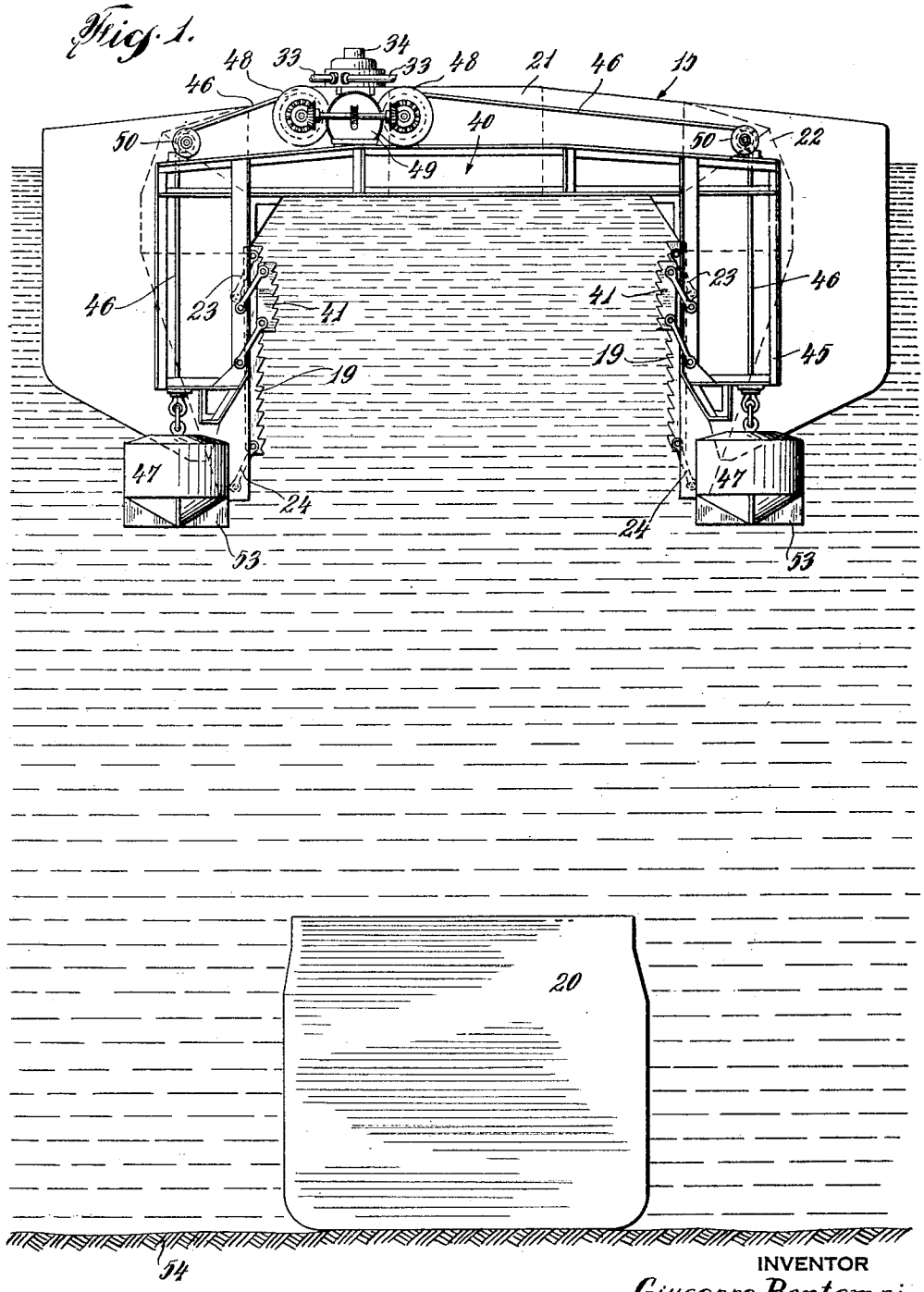
June 6, 1933. G. BONTEMPI 1,912,428

SALVAGE APPARATUS

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Fig. 1.

