

(No Model.)

J. LINES & A. J. WOLFF.  
PORTABLE AIR PUMP.

No. 556,153.

Patented Mar. 10, 1896.

Fig. 1

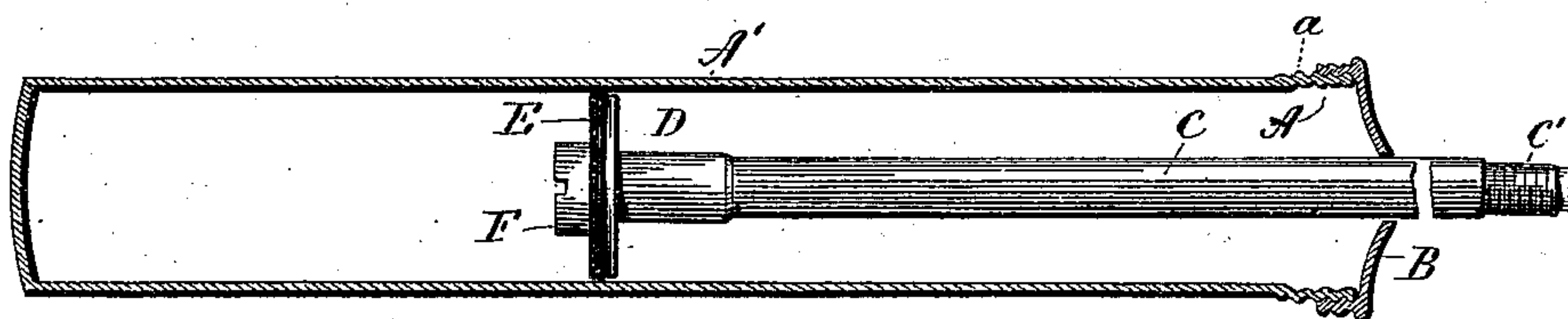


Fig. 2

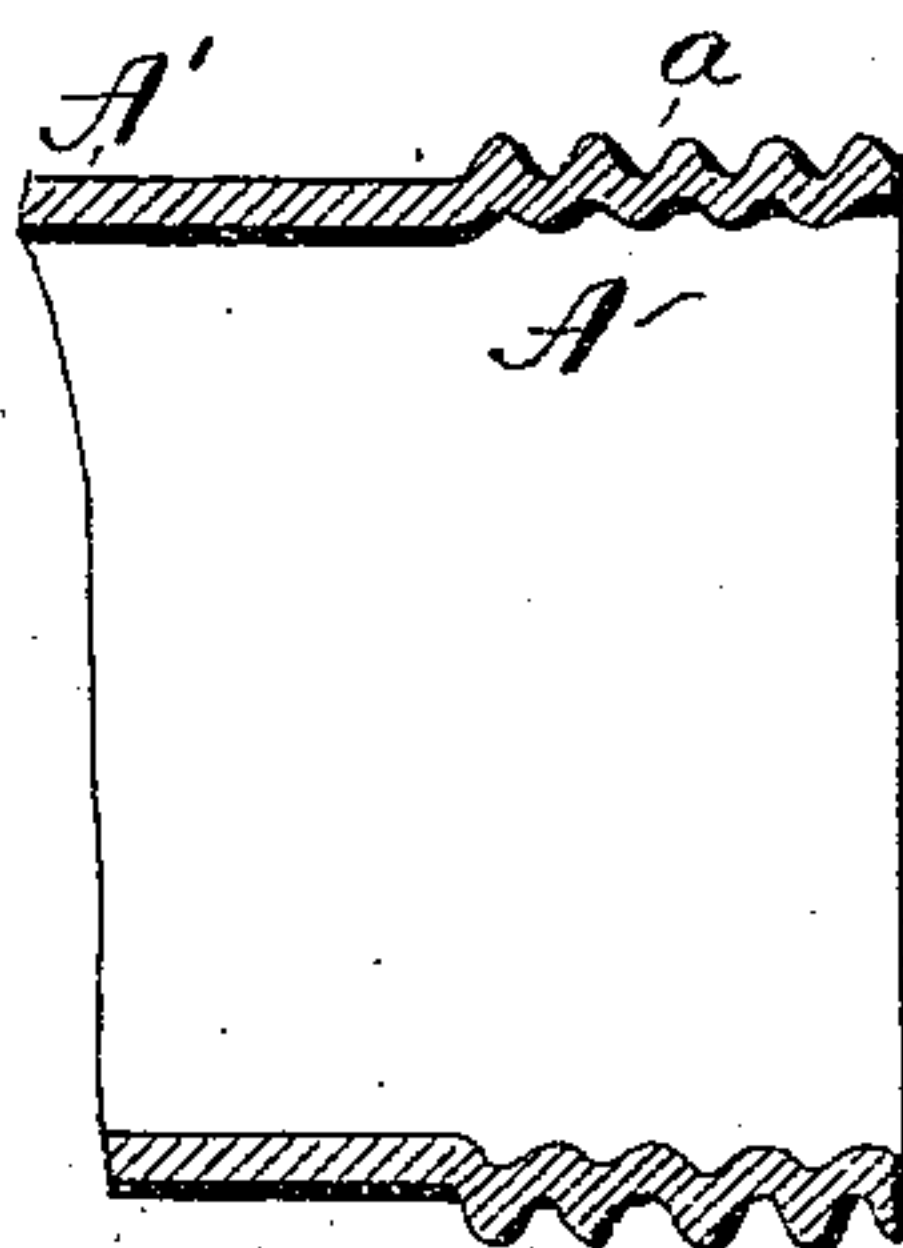


Fig. 3

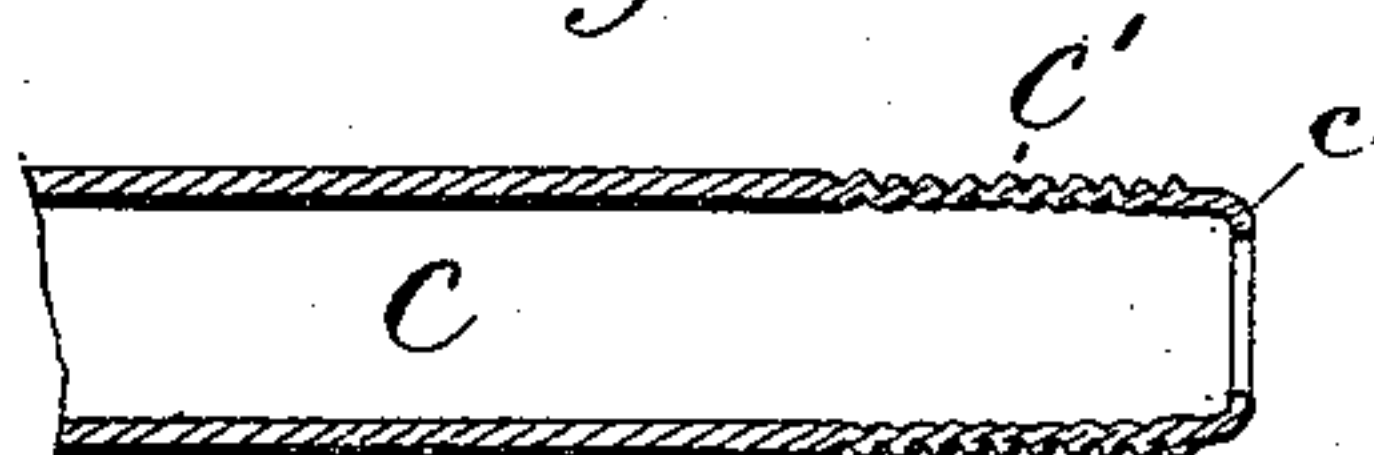


Fig. 4

