wound about a pair of drums 65, and from these drums each cable forwardly extends and passes around a pair of sheaves 66 and 67 secured to one of the cross beams 7 of the frame. From the sheaves 67 each cable rearwardly extends and passes over a similar sheave 68, thence forward to a sheave 69. From the two sheaves 69 at the forward end of the boom, the two swinging cables 64 outwardly extend in opposite directions and have their ends secured to suitable anchors or supporting means so that when the winding drums 65 are rotated the forward end of the dredge will be shifted or swung to one side or the other, depending, of course, upon the direction of rotation of the two winding drums.

The boom extends a substantial distance beyond the forward end of the dredge, and the landward runs of the cable are thus non interferingly disposed with respect to the pontoons, and this arrangement of the cables does away with tackle on the forward portion of the dredge.

The winding drums 53, 62 and 65 are each provided with a friction drive consisting of a disc 71 and a friction drive wheel 72. The friction drive wheels 72 are all mounted upon a counter-shaft 73 which is rotatably mounted in suitable bearings provided on the frame of the structure, and which shaft is driven from a short jack shaft 74 by means of a gear drive 75. The jack shaft 74 may be driven from a motor 76 through a silent chain belt 77 (see Figure 3).

Another feature of this invention resides in the novel arrangement of the control levers for operating and controlling the movement and operation of the dredge. As shown in Figure 1, an operator's cabin or cab 78 is mounted at the rear of the dredge preferably above the winding mechanism at a point where the operator will have a clear vision on all sides of the dredge. This cabin is also so mounted that the operator may readily and conveniently watch the opera-

tion of the pump, motors and all moving parts. A plurality of control levers 79 are provided in the cabin 78 for controlling the operation of the winding drums. Each winding drum is provided with a control lever 79 and is operatively connected therewith by means of the connecting rods 81.

The bearing against the friction disc 71 of each winding drum is preferably slidably mounted on its supporting means, and these bearings are so arranged and connected with their respective control levers that when one of the control levers is actuated its respective friction disc will be moved in and out of engagement with one of the friction drive wheels 72. Means may also be provided for braking or retarding the movement of each winding drum when its friction disc is moved out of engagement with its complementary friction drive wheel. Each winding drum may be provided with a stationary brake shoe, (not shown) so that when the friction disc is moved out of engagement with the drive wheel 72 it will engage a brake shoe which will thereby retard or interrupt its further movement.

The above mechanism and also the connecting means between the connecting rods 81 and their respective slidably mounted bearings are of ordinary construction and therefore are not shown in the drawings.

From the foregoing it will readily be seen that this novel dredge may readily and conveniently be controlled and operated by one man stationed in the cabin 78, by means of the control levers 79 of the winding drums 53, 62 and 65. When it is desired to swing the forward end of the dredge from one side to the other, one of the drums 65 will be rotated by moving one of the friction discs 71 into driving contact with its complementary drive wheel 72, thereby causing one of the swinging cables to be wound upon one of the drums 65 while the other is being unwound from the other drum. Such movement of the two swinging cables will cause the forward end of the dredge to be swung from one side to the other. The raising and lowering of the boom 21 and the suction tube 19 is effected by rotation of the drum 53, and in like manner the movement of the spuds 56 is controlled by the operation of the two winding drums 62.

The movement of the dredge is controlled by means of the two spuds 56, provided at the stern and by means of the two swinging cables at the forward end or bow of the dredge. A cut is made by swinging the forward end of the dredge about one of the spuds as a center, such swinging of the dredge being effected by means of the two swinging cables which have their ends suitably secured to anchors placed either in the lake or ashore. The cut, therefore, will be circular in form and the depth thereof will be regulated by the raising and lowering of the boom carrying the cutter and the suction pipe. Forward movement of the dredge is accomplished by swinging the forward end thereof from one side to the other and alternately changing the spuds, that is, the spuds will alternately be used as centers about which the dredge will swing from side to side.

By arranging the pumping mechanism and the supporting boom for the suction tube substantially in the center of the dredge, the weight thereof will be equally distributed upon the two supporting tanks 6. Such arrangement of the boom will also allow the use of a much longer suction tube, thereby providing a dredge adapted for use in excavating deep canals and excavations. The winding drums and operating mechanism are also preferably mounted at the stern of the dredge beneath the operator's cabin for convenient accessibility, and also for the purpose of balancing the dredge when the suction tube or pipe is in elevated position as shown by the dotted lines in Figure 1.