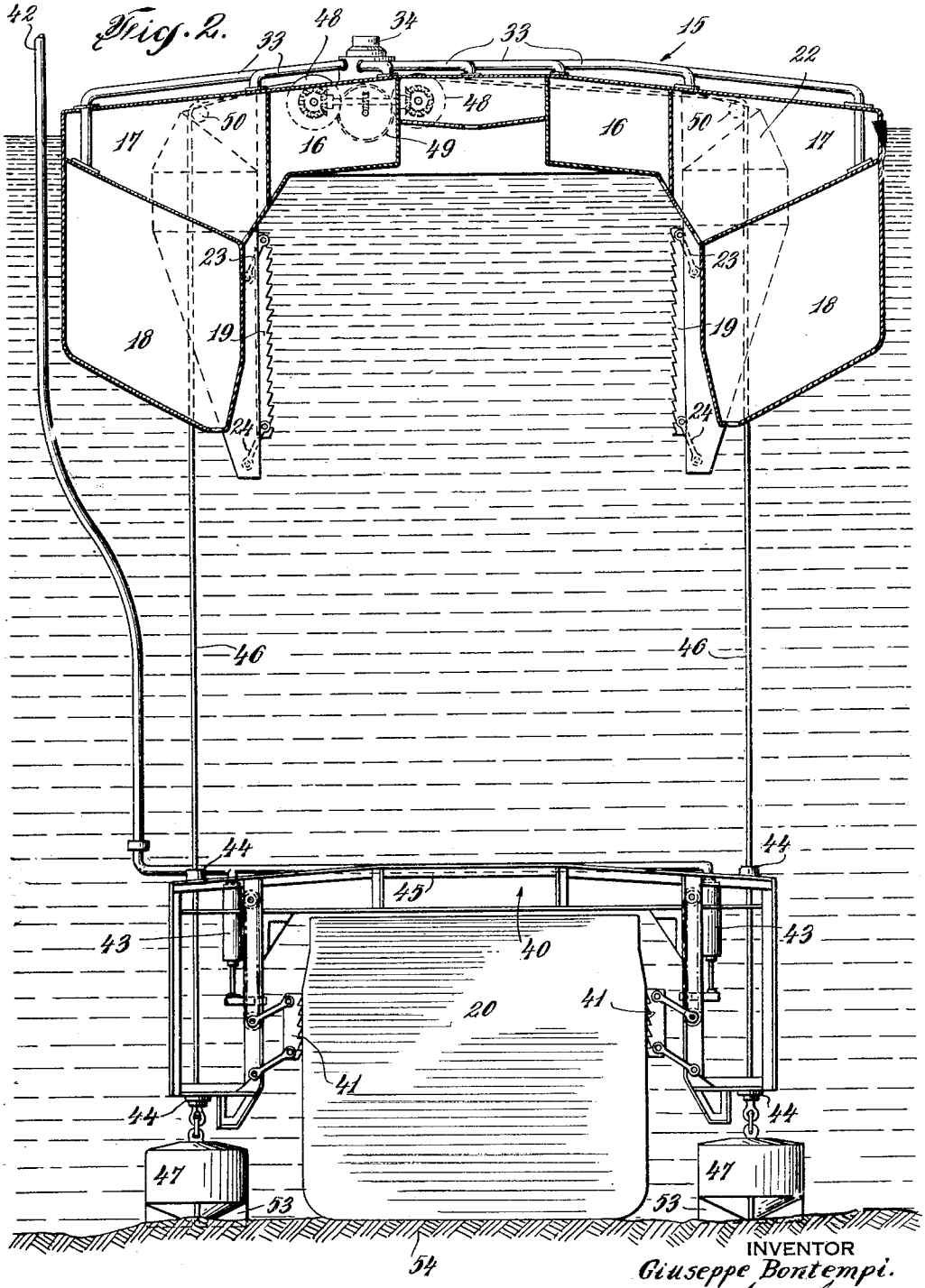


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SALVAGE APPARATUS

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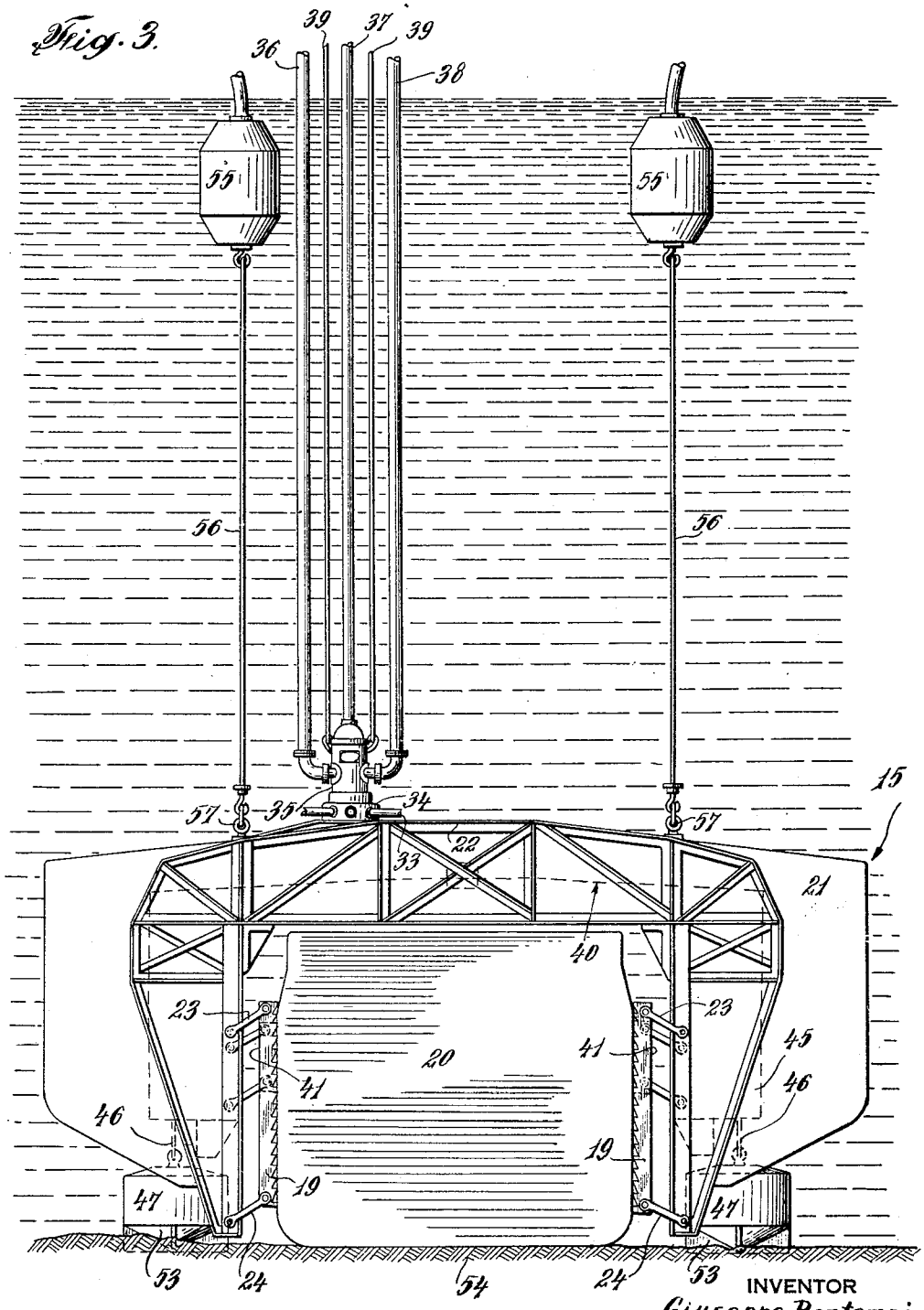
