May 26, 1931. C. G. WEINREICH 1,807,361

LIFTING DEVICE

Filed March 17, 1928 4 Sheets-Sheet 1

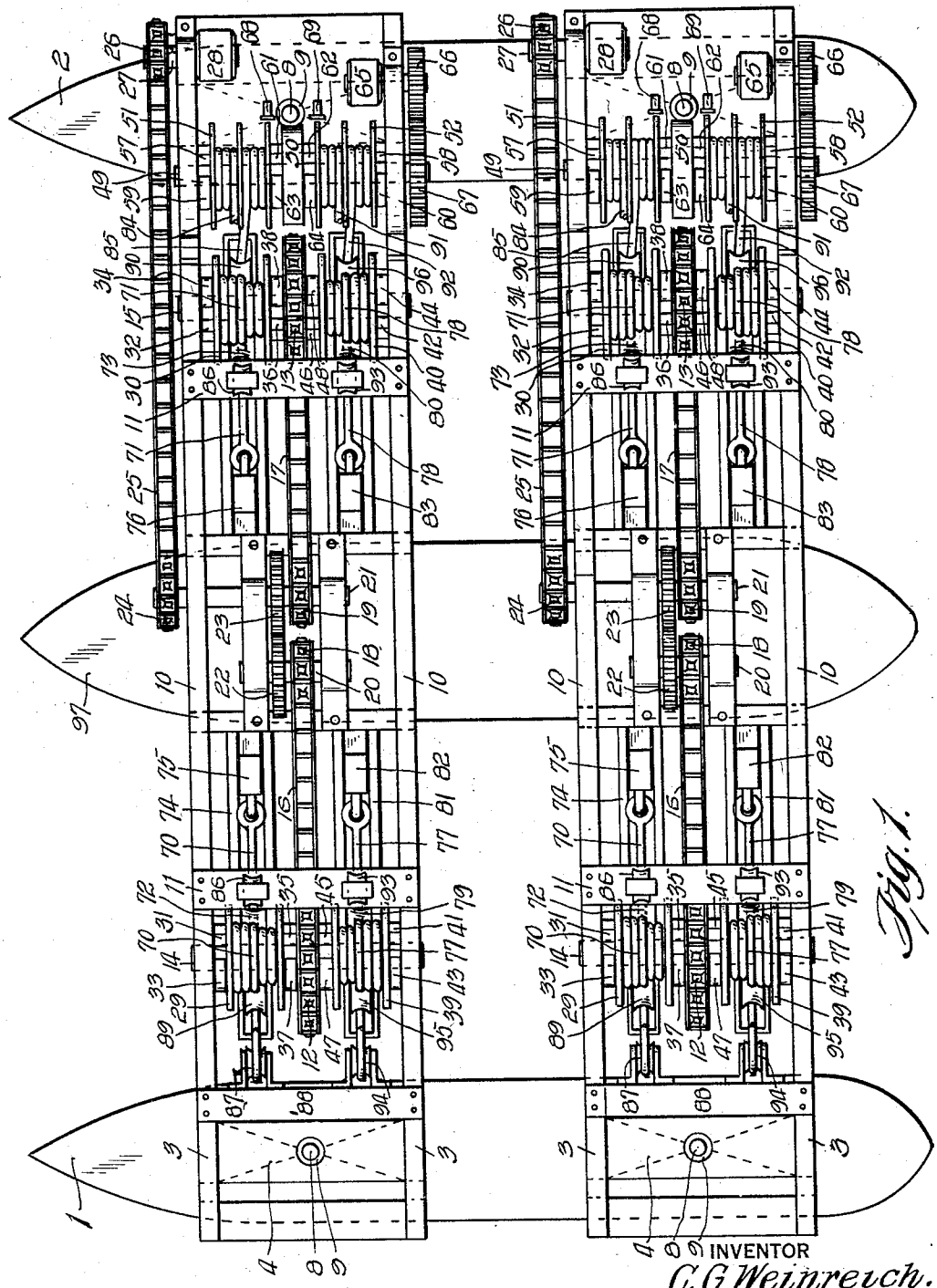


Fig. 1.