It will also be noted that the pump 13 and drive motor 14 are located substantially beneath the level of the water, thereby increasing the stability of the dredge, and by which arrangement the pump may also readily and conveniently be primed, should it be necessary to do so in starting the suction through the suction tube or pipe 19.

I claim as my invention:

1. A dredge structure, comprising elongated pontoons, arranged in spaced parallel relation, a float as a pump-receiving chamber rigidly connecting the pontoons transversely, rearwardly of the longitudinal middle, and a boom-frame terminally horizontally pivoted between the pontoons substantially at the longitudinal middle thereof, and below the water level, to obtain low center of gravity and balance of the dredge, and maximum working range of the boom.

2. A dredge structure, comprising pontoons, arranged in spaced parallel relation, a float as a pump-receiving chamber rigidly connecting the pontoons transversely, rearwardly of the longitudinal middle, a boom-frame terminally horizontally pivoted between the pontoons substantially at the longitudinal middle thereof, to obtain low center of gravity and balance, and maximum working range for the boom, and hoisting apparatus for the boom, including a power driven hoisting drum arranged rearwardly of the pump-chamber, symmetrically with respect to the long axis of the structure.

3. A device of the class described comprising pontoons arranged in parallel spaced relation, each having an equal number of spaced rings secured therearound, and angle

irons disposed across the tops of and connecting corresponding pairs of rings, a boom terminally pivoted between the pontoons substantially at the longitudinal middle thereof below the water level, and a pump chamber transversely connecting and securing the pontoons at the opposite side of the longitudinal middle, submerged, and having its bottom below the level of the bottom of the pontoons.

4. A one-man dredge comprising spaced parallel pontoons transversely connected by a pump-housing float chamber, extending rearwardly from the longitudinal middle of the pontoons and of a depth to dispose pump below the water line for stabilizing purposes, a boom-frame terminally pivoted adjacent the chamber, substantially at the longitudinal middle and beneath the water, to lower the center of gravity of the dredge, and obtain maximum working range for the boom, operating machinery for the dredge at the rear thereof, and a control bridge also at the rear of the dredge having grouped control levers connecting with the machinery, whereby all working parts of the dredge are in constant view and operable from central control apparatus, by one person.

5. A device of the class described comprising spaced parallel pontoons, a float chamber transversely connecting said pontoons rearwardly of their longitudinal middle, said chamber having a motor-driven suction pump therein below the water level, cross irons connecting the pontoons at opposite sides of the chamber, motor-driven hoisting drums disposed rearwardly of the chamber upon the cross irons, a boom-frame terminally pivoted between and at the longitudinal middle of the pontoons in a position to counter-balance the dredge machinery, a motor-driven suction tube and cutter on the boom, connections between suction tube and pump, a control cabin above the drums, and control connections in the cabin for the drums, pump and suction tube motors.

6. A dredging apparatus comprising pontoons, a partly submerged pump chamber as an open float, transversely connecting the pontoons and extending rearwardly from the longitudinal middle thereof and below the bottoms of the pontoons, a motor-driven suction pump in said chamber, having intake and discharge pipes, a boom terminally pivoted to and transversely between the pontoons substantially at the longitudinal middle thereof below the water line, said boom of a length substantially equal to the pontoons, and said boom carrying a rotatable suction tube having a terminal cutter and motor-driving mechanism therefor, the motor mounted to be above the water level at all working positions of the boom, flexible conduit connections between suction tube and pump intake, hoisting connections for the boom including a motor-driven hoisting drum, said drum centrally arranged at the rearmost portion between the pontoons, a control cabin overlying the drum, and grouped control means in the cabin for pump, suction pipe and drum motors.

7. A dredge comprising spaced pontoons connected rearwardly of their longitudinal middle by an open float chamber having a motor-operated pump therein symmetrically arranged, a motor-operated hoisting drum rearwardly of the tank symmetrically arranged between and carried by the pontoons, a boom terminally pivoted substantially at the longitudinal middle of the pontoons, transversely thereof and having motor-operated suction tube and cutter, the hoisting and pump apparatus occupying the rear half of the dredge, and grouped control means for the motors operable from a point above the drums.