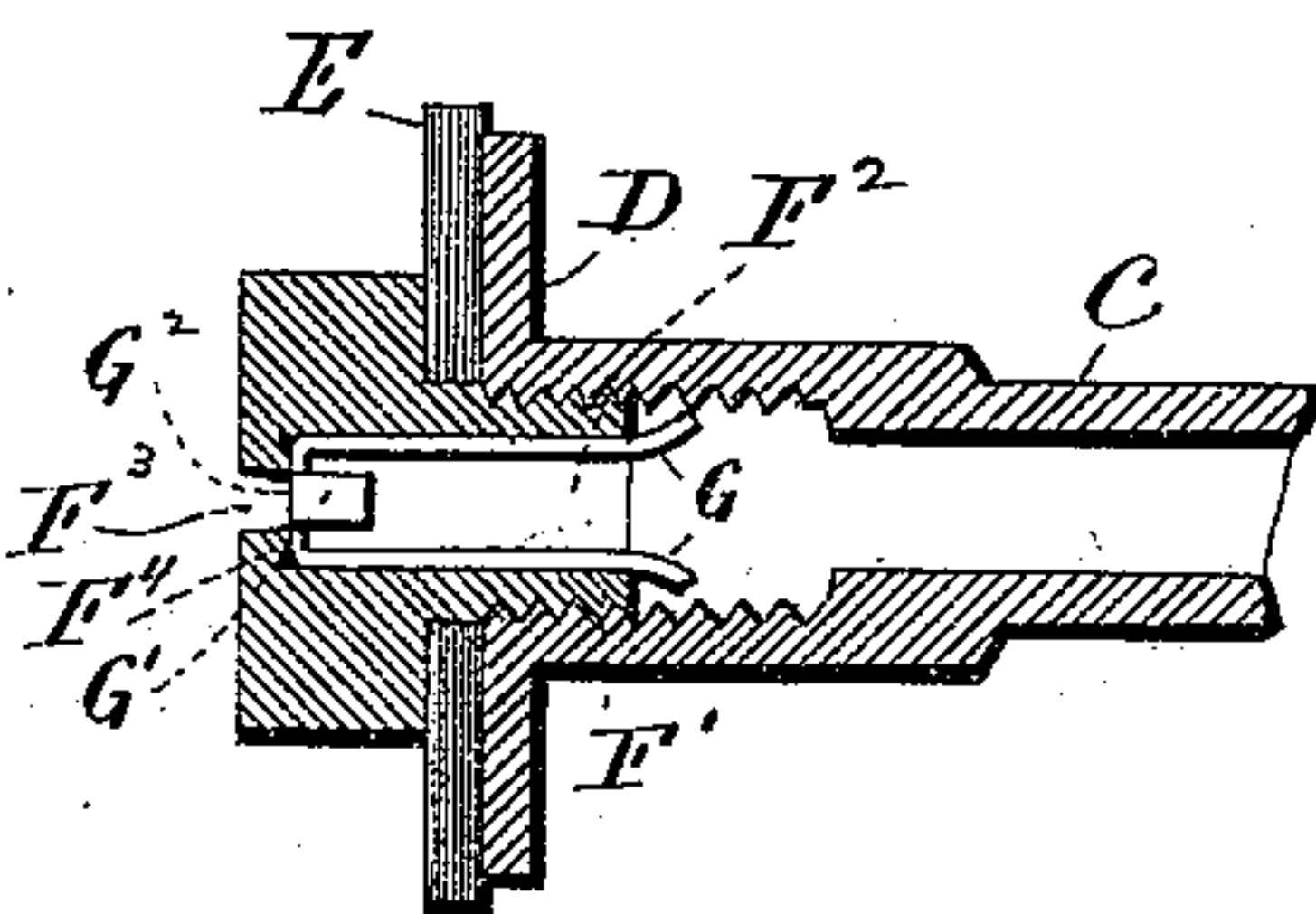


Fig. 5

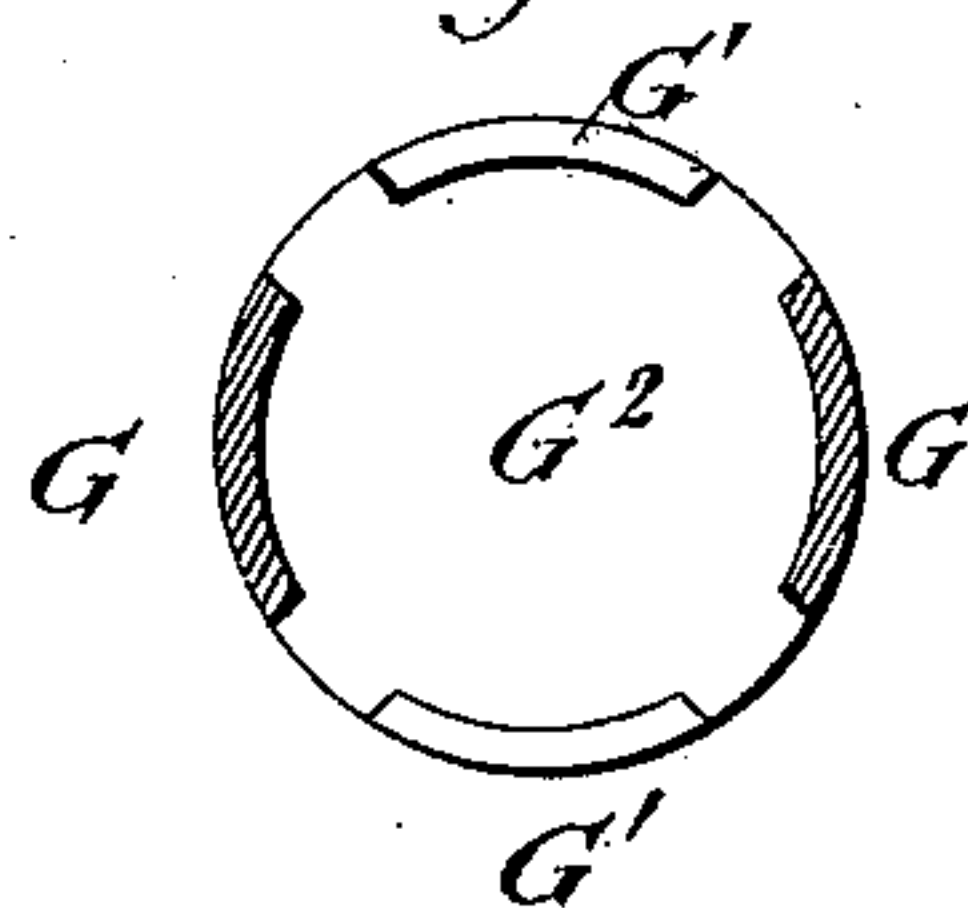


Fig. 6



Fig. 7

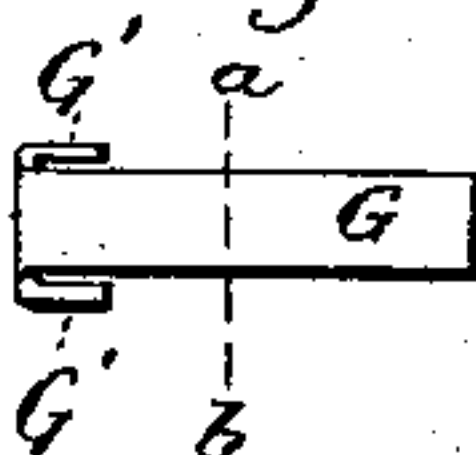


Fig. 8

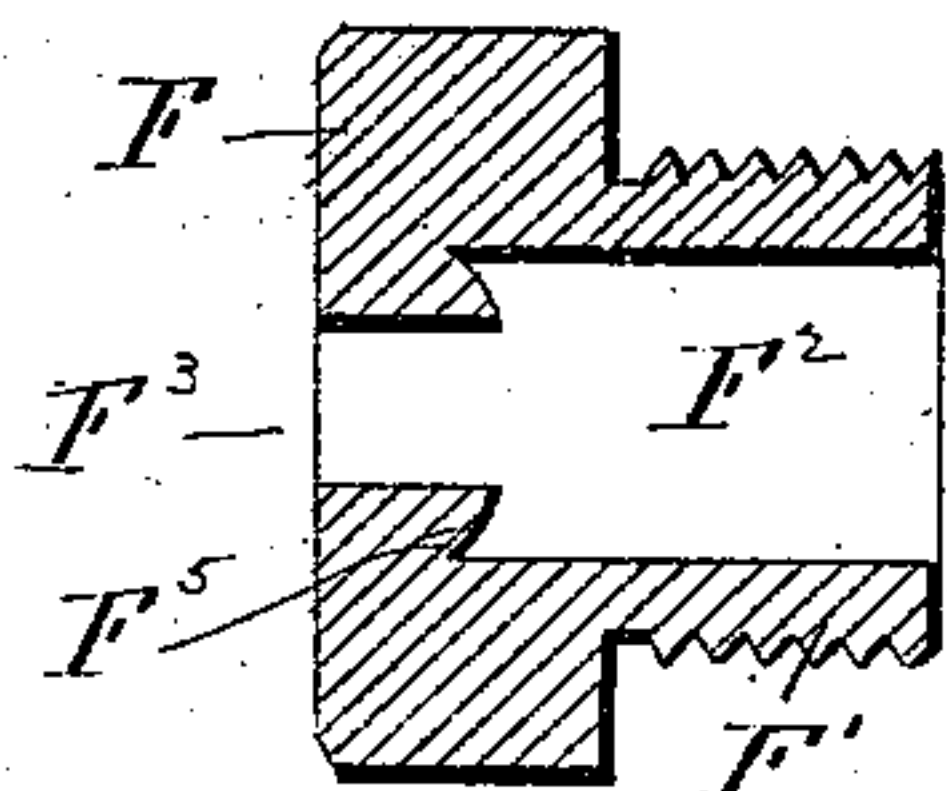
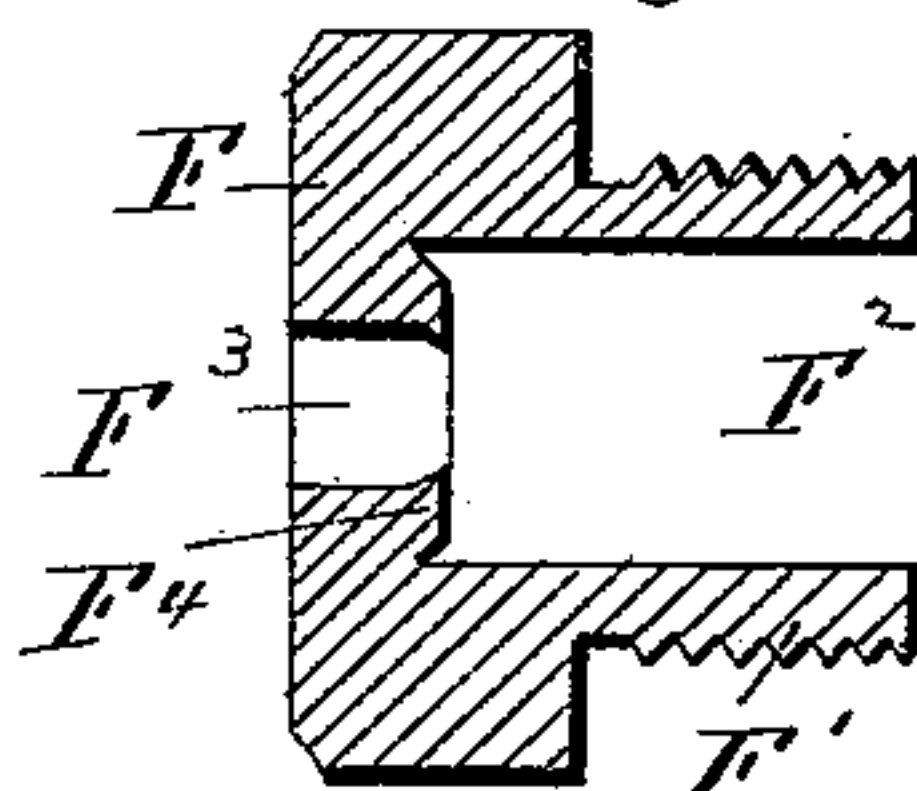


Fig. 9



Witnesses.  
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# UNITED STATES PATENT OFFICE.

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## PORTABLE AIR-PUMP.

SPECIFICATION forming part of Letters Patent No. 556,153, dated March 10, 1896.

Application filed September 7, 1894. Serial No. 522,336. (No model.)

*To all whom it may concern:*

Be it known that we, JOHN LINES and ALFRED J. WOLFF, of Waterbury, in the county of New Haven and State of Connecticut, have  
5 invented a new Improvement in Portable Air-Pumps; and we do hereby declare the following, when taken in connection with the accompanying drawings and the letters of reference marked thereon, to be a full, clear, and exact  
10 description of the same, and which said drawings constitute part of this specification, and represent, in—

