No. 711,697. Patented Oct. 21, 1902.

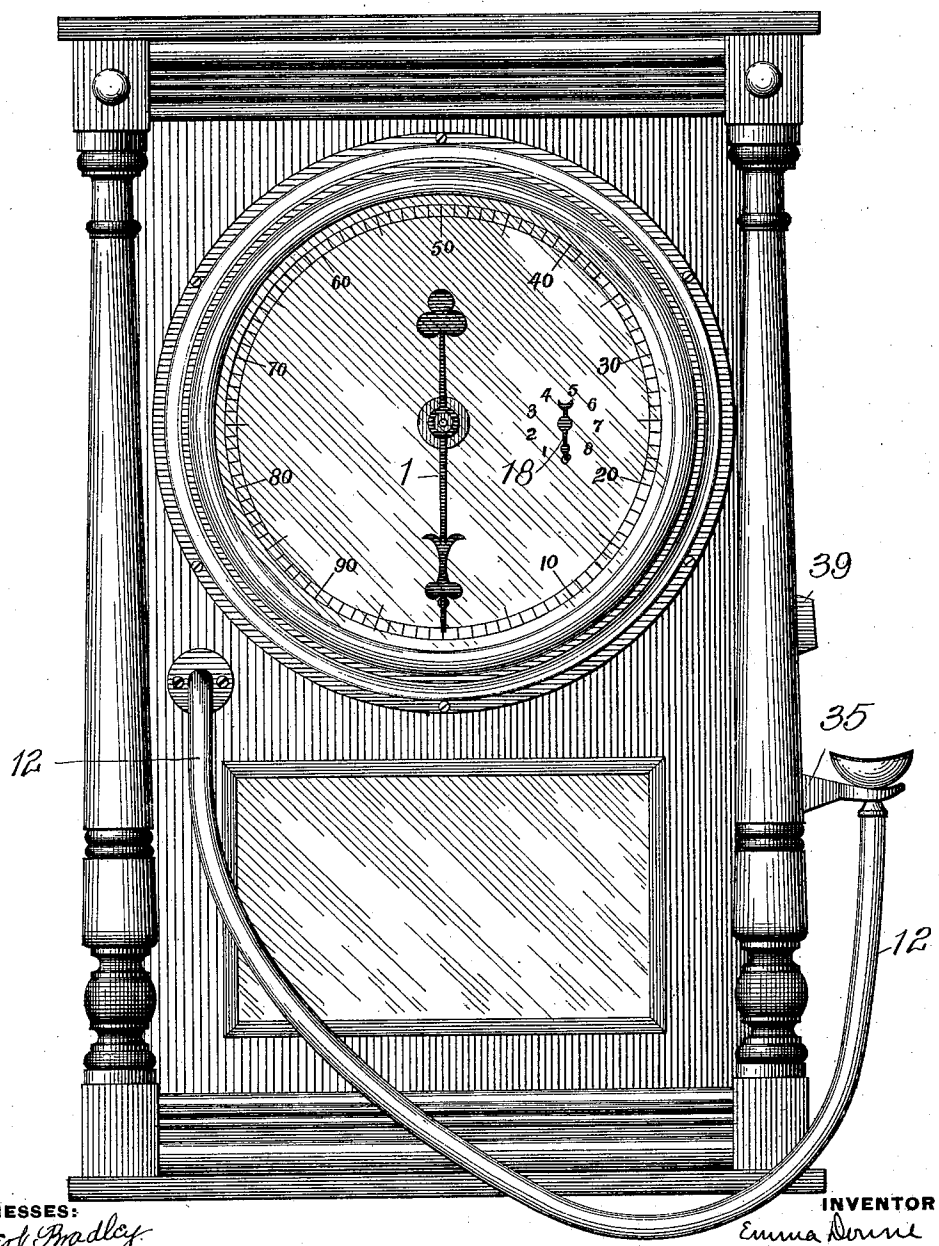
E. DONNE.

MACHINE FOR TESTING LUNGS.

(Application filed Mar. 28, 1901.)

(No Model.) 5 Sheets—Sheet 1.

FIG. 1.



