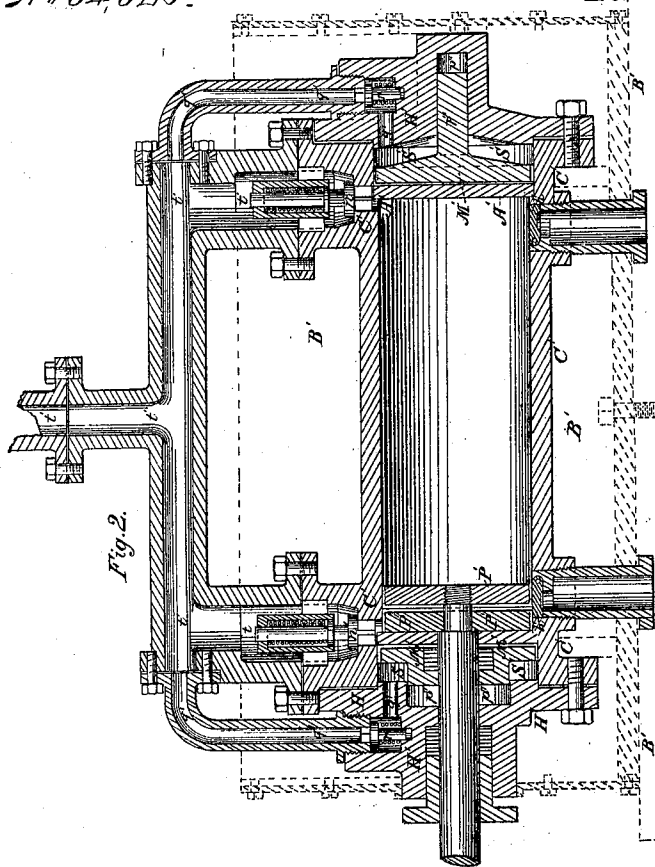


*H. Gottfried*

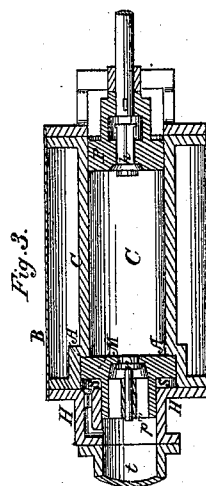
*Air Pump*

*N<sup>o</sup> 54,328.*

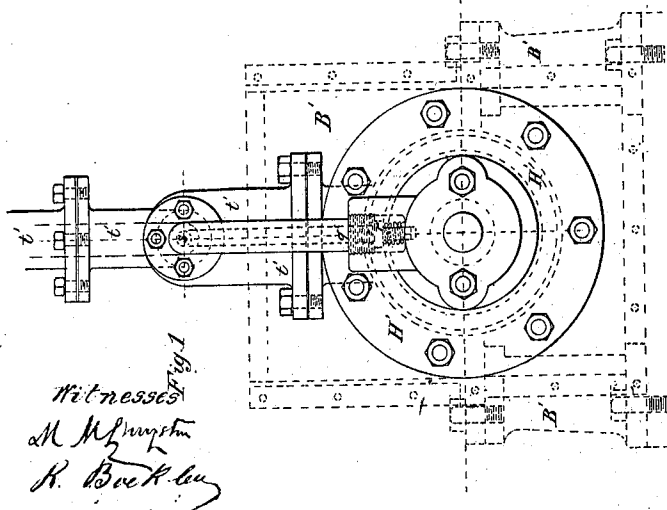
*Patented May 1, 1866.*



*Fig. 2.*



*Fig. 3.*



*Fig. 1.*

*Witnesses*  
*M. M. [unclear]*  
*R. B. [unclear]*

*Inventor*  
*Henry Gottfried*

# UNITED STATES PATENT OFFICE.

HENRY GOTTFRIED, OF NEW YORK, N. Y.

## IMPROVEMENT IN PNEUMATIC PUMPS.

Specification forming part of Letters Patent No. 54,328, dated May 1, 1866.

*To all whom it may concern:*

Be it known that I, HENRY GOTTFRIED, of the city, county, and State of New York, have invented and made certain new and useful Improvements in Air and Vacuum Pumps; and I do hereby declare that the following is a full, clear, and exact description of the same, reference being had to the accompanying drawings, in which—

Figure 1 represents an end view of a double-acting air-pump constructed according to my improvements. Fig. 2 is a longitudinal central vertical section of the same. Fig. 3 is a longitudinal vertical section of a single-acting air-pump with my improvements.

Similar letters of reference indicate corresponding parts in the several figures.

The object of my invention is to obviate the usual great loss of effective working of air-pumps, caused by having a clearance left, when the piston is at the end of its stroke, between it and the respective cylinder-head, in order to prevent the same from coming in contact and breaking each other. The usual amount of this clearance is sufficient room that the air compressed therein, which, by the return of the piston, will take up a room nearly equal to one-third of the acting contents of the cylinder, and therefore the piston is not able to suck while moving on the first third of its stroke.

