This invention relates to improvements in escapes for submarines.

The primary object of this invention is to provide an escape for a submarine having an air chamber carried thereby for assisting in raising the escape to the surface of the water.

A further object of this invention is to provide a windlass for holding the submarine escape compartment and air chamber in a vertical opening formed in the submarine so that a packing member carried by the upper end of the opening may be engaged by the flanged portion of the air chamber and prevent the leakage of water into the opening in which the escape is positioned until after the occupants of the submarine have all safely entered the escape chamber.

A still further object of this invention is to provide guideways carried by the opening in the submarine for guiding the escape chamber and air compartment during its upward travel prior to its release from the submarine.

A still further object of this invention is to provide a submarine escape with positive means for projecting the escape from the opening in the submarine after the submarine has sunk or has become damaged so that it cannot be moved under its own power.

Other objects and advantages of the invention will become apparent during the course of the following description forming a part of this specification and in which,

Figure 1 is a vertical cross-sectional view taken through the central portion of a submarine showing the embodiment of the invention incorporated in an opening formed in the submarine and illustrating the escape chambers and other detailed elements of construction seated within the opening of the submarine;

Figure 2 is a fragmentary cross-sectional view illustrating the valve for the air chamber which is connected to the upper portion of the escape chamber;

Figure 3 shows a modified form of the invention in which the air chamber is provided with a hose extending through the escape chamber and connected to one end of a series of telescoped cylinders adapted to be extended when filled with air pressure to assist in moving the escape and air chambers upwardly;

Figure 4 is a vertical cross-sectional view showing the telescoped air chambers for assisting in moving the escape and air chambers upwardly; and

Figure 5 is a vertical cross-sectional view of the connection and hose employed for connecting the air chamber with the telescoped cylinders.

In the drawings, the reference character 6 designates a submarine having decks 7 and 8 and a floor 9. The submarine 6 is provided with an opening extending from the floor 9 to the top thereof and said opening is provided with a pair of vertical guide bars 10 fastened to the bottom wall by means of a plate 11 bolted to the floor 9 by means of bolts 12 on the opposite end of which are provided nuts 13. The plates 11 are surrounded by a housing 14 to assist in excluding water from passing through the bolt holes formed in the floor 9.

The top wall of the submarine is provided with an annular bowl portion 15 having an annular groove 16 to which connects the upper ends of the guide bars 10.

Seated in the bowl portion 15 of the opening is an air chamber 17 having an enlarged head 18, the upper portion of which is curved as at 19 and the circular edges are curved as at 20. The head 16 is adapted to be seated in the bowl 15 and a packing member 21 interposed between the head 18 and the bowl 15 whereby an annular rib 22 will force the rubber packing element 23 downwardly into the recess 16.

The air chamber 17 is circular in cross-section and has its lower end formed in a bulbous fashion whereby a pipe 23 may be formed integral therewith so that air may be forced into the air tank 17 by threading the air pipe onto the screw threads 24. As shown in Figure 2, the air pipe 23 is provided with the valve 25 mounted on a reciprocating stem 26 guided in the tube 23 by means of a support 27. A coil spring 28 encircles the guide rod 26 and normally holds the valve 25 seated on its seat 30. A nut 31 and washer 32 prevent the coil spring from being displaced relative to the guide rod 26.

The lower bulbous portion of the air tank 17 is provided with a cylinder 33 having a reduced screw threaded portion 34 adapted to be covered by a screw cap 35. Formed integral with the cylindrical portion 33 of the bulbous lower portion of the air tank 17 is an adjacent escape chamber including a top wall 36 having the outer surface thereof formed conical while the inner surface is formed horizontal and said top wall is provided with an opening 37 whereby the passengers in the escape chamber may gain access to the screw cap 35 should it be desired to release a portion of the air from the air
chamber 17. The escape chamber 39 is formed circular and is provided with a bottom wall 40 and a central horizontal partition 41 thereby providing two chambers 42 and 43 for the crew and passengers of the submarine.

The floor 40 of the escape chamber 39 is provided with an entrance 44 having external screw threads adapted to receive the internal screw threads of a top or closure 45, and an operating member 46 is provided on the inner wall of the cap 45 so that the cap may be removed by the occupants within the escape chamber 39. Also formed in the escape chamber 39 are windows 47 so that the occupants therein may determine the arrival of the escape chamber to the surface of the water. An opening 48 is formed in the horizontal partition 41 so that the occupants in the escape chamber may pass from the compartment 45 to the upper compartment 42 and vice versa.

