

(No Model.)

G. E. FELL.

APPARATUS FOR PRODUCING ARTIFICIAL RESPIRATION.

No. 374,402.

Patented Dec. 6, 1887.

Fig. 1.

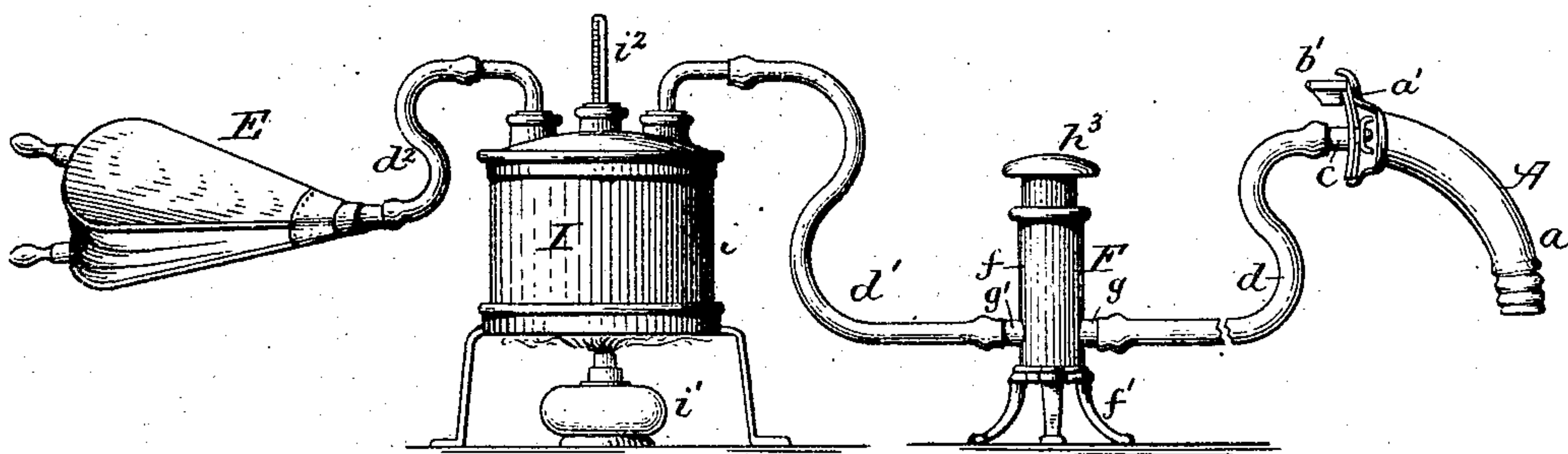


Fig. 2.

