No. 631,334. Patented Aug. 22, 1899.

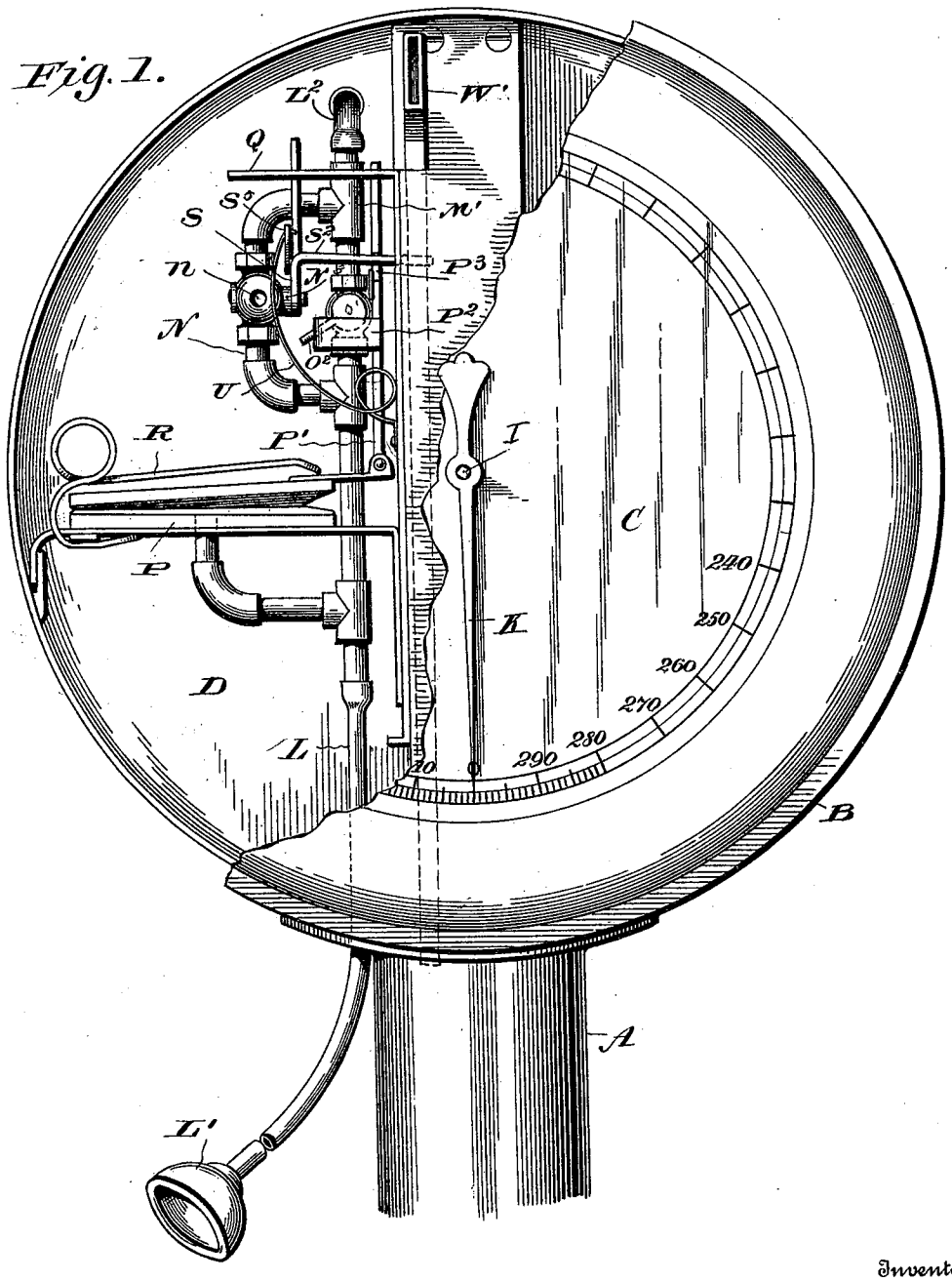
W. E. SANDERS.

LUNG TESTING MACHINE.

(Application filed Oct. 12, 1898.)

(No Model.) 3 Sheets—Sheet 1.

Fig. 1.



