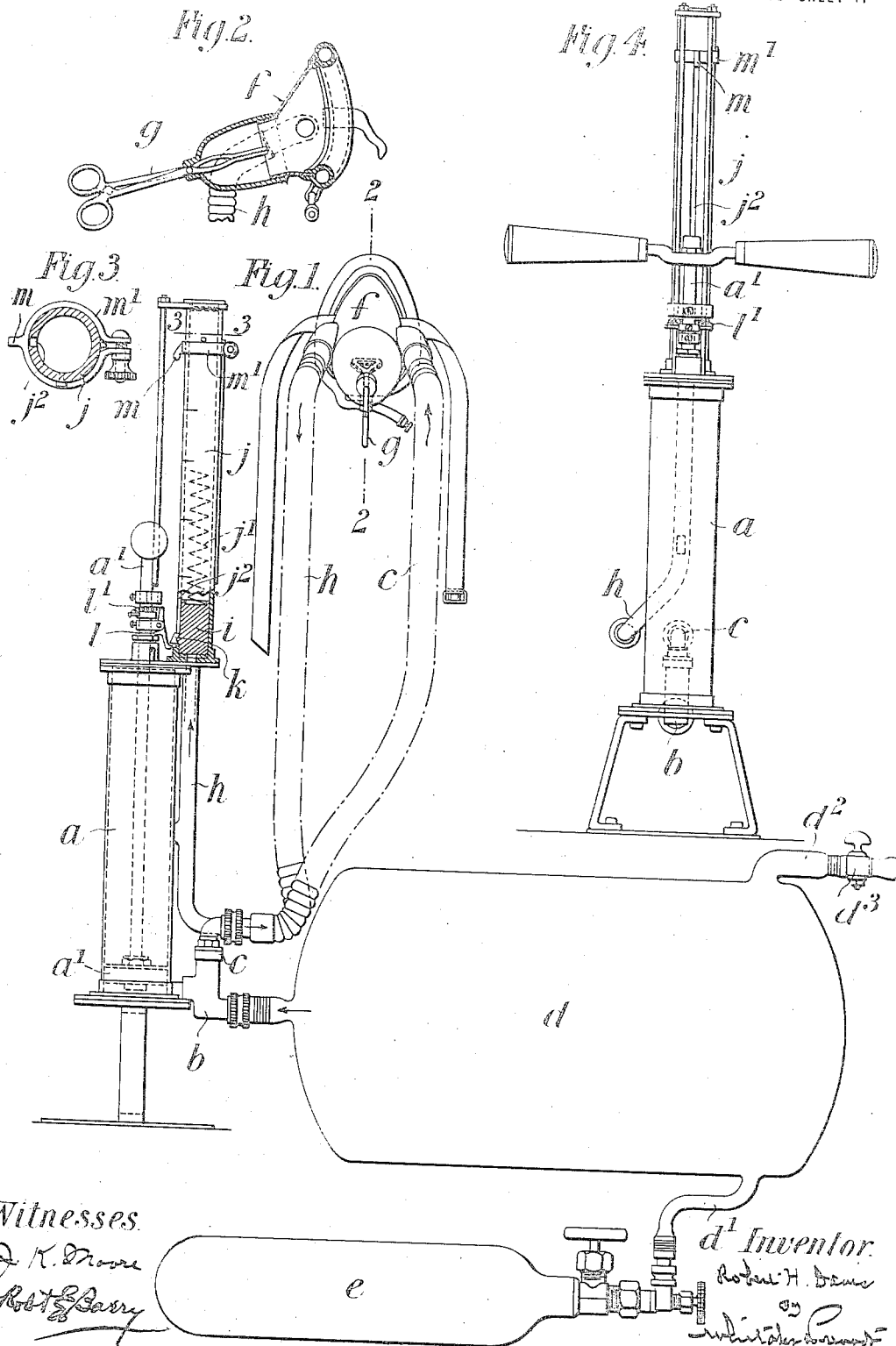




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 APPARATUS FOR ADMINISTERING OXYGEN TO PERSONS IN A STATE OF COLLAPSE BY
 ASPHYXIATION OR OTHER CAUSES.
 APPLICATION FILED JAN. 13, 1915.

