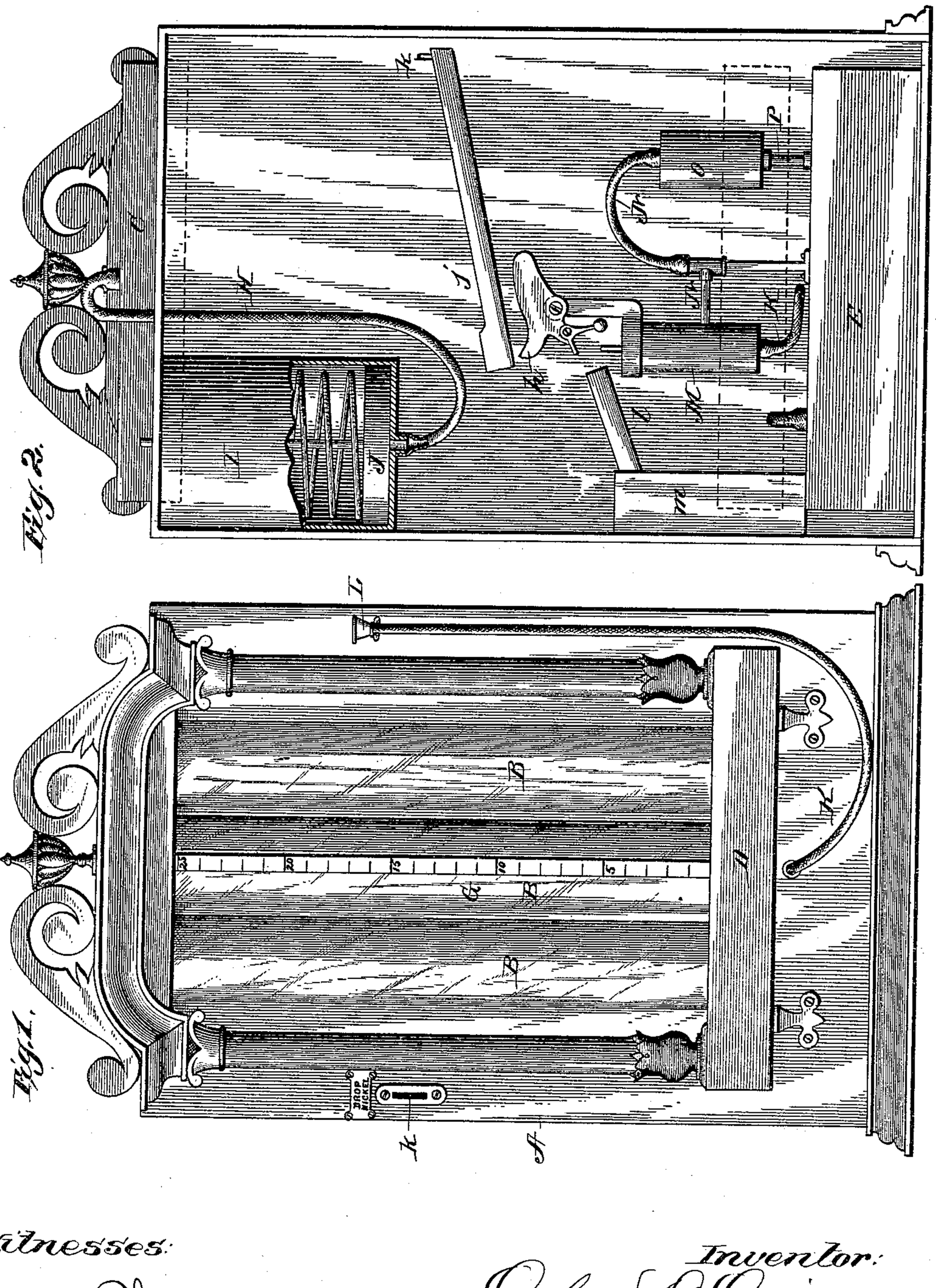
(No Model.) 2 Sheets—Sheet 1.

# O. D. ORVIS.

## COIN CONTROLLED SPIROMETER.

No. 481,965. Patented Sept. 6, 1892.

