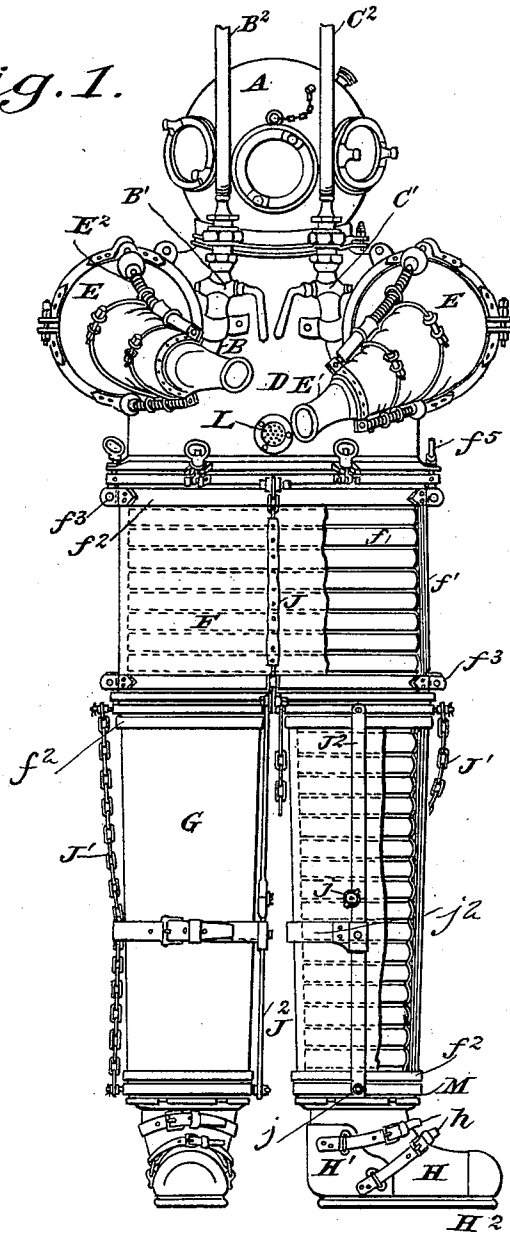


A. GORDON.
DIVING APPARATUS.

No. 594,945.

Patented Dec. 7, 1897.

Fig. 1.



Inventor:

Alexander Gordon

Witnesses:

E. B. Bolton

Otto Munk

By Richard R

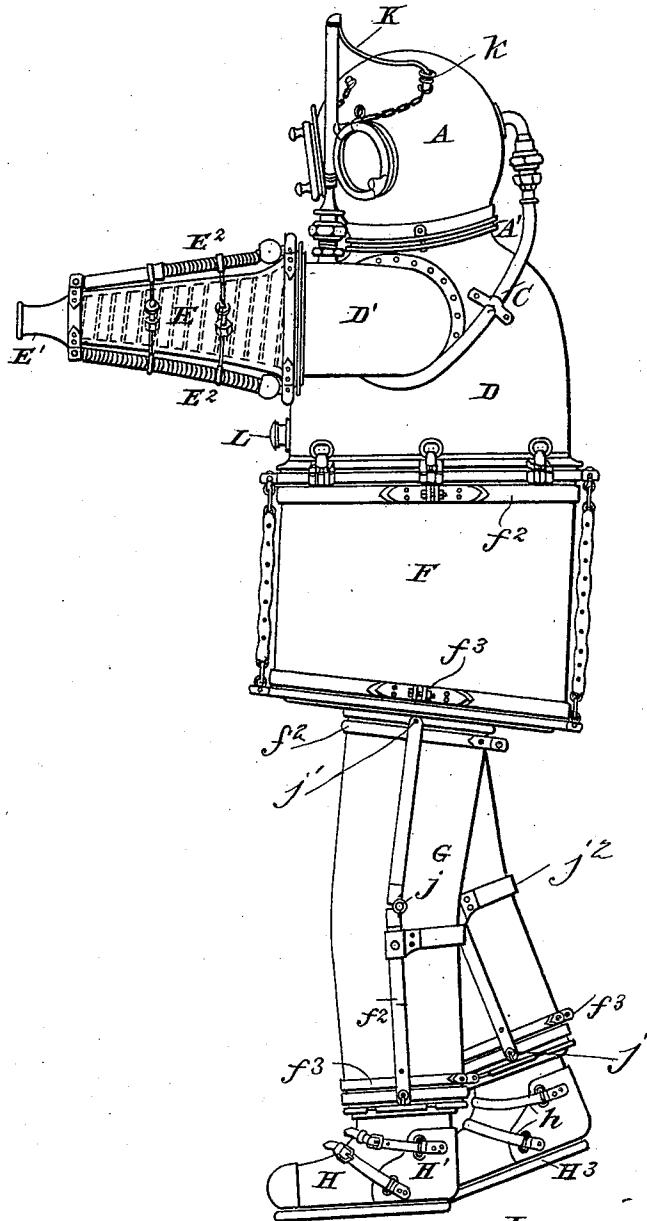
his Attorneys.