1,172,879.

Patented Feb. 22, 1916.

2 SHEETS—SHEET 2.

Fig. 5

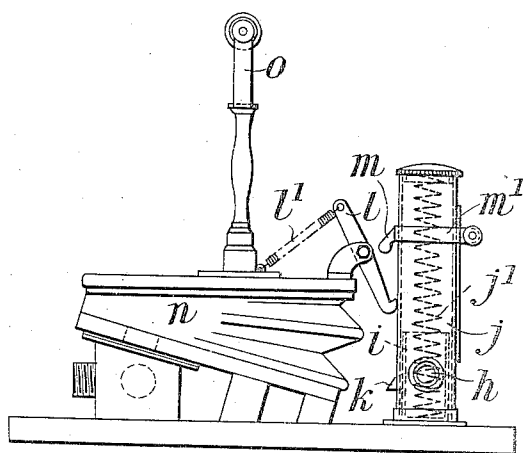


Fig. 6

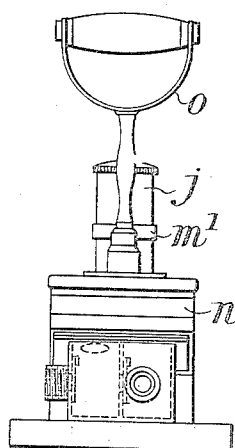
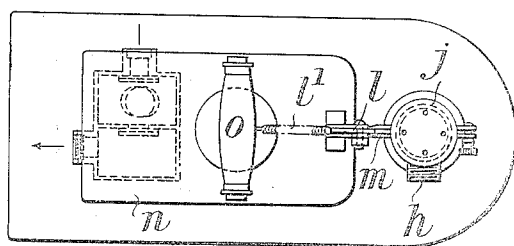


Fig. 7



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APPARATUS FOR ADMINISTERING OXYGEN TO PERSONS IN A STATE OF COLLAPSE BY ASPHYXIATION OR OTHER CAUSES.

1,172,879.

Specification of Letters Patent.

Patented Feb. 22, 1916.

Application filed January 13, 1915. Serial No. 2,044.

To all whom it may concern:

Be it known that I, ROBERT HENRY DAVIS, a subject of the King of Great Britain, residing at 187 Westminster Bridge road, London, England, have invented new and useful Improvements in Apparatus for Administering Oxygen to Persons in a State of Collapse by Asphyxiation or other Causes, of which the following is a specification.

10 This invention relates to improvements in apparatus for the resuscitation of persons apparently drowned or asphyxiated or in a state of collapse from electric shock or other causes, the object being to provide
15 apparatus which is capable of delivering oxygen into the lungs of a patient at a slight pressure, and which can be operated in such a manner as to synchronize with the normal respiratory movements. In such
20 apparatus as hitherto usually made a pump device has been employed which alternately sucks out or withdraws the contents of the lungs of the patient and forces oxygen, or a mixture of oxygen and air, into the lungs.
25 This process possesses defects in practice which it is the object of the present invention to obviate, and to this end, according to my invention, I provide apparatus comprising a compressing device which alternately
30 forces a charge of oxygen, or a mixture of oxygen and air, or air, into the lungs of the patient and allows the contents of the lungs to be expired by the natural elastic recoil of the disturbed parts, that is to say, the chest and lungs, this latter operation taking place while a fresh charge of oxygen, or a mixture of oxygen and air, or air is being drawn into the compressor.