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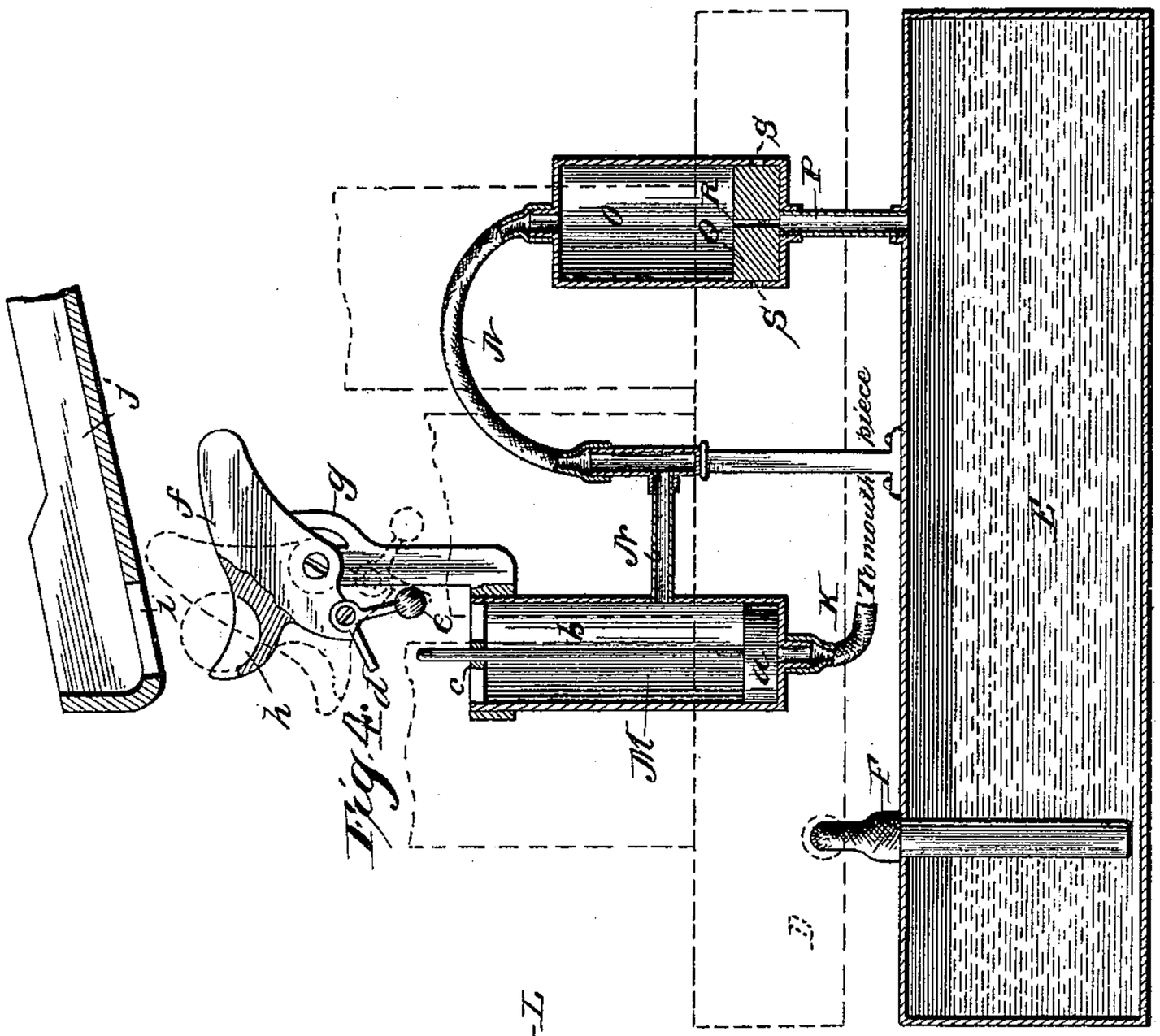


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# UNITED STATES PATENT OFFICE.

ORLAND D. ORVIS, OF CHICAGO, ILLINOIS.

## COIN-CONTROLLED SPIROMETER.

SPECIFICATION forming part of Letters Patent No. 481,965, dated September 6, 1892.

Application filed February 10, 1891. Renewed January 30, 1892. Serial No. 419,747. (No model.)

*To all whom it may concern:*

Be it known that I, ORLAND D. ORVIS, a citizen of the United States, and a resident of the city of Chicago, county of Cook, and State of Illinois, have invented certain new and useful Improvements in Coin-Controlled Spirometers, of which the following is a specification.

This invention relates to improvements in coin-released spirometers in which the apparatus is normally controlled to prevent its use by devices which may be released by a coin deposited in the machine, and has for its prime object to have the locking device automatic in its operation, so that but a single use thereof can be made on the deposit of each coin, the locking device automatically operating to lock the apparatus against a second or further use of the apparatus without first depositing another coin in the machine.

