

E. W. COX.
 APPARATUS FOR SALVAGING SUNKEN SHIPS.
 APPLICATION FILED MAY 15, 1920.

1,379,533.

Patented May 24, 1921.

2 SHEETS—SHEET 1.

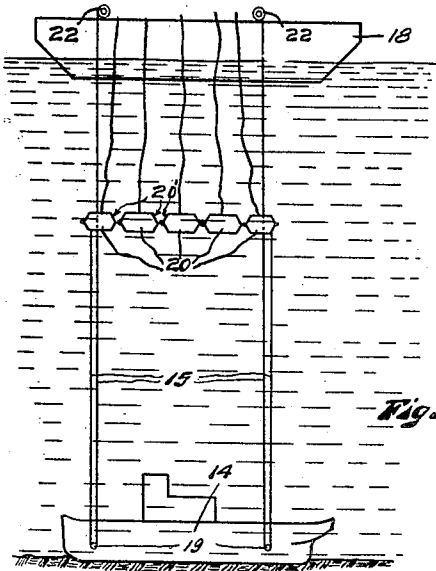


Fig. 2

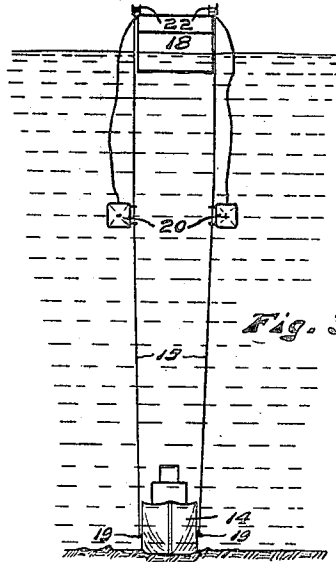


Fig. 3

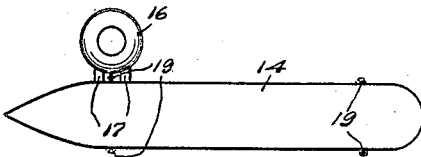


Fig. 1

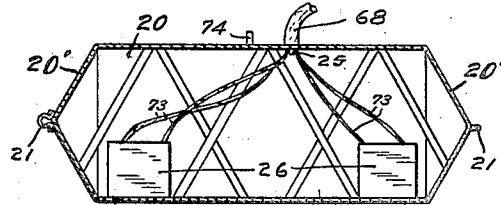


Fig. 4

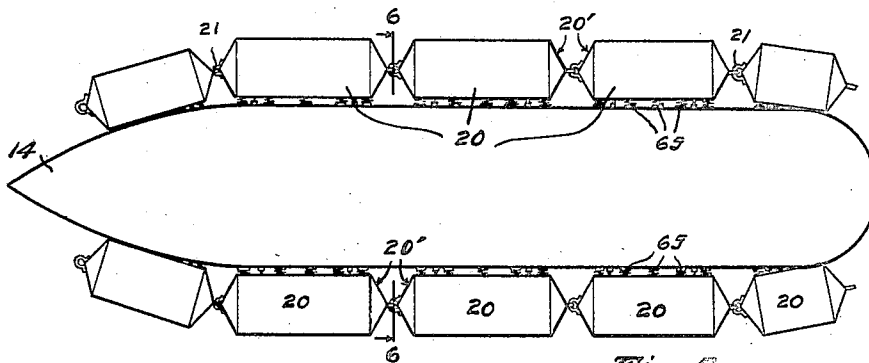


Fig. 5

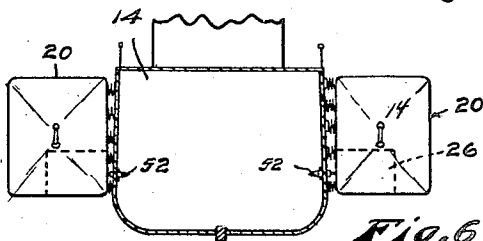


Fig. 6

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2 SHEETS—SHEET 2.

