

May 30, 1933.

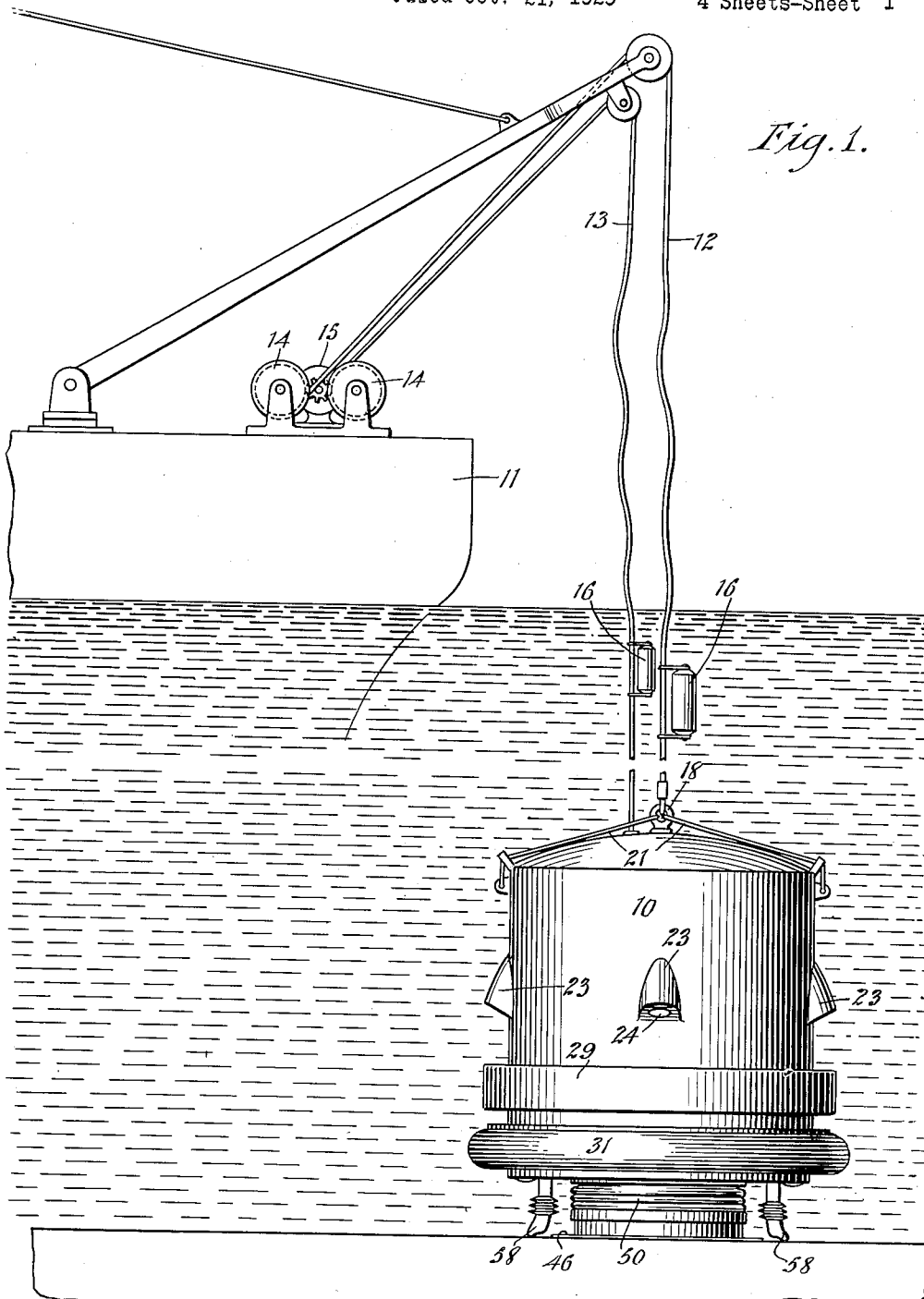
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1,912,271