The air chamber 17 and escape chamber 39 are provided with vertical ribs 50 and 51 respectively arranged diametrically and said ribs operate in a slot 52 forming a vertical guide member whereby the air chamber 17 and escape chamber 39 will be centered relative to the opening in the submarine.

The means for retaining the air tank 17 and the occupant chamber 39 within the submarine includes a rotary shaft 53 journaled as at 54 in the guide members and one end of said shaft extends outwardly from the guide rail 10 and is provided with a gear 55 adapted to mesh with a gear 56 secured to the crank shaft 57 having a hand crank 58 on the end thereof. The crank shaft 57 is journaled in a bearing 59 formed on the extreme upper end of a bracket 60 secured to the vertical guide rail 10 as at 61. The extended end of the shaft 53 is also journaled in the bracket 60 as at 62. Rigidly secured to the rotary shaft 53 are a series of spaced disks 63 adapted to form a windlass upon which a cable 64 may be wound and the free end of the cable 64 having its ends secured to eye-bolts 65 having eyes 66 and said eye-bolts 65 are anchored in the floor 40 of the escape chamber 39 by means of nuts 67. Cape 68 are provided with internal screw threads adapted to engage the external threads formed on the bosses 69 so that the cap 68 may completely enclose the free ends of the eye-bolts 65 and prevent water from gaining access to the interior of the escape chamber 39 through the bolt holes.

In the form of the invention shown in Figures 1 and 2, it will readily be observed that all the occupants of the sunken submarine enter the escape chamber 39.

The caps 68 are removed and the nuts 67 uncoupled from the bolts 65 whereby the escape chamber 39 will be released and the buoyancy of the air chamber 17 will cause the unit to ascend and the caps 68 may be replaced to prevent the intrusion of water into the interior of the escape chamber 39.

The form of the invention shown in Figures 3 to 5 inclusive comprises an opening formed in the submarine 6' in the top wall 7'. Extending from the floor 9' of the submarine to diametrical points relative to the opening is a pair of guide bolts 10' anchored to the floor 8' by means of plates 11' held in place by bolts 12' on the opposite end of which are provided nuts 13'.

The vertical guide rails 10' are provided with slots 14' and at spaced intervals along the slots 14' are positioned anti-friction balls 15' movably mounted in sockets 16'.

The opening in the top deck 7' of the submarine comprises a bowl-shaped portion 18' having an annular recess 19' formed on the marginal edge of the bowl-shaped opening 15'. Mounted between the vertical guide rails 10' is an air chamber 17' having a top wall 18' extending radially a short distance from the vertical walls of the air chamber 17'. Formed on the extended portions is an annular rib 20' interposed between the annular portion 19' and the top wall 18' of the air container 17' is a rubber packing member 21' for preventing the intrusion of water into the interior of the submarine under normal conditions.

The lower portion of the air compartment 17' is formed identical with the form of the invention shown in Figures 1 and 2 with the exception that the air inlet pipe 23' is provided with a screw threaded portion 24'. A manually operated valve 25' having a hand wheel 26' is interposed therein. At the extreme lower portion of the air chamber 17' there is provided a cylindrical portion 33' having a reduced externally screw threaded portion 35' to which may be screwed a cap 36'. Formed integral with the cylindrical portion 33' is an escape chamber having a conical upper wall 37' and cylindrical side walls 39'. The escape chamber 39' is provided with horizontal partitions 41' and 42' to form compartments 43', 44' and 45'. Openings 46' and 47' are provided for passing from one compartment to the other. Port holes 48' may be provided in the side walls of the escape chamber 39' for allowing the occupants of the means of determining when the surface of the water has been reached.

The air chamber 17' and escape chamber 39' are connected by guide rails 50' after the same 115 fashion as is shown in Figure 1 and the outer edge of the guide rails 50' engage the balls or anti-friction members 15' to allow the easy movement of the air chamber 17' and escape chamber 39' within the opening of the submarine.

Journaled in the lower ends of the guide rails 10' is a rotary shaft 53' having one of its ends extended through a bracket 60' and is provided with a gear 55' adapted to mesh with a gear 56' 125 rigidly secured to a crank shaft 57' having a handle 58'. Turning movement of the handle 58' causes the rotation of the shaft 53' to rotate the windlass drums 63' around which is wound a cable as 64'. The free end of the 130 cable is attached to an eye-bolt 65' as at 66' and said bolt 65' extends through an opening in the floor 40' of the escape chamber 39' and in the other end of the bolt is secured a nut 67' and completely enclosing the nut on the interior of 135 the escape chamber 39' is a cap 68' having internal screw threads adapted to be threaded on corresponding screw threads 69'.