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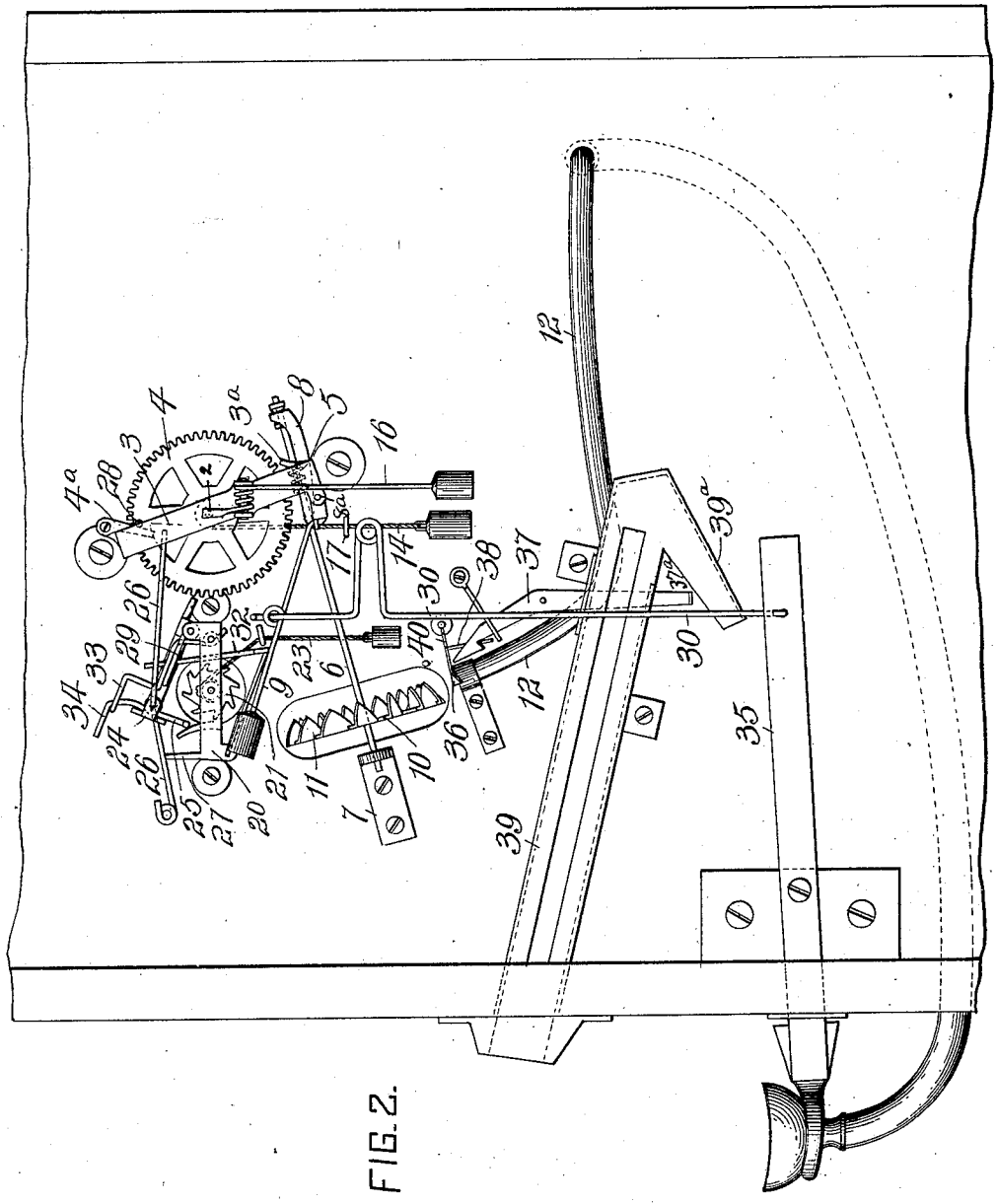


FIG. 2.