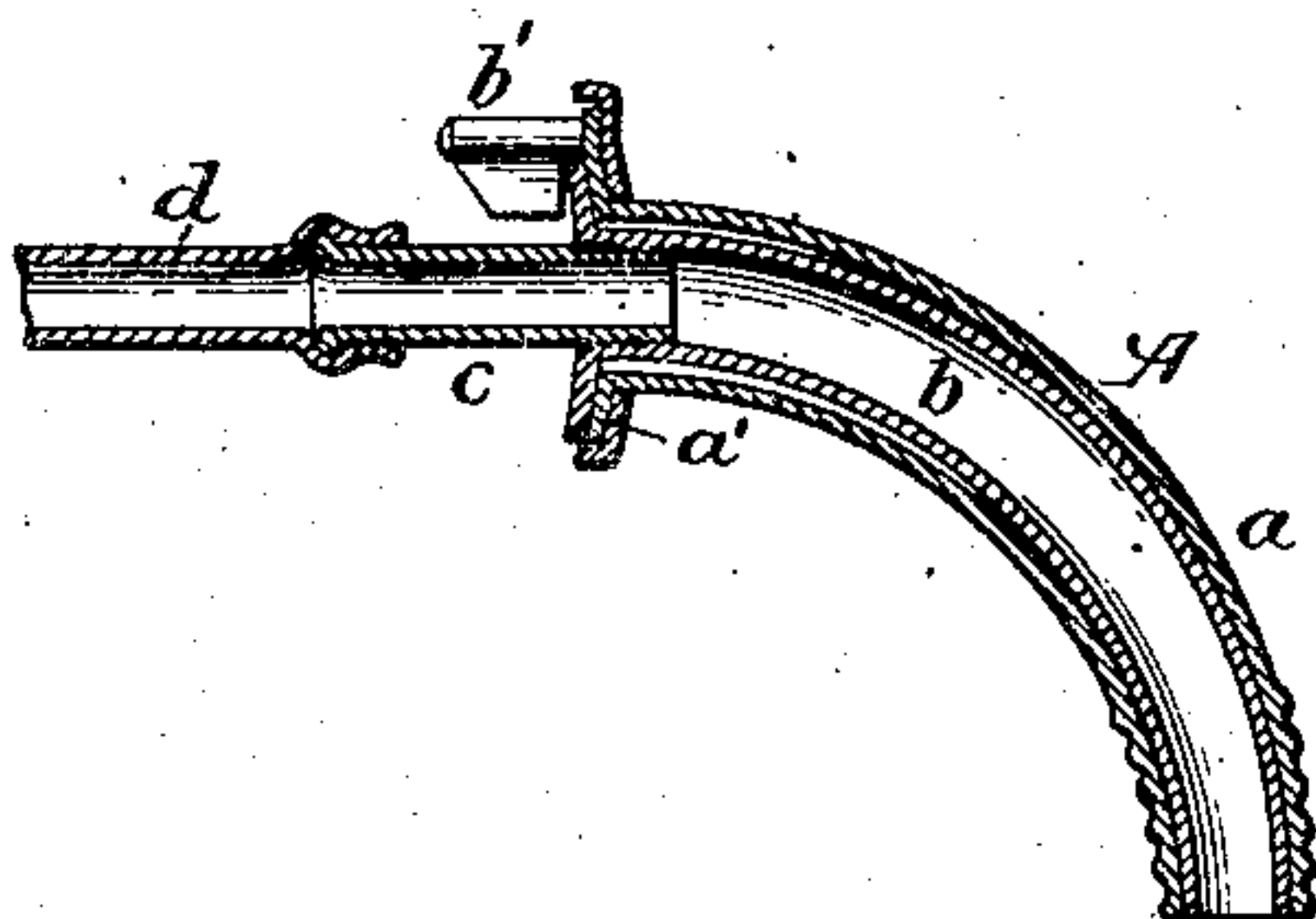


Fig. 3.

