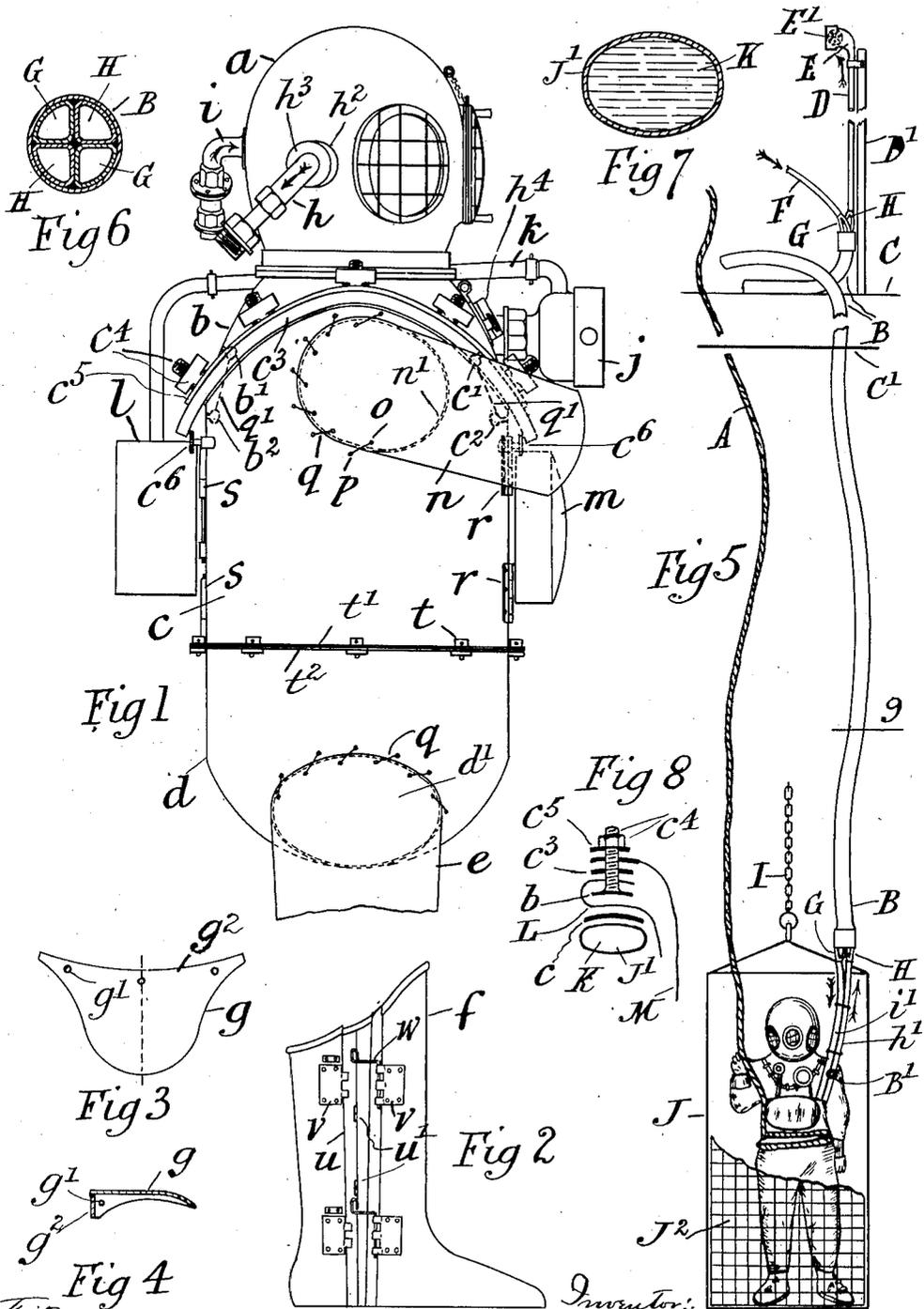


A. MCGREGOR.
DIVING DRESS.

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Witnesses:
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UNITED STATES PATENT OFFICE.

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DIVING-DRESS.

No. 827,029.

Specification of Letters Patent.

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To all whom it may concern:

Be it known that I, ARCHIBALD MCGREGOR, a subject of the King of Great Britain and Ireland, residing at Geraldton, in the State of Queensland, Commonwealth of Australia, have invented certain new and useful Improvements in Diving-Dresses and in and Relating to Apparatus Connected Therewith; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to diving-dresses and apparatus connected therewith whereby the whole may be used to enable a diver to work at particularly great depths. These improvements include means to regulate and safeguard the air pressure and supply and pressure-resisting armor for use at great depths, and an electric-light device is combined with the dress in a manner not before adopted. The exhaust-air is conducted by piping and discharged into the atmosphere above the water-level, enabling the diver to work without being subjected to excessive air-pressure. In practice the upper end of the exhaust is so arranged that it will be visually (or visually and otherwise) self-indicating and may be observed by attendants, causing action at once in the event of it being indicated, for example, that the exhaust has been accidentally interfered with. There are other important details, of which particulars follow, it being convenient to refer to the accompanying drawings in explaining them.