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SALVAGE APPARATUS

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Fig. 3.



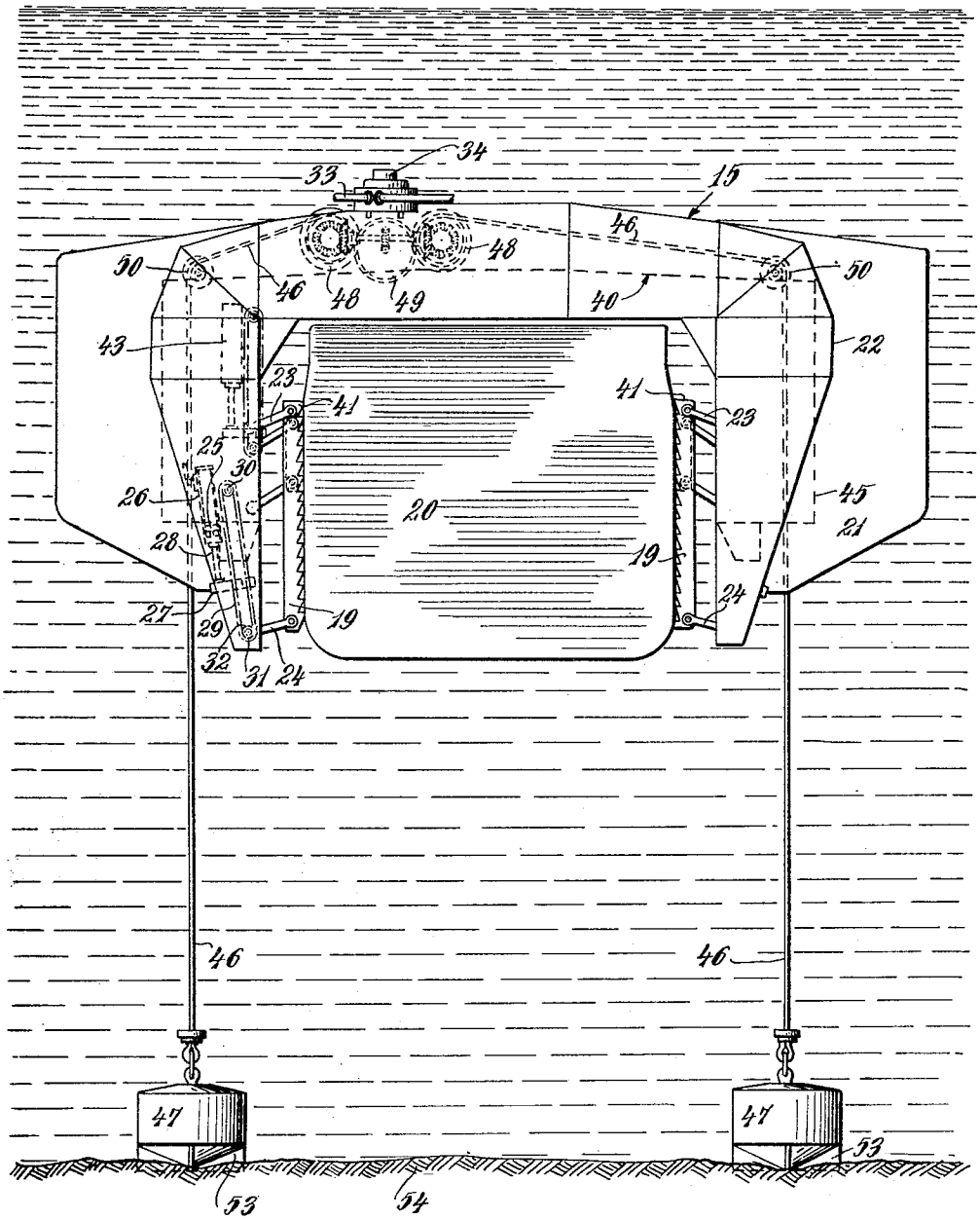
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Fig. 4.



