

(No Model.)

C. C. DAVIS.
DEVICE FOR INDUCING FULL RESPIRATION.

No. 443,204.

Patented Dec. 23, 1890.

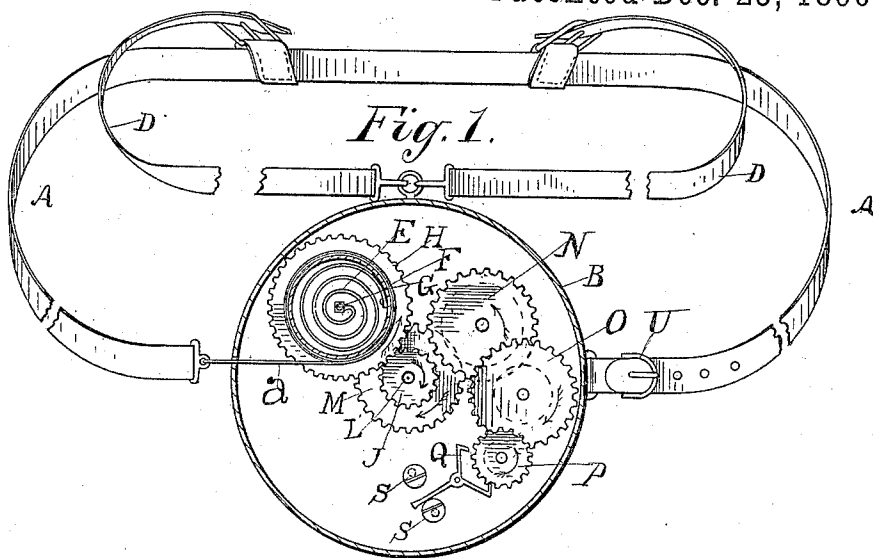


Fig. 3.

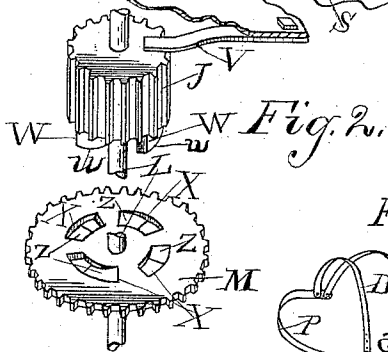
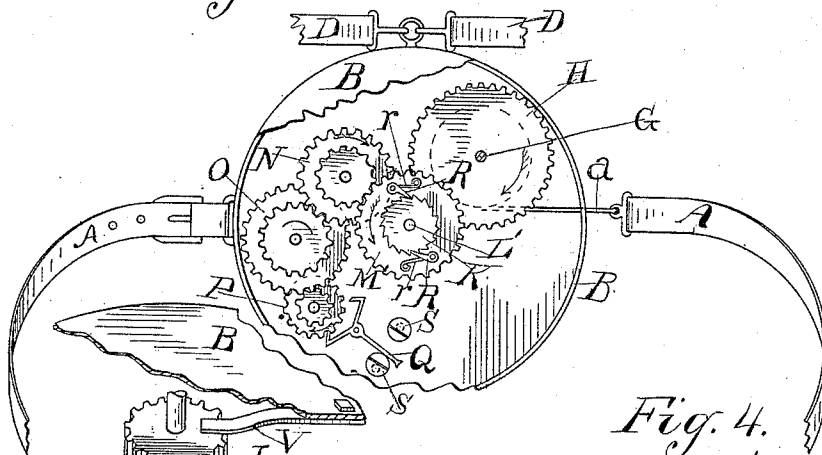


Fig. 4.

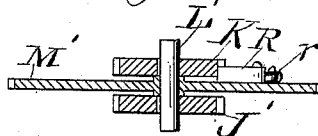
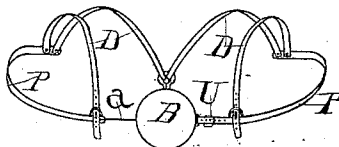


Fig. 5.



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DEVICE FOR INDUCING FULL RESPIRATION.

SPECIFICATION forming part of Letters Patent No. 443,204, dated December 23, 1890.

Application filed January 13, 1890. Serial No. 336,734. (No model.)

To all whom it may concern:

Be it known that I, CHARLES CASSAT DAVIS, a citizen of the United States, residing at Los Angeles, in the county of Los Angeles and State of California, have invented a new and useful Device for Inducing Full Respiration, of which the following is a specification.

The purpose of my invention is to induce full natural expansions of the lungs at proper intervals.