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Fig. 2.



Witnesses:

E. B. Bolton
O. W. Munk

Inventor:

Alexander Gordon

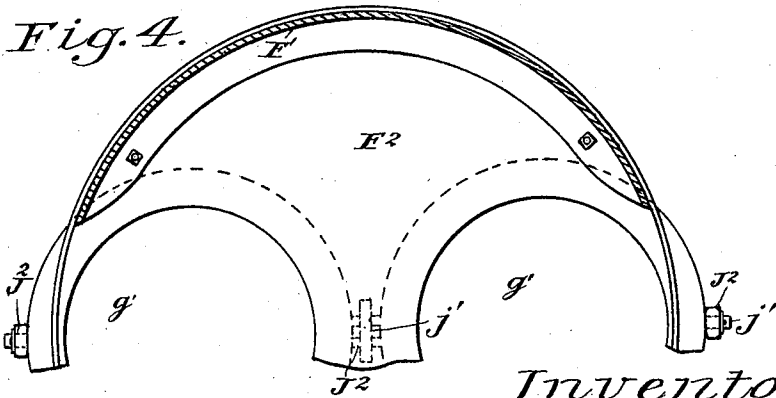
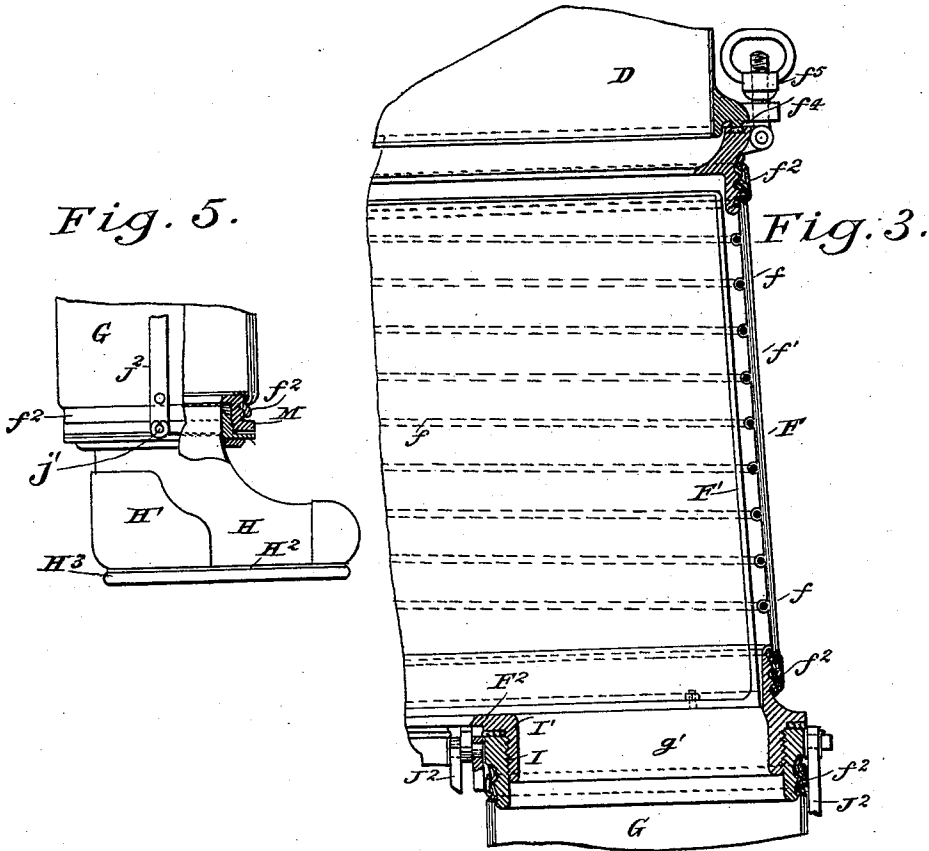
By Richards & Co.

his Attorneys.

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Patented Dec. 7, 1897.



Inventor:

Witnesses:

Alexander Gordon

E. B. Bolton
Otho Munk

By Richard A. [Signature]

his Attorneys.

