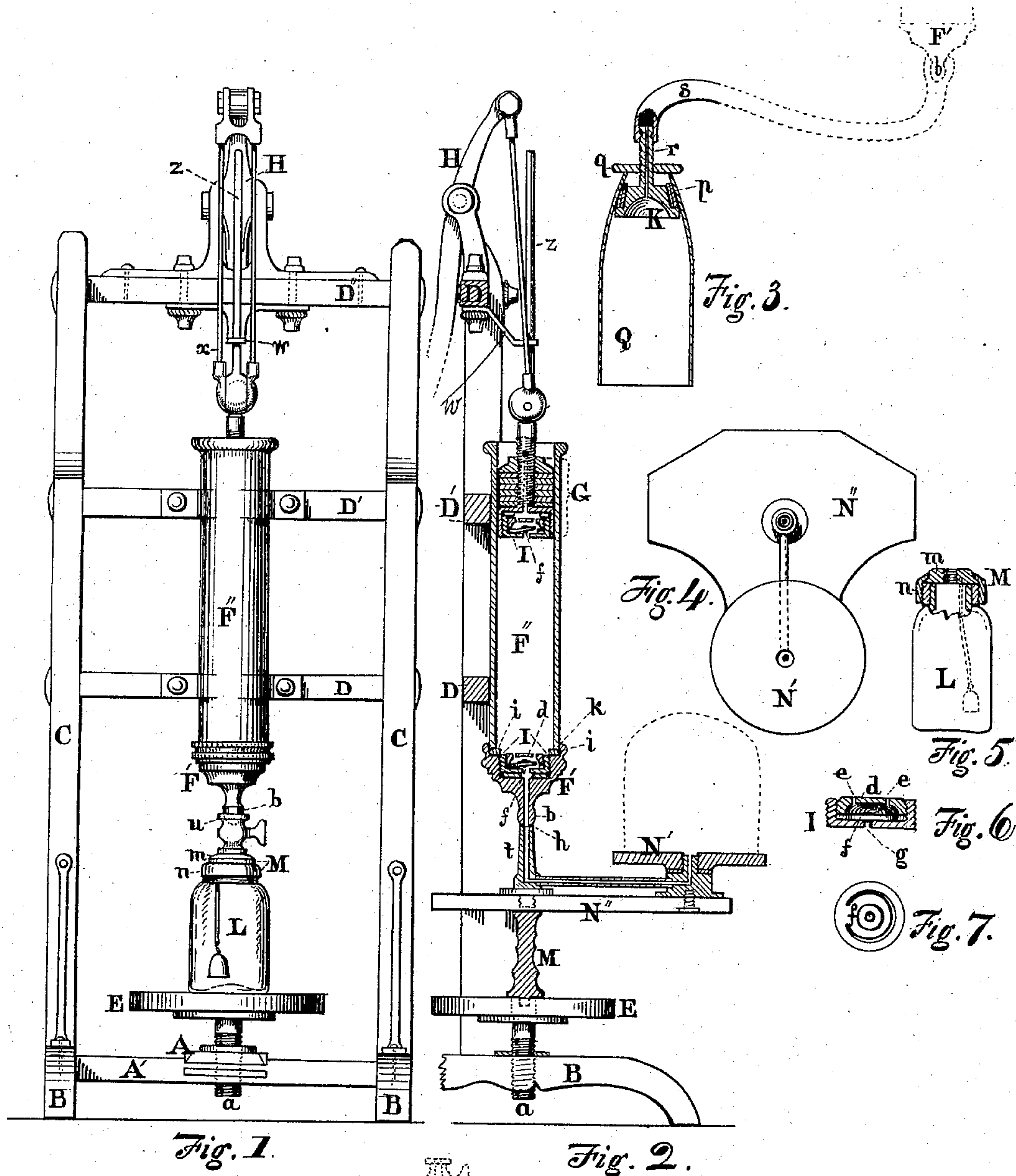


J. H. ELLIS.

Air-Pump.

