

Sept. 22, 1936.

E. GEROLAMI ET AL

2,055,286

SALVAGE DEVICE FOR SUBMARINES

Filed Oct. 23, 1934

3 Sheets-Sheet 1

Fig. 1

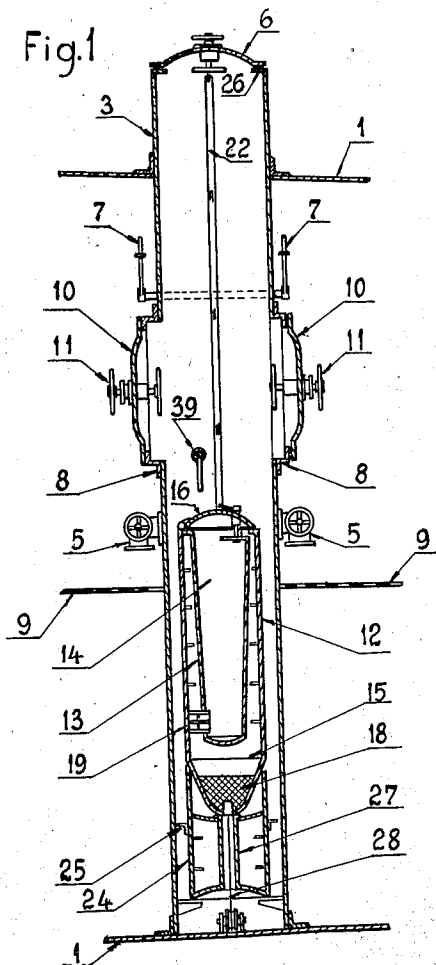


Fig. 7

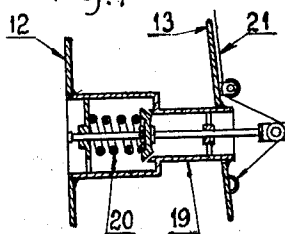


Fig. 8

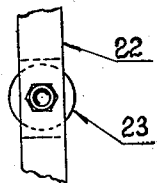


Fig. 9

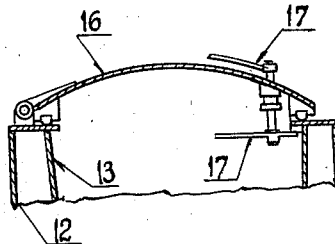


Fig. 6

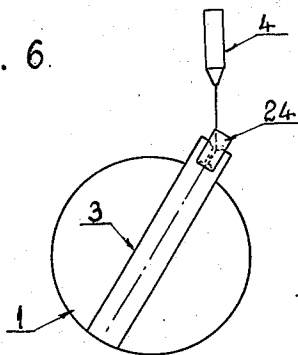
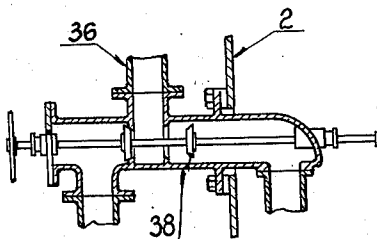


