(No Model.) 2 Sheets—Sheet 1.

C. F. GILLET.

COIN RELEASED SPIROMETER.

No. 419,938. Patented Jan. 21, 1890

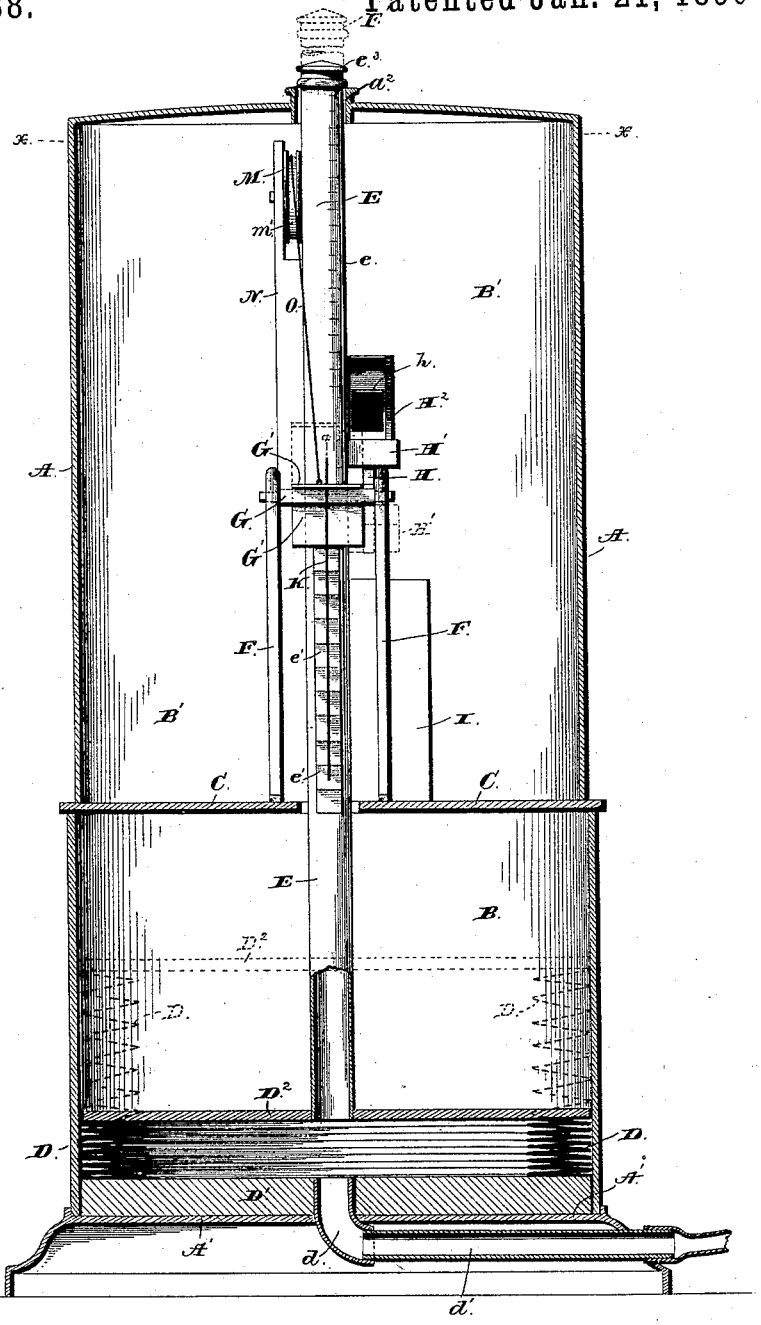

Fig. 1.

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(No Model.) 2 Sheets—Sheet 2.

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Fig. 2.

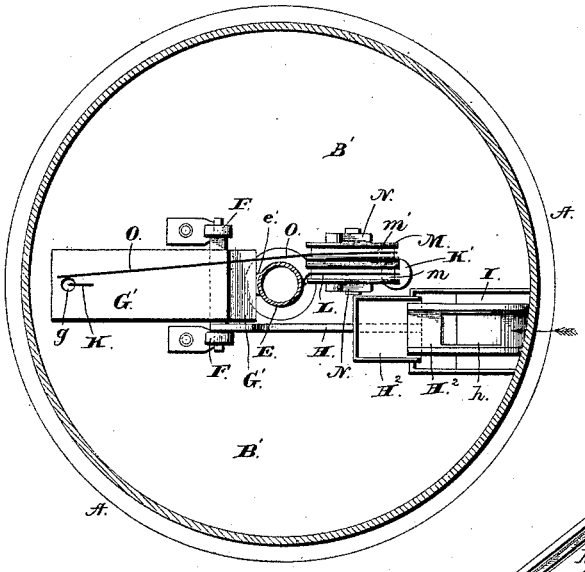


Fig. 4.

