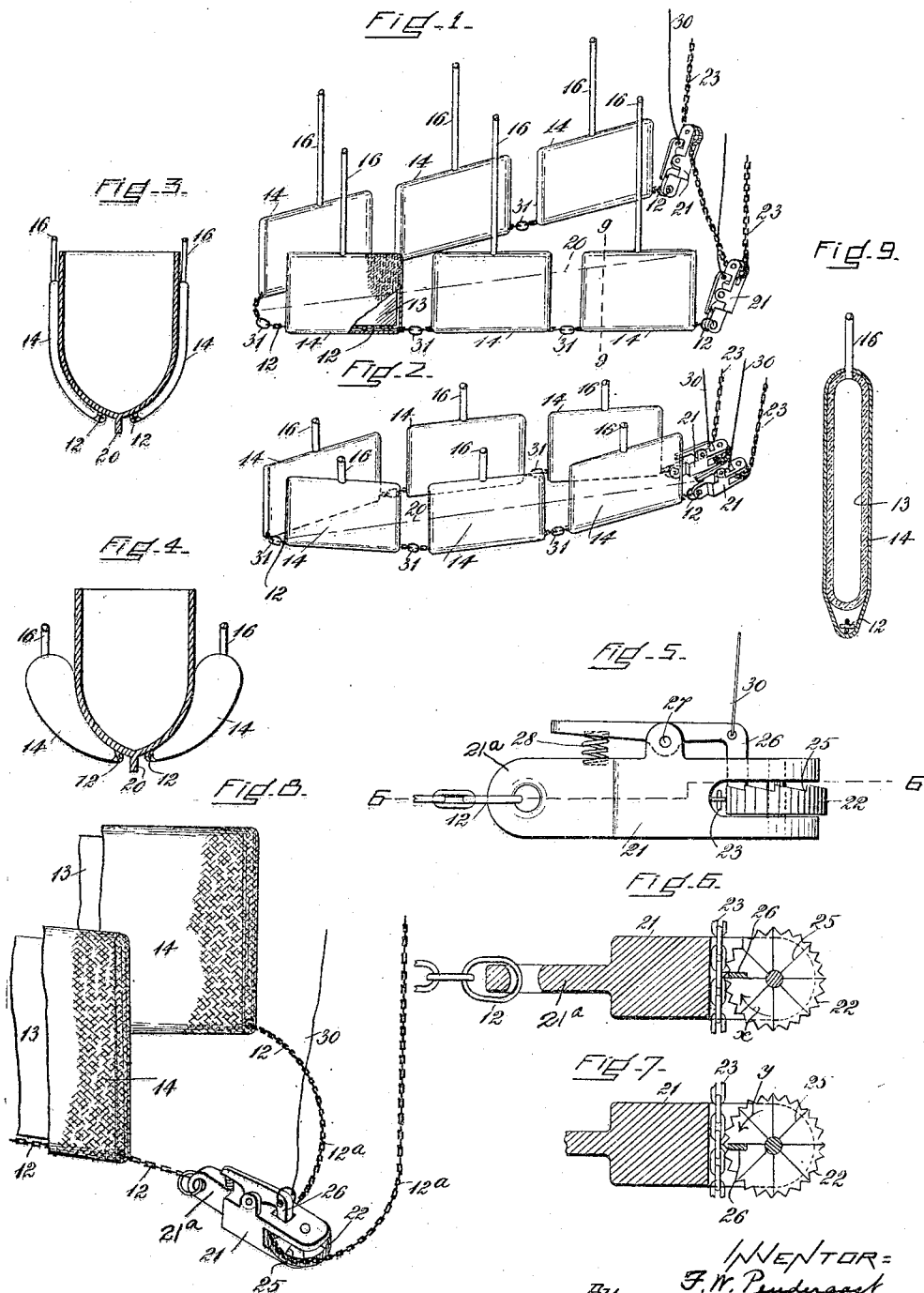


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 APPARATUS FOR RAISING SUNKEN VESSELS.  
 APPLICATION FILED JULY 18, 1918.

1,293,900.

Patented Feb. 11, 1919.



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# UNITED STATES PATENT OFFICE.

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## APPARATUS FOR RAISING SUNKEN VESSELS.

1,293,900.

Specification of Letters Patent.

Patented Feb. 11, 1919.

Application filed July 18, 1918. Serial No. 245,541.