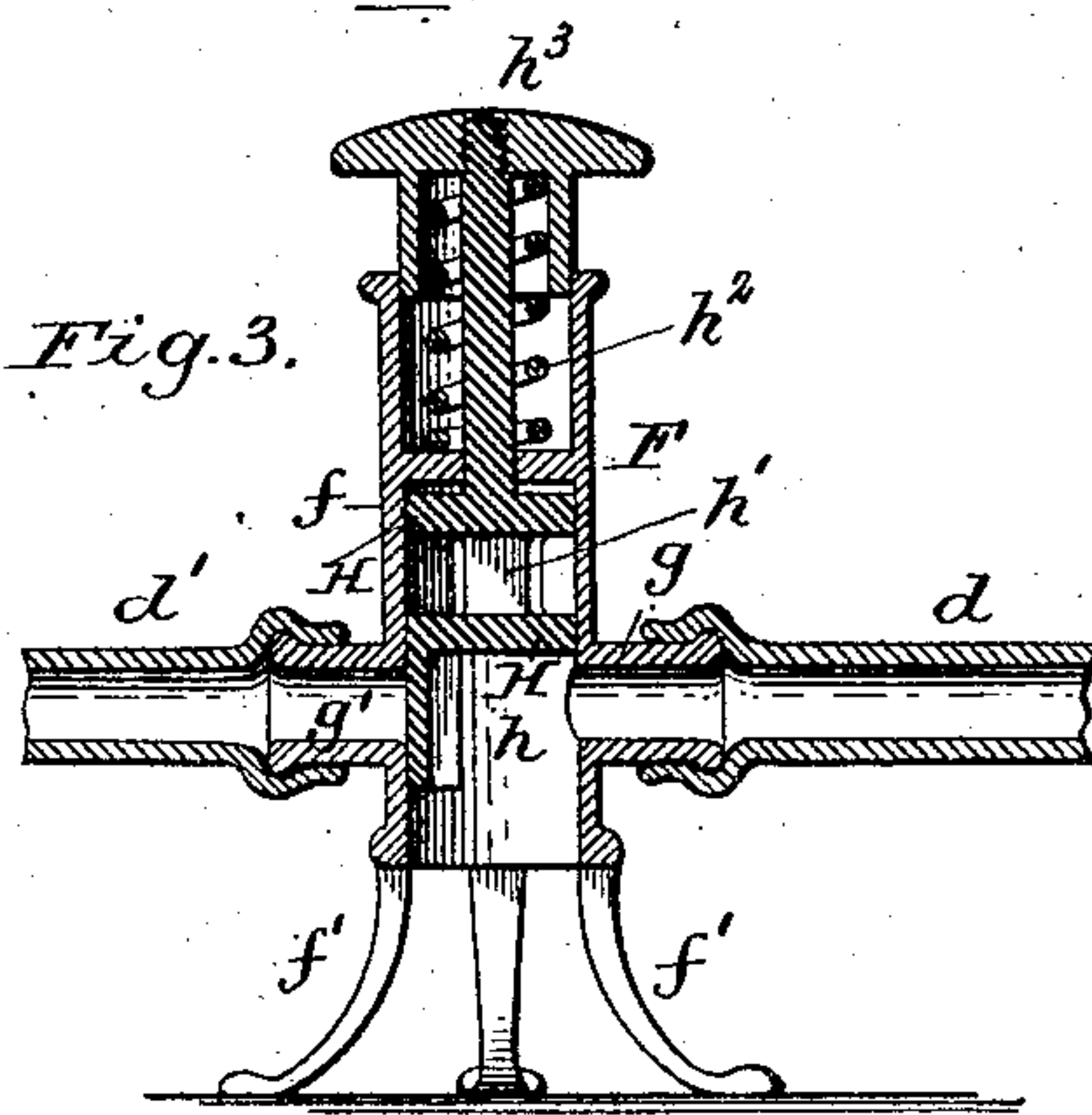


Fig. 4.

