

No. 609,418.

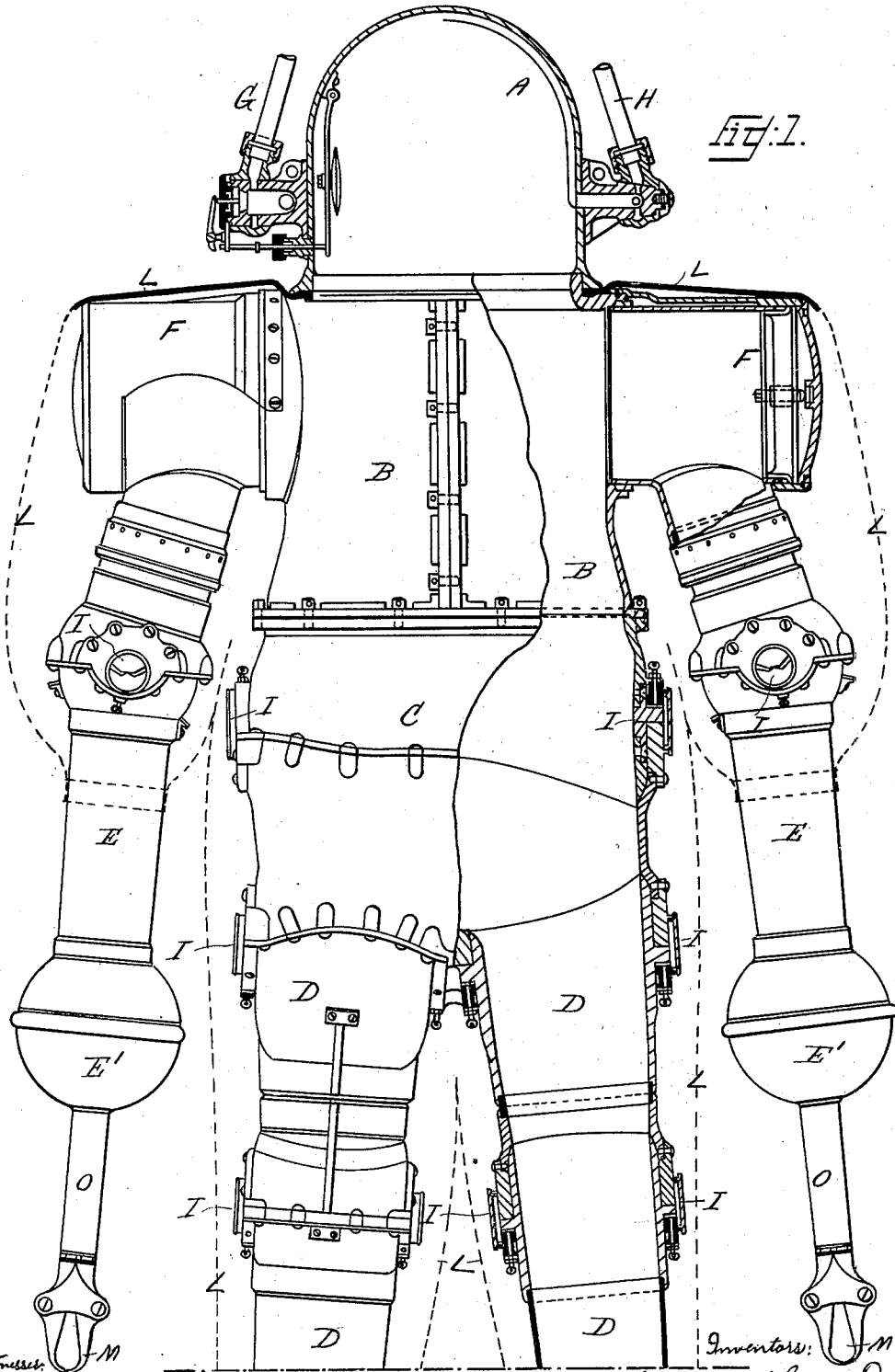
Patented Aug. 23, 1898.

J. & G. DAY.
DIVING APPARATUS.

(No Model.)

(Application filed Dec. 22, 1897.)

3 Sheets—Sheet 1.



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UNITED STATES PATENT OFFICE.

JOHN DAY AND GEORGE DAY, OF MAESTEG, ENGLAND.

DIVING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 609,418, dated August 23, 1898.

Application filed December 22, 1897. Serial No. 662,974. (No model.)