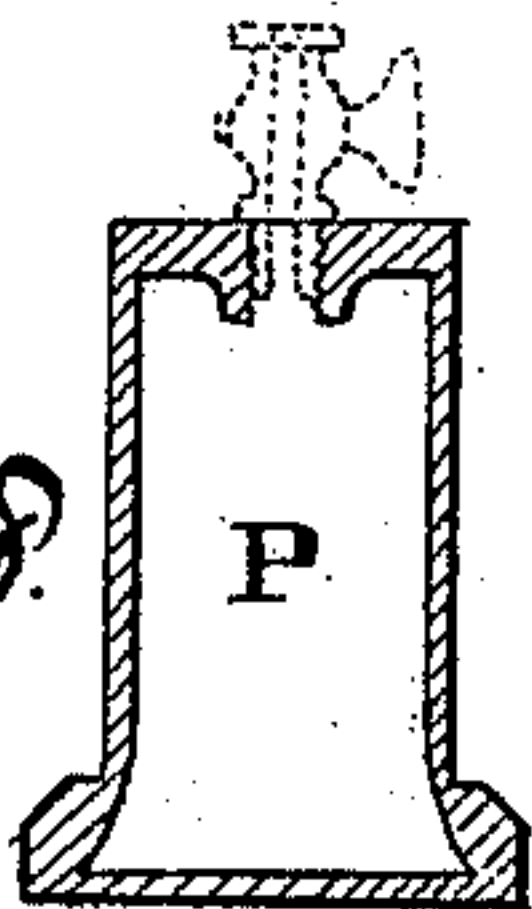
No. 168,888.

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Witnesses -  
 Andrew Bunttetter  
 Anson Cardon

Fig. 8.



Inventor -  
 John H. Ellis



# UNITED STATES PATENT OFFICE.

JOHN H. ELLIS, OF PEORIA, ILLINOIS.

## IMPROVEMENT IN AIR-PUMPS.

Specification forming part of Letters Patent No. 168,888, dated October 19, 1875; application filed March 15, 1875.

*To all whom it may concern:*

Be it known that I, JOHN H. ELLIS, of the city of Peoria, in the county of Peoria and in the State of Illinois, have invented an Improvement in Air-Pumps and their Attachments, adapted for the use of schools and colleges; and do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the annexed drawings, making a part of this specification, in which like letters of reference refer to like parts, and in which—

Figure 1 represents a front elevation of the pump, showing the application of an exhausting-vessel, L; Fig. 2, a vertical section of pump, and attached receiver-plate, table, and nozzle N' N'', and intermediate support M, to illustrate the adjustability of said usual receiver-plate, nozzle, &c.; Fig. 3, a sectional elevation of lamp-chimney, and attachments to connect the same to the nozzle of the pump; Fig. 4, plan of the removable receiver-plate, &c.; Fig. 5, jar, showing a sectional view, cap to receive stop-cock; Fig. 6, vertical section of the reversible valve-box; Fig. 7, plan of valve; Fig. 8, sectional elevation of condensing-vessel, showing application of the stop-cock connection for attachment to the pump.

The object of this invention is to furnish an improved and economical air-pump (both for exhausting and condensing) and attachments for experiments in natural philosophy, particularly adapted for the use of colleges and schools—the principal improvements being, first, a terminal nozzle so constructed as to admit of various attachments by means of rubber hose, socketed stop-cock, &c.; second, in the employment of reversible valve-boxes, both in pump and piston, which may be taken out and reversed according to the experiment to be tried—*i. e.*, in exhausting or condensing; third, in the adaptation of ordinary glass fruit-jars or lamp-chimneys as receivers or hand-glasses, by means of simple devices, as an economical substitute for the more expensive and specific pneumatic vessels.

I use a vertical pump-barrel, F'', secured to horizontal arms D D', which connect two vertical standards, C C, rising from the base A' B B'. The piston-rod *z* moves in socket *w*, projecting from the upper bar D'' of the frame,

upon which the pump-handle H is also pivoted, the latter being connected to the piston-rod by rods *x x* just above the piston G.

To accomplish the first-described object the pump-barrel is terminal below in a nozzle, F', screwed upon the end of said barrel, said nozzle ending in bulb *b*, for the purpose of retaining a rubber hose, or for entering a socket in the stop-cock connection *u*, used to connect the usual jars with said nozzle.

The nozzle F', as before said, is made to unscrew from the barrel to accomplish the second-described object—*viz.*, for the purpose of reversing the valve *f*, which is seated in a removable and reversible box, I, which is screwed into a recess in said nozzle, and provided with air-orifices *e e* in the cap *d*, screwed down upon the said valve *f*, leaving a concave space, in which the valve may work. Such reversion is useful in experiments in condensed air, in which the latter is forced into a condensing-chamber, (as P, Fig. 8,) and retained by usual stop-cock, (with ground cock). The piston G, in like manner, is fitted with a similar box and valve, reversible with that in the nozzle when required, (see Fig. 6) for a larger view of said valve-box.)

