

No. 711,342.

Patented Oct. 14, 1902.

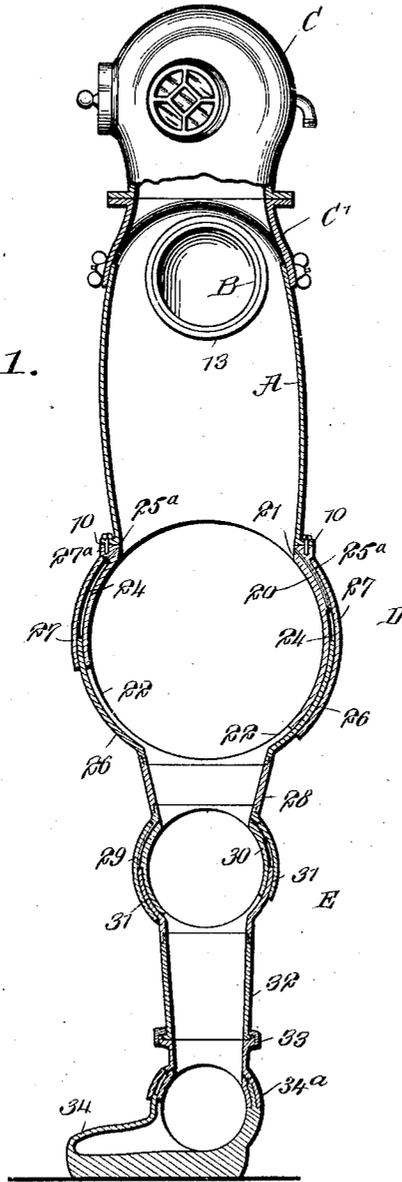
E. B. PETRIE.  
DIVING APPARATUS.

(Application filed Jan. 18, 1902.)

(No Model.)

2 Sheets—Sheet 1.

Fig. 1.



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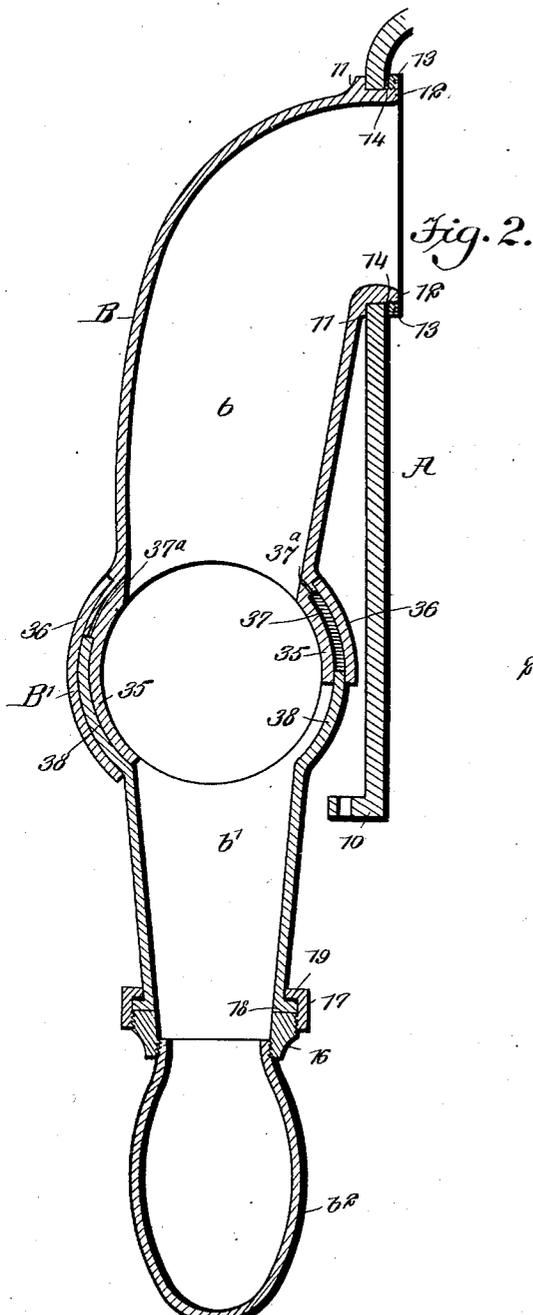


Fig. 2.

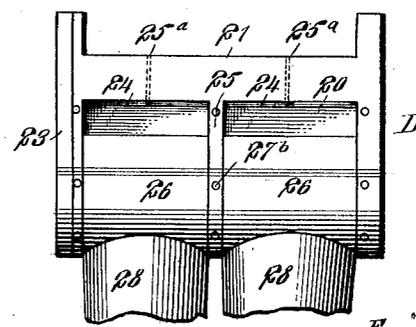
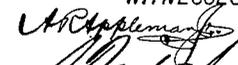


Fig. 3.

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# UNITED STATES PATENT OFFICE.