SUBMARINE SALVAGE DEVICE

Filed Oct. 21, 1929

4 Sheets-Sheet 1



WITNESSES

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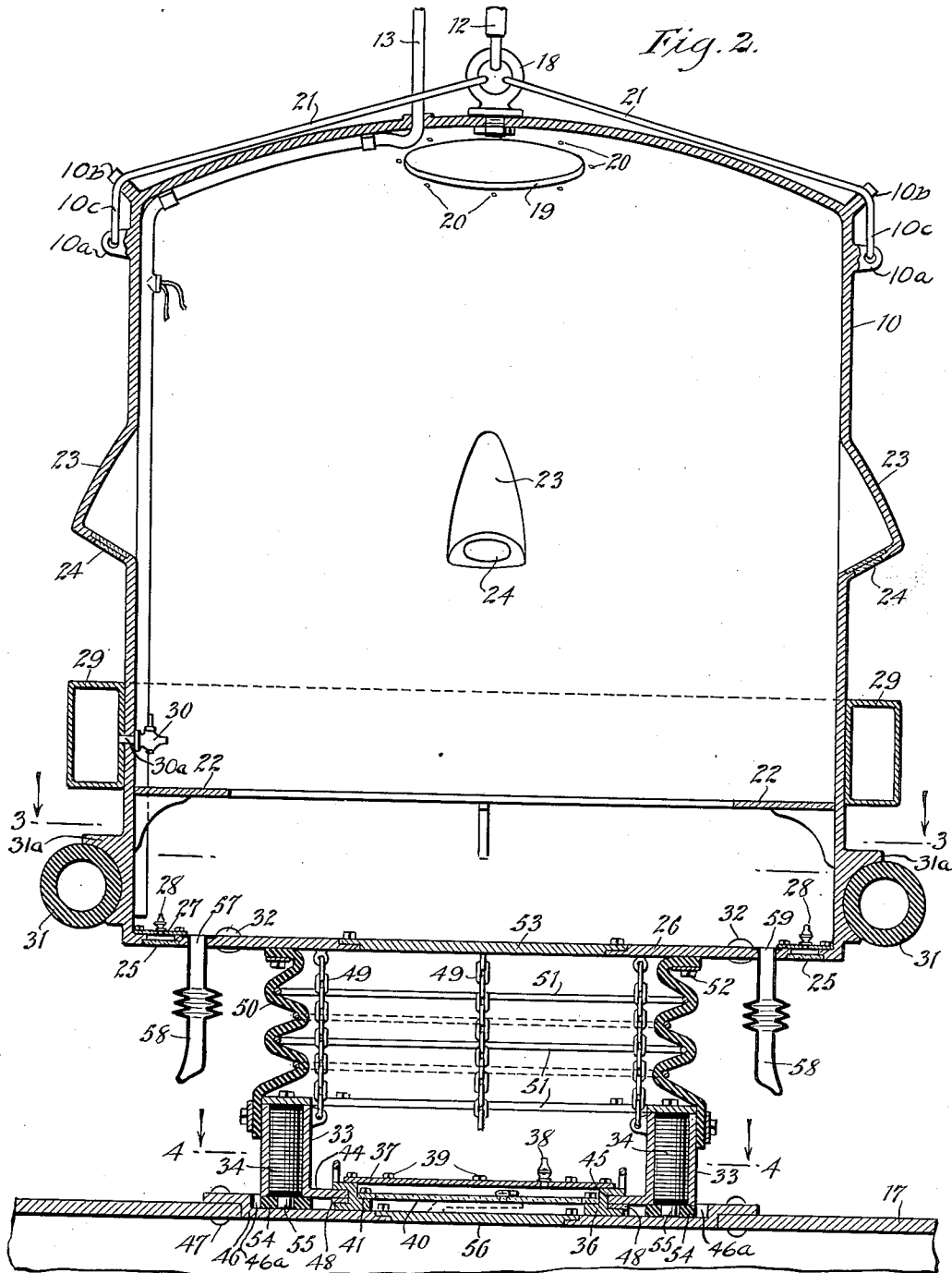
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4 Sheets-Sheet 3

Fig. 3.