Suitable apparatus constructed according
40 to the invention comprises a pump which is designed to deliver oxygen to the patient in the usual way, and in combination therewith a valve controlling an exhalation or expiratory tube, which valve is designed to
45 be lifted on the up or induction stroke of the pump plunger and to be released at a predetermined point so as to again close the exhalation tube during the succeeding compression stroke of the pump plunger. The
50 pump is in connection with an oxygen cylinder, through a reducing valve and a bag, and with a mask, preferably of the construction described in the specification of

former Patent No. 23021 of 1913, from which the exhalation tube also extends. 55

As will be understood, as the pump plunger is reciprocated a charge of oxygen is alternately drawn into the pump cylinder and discharged therefrom into the lungs of the patient; during the induction stroke of 60 the pump, however, the valve, which closes the exhalation tube from the mask, is raised and remains raised until it is released so as again to close the said tube prior to the succeeding compression stroke of the plunger 65 by which oxygen is delivered to the patient. It will thus be evident that the pump itself takes no part in the withdrawal of the noxious fumes or deleterious contents of the lungs, which withdrawal is due entirely to 70 the natural elastic recoil of the patient's chest and lungs. As will be obvious, in lieu of a reciprocating pump, I may make use of a bellows device for delivering the oxygen and controlling the exhalation tube. 75

To enable my invention to be fully understood I will describe it by reference to the accompanying drawings, in which:—

Figure 1 is a sectional elevation of one form of apparatus constructed according to 80 the invention and in which a reciprocating pump is made use of. Fig. 2 is a section on the line 2—2, Fig. 1. Fig. 3 is a section on the line 3—3, Fig. 1 drawn to a larger scale. Fig. 4 is a view of the pump shown at right 85 angles to Fig. 1. Fig. 5 is a side view showing a modified form of apparatus in which a bellows device is employed. Fig. 6 is an end view thereof, and Fig. 7 is a plan view of the apparatus. 90

Referring first to the construction of apparatus shown in Figs. 1 to 4, *a* represents the pump cylinder having the manually reciprocable plunger *a*¹, and the inlet or induction pipe *b* and the delivery pipe *c*. 95 The inlet pipe *b* and outlet pipe *c* are provided respectively with the usual inlet and outlet check valves (not shown). The inlet pipe *b* is connected to the bag *d* which is in communication by a pipe *d*¹ with the oxygen 100 cylinder *e* and is provided with an inlet tube *d*² furnished with a cock *d*³ through which air may be admitted to the bag *d*, if desired. The delivery pipe *c* opens into the mask *f*, which in the drawing is shown of the type 105 described in the specification of former Pat-

ent No. 23021 of 1913; it is designed to be attached over the mouth and nostrils of the patient and is furnished with the forceps *g*.

h is the exhalation or expiratory tube which extends from the mask *f* and is fitted at its end with the valve *i*. This valve *i* is mounted in a cylindrical guide *j* secured to the upper end of the pump cylinder *a*, and normally bears upon and closes the upper end of the expiratory tube *h*.

*j*¹ is a spring which is located in the cylindrical guide *j* and bears upon the valve *i*. The guide *j* is furnished with a vertical slot *j*² through which extends a finger-piece *k* on the valve *i*, the said finger-piece being engaged by a trigger *l* which is pivoted upon the upper end of the pump plunger *a*¹, and is normally held by the spring *l*¹ in a position such that it snaps into engagement with the finger-piece *k* when the pump plunger is in its lowest position, as shown in Fig. 1.

m is a trip-piece and stop which projects into the path of the trigger *l* as the pump plunger *a*¹ moves upward, whereby the said trigger is held so as to arrest the upward movement of the plunger and is disengaged from the finger-piece *k*, whereby the valve *i* is released and under the action of the spring *j*¹ and gravity returned to its seat upon the end of the respiratory tube *h* to close the latter. The position of the trip-piece *m* upon the cylindrical guide *j* can be adjusted in order to regulate the quantity of oxygen which can be delivered at each stroke of the pump, and for this purpose the said trip-piece is mounted upon a clamp *m*¹ which encircles the said cylindrical guide, which latter may be graduated as shown, so as to indicate the several positions of the trip-piece when treating patients of different ages.