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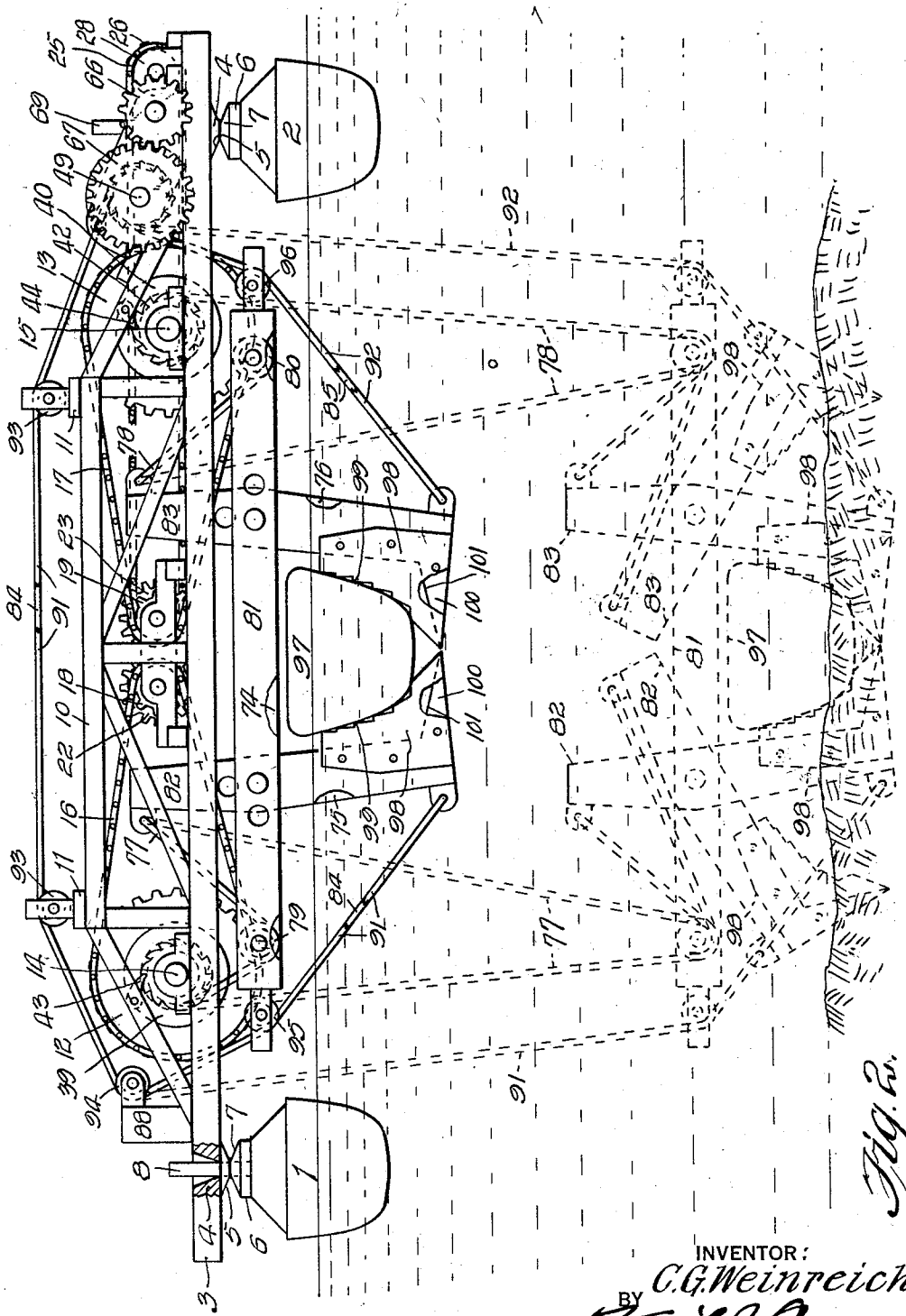


Fig. 2.

