Dec. 31, 1946. J. A. COOK 2,413,313

COLLAPSIBLE SALVAGE PONTOON

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Fig. 1.

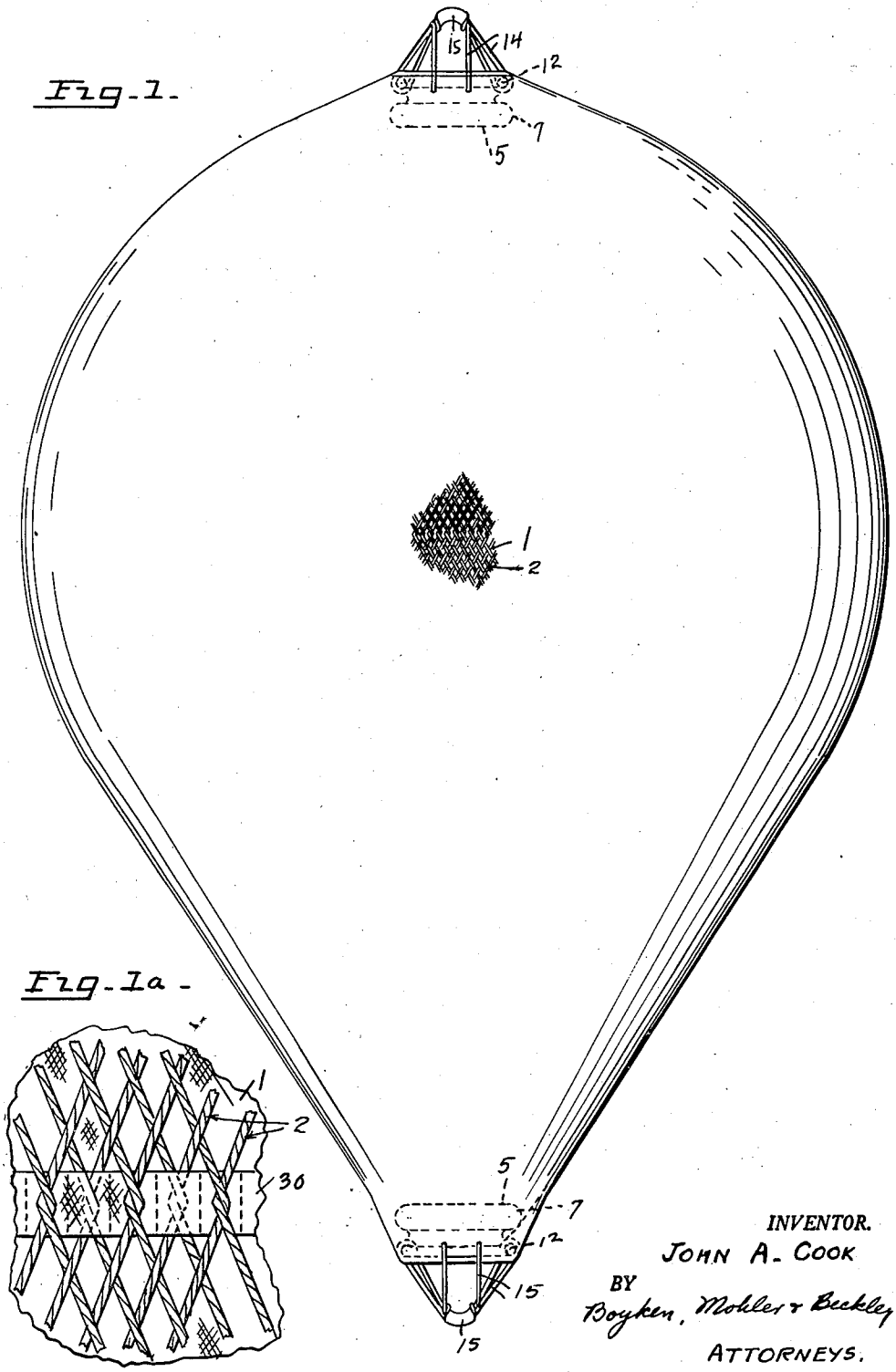


Fig. 1a.

