I. M. Wightman,

Air Pump.

No. 2,338. Patented Nov. 10, 1841.

Fig: 1.

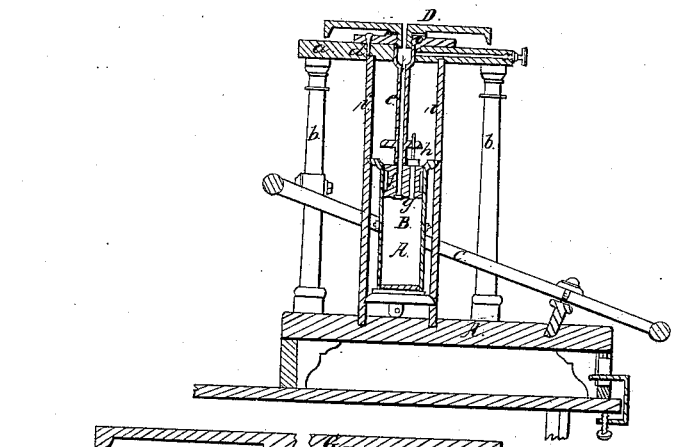


Fig: 2.

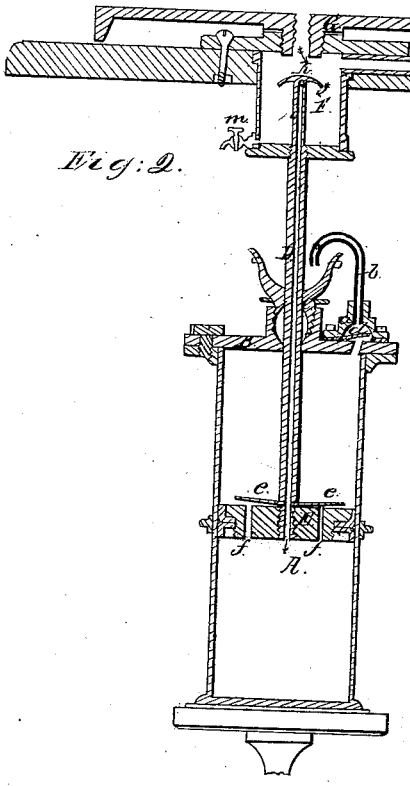
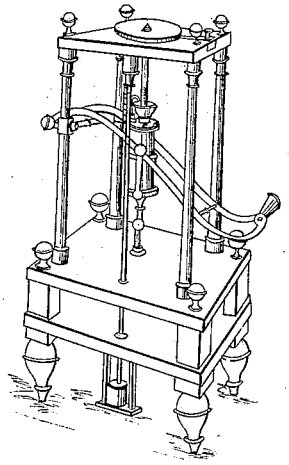


Fig: 3.



UNITED STATES PATENT OFFICE.

JOSEPH MILNER WIGHTMAN, OF BOSTON, MASSACHUSETTS.

CONSTRUCTION OF AIR-PUMPS.

Specification of Letters Patent No. 2,338, dated November 10, 1841.

To all whom it may concern:

Be it known that I, JOSEPH MILNER WIGHTMAN, of Boston, in the county of Suffolk and State of Massachusetts, have invented, made, and applied to use certain Improvements in Air-Pumps; and I do hereby declare that the following is a full, clear, and exact description of the construction and operation of the same, reference being had to the annexed drawings, making a part of this specification, in which—

Figure 1 is a longitudinal section of a lever air pump as now constructed and usually known as "Claxton's single barrel table air pump;" Fig. 2, an enlarged sectional view of the barrel, cover, packing box, safety box, piston, and rod, for showing more clearly those parts of the pump to which my improvements are applied in the improved lever air pump as constructed by me; Fig. 3, a perspective view of an improved lever air pump on table stand.

A, Fig. 1, is the base of a mahogany table or frame of the pump. On the upper side of the board *a*, which is supported by the pillars *b*, *b*, is a brass plate *c*, secured by the screws *d*. To the under side of the plate *c*, one end of the piston rod *e*, is firmly fastened, having the piston *f*, at the other end. The piston rod *e*, is hollow through its length, and terminates in a series of small holes at the bottom of the piston *f*, over which a suitable valve is placed to prevent the air in the barrel B, from returning to the receiver on the upward motion of the barrel B, which motion expels the air contained in the barrel B, through the hole at *g*, in the side of the piston, which is there prevented from returning by the valve *h*, opening outward from the barrel. In this construction of the air pump the barrel B, is a cylinder, closed at one end and open at the other, and is moved upon a fixed piston *f*, between the steel guide rods *i*, *i*, by means of a simple lever *c*, by the downward action of which the air is expelled or exhausted from the receiver or vessel placed upon or attached to the pump plate D. The continued action of the pump increases the vacuum in the receiver and also in the barrel B, on the under side of the piston *f*, causing the external air to press the barrel upward on the piston with a force proportionate to the degree of exhaustion and the area or diameter of the barrel. To overcome this pressure requires a great additional power or force, when the barrel is beyond a certain diameter, and as this resistance increases with the vacuum it follows that beyond a certain limit the power which can be conveniently applied is not adequate to the resistance without great labor. In consequence this form of the air pump which has been much used and approved for its simplicity has been limited to a certain size. To obviate this difficulty and render this form and construction of the air-pump more universally applicable I fasten to the top of the barrel A, Fig. 2, a metal cover B, secured to its place and rendered tight by means of a flange on the upper edge of the barrel A, a ring of leather and secured by screws or otherwise. The cover B, is fitted with a packing box C of the usual form and construction through which the piston rod D moves air tight. I also attach to the upper side of the cover B, a hollow metal box *a*, secured to its place by screws or otherwise and terminating on top with a metallic tube *b*, bent over to conduct any refuse oil from the pump to the cup of the packing box C, or any other suitable receptacle. The object of the box *a*, is to cover and contain a valve *d*, of leather (or other suitable material) opening outward from the barrel A. The valve *d*, covers a hole drilled through the cover B, of suitable size to permit the passage of the air from the barrel A. The piston E in my present form is only three fourths of one inch thick for barrels of three inches in diameter. It is composed of two circular pieces of brass, one of which screws upon the other to hold the packing between them. The packing consists of two circular rings of thick leather (commonly known as sole leather) turned up around the edges three eighths of one inch by being forced while wet into a suitable mold, and when dry applied together on the piston E, in the form and position shown in the drawing. The peculiar form and elasticity of this packing causes it to fit tight to the sides of the barrel A, with but little friction or lubrication, besides being very durable. The two sides of the piston E are plane surfaces corresponding to the bottom of the barrel A, and under side of the cover B, suffering but little if any space or cavities for air to be concealed and vitiate the vacuum. One side of the piston E has a strong screw cut into it by means of which it is attached by a corre-