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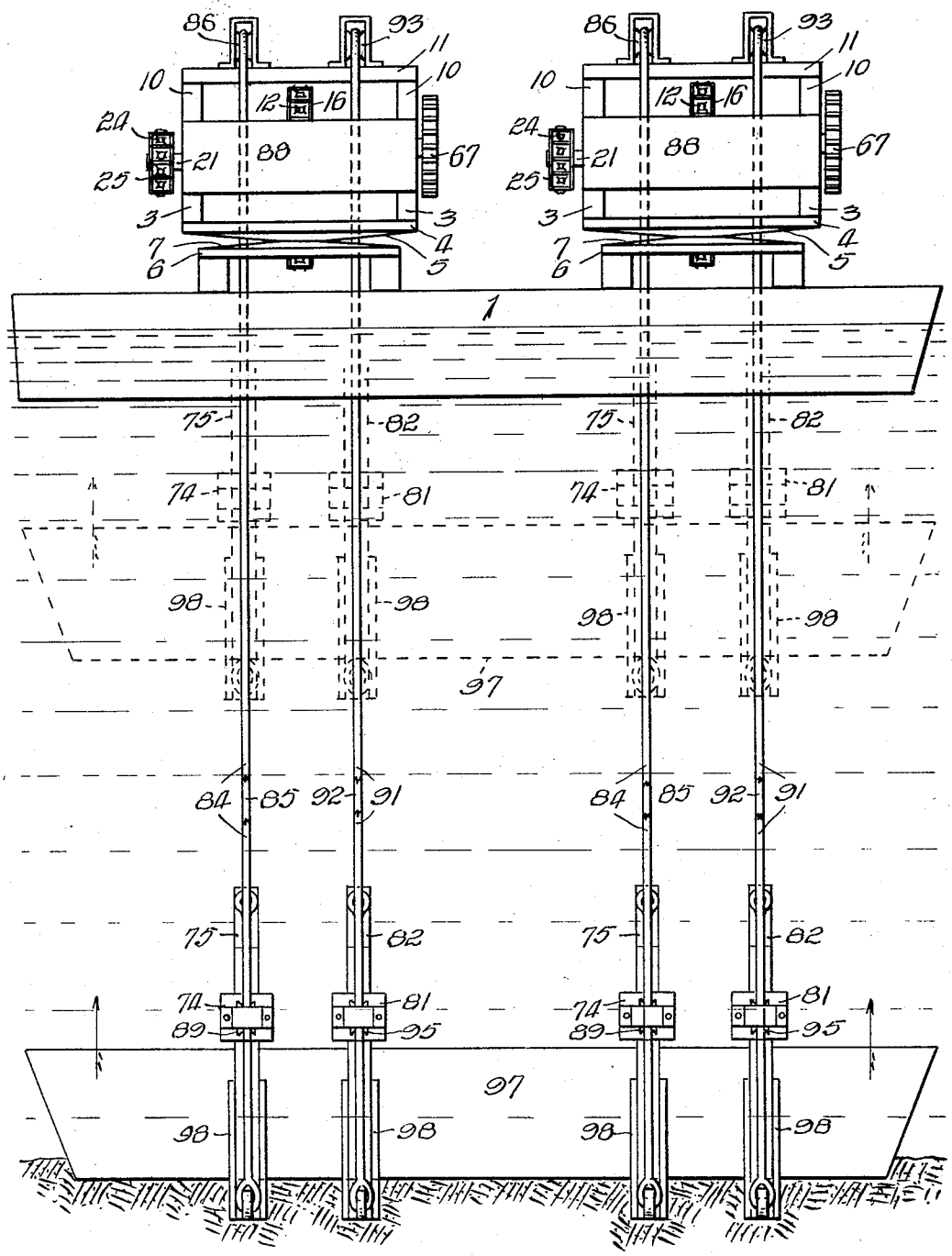



Fig. 3.