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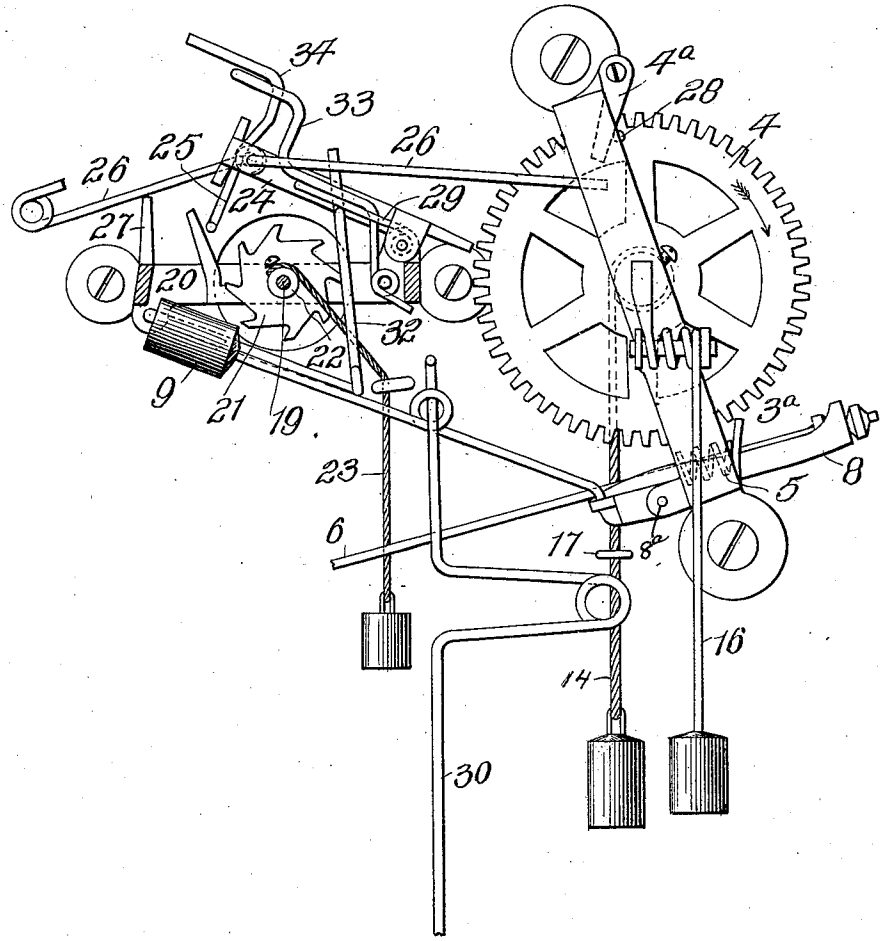
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MACHINE FOR TESTING LUNGS.

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(No Model.) 5 Sheets—Sheet 3.

FIG. 3.



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MACHINE FOR TESTING LUNGS.

(Application filed Mar. 28, 1901.)

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FIG. 4.

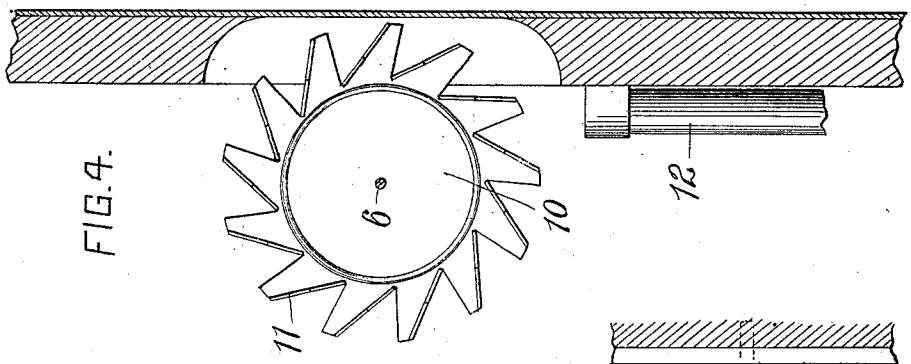


FIG. 6.