ENOS B. PETRIE, OF NEW YORK, N. Y.

## DIVING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 711,342, dated October 14, 1902.

Application filed January 18, 1902. Serial No. 90,304. (No model.)

*To all whom it may concern:*

Be it known that I, ENOS B. PETRIE, a citizen of the United States, and a resident of the city of New York, borough of Brooklyn, in the county of Kings and State of New York, have invented a new and Improved Diving Apparatus, of which the following is a full, clear, and exact description.

My invention relates to an improvement in diving apparatus, particularly such apparatus as is employed for deep-sea diving, and to so construct the apparatus that it will withstand the pressure of deep water and yet may be worn with comparative comfort.

A further purpose of the invention is to so construct the diving apparatus, armor, or suit that a perfectly-articulating water and air tight joint is provided at the connection of the hip, body, and leg sections and the knee, ankle, and elbow sections or wherever movement of the body or limbs is necessary or desirable, the movement attainable being in any necessary direction, thus affording to a diver in a heavy suit the greatest freedom of action.

A further purpose of the invention is to provide a connection between the arm-sections of the armor or suit and the body-section which will permit the arm-sections to be turned as occasion may demand and also to provide a swivel connection between the hand or mitten sections and the arms.

The invention consists in the novel construction and combination of the several parts, as will be hereinafter fully set forth, and pointed out in the claims.

Reference is to be had to the accompanying drawings, forming a part of this specification, in which similar characters of reference indicate corresponding parts in all the figures.

Figure 1 is a vertical section taken centrally through the improved apparatus, the helmet being shown in side elevation. Fig. 2 is an enlarged view illustrating a vertical section of one part of the body of the apparatus and an arm and mitten section, the said view illustrating the manner in which an arm-section has a movable connection with the body-section, the mitten-section a swivel connection with the arm-section, and an articulating joint at the elbow of an arm-section; and Fig. 3 is a rear view of the trunk-section of the apparatus, a part being removed.

The entire apparatus is made to fit the person in the most convenient manner, thoroughly incasing it, and said apparatus is made of metal of any desired weight of material necessary to withstand the pressure of water at the various depths to which the diver is to descend.

A represents what may be called the "body" portion of the apparatus, which is to inclose the abdomen and chest, and at each shoulder portion of this body-section A an opening is made to receive the upper end of a sleeve-section B. The entering portion of a sleeve-section is particularly shown in Fig. 2, and an annular collar 11 is formed on the exterior of each sleeve-section near its upper end, which collar is adapted for engagement with the outer face of the body-section A around the opening at the shoulder portion thereof. The upper end 12 of each sleeve-section B extends through a shoulder-opening into the interior of the body-section A, and the inwardly-extending portion of each sleeve-section B is exteriorly threaded to receive a nut 13, which bears against a gasket 14, located between the nut and the inner face of the body-section, the gasket extending around the inner projecting portion of a sleeve-section, as is also shown in Fig. 2. By means of such a connection the arm in a sleeve or arm section may be turned as desired, since each arm or sleeve section has rotary movement in the body-section A of the apparatus, and this connection, as has been shown, is made in a water and air tight manner.

Each sleeve or arm section B comprises an upper shoulder portion or section *b*, a forearm-section *b'*, connected with the upper or shoulder section *b* by an articulated connection *B'*, to be hereinafter described, and a hand or mitten section *b<sup>2</sup>*, which section *b<sup>2</sup>* is screwed at its upper end into a nut 16. The nut 16 is provided with an exterior upper thread adapted for engagement with a collar 17, having an inwardly-extending flange, which is carried over an outwardly-extending flange 18 at the bottom portion of the forearm-section *b'* of a sleeve or arm section of the apparatus, as is shown in Fig. 2. A gasket 19 intervenes the flange of a forearm-section and the flange of the sleeve or collar 17.

Thus the mitten or hand section of a sleeve or arm section B of the apparatus has practically a swivel connection with the forearm-section, and the hand or mitten section  $b^2$  of each arm or sleeve section B is provided with a hook 15 or other suitable device, whereby objects may be picked up and retained.