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Fig. 2.

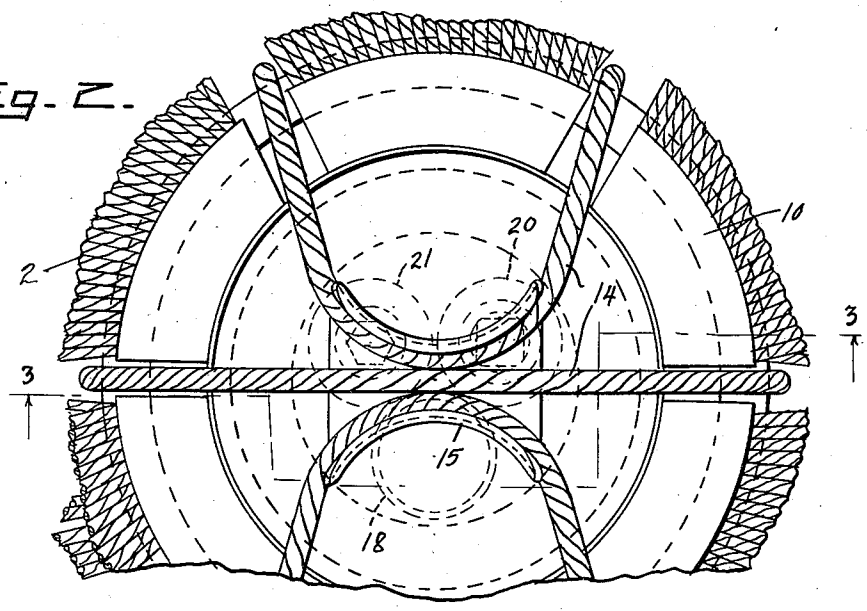
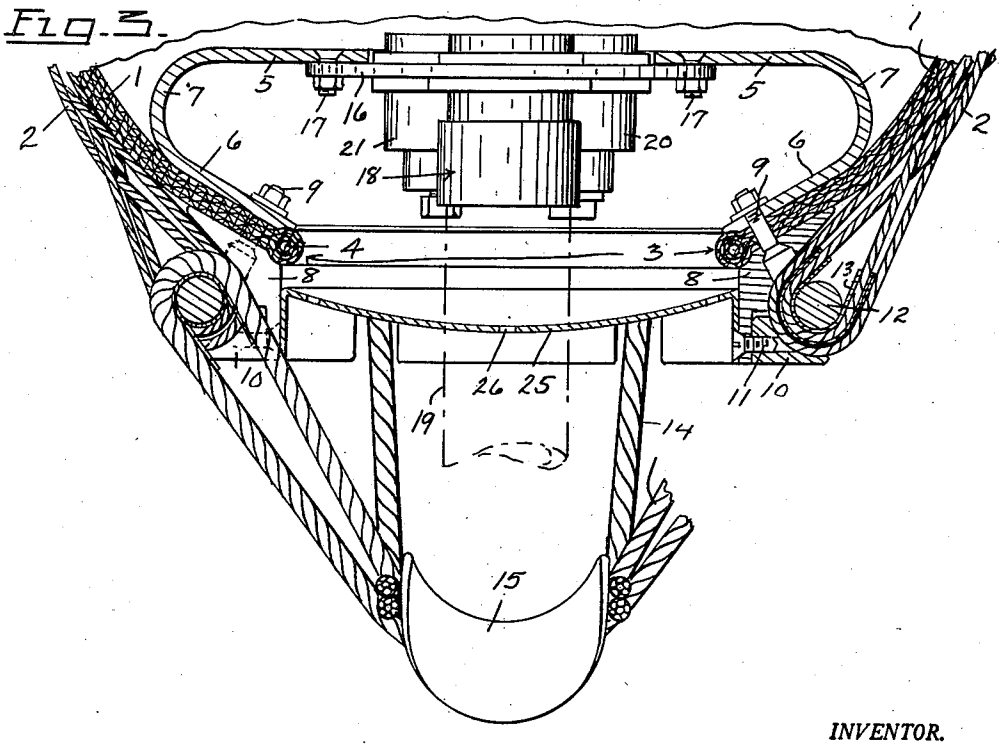


Fig. 3.