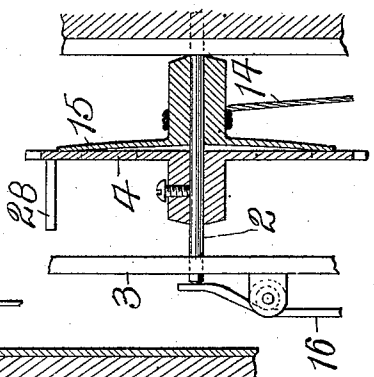
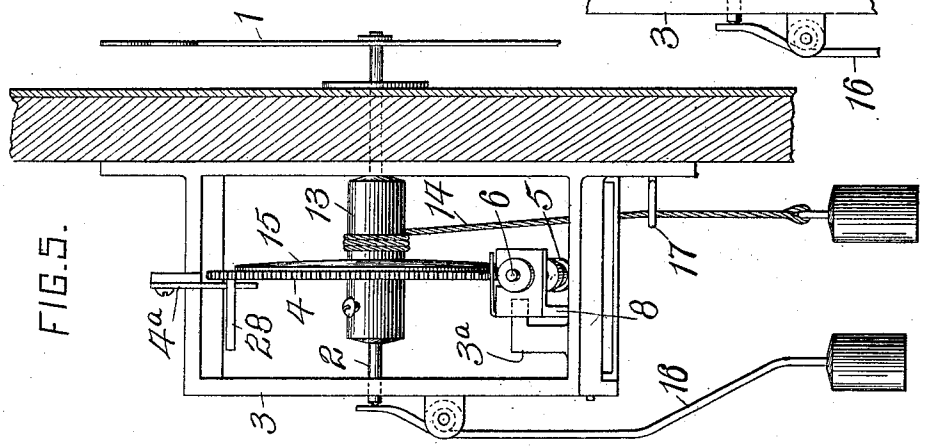


FIG. 5.



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MACHINE FOR TESTING LUNGS.

(Application filed Mar. 28, 1901.)

(No Model.) 5 Sheets—Sheet 5.

FIG. 7.

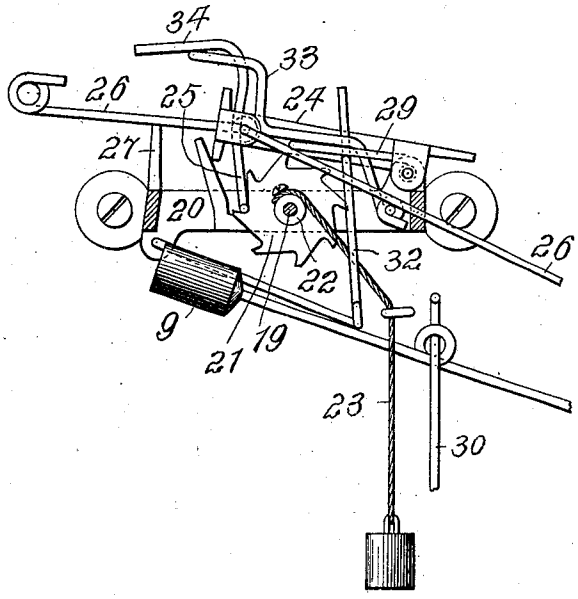


FIG. 8.

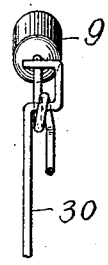
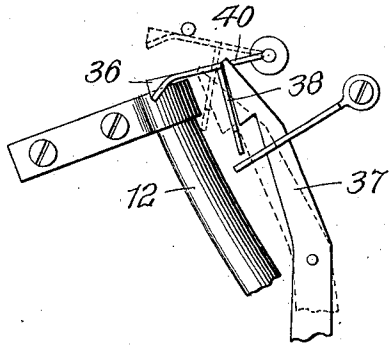


FIG. 9.



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UNITED STATES PATENT OFFICE.

EMMA DONNE, OF CHICAGO, ILLINOIS, ASSIGNOR, BY MESNE ASSIGNMENTS, TO JAMES M. ARNOLD, OF PITTSBURG, PENNSYLVANIA.

MACHINE FOR TESTING LUNGS.

SPECIFICATION forming part of Letters Patent No. 711,697, dated October 21, 1902.

Application filed March 28, 1901. Serial No. 53,167. (No model.)

To all whom it may concern:

Be it known that I, EMMA DONNE, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented or discovered certain new and useful Improvements in Machines for Testing Lungs, of which improvements the following is a specification.

The invention described herein relates to certain improvements in lung-testing apparatus, and especially to that type or kind which are coin-controlled.

The invention is hereinafter more fully described and claimed.

