

J. F. DERAY.
 DIVER'S SUIT.
 APPLICATION FILED JULY 26, 1913.

1,096,607.

Patented May 12, 1914.

2 SHEETS—SHEET 1.

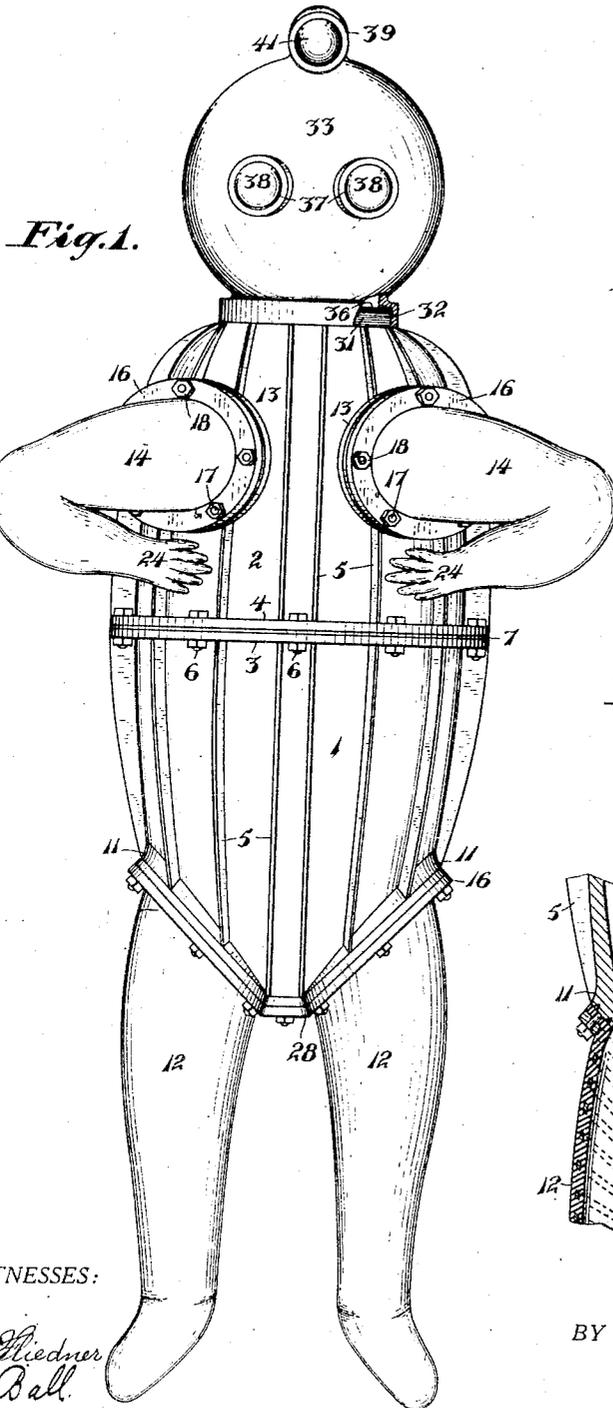


Fig. 1.

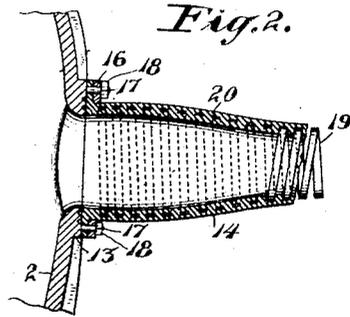


Fig. 2.



Fig. 3.

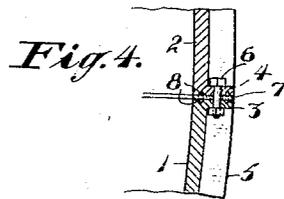


Fig. 4.

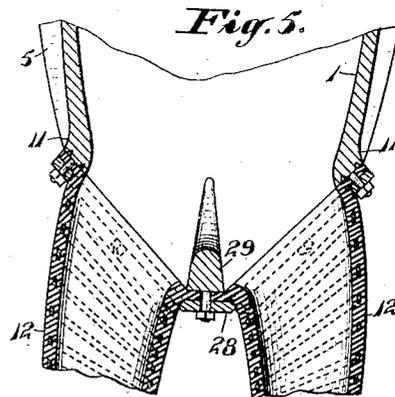


Fig. 5.

