Jan. 3, 1950 C. I. WEIR 2,493,050

GRAVITY ACTUATED BOAT PUMP

Filed Oct. 24, 1946 2 Sheets-Sheet 1

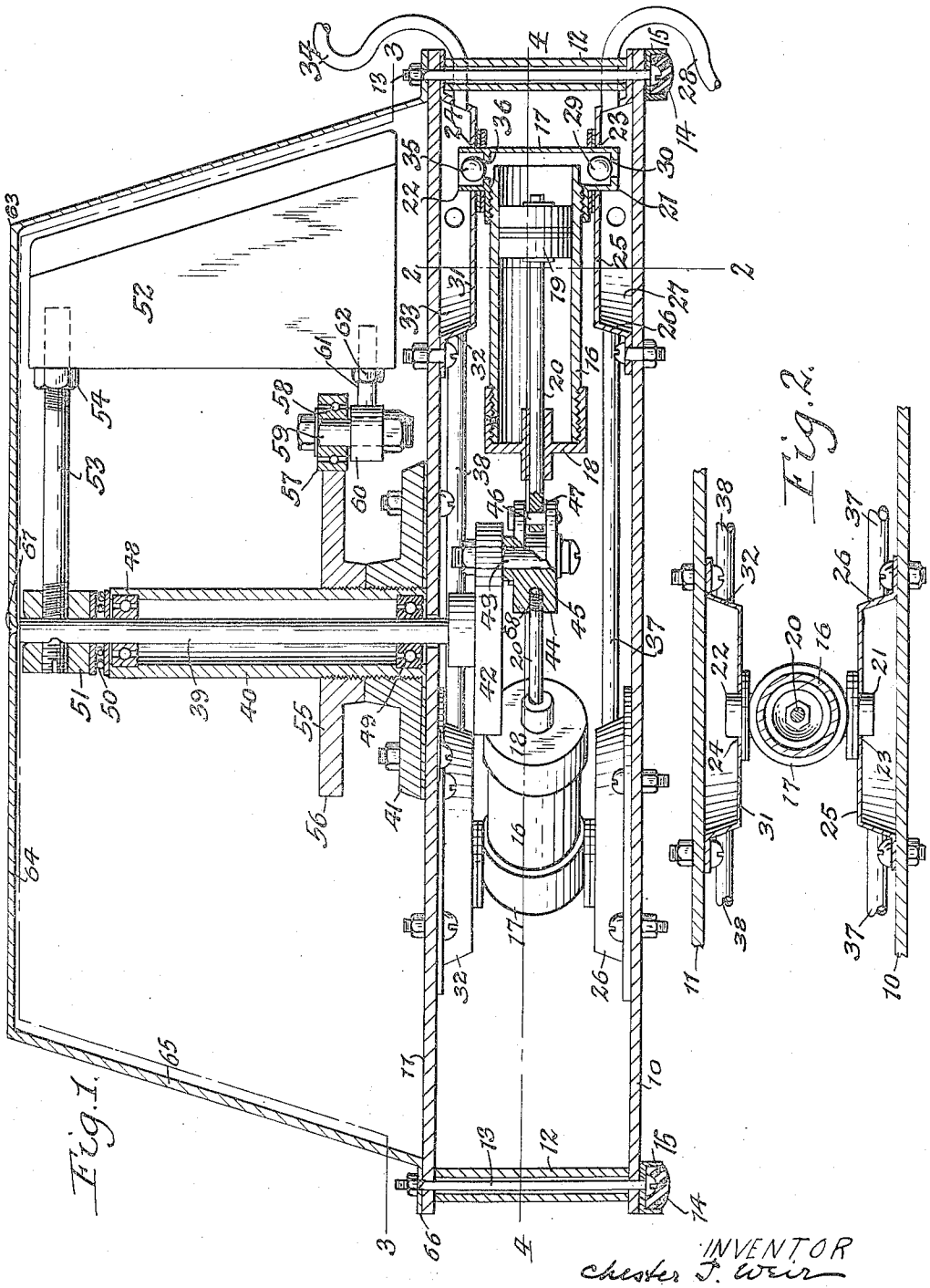

Fig. 1.

