

Improvements relating to apparatus for producing artificial respiration / [George Edward Fell].

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A.D. 1888, 13th MARCH. N<sup>o</sup> 3912.  
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COMPLETE SPECIFICATION.

[Communicated from abroad by GEORGE EDWARD FELL, of Buffalo, New York,
United States of America, Physician.]

**Improvements relating to Apparatus for Producing Artificial
Respiration.**

I, HENRY HARRIS LAKE, of the firm of Haseltine, Lake & Co., Patent Agents, Southampton Buildings, in the County of Middlesex do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

- 5 This invention relates to an apparatus for producing artificial respiration in cases where the action of the lungs is impaired or suspended, and artificial aeration of the blood becomes necessary to sustain life, as for instance in resuscitating drowned or poisoned persons, in cases of shocks from wounds, or in conditions where the brain is inactive from disease or otherwise.
- 10 The object of the said invention is to produce an apparatus which is reliable in its operation and easily applied and manipulated. The invention consists of the improvements which will be hereinafter fully set forth.
- In the accompanying drawing
Figure 1 is an elevation of my improved apparatus.
- 15 Figure 2 is a sectional elevation of the tracheotomy tube by which connection is made with the trachea.
Figure 3 is a sectional elevation of the air valve.
Figure 4 is a sectional elevation of the air warming apparatus.
Figure 5 is a sectional view of a modified construction of the air valve.
- 20 Figure 6 is a sectional view of another modified construction of the air valve.
Figure 7 is a sectional elevation of the trachea tube which may be employed in place of the tracheotomy tube when desired.
Like letters of reference refer to like parts in the several Figures.

[Price 8d.]

Lake's Improvements relating to Apparatus for Producing Artificial Respiration.

A represents a tracheotomy tube by which connection is made with the trachea or larynx, as the case may be. The tracheotomy tube consists as usual of an outer tube *a* provided with a shield *a*¹ and an inner tube *b*, which is held in place by a turn button *b*¹. *c* represents a nipple which is attached to the end of the flexible air supply tube *d* and which is connected with the upper end of the inner tube *b* by a screw thread, as shown, or in any other suitable manner, so as to form a tight and secure joint, and at the same time permit the nipple to be readily detached from the inner tube. 5

E represents a bellows or other suitable air forcing device, whereby air is supplied through tubes *d*, *d*¹, *d*² and the tracheotomy tube A to the trachea and lungs. 10

F represents an air valve arranged between the air supply tubes *d* *d*¹ and establishing at desire, communication between the tracheotomy tube and the bellows or with the outer air. As represented in Figure 3, the valve F is provided with an upright tubular shell or case *f* open at its lower end and supported on legs *f*¹, to permit of the free escape of the air through the lower end of the shell. *g* is the air outlet nipple, and *g*¹ the inlet nipple arranged diametrically opposite each other on the lower portion of the shell *f* and connected respectively with the tubes *d*, *d*¹. H represents a movable piston arranged in the shell *f* and provided at its lower end with a recess *h*, which opens downwardly and toward the exit nipple *g*. *h*¹ is a diametrical passage formed in the piston H above the recess *h*, so that by depressing the piston the two nipples can be placed in communication through the passage *h*¹. *h*² is a spring which holds the piston in an elevated position, and *h*³ is a push button formed at the upper end of the stem of the piston. In the elevated position of the piston represented in Figure 3, the recess *h* establishes communication between the trachea and the outer air. 20 25

*h*⁴ is a vent or exhaust opening whereby the air from the bellows escapes when the piston H is in an elevated position and the communication between the nipples *g*, *g*¹ is cut off by the recess *h*.