My invention, briefly stated, consists of the combination of a chest-compressor brace adapted to wholly or partially encircle the chest, and suitable speed-regulated take-up mechanism connected therewith and arranged to automatically contract the brace and cause a compression of the chest at regulated intervals, so that unless the wearer respire fully the compression of the chest by the contraction of the brace will cause greater and greater discomfort until relief is gained by a full inspiration.

Various take-up devices will suggest themselves to those skilled in mechanics; but the accompanying drawings illustrate mechanism which I deem specially adapted to carry out my invention in a practical manner.

Figure 1 is a view of a device embodying my invention, one face of the case being broken away to expose the take-up mechanism. Fig. 2 illustrates the slip-pinion and its connections, whereby greater resistance to the expansion of the compressor belt or brace is given at the beginning of the expansion than is given to its continued expansion. In this view the parts are shown separated from each other for more convenient illustration. Fig. 3 illustrates a modification of the take-up mechanism shown in Figs. 1 and 2, a ratchet-wheel and pawl being substituted for the slip-pinion. In this figure the mechanism is viewed from the reverse side to that of Fig. 1. Fig. 4 is a sectional detail of the arbor L' and its connections. Fig. 5 illustrates a modification in which the compression-brace is formed of two rigid J-shaped pieces.

In the form shown in Figs. 1 and 3 the compressor-brace consists of a light inelastic strap or cord A, attached by one end to the case B, which contains the take-up mechanism, and attached by the other end (prefer-

ably through the medium of a small cord or chain a, which is substantially a part thereof) to the barrel F, around which it is wound reverse to spring E, which actuates the barrel, so that when the barrel is turned by the unwinding of such cord the tension of the spring is increased. When in use the continuous belt formed by the strap or cord A, the cord or chain a, and the case containing the take-up mechanism encircles the chest under the arms, and is supported in place by cords or straps D D, attached to the case on the breast, thence carried over the shoulders and attached at the back to the compressor-brace. The take-up spring E is coiled within a barrel F, which is fixed solidly upon and coaxial with its spur-wheel H, one end of the spring being attached to fixed arbor or spindle G, the other to the inside of barrel F. A slip or sliding pinion J, whose teeth mesh with those of wheel H, is loosely mounted on arbor or spindle L. The slip-pinion J is provided on its lower end with one or more ratchet-teeth W, arranged to engage with the notched face of spur-wheel M, which is coaxial with pinion J to rotate such wheel when the pinion is driven by the action of spring E. When the pinion is driven in the opposite direction, the sloping faces w of the teeth engage with the sloping faces Z of the notches X in the face of wheel M, whereby the pinion is elevated and the teeth withdrawn from the notches, thereby allowing the pinion to revolve without revolving wheel M. A small spring V is arranged to engage the pinion to hold it in operative contact with the notched face of its spur-wheel M. Spur-wheel M engages with and is controlled by suitable escapement mechanism. In the drawings the teeth of spur-wheel M mesh with those of the pinion of spur-wheel N, which wheel in turn meshes with the pinion of spur-wheel O, which wheel meshes with pinion of escapement-wheel P, which is controlled by pallet Q.

It will be observed that the rotation of wheel M is obstructed by the escapement mechanism comprising the train of wheels and their escapement, so that when on the withdrawal of the cord by reason of an inspiration pinion J is revolved by wheel H in the direction opposite to that shown by the

arrow, the ratchet mechanism slips and the wheel M remains stationary. When the inspiration is complete and the cord slackens, the spring-driven pinion rotates in the direction of the arrow, and by the action of spring V the teeth are pressed into the notches X, and wheel M and its train are thereby driven in the direction of the arrows. The escapement-wheel P, working against pallet Q, checks the speed of the train and retards and regulates the recovery of spring E. Revolvable lugs S S, each having a large head placed eccentric to its axis, are fixed to the frame of the take-up mechanism, one on each side of the arm of the pallet Q, to regulate the length of its swing. By turning the lugs the space between their heads in which the fan of the pallet works may be increased or diminished, as desired. As the space within which it works is increased or diminished, the speed of the escapement and of the train of wheels is correspondingly retarded or accelerated.

In the modification shown in Figs. 3 and 4 the pinion J', instead of being loose on the arbor L', is fixed thereon, and wheel M' is loose instead of being fixed, and the pinion and wheel are connected by a ratchet-wheel K and pawls R, so arranged that when the pinion is driven by the spring E the wheel M' will be rotated in the direction indicated by the arrows, and when the pinion is driven in the opposite direction the pawls will slip and wheel M' remain stationary.