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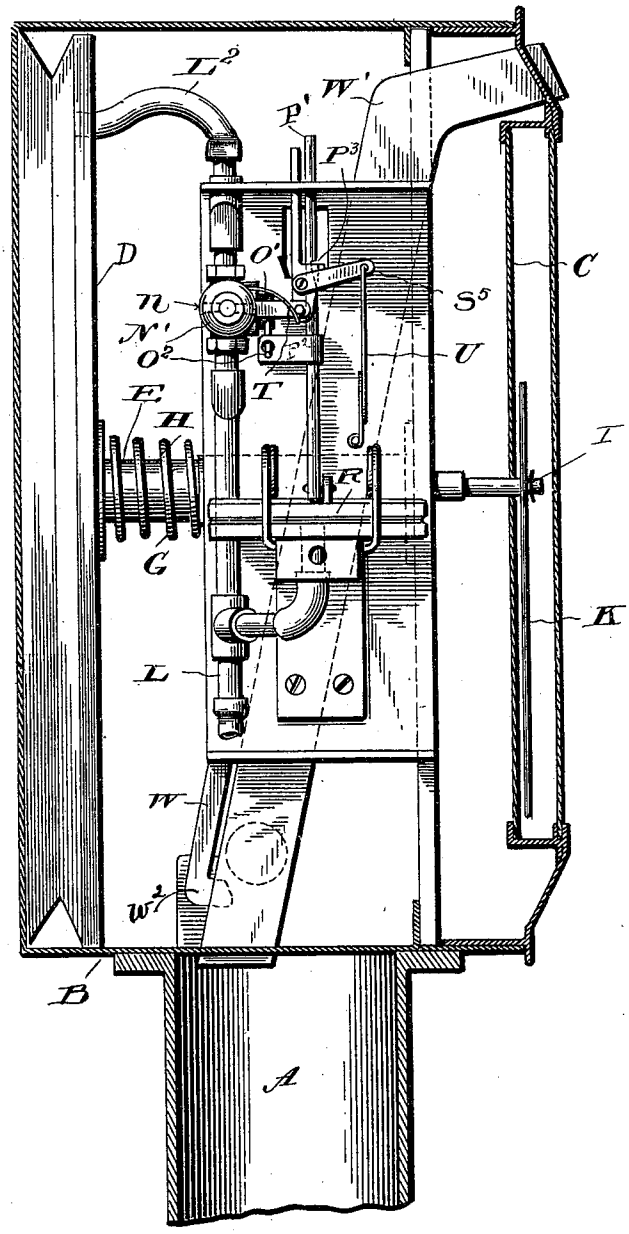
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Fig. 2.



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Fig. 3.

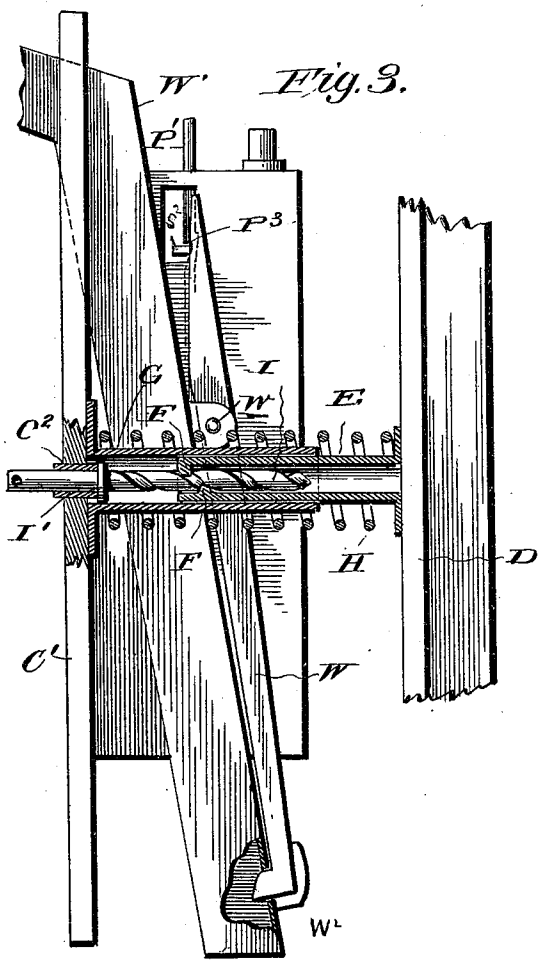


Fig. 4.

