H. D. DEAM.

SHIP SALVAGING APPARATUS.

APPLICATION FILED AUG. 31, 1918.

1,377,404.

Patented May 10, 1921.

3 SHEETS—SHEET 1.

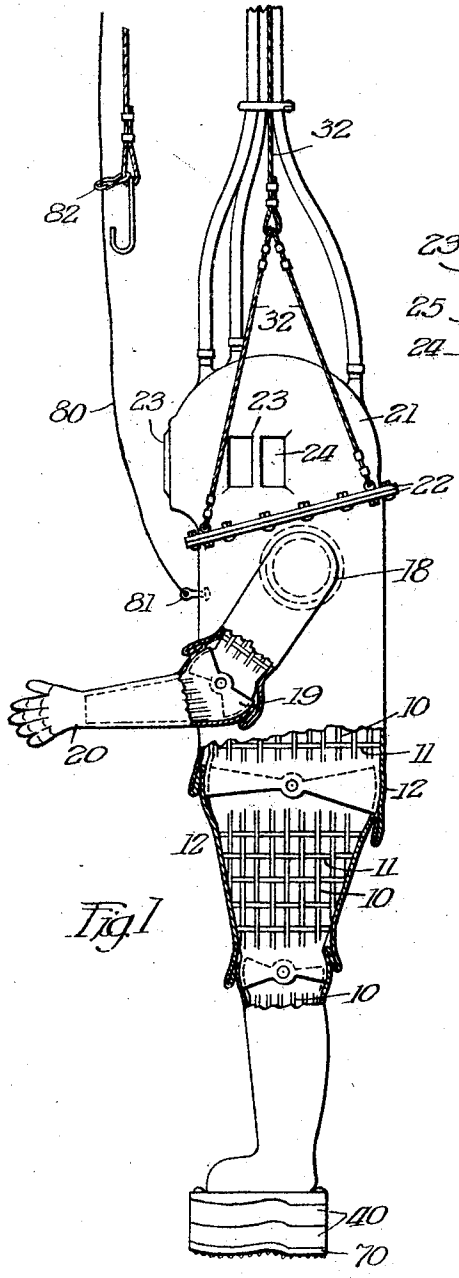

Fig. 1

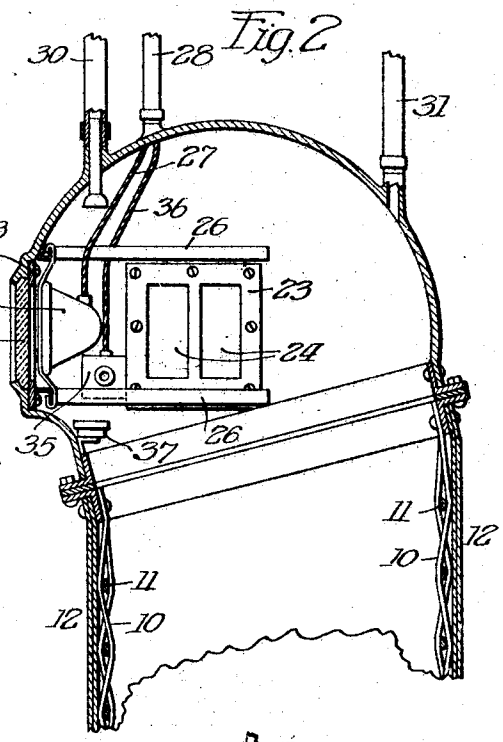

Fig. 2

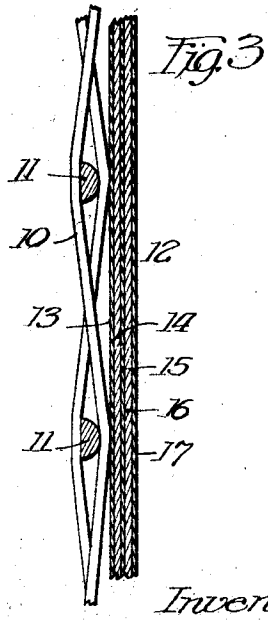

Fig. 3

Witness:

Leonard W. Noxander.