Fig. 2.

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Fig. 3.

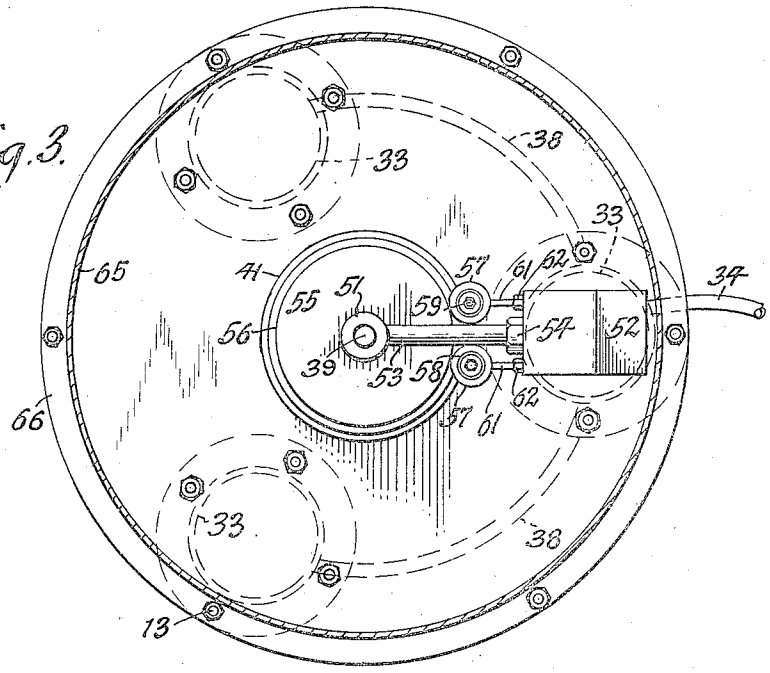
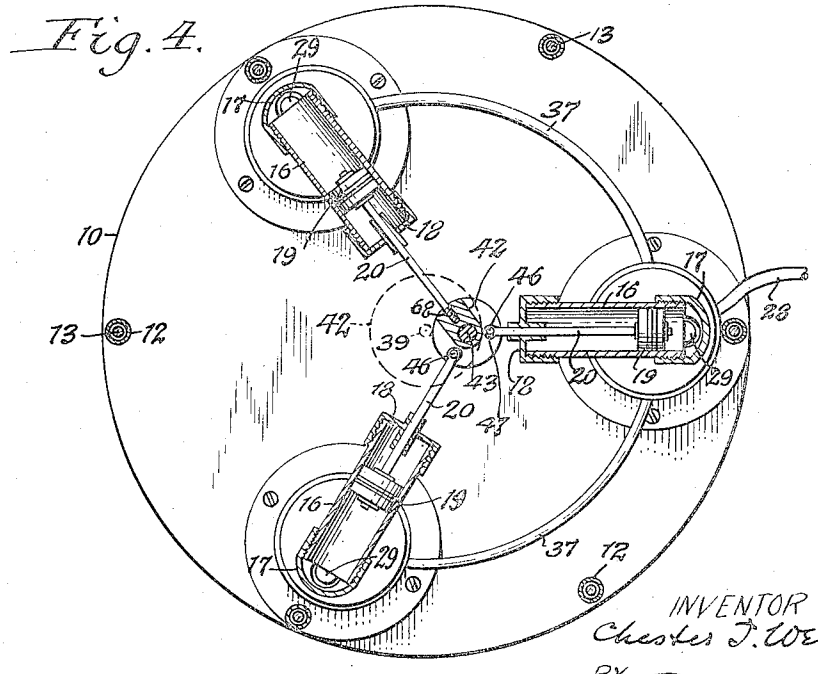


Fig. 4.



