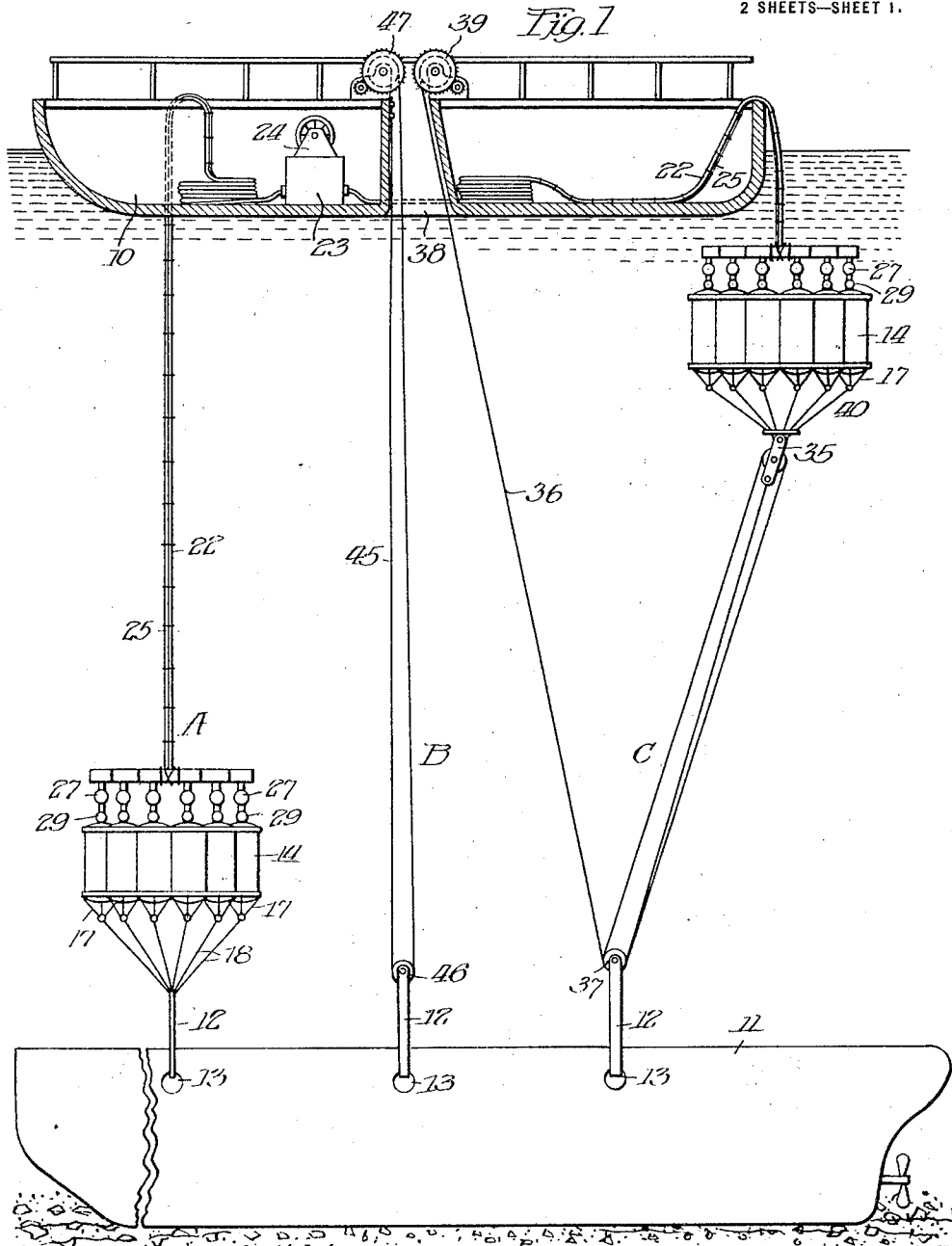


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SALVAGING APPARATUS.
APPLICATION FILED APR. 13, 1918.

1,332,433.

Patented Mar. 2, 1920.
2 SHEETS—SHEET 1.