In the accompanying drawings, forming a part of this specification, Figure 1 is a front elevation of the case or frame inclosing the operating mechanism. Fig. 2 is a view in elevation, on an enlarged scale, of the operating mechanism. Fig. 3 is a view on a still larger scale of the operated parts connected to the dial fingers or hands. Fig. 4 is an enlarged detail view of the driving-wheel. Fig. 5 is a detail view illustrating the finger-shifting wheel and the return mechanism therefor. Fig. 6 is a sectional view of the construction shown in Fig. 5. Fig. 7 is a view of some of the parts illustrated in Fig. 3 in lowered position. Fig. 8 is a detail view of certain parts, and Fig. 9 is a detail view of the mechanism controlling the escape of air from the blowpipe.

In the practice of my invention the main finger 1 is secured upon a shaft 2, which extends back through the front of the case or shell and is mounted in suitable bearings upon a frame 3, secured to the case. On this shaft is secured a toothed wheel 4, with which a worm 5 on the driving-shaft 6 intermeshes. One end of the shaft is mounted in a fixed bearing 7, secured to the supporting-case, and the opposite end is mounted in a cradle 8, pivotally mounted on the frame 3, as clearly shown in Figs. 2, 3, and 4, the shaft being loosely mounted in its bearings to permit of a tilting movement of the cradle 8. In order to shift the cradle 8 so as to bring the worm-wheel 5 into engagement with the toothed wheel 4, a weighted arm 9 or other suitable means is connected to the cradle on one side of its pivotal point, so that the latter when free to move can be tipped, thereby imparting a slight lateral movement to the shaft 6 and causing the worm 5 to be engaged by the toothed wheel. The worm is prevented from pressing too hard upon the toothed wheel by a stop 3^a on the frame 3, as shown in Figs. 3 and 5. Upon the shaft 6 is secured the driving-wheel 10, provided with a series of blades 11, which are suitably arranged to receive the impact of a blast of air escaping through the nozzle of the blowpipe 12. When driven by the blast of air on the nozzle, the wind-wheel 10 is rotated at a high speed, thereby driving the worm-wheel 5, which will impart a slower rotation to the toothed wheel 4 and the hand 1. In order to return the hand 1 to its original or starting position, a drum 13 is loosely mounted upon the shaft 2, and on said drum is wound a rope 14, having a weight connected to its lower end. The drum is rotated to wind the rope thereon by means of the frictional contact of the side of the toothed wheel 4 with the disk 15, carried by the drum. These parts are held in frictional engagement by means of a weighted lever 16 bearing against the end of the shaft 2, thereby pressing the toothed wheel against the disk 15, which is held as against lateral movement by the bearing of one end of the drum 13 against the frame 3, as clearly shown. When in operation the toothed wheel 4 is rotated, the disk 15 and the drum 13 will be rotated therewith until the weight on the rope 14 is drawn up against a stop 17, and thereafter the toothed wheel will rotate independent of the disk 15. The rope 14 is made of such a length that sufficient turns will be made on the drum to cause at least one reverse rotation of the shaft when operated by the drum, thereby insuring a return of the hand 1 to normal or starting position. The reverse rotation of the toothed wheel 4 and hand 1 is arrested at the proper time by a pawl 4^a, pivoted to the frame 3 and projecting into the path of movement of the pin 28 in wheel 4. The pawl is so mounted as to permit the forward movement of the toothed wheel and to arrest the reverse movement when the hand is at the starting-point.

In order to register the number of movements of the hand 1 around the dial, a count-