*To all whom it may concern:*

Be it known that I, FREDERICK W. PENDERGAST, a citizen of the United States, residing at Cambridge, in the county of Middlesex and State of Massachusetts, have invented new and useful Improvements in Apparatus for Raising Sunken Vessels, of which the following is a specification.

This invention relates to an apparatus comprising an elongated weighted cable adapted to be adjusted to surround a portion of the hull of a submerged vessel, and inflatable raising means, preferably embodied in a plurality of air-tight inflatable bags engaged with the cable and adapted to bear on side portions of the hull above the cable. The invention is embodied in the improved means hereinafter described, for drawing portions of the cable toward each other and confining said portions to form an inexpandible cradle closely embracing the lower portion of the hull, the said cradle being formed and maintained in an inexpandible condition prior to the inflation of the said bags, so that the bags when inflated, are securely connected with the hull and adapted to raise the same from the bottom of a body of water of considerable depth.

Of the accompanying drawings, forming a part of this specification,—

Figure 1 is a perspective view of an apparatus embodying the invention, the cable being shown in position to partly form a cradle.

Fig. 2 is a view similar to Fig. 1, showing the end portions of the cable drawn toward each other to form an inexpandible cradle.

Fig. 3 is a cross section of a hull, showing the apparatus of my invention engaged with the hull, and as it appears before inflation.

Fig. 4 is a view similar to Fig. 3, showing the raising means inflated.

Fig. 5 is a side view of one of the two pulley blocks hereinafter described.

Fig. 6 is a section on line 6—6 of Fig. 5.

Fig. 7 is a view similar to Fig. 6, showing the other of the two pulley blocks.

Fig. 8 is a perspective view of a different embodiment of the invention including only one pulley block.

Fig. 9 is a section on line 9—9 of Fig. 1.

The same reference characters indicate the same parts in all of the figures.

In the drawings, referring first to Figs. 1 to 7, inclusive, 12 represents an elongated

weighted cable, preferably composed of chain links.

With the cable is associated a suitable raising means, here shown as embodied in a plurality of inflatable bags 13 (Fig. 2), each bag being inclosed in a sheath 14 of strong woven fabric, each sheath being preferably woven in cylindrical or tubular form, from relatively heavy cord or rope, the ends of the tubular fabric being suitably closed over opposite ends of the rubber bag 13. Portions of the cable 12 pass through the sheaths 14, said sheaths and bags being flattened, as indicated by Figs. 1, 2 and 3, when the bags are deflated, the cable passing through the lower portion of each sheath and between the sheath and the lower portion of the accompanying bag 13. When the apparatus is submerged, the weight of the cable causes it to rest on the bottom of a body of water, the bags containing sufficient air to cause the bags and sheaths to project upwardly from the cable.

Each bag may be inflated through a tube 16 connected with its upper portion and extending to and above the surface of the water in which the apparatus is submerged.

The cable and its raising means may be dropped into the water while the cable is substantially straight, and allowed to sink until the mid length of the cable is in suitable proximity to either the bow or stern of a submerged vessel. The cable is then adjusted to swing the portions provided with the raising means inwardly toward opposite sides of the keel 20 of the vessel, the position of the keel being indicated by the straight dotted line in Figs. 1 and 2. When the cable is adjusted as shown by Fig. 1, the portions which rest on the bottom diverge from each other. The end portions of the cable are next brought into close proximity to each other as shown by Fig. 2, and confined to cause the portions resting on the bottom to extend beside the keel at opposite side thereof.

The apparatus above described is set forth and claimed in my application filed May 7, 1918, Serial No. 233,014.

To the opposite ends of the cable 12 are hinged or jointed the inner ends of elongated pulley blocks 21. Said blocks and the cable 12 constitute a cradle which, when operatively adjusted, is practically continuous and inexpandible, and closely embraces the

lower portion of the hull. Each block 21 is adapted at its inner end, by means of an apertured ear 21<sup>a</sup>, to be hinged or jointed to one end of the cable 12. In the outer end of each block is journaled a pulley 22, the periphery of which is serrated to mesh with the links of a cradle-closing chain 23.

The central portion of the chain 23 passes from block to block, and the end portions are adapted to extend upwardly from the blocks to a scow or pontoon and be engaged with hoisting means thereon. When the up-standing portions of the chain 23 are pulled upward, the pulley blocks are first swung upwardly from the cable 12, as shown by Fig. 1, and then the ends of the cable 12 are drawn toward each other until the blocks meet, as shown by Fig. 2, which shows the blocks as they appear after the upward pull is released, and the blocks are allowed to swing downwardly. The pulleys are freely rotatable in the directions required to permit the described operation.