I consider the most convenient means for connecting the pinion and wheel M' to be that illustrated in Fig. 4, in which the pinion and ratchet-wheel are fixed to the arbor L', and the pawls are pivoted to the face of loose wheel M' and are held in engagement with the ratchet-wheel by spring r. The form of the mechanism last described differs noticeably in its practical working from the form employing the slip-pinion. In the form of the mechanism employing the ratchet-wheel the force required to wind or work the take-up mechanism need be only slightly in excess of the resistance offered by spring E, the frictional resistance being inappreciable. With that employing the slip-pinion, when force is applied to coil-spring E the slip-pinion J, gearing with H, is compelled to revolve. In order to revolve, its teeth W must be withdrawn from the notches X in wheel M, which is held stationary by the escapement. To withdraw the teeth W, the pinion is compelled to rise against the pressure of spring V. The friction occasioned by the sliding of the face of teeth W against the surfaces of slots X, the sliding of pinion J on arbor L, the slipping of the teeth of the pinion on the teeth of wheel H, all occur simultaneously with the first movement in coiling the spring by the withdrawal of cord a, and thereby creates a marked resistance in addition to that offered by the spring. This frictional

resistance, however, is exhausted by the first part of the movement of withdrawing the cord. After the teeth W have withdrawn from notches X the spring E offers the only noticeable resistance to the withdrawal. In consequence of the increased initial resistance offered by this form of the machine ordinary breathing is less likely to wind the mechanism than it is with the form using the ratchet-wheel. Immediately the chest relaxes the mechanism resumes its gathering up of cord or chain a, compelling the wearer to make a full expansion of the lungs to gain relief from the pressure.

Instead of the brace being made flexible and continuous, it may be made of two stiff J-shaped pieces P, as shown in Fig. 5. The curved parts of the J being adapted to clasp the chest under each arm and the two ends of the straight parts of the J being attached, respectively, to the take-up mechanism and small cord a, in the same manner as is the flexible compressor-brace before described, the whole being supported by small straps carried over the shoulders, substantially as above described. The use of this form of compressor leaves the back of the person free from the belt and its pressure.

In adjusting the mechanism for use the cord or small chain a is drawn out its full length, thus coiling spring E. By means of a buckle U the compressor-belt is then adjusted around the chest to be comfortably tight when the lungs are expanded.

The operation of the machine is as follows: On expelling the air from the lungs in the ordinary course of breathing, the circumference of the chest is lessened, the compressor-belt is loosened, and the spring E in coiling immediately begins to take up the cord or chain a. As this cord is taken up the belt is tightened gradually until it finally produces a pressure about the chest which remains and increases until the attention is attracted and the person, for relief, inhales deeply, thus expanding the chest. On expanding the chest the movement of the brace withdraws the cord or chain a from the barrel F. This revolves the barrel and coils the spring E. On exhaling the chest is relieved from the pressure of the brace and remains free from it for an interval, during which the person indulges in his usual respirations. The mechanism immediately engages in taking up the slack of the cord or chain a, which has been drawn out by the full inspiration. When the slack is taken up, the pressure begins again and continues and increases until another deep inhalation. In practice a full inspiration withdraws such a length of cord that it remains slack and produces no pressure to obstruct the ordinary breathing until the take-up mechanism has taken up all the slack. Then the pressure begins, as before described. The intervals between the successive pressures of the brace may be regulated at pleas-

ure by turning the lugs S S to control the movement of the pallet.

Although the slip-pinion form has an advantage over the pawl-and-ratchet form, the latter form is simpler and is preferable where it is not necessary to employ specially obtrusive means for attracting the attention. I do not wish to be limited strictly to either form; but

What I claim, and desire to secure by Letters Patent, is—

1. In a device for inducing full respiration, the combination of a chest-compressor brace and speed-regulated take-up mechanism adapted to contract such brace.

2. The combination of the case, the take-up mechanism in such case, and a chest-compressor brace secured by one end to such case and by the other end to the take-up mechanism.

3. The combination of the case, the spring, the spring-actuated barrel, train of wheels

and escapement-pallet in such case, and the compressor-brace attached by one end to the case and attached by its other end to the spring-actuated barrel reverse to the spring.

4. The combination of the case, the spring-actuated barrel, the spring, a spur-wheel fixed upon such barrel, escapement mechanism, and ratchet mechanism connecting such spur-wheel with such escapement mechanism.

5. The combination of the spur-wheel of the take-up barrel, the slip-pinion meshing therewith and provided on its lower end with ratchet-teeth, a spur-wheel coaxial with the slip-pinion and having a notched face arranged to engage such ratchet-teeth, a spring arranged to hold the slip-pinion in operative contact with its spur-wheel, and escapement mechanism engaging with such spur-wheel.

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