ing finger or hand 18 is secured upon a shaft 19, passing back through the front of the case and mounted in suitable bearings upon a frame 20. On the shaft is secured a toothed wheel 21 and a drum 22, on which is wound by the rotation of the drum a rope 23, carrying a weight. The purpose of said weight and rope is to return the finger or hand 18 to normal position. A rocking bar or frame 24 is pivotally mounted on the frame 20 or other convenient support, and a finger 25 is so secured to said frame 24 that when the frame drops, as will be hereinafter described, said finger will strike a tooth on the wheel 21 and impart a partial rotation to the shaft 19. In order to raise the rocking frame, a lever 26 pivotally engages the frame 24, near its free end, and has its fulcrum 27 on the frame 20 or other convenient support. The opposite end of this lever projects into the path of movement of a pin 28 on the toothed wheel 4. As this pin 28 is carried around by the toothed wheel 4 and lifts the free end of the lever 26 the frame 24 will be raised, as shown in Fig. 3, and when the pin 28 has passed beyond the end of the lever the frame 24 will drop, carrying with it the finger 25, which, striking one of the teeth of the wheel 21, will impart a partial rotation to the counting-finger 18. In order to prevent a reverse rotation of the wheel 21 and the counting-finger under the action of the weight or rope 23 when the frame 24 is raised, a pawl 29 is loosely pivoted on the frame 20 in suitable relation to the toothed wheel, so as to normally engage the teeth thereof. When the toothed wheel is rotated by the finger 25, the teeth of the wheel will pass freely under the pawl, which will check any reverse movement. In order to release the toothed wheels 4 and 21 to permit of their return to normal position by their weights, a bar 30 is connected at one end to the weighted arm of the cradle 8 and a pivotally-mounted lifting-arm 32, having shoulders, is arranged in the path of movement of the weighted arm 9, so that when the latter is raised it will strike against one of the shoulders of the arm 32, raising said arm to bring the other shoulder against the retaining-pawl, and thereby lift the retaining-pawl 29 and also the rocking frame or bar 24, the movement of the latter being preferably effected through the medium of a pivotally-mounted arm 33, lying in the path of movement of the arm 32 and adapted to engage a lug or projection 34 on the rocking frame. By the upward movement of the rod 30, which is provided with a lateral projection engaging an eye formed on the rod extending from the cradle 8, as shown in Figs. 3, 7, and 8, the latter is rocked on its pivot-pin 8^a, so as to shift the worm 5 away from the toothed wheel 4, and the rocking frame 24 and pawl 29 are shifted to release the toothed wheel 21 from the finger 25 and the pawl 29, so that the two hands or fingers will be returned to normal or starting position by the weights on the cords 14 and 23. The lower end of the rod 30 is connected to an arm 35, which projects through the side of the inclosing case and is provided with forks at its outer end to support the mouthpiece of the blowpipe, as clearly shown in Figs. 1 and 2. The weight of this mouthpiece is sufficient to raise the rod 30, and thereby through the described mechanism to release the toothed wheels 4 and 21, so that when the mouthpiece is hung on the lever the parts of the device will be ready for a second operation.

A valve-plate 36 is arranged over the nozzle of the blast-pipe 12 and is held in such position by means of a shoulder on a lever 37 engaging a lug or finger 38 on the valve-plate. As shown in Fig. 2, the tail of this lever projects down alongside of the main portion of the chute 39 and is provided at its lower end with a toe 37^a, extending into the path of movement of a coin passing along the portion 39^a of the chute, so that the coin will shift the lever and release the valve-plate. A suitable means is employed for holding the lever out of engagement with the lug or projection on the valve-plate—such, for example, as that shown, consisting of a shoulder 40 on the valve-plate, behind which the upper end of the lever is shifted when moved by the coin, thereby holding the lever out of engagement with the valve-plate. The valve-plate is raised by the blast of air passing out of the nozzle of the blowpipe, and in such upward movement the end of the lever is freed from the shoulder 40 on the valve-plate and automatically returns to position to engage the lug or finger 38 on the plate as soon as the valve-plate resumes closed position, which it will do when the blast of air is stopped. After the valve-plate has dropped to closing position the mechanism cannot be again operated until the lever 37 is again tripped by a coin passing through the chute 39.

When the machine is to be operated, a suitable coin is dropped into the chute 39, which will direct it against the end of the lever 37, thereby shifting the upper end of the lever out of engagement with the finger 38 on the valve-plate and raising said valve-plate away from the outlet of the pipe 12. The mouthpiece of the blast-pipe is then removed from the forks at the end of the lever 35, so that the inner end of said lever will drop, and thereby through the medium of the rod 30 shift the cradle 8, so as to lift the worm on the shaft 6 into engagement with a toothed wheel 4. The dropping down of the weighted arm 9 of the cradle will permit the arm 32 to drop and with it the frame 24, carrying the actuated finger 25 and the retaining-pawl 29, so that the latter will engage the teeth of the toothed wheel 21. The wind-wheel of motor 11 is rotated by the blast of air entering through the pipe 12, thereby rotating the shaft 6 and wheel 4 and the indicating-fingers 1 through the friction of engagement of the disk 15 with said wheel. As the wheel 4