For the purpose of raising and pressing the mouth or stop-cock of a vessel (as L, Fig. 1) up to the bulb of the nozzle *b*, I use the rotary table E, mounted upon the screw *a* in the base A, by which vessels of different elevations may be adjusted to said nozzle, as well as the usual table bearing the receiver-plate N' N'', as seen in Fig. 2, which, for the purpose of elevating the receiver toward the eye, may rest upon a pillar, M, having a nipple on its under surface, which fits into a corresponding socket in said rotary table.

The third object is accomplished, in the case of the use of a fruit-jar, by using one of these which are sold with a screw-cap, *n*, upon them, whose inner upper edges clasp the cover, holding the same sealed by means of a thread upon the neck of the jar. I modify the cap of this readily-obtained jar (see Fig. 5) by making the cover *m* thick enough to receive a screw-socket for the reception of the stop-cock connection *u*. (Shown in Fig. 1.) This jar, having a bottom, unusual with the ordinary glass chambers furnished or sold with air-pumps, is thus



qualified, by closing the ground stop-cock, to be removed from the pump when exhausted of air—a particularly useful thing in illustrating the absence of sound in ringing the inclosed bell, as the jar can be handed round for observation. The adaptation of an ordinary lamp-chimney as an exhaust-chamber is accomplished by providing a disk, *q*, through which is screwed the threaded stem *r*, or air-passage, of a metal cone or cork, *k*, provided with rubber ring or packing *p* (see Fig. 3) upon its conical surface, which is pressed tightly against the upper tapering interior surface of the chimney by screwing the disk *q* down upon the chimney-top. A hose, *s*, may be then used to connect the stem *r* with the nozzle or bulb *b* of the pump, as well also for connection to the other vessels. In like manner the bulb *b* may be connected with the nozzle *t* of the receiver-plate *N'*. The hose will thus prevent the jar or oscillation which is given by the pump-handle *H* to the same, when said plate is connected rigidly with said pump, by which means (*i. e.*, the hoses) all objectionable oscillation is avoided, as—for instance, when liquids are evaporating and crystallization is taking place.

The advantages of this pump, connections, and attachments are, first, the pump is so made that it can readily be taken apart, cleaned and packed, and put together by persons of ordinary skill; second, that the working of each valve in separate reversible boxes makes the pump an exhaustor or condenser, at pleasure, and protects the valves from derangement, whether used in condensing or in exhausting—*i. e.*, with the valves downward or upward; third, in its adaptation for many different attachments, as of ordinary fruit-jars, lamp-chimneys, bottles, &c., by means of the hose and other described devices, the hose making the glass vessels comparatively independent of the pump; fourth, the advantage in the use of a fruit-jar as a chamber, having a ground stop-cock, (which holds the exhaustion much longer than similar devices of pneumatic instruments,) so that the jar can be removed from the pump, as in illustrating the ringing of bells *in vacuo*, boiling water at low

temperature, experiments on insects without danger of their getting into the air-passages, and the cheapness and ease with which a broken glass may be replaced from any drug or grocery store; fifth, in not preventing the attachment to the terminal nozzle of the time-honored metal disk *N'* and tube *U* with the bell-glass.

What I claim as my invention is—

1. In combination with the nozzle *F'*, the reversible valve-box *I* and the piston *G*, with its reversible valve-box *I*, substantially as and for the purposes described.

2. The valve-box *I* in the nozzle, when provided with a screw-cap or valve-cover, *d*, and inclosed valve, so constructed as to be reversible, for exhausting or condensing, in connection with a corresponding valve-box in the piston, substantially as and for the purposes described.

3. The combination, by means of the bulb *b* of the nozzle *F'*, with the socket *h* of the pipe *t* of the pneumatic receiver-plate *N'*, with its table *N''*, by which the receiver-plate is readily attachable to and detachable from said nozzle *F*.

4. The combination, by means of bulb *b* and socket *h*, of the nozzle *F'*, the pipe *t*, the metal disk of the ordinary air-pump, and the rotary table *E*, substantially as and for the purposes described.

5. As an attachment to an air-pump, the fruit-jar *L*, of a well-known form—*i. e.*, having a screw-thread around its neck, an outer screw-cap, *n*, in combination with a cover, *m*, provided with a screw-socket to receive the stop-cock connection *u*, substantially as and for the purposes described.

6. The combination, with the nozzle *F'*, of the hose *s*, pipe *r*, provided with thread to receive the disk *q*, cork *K*, provided with the rubber packing *p*, glass *Q*, and disk *q*.

In testimony that I claim the above-described improvement in air-pumps and attachments, I have hereunto set my hand this 4th day of March, 1875.

JOHN H. ELLIS.

Witnesses:

ANDREW RUNSTETTOR,  
JAMES M. MORSE.