

No. 767,659.

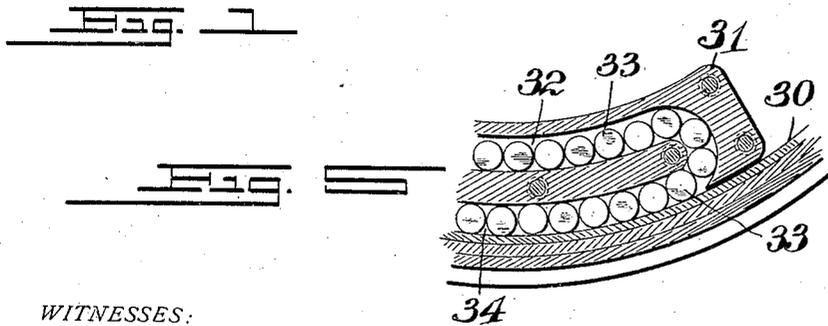
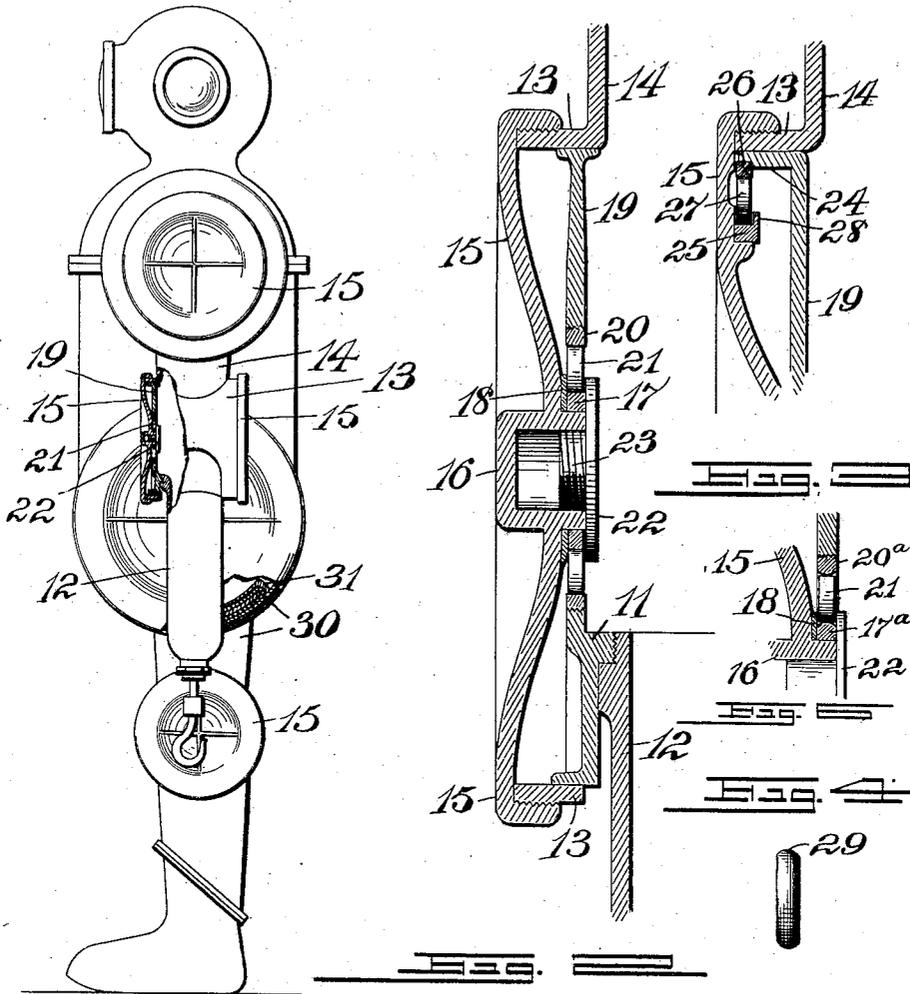
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E. B. PETRIE & J. E. MARTIN.

DIVING SUIT.

APPLICATION FILED MAR. 7, 1904.

NO MODEL.



WITNESSES:

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# UNITED STATES PATENT OFFICE.

ENOS B. PETRIE, OF NEW YORK, N. Y., AND JOSEPH E. MARTIN, OF NEWARK, NEW JERSEY, ASSIGNORS TO THE PETRIE DEEP SEA DIVING COMPANY, OF NEWARK, NEW JERSEY, A CORPORATION OF NEW JERSEY.

## DIVING-SUIT.

SPECIFICATION forming part of Letters Patent No. 767,659, dated August 16, 1904.

Application filed March 7, 1904. Serial No. 196,838. (No model.)