8. A dredging apparatus comprising parallel pontoons, a partly submerged open tank connecting the pontoons rearwardly of their longitudinal middle, and having therein a suction pump, having intake and discharge pipes, and driving means including a motor, all substantially below the water level and symmetrically arranged, a plurality of cross-irons connecting pontoons across the top at front and rear of the tank, a structural iron boom terminally pivoted substantially at the longitudinal middle of and between the pontoons below the water level, the tank and boom thus acting to ballast and stabilize the structure by obtaining a low center of gravity, a rotatable cutter-carrying suction pipe and driving means therefor upon the boom, including a motor adjacent the pivotal point of said boom positioned to be out of water at all positions of the boom, said boom having pairs of pulleys at its outer and inner ends symmetrically arranged cross-wise thereof, pairs of pulleys similarly arranged on one of the cross irons, winding drums at the rear of the pontoons one on each side, a drag cable leading forwardly from each drum and around corresponding pulleys, and outwardly in opposite directions from the outermost boom pulleys, a spud translatable at the rear under side of each pontoon, a winding drum for each spud, having guiding cable attached at the lower ends of the spud, a boom hoisting drum, guided cables therefor including sheaves disposed centrally of the boom and cross iron, the axes of all drums being alined cross-wise of the pontoons rearwardly of the tank and symmetrically arranged with respect to the longitudinal center of the pontoons, common motor driving and brake mechanisms for selectively operating the drums, and grouped

central control means for the drums, pump and suction pipe motors, and drum brake mechanism.

9. A dredging apparatus comprising supporting tanks spaced apart and having a rigid structural framework above and between them adapted to resist rotary movement of said tanks on a longitudinal axis, a boom pivotally supported near the middle portion of said tanks therebetween and below the water line and having a vertical oscillating movement between them, a sheave mounted in the forward portion of said framework, a hoisting drum mounted in said framework at the rear portion thereof, a cable connecting said hoisting drum with said boom and having a running connection with said sheave whereby said boom may be raised and lowered, a suction tube mounted in said boom and having an agitator at its lower end, and a pump and driving means therefor supported in said framework in the rear and adjacent to said boom and in advance of said hoisting drum whereby the load may be evenly distributed on said tanks.

10. A dredging apparatus comprising elongated pontoons, a float tank interposed between said pontoons and having a closed bottom and side walls, rings on the pontoons, gusset plates securing the walls of said tank rings, a cross beam contacting with the upper edges of said tank above the pontoons, and end gusset plates connecting said beam with said rings and cooperating with said tank and its rings and gusset plates to hold said pontoons in parallel relation and prevent a rotary movement thereof, said tank extending from the longitudinal middle of the pontoons rearwardly of the middle.

11. A dredge comprising spaced pontoons connected rearwardly of their longitudinal middle by an open float chamber, a boom pivoted substantially at the longitudinal middle of the pontoons and extending a substantial distance beyond the pontoons forwardly thereof, drag cable drums disposed at the rear of the pontoons and having drag cables leading forwardly on the pontoons, then inwardly onto the boom at and to opposite sides thereof substantially at the pivotal point, then forward to take off in opposite directions at the outer extremity of the boom.

12. A dredging apparatus comprising elongated pontoons arranged in parallel relation, and having reinforcing hoops thereon at intervals, upright standards having their lower ends secured to said hoops and projecting above said pontoons, cross beams secured to said standards and cooperating therewith to hold said pontoons in rigid relation, a boom pivotally supported between and by said pontoons at the longitudinal middle thereof, a suction tube and agitator mounted therein and a cable having a running connection with said boom and also having a running connection with the cross beams between said standards.

13. A dredging apparatus comprising a pair of elongated metallic substantially cylindrical tanks having walls closed to the entrance of water therein, reinforcing angle bands provided on said tanks at intervals, means connecting the vertical flanges of opposite hoops above the pontoons and forming a rigid frame connection between said tanks, an open tank rearwardly of the longitudinal middle interposed between said cylindrical tanks and having its walls rigidly secured to said hoops and adapted to support a pump and motor, and a boom having a suction pipe said boom terminally pivotally supported between said cylindrical tanks forwardly of the longitudinal middle and operatively connected with said pump and motor.

In witness whereof, I have hereunto set my hand this 7th day of March, 1925.

VASCO F. CASEY.