Fig. 10



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Fig. 2

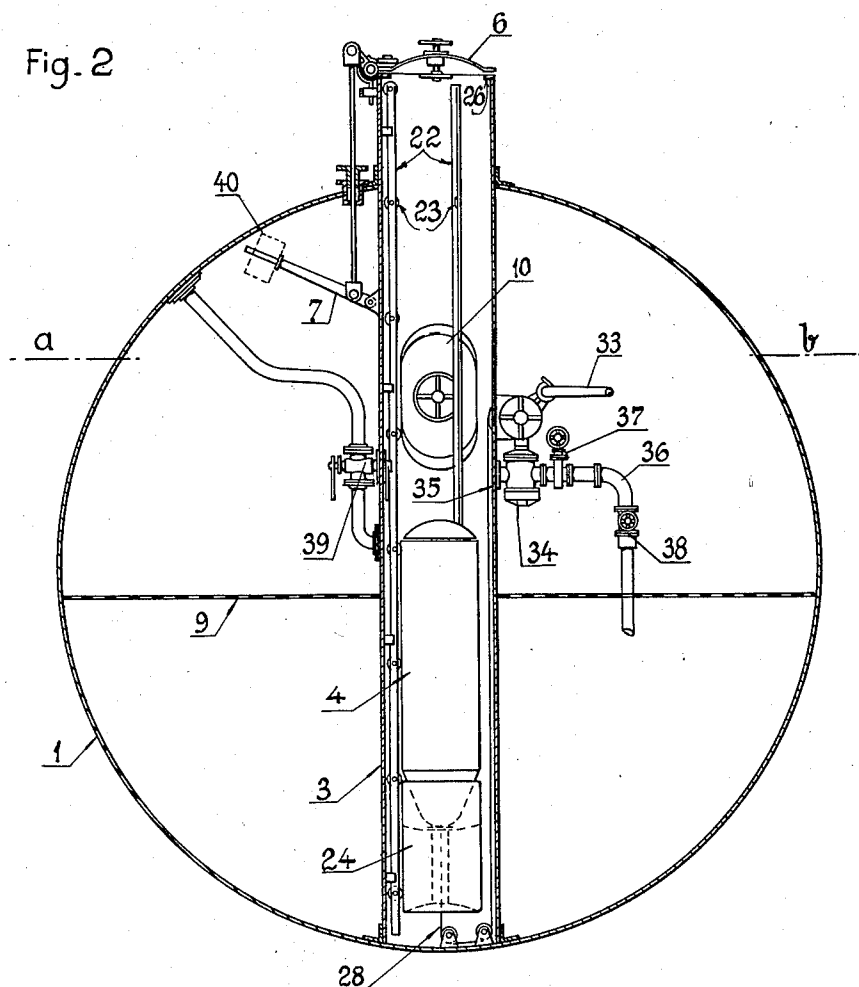
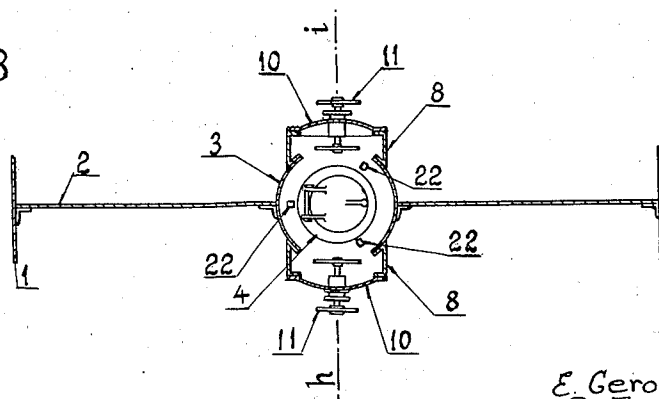


Fig. 3



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Fig. 4.

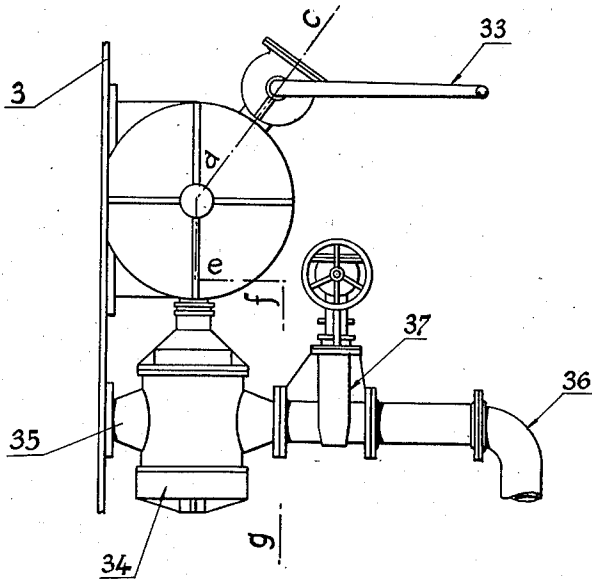
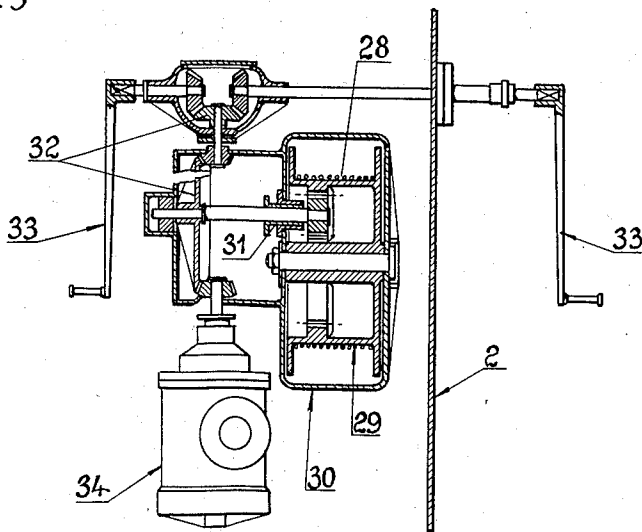