To all whom it may concern:

Be it known that we, JOHN DAY and GEORGE DAY, subjects of the Queen of Great Britain and Ireland, and residents of Maesteg, Glamorgan county, England, have invented certain new and useful Improvements in Diving Apparatus, of which the following is a specification.

This invention relates to an improved diving apparatus which consists of an inner non-collapsible jointed suit of improved construction and an outer flexible covering which serves to protect the suit-joints; and it may consist of an entire dress inflated with air, or of joint-coverings charged with suitable lubricant, or of an inflated body-dress, and leg, or leg and arm joint coverings charged with lubricant.

The invention has special reference to the joints of the suit, with the object of minimizing the friction and facilitating the movement thereof and obtaining a reliable water-tight joint, and to means of mechanically grasping objects under water.

On the drawings, Figure 1 represents a front elevation, partly in section, of the improved apparatus. Fig. 1' is a continuation downward of Fig. 1. Fig. 2 represents a side elevation, partly in section and with the near-arm casing removed. Fig. 3 is an elevation, partly in section, and Fig. 4 is an under view, of one of the suit-joints on an enlarged scale. Fig. 5 is a section on line 5 5, Fig. 4; and Fig. 6 is a vertical section of the means for grasping objects under water. Fig. 7 is a side view, partly in section, of a foot.

The non-collapsible suit is formed of metal, with a helmet A, a casing B for the upper part of the body, projecting shoulder and arm casings F, secured to the casing B, forearm-casings E, elbow-jointed to the casings F and adapted for use with depending hand-actuated mechanical gripping devices, a casing C for the abdominal part of the body jointed to the casing B, and sectional leg and foot casings D, hip-jointed to the casing C, and also knee and ankle jointed together.

The outer flexible covering L, serving to

protect the suit-joints, may be formed of any suitable waterproof material and may be adapted to envelop the suit from the helmet-neck (see dotted lines in Figs. 1 and 2) and may be lashed around or otherwise suitably fastened in a water-tight manner to the suit at the neck, wrists, and ankles, or elsewhere, as required, or it may consist of sectional coverings adapted to each respective joint (see Fig. 3) or of an inflated body-dress and sectional coverings for the leg or leg and arm joints.

The special purpose of the covering or coverings L is to insure freedom of movement to the suit-joints by preventing access thereto of water, sand, and other foreign matter, and this end it attains, if entire or a body-dress, by being inflated with air at a pressure about that of the water in which the apparatus will be used and, if sectional, by being charged with suitable lubricant L', which will also facilitate the working of the joint.

The preferred construction and connection of the parts A, B, and F are represented on the drawings, but are not material to the invention and may be varied.

I indicates the jointing together of the parts B C, C D, F E and the sections of the parts D, and to which the invention has special reference. As all said joints are similar in construction and vary only in size and proportion, they will be described with reference to the elbow-joint represented in Figs. 3 to 5. The joint is made with inner and outer spherical or spheroidal parts I¹ I², flattened at opposite ends of the lineal axis of movement and formed or adapted with cylindrical bearings V-shaped at the axis of rotation.

The part I² is fitted with a bearing-block I⁵, which is formed with a sectoral upper bearing I⁶, V-shaped at the axis of rotation, and is fitted with a sectoral bushing J'.

The part I¹ is formed or fitted with a sectoral bearing J, adapted to be supported by and to freely turn in the bushing J'; and is V-shaped at the axis of rotation, at which it supports the bearing I⁶ with freedom of movement, being pressed into contact therewith

by a screw-pin J^3 , passed through the block I^5 and pressing against the bushing J' . The opposing faces of the parts $I^6 J$ are shaped to allow of the required movement between the parts $I' I^2$, the extent of which movement is determined by stops I^7 , fitted to the part I' , abutting against plates I^4 , fitted to the part I^2 . The joint parts $I^5 I^6 J J^2$ are preferably formed of hardened steel. The block I^5 is formed with an opening I^9 , which enables the axial bearings to be readily inspected and is normally closed by a screwed or other removable cap K and packing K' to prevent access of foreign matter to the axial bearings. Peripherally the part I^2 is formed with stuffing-chambers I^8 , fitted with inclosing plates I^4 , serving to prevent access of foreign matter between the parts $I' I^2$.

If the joint is surrounded with a sectional waterproof covering L , charged with lubricant as aforesaid, sufficient slack should be allowed in the covering material to enable the joint to be freely moved to its full extent without disturbing the attached parts of the covering.