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COLLAPSIBLE SALVAGE PONTOON

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15 Claims. (Cl. 114—54)

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This invention relates to pontoons for use in salvaging operations.

One of the objects of the invention is the provision of a collapsible pontoon that is adapted to be inflated so as to contribute the desired buoyancy thereto, and which pontoon is so constructed as to withstand the most severe wear, tear and strain imposed thereon in salvaging operations, both when the pontoon is deflated and is being connected to the object to be salvaged, as well as after such inflation when the same is subjected to the pressures and strains incident to lifting such object.

Another object of the invention is the provision of a pontoon that is adapted to be taken through relatively small openings in a submerged object, such as through door openings in the hold of a ship, and which pontoon is adapted to conform generally to irregularities as might occur by reason of cargo in the holds of vessels when the pontoon is inflated, and without injury to itself.

Another object is the provision of a pontoon that is adapted to be easily connected to a projection on a sunken object, or to a hook that may be on a line that is secured to such object, and which pontoon may be readily inflated from several points thereon and which pontoon is provided with safety means for maintaining the correct pressure therein at different levels.

A still further object is a pontoon that is adapted to be collapsed to an elongated, generally tubular body that can more readily be manipulated than previous pontoons of which I am aware.

Other advantages and objects will appear in the drawings and in the description.

In the drawings

Fig. 1 is an elevational semi-diagrammatic view of a pontoon embodying my invention, a portion only of the woven outer cage being shown in detail in about the center of the figure.

Fig. 1*a* is a fragmentary elevational view of a portion of the cage and bag of the pontoon.

Fig. 2 is a fragmentary, enlarged plan view of the lower end of the pontoon.

Fig. 3 is a fragmentary sectional view taken along line 3—3 of Fig. 2.

Before describing the elements in detail, it is to be understood that the closure at the upper end of the pontoon of Fig. 1 is structurally identical with that of Figs. 2, 3, except that the upper closure is inverted as compared with the closure of Fig. 3. Therefore, only the lower closure seen in Figs. 2, 3, will be described in detail.

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The pontoon illustrated herein is elongated and is generally globular or pear-shaped, with its larger end uppermost as best seen in Fig. 1, and comprises an inner bag 1 of flexible, gas-tight material (Fig. 3) which may be one or more plies of woven cloth treated with rubber or synthetic rubber or any suitable composition material that is flexible, durable and that will provide the proper seal against escape of gas, such as air, from within the bag.

This inner bag 1 is enclosed in an outer, collapsible, flexible, metal cage 2 that is preferably woven to the desired shape from wire or cable.

The inner bag 1 is provided with a pair of coaxial, circular openings, one being at each end of the bag and both being coaxial with the longitudinal axis of the bag. As these openings and the structure associated therewith are identical, the structure shown in Fig. 3 wherein the lower opening is shown, will be described in detail.

The opening 3 in the lower end of the bag (and upper end) may be formed by wrapping the plies of fabric forming said bag around a circular wire 4 after a circular plate 5 having an annular flange 6 therein is within the bag. This plate and flange resemble a pan in which the bottom (which corresponds to plate 5) is uppermost, while the sides (which correspond to flange 6) extend convergently toward the central axis of the bottom, and downwardly, with the bottom curving in continuation of its edges as at 7, to join the sides.

The portion of the bag around opening 3 is adapted to be clamped tightly against the outer divergently outwardly facing sides of flange 6 by means of segments 8 that are bolted to flange 6 by bolts 9.

These segments are separate parts of an annular member the radially outwardly facing sides of which coact with the curved outer surfaces of other segmental elements 10 that are detachably secured to segments 8 by screws 11 for forming a concavely curved surface adapted to follow and to engage the cables or wires of the cage 2 where said cables extend over a ring 12.