Fig-5



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UNITED STATES PATENT OFFICE

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SALVAGE DEVICE FOR SUBMARINES

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3 Claims. (Cl. 114—16.7)

This invention relates to the general class of salvage devices for submarines, in which the men to be rescued are brought up to the surface of the sea by means of a watertight vessel or buoy, connected to a rope the other end of which is wound on the drum of a winch which is operated from within the submarine, the buoy being normally housed within a watertight chamber provided with the necessary flooding and draining arrangements as well as with an upper opening for communicating with the sea and another opening for communicating with the interior of the submarine, both fitted with watertight doors.

One object of this invention is to provide in the salvage devices of the class referred to, improved means for facilitating the egress and ingress of the buoy into the watertight chamber especially when the submarine is lying in an inclined position.

A further object is to provide, in addition to hand power means, an infallible mechanical power means for driving the rope winch.

Another object is to eliminate the danger of the buoy, if flooded when on the surface owing, for example, to rough sea, sinking to the bottom and thus excluding any further use of the salvage device.

With the foregoing and other objects in view, the invention consists of certain novel features of construction, combinations and arrangements of parts, one satisfactory embodiment of which is disclosed by the accompanying drawings.

In the drawings:

Figure 1 is a longitudinal vertical sectional view of the salvage device;

Figure 2 is a transversal view of the salvage device, partly in section and partly in elevation;

Figure 3 is a horizontal sectional view of the submarine and the salvage device, taken along line *a-b* of Figure 2;

Figure 4 is an enlarged elevational view of the hydraulic and hand driven winch as shown in Figure 2;

Figure 5 is an enlarged view of the winch, partly in section and partly in elevation, along line *c-d-e-f-g* of Figure 4;

Figure 6 is a diagrammatic cross-sectional view of the submarine and the salvage device, showing one function of the auxiliary vessel;

Figure 7 is an enlarged sectional view of the salvage buoy's flooding and draining valve.

Figure 8 is an enlarged, fragmentary detail view of a guide rail;

Figure 9 is an enlarged view, partly in section

and partly in elevation, of the salvage buoy's upper end;

Figure 10 is an enlarged view, partly in section and partly in elevation of the double valve fitted on the hydraulic motor's discharge conductor.

In the drawings, 1 is the hull of the submarine, 2 a watertight bulkhead thereof and 3 the watertight chamber housing the salvage buoy 4 in its lower part.

This watertight chamber is preferably of cylindrical shape, in order to withstand the water pressure better when it is flooded, and it preferably extends down the full depth of the bulkhead so as to constitute of itself an efficient strength member thereof.

The watertight chamber is fitted with the usual flooding and draining means, all of which can be operated from either side of the bulkhead. These means include two drain valves, 5 leading to the adjoining compartments for direct drainage of the water into the bilges in the event of failure of the electric current supply for the bilge pump motors.

The watertight chamber 3 is further provided upon the crown with an opening of such size as to allow the free passage through it of the salvage buoy 4.