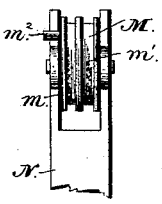


Fig. 5.

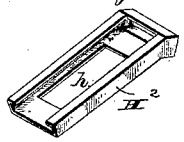
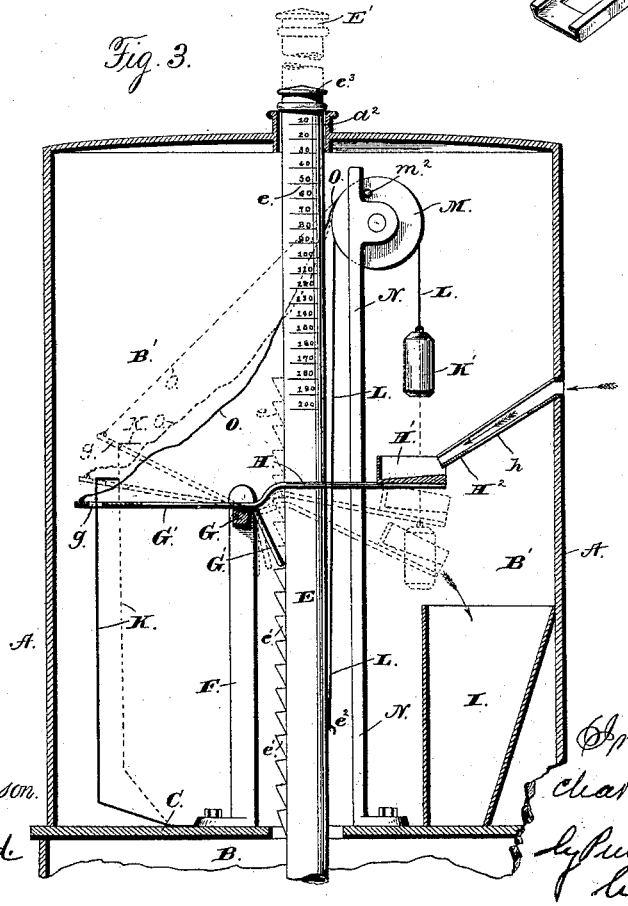


Fig. 3.



Witnesses:
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Henry C. Hazard.

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UNITED STATES PATENT OFFICE.

CHARLES F. GILLET, OF SPRINGFIELD, ILLINOIS.

COIN-RELEASED SPIROMETER.

SPECIFICATION forming part of Letters Patent No. 419,938, dated January 21, 1890.

Application filed October 26, 1888. Serial No. 289,194. (No model.)

To all whom it may concern:

Be it known that I, CHARLES F. GILLET, of Springfield, in the county of Sangamon, and in the State of Illinois, have invented certain new and useful Improvements in Spirometers; and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, in which—

Figure 1 shows a vertical central section of my apparatus; Fig. 2, a horizontal section of the same on line *x x* of Fig. 1; Fig. 3, a vertical section of the upper portion of the apparatus, the section being made on a plane at right angles to the plane of the section shown in Fig. 1; Fig. 4, a detail view in elevation of the roller or pulley for the weight and pawl cords, and Fig. 5 a detail view of the coin chute or trough.

Letters of like name and kind refer to like parts in each of the figures.

The object of my invention is to provide certain improvements in spirometers; and to this end my invention consists in the apparatus and in the construction, arrangement, and combination of the parts thereof, as hereinafter specified.

It is the special design of my invention to provide a spirometer whose measuring or registering mechanism will be normally locked from operation, but will be set free to act or to be operated upon the deposit of a coin in a slot or receiving device therefor. With this end in view I combine with the spirometer mechanism proper a locking device adapted to remain normally in position to lock said mechanism from movement and to be tripped from such locking position by the weight of a coin deposited through a suitable slot or passage.