Inventor

Henry D. Deam

By E. J. Andrews

atty

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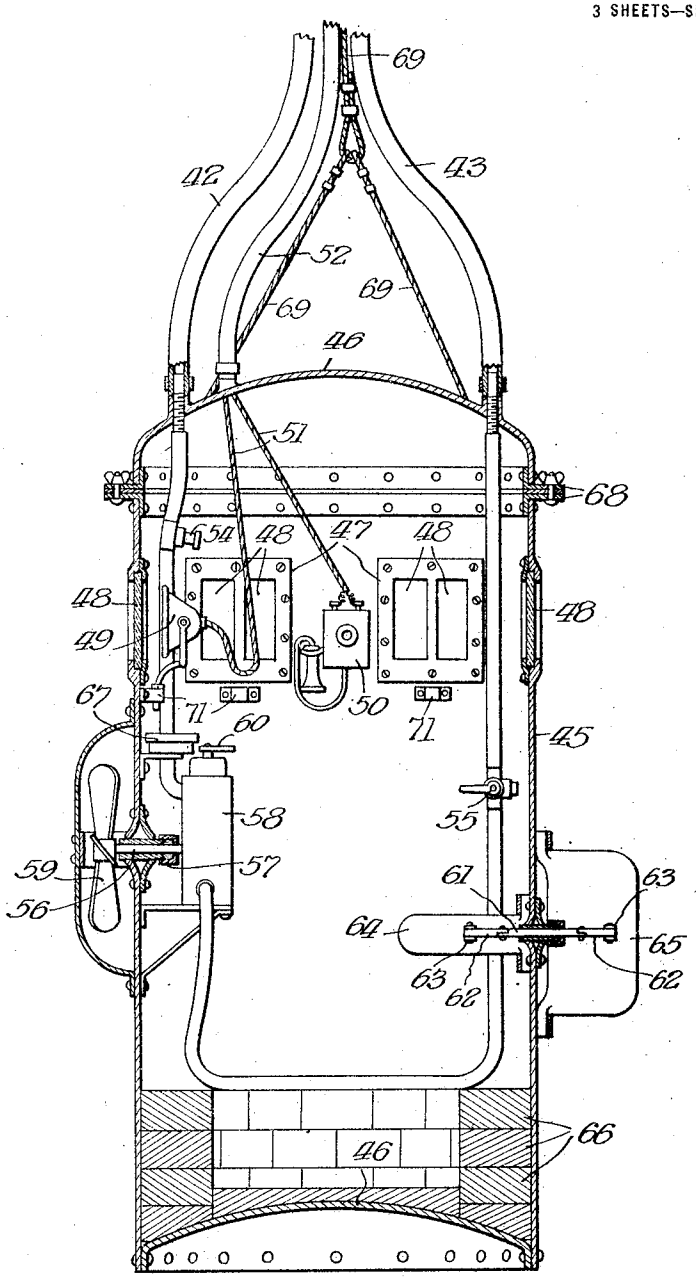