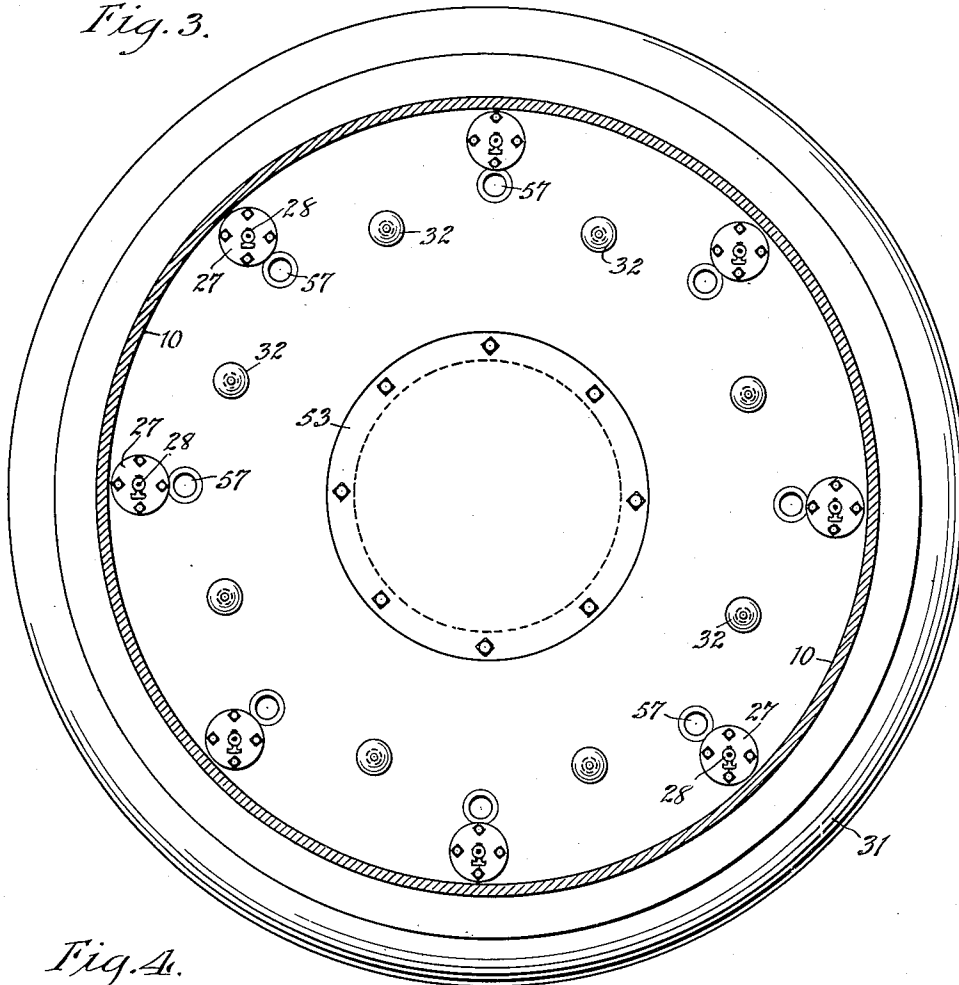
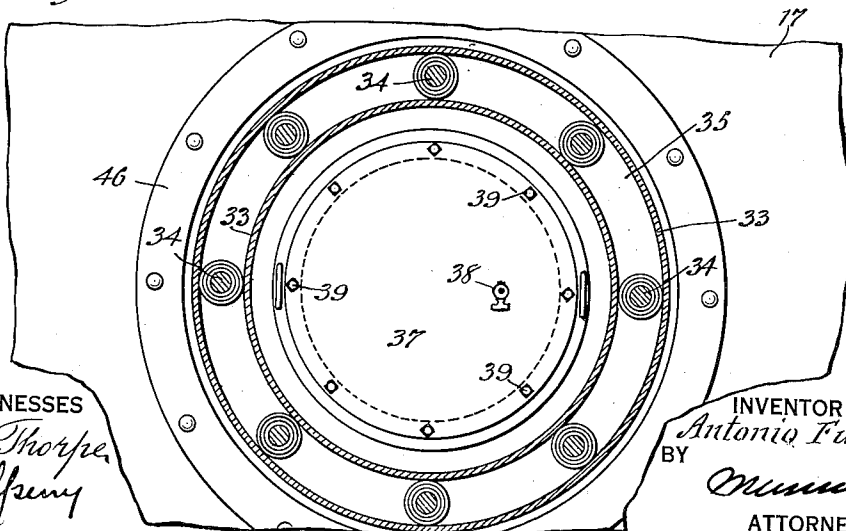


