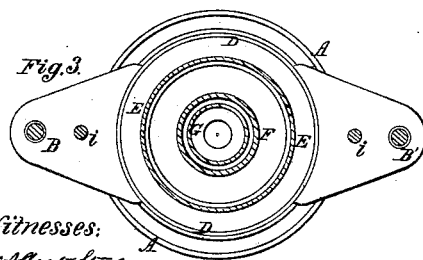
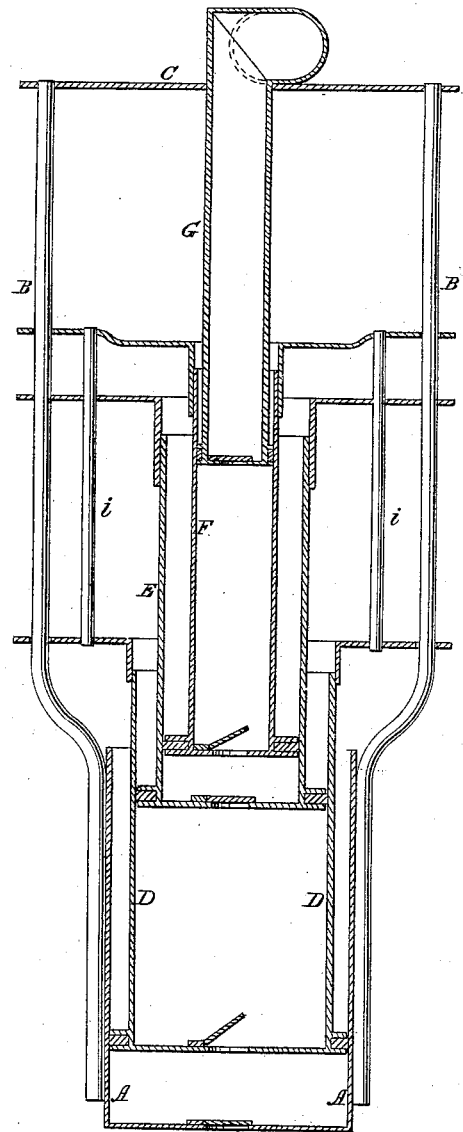
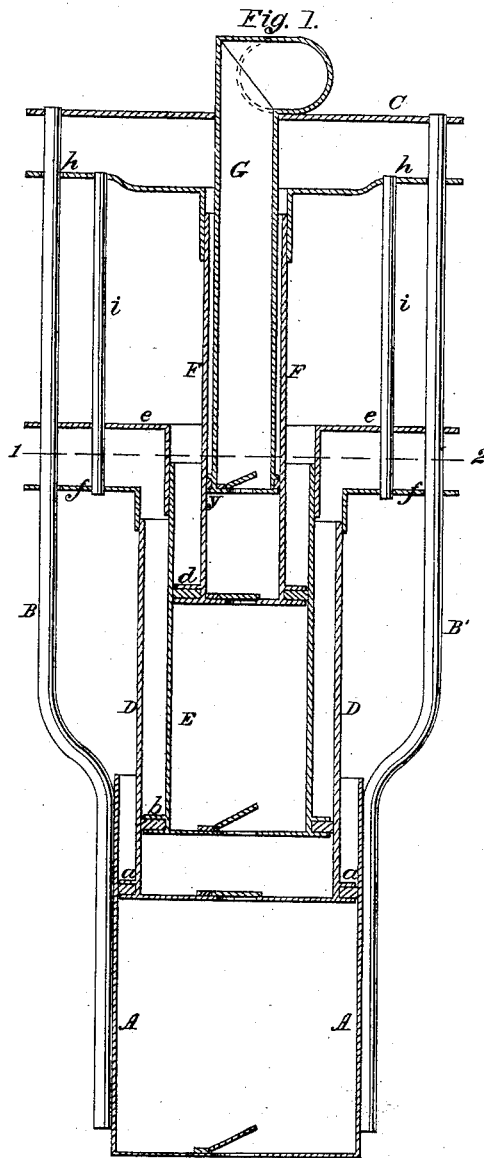


# S. Bidwell, Compressing Air

N<sup>o</sup> 44,930.

Patented Nov. 8, 1864.



Witnesses:  
Wm. Albert Steel,  
Charles Howson.

Inventor:  
Henry Barker  
Atty for S. Bidwell

# UNITED STATES PATENT OFFICE.

SALMON BIDWELL, OF PHILADELPHIA, PENNSYLVANIA.