Fig. 4

Witness:
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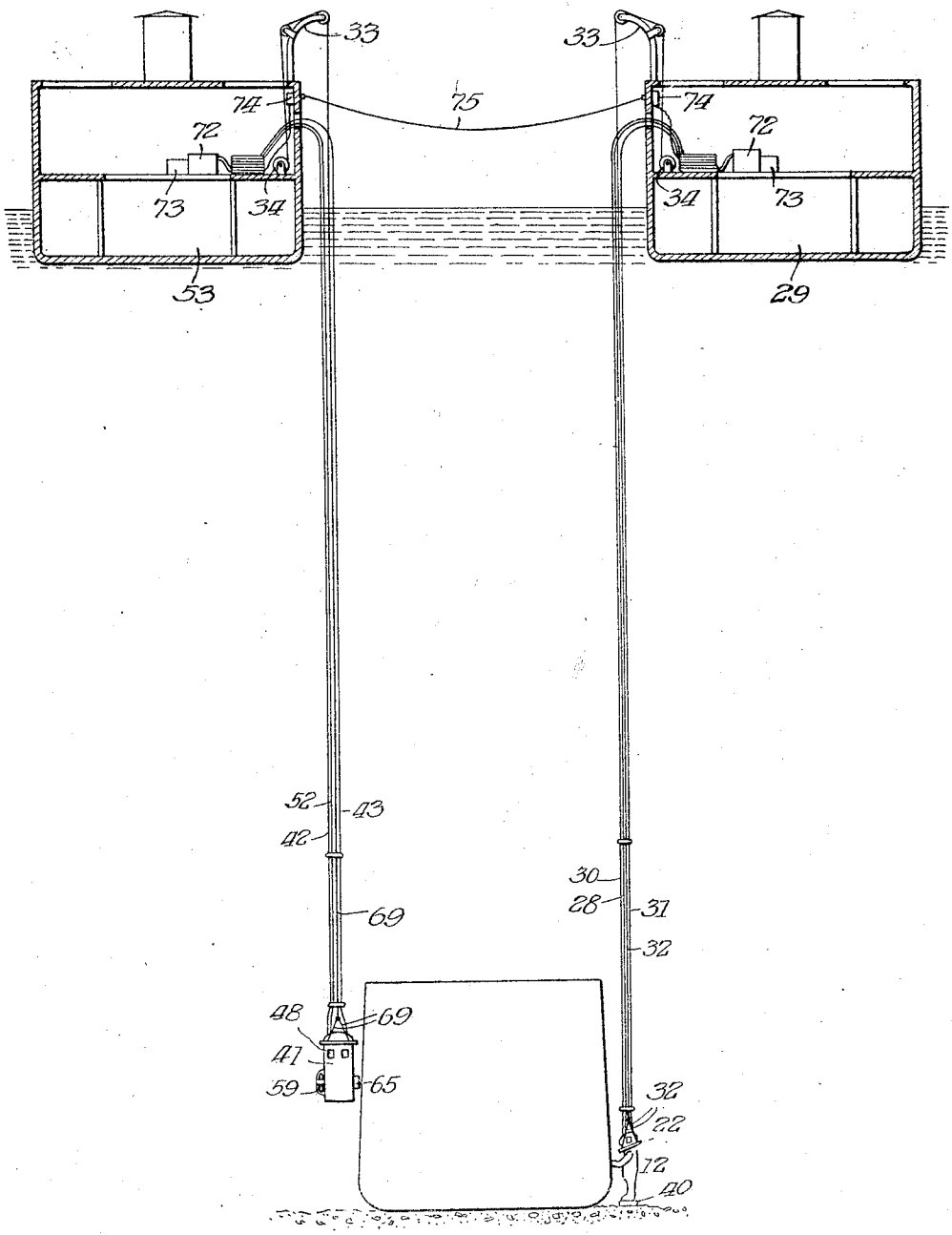

Fig. 5

Witness.
Leonard W. Novander.

Inventor
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By E. J. Andrews
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UNITED STATES PATENT OFFICE.

HENRY D. DEAM, OF BENTON HARBOR, MICHIGAN.

SHIP-SALVAGING APPARATUS.

1,377,404. Specification of Letters Patent. Patented May 10, 1921.

Application filed August 31, 1918. Serial No. 252,199.

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 Ship-Salvaging Apparatus, of which the following is a specification.

This invention relates to the salvaging of boats and ships, and particularly to the salvaging of ships which are sunk in deep water. An object of the invention is to provide apparatus to be used in attaching the cables or other elevating means to the sunken ship, and to provide a method by which the apparatus may be used in an efficient and practicable manner. Other objects of the invention will be apparent from a consideration of the accompanying drawings and the description thereof.

Of the accompanying drawings Figure 1 is an elevation, partly in section, of a diving suit which embodies features of my invention. Fig. 2 is an enlarged sectional view of the upper portion of the diving suit. Fig. 3 is an enlarged fragmental section of a portion of the suit. Fig. 4 is a central sectional view of a diving bell used in conjunction with the rest of the apparatus; and Fig. 5 is a view, more or less diagrammatic, of the entire apparatus when used in combination.

In case of a ship sunk in deep water it is difficult for divers to operate in the vicinity of the ship, partly because of the enormous pressure of the water on the diving suit and hence on the body itself. To avoid this I provide a diving suit the walls of which are self sustaining against any pressure that is likely to be encountered by the diver. In order to provide a suitable wall for this purpose, which will be sufficiently light and yet strong enough for all ordinary pressures, I provide an inner framework comprising longitudinal strips 10 of any suitable material; I prefer for the purpose steel strips. Weaved transversely in these longitudinal strips are bands or rings 11 of any suitable cross section and material, such as half-round steel. The strips extend longitudinally from one joint to another, as from the feet to the knees and from the knees to the hips; and the rings 11 are substantially circular, extending around the limbs and the body; and being circular they are able to stand an enormous external pressure. Outside of the framework formed by the strips and rings I provide a flexible waterproof fabric 12, composed of any suitable material. In this instance I prefer for this fabric an inner lining of sheet rubber 13; outside of this is a sheet of duck 14, then a second sheet of rubber 15, then a second sheet of duck 16, and then a third sheet of rubber 17; so as to form an extremely strong waterproof but flexible fabric. This fabric extends over the entire framework, closely fitted thereto except at the joints, such as the knees, elbows and the hip. At these joints the fabric fits loosely, as indicated in Fig. 1, so as to allow the required amount of movement without unduly straining the fabric. The arms of the suit are connected to the body by means of a ball and socket joint 18, the elbows having an ordinary joint 19, and the hands being covered by gloves 20, composed of thick waterproof fabric, somewhat similar to that covering the framework, so that a slight amount of movement of the fingers is possible; while the arm may be moved at both the shoulder and the elbow.