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LIFTING DEVICE

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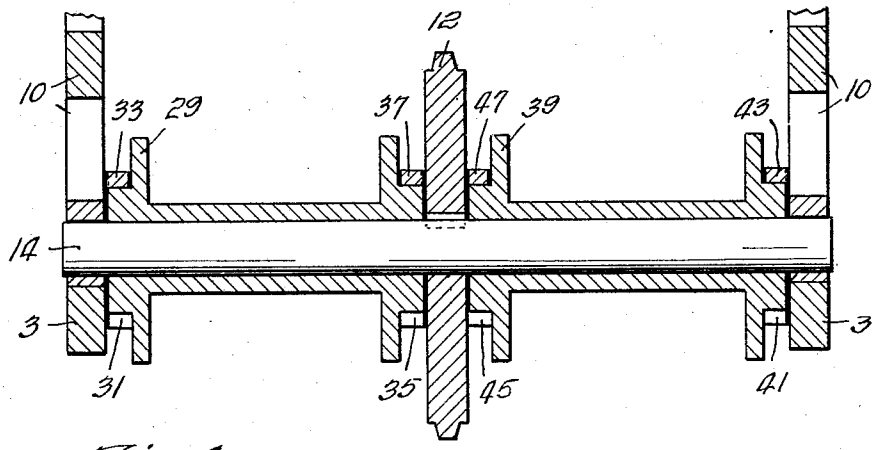



Fig. 4.

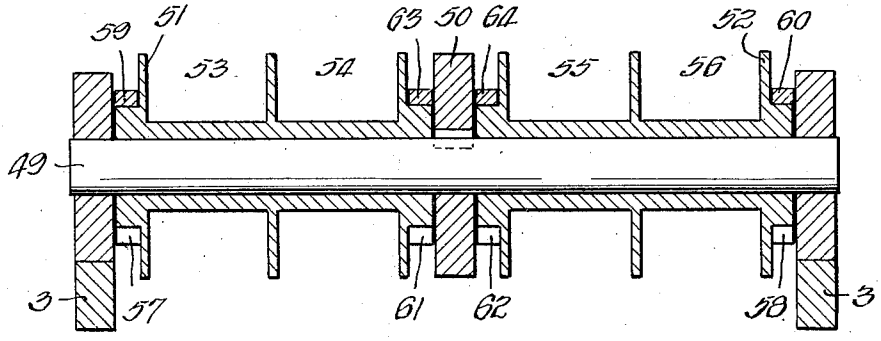



Fig. 5.

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Patented May 26, 1931

1,807,361

# UNITED STATES PATENT OFFICE

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## LIFTING DEVICE

Application filed March 17, 1928. Serial No. 262,409.

My invention relates to lifting devices, and more particularly to a device for lifting, or raising sunken vessels, such for instance as submarines, and other watercraft, and, it is a distinct and practical improvement to overcome certain practical objections to, and defects in, the present known devices and methods employed in raising sunken vessels.

The primary object of my present invention is the provision of a pontoon supported bridge structure provided with controlled vessel gripping members capable of being lowered to various depths into a body of water, and then raised for bringing to the surface any sunken watercraft that has been engaged by said gripping members.

A further object of the invention is the mounting of the bridge structure upon spaced pontoons and to permit the pontoons to ride the waves without affecting the stability and equilibrium of the bridge structure supported thereby.

With the above and other objects in view, the invention consists in the novel features of construction, arrangement and combination of parts hereinafter more fully described and finally pointed out in the claims hereto appended.

Referring to the accompanying drawings forming a part of this specification, wherein like characters of reference denote similar parts throughout the several views:

Fig. 1 is a plan view of a lifting device embodying the features of my invention.

Fig. 2 is a side elevation thereof showing the vessel clamping members in both their upper and lower positions and in engagement with a vessel in both instances.

Fig. 3 is an end elevation of the device.

Fig. 4 is a detail showing the drums mounted upon one of the cross-shafts for supporting cables leading to the upper ends of the vessel clamping members.

Fig. 5 is a detail showing the drums mounted upon one of the cross-shafts for supporting cables leading to the lower ends of the vessel clamping members.

