

(No Model.)

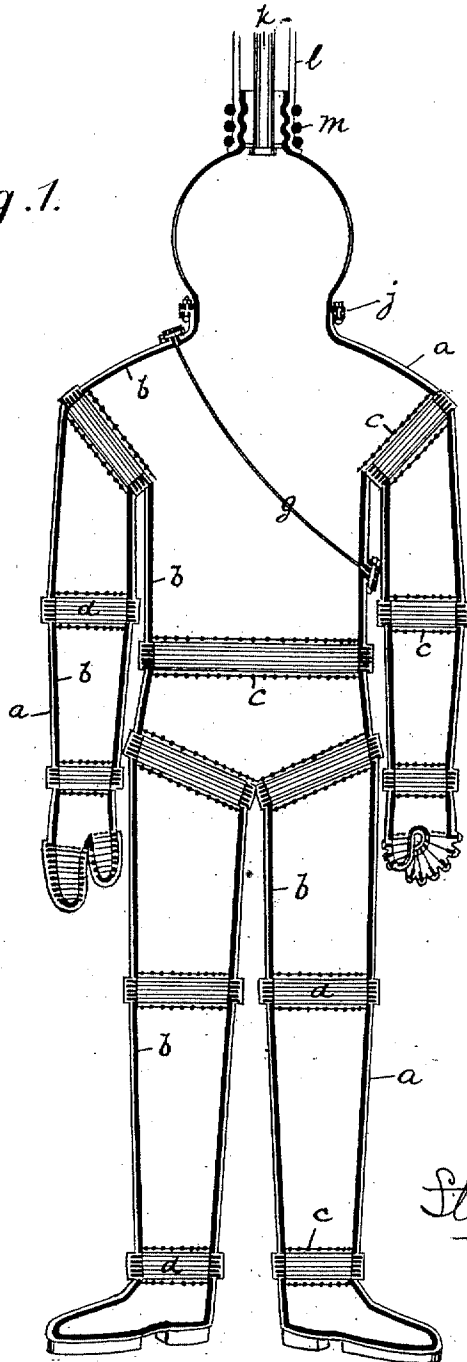
3 Sheets—Sheet 1.

S. P. M. TASKER.
Diving Apparatus.

No. 236,858.

Patented Jan. 18, 1881.

Fig. 1.



Stephen P. M. Tasker
Inventor.

Witnesses.

John D. Leary

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*By his Attorneys,
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(No Model.)

3 Sheets—Sheet 2.

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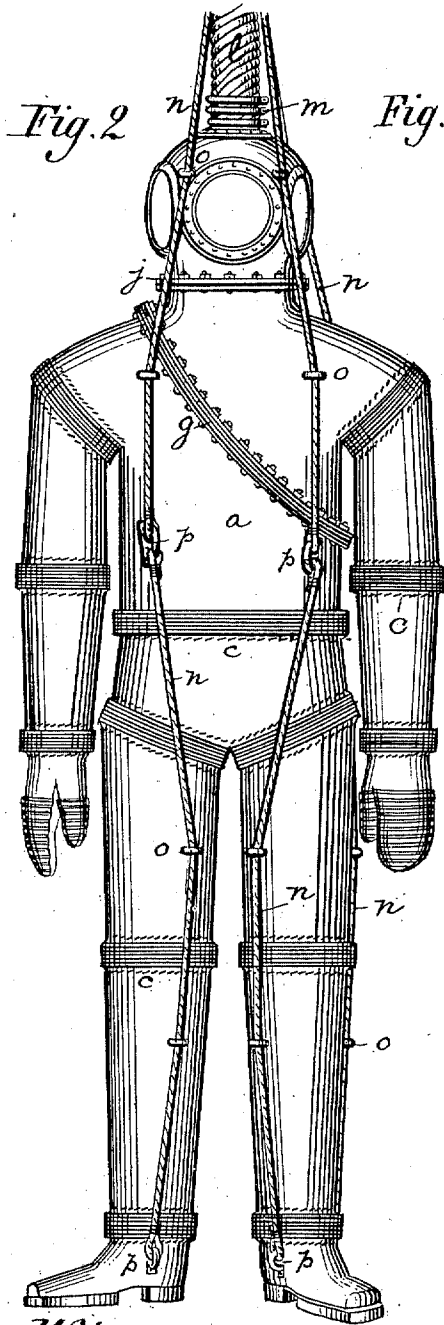


Fig. 2

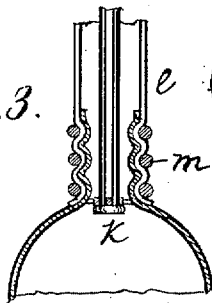


Fig. 3.