The upper portion of the suit comprises any suitable form of helmet 21, fastened to the framework by means of flanges 22, or in any other suitable manner. In the front part of the helmet, and on each side thereof, there are windows 23, through which the wearer of the suit may observe surrounding objects, either by looking straight ahead through the front windows or turning his head sidewise and looking through the side windows. Each window comprises two panes 24 of heavy plate glass suitably mounted in the helmet. And slidably fixed within the helmet is a searchlight 25, arranged to slide upon rails 26, so it may be moved freely from one window to either of the others; and so arranged that the operator may, by a mere movement of his head, push the lamp to which ever window he may desire; the intention being for the operator to look through one pane of glass of the window while the searchlight is shining through the other pane. Connected to the searchlight are suitable electric cables 27, passing upwardly through the flexible conduit 28 to the attending scow or barge 29, Fig. 5.

Extending upwardly from the helmet are flexible tubes 30 and 31. These tubes also pass to the attendant scow, and one of the tubes is arranged to receive compressed air

for use of the operator, and the other allows the exhaust air to pass out of the helmet. Also, fixed in any suitable manner to the suit, such as to the flanges 22, are cables 32, by means of which the suit is connected to the attendant scow, and the diver may be raised or lowered as desired, by means of the davit 33, and the windlass 34. A telephone 35 is also suitably mounted in the helmet having wires 36 passing upwardly, through the flexible tube 28, to the scow; so that the operator may at any time communicate with the attendants in the scow. Also, suitably mounted in the suit, is a compass 37.

A consideration of this structure will show, that the wearer of the suit will have the pressure of the water entirely removed from his body except on his fingers; and the gloves worn can be made sufficiently strong to reduce the pressure within safe limits. The diver may also be moved from one place to another by signaling to his attendants, and is at liberty to move around somewhat himself; and he may also handle tools, and particularly place cables and the like wherever necessary and make such other attachments to the vessel as may be deemed best. In order to overcome the buoyancy of the diving suit, and particularly the buoyancy due to the long flexible conduits, weights 40 may be attached to the feet of the suit; and the number or magnitude of these weights may be varied to suit the needs, depending upon the distance the diver is to descend underneath the water. A friction pad 70 made of any suitable material, such as crushed agate, is fixed to the lower surface of the lower weight, to reduce the tendency of the divers feet to slip on the surfaces of the boat.

To assist the diver in his operations, the diving bell 41, shown in detail in Fig. 4, is provided. This bell may be made in any suitable manner, I prefer for the purpose the cylindrical casing 45, with the convex and concave ends 46, so as to give the maximum amount of strength for the weight; the dimensions of the shell being such as to allow a man to stand and move about more or less therein. In the wall of the shell are several windows 47, each comprising two panes of thick glass 48, through which the observer may look in any direction; and a searchlamp 49 is also provided, by means of which light may be thrown where desired through the windows, sockets 71 being provided for suitably positioning the lamps. A telephone 50 is also installed; and suitable electric cables 51 for the lamp and telephone pass upwardly through the flexible conduit 52 to the attending scow 53. Flexible conduits 42 and 43 also connect the bell with the scow; and through these compressed air may be forced to the bell and allowed to exhaust upwardly therefrom. A reducing valve 54 is provided by means of which so much air as may be desired may be allowed to pass into the bell; and a three-way valve 55 is provided which allows exhaust air to pass out of the bell, and, in case of accident, will allow the operator to force air into the bell, as hereinafter explained.