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SALVAGE APPARATUS

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Fig. 5.

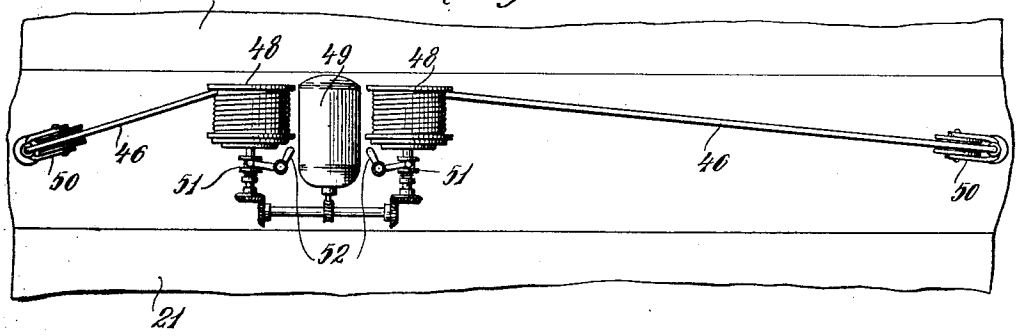
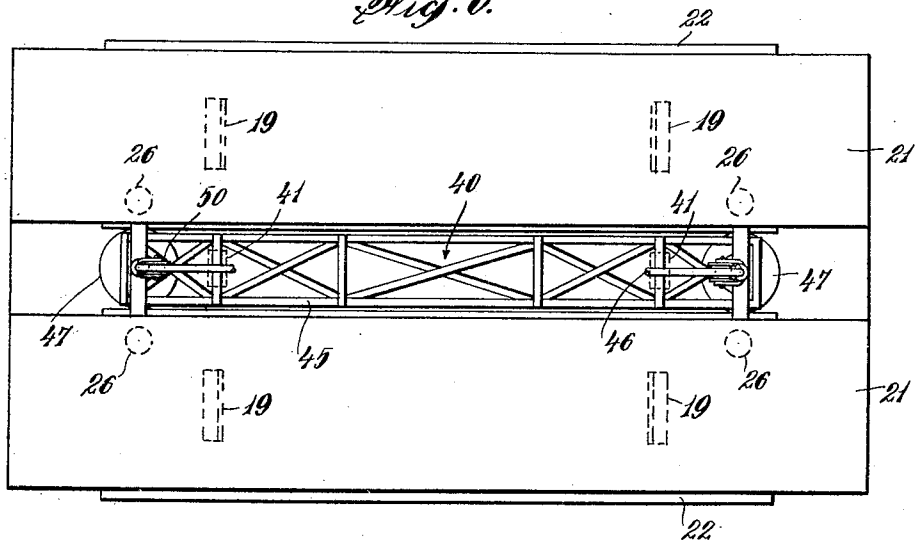


Fig. 6.



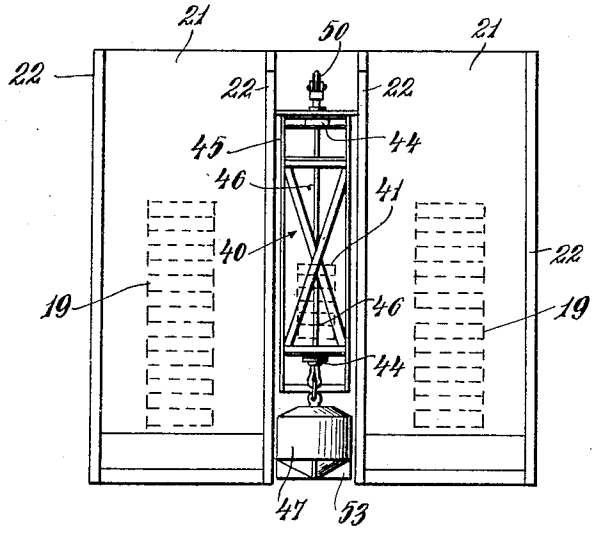


Fig. 7.