If the suit be enveloped from the neck downward with an entire or body covering L , the latter must also have sufficient slack to permit of the free movements of the suit, and is connected by tubing L' with a union G^5 , leading from the air-supply apparatus G , (which may be of any suitable nature,) by which the helmet is supplied and is kept charged with air at a pressure about that of the water in which the apparatus is to be used.

The excess of vitiated air from the helmet is conveyed to above water by a pipe H .

In the means of mechanically grasping objects under water (see Fig. 6) the forearm-casing E terminates in a hand-casing E' , having a tubular extension O , ending in a stuffing-box P . Projecting through the extension is a tube N , which within the casing E' is fitted with a handle Q , and beyond the extension is formed with a stuffing-box T' and is adapted to carry a pair of opposing grips M , pivoted at M' and having inner projecting spurs W . Within the tube N is a rod T , which within the casing E' is fitted with a handle Z and is screw-threaded and fitted with a wing-nut X , and beyond the stuffing-box T' is formed with a head U , having notches V , adapted to engage with the grip-spurs W . A spring Y is interposed between the handles $Q Z$, tending to separate the same and to open the grips M . The rod T can be reciprocated within the tube N to an extent determined by the engagement of projections Z' on the handle end Z with slots Q^2 in the handle end Q , which projections also prevent the rod T from turning within the tube N . The tube N , rod T , and jaws M can be turned around or rotated about the axis of the rod T by turning the handles $Q Z$, and can be ar-

rested in any desired position by a spring-catch R , adapted to engage with holes S in a ledge projecting within the casing E' . The grips M can be opened and closed by manipulating the handle Z and can be forcibly brought together by turning the nut X down the screwed portion of the rod T .

What we claim as our invention, and desire to secure by Letters Patent, is—

1. The combination of an inner water-tight non-collapsible jointed metal diving-suit, an outer flexible waterproof covering or coverings secured water-tight to the suit and serving to protect the suit-joints from the access of water, sand, and other foreign matter and to permit of their freedom of movement, as set forth.

2. In diving apparatus, in combination, an inner non-collapsible metal-jointed diving-suit and outer flexible waterproof covering secured water-tight to the suit, covering one or more joints of the suit, lubricating material within said covering for said joints, the covering and lubricant serving to protect the suit-joints from the access of water, sand and other foreign matter and to permit of their freedom of movement, as set forth.

3. In joints for connecting the relatively-movable parts of diving apparatus, in combination, inner and outer jointed spherical or spheroidal parts (as I', I^2) peripherally packed and having trunnion-bearings concentric with the axis of movement and V -shaped at the axis of rotation, the opposing faces of the axial bearings being shaped to allow of the required movements of the joint parts, and the peripheral parts being adapted with stops to determine the extent of movement, as set forth.

4. In joints for connecting the relatively-movable parts of diving apparatus, in combination, inner and outer jointed spherical or spheroidal parts (as I', I^2) peripherally packed and having trunnion-bearings concentric with the axis of movement and V -shaped at the axis of rotation, the opposing faces of the axial bearings being shaped to allow of the required movements of the joint parts, and the peripheral parts being adapted with stops to determine the extent of movement, and an outer flexible and waterproof covering charged with lubricant and secured water-tight about the upper and lower parts of the joint, as set forth.

5. In joints for connecting the relatively-movable parts of diving apparatus, in combination, trunnion-bearings respectively applied to said parts concentric with the axis of movement and V -shaped at the axis of rotation of said parts, the opposing faces of the axial bearings being shaped to allow of the required movements of the joint parts, as set forth.

6. In combination with a diving apparatus,

a manually-actuated mechanically-grasping device applied to a tubular extension of the hand-casing and consisting of a tube N, fitted with a handle Q, and pivoted spurred grips M, an inner rod T, formed with a handle Z, and a recessed head U, adapted to coact with the grip-spurs, means for separating and for closing together the handles Q, Z, and means for arresting the gripping device in any desired position about its axis of rotation, as set forth.

Signed by me, JOHN DAY, at Cardiff, Gla-

morganshire, Wales, this 7th day of December, 1897.

JOHN DAY.

Witnesses:

JOHN AUGUST DAY,

DAVID ILIAD EWIL.

Signed by me, GEORGE DAY, at London, England, this 8th day of December, 1897.

GEORGE DAY.

Witnesses:

CHARLES AUBREY DAY,

ALFRED CHARLES DAY.