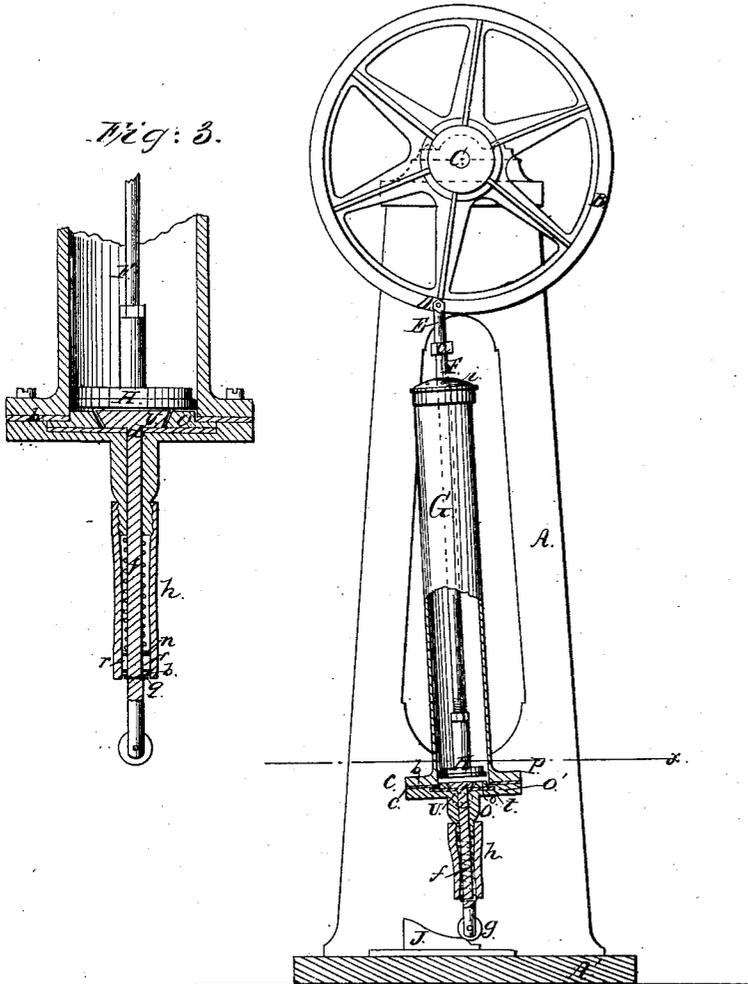


*A. S. Lyman,*  
*Air Pump.*

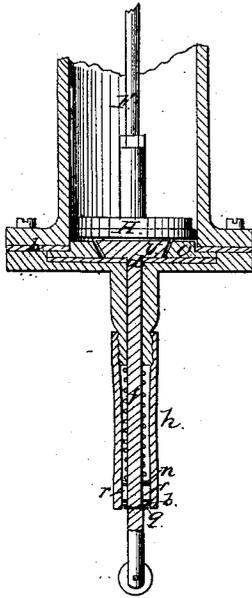
*N<sup>o</sup> 46122.*

*Patented Jan. 31, 1865.*

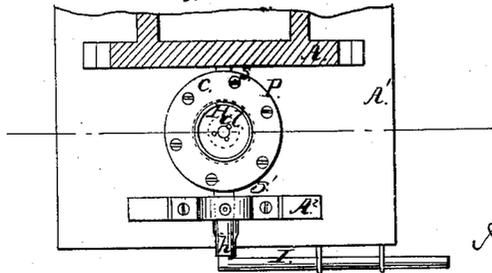
*Fig: 1.*



*Fig: 3.*



*Fig: 2.*



*Witnesses:*  
*Henry Morris*  
*E. C. Topliff*

*Inventor.*  
*Axel Storr Lyman*

# UNITED STATES PATENT OFFICE.

AZEL S. LYMAN, OF NEW YORK, N. Y.

## IMPROVEMENT IN AIR-PUMPS.

Specification forming part of Letters Patent No. 46,122, dated January 31, 1865.

*To all whom it may concern:*

Be it known that I, A. S. LYMAN, of the city, county, and State of New York, have invented new and useful Improvements in Air-Pumps; and I do hereby declare that the following is a full, clear, and exact description thereof, which will enable those skilled in the art to make and use the same, reference being had to the accompanying drawings, forming part of this specification, in which—

Figure 1 is an elevation, partly in section, of an air or vacuum pump made after my invention. Fig. 2 is a plan view of a horizontal section taken on the line *x* of Fig. 1. Fig. 3 is a detailed view of the valve-stem.

Similar letters of reference indicate like parts.