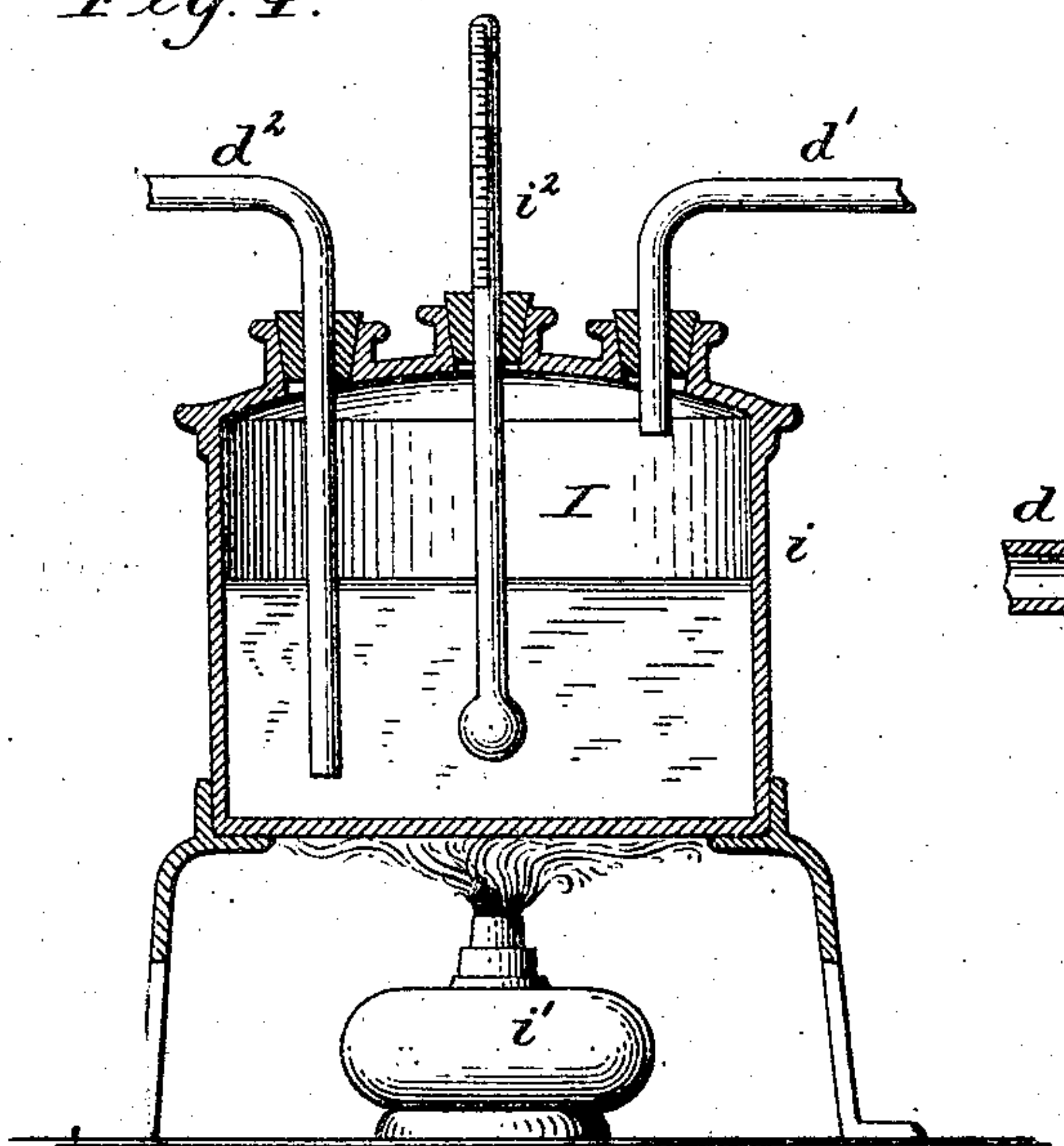
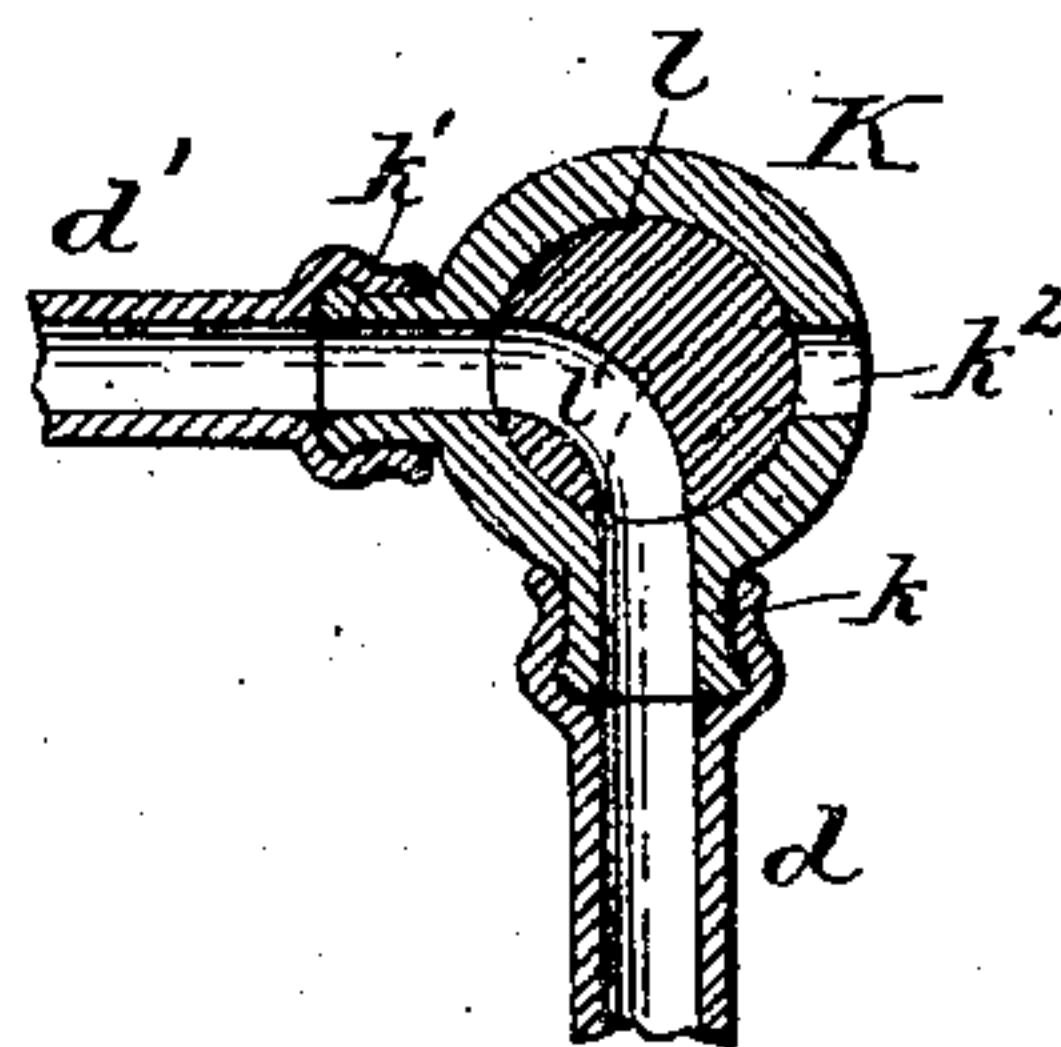


Fig. 5.