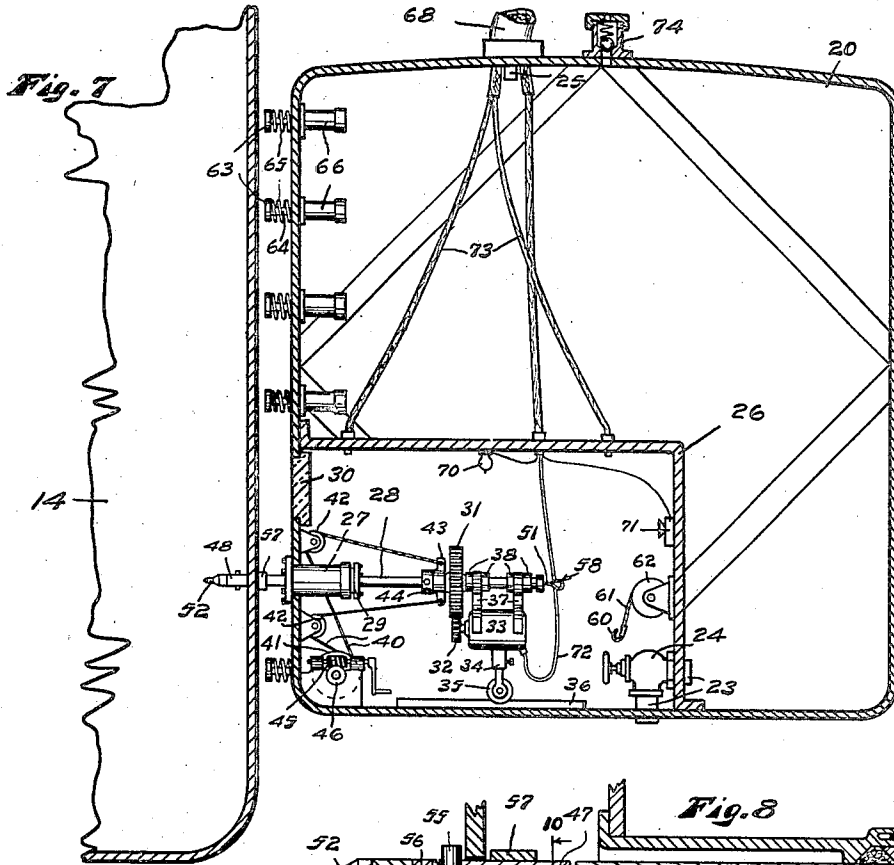
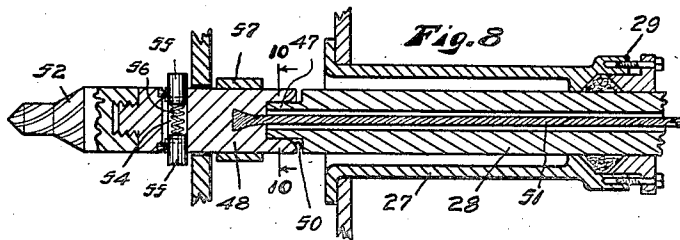
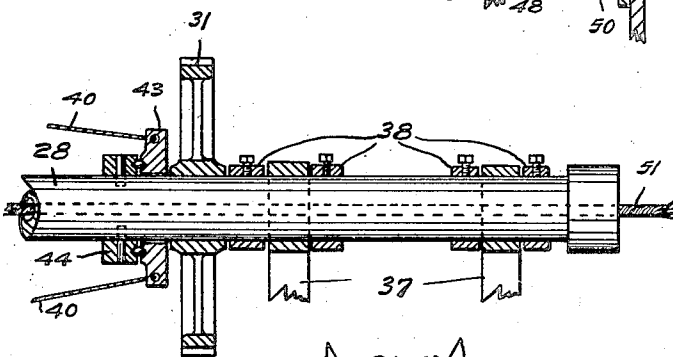
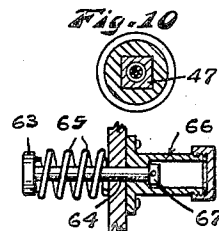
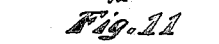


Fig. 9

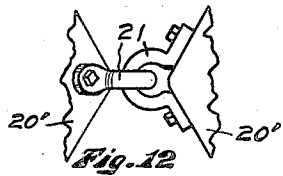


Fig. 12

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APPARATUS FOR SALVAGING SUNKEN SHIPS.