## IMPROVED APPARATUS FOR COMPRESSING AIR, GAS, &c.

Specification forming part of Letters Patent No. 44,930, dated November 8, 1864.

*To all whom it may concern:*

Be it known that I, SALMON BIDWELL, of Philadelphia, Pennsylvania, have invented an Improved Apparatus for Pumping Elastic Fluids; and I do hereby declare the following to be a full, clear, and exact description of the same, reference being had to the accompanying drawings, and to the letters of reference marked thereon.

My invention consists of a series of barrels of different diameters, provided with pistons and valves, and arranged and operating in unison with each other, substantially as described hereinafter, so that the elastic fluid compressed in the large barrels shall pass directly into the smaller barrels, to be there further compressed, as hereinafter set forth.

My invention is especially designed for the purpose of compressing air, gas, and other elastic fluids to a great density, and for accomplishing this end without interfering with the proper operation of the necessary valves.

In order to enable others to make and use my invention, I will now proceed to describe its construction and operation.

On reference to the accompanying drawings, which form a part of this specification, Figures 1 and 2 represent vertical sections of my improved pumping apparatus with the moving parts in different positions; Fig. 3, a sectional plan on the line 1 2, Fig. 1.

A is the lower barrel of the apparatus, and to the exterior of this barrel are secured the two rods B and B', which are connected together at the top by a cross-piece, c.

To the interior of the barrel A is adapted a piston, a, formed at the lower end of the second barrel, D, to which is adapted the piston b of the third barrel, E, which receives the piston d of the fourth barrel, F, the latter receiving a pipe, G, at the lower end of which is a packing, y. This pipe is secured to the cross piece C, and the flanges e e on the upper end of the third barrel, E, are permanently secured to the rods B and B', which serve as guides for the flanges f f of the second barrel, D, and for the flanges h h of the fourth barrel, F, the two last-named barrels being connected together by the rods i i, so that they can move simultaneously, a vertical reciprocating motion being imparted to them by any suitable mechanism.

It will be observed that each barrel, as well

as the pipe G, is closed at the lower end, with the exception of the central opening, above which is a suitable valve.

As seen in Fig. 1, the barrels D and F are in the act of rising simultaneously, in which case the fluid contained in the barrel D (the valve of the latter being closed) is being forced into the barrel E, the valve of which is open, at the same time the fluid in the barrel F is being forced into the pipe G, and a new supply of fluid is in the act of entering the barrel A through the opening at the bottom of the same.

In Fig. 2 the barrels D and F are in the act of moving downward in a direction contrary to that illustrated in Fig. 1, so that the fluid previously admitted into the first barrel, A, is being forced into the barrel D while the fluid in the barrel E is passing into the barrel F. It will thus be seen that as the two barrels D and F reciprocate there will be an intermittent discharge of fluid from the pipe G.

Ordinary pumps have been hitherto used for forcing compressed air or other elastic fluid into vessels or reservoirs and producing a high pressure therein; but they are defective in their action, owing to the high pressure of the fluid contained in the barrels of the pumps, this compressed air interfering with the proper working of the necessary valves.

In my improved pumping apparatus the pressure in the first barrel, A, is comparatively light, while that in the smallest fourth barrel, F, has reached the desired density. When the piston a is at the limit of its downward movement, it is at a proper distance above the bottom of the barrel A to permit the valves to operate. A supply of compressed fluid must consequently remain behind as the piston commences its upward movement. The pressure of the fluid, however, in the first barrel is so inconsiderable that it can have little or no tendency to interfere with the proper working of the valve. The fluid in the fourth barrel, F, has been compressed to a greater density, but when that barrel has reached the limit of its upward movement and is about to return, the compressed fluid between the bottom of the barrel and the end of the pipe G is so small in quantity that its expansion, when the barrel begins to move down, cannot seriously interfere with the proper working of the valves. It will now be seen that by the use of a series

of barrels having different areas and communicating directly with each other, and arranged and operating substantially in the manner described, the supply of elastic fluid can be compressed to a high density and forced into vessels or reservoirs with much greater uniformity of action and by less defect in the operation of the valves than by the usual air-pumps. It will be also seen that the number of barrels may be increased without departing from the main features of my invention.

I claim and desire to secure by Letters Patent—

A series of barrels of different diameters,

provided with pistons and valves, and arranged and operating in unison with each other, substantially as herein described, so that the elastic fluid compressed in the larger barrels shall pass directly into the smaller barrels, to be there further compressed, as set forth, for the purpose specified.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

S. BIDWELL.

Witnesses:

CHARLES E. FOSTER,  
JOHN WHITE.