This opening is fitted with a watertight spring-balanced hinged cover 6, which can be operated by hand from both of the adjoining compartments of the submarine, preferably by means of a lever-gear 7.

The watertight chamber is also provided with two openings 8, arranged at the sides. These, as shown, are situated in the upper part of the chamber above the floor 9 of the submarine, and they respectively communicate with the two adjoining compartments while providing through the chamber 3 a means of access from one of the compartments to the other.

The said openings 8 are fitted with watertight doors 10, the locking mechanism 11 of which can be worked from either side of the door.

With the above arrangement of the watertight chamber and its accessories, the salvage device can be used from two compartments of the submarine. Also, the upper part of the chamber 3 can be utilized as an entrance hatchway to these two compartments, independently of the presence of the buoy, thus dispensing with the necessity of fitting separate hatchways therefor, and also as a transfer passageway from the one compartment to the other, thus avoiding the need of fitting a separate watertight door for this purpose in the bulkhead.

The salvage buoy 4 is of cylindrical shape, with the lower end preferably conical, and is composed of an outer shell 12 and an inner shell 13, both watertight and of sufficient strength to withstand the water pressure corresponding to the maximum depth at which the salvage device is to be used. The internal chamber 14 of the buoy is of sufficient capacity to house one man. The space 15 between the two shells, constituting an air chamber, is of such capacity that even in the event of the internal chamber 14 becoming completely flooded, the buoy will still possess sufficient buoyancy to remain afloat.

Further, the arrangement of the internal chamber 14 is such that, when the said chamber is flooded, the stability of the buoy is reduced to a minimum in order to facilitate the latter, when withdrawn into the submarine, to assume the necessary inclination for entering into the watertight chamber, in case the submarine is lying in an inclined position.

The upper end of the buoy is provided with an opening of such size as to allow the free passage of a man and is closed by a watertight hinged cover 16, the locking gear 17 of which can be operated from either side of the cover. At the lower end of the buoy, a suitable amount of solid ballast 18 is fitted, intended to keep the buoy in an upright position, when floating on the surface of the sea. At the bottom of the internal chamber 14 it is desirable to fit a drain and flooding valve 19, which is normally kept closed by means of a spring 20 and can be opened by means of the rope 21 from the upper part of the chamber 14.

In order that the buoy 4 shall guide smoothly along the chamber 3, the latter is provided with at least three guide rails 22, which are preferably fitted with anti-friction rollers or balls 23. The buoy 4 normally rests upon a buoyant body 24 (referred to herein as the auxiliary vessel) the important function of which is to facilitate the egress and ingress of the buoy 4 into the chamber 3, especially when the boat is lying in an inclined position.

The auxiliary vessel is of watertight construction and preferably of cylindrical shape. It is closed at both ends and designed to resist the same water pressure as the buoy 4. It has preferably the same diameter as the buoy 4 and is so arranged as to be capable of automatically rising by its buoyancy nearly to the upper end of the chamber 3 where its upward movement is arrested by one or more stops 25 on the vessel 24 engaging with the ring 26 at the upper end of the chamber 3. Extending along the vertical center line of the auxiliary vessel is a tube 27 open at both ends for the passage of a rope 28, one end of which is connected to the bottom of the buoy 3 and the other end to a drum 29 on which the cable is normally wound.

The auxiliary vessel 24 fulfills two functions; firstly it facilitates the egress of the buoy 4 from the chamber 3, by exerting an additional upward thrust upon the buoy, and secondly, it forces the rope 28 to pass through the center of the chamber 3 at the upper end thereof, thus facilitating the ingress of the buoy 4 into the chamber 3 even when the boat is lying in an inclined position, as clearly shown in Figure 6.

The drum 29 is housed in a watertight casing 30, communicating with the chamber 3. The shaft, fitted with a pinion for rotating the drum, extends out of the casing 30, passing through a watertight gland therein 31 and is

driven by means of a suitable gear 32 operable by means of cranks 33 from either side of the bulkhead.