As will be understood from the foregoing description the apparatus operates as follows, that is to say, the mask *f* is secured over the mouth and nose of the patient, whose tongue is pulled out by means of the forceps *g* and the pump-plunger *a*¹ is then reciprocated, the length of stroke of the said plunger being determined, as above indicated, by the position of the trip-piece *m* in accordance with the age of the patient. The reciprocation of the plunger *a*¹ first draws in a charge of oxygen, or oxygen and air, from the bag *d* and inlet pipe *b* into the pump cylinder *a* and on the return stroke delivers the said oxygen, or oxygen and air through the tube *c* into the mask *f* and so into the lungs of the patient. The succeeding suction stroke of the pump not only draws in a fresh charge of oxygen or oxygen and air to be delivered on the next down-stroke, but it opens the valve *i* through the medium of the trigger *l* thus permitting the exhaled air to escape through the slot *j*² and

allowing the expiratory movements of the patient free play. The valve *i* remains open during the up-stroke, on the termination of which it is automatically closed, under the action of the spring *j*¹ and gravity in the manner above described, and the piston descends and delivers a further supply of oxygen, and so forth.

As above described, the apparatus is calibrated to suit patients of different ages and the speed of reciprocation of the piston should be adapted to the different ages, as, for example, for an average healthy adult about twenty to twenty four strokes per minute, the rate of working being increased in the case of children. It is only necessary to administer oxygen during unconsciousness; when consciousness returns it is sufficient to deliver ordinary air by means of the apparatus for which purpose the connection between the oxygen cylinder *e* and bag *d* is cut off.

In Figs. 5 to 7 I have illustrated a form of apparatus in which a bellows takes the place of the pump. The bellows *n* is designed to be operated by a handle *o* and is fitted with a trigger *l* under the action of a spring *l*¹, as is the case with the pump hereinbefore described. The trigger is tripped by means of trip-piece *m* adjustably clamped upon the guide cylinder *j* having the valve *i*, which, under the action of the spring *j*¹, closes the orifice *h* leading to the mask which is not shown.

The action of this apparatus is identical with that hereinbefore described and needs no further description.

Claims:

1. An apparatus for resuscitating asphyxiated persons and the like, comprising a compression device for delivering a charge of resuscitating medium to the patient and means for normally preventing exhalation by the patient, in combination with automatic means for permitting the exhalation to be effected by the natural elastic recoil of the chest and lungs.

2. An apparatus for resuscitating asphyxiated persons and the like, comprising a compression device for delivering a charge of resuscitating medium to the patient, a valve for normally preventing exhalation by the patient, and automatic means for opening said valve and permitting the exhalation to be effected by the natural elastic recoil of the chest and lungs.

3. An apparatus for resuscitating asphyxiated persons and the like, comprising a compression device for delivering a charge of resuscitating medium to the patient, a valve for controlling the exhalation of the patient, and automatic means for closing said valve during the delivery stroke of the compressor and opening the valve during the suction stroke of the compressor.

4. An apparatus for resuscitating asphyxiated persons comprising a reciprocating pump for delivering a resuscitating medium to the patient, the plunger of which is
5 furnished with a spring actuated trigger, an expiratory pipe for conducting the exhalation, a valve normally closing the expiratory pipe and with which the trigger is brought into engagement when the plunger
10 is at the end of the delivery stroke, and a trip piece for disengaging the trigger from the valve and arresting the suction stroke.

5. An apparatus for resuscitating asphyxiated persons comprising a single compression device for delivering a charge of
15 resuscitating medium to the patient, a pipe

extending from said compression device and adapted to be connected to the patient's head, an exhaling pipe also adapted to be connected to the patient's head, a valve for
20 closing said exhaling pipe, and means operable by said compression device for opening said valve on the suction stroke of said compression device and closing said valve on the delivery stroke thereof and permitting the
25 exhalation to be effected by the natural elastic recoil of the chest and lungs.

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Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."