As will appear from the drawings and from the description to be hereinafter given, I have in my apparatus also provided means for retaining the locking device out of locking position while the mechanism of the spirometer is being used to make an indication or registration of lung capacity, and then insuring the return of the locking device to its locking position, so as to prevent another use of the apparatus until another coin is deposited. As will also be seen, I have provided in my spirometer apparatus, as shown and described, means for insuring that the full capacity of the lungs being tested will be indicated or registered.

In the drawings, A designates the casing of my apparatus. It is shown as cylindrical in general shape, with its lower portion slightly greater in diameter than its upper portion; but I do not intend to limit myself to such shape or construction of the casing. The spirometer mechanism proper within this casing is of the kind adapted to test the capacity of the lungs by indicating the amount of air from one exhalation; but my coin-tripped locking device for the mechanism can be used in connection with the moving parts of other forms of spirometers, whether for measuring the capacity or the strength of the lungs. The interior of the casing is divided into the two compartments B B′ by the horizontal partition C. Within the lower compartment B is an extensible and collapsible bag or bellows D, the bottom of which is formed of a disk or plate D′, resting upon and attached to the bottom A′ of the casing A. Upon and attached to the top of this bag or bellows is the disk D^2, preferably of wood or other light stiff material. The bag or bellows is shown with its sides arranged in folds like those of the sides of an accordion. This construction is what I prefer, though I do not limit myself thereto.

A short pipe or tube *d*, extending up through the disk D′, communicates at its upper end with the interior of the bellows D, and at its lower and outer end is connected with a tube *d′*, which in turn is to be connected by any suitable piping or tubing with any desired form of mouth-piece. Attached to and carried by the top disk D^2 of the bellows is the vertical tube E, whose lower end is in communication with the interior of bellows D and whose upper end is closed by a removable plug E′. At its upper end this tube E extends up through and is guided in the bushing or collar a^2 in the central opening in the casing-top A. While the bushing, or the opening in the casing-top without the bushing, serves to steady and guide the tube, it should not fit the latter so closely as to in any way hinder its up-and-down movement.

On the outer side of the upper portion of the tube E is a graduated scale *e*, marked

with suitable figures, which, in connection with the upper edge of the guide-opening in the top of the casing or the upper edge of the bushing or collar a^2, used as an index, will as the tube is raised by the expansion of the bellows by air forced into it, indicate in cubic inches or other measurement, as desired, the volume of air passed into the bellows.

My apparatus as thus far described is of the usual and well-known construction of spirometers. Its operation and use and the manner of securing the return of the tube and bellows to the lowest or starting position after each use of the apparatus will be fully understood by those familiar with this class of invention.

In order to make sure that users of the apparatus shall pay suitable toll for each testing operation, I have provided my spirometer with an automatic locking device to be tripped only by or upon the deposit of a coin of the desired denomination.

On one side of the tube E, below the scale or series of graduations thereon, I place a series of ratchet-teeth e' e', whose abrupt sides are turned upward.

Supported upon the division-plate or partition C within the casing are the two upright standards F F, carrying journaled in their upper ends the ends of the pivot-shaft G of the pawl G'. Such pawl consists of a plate whose inner and shorter end is bent downward at an angle, so as to engage the ratchet-teeth e' e' on the tube E, as shown best in Fig. 3. Its outer end or arm is made longer and heavier than said inner end or arm, so that the pawl tends to stand normally in position to engage the ratchet-teeth e' e'. Attached to the pawl pivot-shaft G is the arm H, extending in a direction opposite to that of the long arm of the pawl and carrying on its outer end a tray H', adapted to receive a coin falling from the coin-trough or guide-tube H^2. The outer end of this tray is open, as shown, so that when the tray is tilted down by the descent of the arm H, as hereinafter described, any coin on the tray can slide off and fall into the coin-receptacle I within the casing A. The arm H is of such length that the weight of a coin of the selected denomination to be paid for each use of the apparatus will be sufficient to cause the arm to descend, so as to swing the pawl G' out of position to engage the teeth e' e' on tube E. The outer longer and heavier arm of pawl G' is of such weight as to overbalance the empty tray and the arm H, but to be at once overbalanced by the weight of the coin placed on or in the tray.

If the arm H were allowed to descend unchecked, the tray H' would be so tilted at once that the coin would slide off of it, and the weight of the long pawl-arm would return the pawl to its locking position before the apparatus could be used. To prevent this, I have provided means for checking the swing of arm H and pawl G' at a point where the pawl clears the teeth e' e', and the tray is not so inclined as to cause the coin to slide off.