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Specification of Letters Patent.

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To all whom it may concern:

Be it known that I, EARL W. COX, a citizen of the United States, residing at Seattle, in the county of King and State of Washington, have invented a certain new and useful Improvement in Apparatus for Salvaging Sunken Ships, of which the following is a specification.

My invention relates to improvements in apparatus for salvaging sunken ships and the object of my improvement is to provide simple and efficient apparatus by the use of which sunken ships, in either deep or shallow water, may easily be raised and towed into port with a minimum amount of labor and expense and without inflicting serious damage on the ship.

A more specific object is to provide means whereby a sunken ship may be raised by the buoyancy of a plurality of air tanks that are first lowered, by permitting them to fill with water, and are then secured to the sunken ship whereupon air under pressure is admitted to force the water out to render the tanks buoyant.

Another object is to provide simple and efficient means for securing the buoyant tanks to the sides of a sunken ship.

A still further object is to provide automatic means for permitting the escape of compressed air from the buoyant tanks when the pressure within the tanks becomes greater than the water pressure on the outside of such tanks.

Other and more specific objects will be apparent from the following description taken in connection with the accompanying drawings.

In the drawings Figure 1 is a somewhat diagrammatic view illustrating one manner of securing guide cables to a sunken ship after the ship is located.

Fig. 2 is a somewhat diagrammatic view in side elevation showing the manner of lowering the buoyant tanks after the guide cables are secured to the ship.

Fig. 3 is a view in end elevation of the devices shown in Fig. 2.

Fig. 4 is a view in longitudinal vertical section of one of the buoyant tanks.

Fig. 5 is a somewhat diagrammatic plan view of a ship to which the buoyant tanks are secured.

Fig. 6 is a sectional view substantially on a broken line 6, 6 of Fig. 5.

Fig. 7 is a sectional view through one of

the tanks showing it in operative relation with respect to a ship's hull.

Figs. 8 and 9 are fragmentary views partly in section and partly in elevation showing details of the drilling apparatus.

Fig. 10 is a view in cross section on broken line 10, 10 of Fig. 8.

Fig. 11 is a fragmentary sectional view of a detail of the invention.

Fig. 12 is a fragmentary view in elevation showing a form of universal joint that may be used for securing the ends of adjacent tanks together.

Like reference numerals designate like parts throughout the several views.

After a sunken ship 14 has been located it is necessary to first secure guide cables 15 to the ship so that the buoyant tanks may be guided downwardly and secured thereto. This may be done by sending down a diving bell 16 to drill into the sides of the ship at four or more points substantially as shown in Figs. 1 to 3 inclusive and attach the cables 15 thereto. The diving bell may be provided with magnets 17 by which it may anchor itself securely to the hull of a steel ship while at work.

Each of the guide cables is preferably double as shown in Fig. 2 with its two ends secured to a ship or scow 18 on the surface of the water and the bight of the cable slidable within a drill shank 19 that is left anchored in the side of the ship by the operation of the diving bell 16.

The ship lifting apparatus comprises a plurality of hollow metal tanks 20 preferably of rectangular cross section as shown in Figs. 6 and 7 that are provided with conical ends 20' and are arranged to be secured together in chain like formation by links 21, see Fig. 12 that form universal joints and permit relative universal movement of the tanks with respect to each other.

In raising a ship two chains of tanks 20, as shown in Figs. 2, 3 and 5, are preferably used, one for each side of the ship, each of such chains of tanks being of a length substantially equal to or slightly less than the length of the ship.