Referring to the drawings, the reference characters 1 and 2 designate suitable pontoons which are adapted to be disposed in side by side relation and spaced the desired distance apart, as disclosed in Figs. 1 and 2.

Mounted upon the pontoons 1 and 2 and spanning the gap between the pontoons are one or more bridge structures. Two of these bridge structures have been shown in the drawings, one located at the aft part of the pontoons 1 and 2, and one at the fore part of the pontoons 1 and 2, but it is apparent that a greater number of bridge structures may be employed, or only one, if desired, depending upon the size and weight of the sunken ship.

Each bridge structure comprises a suitable frame work including spaced parallel arranged sill members 3 having the end cross-pieces 4 provided with lower beveled faces 5 lying in a plane below the sill members 3, and which are mounted upon supporting plates 6 having upper beveled faces 7, and which supporting plates 6 are suitably supported by the pontoons 1 and 2. A vertically disposed pivot pin 8 is carried by each supporting plate 6 and these pins 8 pass upwardly through beveled openings 9 in the sill cross-pieces 4 to permit the pontoons 1 and 2 to rock independently of each other without affecting the stability of the bridge structure. Each sill member 3 is provided with a suitable truss structure 10 connected by means of suitable top cross-pieces 11.

A pair of opposed suitably spaced sprocket wheels 12 and 13 are fixed midway the ends of a pair of rotatable shafts 14 and 15, respectively. Riding over the sprockets 12 and 13 are a pair of chains 16 and 17, respectively, which chains also ride over smaller sprockets 18 and 19, respectively, which are fixed to rotatable shafts 20 and 21, respectively. Intermeshing gears 22 and 23 are secured to the shafts 20 and 21 so as to reverse the rotation of said shafts. A sprocket wheel 24 is fixed to the extended end of shaft 21 and over which sprocket rides a chain 25, which chain also rides over a second sprocket 26 fixed to a rotatable shaft 27 which is driven by means of a suitable motor 28. This arrangement, as is apparent, will impart rotary movement to the shafts 14 and 15 through the aforesaid sprocket and chain connections.

Loosely mounted upon the shafts 14 and

15 of each bridge structure and upon one side of the sprockets 12 and 13, are opposed cable drums 29 and 30, respectively. Drums 29 and 30 are provided at their outer ends with ratchet wheels 31 and 32, respectively, which are engaged by dogs 33 and 34, respectively, and are also provided at their inner ends with the ratchet wheels 35 and 36, respectively, which are engaged by dogs 37 and 38, respectively. Also loosely mounted upon the shafts 14 and 15 upon the opposite sides of the sprockets 12 and 13 are opposed cable drums 39 and 40, respectively. Drums 39 and 40 are provided at their outer ends with ratchet wheels 41 and 42, respectively, which are engaged by dogs 43 and 44, respectively, and are also provided at their inner ends with the ratchet wheels 45 and 46, respectively, and which are engaged by the dogs 47 and 48, respectively.

Each bridge structure is also provided with a shaft 49 which is rotatably supported adjacent shaft 15 and it is provided midway its ends with a flange 50. Loosely mounted upon the shaft 49 at opposite sides of the flange 50 are double cable drums 51 and 52. Drum 51 is provided with the cable receiving grooves 53 and 54, and drum 52 is provided with the cable receiving grooves 55 and 56, as shown in detail in Fig. 5. Drums 51 and 52 are provided at their outer ends with the ratchet wheels 57 and 58, respectively, which are engaged by the dogs 59 and 60, respectively. Drums 51 and 52 are also provided at their inner ends with the ratchet wheels 61 and 62 respectively, which are engaged by the dogs 63 and 64, respectively. Shaft 49 of each bridge structure is driven by means of a motor 65 through the medium of a train of gears designated 66 and 67. Suitable brake levers 68 and 69 are disposed opposite the inner flanges of the drums 51 and 52, respectively, for engagement therewith when necessary during lowering operations, as will be apparent hereinafter.