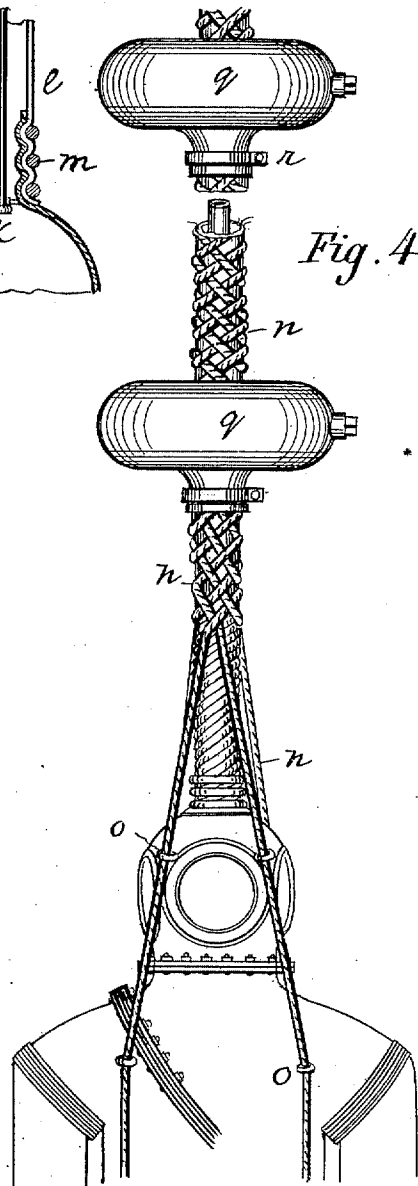


Fig. 4.

Witnesses.
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(No Model.)

3 Sheets—Sheet 3.

S. P. M. TASKER. Diving Apparatus.

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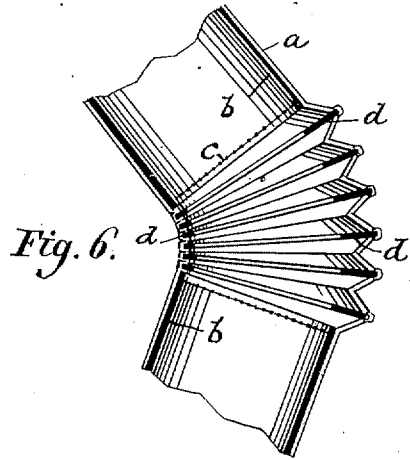
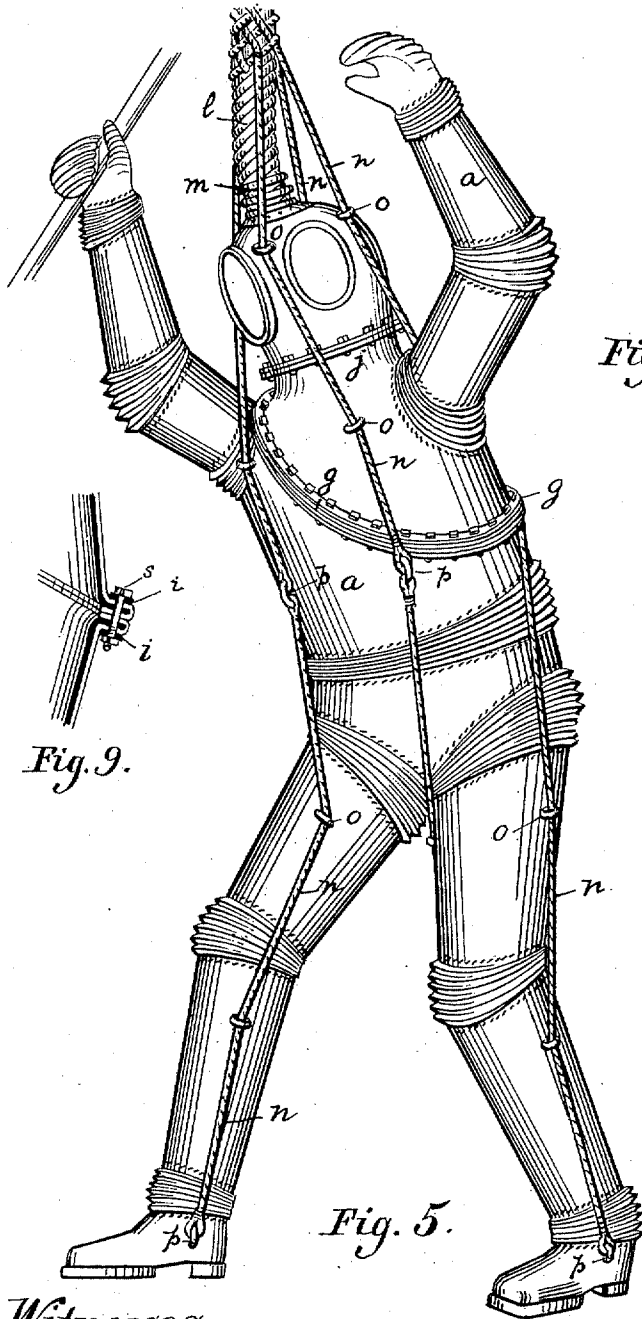