*To all whom it may concern:*

Be it known that we, ENOS B. PETRIE, of New York, in the county of Kings and State of New York, and JOSEPH E. MARTIN, of Newark, in the county of Essex and State of New Jersey, have invented a new and Improved Diving-Suit, of which the following is a full, clear, and exact description.

Our invention has reference to an improved diving-suit of the metallic kind, and refers more particularly to the joints employed in the movable part of the suit.

This invention is an improvement over the invention disclosed in our patent of August 11, 1903, No. 735,809, and the primary object is to provide an easier-turning joint; and it is also designed to economize the space in the joints to provide more room for the portions of the body at these points.

This invention is illustrated in the accompanying drawings, in which—

Figure 1 is an elevation of a diving-suit, partly broken away, to show some of the joints. Fig. 2 is an enlarged section of a joint. Fig. 3 is a partial section of a modified form of joint. Fig. 4 is a modification of the style of roller employed. Fig. 5 is a section of another joint, and Fig. 6 is another section of a modified form of roller-bearing.

In the joints of the suit described in the prior patent and also in this there are two cylinders working one within the other, the outer one being slotted to provide for the movement of the projecting member of the inner cylinder, and an end plate is screwed to the outer cylinder to form a closure and to stiffen the joints. As shown in Fig. 2, in this case we employ the inner cylinder 11 and the outer cylinder 13, to the inner one being secured, preferably as shown, a projecting member 12 for the reception of an arm or leg, as the case may be, and to the outer cylinder a tubular projecting member 14, as will be evident. An end plate 15 screws over the end of the outer cylinder 13 and has arranged on a central boss

16 a bearing-ring 17, and between the bearing-ring and the inner edge of the plate 15 is a washer 18 to guide the rollers.

In an opening in the wall 19 of the inner cylinder 11 is a bearing-ring 20, and between the bearing-rings 17 and 20 are arranged the flat rollers 21, these being held in place by the flange 22 of the nut 23, that screws inside the boss 16, as will be seen in Fig. 2. It will thus be seen that the rollers provide a narrow means for taking up the wear and allows an economy of space where space is necessary.

In Fig. 3 is shown a modification where the wall 11 has a flange 24, and on the inner side of the end plate 15 is a bearing-ring 25, and on the inner edge of the flange 24 is a bearing-ring 26, while the rollers 27 are placed between them, a flange 28 in the ring 25 serving as a retainer. It will be observed also in this construction that the turning-friction is not between the inner and outer cylinders, but between the inner cylinder and the end plate. In all these constructions we may employ a roller having a rounded edge 29 to provide a minimum amount of tread.

In the joint shown in Fig. 5 we employ the bearing-ring of a movable member 30, and a fixed member 31 serves to hold the rollers 33, the return-race 32 being of a greater width than the race 34, where the rollers take up contact, as this reduces the friction, and there is no contact when the rollers are returning through the race 32. As will be evident, this joint allows a very narrow roller to be used, and this is desirable, as a suit cannot be cumbersome nor very wide at these joints and at the same time provide a freedom of movement.

In the construction shown in Fig. 6 we employ the usual form, (shown in Fig. 2;) but the bearing-rings 17<sup>a</sup> and 20<sup>a</sup> have their bearing-surfaces made rounded or convex, and the roller 21 can be made flat, as shown, or we may employ the roller shown in Fig. 4. This allows of a rocking motion sidewise and takes

up any difference of registry between the outer and inner races due to the effect of external pressure on the end plate.

The leg-joints last described are expected to embody a construction that fills all requirements and allows an economy of space not permissible when balls are employed. Coupled with this economy of space we wish to emphasize the feature of placing the friction-rollers between the end plates of the joints and the inner cylinder.

Having thus fully described our invention, we claim as new and desire to secure by Letters Patent—

1. A joint for a diving apparatus comprising an outer cylindrical shell having a tubular portion emerging therefrom, an inner cylindrical shell having an end wall, the end wall having a central circular opening therein, an end plate on the outer cylindrical shell, a central boss on the inner side of the end plate, and rollers arranged between the boss and the opening in the inner shell.

2. A joint for a diving apparatus comprising an outer cylindrical shell having a tubular

portion emerging therefrom, an inner cylindrical shell having an end wall and having a tubular member secured thereto and projecting through the outer cylindrical shell, an end plate secured to the outer cylindrical shell, and rollers arranged between the inner cylindrical shell and the end plate.

3. A joint for a diving apparatus comprising an outer cylindrical shell having a tubular member emerging therefrom, an inner cylindrical shell provided with an end wall, the end wall having an opening, a tubular member secured to the inner shell and projecting through the outer cylindrical shell, an end plate secured to the outer shell, a boss on the inside of the end plate, a series of rollers arranged between the boss on the end plate and the opening in the end wall of the inner shell, and means for retaining the rollers in place.

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