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GRAVITY ACTUATED BOAT PUMP

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10 Claims. (Cl. 103—71)

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This invention relates to an automatic boat pump whereby water is removed from the bilge hull or hold of a boat for keeping the same dry by power derived from the rocking, pitching or similar movement of the boat while floating or lying in a body of water.

It is the object of this invention to provide a pump of this character which is very simple and durable in construction, and low in cost of production, efficient in operation under all conditions, not liable to get out of order or require frequent repairs for maintaining the same in condition, very light and also capable of being readily installed and transported.

In the accompanying drawings:

Fig. 1 is a vertical cross section of an automatic boat pump embodying this invention.

Fig. 2 is a fragmentary vertical section taken on line 2—2, Fig. 1.

Figs. 3 and 4 are horizontal sections, on a reduced scale, taken on the correspondingly numbered lines in Fig. 1.

In the following description, like numerals indicate similar parts in the several figures of the drawings.

Although the main frame of this pumping apparatus may be variously constructed the same, as shown in the drawings, preferably comprises a lower horizontal plate 10, an upper horizontal plate 11 spaced from said lower plate, a plurality of upright tubular spacers or posts 12 interposed at intervals between the marginal parts of said plates, and upright tie bolts 13 each passing through one of said spacers and the adjacent parts of said plates and connecting the same so that they form a rigid unit. This frame is preferably supported on the bottom or other suitable part of the boat by means of rubber feet or soft pads 14, adapted to rest on a support and each of which is seated in a downwardly opening metal cup 15, the bottom of which is engaged by the head of one of the tie bolts and clamped against the underside of the lower frame plate, as shown in Fig. 1.

In the space between the upper and lower frame plates are arranged the pumping means which withdraw the water from the bilge of the boat and discharge the same overboard. These means include a plurality of pump units, preferably three in number, which are arranged substantially radially with reference to the vertical central axis of the frame and equidistant in an annular row around this axis. Each of these pump units includes a horizontal cylinder or barrel 16 which is closed at its outer and inner

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ends by heads 17, 18, a piston or plunger 19 reciprocating lengthwise in this cylinder and a piston rod 20 connected with this piston and sliding lengthwise in the inner head 18 of the cylinder. Each of the pump cylinders is pivoted at its outer end so that the same is capable of rocking in a horizontal plane during the operation of the pumping apparatus, the means for thus pivoting the cylinder being preferably combined with the valve means whereby water is admitted to the outer end of the cylinder during the inward movement of the piston in the cylinder and water is discharged from the outer end of the cylinder upon moving the piston outwardly in the cylinder. This is accomplished in the present construction by providing the lower and upper sides of the outer head of the cylinder with lower and upper tubular trunnions 21, 22, the axes of which are in vertical alinement and turn respectively in lower and upper bearings 23, 24 arranged on the adjacent parts of the main frame. The lower bearing 23 is preferably formed in a top plate 25 which has an annular depending flange 26 secured to the upper side of the lower main frame plate 10, thereby forming with the latter a water inlet chamber 27 which communicates with the outer end of the pump cylinder through the medium of the lower tubular trunnion 21 which forms a water inlet for this purpose. Water is conducted to this inlet chamber, preferably, by means of a flexible tube or hose 28 the lower inlet end of which is placed in the bilge or other part of the boat from which water is to be removed and the upper end of this hose being connected with the wall of the inlet chamber 27 so as to deliver thereto the water which is removed from the bilge or elsewhere.

Water is only permitted to pass from the inlet chamber 27 through the lower inlet trunnion into the outer end of the pump cylinder but prevented from flowing in the reverse direction by a check valve having preferably the form of a ball 29 arranged in the tubular inlet trunnion 21 and movable into and out of engagement with an inwardly facing valve seat 30 in this trunnion, as shown in Fig. 1.