Rigidly formed in the floor 40' of the escape chamber 39' is an inverted cup-shaped portion 140' 80' having a central boss 81' having internal screw threads for receiving a hose connection 82'. A cylinder 83' is provided at one of its ends with an annular flange 84' adapted to be bolted in place relative to the inverted cup-shaped floor 8' by means of plates 11' held in place by bolts 12' on the opposite end of which are threaded nuts 86'. The free end of the cylinder 83' extends into the cup-shaped portion 80' and is surrounded by a packing element 87'.
The lower end of the cylinder 83' is provided with an opening 88' in which is telescoped a cylinder 89' of smaller diameter. One end of the cylinder 89' is formed similar to the lower end of the cylinder 83' and is provided with a reduced portion 95' having an opening 97' for receiving a telescopic cylinder 95' on one end of which is formed a reduced portion 96' having screw threads 97' for receiving corresponding screw threads on a piston 98' around the circumference of which is a packing gland 99'. The lower end of the cylinder 95' is provided with a reduced portion 100' having an opening for receiving a rod 101' on the upper end of which is provided a reduced screw threaded portion 102' to which may be screw threaded a piston 103' also having a packing gland 104'.

The lower end of the rod 101' is pointed as at 105' to be received in a conical opening 106', formed in a support 107' having a lower channel portion 108' adapted to rest on a rod or support 109' carried by the floor of the submarine.

It is intended to employ the air pressure in the air tank 17' to assist in raising the escape chamber 39' from its opening in the submarine 6' by connecting the tank 17' to the cylinder 83' by means of a hose connection 109', one end of which is connected to the hose connection pipe 82' by means of pipe clamps 107'. Within the hose connection 109' is connected a nipple 111' having the screw threaded end portion 112' and a pointed portion 113' so that the nipple 111' may be easily inserted in the pipe 109'. After the nipple has been placed in position as shown in Figure 5, hose clamps 114' are clamped tightly about the hose 109' so that the same will enter annular recesses 115' formed in the nipple 111'. The screw threaded end 112' of the nipple is threaded into a manual valve 116' having a hand wheel 117' and said valve is connected to the screw threaded cap 36'.

In the floor 40' of the escape chamber 39' there is formed an opening 119' having an externally screw threaded portion adapted to receive a closure cap 120' on the inner end of which is provided an operating hand member 121' whereby the occupants within the escape chamber may unscrew the cap 120' after they have reached the surface of the water.

The operation of the invention as shown in Figures 3 to 5 inclusive is similar to that shown in Figures 1 and 2 inclusive with the exception that the compressed air contained in the air tank 17' may be fed to the telescopic cylinders 83', 89', and 95' whereby the cylinders will move relative to each other as shown in Figure 4 to their limit to project the escape chamber 39' and the air tank 17' from within the opening in the submarine 6'. After the telescopic cylinders have elongated to their limit, the rod 101 will be withdrawn from its pocket 101' so that the entire structure may leave the opening in the submarine.

It is to be understood that the form of the invention herewith shown and described is to be taken as the preferred embodiment of the same and that various changes in the shape, size and arrangement of parts may be resorted to without departing from the spirit and scope of the invention as claimed.

I claim:--

1. A vessel having an opening therein, a compressed air chamber having a restricted lower end, an escape chamber having a restricted upper end connected to the lower restricted end of the compressed air chamber, the connected chambers being slidably received in the vessel opening, means for sealing the opening against the intrusion of water, means for retaining the connected chambers in the vessel opening, a series of telescopic cylinders carried by and depending from the floor of the escape chamber and engaged with the bottom of the vessel, a pipe connecting the air chamber to the telescopic cylinders and a valve interposed between the compressed air chamber and cylinders whereby compressed air may be fed to the cylinders to extend the same and project the connected chambers from the opening.

2. A vessel having an opening therein, a compressed air chamber having a restricted lower end, an escape chamber having a restricted upper end connected to the lower restricted end of the compressed air chamber, the connected chambers being slidably received in the vessel opening, means for sealing the opening against the intrusion of water, means for retaining the 120 connected chambers in the vessel opening, a series of telescopic cylinders carried by and depending from the floor of the escape chamber and engaged with the bottom of the vessel, a pipe connecting the air chamber to the telescopic cylinders and a valve interposed between the compressed air chamber and cylinders whereby compressed air may be fed to the cylinders to extend the same and project the connected chambers from the opening, said pipe extending axially of the escape chamber with the air controlled valve set therein.

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