Figure 1, a view, partly in elevation and partly in central longitudinal section, of an  
15 air-pump constructed in accordance with our invention; Fig. 2, an enlarged broken sectional view of the outer end of the cylinder, showing the threaded flange formed thereat; Fig. 3, an enlarged broken view of the outer  
20 end of the piston-rod, showing the safety-bearing flange formed thereat; Fig. 4, an enlarged sectional view showing the piston and the inner end of the piston-rod and the piston-valve; Fig. 5, a view in side elevation of  
25 the valve; Fig. 6, an end view thereof, looking toward its bearing-face; Fig. 7, a sectional view of the valve on the line *a b* of Fig. 5 on a still larger scale; Fig. 8, an enlarged sectional view of the chambered screw forming a part of the piston, the said screw being  
30 shown after it has been bored out to form the valve-chamber and to develop the valve-seat; Fig. 9, a corresponding view after the valve-seat has been completed by subjecting it to  
35 the stamping action of a flat-ended punch, which flattens it and upsets it inward.

Our invention relates to an improvement in that class of portable air-pumps which are particularly designed for inflating the tires of  
40 pneumatic cycles, though also adapted for the inflation of other articles, the object being to produce, at a low cost for manufacture, a simple, convenient, effective and durable device, composed of few parts and not liable  
45 to derangement or injury.

With these ends in view our invention consists in a portable air-pump having certain details of construction and combinations of parts, as will be hereinafter described, and  
50 pointed out in the claims.

In carrying out our invention we form a flange A at the open outer or discharge end of the cylinder A', the inner or handle end of which is closed. The internal diameter of the said flange is a very little greater than  
55 the internal diameter of the body of the cylinder. In the outer periphery of the flange we form screw-threads *a*, which are taken into by corresponding threads formed upon  
60 the inner periphery of the flange of the removable screw-cap B, which may be of any approved construction, and which contains a circular central opening through which the  
65 hollow piston-rod C passes. It is designed that the rod shall be so loosely fitted in this opening that air will leak through the same into the cylinder for compression therein. By preference both the cylinder and screw-  
70 cap will be made of sheet metal. By preference, also, the screw-threads *a* will be formed in the flange A by rolling them thereinto by means of suitable dies; but in any event the  
75 internal diameter of the flange will, in the finished cylinder, be slightly greater than the internal diameter of the body of the cylinder.

By flanging the open outer end of the cylinder, as described, so as to make it larger in diameter than the internal diameter of the  
80 body of the cylinder the piston D, located upon the inner end of the piston-rod C, may be readily introduced into and removed from the cylinder without injuring, distorting or  
85 displacing its leather packing-washer E in passing the screw-threads. Moreover, it makes the manipulation of the pump much easier to construct it so that the piston may be  
90 readily introduced into and removed from the cylinder. Furthermore, if the cylinder is made from thin sheet metal the thread provided at its open outer end for the applica-  
95 tion of the removable screw-cap must be rolled into it instead of cut, and if the thread is rolled into it the end of the cylinder must be slightly enlarged or expanded for that purpose.

The outer end of the piston-rod C is constructed to form an externally-threaded stem  
100 C' for the attachment of the flexible tube, the opposite end of which is temporarily connected with the other object to be inflated.



The said flexible tube is well known to those familiar with the art and does not need illustration or description herein. We may say, however, that its inner end is provided with  
 5 a brass connection containing a packing-washer, and for the purpose of preventing this washer from being cut and for the further purpose of securing a good joint between it and the threaded stem C' of the outer end  
 10 of the piston-rod we turn the extreme outer end of the said stem inward at a right angle to form an annular safety-bearing flange c, as well illustrated in Fig. 3 of the drawings. We have found the use of such a flange to be  
 15 effective in preventing the cutting of the leather of the said connection and in securing the proper seating of the end of the stem against the leather.

The piston D, located at the inner end of  
 20 the piston-rod C, consists of an internally-threaded annularly-flanged head, permanently secured to the said end of the rod which enters it by brazing or otherwise. The packing-washer E, before mentioned, is made  
 25 larger in diameter than the annular flange of the said head and placed against the outer face thereof and held in place by means of a large-headed screw F, the shank F' of which takes into the threads of the said head. The  
 30 head and shank of the screw are counterbored to form a valve-chamber F<sup>2</sup>, the extreme inner end of which intersects a small concentric longitudinal air-passage F<sup>3</sup>, entering the chamber through the center of the outer face  
 35 of the screw. At the intersection of the said chamber and air-passage there is formed a raised flat annular valve-seat F<sup>4</sup>, which may be produced in any desired manner, but by preference as illustrated in Figs. 8 and 9 of  
 40 the drawings. In Fig. 8 a convex annular boss F<sup>5</sup> is shown as having been formed at the inner end of the valve-chamber F<sup>2</sup> when the same is being bored out. Then a perfectly-flat-ended steel punch is introduced  
 45 into the valve-chamber, and the said boss flattened by the stamping action of the punch to form the annular valve-seat F<sup>4</sup>, which is perfectly flat and smooth.