The upper bearing 24 is preferably formed in a bottom plate 31 which has an annular upstanding flange 32 secured to the underside of the upper main frame plate 11, thereby forming with the latter a water outlet chamber 33 which communicates with the outer end of the pump cylinder through the medium of the upper tubular trunnion 22 which forms a water outlet for this

purpose. Water is conducted from this outlet chamber preferably, by a flexible tube or hose 34 the inner end of which connects with a wall of the outlet chamber 33 while the outer end of this hose extends over the gunwale of the boat or elsewhere for delivering the water overboard or any other desired place.

Water is permitted to pass out of the outlet chamber through the upper outlet trunnion and discharge hose, but is prevented from flowing in the opposite direction by a check valve consisting preferably of a ball valve 35 arranged in the outlet trunnion 22 and movable toward and from an outwardly facing valve seat 36 arranged in this trunnion, as shown in Fig. 1.

The several inlet chambers 27 of the pumping apparatus are connected with each other by communication pipes or tubes 37 so that one water suction or inlet hose 28 will serve all of these chambers and in like manner the several water outlet chambers are connected with each other by communicating pipes or tubes so that a single water delivery hose 34 can be used to discharge the water overboard from these outlet chambers.

Actuating means are provided which embody the present invention whereby rocking or pitching of the boat in which this pumping apparatus is installed will cause the pistons in the several cylinders to reciprocate so as to withdraw water from the bilge of the boat and discharge the same overboard, these actuating means being also capable of use in connection with a single pumping unit if desired. In their preferred form, these actuating means are constructed as follows:

The numeral 39 represents an upright driving shaft which has its central part arranged within a vertical tubular standard 40 while its lower part extends through an opening in the upper frame plate 11 and into the space below the same and its upper part extends above this standard. The latter is rigidly supported on the main frame by a base 41 secured to the top of the upper frame plate and having a central opening into which the lower end of the tubular standard is fastened by screwing, as shown in Fig. 1, or in any other suitable manner.

Below the upper frame plate a main crank disk 42 is secured to the lower part of the driving shaft and this disk is provided adjacent to its periphery with a main crank or crank pin 43 which projects downwardly from this disk. Below the main crank disk is arranged an auxiliary crank disk 44 having an annular groove 45 on its periphery. This auxiliary crank disk is pivoted on the main crank disk by passing the main crank 43 through the same, whereby this auxiliary crank disk is capable of rocking on the main crank disk and also turning bodily with the same.

Adjacent to its periphery the auxiliary crank disk is connected at equidistant points around its axis with the inner ends of the several piston rods so that the pistons are actuated simultaneously.

In order to retain the auxiliary crank disk 44 in a definite relation to all of the several piston rods 20, pistons 19 and cylinders 16 and insure uniform action of these pistons in their respective cylinders, one of the piston rods 20 is rigidly connected at its inner end by a screw joint 68 or otherwise with the auxiliary crank disk and each of the other piston rods has its inner end pivotally connected with the auxiliary

crank disk by an auxiliary crank pin 46 passing through an eye 47 on the inner end of the respective piston rod, as shown in Figs. 1 and 4.

As the driving shaft is rotated or rocked the main crank pin 43 will be correspondingly rotated or rocked and carry the auxiliary crank disk bodily with it to the same extent. As the auxiliary crank disk moves bodily in a concentric path around the axis of the main crank disk and driving shaft, the auxiliary crank pins exert a pushing and pulling effect on the piston rods so that the pistons are reciprocated in the cylinders and cause water to be drawn into the same and expelled therefrom. The length of strokes of these pistons and piston rods is dependent on the extent of bodily movement of the auxiliary crank disk around the axis of the main crank disk. During the bodily movement of the auxiliary crank disk relative to the axis of the main crank disk, the auxiliary crank disk rocks more or less on the auxiliary crank pin and the several pump cylinders also rock more or less relative to the inlet and outlet chambers as these members change their position relative to one another during the operation of the pumping apparatus.

The driving shaft may be journaled on the standard so as to turn about a vertical axis in any suitable manner but this is preferably accomplished by means of side thrust ball bearings 48, 49 interposed between the upper and lower parts of the driving shaft and the standard.