Fig. 6.

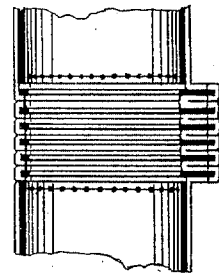


Fig. 7.

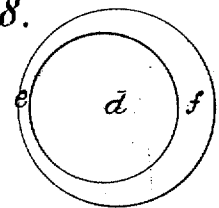
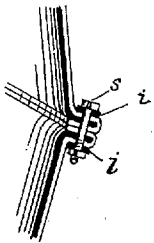


Fig. 8.

Fig. 9.



Witnesses.

John D. Miller
Ashbel E. Ware.

Fig. 5.

Stephen P. M. Tasker By his Attorneys,
W. C. Strawbridge,
Abraham Taylor

UNITED STATES PATENT OFFICE.

STEPHEN P. M. TASKER, OF PHILADELPHIA, PENNSYLVANIA.

DIVING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 236,858, dated January 18, 1881.

Application filed June 21, 1880. (No model.)

To all whom it may concern:

Be it known that I, STEPHEN P. M. TASKER, of Philadelphia, Pennsylvania, have invented an Improvement in Diving Apparatus, of which
5 the following is a specification.

Heretofore in diving apparatus shaped to the human body it has been difficult to combine with the requisite flexibility of material a rigidity or stiffness sufficient to resist at
10 every portion of the armor the external pressure of the water without re-enforcing or aiding the material of which the apparatus is composed by pumping within it a supply of
15 atmospheric air not only sufficient to insure life to the diver, but also sufficient to counteract, balance, and resist the external pressure of the water.

The object of my invention is the construction of such an armor, suit, or apparatus as
20 shall overcome this difficulty, and be of itself of sufficient strength to resist at its every portion the external pressures without re-enforcement by an over-supply of internal air, and shall at the same time be of sufficient flexibility
25 to permit the requisite movements of the diver.

It further has for its object a better construction of the armor-lifting devices, whereby the strains in lowering and lifting the apparatus
30 out of the water are not, as heretofore, confined to one portion of the armor, but are distributed more equally over it, so as to act not only upon the head and trunk portions, but also upon the legs, and thereby take from off
35 them in the elevation and lowering of the apparatus.

It further has for its object such an arrangement of the air inlet and exhaust tubes as concentrates them into one and prevents the com-
40 plexity and entanglement incident to the old arrangements; and, further, such a construction of the suit as enables it to be easily put on and taken off; and, finally, such an arrangement of the air-tubes that by the application of suit-
45 able floats they are kept continuously elevated and out of the way of the diver.

In the accompanying drawings, Figure 1 is a central sectional elevation of an apparatus embodying my improvements, and consisting,
50 essentially, of an interior lining of rigid ma-

terial and an exterior coating of flexible material; Fig. 2, a front elevation of the same, showing the method of attachment of the lifting-ropes and the location of the various joints; Fig. 3, a sectional elevational detail of the
55 upper portion of the helmet and the method of attachment thereto of the lower extremities of the exhaust and inlet air-tubes; Fig. 4, an elevation of the tubes, showing the means whereby the lifting-ropes are applied, showing
60 also the application of the floats; Fig. 5, a perspective view of the position of the armor in a given movement of the diver—as, for instance, in his movement of walking upon the
65 bottom of the sea, illustrating also the expansion of the bellows-joints; Fig. 6, an enlarged sectional detail, showing the form of a bellows-joint expanded; Fig. 7, a similar view of the
70 same contracted or closed up; Fig. 8, a form of ring employed in the construction of a single-acting bellows-joint; Fig. 9, an enlarged sectional view of the body-coupling.