By reference to Fig. 9 it will be observed  
 50 that the flattening of the convex boss sets the metal inward a little, so as to reduce the size of the longitudinal air-passage F<sup>3</sup>. By reference to the same figure it will also be observed that the boss is not entirely reduced, so that  
 55 the flat valve-seat is virtually raised away from the extreme inner end of the valve-chamber, thus forming a small clearance-space around the valve-seat. By forming the valve-seat as described it may be brought to just  
 60 the size required by means of the punch. Within the said valve-chamber F<sup>2</sup> we locate, by preference, a reciprocating skeleton valve, formed from a single piece of sheet metal by simple and economical operations of cutting  
 65 and drawing, and consisting of two long parallel corresponding oppositely-arranged arms G G, concavo-convex in cross-section and hav-

ing their extreme outer ends slightly deflected outward, and two short arms G' G' located opposite each other and between the long arms,  
 70 and a flat bearing-face G<sup>2</sup> into which the inner ends of the said arms, which are located at a right angle to it, merge, and which seats upon the valve-seat F<sup>4</sup>, the construction of which has already been described. By turn-  
 75 ing the outer ends of the long arms G G outward they are adapted to engage with the extreme inner end of the rod C, which forms a stop for the inward movement of the valve. By constructing the valve in skeleton form,  
 80 as described, we are enabled to form it very cheaply, and to so reduce its weight, without depriving it of the length required to keep it in line, as to make it very sensitive in operation to obvious advantage in the performance  
 85 of the pump. We do not limit ourselves, however, to using the particular form of valve shown and described in connection with the particular form of valve-seat, nor is the use of such a valve-seat limited to such a valve. 90

We are aware that an air-pump having a hollow sheet-metal cylinder, a hollow piston-rod provided at its inner end with a valved piston, and a removable sheet-metal cap applied to the open outer end of the cylinder  
 95 and having a central opening for the piston-rod is old. We are also aware that it is old to secure the leather packing-washer of a piston in place by clamping it between a flange forming a part of the piston and a large-headed screw, and, further, that it is old to employ in such a construction a sheet-metal valve the inward movement of which is limited by the extreme inner end of the piston-rod. We are also aware that it is old to roll  
 100 threads into articles made of sheet metal. We do not, therefore, claim any of those constructions broadly.

Having fully described our invention, what we claim as new, and desire to secure by Letters Patent, is— 110

1. In a portable air-pump for bicyclists' use, the combination with a cylinder, of a removable screw-cap applied to the open outer end thereof and containing a central opening, a  
 115 hollow piston-rod passing through the opening in the said cap, a piston located at the inner end of the said rod, and including a chambered screw which assists in holding the packing-washer of the piston in place, and which  
 120 contains a central longitudinal chamber, and a skeleton valve located in the said chamber, formed from a single piece of sheet metal, and comprising two long arms located opposite each other, two short arms located opposite  
 125 each other and between the long arms, and a bearing-face into which the inner ends of the arms merge, the said arms operating to keep the valve in right position in the chamber and permitting a ready flow of air between the  
 130 hollow piston-rod and the cylinder when the valve is lifted from its seat, substantially as set forth.

2. A chambered screw for the piston of a



portable air-pump, the said screw containing  
a central longitudinal air-chamber, a longi-  
tudinal air-passage intersecting the inner end  
of the said chamber, than which it is of  
5 smaller diameter, and a raised, flat annular  
valve-seat located at the inner end of the  
chamber and made integral with the said  
screw, substantially as described.

In testimony whereof we have signed this  
specification in the presence of two subscrib- 10  
ing witnesses.

JOHN LINES.

ALFRED J. WOLFF.

Witnesses:

F. L. CURTISS,

C. P. GOSS.