Fig. 4.



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Fig. 5.

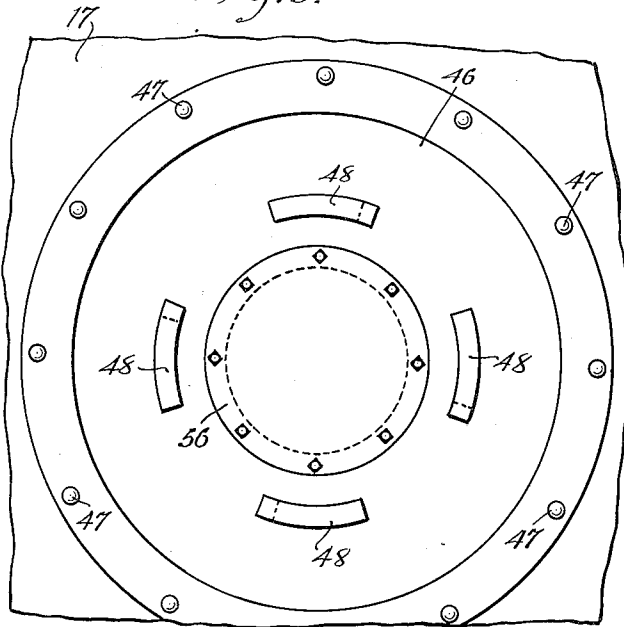


Fig. 6.

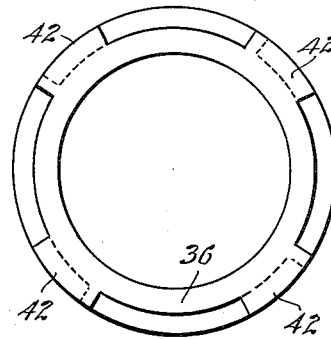


Fig. 7.

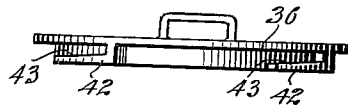
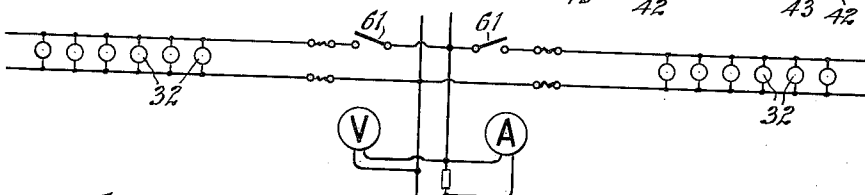
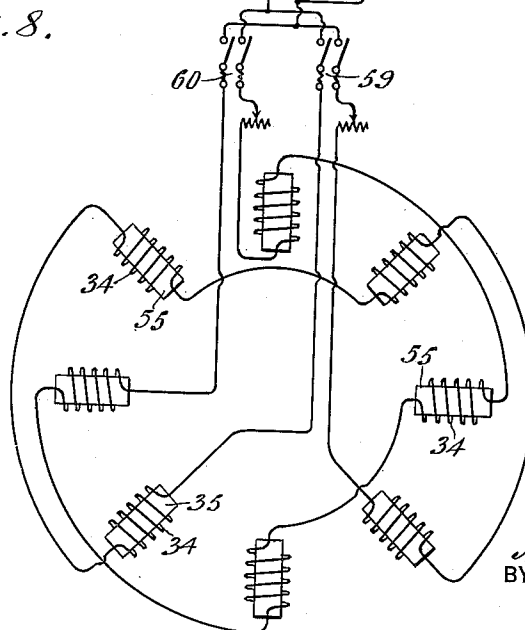