Suitable lifting cables designated 70 and 71 are secured at one end to the drums 29 and 30, respectively of each bridge structure. These cables 70 and 71 are adapted to be wound around the drums 29 and 30 and then they ride under and over pulleys 72 and 73, respectively, which are rotatably mounted at opposite ends of a suitable suspended lifting beam 74, and then finally connected at their opposite ends to the upper ends of suitable opposed gripping levers 75 and 76, respectively, which levers are pivotally supported by the lifting beam 74.

Suitable lifting cables designated 77 and 78 are secured at one end to the drums 39 and 40, respectively of each bridge structure. These cables 77 and 78 are adapted to be wound around the drums 39 and 40 and then they ride under and over pulleys 79 and 80, respectively, which are rotatably mounted at opposite ends of a suitable suspended lifting beam 81, and then finally connected at their opposite ends to the upper ends of suitable opposed gripping levers 82 and 83, respectively, which levers are pivotally supported by the lifting beam 81.

Suitable lowering cables 84 and 85 are secured at one of their ends to the double drum 51. These cables ride in the drum grooves 53 and 54, respectively. Cable 84 rides over pulley 86 supported by the truss cross-members 11, over the pulley 87 supported by the cross-member 88 and then over a pulley 89 rotatably mounted at one end of the lifting beam 74 and is finally connected to the lower end of the pivotally supported gripping lever 75. Cable 85 rides over pulley 90 rotatably supported by the opposite end of the lifting beam 74 and is finally connected to the lower end of the pivotally supported gripping lever 76.

Suitable lowering cables 91 and 92 are secured at one of their ends to the drum 52. These cables ride in the drum grooves 55 and 56, respectively. Cable 91 rides over pulley 93 supported by the truss cross members 11, over the pulley 94 supported by the cross-member 88 and then over a pulley 95 rotatably mounted at one end of the lifting beam 81 and is finally connected to the lower end of the pivotally supported gripping lever 82. Cable 92 rides over pulley 96 rotatably supported by the opposite end of the lifting beam 81 and is finally connected to the lower end of the pivotally supported gripping lever 83.

The lifting beams 74 and 81, as well as the gripping levers 75, 76, 82 and 83 are each provided with a plurality of openings so that the pivotally supported gripping levers may be lowered or set further apart to accommodate various sizes of sunken vessels, designated 97. The lower end of each gripping lever is provided with a detachable shoe member 98 having the serrated inner edge 99 for gripping the hull of a sunken vessel 97. The lower end of each gripping lever is also provided with a laterally directed arm 100 having a beveled upper face 101 for engaging a relatively flat bottom vessel without the use of the detachable vessel engaging shoes 98. It is apparent that shoes having various shapes of gripping edges may be employed.

*Operation*

Whenever it is desired to raise a sunken ship from a body of water with my lifting device, the pontoons 1 and 2 provided with any number of bridge supporting devices mounted thereon in spaced parallel relation (two of such bridge devices being shown in Fig. 1), are moved to the location of the sunken vessel 97 and positioned above the vessel with the pontoons 1 and 2 lying parallel with the sunken vessel and with the bridge structures positioned transversely of the

sunken vessel, as clearly shown in full and dotted lines in Fig. 2.

The pontoons 1 and 2, if the sunken vessel is a heavy one, can then be filled with the desired amount of water ballast to cause them to settle well into the water to afford the greatest amount of stability thereto, which water ballast can then be gradually removed from the pontoons to lighten them as the sunken vessel nears the surface of the water in which it is submerged.

After the lifting device has been positioned for operation, the lifting beams 74 and 81 of each bridge structure carrying the gripping levers 75 and 76 and 82 and 83, respectively, are lowered into the water transversely of the sunken vessel 97 until the lifting beams 74 and 81 of each bridge structure rests upon the sunken vessel 97. This operation is accomplished by releasing the dogs 33, 34, 37, 38, 43, 44, 47 and 48 from their respective ratchet wheels, which permits the lifting beams 74 and 81 to lower themselves by gravity into the water until they rest upon the sunken ship by the unwinding of the lifting cables 70, 71, 77 and 78 from their respective drums.