A is a standard resting upon a platform, A', and supports in bearings upon its top a shaft, C, which carries at one end on one side of the standard a crank or driving-pulley, (not shown,) and at the other a balance-wheel, B. A link, E, pivoted to the rim of the wheel at its side, receives by a screw-thread cut in its free end the end of a piston-rod, F, which is secured therein and secured by means of a jam-nut, *a*. The piston-rod extends down into the cylinder G of a vacuum-pump, where it is connected with a piston, H, which is perforated, as shown by dotted outline in Fig. 2. The cover of the cylinder is also perforated by holes *i*. The base of the cylinder C is bolted to a base-plate, C', which carries journals S S', upon which the pump P oscillates. The journal S has a bearing in the standard A, and the journal S' has a bearing in the standard A<sup>2</sup>. The latter journal is hollow, and is connected to the tube I by a packing-ring, h', which covers the joint between them, as seen in Fig. 2. A leather or cork or other suitable packing, *b*, is to be placed between the base *c* and the base-plate *c'*. The base-plate has a circular depression in its face, which receives a packing, *t*. A ring, *o*, of such a diameter as to fit within the inside of the cylinder G at bottom, lies upon the packing *t*, and is firmly held in position by means of its flange O', which extends beyond the body of the ring to the circumference of the circular packing *t*, to which it is held by the overlying packing-ring *b*, and the base of the cylinder. The sides of the central opening of the

ring O are conical, and the depth or thickness of the ring slightly exceeds the thickness of the valve U, which lies within it, so that the ring will prevent the piston H from coming in contact with the valve when the latter is on its seat. U is the valve of the pump. Its stem *d* extends down through the center of the base-plate, and its hub *e* nearly to the platform A', carrying on its end a friction-roll, *g*. The sides of the hub *e* serve as guides to the stem, and it will be proper in large pumps to make the hub of greater strength than the proportions here shown. The valve-stem should be so fitted to the hub as to prevent it rotating therein, so that the friction-roll shall not be presented at an angle or sidewise to the inclined plane. This may be accomplished by a groove and guide-pin, or in other suitable ways, and as it can be easily done by any skillful mechanic I have not here shown nor described it. A pin, *q*, is inserted through the valve-stem near its foot, upon which rests a metallic ring, *p*, which supports a rubber or other elastic ring, *r*, fitting closely to the stem. Above the ring *r* is another metallic collar, *n*, which sustains a spiral spring, *f*, whose upper end bears against the end of the hub *e*. The action of the spring to restrain the valve upon its seat. The joint made by the passage of the valve-stem through the hub *e* is closed by means of a packing-ring *h*, which covers the spring and extends down over the elastic ring *r*, thus preventing the ingress of air while the valve-stem is reciprocating within the hub. An inclined plane, J, is laid down on the platform A', in the line of oscillation of the pump, upon which the friction roll of the valve-stem rides when the pump is in operation. The hollow journal S' communicates with the air-chamber beneath the valve, as seen in Fig. 1, where the position of the journal is shown in red outline. The packing-rings *h* and *h'* may be held securely by means of the tension put upon them in fixing them to their places without other means of fastening; but in large pumps, and indeed in those of every size, it is advisable and may be found necessary to successful operation to bind the packing-rings *h* and *h'* to their places by means of wire or its equivalent wound around them. Their flexibility permits the motion of the movable parts in-

closed or embraced by them without opening the joints they are intended to close, and without displacement of the rings; and in the case of the ring *h* it will be noticed that when its lower part, which embraces the spring *f*, is carried upward along with the spring when the stem rises over the inclined plane *J*, a relaxation of the tension put upon it in the direction of its length takes place, and the ring consequently clasps the ring *r* and the hub *e* so much the more closely.

The operation of the pump is as follows: The shaft *C* being put in motion, the piston-rod *F* is carried around with the balance-wheel to which it is attached, and the cylinder within which it moves is thereby caused to oscillate upon its journals *S* and *S'*. The ascent of the piston begins when the valve-stem is riding up the inclined plane *J*, and its ascent is completed while the valve is descending; consequently the valve is opened while the piston rising in the cylinder, and is closed before it has reached the end of its stroke. The continued revolution of the shaft drives the piston down into the cylinder and expels the air through the holes made in it, which are to be closed by valves (not shown) into the upper part of the cylinder, whence it

is expelled through holes *i* in its cover on the next ascent of the piston.

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

1. An oscillating air or vacuum pump whose valve is operated by a positive movement derived from its vibrating motions and independent of the piston, substantially as above described.

2. Constructing and operating the valve and its stem of vacuum pump substantially as above described.

3. The combination of the inclined plane *J* with the valve and valve-stem of an oscillating vacuum-pump, substantially as and for the purpose above described.

4. Packing the joint around the valve-stem by means of the elastic ring *r* and the packing-ring *h*, substantially as above described.

5. Packing the joint on the hollow journal of the pump where it unites with the air-tube by means of a packing-ring, substantially as above described.

AZEL STORRS LYMAN.

Witnesses:

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