In order to reduce to a minimum the necessary man power to be expended in operating the salvage device, the rope drum is fitted for operation also by means of a suitable hydraulic motor 34 fed from the outer sea and discharging the water into the interior of the submarine. This type of motor drive gives the important advantage over all others proposed hitherto, in that it uses a source of energy which can never fail in a sunken submarine, namely, the energy due to the difference of pressure between the surrounding water and the interior of the submarine.

The hydraulic motor must of course be capable of developing the power necessary to exert the necessary pull on the rope 28. With regard to its construction, it can be of any known type provided it be suitable for working with water pressure.

The inlet 35 of the hydraulic motor communicates with the sea preferably through the chamber 3. The discharge from the motor is led by way of another pipe 36, fitted with a stop valve 37 and a double valve 38, both controllable from either side of the bulkhead, to the bilges of both the two adjoining compartments of the submarine, the valve 38 being of such construction as to allow of the passage of water selectively to either side of the bulkhead, as shown in Figure 10.

To permit the escape of the last survivor, the flooding valve 39 is fitted on the wall of chamber 3, so as to be operable also from the interior of the chamber.

Operation

The man to be rescued enters into the watertight chamber 3 through one of the openings 8, opens cover 16 of the salvage buoy, enters into same and closes the said cover. After the watertight door 10 has been closed by the other members of the crew, the valve 39 for flooding chamber 3 is opened. The water penetrating into the chamber presses the air contained therein and lifts the buoy and the auxiliary vessel 24 until they are stopped by cover 6. As soon as the pressure inside the chamber 3 has equalized the outside pressure of the sea, the cover 6 being spring-balanced and pushed also by the buoy, opens automatically, thus giving free passage to the buoy which now ascends up to the surface of the sea, whereas the auxiliary vessel remains stopped at the mouth of chamber 3, as shown in Fig. 4.

Should the cover 6 not automatically open, owing for instance to the inclination of the submarine which reduces the thrust of the buoy, said opening can be facilitated by the crew by acting on the lever 7.

As soon as the man in the buoy has noticed that he has reached the surface of the sea, he will open the cover 16 and leave the buoy after having opened valve 19 in order to flood the internal chamber 14 of the buoy and so reduce its buoyancy and stability. As soon as the crew in the sunken submarine have received the signal (by means of hammering on the buoy itself or by any other means) that the man has left the buoy, they will start operating the winch by means of the hydraulic motor or by hand so as to draw in the buoy. For starting the hydraulic motor it is necessary first to open that part of

the double valve 38, which leads the discharge water from the motor to that internal compartment into which it is desired to discharge it and afterwards open stop valve 37. The buoy upon reaching the mouth of chamber 3 will also push down the auxiliary vessel and as soon as both have completely entered into the chamber, the cover 6 will be closed by the crew and both chamber 3 and the buoy will be drained either by means of a pump (if available) or by direct discharge into the bilge of one of the adjoining compartments. Now the door of chamber 3 can be opened and the device is ready for the next salvage operation.

The last man to be rescued, after having drawn in the buoy, closed the door and drained the watertight chamber, will apply a balance weight 40 to the lever 7, said weight having the function of substituting the man power which in some cases, as stated before, might be necessary for assisting the opening of the cover.

He now enters chamber 3 and locks the entrance door from inside the chamber. He then steps into the buoy and, before closing its cover, he opens the flooding valve 39, which will allow flooding of the chamber and his reaching the surface of the sea without any help from outside.

It is obvious that the buoy can also be used for introducing into the sunken submarine men or materials which might be useful for salvage operations or any other purpose. In this case, of course, the buoy will not be flooded before withdrawal into the submarine.