Fig. 8.



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UNITED STATES PATENT OFFICE

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SUBMARINE SALVAGE DEVICE

Application filed October 21, 1929; Serial No. 401,355.

This invention relates generally to devices for accomplishing submarine work, and refers more particularly to an apparatus by virtue of which workmen may be lowered under water to a sunken vessel or submarine for releasing and rescuing the crew and/or salvaging the vessel.

It is among the objects of the present invention to provide a novel and improved rescue or salvage device for submerged, disabled or sunken submarines or other craft which may be carried by and lowered from a surface vessel to a point in juxtaposition to said submarine or craft.

A further object of the present invention is to provide a salvage device for submarines, including a hollow body member defining a fluid tight chamber which may be lowered from the surface vessel to a sunken craft whereby workmen may be conveyed thereto and by virtue of which access may be gained to the craft.

A further object of the present invention is to provide in a device of the character described, novel and improved means for securing the device to the submarine after the body member has been lowered to a point in proper relative position thereto.

A further object of the present invention is to provide novel and improved means for joining the device in water-tight relation with the submarine so that workmen may pass from the chamber into the submarine.

Numerous other objects of the present invention include the combination and interrelation of parts whereby the whole forms a novel, simple and improved construction well designed to meet the demands of economic manufacture.

Further objects of the present invention will be apparent from a consideration of the following specification taken in conjunction with the accompanying drawings, in which

Figure 1 is a side elevation of one form of the present invention showing the device sealed to a submarine;

Fig. 2 is a sectional view showing the device connected to the hatch of a submarine prior to the establishment of communication therewith;

Fig. 3 is a horizontal sectional view taken approximately on the line indicated at 3—3 in Fig. 2;

Fig. 4 is a horizontal sectional view taken approximately on the line indicated at 4—4 in Fig. 2;

Fig. 5 is a plan view of a submarine hatch constructed in accordance with the invention;

Fig. 6 is an inverted plan view of the removable closure assembly for the lower end of the magnetic engaging member;

Fig. 7 is an edge view of said closure assembly;

Fig. 8 is a wiring diagram of the device.

Referring more particularly to the drawings by characters of reference, the device includes a hollow body or member generally indicated by the numeral 10, which member is adapted to be carried by a surface vessel 11 and lowered from the decks thereof by means of a lowering cable 12. A conduit 13 is also provided, which, if desired, may be employed to deliver air to the chamber. The cable 12 and conduit 13 are wound upon suitable drums 14 carried by the vessel, the drums being operated by a suitable motor 15 for lowering or raising the body or member 10 and simultaneously paying out or winding up the conduit 13. Buoys 16 are connected with the cable 12 and conduit 13 at an appropriate distance above the member 10 to natantly maintain the cables separated and taut so that fouling of the same with each other is prevented. The device is adapted to be lowered by the cable 12 upon a submarine, as indicated at 17 in the drawings. The hollow member or body 10 defines a chamber which is adapted to accommodate workmen, divers, or the like, who enter the chamber while it is on the vessel and then are lowered therein to the submarine. Referring more particularly to Fig. 2 of the drawings, it will be seen that adjacent the attaching ring 18 for the cable 12, a manhole 19 is provided through which the passengers of the chamber may enter. The manhole 19 is, of course, adapted to be closed by a suitable cover plate which is secured in water tight position over the manhole, such as by the bolts 20. Associated with the ring 18, brace rods 21 are provided,