In the drawings, Figure 1 is a side view of various upper parts of the dress to be worn by the diver. Fig. 2 shows in side view, in partly-opened position, a lower part or boot of said dress; and Figs. 3 and 4 show in plan view and sectional side elevation, respectively, a shoulder-protecting armor-plate. Fig. 5 is a diagram representing the diver under water and showing part of his cage and connections which extend above the water to near the attendants. Fig. 6 shows a section through line 9, Fig. 5. Fig. 7 shows a vertical section through the collar-pad. Fig. 8 is a diagram illustrating superposition of parts when the diver is fully dressed, these

parts being shown separated for greater clearness. Arrows in Figs. 1 and 5 show the directions of air-currents.

The air-inlet pipe and the air-exhaust pipe are shown at B, forming a multichambered tube with its interior longitudinally divided. An inner air-delivery tube inclosed by an exhaust-tube, guarding the former from injury, (all parts being strengthened in any convenient manner,) may be used, one or both longitudinally divided to provide a plurality of air-channels for use at will; but the use of two tubes—one inlet and one exhaust—not connected, but free to spread apart widely in the water or to become entangled and twisted, is apt to prove dangerous, although distinct tubes bound together firmly by means which allow of them being payed out or hauled in as one may be employed. The best combination is shown in Fig. 6, in which four tubes of sector form are combined, two marked G and two H, the whole in a sheath B and each tube permanently united to the others. This produces very strong partitions inside tube B. The two diagonally opposite tubes G are used for down or air-supply current and the other diagonally opposite tubes H for upward air-current or exhaust. F, the supply-pipe from the air-pump, may divide into the two pipes G or before entering sheath B. After or near the point of leaving sheath B pipes G unite as pipe *i'*, which passes under the diver's arm and joins pipe *i*, below mentioned.

The connection of inlet and exhaust tubing *i'* *h'* (with which latter pipes H connect) to the diver need not be restricted to the helmet, (marked *a*.) The air-inlet may be at *i*, as in well-known helmets, the exhaust preferably beginning at the helmet side, as at *h'*, and passing a check-valve in box *h'*, which allows air outward, but would not allow water inward. The exhaust-air does not enter the water from box *h'*. It issues into pipe *h*, then through the tubing shown in Fig. 5, (respectively marked *h'* H B H D,) and through outlet E. Pipe D is supported, as by pillar D', above a deck-surface C, the water-surface being as at C'. Any desired valves, forks, and unions for the piping are provided. Pipe *h'* has a regulating-valve B'

within easy control of the diver, so that he can reduce or stop the exhaust of air.

If accident cause the exhaust-piping to fail to carry air above the surface, as to outlet E, the check-valve in box h^3 would, as explained, resist inrush of water, while allowing air-discharge, and an emergency-valve h^4 in the breast-plate or other suitable place is provided for direct air-discharge into the water. To a metal corselet breast-section (marked b) is fastened helmet a in any suitable manner. To part b is connected (by water-tight jointing) an external (or both an external and an internal) waterproof flexible diving-dress, of suitable material, these dresses being referred to further below.

A weight-easing collar or pad J' (see vertical section in Fig. 7) of the usual ring form is used, (under the metal vest below mentioned,) resting on the diver's shoulders.

Instead of hair filling, the pad is filled with water or suitable liquid K . Part b is connected to a rigid metal (as sheet-copper) vest c , to which are attached metal arms, each in two sections, so connected or jointed as to allow of shoulder and elbow movements.

n shows the upper arm-section having holes o united to vest c (having holes p) sufficiently loosely by flexible wire or suitable lacing q . The top of section n fits over flanging n' , projecting outwardly round the edge of the vest-armhole. When arm-section n is removed or omitted, a rigid metal plate g , Figs. 3 and 4, having means of connection to vest c , as holes g' , (for screw-bolts,) may be substituted with edge g^2 supported by the shoulder of the said vest, plate g then projecting outward from over the diver's shoulder as a protective and weight-supporting device. Connection of breast-section b and vest c is by india-rubber ring or collar c^3 and connecting means (shown as stud-bolts and nuts) c^4 , as will be understood by noting the bolts and nuts of ordinary diving-dress.