The driving shaft and the parts supported thereon are also supported against down thrust by a ball bearing 50 interposed between the upper end of the standard and a collar 51 secured to the driving shaft above the standard.

The numeral 52 represents a gravity responsive weight or pendulum which is connected with the driving shaft and arranged on one side of its axis so that when the boat and the pumping apparatus mounted therein are tilted due to rocking, pitching or similar movements on the water this weight or pendulum will always tend to move by gravity from a high position on one side of the shaft to a lower position on the opposite side of the same. This weight may be of any suitable shape and is preferably connected with the shaft by a horizontal radial arm or rod 53 which has its inner end screwed into an opening in the collar 51 and its outer end screwed into the upper part of the pendulum weight.

Rotation of the arm after the parts are assembled is prevented by a clamping screw nut 54 threaded on this radial arm and engaging the inner side of the pendulum weight, as shown in Figs. 1 and 3.

As the boat changes its position from a level or horizontal to an inclined position and the driving shaft is tilted relative to the horizon, the pendulum weight moves downwardly in adjusting itself to this change. When the wave action on the boat is regular and the boat is rocked or pitched in rhythm the pendulum may be turned a complete revolution around the axis of the shaft, in which case the pump pistons will be moved successively inwardly and outwardly in the respective cylinders with complete or full strokes and thereby operate the pumping apparatus at maximum capacity. When, however, the boat rests in choppy water or the wave action on the same is irregular, then the boat may be rocked and pitched irregularly in which case the pendulum may oscillate only through

part of a complete turn thus shortening the strokes of the pistons in the cylinders and reducing the capacity of the pumping apparatus accordingly.

In order to render the movement of the pendulum sensitive and enable the same to shift quickly and easily from one positon to another around its axis of rotation, friction relieving guide means are provided which are preferably constructed as follows:

The numeral 55 represents a stationary guiding or supporting member having the form of a plate or disk which rests on the base 41 and held against turning by screwing the lower part of the standard into an opening formed centrally in this disk. The periphery of this guiding disk is concentric with the axis of the shaft 39 and forms an annular track 56 which is engaged by retaining means mounted on the lower part of the pendulum weight. In their preferred form these retaining means comprise two side thrust wheels or rollers 57 which are arranged side by side circumferentially of the supporting disk and engage the track on the periphery of this disk on opposite sides of a radial line extending from the axis of the driving shaft to the pendulum weight, shown in Fig. 3.

Each of these side thrust rollers or wheels is journaled by means of a ball bearing 58 on the upper end of an upright pivot bolt or shank 59 the lower end of which is connected with a supporting block 60. The latter is supported on the lower part of the pendulum weight by means of a horizontal arm or rod 61 of which opposite ends are screwed into said supporting collar and pendulum weight and which is held against turning relative thereto by a clamping screw nut 62 engaging with the threaded outer part of this supporting arm and bearing against the inner side of this weight.

As this pendulum weight swings around the vertical axis of this apparatus or oscillates relative thereto to a greater or lesser extent the lower part of the same is guided by means of this friction relieving device running on the track 56, thus causing the apparatus to perform its function even when the boat is only agitated moderately during calm weather, thereby automatically keeping the hold of the boat dry and in comfortable condition at all times and permitting the same to be used immediately whenever desired.

By employing two side thrust anti-friction wheels or rollers 57 side by side, the pendulum weight is reliably held against twisting during its rotary movement and thus prevents binding or cramping on the track 56 which otherwise would interfere with the free movement of the pendulum.

For the purpose of protecting the pumping apparatus a cover 63 is provided which extends over the top of the same and which comprises an upper horizontal head 64 arranged above the driving shaft, pendulum and associated parts, an annular side wall 65 extending downwardly from the periphery of this head and surrounding the parts above the upper frame plate 11, and an attaching flange 66 extending outwardly from the lower edge of this wall and secured to the top of the upper frame plate by means of the same bolts 13 which connect this plate with the lower frame plate 10, as shown in Figs. 1 and 3.