Journaled in the wall of the bell is a shaft 56, passing through a stuffing box 57, and being connected with a pneumatic motor 58. Fixed to the outer end of the shaft is a propeller 59. The motor is controlled by means of the throttle valve 60, so that the operator can at any time operate the motor and force the bell through the water more or less, as may be desired. Also, slidably mounted in the wall is a shaft 61 pivotally connected, by means of links 62, to arms 63 fixed, respectively, to a tiller 64 within the bell and to a rudder 65 without the bell; the arrangement being such that the operator can, at pleasure, by means of the tiller, operate the rudder to steer the bell. In the lower part of the bell are weights 66, which may be increased to such an amount as may be necessary to overcome the buoyancy of the bell and the connecting conduits. Also suitably mounted in the bell is a compass 67. Fixed to the flanges 68 are cables 69, Fig. 5, by means of which the bell may be raised or lowered by the attending scow.

In use, the operator of the bell may, by signaling to the attendants in his scow, be moved around, from place to place, by means of the cables 69; and in connection therewith he may also move the bell by means of the propeller 59 and the rudder 65; so that he is at liberty to move the bell wherever desired in the vicinity of the sunken ship, or he may allow it to rest upon, or be suspended over, the ship if desirable.

The three-way valve 55 is arranged so as to close the exhaust pipe 43; and the valve 60 is also a three-way valve which, when in one position, closes the conduit 42 to the motor 58 and opens the conduit to the interior of the bell; so that in case of water leakage in the walls of the bell the operator may allow the compressed air to enter the bell and reduce as much as possible the amount of water entering therein; thus, if at the same time he gives the signal to hoist, he may be elevated to safety before being seriously injured.

One or more attendant scows may be used. I prefer to use a scow 29 which is the attendant of the diver, and a scow 53 which is the attendant of the operator of the diving bell. The purpose of the use of two scows is so that either scow may move the apparatus to which it is connected independently of the other; thus the diver may

be moved about one end or side of the sunken boat and the bell about the other end or side, or in any manner which may be necessary in order to carry on properly the operations. Each scow is provided with suitable elevating means 33 and 34, an air compressor 72, an electric battery 73, a telephone 74, and other suitable apparatus; and electric signal cables 75 connect the two scows.

While the diver and the bell operator may work independently of each other at times, yet during a portion of the operations it is desirable for them to coöperate, particularly in suitably attaching various elevating means to the sunken ship. As the operator of the diving bell has much more freedom of action in moving about and viewing the different portions of the ship, it is in general his function to be the observer as to the conditions surrounding the ship and as to what should be done. For instance, if in his opinion a lifting cable should be placed under the bow of the boat he signals to the attendant in his scow, his attendant signals to the diver attendant in the other scow, and the diver attendant signals to the diver, at the same time moving the diver as nearly as possible to the proper position. If the diver upon receiving orders desires to be removed farther, or needs further information, he informs his attendant. In general it is his function to make the attachments to the boat in the manner and at the place indicated by the observer in the diving bell.

A further function of the observer in the bell is to inform the attendant of the exact condition of the boat, the direction in which it lies and all other matters of importance; and these, so far as they are material, are transmitted to the diver.

By these various means it is possible to apply any suitable attaching means, many of which I have fully described in my copending applications, Serial Numbers 228,292; 232,677; 240,313.

In order to assist the diver in finding the attaching means, a messenger cable 80 is attached to his suit by any suitable means such as an eye 81 fixed to the suit. The attendant before lowering the attaching means fixes thereto snap hook 82 and passes the messenger cable through the hook. The attaching means is then lowered to the diver, guided by the messenger cable, from which the hook is removed by the diver.

I claim as my invention:

1. A diving suit comprising a framework having rigid sections with flexible joints, and a flexible, waterproof fabric surrounding said framework, said fabric comprising a plurality of sheets of rubber alternating with sheets of duck.

2. A diving suit comprising a framework having rigid sections with flexible joints, a flexible, waterproof fabric surrounding said framework, and means for passing air into and out of said suit, said framework comprising transverse rings of stiff metal interwoven with longitudinal strips of steel.

3. In a diving suit a helmet, a searchlamp, means slidably connecting said searchlamp with the interior of said helmet and transparent panels in the walls of said helmet adjacent said means, whereby said lamp may be moved from one of said panels to another.

4. In a diving suit the combination of a helmet, rails fixed to the inner walls of said helmet, a plurality of transparent panels inserted in the wall of said helmet adjacent said rails, and a searchlamp slidably mounted on said rails.

5. In a suit adapted to be worn under water by a diver, a helmet, a searchlight movably positioned in said helmet, a plurality of transparent panels inserted in the wall of said helmet, and means arranged so that said light may be moved by the head of the diver from one of said panels to another of said panels.

In testimony whereof, I hereunto set my hand.

HENRY D. DEAM.