I represents an air warming apparatus which may be used in cold weather for raising the temperature of the air to the proper point before supplying it to the patient, or for supplying stimulating medicine to the lungs. As shown in the drawings, the warming apparatus consists of a vessel *i* which is filled with water and is heated by a lamp *i*¹. The air is conducted to the lower portion of the vessel *i* by the tube *d*², which descends nearly to the bottom of the vessel and the air escapes from the vessel through the tube *d*¹. The tubes *d*², *d*¹ may be connected by a coil arranged in the vessel *i* if desired. A thermometer *i*² is provided in the vessel for indicating the temperature of the water and air. The water in the vessel also serves to intercept any impurities which may be contained in the air. When the outer air has the proper temperature, this warming apparatus may be omitted. 30 35 40

My improved apparatus is used by introducing the tube A into the trachea and alternately supplying air thereto and permitting it to escape therefrom. This regulation of the flow of air is effected by the valve F. Upon depressing the button *h*³ so as to bring the passage *h*¹ in line with the nipples *g*, *g*¹, the air is forced by the bellows through the tube *d* and the tracheotomy tube A into the trachea and lungs. Upon releasing the button the spring raises the piston H to the position represented in Figure 3 in which the piston shuts off the air from the bellows and permits the air to escape from the lungs through the tubes A and *d*, nipple *g* and recess *h*. While the expiration is being made the air from the bellows is permitted to escape through the vent *h*⁴. By working the bellows and depressing the piston H at regular intervals, forced respiration is produced in a simple and certain manner. 45 50

When the patient has so far recovered that the lungs resume their action, the nipple *c* and tube *d* are disconnected from the inner tube *b*, leaving the latter and the outer tube *a* in place in the trachea, so that connection can be made again with the bellows, if the action of the lungs should temporarily fail. 55

In the normal position of the piston H communication is established between the lungs and the outer air, so that the patient can breathe through the valve, if capable

Lake's Improvements relating to Apparatus for Producing Artificial Respiration.

of doing so, and whereby a free passage is formed for the escape of blood, water &c. which may be coughed up.

Instead of the valve F a two way cock may be employed, as represented in figure 5. K represents the case of the cock provided with nipples k k^1 connected respectively with the tubes d d^1 and having a passage k^2 , which opens into the outer air. The plug l of the cock is provided with a bent passage l^1 by which communication can be established between the tubes d d^1 , as shown, for forcing air to the tube A, or by which the air can be exhausted through the passage k^2 , when the passage is arranged as indicated by dotted lines. I prefer however, to employ a spring valve F as it automatically establishes communication between the trachea and the outer air.

If desired, the air valve may be constructed as represented in figure 6, in which M is a frame to which is pivoted a tube section m having a thumb piece m^1 . N is the inlet tube to which the section m is hinged at n and which receives the air from the supply tube d^1 . N¹ is the outlet tube which communicates with the tracheal or tracheotomy tube. The tube section m is held out of register with the outlet tube by a spring o . Upon placing the tube section m in line with the outlet tube N¹, communication is established between the supply tube and the trachea, while by releasing the thumb piece, the spring causes the movable tube section to break register with the outlet tube N¹ and opens the latter and the inlet tube to the outer air. When it is desired to avoid tracheotomy, a tracheal tube P of any suitable construction may be employed for establishing communication with the lungs through the larynx and trachea.

A tampon may be attached to the lower end of the tracheal tube P to close the opening between the outside of the tube and the trachea, if desired.

The end of the tracheotomy tube is provided with a movable collar q which fills the space between the outer side of the tube and the mucous membrane of the trachea, to prevent the air from passing into the mouth. The collar q is preferably attached by a screw thread so that a larger or smaller collar may be applied to the tube as may be necessary to fit the trachea.

My improved apparatus may also be used in physiological laboratories to keep up artificial respiration in animals as an improvement upon the methods now in use.

Having now particularly described and ascertained the nature of the said invention, and in what manner the same is to be performed as communicated to me by my foreign Correspondent I declare that what I claim is:—

First. The combination with the tracheal or tracheotomy tube composed of an outer tube a and inner tube b , of an air supply tube d detachably connected with the inner tube b , substantially as set forth.

Second. The combination with a tracheal or tracheotomy tube of an air forcing apparatus, a tube connecting said apparatus with the tracheal or tracheotomy tube, and a regulating valve whereby communication can be established at will between the tracheal or tracheotomy tube and the air forcing apparatus or the outer air, substantially as set forth.

Third. The combination with a tracheal or tracheotomy tube, of an air forcing apparatus, a tube connecting said apparatus with the tracheal or tracheotomy tube a regulating valve and an air warming apparatus, substantially as set forth.

