

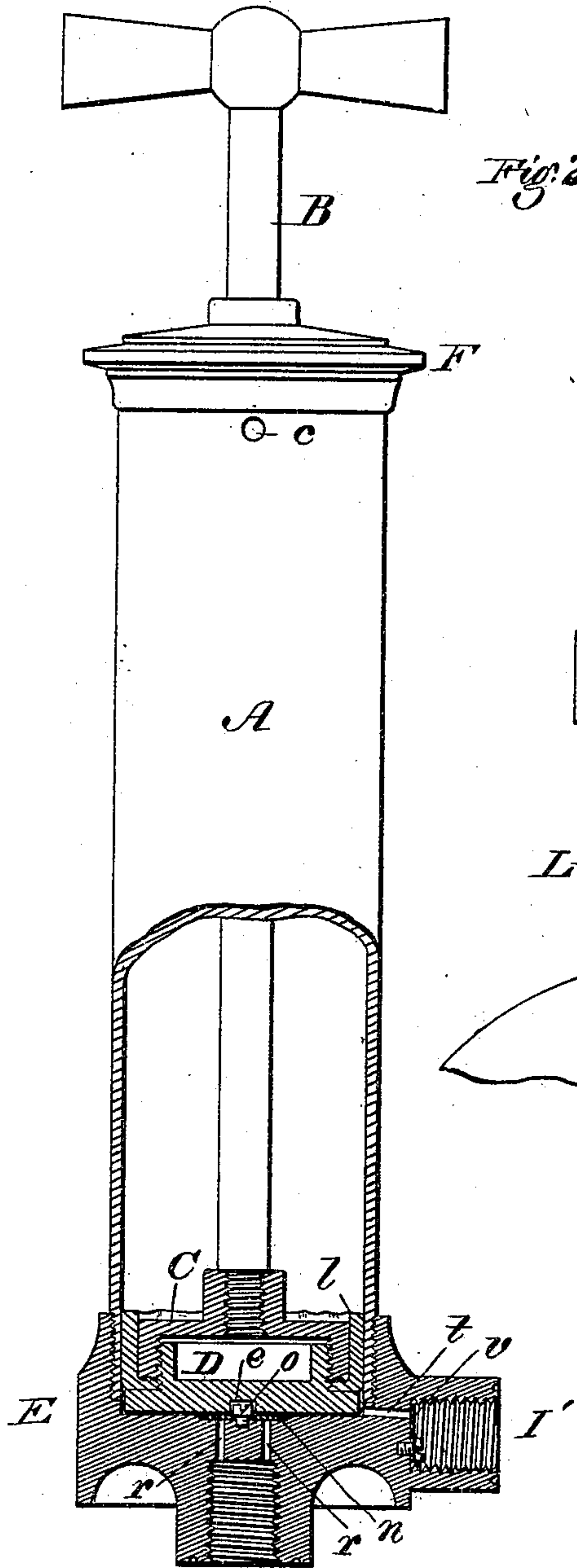
R. H. HOLBROOK.

AIR-PUMP.

No. 178,851.