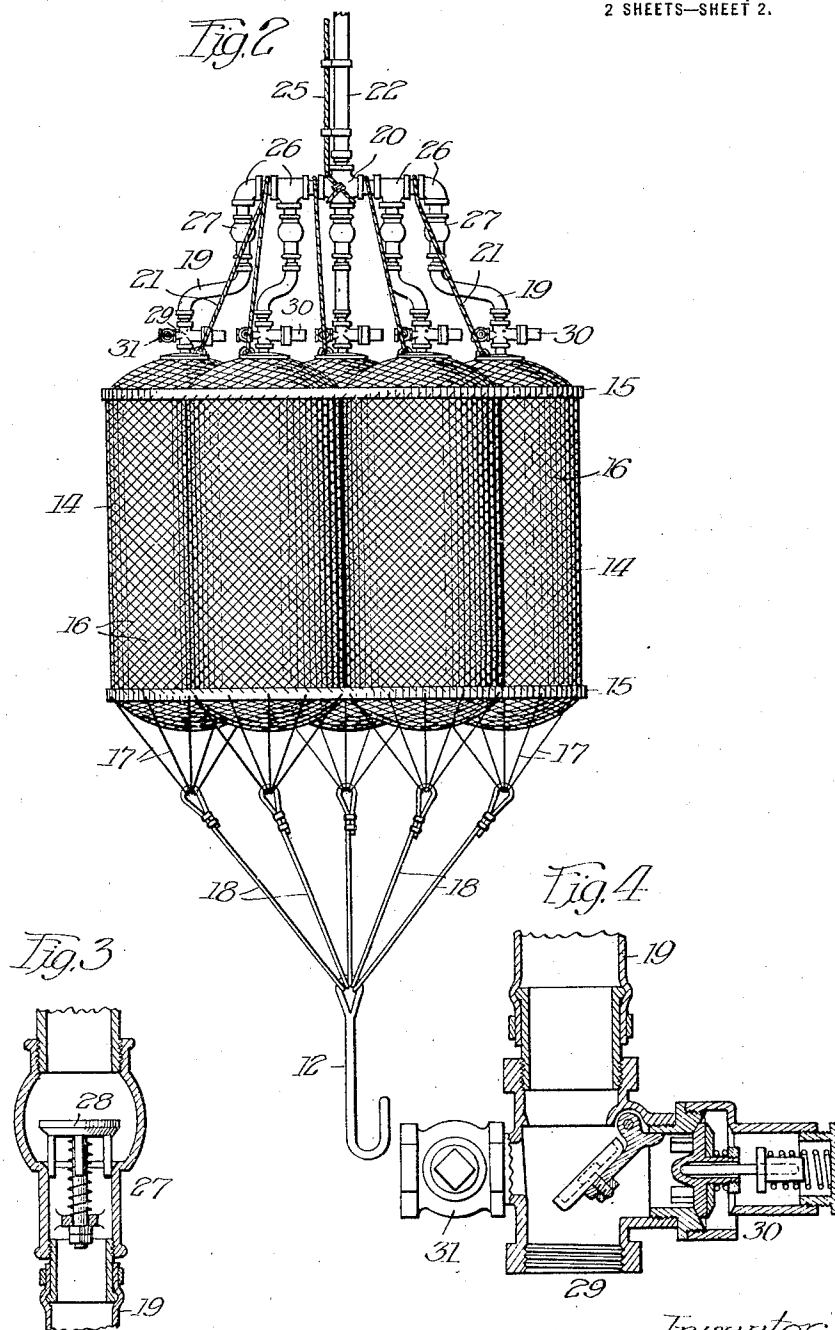
Witness:
Leonard W. Novander.

Inventor
Henry D. Deam
By E. J. Andrews
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UNITED STATES PATENT OFFICE.

HENRY D. DEAM, OF BENTON HARBOR, MICHIGAN.

SALVAGING APPARATUS.

1,332,433.

Specification of Letters Patent.

Patented Mar. 2, 1920.

Application filed April 13, 1918. Serial No. 228,292.

To all whom it may concern:

Be it known that I, HENRY D. DEAM, a citizen of the United States, residing at Benton Harbor, in the county of Berrien and State of Michigan, have invented certain new and useful Improvements in Salvaging Apparatus, of which the following is a specification.

This invention relates to improvements in salvaging apparatus, and particularly to such apparatus when used for the purpose of raising sunken vessels. It has for its object the production of apparatus which, because of its buoyancy, when under water, exerts an upward pull on the sunken vessel to which the apparatus is in some suitable manner attached; and this, in conjunction, if necessary, with other lifting means, raises the boat to such a height that other additional lifting means may be applied, and finally floating means may be applied, so as to bring the vessel to the surface and allow it to be repaired, if necessary, and finally floated under its own buoyancy.