The cage 2, as already explained, may be woven to shape as by cables extending over saddles 13 on rings 12 (one ring being at the top of bag 1 and the other at the bottom). These lengths of cable may extend angularly from said rings toward the major circumference of the bag where they engage other similar cables that extend angularly in the opposite direction as best seen in Fig. 1*a*. By interlacing the various

lengths as indicated, it will be seen that an elastic weave is provided so that the cage can readily be collapsed longitudinally thereof by a sort of hinge action permitted between the various cables at the point of maximum circumference of the cage. The cage may also readily be expanded, and this elasticity of the weave also facilitates the distortion of the cage without injury thereto. Such distortion ordinarily would occur when the bag and cage might be confined in the hold of a vessel or in a limited space bounded by irregular objects on one or more sides.

The weave of the cage is preferably relatively loose, providing say about one inch mesh openings where the weave is most expanded. The cage itself may be about fifteen feet in diameter at its minor axis. Of course in weaving a bag of about the shape illustrated in Fig. 1, the cables will be in several layers adjacent the rings 12, as indicated in Fig. 3.

Over each ring 12 may be looped cables 14 that may be gathered together on the longitudinal axis of the cage by a saddle 15 over which a hook or cable secured to the object to be salvaged may extend. Any other suitable means may be secured to ring 12 to provide for connecting the cage to such object.

The saddle and cables on the ring at the upper end of the cage may function ordinarily as a means for handling the pontoon, since it may be dragged into a ship's hold or elsewhere, from either end, as may be found to be most desirable under the circumstances.

The plate 5 at each end of the bag may be provided with an opening and a closure 16 may be bolted to the plate around said opening by means of bolts 17. This closure 16 in turn may be formed with a plurality of openings in one of which may be secured a valved inlet 18 provided with a conventional coupling for securement of an air hose 19 (dot dash line) thereto for inflating the bag. In another of said openings may be secured a discharge conduit 20 having a manually controlled valve therein, while a third opening may have a conventional adjustable relief valve 21 therein. Other openings for other valves may be provided if desired, but under most circumstances the valved inlet and valved outlet and relief valve in at each end of bag 1 is generally adequate, and particularly at the upper end.

The relief valves at opposite ends of the bag are necessary to control the pressure within the bag under any one or more of the various conditions that frequently exist in salvaging operations, and at times it may be desirable to adjust the two valves differently when the pontoon is vertical and fully inflated to insure their simultaneous opening in an emergency. This latter circumstance is due to the different exterior water pressures at said valves resisting their opening. The hose connections at opposite ends of the bag enable filling it from either end, while the exhaust valves at opposite ends enable manually exhausting the bag from either end.

The flange 6 around the plate 5 and closure 16 projects outwardly of the various valves 18, 20, 21 and thoroughly protects said valves against injury at all times, although an extra closure 25 may be removably secured over the valves by screws 11, said closure 25 being ported as at 26 to enable escape of air or gas from the relief valve.

The segments 8 and 10 may provide for passage of the cables 15 to the ring 12 between the ends of adjacent pairs of segments, as seen in Fig. 2,

although as already explained, other means may be provided for connecting the cage 2 to the object to be salvaged than by cables 15.

By securing the various valves to closure 16, they may be readily removed as a unit from the plate 5, which is ordinarily desirable in the event of a replacement rather than attempting to replace any one valve that may require servicing.

By the structure above described, it will be seen that the bag 1, which may be of canvas, rayon, nylon, etc., properly processed, is held within the cage and is supported, except at the relatively small mesh openings, against strain. The strain at said openings is relatively slight.

As the cage is directly connected to the object to be salvaged, the lifting strain is in the cables of the cage and on cables 15. The convergence of the cables forming the cage at the top of the latter, closes the mesh openings where the strain on the bag would otherwise be greatest. Thus the bag is not only supported against injury from detrimental strains, but the cage also protects the bag against being torn or detrimentally chafed or cut by external objects.