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# UNITED STATES PATENT OFFICE.

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## APPARATUS FOR PRODUCING ARTIFICIAL RESPIRATION.

SPECIFICATION forming part of Letters Patent No. 374,402, dated December 6, 1887.

Application filed August 24, 1887. Serial No. 247,706. (No model.)

*To all whom it may concern:*

Be it known that I, GEORGE E. FELL, a citizen of the United States, residing at Buffalo, in the county of Erie and State of New York, have invented new and useful Improvements in Apparatus for Producing Artificial Respiration, of which the following is a specification.

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.

The object of my invention is to produce an apparatus which is reliable in its operation and easily applied and manipulated.

My invention consists of the improvements which will be hereinafter fully set forth, and pointed out in the claims.

In the accompanying drawings, Figure 1 is an elevation of my improved apparatus. Fig. 2 is a sectional elevation of the tracheotomy-tube, by which connection is made with the trachea. Fig. 3 is a sectional elevation of the air-valve. Fig. 4 is a sectional elevation of the air-warming apparatus. Fig. 5 is a sectional view of a modified construction of the air-valve.

Like letters of reference refer to like parts in the several figures.

A represents a tracheotomy-tube, by which connection is made with the trachea or larynx, as the case may be, preferably with the trachea, as it avoids injury to the larynx and establishes communication with the air-passages below any obstruction which may exist in the larynx by paralysis or otherwise. The tracheotomy-tube consists, as usual, of an outer tube, *a*, provided with a shield, *a'*, and an inner tube, *b*, which is held in place by a turn-button, *b'*. The lower end of the outer tube, *a*, is preferably corrugated, so that it can be firmly secured in the trachea by a ligature.

*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.

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

*F* represents an air-valve arranged between the air-supply tubes *d d'* and establishing at desire communication between the tracheotomy-tube and the bellows or with the outer air. As represented in Fig. 3, the valve *F* is provided with an upright tubular shell or case, *f*, open at its lower end and supported on legs *f'*, to permit of the free escape of the air through the lower end of the shell.

*g* is the air-outlet nipple, and *g'* the inlet-nipple, arranged diametrically opposite each other on the lower portion of the shell *f*, and connected, respectively, with the tubes *d d'*.

*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*, while it closes the inlet-nipple *g'*.

*h'* 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'*.

*h<sup>2</sup>* is a spring which holds the piston in an elevated position, and *h<sup>3</sup>* is a push-button formed at the upper end of the stem of the piston. In the elevated position of the piston represented in Fig. 3 the recess *h* establishes communication between the trachea and the outer air.

*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. 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'*. The air is conducted to the lower portion of the vessel *i* by the tube *d<sup>2</sup>*, which descends nearly to the bottom of the vessel, and the air escapes from the vessel through the tube *d'*. A thermometer, *i<sup>2</sup>*, 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.

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  $h'$  in line with the nipples  $g g'$ , 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 Fig. 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  $h$ . By working the bellows and depressing the piston H at regular intervals artificial respiration is produced in a simple and certain manner. 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. In the normal position of the piston H communication is established between the lungs and the outer air, so that the patient can breath through the valve, if capable 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 Fig. 5.

K represents the case of the cock, provided with nipples  $k k'$ , connected, respectively, with the tubes  $d d'$ , and having a passage,  $k^2$ , which opens into the outer air. The plug  $l$  of the cock is provided with a bent passage,  $l'$ , by

which communication can be established between the tubes  $d d'$ , 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 establishes automatically communication between the trachea and the outer air.

I claim as my invention—

1. The combination, with the 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.

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

3. The combination, with the tracheotomy-tube, of an air-forcing apparatus, a tube connecting said apparatus with the tracheotomy-tube, a regulating-valve, and an air-warming apparatus, both arranged in said connecting-tube, substantially as set forth.

4. The combination, with a tracheotomy-tube, of air-supply tubes  $d d'$ , a regulating-valve, F, having a shell,  $f$ , nipples  $g g'$ , and a piston, H, provided with a recess,  $h$ , and passage  $h'$ , and an air-forcing apparatus, substantially as set forth.

Witness my hand this 19th day of August, 1887.

GEO. E. FELL.

Witnesses:

JNO. J. BONNER,  
GEO. J. BUCHHEIT, Jr.