(No Model.)

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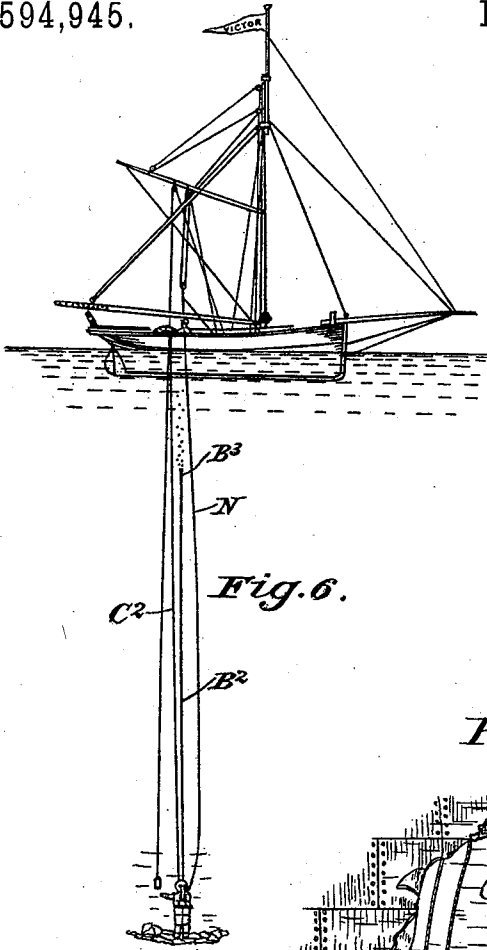


Fig. 6.

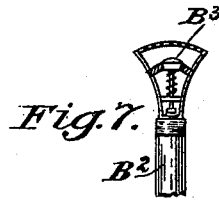
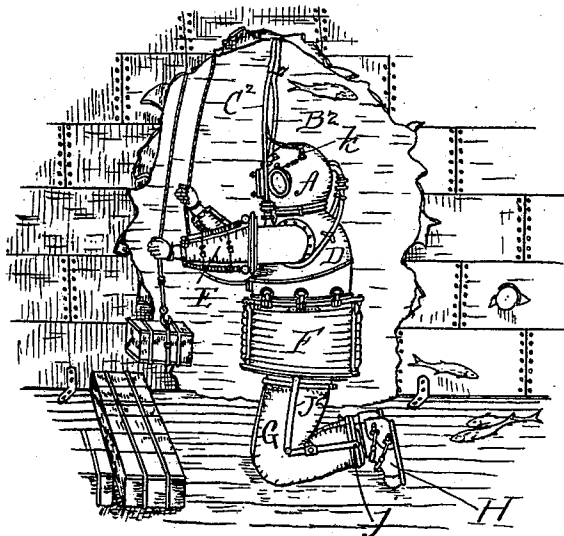


Fig. 7.

Fig. 8.



Inventor:

Witnesses:

E. B. Bolton
Otto Munk

Alexander Gordon

By Richardson

his Attorneys.

UNITED STATES PATENT OFFICE.

ALEXANDER GORDON, OF STRAHAN, TASMANIA.

DIVING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 594,945, dated December 7, 1897.

Application filed December 5, 1896. Serial No. 614,626. (No model.) Patented in Queensland August 26, 1893, No. 2,443; in Victoria August 30, 1893, No. 10,776; in Western Australia July 19, 1894, No. 535; in England July 31, 1894, No. 14,672; in British Guiana September 19, 1894, No. 1, and in India July 9, 1896, No. 340.

To all whom it may concern:

Be it known that I, ALEXANDER GORDON, accountant, a subject of the Queen of Great Britain and Ireland, and a resident of Strahan, in the British Colony of Tasmania, have invented certain new and useful Improvements in Diving Apparatus, of which the following is a specification.

The invention has been patented in Queensland, No. 2,443, dated August 26, 1893; in Victoria, No. 10,776, dated August 30, 1893; in Western Australia, No. 535, dated July 19, 1894; in England, No. 14,672, dated July 31, 1894; in British Guiana, No. 1, dated September 19, 1894, and in India, No. 340, dated July 9, 1896.