The body-section A is connected with what may be termed a "trunk-section" D, adapted to receive the hips and upper portions of the legs of the diver. This trunk-section is of an articulated construction and comprises a shell 20, semicircular in cross-section and of any suitable dimensions. This shell is provided with an opening 21 at the top and an opening 22 in the bottom, the opening at the top being in communication with the body portion of the diving apparatus, and the opening 22 in the bottom, which latter opening predominates in size, is adapted for communication with the leg-sections E of the apparatus and to be hereinafter described. This shell 20 is closed permanently at one end, and is usually closed at the opposite end by a cap 23, attached thereto in any approved manner. The upper edges of the shell at the opening 21 when the armor suit or apparatus is in an upright position are practically in alignment with the front and rear inner faces of the body-section A, as is shown in Fig. 1. In the front and rear of the shell 20 vertical recesses 24 are produced, as shown best in Fig. 3, separated by a rib 25, and these recesses receive curved extensions 26 from the upper portion of the leg-sections E, as is shown in Figs. 1 and 3. An outer shell 27, also semicircular in cross-section, engages the inner shell 20 and is secured thereto by means of suitable bolts. (Not shown.) This outer shell 27 is provided with an upper opening and a lower opening, the lower opening being usually of greater extent transversely than the upper opening. In the formation of the trunk D the rear portion of the outer shell 27 extends farther downward than does the inner portion of said shell, and at the upper edge of the outer shell 27 an enlargement  $27^a$  is formed, adapted to receive flanges 10 at the lower ends of the body-section A, and these flanges are secured to the enlargements  $27^a$  by means of bolts or their equivalents. It will be observed that the upper curved portions of the leg-sections have free and articulating movement between the outer and inner shells of the trunk in the recesses or channels 24, and in order to prevent the air from cushioning the upper portions 26 of the leg-sections E channels  $25^a$  are produced between the outer and inner shells, leading from the recesses 24 to the interior of the body portion of the apparatus, as is clearly shown in Figs. 1 and 3.

The upper portions 26 of the legs E, forming a part of the articulated trunk, are connected in any suitable or approved manner to tubular members 28, which members receive the lower thigh portions of the legs of the diver. These upper members 28 of the leg-sections

are connected with outer shells 29, which are secured to inner shells 30, having recesses therein corresponding to the recesses 24, and curved extensions 31 from the ankle member 32 of the leg-section are passed between the two shells 29 and 30 and slide in said recesses, forming an articulated connection between the members of the leg to receive the knee portions of the limbs of the diver.

The arrangement of the articulated knee-joint just described is substantially the reverse of that described in relation to the articulated connection at the front—that is to say, the preponderance of material is at the front of the connection instead of at the rear, so that the movement of the legs can be greater rearward than forward, while in the articulated connection at the front it is necessary that the movement should be greatest in direction of the front, so that the body can be brought to a full stooping position.

The ankle member 32 of each leg is connected with a foot member 34 by a joint 33, corresponding to the joint employed to connect the mitten-section  $b^2$  with the forearm-section  $b'$  of a sleeve-section B of the apparatus. The foot member of each leg is provided with an articulated connection  $34^a$ , which corresponds in construction to the articulated connections heretofore described.

The articulated connection B' between the shoulder and forearm sections of the apparatus is shown in Fig. 2 and corresponds in construction to that described at the other joint portions of the apparatus. It consists of an inner shell 35 in communication with the shoulder and forearm of a sleeve or arm section, an outer shell 36, connected to the inner shell, slideways or recesses 37, produced in the outer face of the inner shell and having vent communication  $37^a$  with the shoulder-section of the sleeve, and curved extensions 38 from the forearm-section, which have movement between the two shells in the recesses 37.

The entire apparatus is preferably provided with a rubber jacket either loosely or closely applied thereto.

Having thus described my invention, I claim as new and desire to secure by Letters Patent—

1. A diving apparatus having articulated sections for the reception of the jointed portions of the body, which sections consist of inner and outer shells connected with one main section of the apparatus, and extensions from an opposing main section of the apparatus, having movement in a circular direction between the inner and outer shells, as described.

2. A diving apparatus having articulated sections for the reception of the jointed portions of the body, which sections consist of inner and outer connected shells attached to one main section of the apparatus, the inner shell having recesses in its outer face and vents leading from the recesses to the interior of the apparatus, and extensions from the adjoining main section of the apparatus,

which extensions have sliding movement in the said recesses and between said shells, as described.

3. In a diving apparatus, the combination, 5 with main sections of the apparatus, of an articulated connection between said main sections, the said connection comprising inner and outer connected shells, semicircular in cross-section and attached to one main section 10 of the apparatus, the inner shell having recesses in its outer face, which recesses are provided with air-vents leading to the interior of the apparatus, and curved extensions from the second main section of the apparatus, 15 fitted to the recesses in the inner shell and mounted to slide therein between the two shells, as described.

4. In a diving apparatus, the combination with the body, leg, foot and arm sections, of 20 a cylindrical articulated section connecting the body and leg sections of the apparatus,

articulated cylindrical sections located at the knee portions of the leg-sections, the ankle portions of the foot-sections and between the 25 shoulder and forearm portions of the arm-sections of the apparatus, the said cylindrical articulated connections permitting the body to move at said parts freely backward and forward, and horizontally-operating articulated connections above the main ankle-joints 30 and at the wrist portions of the apparatus, whereby the mitten and foot portions of the apparatus may be laterally or horizontally moved around the parts with which they are connected, as described. 35

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

ENOS B. PETRIE.

Witnesses:

J. FRED. ACKER,  
JNO. M. RITTER.