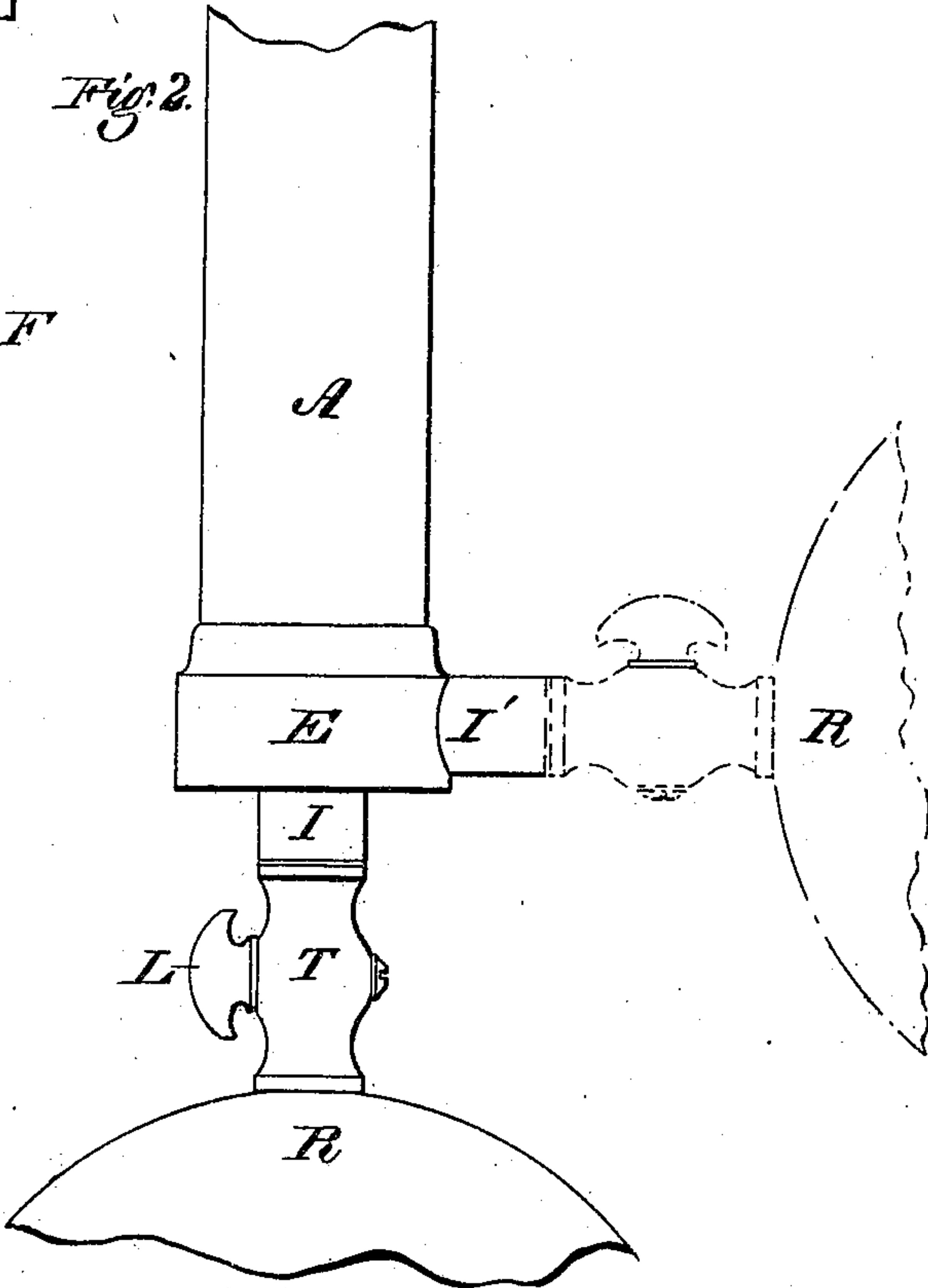
Patented June 20, 1976.

Fig. 1.



Witnesses: I
 Will M. Dodge.
 John P. Twitchell.

Fig. 2.



Inventor:
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UNITED STATES PATENT OFFICE.

REGINALD H. HOLBROOK, OF LEBANON, OHIO.

IMPROVEMENT IN AIR-PUMPS.

Specification forming part of Letters Patent No. **178,851**, dated June 20, 1876; application filed March 15, 1876.

To all whom it may concern:

Be it known that I, R. H. HOLBROOK, of Lebanon, in the county of Warren and State of Ohio, have invented certain Improvements in Air-Pumps, of which the following is a specification:

My invention consists in so constructing the pump that when the piston is at the limit of its stroke at the end where the valves are located there shall be no space left for the retention of any air between the piston and the valve or end of the cylinder, all as hereinafter more fully described.

Figure 1 is a side elevation, shown partly in section; and Fig. 2 is a side view of a portion of the pump with the air vessels or receivers attached.

In air-pumps as ordinarily constructed there is a space left between the piston and the inlet-valve or between the piston and the end of the cylinder or barrel, in which, at each stroke of the piston, more or less air remains, thereby preventing, to a greater or less extent, the perfect operation of the pump.

The object of the first part of my invention is to overcome this objection or defect, which I accomplish by constructing the parts as shown in Fig. 1.