This invention of improvements in diving apparatus relates, first, to the dress, which is constructed strong enough to withstand the pressure exerted on it when in water, say, from twenty to forty fathoms deep, or so that it will withstand the difference in pressure between the water outside and the air within when at such depths. The arms, lower part of body, and the legs are made up of flexible materials strengthened with a coiled metallic core and with spring-stays, distance-pieces, and articulated links, respectively, all arranged in such a manner that the diver can bend, kneel, or twist about with ease while in the water; secondly, to the combination, with such a dress, of an exhaust-pipe which is designed to exhaust the vitiated air under water at a predetermined distance from its surface, such distance being regulated by the depth at which the diver is working, and also to furnishing the dress with a telephone by means of which communication may be had with and from the diver at the surface, the object of the improvements being mainly to relieve divers from excessive air-pressure while within the dress, and also so that they may not be subject to excessive internal air-pressure when diving at great depths, and, further, to enable them to work with ease at greater depths than have been previously attempted.

In order that the invention may be well understood, it will now be described, aided

by a reference to the attached drawings, in which—

Figure 1 is a front view of a complete diving-dress constructed according to this invention, a part of the body and a part of one of the legs having the outer covering removed to show the metallic core and the method of embedding it in the water-tight-dress material; Fig. 2, a side view of the diving-dress and with the metallic core shown by dotted lines on the arm only; Fig. 3, a section, drawn to an enlarged scale, of the flexible body and showing the joint between the metallic jacket and the body and between the latter and the upper part of legs, and also the metallic core as arranged in the dress material and the means for securing the latter to the joint-pieces, and also showing the segmental distance-piece; Fig. 4, a half-plan of a metallic crutch-plate having holes through it for the legs, and also showing the segmental distance-piece upon the crutch-plate. Fig. 5, a side view of the metallic boot and showing by a section the joint between it and the leg; Fig. 6, a general view of a complete diving apparatus as at work and showing the position of the air supply and exhaust pipes; Fig. 7, a section of the exhaust relief-valve, and Fig. 8 a general view of a diver as at work and in a kneeling posture.

In the drawings, A is the helmet, connected by a screwed joint A' with a metallic jacket D, which forms the upper part of the body of diving-dress.

B is the exhaust-pipe, leading from back of helmet to front of dress, whereat it is furnished with a stop-cock B', the branch of which is connected with exhaust-hose B², the upper or free end of the latter being furnished with an escape-valve B³.

C is the air-supply pipe, which, like pipe B, is brought from back of helmet to front of dress, and it has a stop-cock C', which in turn is attached to the air-supply hose C². The metallic jacket D has short metallic arm-pieces D' secured to it, while to said arm-pieces tapering flexible sleeves E are attached by a water-tight screw or other joint, and said sleeves are constructed of waterproof mate-

rial having a spiral metallic core firmly embedded between the material in a manner similar to the body-piece hereinafter described.

E' are india-rubber cuffs attached to the sleeves, and over said cuffs gauntlets may be drawn to protect the diver's hands.

E² are spring-stays arranged, as shown, on the arms and designed to strengthen them sufficient to resist compression and without interfering with their flexibility. Said stays E² are each secured by a ball-joint at their inner ends; also, they pass through eyes or guides attached to arms, while at their outer ends they are secured to straps, as shown in Figs. 1 and 2.

F is the flexible body-piece, made up of a number of folds *f'* of prepared waterproof or water-tight material fixed together with india-rubber or other suitable solution or cement and having a metallic spiral wire core *f*, firmly embedded between the said folds. Said core is preferably made of "Delta" metal, although it may also be made of any suitable non-corrosive material. The top metallic end of body-piece F is connected to the metallic jacket D by a water-tight joint the one half of which has a bead or rib to fit upon a rubber ring *f*⁴ on the other half of joint, the two parts being secured together by hinge-bolts *f*⁵, as shown in Fig. 3, while the bottom end of jacket F is made up of a metallic crutch-plate F², having leg-holes *g'* in it, and around the latter are screw-joints I for connection to the upper metallic joint-rings of the flexible legs G. The legs G are also made of layers of waterproof material having a metallic core *f* between them in the same manner as described for the body-piece. The flexible or water-tight material and core portions of the dress are in all cases firmly secured over their metallic end connections by toothed clasp-bands *f*², the joints of the latter being secured by bolts *f*³.

F' are segmental-shaped distance-plates bolted at their lower ends to the crutch-piece F², while their upper ends are free and determine the distance to which the body-piece will close to, and thus they prevent any possibility of the diver being crushed in a vertical direction while at a great depth under water.

H are the metallic boots, connected to the lower part of the legs by a water-tight screw coupling-joint M.

H' are metallic slippers secured upon the boots by the straps *h*.

H² are metallic soles bolted to the slippers, and H³ lead weights fastened by screws or otherwise to said metal soles.

I are metallic screw-joint connections between the crutch-plate and the leg-pieces, a leather or other washer I' being inserted, as shown, to insure of a water-tight joint.