In the heavy long arm of the pawl G' is the hole g, up through which extends the wire or spring strip K, whose upper end is bent over into position to engage the upper side of the pawl-arm and act as a stop for the pawl when the latter has been swung into position to just clear the ratchet-teeth on tube E. The tray H' is so arranged and situated on the arm H that while the pawl is in this position the coin will remain in the tray and not slide off the bottom thereof. The weight of the coin will then retain the pawl G' out of position to engage the teeth e' e', and the spirometer mechanism is free to act or be operated.

The wire or spring strip K, forming the stop for the pawl, as above described, is near its lower end bent at an angle, and at a distance beyond or below this bend is attached to the partition C. This arrangement makes the pawl-stop a spring-yielding one.

The portion of the strip or wire which is bent at an angle to the rest and attached to the partition C forms a spring-support, which should be of sufficient strength to resist the power exerted upon the pawl by the weight of the coin on tray H'. The pawl and tray can then be swung farther, so as to cause the coin to slide off of the tray only by the exertion of force enough to overcome the resistance of the spring-arm of the pawl-stop.

In order to counterbalance the weight of the tube E and the bellows-top, so as to take all weight off of any air forced into the bellows and prevent such compression of the air as would prevent correct reading of the volume of air exhaled from the lungs of the one using the apparatus, I have provided the weight K', attached to a cord L, which, after passing up over pulley M, supported on standard N, extends downward and is attached at e^2 to the tube E. The standard N is supported at its lower end upon partition or division C. The weight K' is to be just sufficient to counterbalance the weight of such parts of the spirometer mechanism as have to be moved by the air introduced into the bellows. Such counterbalancing is most necessary where the capacity of the lungs is to be tested, for any weight pressing down upon the bellows would cause compression of the air in the latter and contraction of its volume, so that the indication as made by the scale on the tube would be too low. The pulley M is preferably provided with a groove m to receive the weight-cord. It also has a second peripheral groove m' to receive the cord O, one end of which is attached to the pulley. The other end of this cord is carried down and attached to the outer end of the long weighted arm of pawl G'. With this construction as the tube E rises and the weight K' descends the pulley will be rotated, so as to wind up cord O upon it. Such winding up of cord O raises the weighted arm of pawl G', so that the tray-arm H is de-

pressed and the tray is so inclined as to cause the coin therein to slide off into receptacle I.

To limit the winding of the cord O upon the pulley, I provide the latter with a stop-pin m^2, adapted to come in contact with an arm of the standard to which the pulley is journaled. When the pulley has been stopped by this pin, the weight-cord L can slip over the pulley during the further or continued upward movement of the tube E. As soon as the tube begins to descend again the weight-cord being drawn over the pulley will first rotate the same to unwind the pawl-cord O, so as to allow the pawl to drop at once under the influence of its long weighted arm into position to engage the teeth e' e' on the tube E. The apparatus cannot then be used again for testing the lungs, for the engagement of the pawl with the said ratchet-teeth will lock the tube from rising and the bellows from expanding, so as to give the desired indication. The downward pull of the spring-stop at first assists the weight of the long pawl-arm to return the pawl quickly to its operative locking position, as the tube E descends after one indication has been made by the apparatus.

I do not limit myself to the particular form of yielding stop for the pawl shown and described; but whatever form of such stop is used it should be capable of resisting the power exerted by the weight of the coin to turn the pawl and of yielding to additional power acting on the pawl. Instead of a spring-stop, one employing a weight or weighted arm heavy enough to overbalance the weight of the coin on the tray H′ can be used without departure from my invention.

The coin-chute for guiding the coin from the receiving-slot to the tray can be of any desired form or construction. As shown, it consists of a trough of a width substantially equal to the diameter of the coin to be deposited for setting the apparatus in condition for use. Flanges at the sides are turned inward, so as to retain the coin on the chute as it passes down along the same. In the chute-bottom is a slot h of a width less than the diameter of the desired coin. This slot will allow any coin smaller than the desired one to drop through the bottom of the chute before it reaches the tray H′. The receiving-slot leading to the chute can be made of a size and shape to fit the coin of the denomination selected, and the chute can be provided with any desired means for preventing tampering with the locking and tripping mechanism, so as to put the apparatus in condition for use without the deposit of the required coin.