Of the accompanying drawings Figure 1 is a general view, more or less diagrammatic, of various apparatus embodying features of my invention which are attached to a sunken vessel and are used for the purpose of raising the vessel. Fig. 2 is an enlarged detailed view of a portion of the apparatus shown in Fig. 1. Figs. 3 and 4 are enlarged sectional views of valves which are indicated in Fig. 2.

As is indicated in Fig. 1 various means for assisting in lifting the sunken vessel are used successively or simultaneously as the exigencies of the case may require. In general these means may be divided into three units illustrated by the devices A, B, and C, it being understood that as many of the different units as may be desired may be used, but in each case a single unit is shown in order to avoid confusion. And it is also to be understood that as many different scows 10, or barges, may be used as is desired. The sunken vessel 11 may be grappled in any convenient manner. For the purposes of illustration I show the grappling hooks 12 passing through the dead-light openings 13 of the vessel. For simplicity each of the units A, B, and C are shown so connected, it being understood, however, that any suitable method of con-

necting to the vessel may be employed with any of these units.

The unit A, shown enlarged in Fig. 2, comprises a plurality of bags 14 of any suitable material, shape and size, and so arranged as to be air-proof. I prefer for the purpose bags cylindrical in shape, some four feet in diameter, and eight feet long, each bag having a hoop 15 at each end, and being incased in a net 16 formed from flexible cable, or other suitable material. The purpose of the net is to strengthen the bag and to provide means for the upward pull on the vessel. The netting is so arranged as to be collapsible with the bags 14 when the air has been removed from the bags. Each bag is connected, by means of cables 17, fixed to the lower hoops 15, and cable 18 with the hook 12. Each bag also is connected, by means of flexible tubes 19 of any suitable material, with the head 20; and also, by means of the cable 21, the bags are connected to the head so that any undue strain is removed from the tubes 19. A flexible tube 22 passes from the head to the scow 10, and is thereon connected with any suitable means for supplying compressed air such as the storage tank 23 and the air condenser 24. A cable 25 is also connected to the head 20 and passes upwardly to the scow, as indicated in Fig. 1, so as to remove any undue strain upon the tube 22.

The head 20 may be composed in any suitable manner. I prefer to make this head extensible so that as many bags as may be desired may be connected thereto; and in this instance show the pipe fittings 26, which may be readily connected together in a usual manner; and which provide convenient means for connecting the valves 27 to the head.

The valves 27 comprise any suitable form of valve which will allow compressed air to pass freely downwardly through the port, providing the pressure therethrough is not too great; but in case of an abnormal flow of air through the valve, due to a rupture of the pipe 19, or of the bag 14, or any other cause, the valve disk 28 will be forced downwardly into its seat, and the further flow of the air therethrough will be prevented. A valve 29 is also provided between the head 20 and each bag 14, this valve being any suitable form of check valve which will

allow the air to pass freely downwardly into the bag, but prevents flow of air backwardly from the bag into the tube 19. Also connected to the bag, in any suitable place, or to the casing of the valve 29, as is indicated, is the adjustable relief valve 30, which allows the pressure of the air in the bags to be maintained below any predetermined maximum pressure. Also any suitable exhaust valve is connected to each bag, such as the valve 31, so as to allow the air to pass out of the bags, and allow them to be collapsed.

In operation it will be understood that the group of bags in the unit A are connected properly to the head 20, and are passed overboard and allowed to sink; or in any suitable manner are pulled downwardly and connected to the vessel in the manner indicated, or in any other suitable manner, the bags being as close to the sunken vessel as is practicable. Compressed air is then forced downwardly through the tube 22, and the bags are all inflated thereby. The pressure of the air being sufficient to inflate the bags to the maximum amount allowable by the protecting net. In case of a rupture of any one of the bags, or of the connecting tube, the valve 27 closes and cuts that portion of the unit out, so that the other bags are not affected. In case of an abnormal decrease in pressure in the connecting tubes 19 or 22, because of a rupture or otherwise, the return check valve 29 will be closed, and the bag, if full of air, acts substantially in all respects the same as if the rupture had not occurred; and the valve 27 will prevent further passage of air into the ruptured tube 19 as the reduced pressure in the tube allows the valve 27 to close, as the greater flow of air through the valve port will force the valve downwardly against the resisting spring, thus closing the valve.