J and J' are chain connections, the former for adjusting the length of the body-piece F and the latter for adjusting the legs G to suit the diver wearing the dress.

J² are articulated metal links or straps

which are used for deep diving, they being fitted, as shown, at both sides of each leg, the joint at *j* allowing the knee to bend as ordinarily.

j' are pins projecting from joint-pieces to support the ends of articulated links, and *j*² are guide-straps near central joint.

K are electric wires passing through a socket *k* and connected with a press-button or with a receiving and transmitting instrument at inside of helmet and used for signaling and other purposes, and L is an air-escape safety-valve with spring attachment of the ordinary type used in diving-dresses.

The lower end of flexible exhaust-air hose-pipe B² is attached, as before stated, to a metallic pipe leading from the helmet A, said metallic pipe being furnished with a stop-cock B', while the other free end of the hose-pipe B² is provided with an air-outlet valve B³, and this end is led upward to the requisite height in the water to allow the vitiated air to be discharged at the desired depth below its surface. This exhaust-air hose is always arranged to exhaust below the surface of the water, so that if so desired the internal air-pressure in the dress can be increased by shortening the length of the exhaust-air hose from the dress or decreased by lengthening the exhaust-air hose. If, for example, a diver has to go to a depth of, say, thirty fathoms, and if he can conveniently work under an internal air-pressure of, say, forty pounds per square inch, which is equivalent to about fifteen fathoms of water, then the outlet-valve of his exhaust-hose discharges at fifteen fathoms below the surface of the water, and thus, although diving at, say, thirty fathoms, he would only have to withstand an air-pressure equivalent to about fifteen fathoms of water.

In practice it is preferred to lash the air supply and exhaust pipes and the electric wires to the life-line N to prevent their becoming entangled.

The diving-dress when completed is properly adjusted and balanced with weights to suit the diver who is to use it, and I prefer fixing the weights on the top of crutch-piece F² and on the soles H² of the boots.

It will be noticed that the parts of the diving-dress subjected to the most wear and tear—viz., the arms, body, and legs—are made separable, and consequently they can be readily renewed when worn out or damaged.

Having now particularly described and ascertained the nature of the said invention and in what manner the same is to be performed, I declare that what I claim is—

1. In a diving apparatus the body-piece, arms, and legs of the dress or the portions thereof where considerable motion is required constructed of several folds of waterproof material secured together with india-rubber or other solution or cement and having a metallic spiral-wire core firmly embedded between the folds and secured to the connec-

tion-rings by toothed metal bands and said flexible parts being furnished with distance-pieces, spring-stays and hinged or articulated links to resist compression substantially as herein described and explained and as illustrated in the drawings.

2. In combination, the body D, the helmet, the arm-pieces D' rigidly fixed to the body and with the arm-openings facing frontwise, the flexible arm portions E with their gauntlets E', and the spring E² extending along said arms and connected at the opposite ends thereof, substantially as described.

3. In combination, the body D having the arm-pieces D', the helmet connected with the body, and the air and exhaust pipes, the latter at its upper end provided with an air-outlet valve, each of said pipes being connected with the rear of the helmet and extending therefrom under one of the arm-pieces and up in front of the body and helmet, the cocks one for each of said pipes, and the flexible arm extensions connected with the arm-pieces, substantially as described.

4. In a diving apparatus the body-piece F of the dress having the flexible part and having a metallic ring for connection by hinge-bolts f⁵ to the metallic jacket as D and a crutch-piece as F² supporting distance-pieces as F' and at its bottom two screwed rings for connection to the leg-couplings substantially

as herein described and explained and illustrated in the drawings.

5. In a diving apparatus the legs G of the dress having the flexible part and furnished with articulated or hinge links to resist compression and each having a metallic screw-ring at its top end for connection to the ring or crutch-piece F² and at bottom a screw-ring for connection to the metallic boot substantially as herein described and explained and as illustrated in the drawings.

6. In a diving apparatus the metallic boot as H of the dress having a screw connection at its top for attachment to the bottom of leg in combination with the weighted slipper H' H² H³ and the straps h substantially as herein described and explained and as illustrated in the drawings.

7. In combination with the dress having the flexible body portion, the crutch-plate connected therewith, the legs connected to the crutch-piece at its lower end and being free from connection at its upper end, said piece extending within the flexible body, substantially as described.

In witness whereof I have hereunto set my hand in presence of two witnesses.

ALEXANDER GORDON.

Witnesses:

W. STOKES,
BEDLINGTON BODYCOMB.