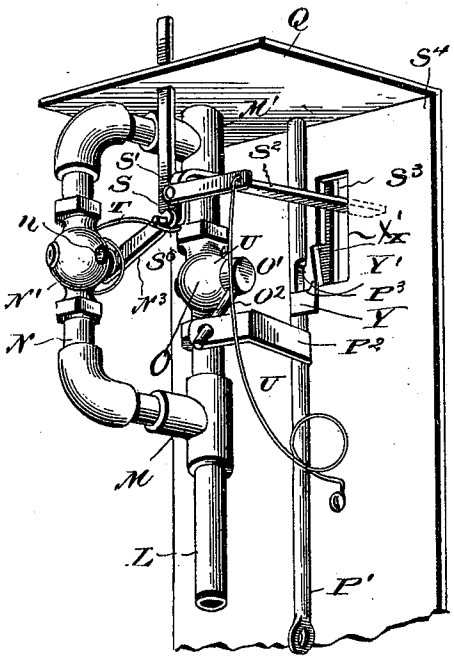
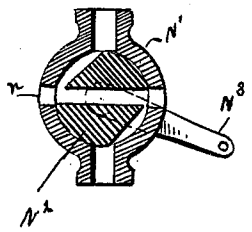


Fig. 5.



Witnesses

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UNITED STATES PATENT OFFICE.

WILLIAM E. SANDERS, OF LOWVILLE, NEW YORK.

LUNG-TESTING MACHINE.

SPECIFICATION forming part of Letters Patent No. 631,334, dated August 22, 1899.

Application filed October 12, 1898. Serial No. 693,328. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM E. SANDERS, a citizen of the United States, residing at Lowville, in the county of Lewis and State of New York, have invented certain new and useful Improvements in Lung-Testing Machines; and I do declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to the letters of reference marked thereon, which form a part of this specification.

This invention relates to certain new and useful improvements in testing-machines, and especially to a machine for accurately determining the capacity of a pair of lungs, and it is my aim to produce an apparatus of this character operated by means of the dropping of a coin which actuates mechanism for opening a valve, thus allowing an unbroken communication for the passage of air from the lungs to a bellows, which as it is inflated causes an indicating-pointer to register the capacity of one's lungs on a suitable dial.

A further and important part of the present invention resides in the provision of means for automatically closing a valve in the pipe leading from the mouthpiece to the bellows after the air has been exhaled from the lungs of the person using the machine, thus making it impossible to register a second time without depositing a second coin in the coin-controlled apparatus, which actuates the valve in the air passage-way leading to the bellows that operates the indicating-pointer.

The invention relates, further, to the provision of a second or auxiliary bellows, the function of which is to close the valve in the air-pipe leading to the main bellows after one has exhaled the air from the lungs and to open an exhaust-valve, allowing any air that may be blown into the air passage-way to escape outside of the apparatus and have no effect on the indicating-pointer.

A still further part of the invention consists in the mounting of the indicating-pointer on a spirally-grooved shaft, which latter is actuated by a reciprocating shaft or cylinder carried by the inflating-bellows, which cylinder carries a lug which travels in the groove of the indicating-pointer shaft, causing the latter to rotate either in one direction or the other accordingly as the bellows opens or closes.

To these ends and to such others as the invention may pertain, the same consists, further, in the novel construction, combination, and adaptation of parts, as will be hereinafter more fully described and then specifically defined in the appended claims.

The invention will be clearly understood when taken in connection with the accompanying drawings, which, with the letters of reference marked thereon, form a part of this application, and in which drawings similar letters of reference indicate like parts throughout the several views, in which—

Figure 1 is a front elevation, parts being broken away to better illustrate the interior of the casing containing the apparatus and showing the parts in their normal position. Fig. 2 is a side sectional view through the casing, showing the operating mechanism in elevation, the valves and levers in position to receive a coin, the safety or exhaust valve being shown open, and the coin about to operate the lever for actuating the valves. Fig. 3 is a detail view taken on a side opposite that of Fig. 2 with the hand operating mechanism in section, showing the coin-slot and its operating-lever. Fig. 4 is a perspective view of the main operating mechanism, a coin having operated the coin-lever, which in turn operates and closes the exhaust-valve. Fig. 5 is a sectional view through the air-cock N'.