In the drawings, A represents the cylinder or barrel, and B the piston of the pump. At the bottom is a tubular neck, I, which has a screw-thread for attaching the air vessel or receiver R, (shown in partial elevation in Fig. 2,) the receiver R being provided with a tube, T, having a corresponding screw and a stop-cock, L. From the tubular neck I a series of small holes, *r*, extend up through the bottom to the interior of the cylinder, as shown in Fig. 1, and in a shallow circular recess made in the upper surface of the bottom piece is secured the valve *n*, which is held in place by a central screw, *e*, said valve being made of oiled silk or other flexible material, and of such a size as to just fill the recess when down.

The piston-head may be made in any suitable manner, it being represented, in this case, as composed of two parts, C and D, united by screw-threads, and claspings the packing *l* between them, the latter being turned up around the exterior. It is, however, obvious that the head may be made solid, and the packing ap-

plied in any other known manner, if preferred, this forming no part of the invention.

The under surface of face of the piston-head is so formed as to fit evenly upon the upper surface of the bottom piece, as shown in Fig. 1, so that when the piston is shoved down its face will come in contact with that of the bottom of the cylinder, thus leaving no space between them or between the piston and the inlet-valve *n*, thereby practically excluding all air from between them. A small recess, *e*, is made in the center of the face of the piston, to fit closely around the head of the screw *o*, which holds the valve *n* in place to permit the piston-head to fit down close upon the bottom piece, thus rendering the exclusion of the air from between them still more complete. If, however, a check-valve were substituted for this flap-valve *n*, and its head made to just fill the recess, and thus dispense with the screw *o*, the recess *e* in the face of the piston might be omitted, the prime object being to have the face of the piston so fit the face of the bottom as to leave no space for the retention of any appreciable amount of air when the piston is forced entirely down.

From one side of the bottom piece E there protrudes another tube, I', having a screw-thread, which corresponds in size with the projection or tube I at the bottom, and within this projection I' is secured an outwardly-opening valve, *v*, there being a small opening, *t*, leading therefrom into the cylinder, as shown in Fig. 1, through which the air escapes at each downstroke of the piston, the valve *v* being located as near the inside of the barrel as possible, so as to leave the smallest amount of space possible for the retention of air in the passage *t*, which latter will ordinarily be filled at the end of the stroke by the oil around the piston.

If it be desired to compress air into a receiver, R, the latter will be attached to the tube I', as shown in dotted lines in Fig. 2, and the pump be operated in the usual manner. If, on the other hand, it be desired to exhaust the air from a receiver, the latter will be attached to the bottom tube I, while, if it be desired to exhaust the air from one receiver and compress it in another at the same operation, then a receiver is to be attached to both

the tubes I and I', in which case, by operating the pump, the air will be exhausted from the receiver at the bottom and compressed or forced into the receiver at the side.

It will thus be seen that no change of the valves and no stop-cocks or other changeable or movable fixtures are used in the pump, either to exhaust or compress the air, or to both exhaust and compress it simultaneously, it only being necessary to connect the receivers according as it is desired to accomplish either of these results.

By these means the construction of the pump is rendered exceedingly simple and efficient, and, consequently, will remain in working order for a much greater length of time than when provided with changeable valves, stop-cocks, and other appliances ordinarily used in the class of air-pumps intended for philosophical experiments.

It is, of course, obvious that, if desired, there may be connected to the neck or projection I a tube so curved as to project above the

bottom piece, thus enabling the receiver to be connected thereto at a point above a base, to which the pump might be secured, if thought necessary.

In Fig. 1 there is shown a small hole, *c*, near to top of the barrel A, for entrance and exit of air above the piston; but this, if preferred, may be made in the cap F, or there may be space sufficient left around the piston-stem B to answer this purpose.

Having thus described my invention, what I claim is—

An air-pump having its inlet-valve *n* located upon the inside of the cylinder bottom, with a solid-faced piston of a configuration to fit closely upon the bottom of the cylinder and the valve therein, for the purpose of excluding all air from under the piston at the end of its stroke, as set forth.

REGINALD H. HOLBROOK.

Witnesses:

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JOSIAH MORROW.