If a sufficient number of units A are thus attached to the vessel the buoyancy thereof will force the vessel free from the ground. As the bags rise the external pressure thereon diminishes rapidly, because of the decrease in water pressure; and, when the excess internal pressure over the external pressure reaches a predetermined maximum amount, the relief valve 30 prevents the stress tending to rupture the bags becoming too great. When the bags reach the surface any suitable means may be used for raising the vessel higher, such as obtaining a new hold on the vessel lower down on the hull, and lowering other lifting units below the surface of the water. Finally the vessel may be repaired and floated under its own buoyancy, in any suitable manner.

The unit C is an improvement of the unit A in two respects: First, the bags may be assembled, and then filled, while they are substantially on the surface of the water; and,

secondly, means are provided in the scow for assisting the bags in pulling upwardly on the boat.

The bags 14 of the unit C may be similar to those of unit A. In fact it is contemplated that all of the bags in the entire system will be interchangeable; and all of the various parts which go to make up the groups of bags also are interchangeable; although it is understood that this is not an essential feature of the general invention. After the bags of unit C are assembled and placed in the water, they are filled with compressed air from the storage tank 23, or from any other suitable source of supply; and they are then connected to a hook 12 in the boat 11, or to any other suitable grappling means, by means of the block and tackle system 35; and the pulling cable 36 of the system passes upwardly from the pulley 37, at the lower end of the block and tackle, which is connected in any suitable manner to the grappling means, through the opening 38 in the boat to any suitable pulling means, such as the windlass 39 mounted in the scow. The windlass 39 is operated in any suitable manner, and force is thus exerted upon the cable 36, which tends to pull the group of bags 40 downwardly and, at the same time, to lift the boat 11. When the group of bags 40 is pulled beneath the surface of the water, if it is found that the boat is not being lifted other units may be connected to the boat in a similar manner until the boat is lifted from the ground. If desired the groups of bags 40, as they are connected up, may be pulled downwardly and substantially to the point of connection to the hook, and no further attention may be paid to these groups when the boat finally begins to rise until the bags reach the surface; or the groups may be pulled a short distance below the surface, as indicated in Fig. 1, and the respective windlasses may be operated as the boat rises, thus keeping the bags below the surface of the water, and in this manner avoiding the use of the long tube connection to the bags, and the high pressure of air, that would be required if the bags were first pulled clear down to the boat. When the bags are pulled down substantially to the boat, it will be seen that each of these units then acts substantially in the same manner as the unit A, except that the scow exerts a certain force tending to lift the sunken boat.

In practice it will be found that units A and C are both desirable, at least in certain cases, as one unit is complementary to the other unit, C being desirable in order to produce a readily controllable force acting upon the sunken boat, that force being due to the cable 36 passing to the scow, and A given a constant force requiring no attention.

In order to still further assist in lifting

the boat, and to give further means of controlling the amount of force effective, or the application of the force, unit B is used. This unit comprises a cable 45 fixed, in any
5 suitable manner, to the scow, passing downwardly under a pulley 46, connected in any suitable manner to the grappling means on the sunken boat, and then passing upwardly, through the opening 38, to any suitable pulling
10 means, such as the windlass 47. If desired a block and tackle system may also be used as unit B in order to reduce the power required to operate the windlass. In practice in many instances it will be found that
15 the use of this unit in conjunction with the other two is desirable, in order to more fully control the force applied and the point of application of the forces, to keep the vessel on an even keel, or for other reasons; it
20 being understood that groups of these various units may be used, and that certain of the units, or groups of units, may be in

one scow and others in other scows, depending on the magnitude of the undertaking and the special conditions involved. 25

I claim as my invention:

In salvaging apparatus a group of bags filled with compressed gas adapted to be sunk in water and means for connecting said group when under water with a sunken ship, 30 whereby said ship will be buoyed up by the said bags; in combination with another group of bags filled with compressed gas and block and tackle means for connecting said second group when under water with a 35 sunken ship, whereby the distance between said group of bags and the ship can be varied, and additional block and tackle means adapted to connect the sunken ship with buoyant means on the surface of the water. 40

In testimony whereof, I hereunto set my hand.

HENRY D. DEAM.