Projections, as eyes c' c^2 at front and b' b^2 at back, respectively, within sections b and c are provided and suitably connected, as dotted lines q' indicate. The vest is open at top to allow ample room for the diver's neck and is open below to leave space for his body and is in sections hinged together, as at r , and connected by suitable catches s at the rear. The armor has (suitably connected to vest c , as by screws t , through apertured flanges t' on the vest and t^2 on the section next mentioned) a dish-shaped lower trunk-section d , having at each side a leg-hole d' . Laced or movably connected to section d are thigh-sections e . Where the tubular metal thigh-sections e are connected movably to section d , any suitable joints are used, q showing flexible wire-stitching.

The metal armor - boots are marked f .

The boot-sections f have each a door u , which when opened fully allows insertion of the foot. The door-hinges u' are at one side of the boot and the fastenings are at the opposite side, the door opening backward and allowing the foot to be put in and out easily. The door u has any desired fastenings, as counterparts v , connected at will by a bolt or wire w . The boot is of sheet-copper or the like; but as the ordinary diver's boot is to be used over it it is not heavily weighted. The top of boot f freely incloses the lower part of the tubular section of the leg-armor, allowing thus of knee movement.

c^5 shows the usual clamp-plates used in sections upon and to fasten down rubber rings c^3 or dress M . c^6 shows at front and back screws which take into nuts fixed to vest c . These screws (usually four in number, two in front and two behind) in practice are passed through holes in collar c^3 , so as to further connect the parts.

The armor shown in Figs. 1 and 2 is put on over a waterproof underdress L , the top of which is indicated in Fig. 8. This dress is so fastened to section b as to prevent water entering, so that if by any means the external waterproof dress M , part of which is also shown in Fig. 8, fails the inner one L safeguards the diver.

The armor described in this specification is not intended to be water-tight. The outer dress M keeps the water from all armor under it. The armor is intended to so box in the diver as to keep off that great water-pressure which has in deep-sea diving proved so serious an obstacle.

Although there is nothing new in the use, broadly, of an electric lamp, yet the lamp j provided is fixed to the front of part b and connected, as by tube k , containing suitable wires, with a storage battery l , located at the back of the part b , by any suitable support or at the back of the dress. By using the battery the ordinary heavy back lead is rendered unnecessary and is dispensed with, and as a counterweight to the battery, there is any suitable front lead m .

A shows the usual rope or diver's life-line, and J indicates a cage or the like for raising the diver and, if desired, lowering him by chain I or wire rope. The diver on reaching the bottom or on coming near it may drift or travel with the cage or may leave it, it having movable protective gratings of metal, as partly shown at J^2 . When the diver wishes to be pulled up, he enters the cage and signals in any prearranged manner.

Pipe-outlet E has a visible indicator-wheel or the like E' , adapted to be rotated by the exhaust-air that escapes past it and when so desired adapted in any suitable manner to work audibly. The action or stoppage, as the case may be, of this wheel would be visible to the diver's attendants. Wheel E' or

the like is providable also with any suitable speed indicating or recording mechanism.

What I do claim as my invention, and desire to secure by Letters Patent of the United States, is—

1. In diving apparatus, the combination, with a helmet, of air-supply tubing, and air-exhaust tubing having at its lower end a check-valve upon the helmet, and a regulating-valve within the diver's reach, the said inlet and exhaust tubing being connected near the diver and extending so connected for a distance to reach above the water-level, and then separating the exhaust-tubing having an outlet means adapted for observation by attendants as described.

2. In diving apparatus, the combination, with a helmet, of means for the inlet and for exhaust of air through tubes connected near the diver to sheathed tubes G G and H H respectively or the like extending to above the water-surface, and there separating the exhaust-tube being mounted in position suitable for observation by attendants.

3. In diving apparatus exhaust-tubing to extend from the diver to near the attendants, and provided with a wheel or other visually self-indicating air-outlet device as described.

4. In diving apparatus, armor comprising the combination with a rigid metal vest

adapted to open on hinges, of a dish-shaped trunk-section rigidly connected to said vest, tubular arm and leg sections connected movably to the vest and trunk respectively by flexible wire lacing, and metal boots adapted to be opened on hinges at the side substantially as described.

5. In diving apparatus, the combination, at the rear of a rigid breast-section or vest of an electric storage battery, and at the front an electric lamp and fixed counterbalancing-weight.

6. In diving apparatus, a rigid metal boot having a door adapted to open backward having hinges at one side of the boot and fastenings at the other as described.

7. In diving apparatus, the combination, with rigid metal armor adapted to protect the diver from external pressure, of an external and an internal waterproof dress as a double safeguard against entrance of water, the necks of both dresses being secured by water-tight jointing upon a breast-section substantially as described.

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

ARCHIBALD MCGREGOR.

Witnesses:

BEATRICE M. LOWE,
ALICE M. HOLT.