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 2 SHEETS—SHEET 2.

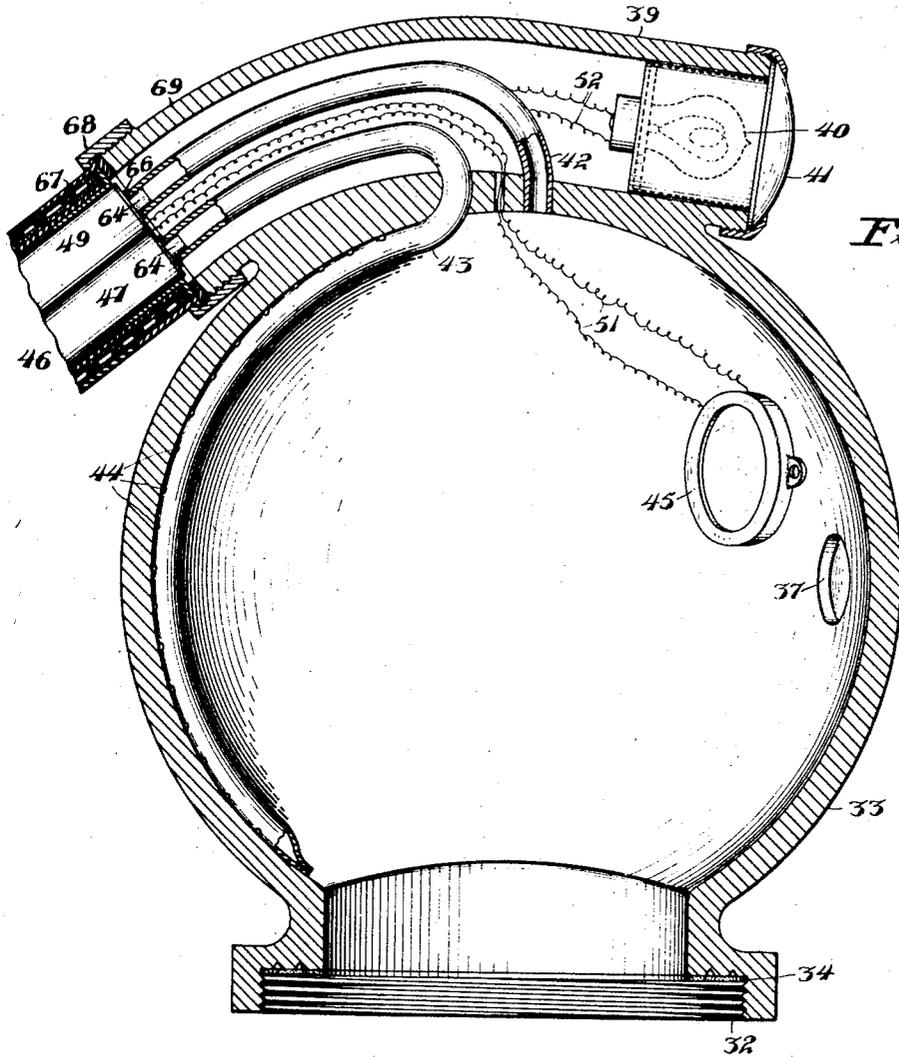


Fig. 6.

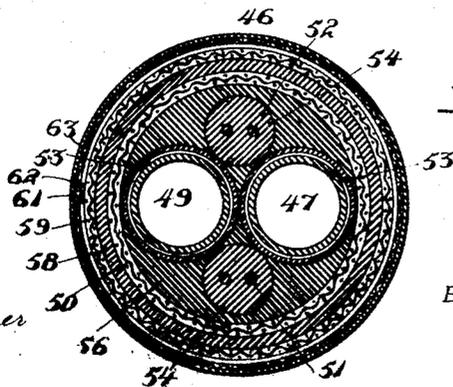


Fig. 7.

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UNITED STATES PATENT OFFICE.

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DIVER'S SUIT.

1,096,607.

Specification of Letters Patent.

Patented May 12, 1914.