One-way clutches are provided to prevent rotation of the pulleys in directions required to permit the separation of the blocks and the ends of the cable 12, or, in other words, the opening of the cradle. Said clutches are preferably embodied in radial ratchet teeth 25 formed on the upper sides or faces of the pulleys 22, and pawls 26, pivoted at 27 to ears on the blocks, and pressed by springs 28 into engagement with the ratcheted faces of the pulleys. The ratchet teeth on one pulley face oppositely from those on the other pulley, as may be seen by comparing Fig. 6 with Fig. 7, so that the pawl on one block prevents rotation of the accompanying pulley in the direction of arrow *x*, while the pawl on the other block prevents rotation of the accompanying pulley in the direction of arrow *y*.

I have provided means operable from an elevated point, as on a floating scow, for separating the said clutch parts, and permitting free rotation of the pulleys in the directions required to permit separation of the ends of the cradle 12, and the expansion of the cradle formed thereby, said means being embodied in pull cords 30 connected with the pawls 26 and adapted to extend to a scow on the surface.

When the cradle cable is confined, as described, the inflatable bags and their sheaths bear on the sides of the hull and are ready for inflation. The capacity of the bags is such that when they are inflated, as indicated by Fig. 4, they are adapted to raise the vessel to the surface. When the bags are inflated the inner sides of the sheaths conform to overhanging portions of the sides of the hull, so that an efficient lifting action is exerted, without involving severe strain on the cable.

The cable may be composed of separably

connected sections, each section being contained in a sheath 14 and slightly longer than the sheath, so that its ends project from the ends of the sheath. The adjacent ends of the sections may be separably connected by links 31, each composed of separably united members. Provision is thus made for connecting any desired number of bags and sheaths to form an apparatus of any desired length. It is obvious, however, that the number of bags and sheaths may be variously modified. For example, there may be only two elongated bags, each formed to extend practically the entire length of the vessel.

The apparatus may be carried on a vessel and used to keep it afloat, in case of any injury by a torpedo, or otherwise, the cable and bags being folded below the rail on the outer side and lowered into the water in case of emergency, the cable being adjusted as above described, to form an inexpandible cradle embracing the lower portion of the hull. When the bags are inflated, the apparatus prevents the sinking of the vessel.

Only one pulley block 21 may be provided, as shown by Fig. 8, the block being hinged to one end of the cradle cable 12, and said cable being provided with an extension 12<sup>a</sup> engaging the serrated pulley 22 of said block. Said extension is adapted to extend upwardly to a scow on the surface. An upward pull on the extension 12<sup>a</sup> has the same effect as an upward pull exerted on the end portions of the chain 23, the portion of the cable 12 to which the pulley block is attached, and the portion joining the extension 12<sup>a</sup>, being drawn toward each other, and prevented from separating by the clutch formed by the ratchet teeth of the single pulley and the pawl on the block thereof.

In each of the described embodiments of the invention, the elongated pulley block is jointed to an end of an elongated cable, and constitutes an extension of the cable. The cable and the block or blocks associated therewith are adapted to be formed as described into a bight, by a contracting chain extending to a distant point and adapted to be moved or pulled to form a contracted bight which includes the elongated cable and the block or blocks associated therewith. It will also be seen that the bight is confined against expansion by the serrated pulley or pulleys and the one-way clutch or clutches engaging said pulley, the pulley of each block being at the outer end of the block, so that a pull exerted on the contracting chain swings the block in the direction required to close the bight.

I claim:

1. In an apparatus of the character stated, in combination, an elongated cable, elongated pulley blocks jointed at their inner ends to the opposite ends of the cable and

constituting cable extensions, said cable and blocks being adapted to form a bight, serrated pulleys journaled in the outer ends of said blocks, a contracting chain meshing with serrations of said pulleys, the central portion of said chain extending from block to block, and its end portions being adapted to be moved to bring the outer ends of the pulley blocks together and thus form a contracted bight, and one-way clutches including members carried by the pulley blocks, and complementary members carried by the pulleys, adapted to lock the pulleys against rotation permitting the expansion of the bight.