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UNITED STATES PATENT OFFICE

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SALVAGE APPARATUS

Application filed February 3, 1932. Serial No. 590,595.

The present invention relates to improvements in apparatus for raising sunken vessels, and more particular of the type which includes a salvage unit of the submergible type which is provided with means to grip the vessel to be raised, and which is capable of being made buoyant.

An object of this invention is to provide a novel and improved salvage apparatus of the character mentioned, including means to control, and when necessary or desirable to fix the submergible unit at any depth of submersion.

Another object of this invention is to provide a salvage apparatus of the character described, including means to control the speed of the submergible unit in its motion either while submerging or emerging.

A further object of the present invention is to provide a salvage system of the class aforesaid, whereby the submergible unit will set correctly and with certainty over the vessel to be raised, without the necessity of maneuvering the said unit.

Another object of this invention is to provide a novel salvage apparatus of the character described, including a definite track to pre-arrange and provide for the line of motion of the submergible unit.

A further object of this invention is to provide a novel salvage apparatus, including an easily maneuverable means for establishing preliminary contact with the object to be salvaged.

Another object of the present invention is to provide a salvage apparatus and system which is adaptable for use with any of the class of salvage units of the submergible type, capable of being made buoyant, and which when set onto the vessel to be raised, the latter is between the gripping elements of said unit.

A further object of this invention is to provide for a salvage system of the character described, a means to determine from the surface of the sea, the buoyancy requirements of the submerged unit.

Another object of the present invention is to provide a salvage system and apparatus of the class mentioned, which permits marine salvage operations to be conducted and completed within a short interval of time.

A further object is to provide apparatus of the class herein concerned, with means to tilt the submerged unit to set with positiveness onto the vessel to be salvaged.

A further object of the present invention is to provide a salvage apparatus of the class mentioned which can be controlled either from the surface of the sea, or from a chamber secured to the submergible unit.

Another object of this invention is to provide a marine salvage apparatus and system of the character mentioned, which is simple in construction, easy and dependable in operation, and the cost of which is reasonable in view of its capability, efficiency, its usefulness and adaptability.

To attain these objects, in a preferred embodiment of my present invention, I provide a salvage system comprising a salvage unit of the submergible type, capable of being made buoyant and including gripping elements, and two spaced groups of pontoon elements between which is housed a preliminary non-buoyant gripping unit which is adapted to be independently lowered onto the sunken vessel by cables unwound from drums secured to the aforesaid salvage unit, which drums are driven by a pneumatically operated motor also secured to said salvage unit. Said preliminary gripping unit is slidable on said cables, at the ends of each of which, beneath said gripping unit are secured ballast or anchorage means.

Also, I provide an observation and control chamber which is demountably secured to said salvage unit, as well as independent pontoon elements secured at the ends of either chains or cables terminating in the salvage unit.

This invention is capable of numerous forms and various applications without departing from the essential features herein disclosed. It is therefore intended and desired that the embodiment shown herein be deemed illustrative and not restrictive, and that the patent shall cover whatever features of patentable novelty exist in the invention disclosed, reference being had to the

appended claims rather than the specific description herein to indicate the scope of the invention.

In the accompanying drawings, forming a part of this application, similar characters of reference indicate corresponding parts in all the views.

Fig. 1 is a view showing a submergible unit with its front group of pontoons removed, the preliminary gripping unit housed therein resting on the anchorage means or ballast secured at the ends of cables wound on drums and the motor to actuate the latter, all afloat over the vessel to be raised.

Fig. 2 is a view showing the submergible unit afloat, section through its front group of pontoons, the preliminary gripping unit set and secured on the vessel to be raised, and the anchorage means fixed resting on the bottom of the sea; the cables extending from the drums and terminating in the ballast or anchorage means aforesaid.

Fig. 3 is a view showing the salvage unit also submerged setting over and gripping the vessel, and again housing the preliminary gripping unit between its spaced pontoon groups; the said salvage unit having been pulled down to this position by winding the cables onto their respective drums. This view also shows the control chamber and buoyancy gauges.

Fig. 4 is a view showing the salvaged unit, the preliminary gripping unit housed therein, all ascending with the vessel securely gripped; the ballast or anchorage means remaining secured to the sea bottom, and the cables being unwound after the buoyancy of the salvage unit has been increased sufficient to raise all but the ballast.

Fig. 5 is a fragmentary plan view showing only the cable winding and control mechanism.

Fig. 6 is a diagrammatic plan view of the apparatus showing the preliminary gripping unit housed within the salvage unit between its two sections of pontoons (cable and control mechanism being removed).

Fig. 7 is a side elevation of Fig. 6.