which extend from the top center of the chamber to the sides for distributing a portion of the lifting stresses from the top of the chamber to the sides thereof, the points of connection with the sides consisting of ears 10^a or the like. The bends of the brace rods are supported clear of the corner of the chamber by struts 10^b. The upright components 10^c of the brace rods extends directly down to the ears 10^a (Fig. 2) thus providing an additional suspension for the chamber 10.

The chamber is further provided with an annular seat 22, upon which the workmen may be seated during the lowering or raising of the chamber. The sides of the chamber are provided with window portions 23 which extend outwardly from the sides of the chamber, their bottoms being arranged at an obtuse angle to the side of the chamber and being provided with double glass windows 24 through which the workmen or operators may see to direct the lowering of the chamber, it being understood that the conduit 13 in addition to carrying cables for the electrical energy required, may also have extended therethrough telephone wires by virtue of which communication between the chamber and the vessel may be maintained. The chamber is also provided with windows 25 in the floor 26. The windows 25, as indicated in Fig. 3, are provided with cover plates 27, each of which includes a valve 28. Through the windows 25 the operators may see the position of the chamber as it is lowered upon the submarine. Before opening the covers 27, however, the operators open the valves 28 to determine the water tight condition of the windows 25 whereby to avoid removal of said cover plates in event the windows are broken or leaking.

For supplying oxygen to the passengers in the chamber, an annular oxygen tank 29 is provided which surrounds the chamber, thus being out of the way of the occupants of the chamber 10, and oxygen may be delivered therefrom to the interior of the chamber through the valve 30, the arrangement being such that compressed oxygen is adapted to be carried with the chamber so that a supply of oxygen from the vessel is not necessarily required. The pipe connection 30^a (Fig. 2) of the valve 30 passes through the walls of both the chamber 10 and tank 29, thus assisting in keeping the tank from slipping down.

The chamber is also provided with an annular surrounding buffer 31 which is positioned around the chamber adjacent the floor 26 and is, as illustrated, formed of rubber tubing or the like, so that damage by forcible contact of the chamber with another object is minimized. The outer periphery of the buffer extends beyond the most prominent one of the elements 23, 29 (Fig. 2) so as to afford

protection thereto during movement of the chamber 10 in one direction. The buffer is mounted upon means 31^a on the side wall of the chamber 10. The chamber also includes illuminating means, such as the lamps indicated at 32, positioned in the floor 26 of the chamber. Other illuminating means may, if desired, be provided. The illuminating means 32 are adapted to cast light both into the chamber and downwardly therefrom so that by looking through the windows 25 as the device is lowered, the submarine may be readily seen in order that the device may be readily positioned properly upon the submarine. The lamps 32 are as indicated in Fig. 8, associated with the magnetic control circuit of the device.

For securing the chamber to the submarine and for sealing the same to the submarine in water-tight relation, there is provided depending from the floor 26, an electromagnetic engaging member including an annular hollow casing 33 within which electromagnets 34 are arranged, the casing defining an annular chamber 35 which accommodates said magnets. The lower open end of the casing is closed by a removable closure assembly including an annulus 36, as shown in detail in Figs. 6 and 7 of the drawings and includes a removable cover 37 provided with a valve 38, which cover is secured to the upper face of the annulus 36 by suitable bolts 39. The closure assembly further includes a transparent panel arranged within and seated upon an internal annular shoulder 41 to which it is bolted or otherwise secured, the arrangement being such that after the casing 33 has been magnetically attached, testing of the water tight condition of the transparent panel 40 may be accomplished through the medium of the valve 38 prior to the removal of the cover for observation shown in Figs. 6 and 7 has formed on its lower reduced periphery, a plurality of integral circumferentially extending lugs 42 having sloping or inclined upper surfaces 43. The casing 33 includes an inwardly extending flange 44 which has projecting portions 45, adapted to be received between the upper surface of the lugs 42 and the top flange of the annulus 36.