2. In an apparatus of the character stated, in combination, an elongated cable, elongated pulley blocks jointed at their inner ends to the opposite ends of the cable, and constituting cable extensions, said cable and blocks being adapted to form a bight, serrated pulleys journaled in the outer ends of said blocks, a contracting chain meshing with serrations of said pulleys, the central portion of said chain extending from block to block and its end portions being adapted to be moved to bring the outer ends of the pulley blocks together and thus form a contracted bight, one-way clutches including members carried by the pulley blocks, and complementary members carried by the pulleys, adapted to lock the pulleys against rotation permitting the opening of the cradle, and means operable from a distant point for disengaging the clutch members on the pulley blocks from the clutch members on the pulleys to permit the expansion of the bight.

3. In an apparatus of the character stated, in combination, an elongated cable, elongated pulley blocks jointed at their inner ends to the opposite ends of the cable, and constituting cable extensions, said cable and blocks being adapted to form a bight, serrated pulleys journaled in the outer ends of said blocks, a contracting chain meshing with serrations of said pulleys, the central portion of said chain extending from block to block and its end portions being adapted to be moved to bring the outer ends of the pulley blocks together and thus form a contracted bight, the pulleys being provided with ratchet teeth constituting members of one-way clutches, and spring-pressed dogs pivoted to the pulley blocks and constituting complementary members of said clutches adapted to engage said ratchet teeth and lock the pulleys against rotation permitting the expansion of the bight.

4. In an apparatus of the character stated, in combination, an elongated cable, elongated pulley blocks jointed at their inner ends to the opposite ends of the cable, and constituting cable extensions, said cable and blocks being adapted to form a bight, serrated pulleys journaled in the outer ends

of said blocks, a contracting chain meshing with serrations of said pulleys, the central portion of said chain extending from block to block and its end portions being adapted to be moved to bring the outer ends of the pulley blocks together and thus form a contracted bight, the pulleys being provided with ratchet teeth constituting members of one-way clutches, spring-pressed dogs pivoted to the pulley blocks and constituting complementary members of said clutches adapted to engage said ratchet teeth and lock the pulleys against rotation permitting the expansion of the cable, and pull cords attached to said dogs and adapted to disengage the dogs from ratchet teeth on the pulleys.

5. In an apparatus of the character stated, a bight element comprising an elongated pulley block having an ear at its inner end formed to be jointed to an end of a bight-forming cable of which the block constitutes an extension, and provided at its outer end with a serrated pulley adapted to mesh with links of a contracting chain, the said block and pulley being provided with complementary members of a one-way clutch adapted to lock the pulley against rotation in one direction, and thereby prevent the expansion of a bight which includes the cable and block.

6. In an apparatus of the character stated, a bight element comprising an elongated pulley block having an ear at its inner end formed to be jointed to an end of a bight-forming cable, of which the block constitutes an extension, and provided at its outer end with a serrated pulley adapted to mesh with links of a contracting chain, the said block and pulley being provided with complementary members of a one-way clutch adapted to lock the pulley against rotation in one direction, and thereby prevent the expansion of a bight which includes the cable and block, means operable from a distant point being provided for disengaging said clutch members to permit the expansion of said bight.

7. In an apparatus of the character stated, a bight element comprising an elongated pulley block having an ear at its inner end formed to be jointed to an end of a bight-forming cable, of which the block constitutes an extension, and provided at its outer end with a serrated pulley adapted to mesh with links of a contracting chain, one side of the pulley being provided with ratchet teeth, and a spring-pressed dog pivoted to the block and adapted to engage one of said ratchet teeth to lock the pulley against rotation in one direction, and thereby prevent the expansion of a bight which includes the cable and block.

8. In an apparatus of the character stated, a bight element comprising an elongated pulley block having an ear at its inner end

formed to be jointed to an end of a bight-  
forming cable of which the block constitutes  
an extension, and provided at its outer end  
with a serrated pulley adapted to mesh with  
5 links of a contracting chain, one side of the  
pulley being provided with ratchet teeth, a  
spring-pressed dog pivoted to the block and  
adapted to engage one of said ratchet teeth  
to lock the pulley against rotation in one  
10 direction, and thereby prevent the expansion  
of a bight which includes the cable and  
block, and a pull cord attached to said dog  
and adapted to disengage the dog from a  
ratchet tooth on the pulley and permit the  
expansion of said bight.  
In testimony whereof I have affixed my  
signature.

FREDERICK W. <sup>his</sup> X PENDERGAST.  
mark

Witnesses:

CHARLES F. BROWN,  
GRACE T. PENDERGAST.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents,  
Washington, D. C."