The respective positions of the several components of the system, in the successive steps in a salvage operation with the apparatus, are shown in order in the Figs. 1, 2, 3 and 4, respectively.

In the practice of the present invention, I utilize a salvage unit of the submergible type, generally designated herein by the numeral 15, which is capable of being made buoyant by virtue of its pontoon members 16, 17 and 18, and which is provided with gripping elements 19, adapted to secure between them the vessel 20 to be raised.

The salvage unit 15, illustrated herein, consists of two series of pontoon sections 21, in spaced relation, composed of pontoon members 16, 17 and 18, secured to an inverted U shaped framework 22, which when submerged, shall have the vessel 20 to be raised, between its downwardly extending arms, each of which has pivotally secured thereto, in tandem, a pair of link arrangements, each forming a quadrilateral unit, having for an innermost member, a gripping element 19; the ends of each such gripping element 19, being pivotally secured respectively to the ends of a pair of equal links 23 and 24; the other ends of the latter being pivotally secured to an arm of the frame 22.

So that the opposite gripping elements 19, shall be capable of being brought independently towards each other to grip the vessel 20, that is to gripping position, or else when required to open position, there is provided for each gripping unit, an actuating mechanism therefor, consisting of a pneumatically operated piston 25, slidable within a cylinder 26, the latter being secured to the frame 22.

A coupling 27, secures the piston rod 28, to an endless link chain 29, which engages an idler sprocket 30, and a sprocket wheel 31; the latter being secured to the link 24, at the axis 32, and both sprocket wheels aforesaid are pivotally mounted on the frame 22.

When compressed air is admitted into the cylinder 26, at one end, the gripper element 19 associated therewith will be brought towards its opposite mate, and when the compressed air is fed into the cylinder at its other end, the said gripper element 19, will recede from its opposite mate. Thus, simultaneous operation of opposite gripper actuating mechanisms, will bring the gripper elements 19 associated therewith either towards each other to gripping position, or else, will cause same to recede from each other to open position, as the case may be.

The buoyancy of the pontoon members 16, 17 and 18, are independently controlled by compressed air through individual pipes 33, all terminating and independent in a control head 34, upon which is demountably secured a chamber 35, to house an operator for control and observation purposes. Said control chamber 35, derives a compressed air supply from auxiliary compressor apparatus on the surface (not shown), through a pipe line 36, a normal air supply for the operator, through a pipe line 37, air to be exhausted, is diverted by the operator through pipe line 38, and cables 39, serve for the lifting of the control chamber 35, to insure the safety of the operator.

The aforementioned preliminary gripping unit, herein generally designated by the numeral 40, is adapted to be housed within the framework 22, of the salvage unit 15, between the two pontoon sections 21, and in

slidable relation therewith. The construction of this preliminary unit 40, is quite like that of the salvage unit 15, except that it has no pontoon elements, and is provided with only one set of gripping elements 41, which are actuated by like mechanism hereinabove described as associated with the gripping elements 19. A compressed air supply pipe 42, connects to the cylinders 43 of the actuating mechanism of the gripping elements 41, of the unit 40.

Slidably through sockets 44, in the frame 45, of the unit 40, pass the cables 46, the lower ends of each of which terminates and is secured to the anchorage means or ballast members 47, and the upper ends of which are wound respectively on the drums 48. The preliminary unit 40, therefore rests on the ballast members 47. The drums 48, together with the pneumatically operated reversible motor 49, which drives them through the system of gearing shown in Fig. 5, are secured to the salvage unit 15. Swiveled guide pulleys 50, secured to the salvage unit 15, are provided, one in each vertical line of run of the cables 46.

Clutches 51 are interposed in the transmission shafting, to permit individual control of the respective drums 48. The clutch shifters 52, and the supply system for the motor 49, are operable from within the control chamber 35.

However, the control chamber may be dispensed with. In which instance, all piping will extend to the surface of the sea to control valves situated on board ship. Also there need be no clutches for independent control of the respective drums 48; being that both when directly connected will wind or unwind equal lengths of cable 46. Air compressor apparatus and control valve systems being well known, a description of them is not essential and is therefore omitted. The ballast members 47 are provided on their bottoms with a number of intersecting vanes 53, to prevent lateral movement once the ballast is set and engaged in the ocean floor 54.

As a surface guide or gauge, to indicate the buoyancy requirements of the pontoon members 16, 17 and 18, there is provided a pair of pontoons 55, controlled from the surface of the sea, which are secured to cables 56 terminating in eyelets 57 secured to the frame 22, of the salvage unit 15. The length of these cables 56 is such that the pontoons 55, will be fully submerged, yet very near the surface of the sea, when the salvage unit 15 has gripped the vessel 20, still resting on the sea bottom 54.