The present invention also comprehends for use in connection with the device a submarine hatch structure 46, as shown in Fig. 5, which hatch structure is permanently riveted to the submarine 17 by rivets 47, and includes concentrically arranged circumferentially spaced upwardly offset inclined tongues 48 which tongues coincide with the arrangement of the lugs 42 are adapted to be aligned with the projections 45 of the flange 44, whereby the tongues 48 and the projections 45 may be jointly received between the lugs 42 and the top flange of the member

36 and locked together by rotary movement of the annulus 36 to afford means for hermetically sealing the device in communication with the submarine 17. The hatch 46 is depressed at 46^a to provide a guide which enables the ready "finding" of the position in which the coupling mechanism 35 or 36 is to be actuated in respect to the hatch 46.

The casing 33 is supported from the bottom of the chamber 10, by chains 49 in conjunction with a collapsible or bellows like flexible tubing 50, the folds of which are supported by internal and external steel reinforcing bands 51 which also function to resist external pressure and prevent radial inward collapsing of the tubing. The tubing is secured to the under surface of the floor 26 by any suitable means such as the bolts 52, the arrangement being such that the tubing provides a flexible connection between the body member 10 and the submarine to establish communication between the chamber and the interior of the submarine, the chains 49 serving to prevent damage to the tubing 50 by relieving it of strains and stresses. The floor 26 of the chamber 10 is provided with a central manhole having a removable cover 53, normally secured in place the arrangement being such that upon removal of the cover 53 access may be gained through the tubing 50, to the submarine 17 from the chamber.

In conjunction with the securing of the chamber to the submarine by the co-operating lugs 45 and tongues 48, the electromagnets play an important part in such securement. The lower portion of the casing 33 is provided with an apertured rubber pad 54, through which pole pieces 55 of the magnets extend for magnetic securement of the casing 33 with the hatch 46. The pad ordinarily closes any hole through which there might be communication of the inside of the hollow casing 33 with the outside, but when the electro-magnets are energized the pad is put under compression and then augments the sealing-off function. Within the circle formed by the tongues 48, the hatch 46 is provided with a manhole, normally closed by a removable cover 56, the arrangement being such that when energy is applied to the magnets, they in conjunction with the securement of the tongues 48 with the projections 45 by means of the annulus 36, securely hermetically seal the chamber with the submarine. The flexible chains 49 and tubing 50 permit a limited movement between the body member 10 and the submarine 17, without disturbing the sealed communicating relation therebetween.

For properly alining the casing 33 with the hatch 46, there is provided adjacent the lamps 32 and windows 25, armholes 57, with which are associated downwardly extending flexible waterproof sleeves 58 closed at the

lower ends and open at the upper ends where they communicate through the armholes 57 with the interior of the body 10 and within which the arms of the operators are received, so that while making observations through the windows 25, the casing 33 may be manually adjusted to bring the same in proper alignment with the hatch 26, in order to dispose the projections 45 in juxtaposition to the tongues 48. With such alignment obtained, the annulus 36 may be turned to engage the lugs 43 with the tongues 48. This having been accomplished, the cover 37, panel 40 and manhole cover 56 of the submarine are successively removed in order that the occupants of the chamber may enter the submarine through the hatch manhole.

In the operation of the present device, the same functions in a way similar to that of a diving bell. When the submarine is fouled on the bottom of the ocean, a surface vessel carries the device over the submarine. Operators are admitted to the chamber through the manhole 19 and after properly sealing said manhole, the chamber is lowered over the submarine. When the casing 33 of the chamber is properly positioned over the hatch 46 of the submarine, electrical energy is supplied to the magnets and the annulus 36 is turned, whereby the two in conjunction securely lock the device to the submarine with the chamber in sealed water tight communication with the submarine.