Dated this 13th day of March 1888.

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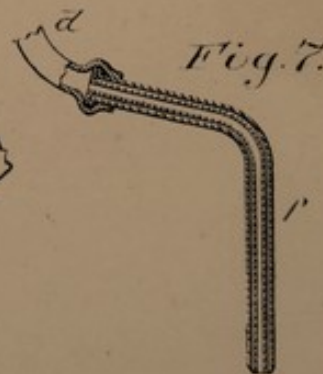
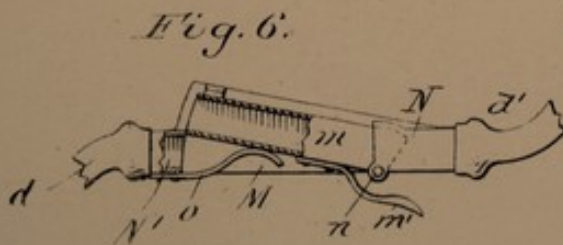
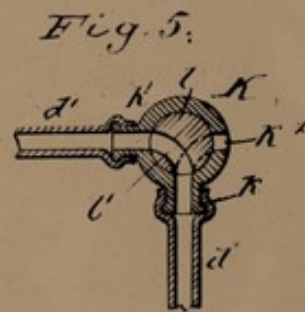
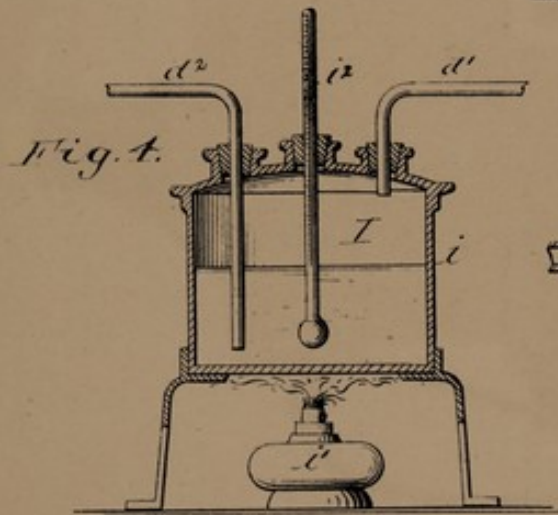
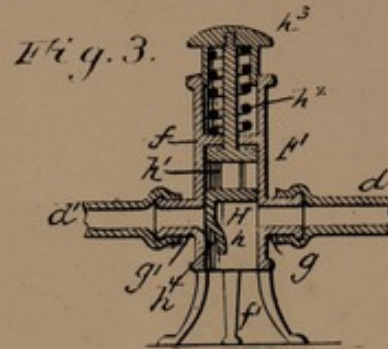
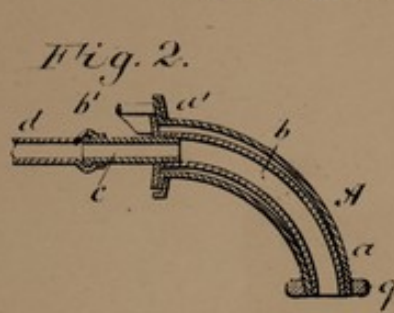
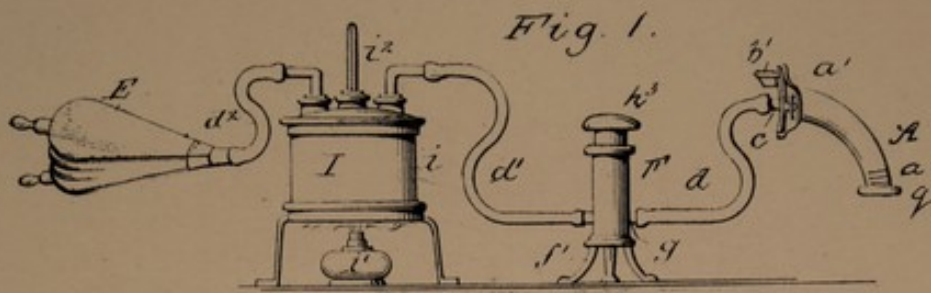
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[This Drawing is a reproduction of the Original on a reduced scale]