In operation, the first step, illustrated in Fig. 1, is to have the preliminary gripping unit 40, housed within the buoyant salvage unit 15, and resting on the ballast members 47; the cables 46, being fully wound on drums 48, and the gripping elements 19 and 41, being all in open position. The entire apparatus is thus floated to a position directly above the vessel 20, to be raised.

In the second step, illustrated in Fig. 2, the salvage unit 15, is maintained in a bouyant condition, and the motor 49, is actuated to unwind the cables 46, from off the drums 48, thereby lowering the ballast members 47, with the preliminary unit 40, resting thereon. The latter is made to set onto the vessel 20, while the ballast members 47, are secured fast in the ocean floor 54. Then the gripping elements 41, which are on either side of the vessel 20, are shifted to close, and are so kept continuously by feeding compressed air through pipe line 42, into the cylinders 43, of the actuating means adapted to close said gripping elements 41. As soon as the ballast members 47 have reached the ocean floor 54, the motor 49 is stopped. The preliminary unit aids to establish and maintain the parallelism of the cables 46; thus providing a definite path for the salvage unit 15, and by virtue of its security onto the vessel 20, insures that the salvage unit 15, when submerged, will set onto the vessel 20, in the required position for effective gripping, with certainty and exactness.

The third step in the operation, which is illustrated completed in Fig. 3, is to attach to each eyelet 57, the respective ends of the cables 56, having the pontoons 55 secured at their other ends, then, to maintain the salvage unit 15, appreciably bouyant, that is at a small fraction of its full capacity. Now, the cables 46, are rewound on the drums 48, by running the motor 49, slowly in reverse. The cables 46, will always be taut, because of the upward tendency of the salvage unit 15, yet the latter will be dragged downward slowly, because of the connecting means, the cables 46, becoming shorter and shorter; the rate of motion of the salvage unit 15, depending upon the speed of the motor 49. The salvage unit will thus submerge until it will set onto the vessel 20, again housing the preliminary unit 40, between the pontoon sections 21, and its gripping elements 19, will have the vessel 20, between them. At this stage, the motor 49, is stopped, the gripping elements 19, are brought towards each other, in closed position, and continuously held so, as to clamp the ship 20 within their grip, by feeding compressed air into the cylinders 26, of the actuating means adapted to operate said gripping elements 19.

All this while, the pontoons 55 are kept buoyant at their minimum by forcing just enough water out of them so that they barely float. After the vessel 20 is tightly within the grip of the salvage unit 15, these pontoons 55 are made buoyant to their full capacity. Their utmost effort is appreciable

and is known to the operator on the surface of the sea.

Prior to the final step, which is the actual raising of the vessel 20, shown completed in Fig. 4, the cables 46, are a little released from the drums 48, and the pontoon members 17, 18 and 19, of the salvage unit 15, are made more buoyant by feeding compressed air thereinto, to force out some of the water contained in said members. As soon as the buoyancy of these pontoon members 17, 18 and 19, aided by the capacity of the pontoons 55, becomes sufficient and lifts the salvage unit 15, the vessel 20 which it holds in its grip, together with all secured thereto, the pontoons 55 will rise to the surface and float, thus losing their lifting value, and when such happens, the operator on the surface will know exactly how much more the buoyancy of the salvage unit 15, need be increased to be enabled to rise with its load. The buoyancy of the pontoons 55, are now reduced a definite amount known to the operator on the surface, and then the buoyancy of the salvage unit 15, is increased until said pontoons 55, again emerge and float. In this manner, the buoyancy requirements of the salvage unit 15, is always fairly known and gauged.

The final step or stage of the operation, shown completed in Fig. 4, takes place when the buoyancy of the salvage unit 15, is sufficient to raise itself and its load, whereupon the motor 49 is actuated to unwind the cables 46, from off the drums 48, causing all to rise and finally emerge afloat, except the ballast members 47, which remain engaged to the ocean floor 54. The cables 56, are detached from the salvage unit 15, and the cables 46, may now be cut and let drop, discarding the ballast or anchorage means 47, or else, the latter may be loosened from their hold in the sea bed 54, and the cables 46, wound up to bring said members 47, up to and beneath the preliminary unit 40, which when in such position, the motor 49, is stopped. The salvage apparatus and the vessel it holds, are now towed into drydock.

Other novel ways of conducting marine salvage operations with various combinations of apparatus herein described, are as follows:—

Utilizing an apparatus consisting of the salvage unit 15, the cables 46, together with their control mechanism 48 and 49, and the anchorage means 47, we proceed by lowering the ballast members 47, to sea bottom 54, and securely anchoring same thereto, one such member 47, on either side of the vessel 20, to be raised, so that the distance between them shall be about equal to the distance between the pulleys 50, in order that the cables 46 shall be in parallel relation. Then, the motor 49, is actuated to wind up the cables 46, on their respective drums 48, thereby causing the salvage unit 15, to be slowly urged downward until it sets over the vessel 20. The necessary remaining steps to complete the operation, have been previously set forth.