A represents the flexible water-proof covering of the armor. This may be made of any
75 suitable material, such as rubber, water-proof cloth, or other fabric which, while both strong and elastic, is yet impervious to water.

b is the interior metallic casing which constitutes the inner layer, lining, foundation, or
80 body of the suit. The lining may be made of sheet metal of any fit kind, or of other material, the essential characteristic of which must be rigidity or stiffness sufficient to retain the
85 contour of its various sections against such collapsing pressures as are found to exist under water.

The union of the metal or other lining and water-proof covering is conveniently effected
90 by rows of wire stitching, as indicated at c, in the place of which, however, may be substituted rivets or equivalent fastening devices.

In the construction of the joints it is, of course, impossible that the metal of the lining
95 should be continued, at least in an unbroken condition, as in the unjointed sections.

The object of extending the water-proof material of which the flexible joints are composed over the entire surface of the limbs and
100 body of the armor is, as far as possible, to save or do away with connecting-couplings in

the armor, as it is obvious that the liability of leakage increases in proportion to the number of coupling-joints in the armor.

If it is desired, the connections, couplings, and the flexible joints in the armor may be fastened and secured by means of flanges and rivets or bolts, as shown on the neck portion of the armor in the drawings. In order, then, to secure the necessary resisting stiffness, and at the same time the requisite flexibility, I have devised a joint consisting, essentially, of a series of flat rings, *d*, each of substantially the form shown in Fig. 8, and of suitable size. The form of the ring is that of a flat disk with a center not concentrically but eccentrically punched therefrom, so that the ring has an edge which is thin and an edge or side, so to speak, which is thick—*e*, for instance, representing a thin and *f* a thick side. The side *e* is placed at the inner junction of the joint, where the latter is constructed to open in one direction, or to be single-acting, as shown in Fig. 6, while the thick side *f* is put upon the outer junction of the joint, as shown in the same figure. The water-proof covering being extended more fully over the outside of the joint, as shown at Fig. 6, forms a bellows-joint which closes in upon itself, in the form shown in Fig. 7, the bellows material folding in between the rings and lying closely compacted between the latter when the joint is closed. The rings are held in place by wire, rivets, or the like.

Where a joint has motion in one direction only—as, for instance, an elbow-joint, as shown in Fig. 6—the rings and joint are constructed as just stated. Where, however, the motion of the joint must be compound, so as to open upon two sides or upon all sides, the joint is made correspondingly—that is to say, has two bellows-joints, or a bellows-joint all around, and the rings correspondingly shaped. It will be understood that when one of these joints is closed by straightening out the jointed sections the rings lie within the bellows-shaped material flat upon each other, thereby effectually resisting external pressure, and forming a portion even more strong than the unjointed portions of the sections, and a portion upon which the unjointed sections on its either side abut, so to speak. When, on the contrary, the joints are bent, the bellows material is prevented from collapsing out of shape by the rings, the flexible material, however, being made of strength sufficient to resist the external pressure.

It is obvious that there are incident to my joint, among other advantages, that the interior diameter of the armor is not contracted at the joints, the bellows material and rings projecting outwardly; that the joints are both laterally stiff, compact, and light, a few rings cut from light sheet metal insuring, from their form and arrangement, both strong resistance to exterior pressures and large extension to the flaps; and that the flap portions are protected, when closed, by the rings, and held with cer-

tainty in their folds, while the connection of section with section is steady and strong, whether the joint be open or shut. The apparatus, therefore, considered as a whole, is a casing at all parts, joints, and unjointed surfaces, capable of resisting external pressures.

The trunk portion of the apparatus is provided with a coupling, which starts from one shoulder, extends obliquely around the body, front and back, and terminates below the arm which is opposite to the shoulder mentioned, whereby the apparatus is easily put on and taken off, the coupling referred to being made operative by any well-known means, such as bolts, clutches, snap-catches, or equivalent fastenings. The water-proof material at this coupling is entirely parted, but is connected by a loose flange, through a fast flange, in the manner represented in section at *g* in Fig. 1, in the following manner—that is, each of the contiguous portions of the armor which are to be united by a coupling is bent out to form a flange of the proper shape. The rubber coating is also turned out, but is lapped around about the flange.

To make the coupling tight I apply upon the exterior surfaces of the flanges, which are rubber-coated, separate metal flanges *i*, so that the bolts or other fastenings, *s*, embrace eight thicknesses and make a perfectly impervious joint. I do not, however, confine myself to eight thicknesses or the exact construction recited, as I contemplate the use of a less number of flanges, or of other analogous methods.