The chains of tanks are preferably assembled in the proper lengths on the surface of the water and after the guide cables 15 are secured to the sunken ship on each side and near each end respectively one end of each of such guide cables is made fast to the end tank of each of the chains of

tanks and as the tanks are lowered the guide cables are wound in on drums 22 thereby guiding the tanks in their downward movement through the water and finally drawing the end tanks securely against the side of the ship 14.

The tanks are lowered or submerged by admitting water through pipes 23 that are opened and closed by valves 24. As the water fills the tanks 20 the air from within the tanks may be permitted to escape through a pipe or tube 25 that may be controlled from the deck of the scow 18.

Each of the tanks is internally provided with two or more air tight drilling compartments 26 wherein one or more operators may work and each of the drilling compartments is provided with a tube 27 that projects inwardly from the external wall of the tank and has a tubular drill shaft 28 projecting outwardly therethrough. The inner end of the tube 27 is provided with a stuffing box 29 to prevent the entrance of water.

Access to the interior of the drilling compartment is had through a port that is closed by a heavy glass door 30, the glass door also serving to permit the operator to see objects on the outside of the tank.

The drill shaft 28 has a gear wheel 31 secured thereon that meshes with a pinion 32 on the shaft of a motor 33. The weight of the motor 33 is supported on an extensible leg 34 having a roller 35 at its bottom end that runs on a track 36, and the motor is connected with the drill shaft by two brackets 37 within which the drill shaft rotates. Collars 38 are secured to the drill shaft 28 on opposite sides of the brackets 37 to prevent endwise movement of the brackets and to insure that such brackets will always hold the gear wheel 31 and pinion 32 in mesh.

The drill shaft 28 may be moved outwardly through the tube 27 by cables 40 that are wound about a drum 41 and thence pass over pulleys 42 and are secured to a yoke 43 that bears against a fixed collar 44 on the drill shaft. The drum 41 may be turned in any suitable manner as by a worm 45 that meshes with a worm wheel 46 on the shaft of such drum.

The outer end of the drill shaft 28 is squared as at 47, Figs. 8 and 10, to fit within a squared socket in the end of a shank 48, the edges of the socket in the shank 48 being rounded or beveled off as at 50 to avoid cutting or wearing on a cable 51 that is secured to the shank 48 and extends lengthwise through the tubular drill shaft 28.

The outer end of the shank 48 is adapted to screw into a drill point 52 by which a hole may be drilled through the side 53 of a ship.

The shank 48 is provided near its outer

end with a transverse passageway 54 wherein are slidably disposed two locking dogs 55 that are urged outwardly in opposite directions by a compression spring 56, see Fig. 8. When the drill is not in use the locking dogs 55 will be pressed entirely within the shank 48 and held by a slidable collar 57 which will be slipped over such dogs. When the shank 48 passes inwardly through the hole that the drill has made in the side of the ship the collar 57 will be moved rearwardly on the shank 48 and the locking dogs 55 will pass through into the inside of the ship and will spring outwardly into the position shown in Fig. 8 thus locking the shank 48 to the ship.

The cable 51 projects outwardly from the end of the drill shaft 28 and may be connected as by a loop 58 and hook 60 with another cable 61 that winds upon a drum 62. When the drill is in operation the cables 51 and 61 will necessarily be disconnected but after the drill has been projected through the side of the ship and the locking dogs 55 released the cables 51 and 61 may be connected and wound in on the drum 62 to draw the tank securely against the side of the ship and bind the tank to the ship.

As soon as the drilling is finished the drill shaft 28 will preferably be disconnected from the shank 48 to avoid twisting and bending strains.

When a chain of tanks are lowered alongside of a ship the guide cables 15 may be held taut to hold the end tank securely against the side of the ship until the drill at that end has been driven through the side of the ship and the tank thus rigidly secured to the ship at that end. With the tank secured at one end the drill at the other end may be driven through the side of the ship thus giving sufficient anchorage to permit the drill at the adjacent end of the next tank to be driven. In this way by working from one end to the other or by working from both ends toward the center all of the tanks may be secured to the side of the ship.