Application filed July 26, 1913. Serial No. 781,383.

To all whom it may concern:

Be it known that I, JEAN F. DERAY, a citizen of the United States, residing at Sunnyvale, in the county of Santa Clara and State of California, have invented new and useful Improvements in Divers' Suits, of which the following is a specification.

The object of the present invention is to provide a diver's suit which will withstand very great external pressure, and therefore be capable of being lowered to very great depth without the necessity of correspondingly increasing the internal pressure as is now the common practice. By this means the evil effects resulting from subjecting the diver's body to a pressure of from fifty to eighty pounds a square inch are avoided. Moreover, the diver can be lowered to much greater depth than has heretofore been possible; thereby greatly extending his field of operations.

A further object is to provide means for distributing the air supplied to the diver in such a manner as to avoid as much as possible the discomforts heretofore arising from this cause.

A further object is to provide improved means for supplying the diver with illumination, and with telephonic communication with the surface of the water.

In the accompanying drawing, Figure 1 is a front view of my improved diver's suit; Fig. 2 is a sectional view of a portion of its arm and the joint therefor; Fig. 3 is a detail sectional view of a portion of a glove finger; Fig. 4 is a detail sectional view of a body portion of the suit; Fig. 5 is a sectional view of a portion of its legs and its connection to the lower body portion; Fig. 6 is a sectional view of the diver's helmet; Fig. 7 is an enlarged sectional view of the cable or hose used therewith.

Referring to the drawing, 1 indicates a lower body section, and 2 an upper body section, both of said sections being of a general tubular form, but of greatest diameter at their point of union. They are joined together by means of flanges 3, 4, formed on the respective sections, which flanges are bolted together by bolts 5, there being interposed between said flanges a ring or gasket 7, preferably of leather. The advantage of leather over, for instance, rubber, for this

purpose is that, if any water should penetrate the flanges and the leather gasket should thereby become wet, it would swell, and render the packing between the flanges still tighter. These body sections have, for greater strength, vertical ribs extending from the flanges at suitable intervals from each other. The flanges are formed on their inner or opposing surfaces with circular V-shaped grooves 8, as clearly shown in Fig. 4, and said opposing surfaces are left in a rough condition, as thereby, when said flanges engage the leather gasket, they better prevent the passage of water therebetween.

The body sections are formed each with two tubular extensions, the lower body section having tubular extensions 11, to which are connected the legs 12 of the suit, and the upper body section having tubular extensions 13, to which are connected the sleeves 14 of the suit. Said legs 12 and sleeves 14 are connected to the extensions in a manner substantially the same for both. The sleeves 14 are connected to the extensions 13 by means of rings 16 of bronze or other suitable metal, having at suitable intervals holes therethrough, through which holes extend studs 17 secured in the outer faces of the extensions 13, said studs also passing through holes in the flaring ends of the sleeve. When each sleeve has been placed in position, with the studs passing through the holes in its flaring ends, the ring 16 is next passed around the sleeves and the studs are passed into the holes in said ring. Nuts 18 are then screwed upon the threaded outer ends of said studs, thereby pressing the ring tightly toward the extension and clamping strongly between said ring and extension the end of the sleeve. The faces of the extensions against which the ends of the sleeves rest are formed, in like manner with the surfaces of the flanges of the body sections, with V-shaped grooves and serving the same purpose as that heretofore described.

Each sleeve is constructed to withstand very great pressure and at the same time to be sufficiently flexible for the necessary operations. It comprises a tubular coil 19 of flat steel, of, say, three-eighths of an inch width and three-sixteenths of an inch thickness and of a single length wound into a

helical or tubular form, on the inside and also on the outside of this coil all vulcanized together as shown at 20, is a tube or layer of canvas, a layer of rubber, a second layer of canvas, and then a second layer of rubber, so that in all there are four layers of canvas and four layers of rubber, containing there-within a tubular coil of steel. It will be understood that the sleeve is not a tube of uniform width, but its form will roughly correspond with that of a person's arm, that is, it is widest at the shoulder and tapers toward the wrist. To the wrist portion of the sleeve is connected by vulcanizing a glove 24 which is made of thick rubber, in which may be introduced, if desired, coils 26 of wound wire for the individual fingers of the glove.