sponding screw to the piston rod D. On this side of the piston at *c*, *c*, is a circular ring of leather, which covers one or more holes *f*, *f*, drilled longitudinally through the piston E. This ring *e*, *e*, operates as a simple and efficient valve to permit the air in the barrel A to pass from the under to the upper side of the piston E, when the barrel A is forced upward by the lever, and by closing, causing the air to be expelled on the reverse motion of the barrel A through the orifice covered by the valve *d*. It is unnecessary in this form of the air pump to have any valve on the bottom of the piston E.

At F, Fig. 2, is shown an addition, which I designate by the name of a "safety box." My present form consists of a cylindrical metal tube F, four inches in length and two inches in diameter, into the top of which the pump plate G, is screwed. The bottom is closed except where the piston rod D, is attached by a suitable screw. This end of the piston rod is elongated by the addition of a piece of brass tubing *i*, three eighths of one inch in diameter and three inches in length, to the top of which is fastened an inverted cup *k*, one inch in diameter. One or more holes are drilled in the sides of the tube *i* near the top where the cap is, through which the air passes, as shown by the arrows. The object of this box is to provide a receptacle of sufficient capacity to receive small portions of water, mercury, or other liquid that might accidentally be spilled upon the pump plate G, and would otherwise pass into the tubes of the pump and seriously injure it. By means of a stop cock or screw at *m*, the mercury &c., is removed at pleasure.

In consequence of the improvements thus set forth I am enabled to increase the size of "single barrel air pumps" very much, and also reduce the labor for whereas the labor increases as the exhaustion proceeds when the barrel is open on top, so it becomes proportionately less by closing the top, and thus preventing the pressure of the external air upon the piston. The advantage in Claxton's pump was in causing the resistance to occur at the downward stroke as being most convenient, and not in any reduction of resistance. By my improvement it is a constantly diminishing resistance in the same ratio as the exhaustion proceeds, until we have merely to overcome the friction of the piston and rod, and can operate a pump of eight inches area with as little labor as one of three and a half inches area when the top is open. Another advantage arising from my improvements is, a higher degree of exhausting power. This is a consequence of bringing the valves of the piston and eduction valve on the cover of the pump more closely together in expelling the air from the barrel, and also of removing the pressure from the valves *e*, *e*, on the top of the piston, which thus opens whenever the force is sufficient to overcome its simple adhesion, and not as in the open top barrel pumps, which can only rise when the force is sufficient to overcome the pressure of the external air in addition to the adhesion, a pressure which becomes greater as the force to open it becomes less.

This pump as improved, is capable and convenient for condensing or transferring air or gases through a flexible tube, one end of which is to be attached by a screw or otherwise to the valve box *a*, and the other end to the vessel into which the gas or air is to be condensed or transferred.

Having thus described the nature of my invention and improvements I proceed, first, to disclaim all right or title to the combination of a simple lever—movable barrel— fixed piston, &c., constituting a "single barrel table air pump," provided the barrel is open, and the top of the piston exposed to the external air. Second, I also disclaim all right or title to the tight cover packing box and piston as herein described, if applied to or combined with, fixed barrels and movable pistons, whether operated by means of a simple lever or otherwise. But

What I claim as my invention and desire to secure by Letters Patent is:

1. The combination of a tight cover, packing box, valve and piston as herein described, with the top of the barrels of all air pumps so constructed that the barrel is moved upon a fixed piston combined by a hollow rod with a receiver and by means of a simple lever or other convenient power, and in which the operation is such that the act of exhausting the receiver, presses the pump down upon the table, stand, or floor upon which it is placed, without regard to the particular form or size of the pump.

2. For the application of a "safety box" as herein described, placed between the pump plate and the barrel of the pump, to all air pumps with either fixed or movable barrels.

JOSEPH MILNER WIGHTMAN.

Witnesses:
GEORGE MINOT,
HENRY M. PARKER.