During the initial downward movement of the lifting beams 74 and 81. It will be observed, that the end pulleys of the lifting beams will ride downwardly upon the lowering cables 84, 85, 91 and 92, respectively, thereby causing the upper ends of each pair of opposed gripping levers to move toward each other, thereby spreading the lower ends of the lifting levers. Just as soon as the levers have been spread to their open position, the dogs 59, 60, 63 and 64 are released from their respective ratchets which allows the lowering cables 84, 85, 91 and 92 to unwind upon their respective drums until the lifting beams have settled upon the sunken vessel. The brake levers 68 and 69 can be manipulated so as to apply pressure upon the inner flanges of the cable drums 51 and 52 to prevent the lifting beams 74 and 81 from being lowered too quickly.

After the lifting beams 74 and 81 of each bridge structure have settled upon the sunken vessel, all of the aforesaid dogs are then brought into engagement with their respective ratchet wheels and motor 28 is then started which causes a rotation of the shafts 14 and 15 and a winding of the lifting cables 70, 71, 77 and 78 upon their respective drums. This winding of said cables upon their respective drums will exert a pulling pressure upon the upper ends of the lifting levers 75, 76, 82 and 83, thereby forcing the lower ends thereof toward each other so as to grip the sides and the bottom of the sunken vessel 97. After this initial pivotal movement of the gripping levers, upward movement of the lifting beams 74 and 81 of each bridge structure will then take place for raising the sunken vessel shown in dotted lines in Fig. 2, to the position shown in full lines in Fig. 2. During the upward movement of the lifting beams 74 and 81 with the sunken ship supported between the gripping levers, the motor 65 is started for gradually taking the slack out of the lowering cables 84, 85, 91 and 92. After the sunken vessel has been raised to its uppermost position shown in Fig. 2, the pontoons, the bridge structures mounted thereupon and the raised vessel are towed to dry dock, or any other suitable location.

It will be readily apparent that for any reason should the gripping levers of one lifting beam fail to properly engage the sunken vessel due to the curved shapes of the hull of the sunken vessel, the dogs cooperating with the cable drums carrying the cables under the greatest strain can be released from their respective ratchets so as to lengthen the cables under the greatest strain and then after this operation, the raising movement of the lifting beams can then again take place. These operations are continued with respect to the various lifting cables until it is found that there is an equal strain, or tension upon all cables, when then it will be known all of the gripping levers are in contact for lifting the sunken vessel with the longitudinal axis thereof in a horizontal position.

The many advantages of the herein described invention will readily suggest themselves to those skilled in the art to which it appertains.

From the foregoing description, it is evident that a simple device for this purpose has been disclosed, but it is to be understood that I do not desire to restrict, or limit myself to the very details of the construction shown and described, which is merely illustrative, it being obvious that changes, not involving the exercise of invention may be made without conflicting or departing from the spirit of the invention within the scope of the appended claims.

What I claim is:

1. In a lifting apparatus, a pair of spaced pontoons, a bridge structure spanning the gap between said pontoons and supported thereby, a lifting member, vessel gripping arms pivotally supported by said lifting member, means for lowering and raising said lifting member including the vessel gripping arms, means whereby the vessel gripping arms are spread apart at their lower ends when lowering the lifting bar including the vessel gripping arms and means whereby the lower ends of the vessel gripping arms are moved toward each other for engagement with the hull of the vessel upon raising movement of the lifting arm to raise a sunken vessel with the lifting member and vessel gripping arms.

2. In a lifting device, a pair of spaced pontoons, a bridge structure supported by said

pontoons, a pair of shafts journaled upon said bridge structure, drums mounted upon said shafts, a vertically movable carrier bar, gripping and lifting arms pivoted to said carrier bar, cables carried by said drums and connected at their one end to the upper ends of said lifting arms, a third shaft, drums mounted upon said third shaft, cables carried by said drums and connected at their one end to the lower ends of said lifting arms and means for lowering and raising said carrier bar, including the lifting arms and any object supported therebetween.

In testimony whereof, I have hereunto affixed my signature.

CHRIST G. WEINREICH.