Referring more particularly to Fig. 8, it will be seen that the circuit to the magnets 34 is divided, every other magnet being energized through the switch assembly indicated at 59, while the remaining magnets are energized through the switch 60. The circuit includes a voltmeter and ammeter as indicated, together with the lights 32 which are separately controlled through switches 61. The energy for the circuit is preferably supplied through a conductor extending through the conduit 13 but, if desired, may be supplied through self-contained batteries or the like within the chamber.

From the foregoing it will readily be seen that the present invention provides a novel, simple and improved device for accomplishing the rescue of the crews or the salvaging of sunken submarines or for other submarine work. It will be understood that the present invention is not confined to the specific structural details herein shown but that numerous changes, modifications and the full use of equivalents may be resorted to in the formation of the present invention without departing from the spirit or scope of the same as outlined in the appended claims.

What is claimed is:

1. In apparatus of the character described having a chamber; means for suspending the chamber from a raising and lowering cable, said means comprising a ring attached to the

top of the chamber with which said ring the cable is connected, brace means attached to the ring and extending toward the sides of the chamber, struts substantially on top of the chamber to space the brace means from the edge of the chamber, and anchorage means jutting out from the sides of the chamber substantially in line with the struts and relatively close thereto for the affixation of the brace terminals.

2. In apparatus of the character described having a chamber, and a plurality of cables leading to the chamber, one of the cables being for the suspension of the chamber; means for keeping the cables separated and preventing fouling, said means including buoys, and means for attaching the buoys to the respective cables.

3. In apparatus of the character described having a chamber; a separate, annular oxygen tank of an internal diameter sufficiently larger than the outside of said chamber to enable its mounting on the outside of the chamber to avoid obstructing the inside, and a valve for controlling the flow of oxygen from the tank into the chamber, said valve having a connection passing through the contacting walls of the chamber and the tank to assist in keeping the tank from slipping in reference to the chamber.

4. In apparatus of the character described having a chamber, and outstanding elements on the outside of the chamber being necessary to the functioning of the apparatus; an annular buffer of hollow, flexible tubing having its outer periphery extending beyond the most prominent of said outstanding elements to protect said elements from striking obstructions during lowering of the chamber, and means for mounting the buffer on the side wall of the chamber in an outstanding position near the bottom of the chamber.

5. In apparatus of the character described having a chamber; a casing carried by the chamber, through which casing communication of the chamber is to be established with a body, means for connecting said casing with the body comprising coupling elements carried both by the casing and the body, and electro-magnetic means for temporarily holding the casing against the body preparatory to interlocking said coupling elements.

6. In apparatus of the character described having a chamber; a casing carried by the chamber through which communication of the chamber with a body is to be established, coupling elements carried inside of the casing, complementary coupling elements carried by the body; an annular resilient pad surrounding all coupling elements, being carried by the casing to be interposed between the casing and the body, and means also carried by the casing and acting against the body to compress the pad thus producing an

annular seal preparatory to interlocking said coupling elements.

7. In apparatus of the character described having a chamber; means to attach the chamber to a body with which communication is to be had, said means comprising a hollow casing, electro-magnets housed in the hollow part of the casing having the similar ends of their pole pieces projecting beyond the casing for contact with the body, a resilient pad fitted upon the pole pieces and contacting the adjacent surface of the casing to seal off any opening through which communication of the inside of the hollow casing with the outside might be established, and means to energize the electro-magnets when the pole pieces contact said body, thus putting the pad under compression and augmenting the sealing off function.

Signed at Brooklyn, New York, in the county of Kings and State of New York this 8th day of October A. D. 1929.

ANTONIO FURINO.