At the center of the head of the cover the same is provided with an oil hole 67 which is located above the upper end of the driving shaft and through which oil may be introduced for lubricating the shaft and its bearings and any other parts to which the oil may flow therefrom.

As a whole this pumping apparatus is very light and compact in construction and can be readily installed for use or removed from the boat and thus be preserved against possible injury when not required.

Moreover, the several parts are strong and durable and not liable to get out of order or require frequent servicing.

This pumping apparatus also very efficient and reliable in its pumping effect and its mechanism, is so sensitive that relatively slight rocking or pitching of the boat will cause the same to evacuate any water in the hull or bilge.

I claim as my invention:

1. An automatic boat pumping apparatus comprising a main frame, an upright shaft rotatably mounted on said frame, a water pumping device operatively connected with said shaft and adapted to be actuated thereby, and means for turning said shaft including a pendulum weight arranged on one side of said shaft and adapted to turn by gravity with the shaft as the latter is tilted relative to the horizon, an arm connecting the upper part of this weight with said shaft, and separate guide means for positioning said weight relative to said shaft while rotating therewith including a stationary guide plate having a radially outward facing circular track on its periphery which is concentric with the axis of said shaft, and retaining means mounted on the lower part of said weight and movable circumferentially in engagement with said track.

2. An automatic boat pumping apparatus comprising a main frame, an upright shaft rotatably mounted on said frame, a water pumping device operatively connected with said shaft and adapted to be actuated thereby, and means for turning said shaft including a pendulum weight arranged on one side of said shaft and adapted to turn by gravity with the shaft as the latter is tilted relative to the horizon, an arm connecting said upper part of this weight with said shaft, and separate guide means for positioning said weight relative to said shaft while rotating therewith including a stationary guide plate having a radially outward facing circular track on its periphery which is concentric with the axis of said shaft, and retaining means mounted on the lower part of said weight and movable circumferentially in engagement with said track, said retaining means including a roller engaging its periphery with said track, and a supporting arm having its outer end connected with the lower part of said weight and pivotally supporting said roller at its inner end.

3. An automatic boat pumping apparatus comprising a main frame, an upright shaft rotatably mounted on said frame, a water pumping device operatively connected with said shaft and adapted to be actuated thereby, and means for turning said shaft including a pendulum weight arranged on one side of said shaft and adapted to turn by gravity with the shaft as the latter is tilted relative to the horizon, an arm connecting the upper part of this weight with said shaft, and separate guide means for positioning said weight relative to said shaft while rotating therewith including a stationary guide plate having a radially outward facing circular track on its periphery which is concentric with the axis of said shaft, and retaining means mounted on the lower part of said weight and movable circumferentially in engagement with said track, said retaining means

including two rollers arranged circumferentially side by side relative to said track and engaging therewith, and supporting means upon which said rollers are pivotally mounted and which are connected with the lower part of said weight.

4. An automatic boat pumping apparatus comprising a main frame, an upright shaft rotatably mounted on said frame, a pendulum weight arranged on one side of said shaft and connected with the same so as to turn with the shaft as the same is tilted relative to the horizon, and a pumping device comprising a plurality of pump cylinders arranged in a circumferential row around the axis of the shaft and each pivoted at its outer part so that its inner part turns horizontally, a piston reciprocable in each cylinder and provided with a piston rod, a main crank disk mounted on said shaft and provided with a main crank, and an auxiliary crank disk pivoted on said main crank and provided with a plurality of auxiliary cranks which are pivotally connected, respectively, with the piston rods of the several pistons.

5. An automatic boat pumping apparatus comprising a main frame, an upright shaft rotatably mounted on said frame, a pendulum weight arranged on one side of said shaft and connected with the same so as to turn with the shaft as the same is tilted relative to the horizon and pumping means operated by said shaft including a pump cylinder provided on the upper and lower sides of its outer part with hollow trunnions one of which forms a water inlet and the other a water outlet, water inlet and outlet chambers having bearings in which said trunnions turn, inlet and outlet check valves arranged, respectively in said inlet and outlet trunnions, a piston reciprocable in said cylinder and provided with a piston rod, and means for operatively connecting said rod with said shaft.