The operation of my apparatus is, briefly, as follows: With the bellows collapsed and the tube E down, so as to bring the zero-mark of its scale opposite the selected index line or mark in the apparatus shown, such line being the upper edge of the bushing or collar a^2, the pawl G′ will normally hold the tube from rising. A coin of the proper size and weight having been passed through the slot in the casing will slide down chute H^2, and, dropping upon tray H′, will cause the pawl G′ to swing so as to be out of engagement with the ratchet-teeth on the tube E. The yielding stop for the pawl will then prevent the pawl swinging so far as to cause inclination of the tray enough to make the coin slide off of the tray-bottom. The apparatus is now free to be used and operated to test the capacity of the lungs in the usual way. The user forces the air from his lungs into the bellows through the mouth-piece and connecting-tube and so expands the bellows. The expansion of the bellows raises the tube E, the amount of the expansion being indicated by the height to which the tube rises. The scale on the tube is preferably made to indicate directly the volumes of air contained in the bellows as the tube reaches different points in its travel. As the tube rises with the expansion of the bellows or air-receiving bag, the counterbalance-weight K′ and cord L, turning the pulley M, wind up the pawl-cord O, and so cause further swinging of the pawl and tilting of the tray to insure deposit of the coin from the tray into the receptacle provided therefor. When the full capacity of the lungs of the user has been tested and noted from the indication of the scale on the tube, the apparatus can be made ready for another test by taking out the plug e^3 in the top of the tube and allowing the air to escape from the bellows through the tube. As the bellows collapses and the tube descends, the pawl G′ returns at once to its locking position to prevent any upward movement of the tube again until another coin has been deposited. When the bellows has collapsed by reason of the air escaping through the tube E, as noted above, or through the mouth-piece and connecting-tubes, and the tube E has reached its lowest position again, with its zero-mark opposite the top of bushing or sleeve a^2, the apparatus has its parts in position for another testing operation upon the deposit of a proper coin of the desired denomination.

The casing is to be provided with a suitable door or slide to allow access to the coin-receptacle, such door or slide being provided with any desired form of lock to prevent opening by unauthorized persons.

I do not claim as my invention the combination of a coin-tripped locking device with the stem of a valve in the air-pipe of a spirometer. My coin-tripped locking device is applied to locking the operative mechanism of the spirometer.

Having thus described my invention, what I claim is—

1. In combination with the operative mechanism of a spirometer having one of its moving parts provided with one or more teeth, the swinging pawl, the arm connected with such pawl and having a support to receive a coin, a yielding stop for the pawl, and means connected with the moving part of the mech-

anism adapted to move the pawl against the stress of its yielding stop, substantially as and for the purpose set forth.

2. In combination with the indicating-standard of the spirometer and one or more teeth on such standard, the weighted pawl, the arm connected with the pawl and carrying the coin-receiving tray, the yielding stop for the pawl, adapted to check the pawl when it is swung out of tooth-engaging position and before the tray-arm has descended to drop the coin, and means connected with the indicating-standard to move the pawl against the stress of its yielding stop, substantially as and for the purpose shown and described.

3. In combination with the toothed movable standard of the spirometer, a weighted pawl, a tray-arm connected with the pawl and a coin-tray on such arm, a yielding stop for the pawl, a pulley, the cord attached to such pulley and to the pawl, a cord attached at one end to the standard and passing over the pulley, and a weight on the other end of the cord, substantially as and for the purpose specified.

4. In combination with the movable indicating-standard of a spirometer, the counterbalance-weight connected with the standard by means of a cord passing over a pulley, one or more ratchet-teeth on the standard, the weighted pawl, the coin-receiving tray connected with such pawl so that the weight of a coin thereon will overbalance the weight of the pawl, a yielding stop for the pawl, and the cord attached to the pawl and to the pulley over which the counterbalance-weight cord passes, substantially as and for the purpose shown.

5. In combination with the rising and falling indicator of a spirometer, the pulley, the counterbalance-weight, the cord to which such weight is attached, passing over the pulley and attached to the indicator, one or more teeth on the indicator, the pawl provided with means tending to keep it normally in position to engage the teeth on the indicator, the tray-arm connected with the pawl, the coin-tray on the arm, a yielding stop for the pawl, the cord attached to the pawl and to the pulley, and a stop to limit the rotation of the pulley as the counterbalance-weight cord moves over the pulley with the movement of the indicator, substantially as and for the purpose set forth.

In testimony that I claim the foregoing I have hereunto set my hand this 14th day of September, 1888.

CHARLES F. GILLET.

Witnesses:
W. R. BURKE,
E. S. FIELD.