Reference now being had to the details of the drawings by letter, A designates the post supporting the casing B, containing the operative mechanism and the dial C. Mounted in the rear of the said casing is a bellows D, to which is secured the hollow cylinder E, which has lugs F on its interior wall, on opposite sides thereof. Secured to the strip C', to which is fastened the dial C, is the cylindrical shell G, which shell telescopes over the cylinder E, as clearly illustrated in Fig. 3 of the drawings. Interposed between the bellows and the said strip and about the circumferences of the two telescoping cylinders is a coiled spring H, which is sufficiently strong to close the bellows and expel the air therefrom after the indicating-pointer K has regis-

tered the capacity of the lungs on the dial. The said pointer K is mounted on the spirally-grooved shaft I, which has a shoulder I', abutting against the end of the collar C^2, and in which collar the shaft has a bearing. This spirally-grooved shaft carrying the indicating-pointer rotates in the cylinder E, and the lugs on the inner wall of the said cylinder engage in the groove in the shaft I and cause the latter to rotate as said cylinder moves longitudinally, as will be readily understood, thus causing the indicating-pointer to register on the dial and return to its starting-point or zero under the tension of the coiled spring H.

L is a pipe, to one end of which is connected the mouthpiece L', and the other end of said pipe is connected to the bellows through the medium of unions and the flexible pipe L^2. Branching off from the pipe L and connected thereto by the T-union M is the air passage-way N, which is connected again to the main pipe through a similar union M' above the valves in the pipes. Located in the air passage-way N is an air-cock N', having an apertured plug N^2 therein, the aperture in which registers with the apertures *n* in the globe when the lever N^3 is at its lowest limit, thus allowing any air that may pass through the passage-way N to escape through the apertures in the plug and globe. In the air passage-way L is a globe valve O, having an apertured plug O' of ordinary construction and has secured thereto the lever O^2. The aperture in this plug is so located that when the handle O^2 is turned up to its highest limit the aperture in said plug O' will register with the air passage-way L and allow air to pass from the mouthpiece to the bellows, but when the handle is at its lowest limit to close the passage-way L, shutting off the passage of air to the bellows. For operating the valve-plug O' a second or auxiliary bellows P is utilized, which is connected to the rod P', which is guided near its upper end in an aperture in the strip Q and by means of the L-shaped bar P^2 is connected to the handle O^2 of the plug-valve O', the said handle passing freely through an aperture in the angle-bar. For closing the bellows P and expelling the air therefrom a spring R is utilized, which is brought under tension as the bellows is inflated, and when the pressure of air is relieved from the bellows the tension of the spring will cause the bellows to close, and as it closes the valve-plug will shut off the passage of air to the large bellows D in the rear of the casing.

It will be observed that when the lever N^3 controlling the valve in the chamber has been thrown to its highest limit the duct in said valve will close communication between the said valve-chamber and the upper passage-way leading to the bellows; but on the return movement of said lever N^3 the duct is turned so as to allow the air to exhaust from the bellows through the upper passage-way leading to the valve contained in the chamber. The only function which the passage-way leading from the globe-valve O to the bellows performs is to allow the air to exhaust from the bellows.

The valve-lever N^3 is pivoted to the downwardly-extended portion S of the angle-lever S', said angle-lever having one portion guided in an aperture in the strip Q, while an arm extending at right angles to the upright portion (shown at S^2) passes through an aperture S^3 in the supporting-frame S^4. A spring T, which is normally under tension will when the lever S^2 is disengaged from the notch in the casing throw the lever N^3 to its highest limit, in which position the exhaust-valve is closed and a spring U has its upper end connected to a lever S^5 and is provided to bear longitudinally on said lever S^5, causing the arm S^2 to engage in the notch in the rod P', as at P^3, when the rod P' is raised by means of the inflating of the bellows P, so that the notch in the rod is opposite the arm, and on the downward movement of the rod P' under tension of the spring R the arm will be drawn down, and with it the lever N^3, opening the exhaust or escape valve in plug N^2 and closing the plug-valve O' in passage-way L. The bellows P, through its connections by rod P' and levers S^2 and N^3 with the valve N^2, acts on the latter only when the rod P' draws down the lever N^3, whereby the exhaust-ducts in valve N^2 are opened to allow the air to escape from the pipe N.