The helmet of the apparatus, which is also adapted to be removed, is connected by a similar coupling, *j*, composed, however, of fewer thicknesses by reason of the different construction of the helmet, which is that generally employed.

The air-tubes in my improved apparatus consist of an inner tube, *k*, for supplying air, and an outer tube, *l*, for carrying off the exhaled air. These tubes can, if desired, be continued within the helmet and terminated at any suitable point. The tubes in question are made to resist a high degree of external pressure and to have a tensile strength sufficient for raising and lowering the apparatus.

Around the external tube, which is connected to the helmet by clamps *m*, as shown in Figs. 2 and 3, or by other analogous devices, is braided or otherwise secured a rope, *n*, which branches off into four strands above the helmet, substantially as shown in Fig. 4, and is carried down at the sides of the helmet, both in front and back of the trunk, and upon both the outside and inside of the legs, being passed through loops *o*, connected to the armor, and made fast to the front and back of the trunk and feet at *p*. This rope is intended to take the strain from the tube in hoisting or lowering the apparatus, and at the same time to hold the flexible joints of the apparatus together, and not permit the weight of the apparatus itself—that is, of the lower portions thereof—to depend upon the joints interme-

diate between the attachment of the lifting device to the helmet and the boots.

In order that the weight of the ropes and tubes may not interfere with the diver, I apply floats *g* at convenient places upon the rope, which may be made of material which will itself float, or may be hollow bags filled with air or light gases. The floats are secured, as is most convenient, by clamps *r* or the like, so that they may be taken off and applied at will.

The object of my invention, in conclusion, is to overcome the defects heretofore existing in common forms of diving apparatus, and in which the armor is obliged to carry or be supplied with an internal pressure of air proportionate to the external pressure of water, by the excessive pressure of which air upon his body the diver is injuriously affected, the blood being, as is well known, forced from the surface of his body to its interior, so as to cause congestion, and even death. Its further object is to effectually prevent the pressure of the water in deep diving from interfering with the movements of the diver, as his requirement is, that the inside pressure of air be merely such as will sustain healthful breathing, while it is essential, as before stated, that further external pressures, either of air or water, should be excluded from him.

Having thus described my invention, I claim—

1. A diving suit or armor conformed to the shape of the human body, and consisting, essentially, of unjointed sections connected together by flexible joints corresponding to the joints of the body, the unjointed sections being formed of rigid material, the joints of flat rings, and both sections and joints being covered and united together by flexible water-proof material, substantially as and for the purposes set forth.

2. In combination with a diving-armor of the class above recited, bellows-joints consisting of flat rings of metal or other rigid material and flat portions of flexible material, in combination with rigid sections, substantially as and for the purposes specified.

3. In combination with bellows-joints of flexible material, flat rings, substantially as hereinbefore set forth.

4. As a coupling for the diving-armor hereinbefore described, composite flanges embodying both fast and loose flanges of coating and lining material, united by bolts or the like, in the manner hereinbefore set forth.

5. In a diving apparatus of the character hereinbefore set forth, a coupling extending from one shoulder to beneath the opposite arm, substantially as and for the purpose set forth.

6. In a diving apparatus, as a means for supplying and exhausting air and preventing entanglement, two concentric pipes connected with the helmet, one adapted to supply and the other to exhaust air.

7. In combination with air-tubes connected with the helmet, ropes or the like secured about the air-tubes, and likewise secured to the armor at various points, as and for the purpose set forth.

8. In combination with the air-tubes and lifting devices of the armor, adjustable floats, as and for the purpose set forth.

In testimony whereof I have hereunto signed my name this 15th day of June, 1880.

STEPHEN P. M. TASKER.

In presence of—

W. C. STRAWBRIDGE,
C. B. TAYLOR.

Correction for Letters Patent No. 236,858.

It is hereby certified that in Letters Patent No. 236,858, granted January 18, 1881, to Stephen P. M. Tasker, for an improvement in Diving Apparatus, the word "flap," in line 45, page 3, of the printed specification forming part of said Letters Patent, was erroneously printed "flat;" that the proper corrections have been made in the files and records of the Patent Office, and are hereby made in said Letters Patent.

Signed, countersigned, and sealed this 2d day of February, A. D. 1881.

[SEAL.]

A. BELL,

Acting Secretary of the Interior

Countersigned:

E. M. MARBLE,

Commissioner of Patents.