In actual use it is intended that any number of these pontoons shall be used as may be required to give the desired buoyancy. A plurality of such pontoons may be hooked onto a projection found on the submerged object, such as a ship, barge, etc. The shape of the pontoon illustrated in Fig. 1 particularly lends itself to the use of several of such pontoons secured to a single point.

Of course, pontoons such as herein illustrated, may be used in the hold of a vessel, or rectangular cages and bags may be fabricated for use in holds.

If desired, the bag may be secured to the cage at different points, as by bands of canvas. Such bands may be at the maximum diameter of the pontoon as indicated in Fig. 1*a* wherein a band 30 is secured to the bag and extends over certain of the cables forming the cage at the point where the hinge action between interengaging cables occurs.

The fact that the collapsed bag and cage may be dragged around columns, trusses, beams, etc., in the hold of a submerged vessel where there may be relatively sharp projections, makes it very important that the bag be protected against injury, and as the mesh openings in the cage are substantially closed when the latter is collapsed, there is practically no chance for injury to the bag.

In most instances I have found that a single layer of a very heavy treated canvas or fabric is adequate for safely holding a pressure of about 60 lbs. per square inch where the mesh openings in cage 2 are largest, and to protect the bag at such places where injury might otherwise occur to the bag when the cage is expanded, extra outer layers of canvas or other tough covering may be provided between the cage and bag. These extra layers need not be treated to render them gas tight, since they are mainly protective and also they function to relieve the bag of strain due to pressure thereon at the mesh openings in the cage.

It is obvious, of course, that where the pontoons can be used in almost perfectly vertical position, as in Fig. 1, the bottom end of the bag and cage can be open at all times, although I preferably use valves generally as described, and the hose 19 in many instances is connected with the inlet at the upper end of the bag as the top end is most accessible.

The drawings and description are not to be considered restrictive of the invention, but rather they are illustrative of a preferred form thereof.

Having described the invention, I claim:

1. A pontoon comprising a flexible, collapsible cage of woven wire, an inflatable substantially gas-tight, flexible bag within said cage of a shape and size adapted to expand said cage when the bag is inflated with a gas, means carried by said cage for securing said cage to the object to be salvaged, and a valved inlet and outlet carried by said bag for inflating and for deflating the same, a ring at one side of said cage to which the wires of the latter are secured; said bag being formed with a circular opening coaxial with said ring, an annular member coaxial with said ring to which the said edges of said opening are secured, means securing said ring to said annular member against removal of said ring therefrom; a plate closing said opening and carried by said annular member, and said valved inlet and outlet being in said plate.

2. A pontoon comprising a flexible, collapsible metal cage enclosing a flexible and collapsible bag of substantially gas-tight material; said cage and said bag being elongated when collapsed, and of generally the same size and shape when expanded; said bag and cage being adapted to be expanded upon inflation of said bag; a pair of coaxial circular openings provided in one of the corresponding ends of said cage and bag when the cage and bag are collapsed, a closure for the said opening in said bag, a valved inlet and outlet in said closure for respectively inflating and for deflating said bag, and an annular member coaxial with said openings and adjacent the edges thereof securing said cage and said bag together, said cage being woven to shape from cables, and a ring coaxial with said annular member to which said cables are secured, means secured to said ring for connecting said ring to the object to be salvaged.

3. A pontoon comprising, a flexible, collapsible cage of woven wire, an inflatable, substantially gas-tight, flexible bag within said cage of a shape and size to expand said cage when the bag is inflated, said bag and said cage being arranged and adapted to be similarly expanded progressively to globular form when said bag is inflated and the cage expanded and similarly elongated to generally cylindrical form when said bag is deflated and the cage collapsed; a relief valve at each of the opposite ends of said bag respectively adjustable to open at any desired pressure of gas within said bag to automatically control the pressure within said bag; means securing corresponding ends of said bag and cage together; openings in opposite ends of said bag and cage coaxial with the longitudinal axis of said cage, a closure in each of the said openings in said bag, said relief valves being carried by said closures, and means carried by one of said closures for securing an air pressure hose thereto and for admitting the air into said bag, and means adjacent each of said closures and respectively secured to said cage for securing the cage to the object to be lifted.