For releasing the arm S^2 from the notched portion of the rod P' the tilting coin-operated lever W is employed, which is pivoted, as at *w*, to the casing of the coin-receiving chute W', the upper end of which extends through the front of the casing at a convenient location to receive the coin, while its lower end extends to the bottom of the casing of the outer casing and registers with a slot through which the coin may pass into a receiving-receptacle. The lower end of the said lever W has an L-shaped beveled portion W^2 extending into the coin-chute, as plainly seen in Fig. 3 of the drawings, and against which beveled end the coin strikes to tilt the lever W, and as it tilts its upper end releases the arm S^2 from the notch in the rod P' and the tension of the spring T will cause the lever N^3 to be raised and the plug-valve N^2 will close, and the air which enters from the mouthpiece will be directed to the auxiliary bellows P, and as the said bellows begin to inflate the rod P' will open the valve O' and allow air to pass into the large bellows D, which will cause the indicating-pointer to register on the dial. When the lever O^2 is raised to its upper limit, the notched portion of the rod P' will have caught over the upper edge of the arm S^2, and when pressure of air from the lungs is exhausted the spring R will return the rod P' to its starting position, will close the valve-plug O', and open the escape plug-valve N^2.

From the foregoing it will be seen that it

will be impossible for a person to take in a second breath and exhale it into the large bellows without actuating the coin-controlled lever a second time.

It will be noted that a notch X is provided in one of the longitudinal edges of the aperture X′ in the upright portion of the supporting-strip Q for the purpose of holding the lever S^2 in a locked relation until a coin is deposited in the coin-receiving tube, after which the tilting lever will release the lever from the notch, and the spring T will cause said lever to rise slightly a sufficient distance to cause the valve N^2 to close and cause any further air that is expelled from the lungs to pass through the pipe L as the lever P′ is caused to be raised by the inflation of bellows P, to which said rod P′ is connected. As the rod or lever P′ rises the valve-lever O^2 is operated and allows the air to pass directly through the valve-chamber and on to the large bellows which actuates the indicating-pointer. In order to securely hold the lever S^2 in the notch X, a member Y, secured to rod P′, is provided, as shown clearly in Fig. 4 of the drawings, which member has a lug on its upper end with a beveled edge Y′, which beveled edge has a tendency to force the lever S^2 in toward the notch and retain the lever therein in case a person seeks to exhale a second breath in the tester without first depositing a second coin in the machine. This mechanism effectually prevents a second registration of the indicator.

Having thus described my invention, what I claim to be new, and desire to secure by Letters Patent, is—

1. In a lung-tester, the casing, the bellows carried therein, inflating-pipe and coin-controlled valve, the hollow cylinder secured thereto, lugs on the inner wall of the said cylinder, the spirally-grooved shaft working in said cylinder with the said lugs engaging in the grooves, the indicating-pointer shell telescoping over the cylinder and the coiled spring about the same, combined as set forth.

2. In a lung-testing machine, the bellows and indicating attachment, the air passage-way leading to the said bellows, the valve in said passage-way, the branching air passage-way communicating with the main air passage-way on opposite sides of the said valve, an escape-valve, an auxiliary bellows communicating with the main air passage-way through a pipe, a spring for closing the said auxiliary bellows, a rod connecting the bellows with the valve in the main air passage-way, combined with a spring-actuated angle-lever connected to the escape-valve and adapted to be actuated by said rod, and a coin-controlled lever for closing the escape-valve, as set forth.

3. In combination with the bellows, air passage-ways, valves and connections, the notched rod, the spring-actuated angle-lever, the tilting coin-actuated lever, the lower end of which extends into the coin-chute, and the upper end resting normally against the arm of the angle-lever, and designed to release the notched rod from the arm of the angle-lever as a coin is dropped in the chute, as shown and described.

4. In a lung-tester, the auxiliary bellows P, the vertically-movable rod actuated thereby, the upright casing with a notched aperture therein, the lever S^2 designed to engage in said notch, the bellows, the inflating pipe and valves and coin-controlled mechanism for releasing said lever and operating the valves, as set forth.

5. In a lung-testing machine the rod P′ and means for raising same, the member Y thereon with beveled lug, the upright portion of the support Q, with the aperture having a notched edge, the lever S^2 against which the beveled lug engages to throw it into said notch, as and for the purpose set forth.

In testimony whereof I affix my signature in presence of two witnesses.

WILLIAM E. SANDERS.

Witnesses:
L. C. DAVENPORT,
A. L. HOUGH.