6. An automatic boat pumping apparatus comprising main frame, an upright shaft rotatably mounted on said frame, a pendulum weight arranged on one side of said shaft and connected with the same so as to turn with the shaft as the same is tilted relative to the horizon, and pumping means operated by said shaft including a pump cylinder provided on the upper and lower sides of its outer part with hollow trunnions one of which forms a water inlet and the other a water outlet, water inlet and outlet chambers having bearings in which said trunnions turn, inlet and outlet check valves arranged, respectively in said inlet and outlet trunnions, a piston reciprocable in said cylinder and provided with a piston rod, and means for operatively connecting said rod with said shaft, said frame including upper and lower frame plates on which said chambers are respectively mounted.

7. An automatic boat pumping apparatus comprising a main frame, an upright shaft rotatably mounted on said frame, a pendulum weight arranged on one side of said shaft and connected with the same so as to turn with the shaft as the same is tilted relative to the horizon, and pumping means operated by said shaft including a pump cylinder provided on the upper and lower sides of its outer part with hollow trunnions one of which forms a water inlet and the other a water outlet, water inlet and outlet chambers having bearings in which said trunnions turn, inlet and outlet check valves arranged, respectively, in said inlet and outlet trunnions, a piston reciprocable in said cylinder and provided with a piston rod, and means for operatively connecting said rod with said shaft, said frame including upper and lower frame plates on which said chambers are respectively mounted, and posts interposed between said frame plates.

8. An automatic boat pumping apparatus comprising a main frame, an upright shaft rotatably mounted on said frame, a pendulum weight arranged on one side of said shaft and connected with the same so as to turn with the shaft as the same is tilted relative to the horizon, and pumping means operated by said shaft including a pump cylinder provided on the upper and lower sides of its outer part with hollow trunnions one of which forms a water inlet and the other a water outlet, water inlet and outlet chambers having bearings in which said trunnions turn, inlet and outlet check valves arranged, respectively in said inlet and outlet trunnions, a piston reciprocable in said cylinder and provided with a piston rod, means for operatively connecting said rod with said shaft, and flexible inlet and outlet tubes connected with said inlet and outlet chambers, respectively.

9. An automatic boat pumping apparatus comprising a main frame, an upright shaft rotatably mounted on said frame, a pendulum weight arranged on one side of said shaft and connected with the same so as to turn with the shaft as the same is tilted relative to the horizon, and pumping means operated by said shaft including a pump cylinder provided on the upper and lower sides of its outer part with hollow trunnions one of which forms a water inlet and the other a water outlet, water inlet and outlet chambers having bearings in which said trunnions turn, inlet and outlet check valves arranged, respectively in said inlet and outlet trunnions, a piston reciprocable in said cylinder and provided with a piston rod, and means for operatively connecting said rod with said shaft, said frame including upper and lower frame plates on which said chambers are respectively mounted, and soft pads secured and adapted to rest on a support.

10. An automatic boat pumping apparatus comprising a driving shaft, a pendulum weight connected with said shaft, an auxiliary crank disk pivotally connected by a main crank with said shaft on one side of the axis of said shaft, a plurality of pump cylinders arranged around the axis of said shaft and each pivoted at its outer end to a support, and a piston reciprocable lengthwise in each of said cylinders and having an inwardly extending piston rod, one of said piston rods being rigidly connected with said auxiliary crank disk and the other piston rod being pivotally connected with said auxiliary crank disk.

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REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
524,490	Singer et al.	Aug. 14, 1894
647,892	Stuth	Apr. 17, 1900
836,600	McManns	Nov. 20, 1906
937,884	Stanley	Oct. 26, 1909
2,068,653	Brynild	Jan. 26, 1937