4. A salvage pontoon comprising a cage formed of interlaced cables diagonally crossing each other and which cables are free from securement to each other at their crossing points whereby said cage may be collapsed to generally cylindrical form and expanded to generally globular form and vice versa free from detrimental strain on said cables at and adjacent said points, said cables being adapted to extend generally axially of said cage when so collapsed and expanded, a flexible substantially fluid tight bag within said cage expansible under gas pressure within said bag for expanding said cage to said globular form when said bag is fully inflated, a valved inlet carried by said bag for inflating the latter, means for securing said cage to an object to be lifted upon inflation of said bag.

5. A salvage pontoon comprising a cage formed of interlaced cables diagonally crossing each other and which cables are free from securement to each other at their crossing points whereby said cage may be collapsed to generally cylindrical form and expanded to generally globular form and vice versa free from detrimental strain on said cables at and adjacent said points, said cables being adapted to extend generally axially of said cage when so collapsed and expanded, a flexible substantially fluid tight bag within said cage expansible under gas pressure within said bag for expanding said cage to said globular form when said bag is fully inflated, a valved inlet carried by said bag for inflating the latter, means for securing said cage to an object to be lifted upon inflation of said bag, a pair of rigid annular members respectively at opposite ends of said cage when the latter is collapsed, said interlaced cables being directly secured to said annular members, said last mentioned means being secured to one of said members.

6. A salvage pontoon comprising a cage formed of interlaced cables diagonally crossing each other and which cables are free from securement to each other at their crossing points whereby said cage may be collapsed to generally cylindrical form and expanded to generally globular form and vice versa free from detrimental strain on said cables at and adjacent said points, said cables being adapted to extend generally axially of said cage when so collapsed and expanded, a flexible substantially fluid tight bag within said cage expansible under gas pressure within said bag for expanding said cage to said globular form when said bag is fully inflated, a valved inlet carried by said bag for inflating the latter, means for securing said cage to an object to be lifted upon inflation of said bag, a pair of rigid annular members respectively at opposite ends of said cage when the latter is collapsed, said interlaced cables and said bag being respectively secured to each of said members, a relief valve carried by each of said annular members respectively communicating between the interior and exterior of said bag at opposite ends of the latter.

7. A salvage pontoon comprising a pair of coaxial spaced annular members, a cage formed of interlaced cables diagonally crossing each other and extending between said members and secured to said members, said cables being free from securement to each other at their crossing points whereby said cage may be collapsed to generally cylindrical form and expanded to generally globular form and vice versa free from detrimental strain on said cables at and adjacent said points, a substantially fluid tight bag within said cage expansible under gas pressure within said bag for expanding said cage to said globular form when said bag is fully inflated, a valved inlet at one end of said bag when the same is collapsed for admitting air into said bag for expanding it, means secured to one of said members for securement to an object to be lifted upon inflation of said bag.

8. A salvage pontoon comprising a pair of co-

axial spaced annular members, a cage formed of interlaced cables diagonally crossing each other and extending between said members and secured to said members, said cables being free from securement to each other at their crossing points whereby said cage may be collapsed to generally cylindrical form and expanded to generally globular form and vice versa free from detrimental strain on said cables at and adjacent said points, a substantially fluid tight bag within said cage expansible under gas pressure within said bag for expanding said cage to said globular form when said bag is fully inflated, a valved inlet at one end of said bag when the same is collapsed for admitting air into said bag for expanding it, means secured to one of said members for securement to an object to be lifted upon inflation of said bag, an opening formed in each end of said bag and the marginal portions of the bag around each of said openings being secured to each of said annular members, a closure carried by each annular member extending across each of said openings closing each end of said bag, said valved inlet being in one of said closures and a relief valve being carried by the other closure.