Another object is to provide certain novel details for the carrying out of my invention and to insure efficiency in the operation of the machine as a whole, all as illustrated in the accompanying drawings, in which—

Figure 1 represents a front elevation of a spirometer embodying my invention; Fig. 2, a rear elevation thereof with the back of the casing removed; Fig. 3, a vertical section through the sight-tubes or indicator of the apparatus; and Fig. 4, a diagrammatic detail section, on an enlarged scale, more clearly showing some of the operating parts of the machine, particularly the fluid-reservoir and the connections therefrom to the mouthpiece.

Similar letters of reference indicate the same parts in the several figures of the drawings.

Referring by letter to the accompanying drawings, A indicates a box or casing of suitable dimensions and any desired ornamental finish, on the front face of which is arranged a series of glass or other transparent tubes B, (or a single sight-tube may be employed of any desired contour in cross-section,) which tubes connect at their upper and lower ends, respectively, with chambers C D, with which they have open communication.

Within the casing is located a reservoir E, containing a suitably-colored fluid, preferably glycerine diluted with distilled rain-water, and connected by a pipe F, reaching nearly to the bottom thereof, with the chamber D at the lower end of the sight-tubes or indicator B, before referred to, and which may be provided with a vertically-arranged scale G for indicating to the user through the medium of the liquid the force or strength test of the lungs. The chamber C at the upper ends of the sight-tubes or indicator is in turn connected by a pipe H with an air-tight chamber I, in which is located a spring-seated piston J, the resistance of which may be varied by adjusting the force of the spring in any well-known manner, so that as the liquid is forced from the reservoir up into the sight-tubes the air contained in said tubes will be forced by the liquid into the closed fixed chamber, or more properly speaking, the compression-chamber, thus lifting the piston therein against the force of the spring, so as to compress the latter and correspondingly compress the air, which compression, as a matter of fact, offering the real resistance to the lung power. The liquid is expelled from the reservoir by the direct action of the breath or lung power of the operator through the medium of a tube K, provided with a suitable mouthpiece L and suspended upon the front of the casing in convenient position for use, the inner end of which tube connects with the lower end of the piston-chamber M, the purpose of which will be described farther on, which chamber is connected at a point a suitable distance above the bottom by a tube N with a valve-chamber O, which in turn is connected by a pipe P with the reservoir E above the line of the liquid contained therein. Within the valve-chamber works a valve Q, fitting in the chamber like a piston and provided at its center with a passage R of small bore, leading from the chamber to the pipe P. This valve is of sufficient height to, when resting upon the bottom of the chamber, close outlet-ports S, formed in the side walls of the chamber. Hence when the mouthpiece is blown into the air will pass through the tube K, piston-chamber M, tube N, valve-chamber O, passage R, and pipe P into the top of the reservoir, forcing the liquid therefrom up into the indicating sight-tubes, so as to compress the air above the liquid in the manner before described and at the same time indicate to the operator upon the scale G the strength

of his lungs. Immediately he ceases blowing, however, the fluid under the combined influence of the compressed air and gravity will be forced back into the reservoir, thereby causing the discharge from the reservoir of the air blown therein, which air, by reason of the contracted passage R in the valve Q, which is of less diameter than the pipe P which leads from the reservoir, will act upon so as to lift the valve in its chamber, and thereby open the discharge-ports S, thus permitting the escape of the air without the necessity for passing back through the mouth-piece and tube.