Having now particularly described and ascertained the nature of our said invention and in what manner the same is to be performed, we declare that what we claim as new and desire to protect by Letters Patent is:

1. A device for rescuing the crew of sunken submarines, comprising a tubular watertight chamber combined with a watertight bulkhead of a submarine, an opening at the top of said chamber fitted with a spring-balanced watertight hinged cover, operating means for the cover comprising a lever gear operable from both sides of the bulkhead, two laterally arranged openings at the upper part of said chamber fitted with watertight doors, locking mechanism for the doors operable from either side thereof, means for flooding said chamber controllable from both sides of the bulkhead as well as from the interior of the chamber, means for draining said chamber with the pumps as well as by direct discharge into the bilge of the submarine and also controllable from both sides of the bulkhead, a salvage buoy normally housed in the lower part of said chamber and provided with a hinged closure at its upper end, said buoy being composed of a double shell so arranged as to form an internal chamber capable of housing at least one man and an air chamber between the shells capable of keeping the buoy still buoyant when the internal chamber thereof is flooded, a hollow buoyant vessel arranged underneath the said buoy, freely movable from its rest position to the upper end of the said chamber and having along its vertical center line a tubular opening, a flexible rope attached to the bottom of the above said buoy, passing through the tubular opening of said buoyant vessel and wound on a drum, said drum being rotatively mounted in a watertight casing communicating with the above said chamber and operatively connected to a driving mechanism

capable of rotating it, said mechanism being operable by means of hand power from both sides of the bulkhead.

2. A device for rescuing the crew of sunken submarines, comprising a tubular watertight chamber combined with a watertight bulkhead of a submarine, an opening at the top of said chamber fitted with a spring balanced watertight hinged cover, operating means for the cover comprising a lever gear operable from both sides of the bulkhead, two laterally arranged openings at the upper part of said chamber fitted with watertight doors, locking mechanism for the doors which is operable from either side thereof, means for flooding said chamber controllable from both sides of the bulkhead as well as from the interior of the chamber, means for draining said chamber with the pumps as well as by direct discharge into the bilge of the submarine and also controllable from both sides of the bulkhead, a salvage buoy normally housed in the lower part of said chamber and provided with a hinged closure at its upper end, said buoy being composed of a double shell so arranged as to form an internal chamber capable of housing at least one man and an air chamber between the shells capable of keeping the buoy still buoyant when the internal chamber thereof is flooded, a hollow buoyant vessel arranged underneath the said buoy freely movable from its rest position to the upper end of the said chamber and having along its vertical center line a tubular opening, a flexible rope attached to the bottom of the above said buoy, passing through the tubular opening of said buoyant vessel and wound on a drum, said drum being rotatively mounted in a watertight casing communicating with the above said chamber and operatively connected to a driving mechanism capable of rotating it, said mechanism being operable by means of hand power from both sides of the bulkhead, a suitable hydraulic motor, operatively connected to said mechanism in association with said hand drive, said motor being capable of the output necessary for driving said mechanism when the buoy is being drawn back into the submarine, a water conductor between the inlet of said motor and the exterior of the submarine, a discharge water conductor leading from the discharge of said motor to the bilges of the submarine, a stop valve controlling the passage through said discharge conductor and controllable from either side of the bulkhead, a double valve on said discharge conductor also controllable from either side of the said bulkhead, said double valve being capable of conveying the discharge water from the said motor selectively to either side of the said bulkhead.

3. A device for rescuing the crew of sunken submarines, comprising a tubular member forming a watertight compartment having an opening at the top thereof, a cover for said opening, operating means for the cover for raising or lowering said cover, said compartment also having laterally arranged openings, watertight doors fitted in said last mentioned openings, means for locking said doors, means for flooding said compartment, means for draining water from said compartment into the bilge of the submarine, a salvaging buoy normally housed in said compartment and provided with a hinged closure at its upper end, said buoy being composed of a pair of shells so arranged as to form an internal chamber capable of housing at least one

man, and an air chamber between the shells capable of keeping the buoy still buoyant when the internal chamber thereof is flooded, a hollow buoyant vessel arranged underneath the said buoy, freely movable from its rest position to the upper end of said compartment, an open-ended tube extending vertically through the center of said vessel, a drum, a rope attached to the bottom of said buoy, passing through said tube and wound on said drum, a casing for said drum, said drum being rotatably mounted in said casing, and a driving mechanism operatively connected to said drum for rotating the latter. 5

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