9. A salvage pontoon comprising a pair of coaxial spaced annular members, a cage formed of interlaced cables diagonally crossing each other and extending between said members and secured to said members, said cables being free from securement to each other at their crossing points whereby said cage may be collapsed to generally cylindrical form and expanded to generally globular form and vice versa free from detrimental strain on said cables at and adjacent said points, a substantially fluid tight bag within said cage expansible under gas pressure within said bag for expanding said cage to said globular form when said bag is fully inflated, a valved inlet at one end of said bag when the same is collapsed for admitting air into said bag for expanding it, means secured to one of said members for securement to an object to be lifted upon inflation of said bag, an opening formed in each end of said bag and the marginal portions of the bag around each of said openings being secured to each of said annular members, a closure carried by each annular member extending across each of said openings closing each end of said bag, said valved inlet being in one of said closures and a relief valve being carried by each of said closures.

10. A salvage pontoon comprising a flexible collapsible gas tight bag of generally globular shape and having an upper and a lower end, means at upper and lower ends of said bag respectively for securing either or both ends thereof to an object to be lifted upon inflation of said bag, a valved air inlet at said lower end for inflating said bag and a relief valve at each of said ends of said bag for controlling the gas pressure within said bag upon inversion of said bag and also under varying degrees of expansion of said bag at different depths irrespective of such inversion.

11. In a salvage pontoon having a flexible collapsible outer cage enclosing a flexible collapsible inflatable substantially gas tight bag, an opening formed in said bag, a circular plate for closing said opening, said plate having an annular flange rigid therewith projecting axially and inwardly thereof from its edges, means for securing the

edges of said bag around said opening to said flange adjacent the outer free edges of the latter with the said plate positioned within said bag relative to said edges of said bag, and means for securing said cage to said flange and valve means carried by each plate disposed substantially wholly within the confines of said flange.

12. In a salvage pontoon having a flexible collapsible outer cage enclosing a flexible collapsible inflatable substantially gas tight bag, an opening formed in said bag, a circular plate for closing said opening, said plate having an annular flange rigid therewith projecting axially and inwardly thereof from its edges, means for securing the edges of said bag around said opening to said flange adjacent the outer free edges of the latter with the said plate positioned within said bag relative to said edges of said bag, said cage being formed of cable strands woven to provide a globular shaped cage when expanded by full inflation of the bag, and means for securing the strands of said cage that are adjacent said edge to said flange outwardly of said edges and valve means carried by each plate disposed substantially wholly within the confines of said flange.

13. In a salvage pontoon having a flexible collapsible outer cage enclosing a flexible collapsible inflatable substantially gas tight bag, an opening formed in said bag, a circular plate for closing said opening, said plate having an annular flange rigid therewith projecting axially and inwardly thereof from its edges, means for securing the edges of said bag around said opening to said flange adjacent the outer free edges of the latter with the said plate positioned within said bag relative to said edges of said bag, said flange being curved in cross-section with the convex side facing axially outwardly relative to the axis of said plate and valve means carried by each plate disposed substantially wholly within the confines of said flange.

14. In a salvage pontoon having a flexible collapsible outer cage enclosing a flexible collapsible inflatable susbtantially gas tight bag, an opening formed in said bag, a circular plate for closing said opening, said plate having an annular flange rigid therewith projecting axially and inwardly thereof from its edges, means for securing the edges of said bag around said opening to said flange adjacent the outer free edges of the latter with the said plate positioned within said bag relative to said edges of said bag, said flange being curved in cross-section with the convex side facing axially outwardly relative to the axis of said plate, and the marginal portion of said bag around said opening extending over the outer convex side of said flange and valve means carried by each plate disposed substantially wholly within the confines of said flange.

15. In a salvage pontoon having a flexible collapsible outer cage enclosing a flexible collapsible inflatable substantially gas tight bag, an opening formed in said bag, a circular plate for closing said opening, said plate having an annular flange rigid therewith projecting axially thereof from its edges, means for securing the edges of said bag around said opening to said flange with the said plate positioned within said bag relative to said edges of said bag, a relief valve carried by said plate projecting outwardly thereof into the area enclosed by said flange and being disposed wholly within the confines of said flange.

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