rotates the pin 28 will be carried around against the inner end of the lever 26, thereby lifting the lever and with it the frame 24, carrying the finger 25. As the pin 28 passes beyond the end of the lever the frame 24 will drop, so that the finger 25 will strike against one of the teeth of the wheel 21, partially rotating the latter and with it the drum 22, raising the weight on the cord 23. By the rotation of the shaft 19, on which the drum 22 is mounted, the counting-finger 18 is shifted one point forward. When the frame 24 and finger 25 are raised on the next rotation of the toothed wheel 24, the retaining-pawl 29 will prevent any backward or return rotation of the shaft 19. As soon as a test has been made the outer end of the lever 35 is depressed either by hand or by hanging up the mouthpiece of the blast-pipe, thereby through the medium of the rod 30 so shifting the cradle 8 as to disengage the worm 5 from the wheel 4, thereby permitting the wheel 4 and the indicating-finger 1 to be rotated back to starting position. By the lifting of the weighted arm 9 the arm 32 is lifted, thereby shifting the retaining-pawl 29 out of engagement with the wheel 21. By the continued upward movement of the pawl 29 the arm 33 is raised against a lug or projection 34 on the locking-frame 24, thereby lifting the latter and the finger 25, so that the shaft 19 is now free to be rotated by its weight in reverse direction to bring the indicating-finger 18 to starting-point. When the valve-plate 36 is raised by the blast of air through the pipe 12 off from the end of the lever 37, the latter will drop forward against the lug or finger 38 on the valve-plate. As soon as the blast is stopped the valve-plate will drop over the nozzle of the blast-pipe, and the lug or finger 38 will pass under the hook on the end of the lever 37, thereby locking up the apparatus until another coin passes through the chute 39.

I claim herein as my invention—

1. In a lung-testing machine, the combination of a directing-nozzle, a winged wheel arranged with its wings projecting into the line of travel of air from the nozzle, an indicating mechanism operated by said wheel, and automatic means for returning the indicating mechanism to normal or starting position without reversing the movement of the motor-wheel, substantially as set forth.

2. In a lung-testing machine, the combination of a movable blowpipe-support, a blast-operated motor, an indicating mechanism, separable driving connection from the motor to the indicating mechanism, means automatically operative on shifting the blowpipe-support for separating the parts of the connection between the motor and the indicating mechanism and means for moving the indicating mechanism to normal or starting position on the separation of such connections, substantially as set forth.

3. In a lung-testing machine, the combination of a blast-operated motor, an indicating mechanism, a separable driving connection from the motor to the indicating mechanism, means for returning the indicating mechanism to normal or starting position, having a frictional engagement with the indicating mechanism, substantially as set forth.

4. In a lung-testing machine, the combination of a blowpipe, a blowpipe-support, a rotary blast-operated motor, a toothed wheel operating a finger or hand, a worm on the shaft of the motor and means controlled by the blowpipe-support for shifting the worm into and out of engagement with the toothed wheel, substantially as set forth.

5. In a lung-testing mechanism, the combination of a blast-operated motor, an indicating mechanism having a separable connection with the motor, a counter operated by the indicating mechanism, means for separating the parts of the connection between the motor and indicating mechanism, and means automatically operative on the separation of the parts of said connection for simultaneously returning the indicating mechanism and counter to normal position, substantially as set forth.

6. In a lung-testing mechanism, the combination of a blast-driven indicating mechanism, a shaft provided with a hand, a toothed wheel mounted on the shaft, a rocking frame provided with a finger adapted to engage the toothed wheel, and a lever for raising the frame operated by the indicating mechanism, substantially as set forth.

7. In a lung-testing mechanism, the combination of a blast-operated motor, an indicating mechanism, a separable driving connection from the motor to the indicating mechanism, means for returning the indicating mechanism to normal or starting position, a counter for the indicating mechanism, driving connections from the indicating mechanism to the counter, means for returning the counter to normal or starting position, and means for simultaneously separating the indicating and counting mechanisms from their driving mechanisms, substantially as set forth.

In testimony whereof I have hereunto set my hand.

EMMA DONNE.

Witnesses:
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