A sleeve of a diver's suit constructed in the above manner is adapted to withstand a pressure of between three or four tons per square inch without being crushed. It is necessary for the diver's work that the fingers should have considerable freedom of movement, and therefore it is not desirable to protect the fingers and hands against external pressure so effectively as the sleeve. If the pressure be so great as to cramp or squeeze the hands, no permanent injury will ensue provided that the pressure be continued for not longer than one hour, as, within that time, it is generally believed that it is possible to restore the hand to its normal condition.

The leg portion of the diver's suit is constructed in a manner similar to the arm portion, except that full protection against pressure is afforded around the foot as well as around the leg. For attaching the leg portion to the lower body section, there are not used two separate rings 16, but the two rings are formed in one piece 28, being connected at the part which fits underneath the crotch of the body.

The lower portion of the lower body section is formed in the interior to form a seat 29 upon which the diver can sit when he is lifted out of the water, so that the suit may be supported independently of his body, as its weight is so great that he is unable to support it.

The top of the upper body section is circular, and is formed with an external thread 31 around which is screwed an internal thread 32 in the lower circular end of the helmet 33, a leather gasket 34 being compressed between a shoulder 36 on the upper body section and the bottom of the helmet, and said shoulder and bottom being formed with V-shaped grooves, similar to, and for the same purpose as, those already described as formed in the flanges of the upper and lower body sections. Said helmet is provided with two openings 37 in which are secured lenses 38, and at its top is secured a

casing 39 in which is an electric lamp 40, and containing a lens 41 in front of said lamp. The casing is also provided with a tube 42 which leads downward into the top of the helmet, to draw vitiated air from the interior of said helmet and with a tube 43 which extends downward at, and supported on, the back of said helmet, and formed with apertures 44 discharging against the inner surface of said back so that air supplied by said tube escapes without violence or noise. Within the helmet is also supported at a suitable point convenient to the diver a telephone 45, which is preferably of the kind used by telephone linemen, that is, serves both as a receiver and as a transmitter.

46 indicates the hose or cable for connecting the suit with apparatus at the surface of the water. It contains a tube 47 for supplying air, a tube 49 for exhausting air, a wire 51 for the telephora, a wire 52 for the electric lamp, the rest of the circuits from said telephone and the electric lamp to the apparatus at the surface of the water being the ground. These tubes 47, 49 are surrounded by helical steel coils 53, and the wires 51, 52 are surrounded by very heavy insulation 54. The tubes and wires are then incased in rubber 56, folded around the same in a cylindrical form, which is wrapped in canvas 59 surrounded by a layer of rubber 58 and again surrounded by a layer of canvas 59, again surrounded by a helical steel coil 61, again surrounded by a layer of canvas 62, again surrounded by a layer of rubber 63. The tubes 47, 49 are connected to the tubes 42, 43 by couplings 64, provided with suitable gaskets 66. The lower end of the compound cable or hose is cramped within a tubular ferrule 67, connected by a coupling 68 with the tubular extension 69 from the casing 39.

I claim:—

1. A diver's suit comprising upper and lower body sections each having at one end a horizontal flange by which flanges they are joined together, and vertical ribs extending from said flanges to the other ends of the sections.

2. In a diver's suit, in combination with a body section having tubular extensions, studs secured in the outer faces of the extensions, sleeves having flaring ends through holes in which the studs pass, rings around said sleeves having holes through which the studs pass, and nuts screwed upon the outer threaded ends of said studs.

3. In a diver's suit, a helmet, a tube for supplying fresh air thereto leading downward at the back of said helmet, having discharge apertures discharging rearwardly therefrom.

4. In a diving apparatus, a cable for connecting the diver's suit with the surface of the water, comprising tubes for supplying and exhausting the air, wires for a tele-

phone and an electric lamp, helical steel
coils around the tubes, insulation around the
wires, alternate wrappings of canvas and
rubber around the tubes and wires, and a
5 helical steel coil around the tubes, wires, and
wrappings.
In testimony whereof I have hereunto set

my hand in the presence of two subscribing
witnesses.

JEAN F. DERAY.

Witnesses:

E. G. MEINECKE,
CHAS. C. DEVERT.