Another combination of apparatus, may consist of the salvage unit 15, the cables 46, together with their control mechanism 48 and 49, and the preliminary gripping unit 40, secured to the ends of said cables 46. To operate, unwind the cables 46, thereby causing the preliminary unit 40, to be lowered until it sets onto the vessel 20, and is made to grip same. Thereupon, the cables 46, are rewound, thereby causing the salvage unit 15 to be slowly brought downward until it sets onto the vessel 20, housing the preliminary unit 40, between its pontoon sections 21. The remaining steps to complete the raising of the vessel 20 and the salvage apparatus, are evident from previous disclosure herein. It is to be noted however, in this set up, the ascent will be comparatively rapid.

A further combination of apparatus herein described, may consist of a gripping unit 40, of heavy construction, the cables 46, together with their control mechanism 48 and 49, and a member capable of being made bouyant, similar to the salvage unit 15, except that it includes no gripping mechanism; said gripping unit 40 mentioned, being secured to the ends of the cables 46. The operation of this combination of apparatus mentioned, will be along similar lines as hereabove described.

Another combination of apparatus herein described, capable of performing marine salvage operations, may consist of the components shown in Fig. 2, except that the gripping unit 40, be of heavy construction, and the salvage unit 15, be minus its gripping mechanism. The method of carrying out the complete operation can be easily understood from matter hereinbefore set forth.

Having described a preferred embodiment of my present invention, I claim:—

1. In a salvage apparatus, in combination with a salvage unit of the submergible type capable of being made buoyant and provided with gripping means; a gripping unit, comprising a frame and gripping elements secured thereto, adapted to grip the object to be raised between them; connecting means secured to and between the said salvage unit and the gripping unit, and means to alter the length of the connecting means.

2. In a salvage apparatus, in combination with a salvage unit of the submergible type capable of being made buoyant and provided with gripping means; anchorage means adapted to engage the sea bottom; connecting means secured to and between the

salvage unit and the anchorage means; a gripping unit, comprising a frame and gripping elements secured thereto, adapted to grip the object to be raised between them, moveably mounted on said connecting means, and means to alter the length of the connecting means.

3. In a salvage apparatus, in combination, a buoyant member capable of being made non-buoyant; a gripping unit, comprising a frame and gripping elements secured thereto, adapted to grip the object to be raised between them; connecting means having its ends secured to and itself being between the said buoyant member and the gripping unit, and means to alter the length of the connecting means.

4. In a salvage apparatus, in combination, a buoyant member capable of being made non-buoyant; anchorage means, adapted to engage the sea bottom; connecting means secured to and between the buoyant member and the anchorage means; a gripping unit, comprising a frame member and gripping elements secured thereto, adapted to grip the object to be raised between them, moveably mounted on said connecting means, and means to alter the length of said connecting means.

5. In a salvage apparatus, in combination with a salvage unit of the submergible type capable of being made buoyant and provided with gripping means and a compartment, open at its bottom; a gripping unit, comprising a frame and gripping elements secured thereto, adapted to grip the object to be raised between them, housed movably within said compartment in the salvage unit; connecting means secured to and between the salvage unit and the gripping unit, and means to alter the length of the connecting means.

6. In a salvage apparatus, in combination with a salvage unit of the submergible type capable of being made buoyant and provided with gripping means and a compartment, open at its bottom; anchorage means adapted to engage the sea bottom; connecting means secured to and between the salvage unit and the anchorage means; a gripping unit, comprising a frame and gripping elements secured thereto adapted to grip the object to be raised between them, movably mounted on said connecting means, and housed movably within said compartment in the salvage unit, and means to alter the length of the connecting means.

7. In a salvage apparatus, in combination, buoyant members secured in spaced relation, capable of being made non-buoyant; a gripping unit, comprising a frame and gripping elements secured thereto adapted to grip the object to be raised between them, slidably housed between said buoyant members; connecting means secured to and between the said buoyant members and the gripping unit, and means to alter the length of the connecting means.

8. In a salvage apparatus, in combination, buoyant members secured in spaced relation, capable of being made non-buoyant; anchorage means, adapted to engage the sea bottom; connecting means secured to and between the buoyant members and the anchorage means; a gripping unit, comprising a frame member and gripping elements secured thereto, adapted to grip the object to be raised between them, slidably housed between said buoyant members, and movably mounted on said connecting means, and means to alter the length of said connecting means.

9. In combination with salvage apparatus of the submergible type, a gauge to determine from the surface of the sea, the buoyancy requirements of the salvage apparatus when submerged, comprising a buoyant member of known lifting capacity capable of being made non-buoyant to decrease its lifting capacity by known amounts, and a connecting means secured to and between the salvage apparatus and said buoyant member; the length of said connecting means being such that the buoyant member shall become submerged when the salvage apparatus is at its lowest submerged position.

In witness whereof, I hereunto affix my signature.

GIUSEPPE BONTEMPI.