The sides of the tanks adjacent the ship may be provided with yielding devices for making contact at a plurality of points with the ship, which devices may each comprise a disk 63 on the end of a shank 64 and resiliently supported by a compression spring 65. The shank 64 may project through the side of the tank into a tube 66 and may have a stop collar 67 on the end thereof as more clearly shown in Fig. 11.

The drilling compartments are necessarily of strong and well braced construction to withstand heavy external pressure owing to the fact that substantially atmospheric pressure must be maintained within such drilling compartments. The main

body of the tank is of strong and well braced construction but owing to the fact that the external and internal pressures to which such tanks are subjected are always approximately balanced the tanks do not need to be excessively strong and heavy.

Each tank will be provided with a flexible conduit 68 that extends to the ship or scow on the surface from which the work is being directed, within which conduit will be disposed all of the air pipes and wires necessary to provide light, power, air and telephone service to the tanks.

Each drilling compartment will have one or more electric lamps 70, a telephone 71 that affords means of communication with the scow on the surface and with the other tanks, conduit wires 72 for supplying power to the motor 33 and two air tubes 73 one for the inlet and one for the outlet of air.

The upper portion of each tank is connected with the tube 25 through which air may be removed when the tank is being sunk and through which air under pressure may be pumped into the tank to force the water out and give the tank buoyancy after it has been secured to the side of a ship. The valves 24 are opened to permit the water to be forced out by the compressed air.

The upper portion of the tank is also provided with a pressure actuated relief valve 74 that permits the escape of compressed air from the tank when the internal air pressure exceeds the external water pressure by a predetermined amount.

The tanks 20 are preferably made in different lengths and sizes and some of such tanks may have one side shaped to conform to the external shape of a ship's hull near the bow and stern so that such tanks will fit snugly against the side of the ship.

In the manner above described it is possible to send down two chains of tanks, then secure such tanks to the sides of a ship and then by pumping air into such tanks to raise the ship by the buoyant force of the tanks and float such ship into port.

I have shown only four of the guide cables 15 but it will be understood that as many of such guide cables as are desired may be used and that such guide cables may be used for the purpose of exerting a lift on the ship from the scow 18 to start the ship or loosen it in case it has become deeply

embedded in the bottom of the body of water in which it sunk.

From the above description taken in connection with the accompanying drawings 60 the advantage of the construction and of the method of operation of my ship salvaging apparatus will be readily apparent to those skilled in the art to which the invention relates, but, while I have described 65 the principle of operation of the invention together with the device which I now consider to be the best embodiment thereof I desire to have it understood that the apparatus shown is merely illustrative and that 70 such changes may be made as are within the scope of the following claims.

What I claim is:—

1. In a ship salvaging device, buoyant tanks, means for securing said buoyant 75 tanks to the side of the sunken ship and resilient devices on the side of each of said buoyant tanks for engaging with the sides of said ship at a plurality of points.

2. In apparatus of the class described a 80 submersible buoyant tank, air tight drill compartments provided within said tank, a tubular drill shaft arranged to project outwardly through the side of each drill compartment, a shank detachably secured to 85 the outer end of each drill shaft, a drill on the outer end of said shank, a cable secured to each shank and extending inwardly through the tubular drill shaft, securing means for the inner end of said cable, stud 90 pins inserted in said shank, a spring for urging said stud pins outwardly, a slidable collar for holding said stud pins within said shank and adapted to release said stud pins when said shank passes through a hole 95 that has been drilled in the side of a ship, means for urging said drill shaft outwardly, a motor suspended from said drill shaft, means for supporting the weight of said motor, gear means forming a driving con- 100 nection between said motor and said drill shaft, air inlet and outlet means connected with each of said drill compartments, means controlling the passage of water to and from said tank, an automatic relief valve 105 in the top of said tank, and means for admitting air under pressure to the top portion of said tank.

In witness whereof, I hereunto subscribe my name this 1st day of May A. D. 1920. 110

EARL W. COX.