To prevent the use of this spirometer for lung-testing without first depositing a coin in the machine, I provide in the piston-chamber M a piston *a*, the rod or stem *b* of which passes freely through the head of the piston-chamber, working in suitable guides *c*, and is opposed by a stop *d*, which when the mouth-piece is blown into without first depositing a coin will prevent the rising of the piston sufficiently to open the end of the tube N leading to the reservoir, and thereby prevent the use of the apparatus. This stop is in the shape of a bell-crank lever, one arm of which projects into the path of movement of the rod *b*, while the other arm hangs in substantially a vertical position and has a weight *e* secured thereto for the purpose of normally maintaining the stop in the position shown by full lines in Fig. 5 (in the path of movement of the piston-rod) and of automatically restoring the stop to that position after each use of the apparatus, as will be more clearly understood farther on. This stop is pivotally secured to a trip *f*, pivoted to a bracket projecting from the piston-chamber and extended or weighted on the side of the pivot opposite the stop, so as to be normally maintained in the elevated position shown by full lines in Fig. 5, with the weighted or extended portion bearing upon a suitable rest *g* of any character that will prevent further movement of the trip in that direction. This trip at a point immediately above the stop and piston-rod is provided with a top pocket *h* for reception of the coin, which is dropped therein through a slot *i* in the bottom of an inclined trough *j*, the upper end of which terminates at the slot *k*, through which the coin is introduced into the machine. At a point below the trip is located another inclined trough *l* to receive the coin when discharged from the pocket in the trip and conduct it into a suitable receptacle *m*, located within the casing of the machine. Hence when the coin drops from the trough *j* into the pocket in the trip at one side of the pivot thereof the gravity of the coin will be sufficient to overcome the counterbalance or weight of the trip and swing the trip upon its pivot, causing it to drop to a position shown by dotted lines in Fig. 5, in which position it will remain after discharging the coin into the trough *l*. When in this position, it will be observed that the stop is out of the path of movement of the piston-rod, while the bottom of the pocket in the trip lies directly in the path of movement of said rod and the parts will remain in this position until the spirometer is used. Immediately, however, the tube K is blown into the piston *a* will be elevated sufficiently to open communication with the pipe N, and consequently with the reservoir, and the same action of the piston causes the rod *b* to strike against the trip and restore the same to its normal elevated position, the stop at this time being below the end of the rod but bearing against the side thereof and held in close relation thereto by the weight *e*, the tendency of which is to cause the stop to assume its normal position, (shown by the full lines in Fig. 5,) but which it is prevented from doing by the interposition of the piston-rod. When the operation is completed and the air is no longer forced into the piston-chamber, the piston will fall back to its normal position at the bottom of the piston-chamber by gravity, and as soon as the end of the piston-rod passes below the stop the latter, under the influence of its weight, will swing out to its normal position in the path of movement of the piston-rod, and thus prevent a further use of the spirometer without first depositing a coin in the machine.

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

1. In a coin-controlled spirometer, the combination, with a liquid-reservoir and an indicator connected therewith, a piston-chamber and a piston working therein for controlling the admission of air to the reservoir, of a stop device for preventing the operation of said piston and a trip carrying said stop device and operated by the coin for removing the same so as to permit the operation of the piston, substantially as described.

2. In a coin-controlled spirometer, the combination, with a liquid-reservoir and an indicator connected therewith, a piston-chamber and a piston working therein for controlling the admission of air to the reservoir, of a stop device for normally preventing the operation of the piston and a trip carrying said stop and alternately operated by the coin and the piston, substantially as described.

3. In a coin-controlled spirometer, the combination, with a liquid-reservoir and an indicator therefor, of the air-inlet passage, a valve-chamber located in said passage provided with outlet-ports, a valve working in said chamber, normally closing said ports and provided with an air-passage of less diameter than the passage connecting said chamber with the reservoir, whereby when air is blown into the reservoir the valve will be forced onto its seat so as to close the outlet-ports, but when the blowing ceases the back-pressure of the compressed air in the reservoir will lift the valve from its seat and open the outlet-ports, so as to permit the escape of the com-

pressed air therethrough, substantially as described.

4. In a coin-controlled spirometer, the combination, with a liquid-reservoir and an indicating-vessel connected at the lower end thereof with said reservoir, of a piston-chamber connected with the upper end of said vessel and a spring-seated piston in said chamber opposing the passage of air from said vessel into the chamber, substantially as described.

5. In a coin-controlled spirometer, the combination, with a liquid-reservoir, an air-inlet passage, a valve-chamber located in said passage provided with outlet-ports, and a valve working in said chamber, normally closing said ports and provided with an air-passage of less diameter than the passage connecting said chamber with the reservoir, of an indicating-vessel connected at its lower end with said reservoir and at its upper end with a piston-chamber, and a spring-seated piston working in said chamber, opposing the passage of the air from said vessel into the chamber, substantially as described.

6. In a coin-controlled spirometer, the combination, with a liquid-reservoir, a piston-chamber, a piston working therein for controlling the admission of air to the reservoir, a stop device for normally preventing the operation of the piston, and a trip carrying said stop and alternately operated by the coin and the piston, of an indicating-vessel connected at its lower end with said reservoir and at its upper end with another piston-chamber, and a spring-seated piston working in said chamber, opposing the passage of the air from said vessel into the chamber, substantially as described.

7. In a coin-controlled spirometer, the combination, with a liquid-reservoir, a piston-chamber, a piston working therein for controlling the admission of air to the reservoir, a stop device for normally preventing the operation of the piston, a trip carrying said stop and alternately operated by the coin and the piston, an air-inlet passage connecting said piston-chamber and reservoir, a valve-chamber located in said passage, provided with outlet-ports, and a valve working in said chamber, normally closing said ports and provided with an air-passage of less diameter than the passage connecting said chamber with the reservoir, of an indicating-vessel connected at its lower end with said reservoir and at its upper end with a second piston-chamber and a spring-seated piston working in said chamber opposing the passage of the air from said vessel into the chamber, substantially as described.

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Witnesses:
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