Now, this invention consists, first, in the employment of a secondary piston or yielding cylinder-head, instead of only one fixed cylinder-head, to air-pumps, which is held to its place by a strong spring and arranged with the stroke of the piston, that the same piston shall completely close upon the said yielding cylinder-head and allow no air to remain between, and that the said cylinder-head shall yield after the air is expelled and prevent the breaking of the piston or said head by coming in contact with each other.

It consists, second, in the employment of an air-chamber arranged in the end of the cylinder and in the rear of the said yielding head and connected with the discharge or reservoir of the pump, whereby said yielding head is provided with a self-regulating sufficiently-strong spring to withstand the pressure from the piston in order to expel the air at every stroke between it and the said piston, while at the same time to allow the cylinder-head to

yield when the piston has come in contact with it.

To enable others skilled in the art to make and use my invention, I will proceed to describe its construction and operation.

C, Fig. 3, and C' C', Figs. 1 and 2, represent the cylinders of a single-acting and a double-acting pump, which are made with water-jackets B, Fig. 3, and B', Figs. 1 and 2, surrounding the same, for the purpose of cooling the respective cylinders while in action.

P, Fig. 3, represents the piston of a single-acting, and P', Fig. 2, of a double-acting, pump, which are properly packed to work air-tight in their respective cylinders.

The suction-valve *h* of the single-acting pump is arranged in the piston, whereas the suction-valves *h' h'* of the double-acting pump are located in the cylinder.

The delivery-valve *n* of the single-acting pump is arranged in the yielding head M, hereinafter described, whereas the delivery-valves *n' n'* of double-acting pump are arranged in the cylinder C', opposite to the suction-valves *h' h'* of the same, in the ordinary way.

*t*, Fig. 3, and *t' t'*, Fig. 2, represent the respective discharge-pipes or reservoirs of the single and double acting pumps.

Now, the one end of the cylinder of the single-acting pump and both ends of the cylinder C' of the double-acting pump are provided with extensions beyond the stroke of piston, which are bored a little larger than the bore of the cylinder, (clearly shown in Figs. 2 and 3,) forming a shoulder, A or A' A', at the end of the stroke of the pistons; and in place of the usual cylinder head or heads, a little off from the end of the stroke of the piston, I place close upon the end of stroke of piston yielding heads M' M', Fig. 2, or a yielding head, M, Fig. 3, made to slide air-tight in the aforesaid extensions of the respective cylinders, and then I place the usual fixed cylinder-heads H or H' H' on the final end of the extensions or cylinders, thereby leaving a certain chamber, S, Fig. 3, or chambers S' S', Fig. 2, between the yielding head M, Fig. 3, or heads M' M', Fig. 2, and the actual or fixed cylinder-heads H or H' H', in which said yielding heads M' M' or head M are or is allowed to slide to or from their respective pistons. The rear part of the said yielding heads M or M' M' are made with projecting stems, which are fitted to work in cor-

responding recesses  $p'' p''$ , or in an opening,  $p'''$ , in the fixed cylinder-heads, to form a more perfect guide to the said yielding heads, which projection of the yielding head, if used in a single-acting pump, as shown in Fig. 3, is made of tubular form, and is working through the cylinder-head H, properly packed air-tight.

$q' q'$ , Fig. 2, and  $q$ , Fig. 3, are passages, or is a passage from the discharge-pipes  $t' t'$ , Fig. 2, and discharge-pipe  $t$ , Fig. 3, to the air-chambers  $S' S'$ , Fig. 2, or air-chamber S, Fig. 3, in each of which is located a drop-valve,  $r$ , which opens, by a pressure from the respective discharge-pipe, toward the respective air-chamber S or  $S'$ , but closes air-tight by a pressure in reverse direction.

The aforesaid yielding heads, when held to the respective shoulders  $A' A'$ , Fig. 2, or A, Fig. 3, are made to leave no room for clearance between their respective faces and respective faces of pistons when at the end of stroke.

By having the delivery-valve  $n$  of the single-acting pump arranged in the yielding head the recess occurring from the construction of the delivery-valve is readily filled up by having a corresponding projection on the end of the piston. (Clearly shown in Fig. 3.)

From the foregoing the operation of the single or double acting pump may be clearly perceived. When the pump is in action the yielding heads are, or head is, to a certain extent, prevented from yielding by means of the pressure of the air in its rear, the same having entered through the respective drop-valve  $r$ , and constantly balancing its pressure with the pressure in the discharge-pipe or reservoir, and the air and its quantity between the rear of said heads  $M' M'$  or head M cut off from the respective drop-valve  $r$ , and, being small in proportion to the air and its quantity in the reservoir, is able to withstand a higher pressure from the piston, on account of being less

elastic, and on account of the area of the face of the yielding heads exposed to the piston being less than the area exposed to the said air chamber or chambers than the air in the reservoir or discharge-pipe. Consequently when the piston is forced up to the yielding head the air between is completely discharged into the discharge-pipe or reservoir at every stroke and complete fresh supply drawn into the cylinder by the return motion of the piston, and is only subject to not avoidable leakages in producing air-tight joints, while at the same time the said head M or heads  $M' M'$  are enabled to yield when the piston strikes the heads, and are guarded against breaking one another.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. The employment of a yielding head, M, or heads  $M' M'$ , arranged in the cylinder of air-pumps in a manner to co-operate with the main piston, for the purpose herein shown and described.

2. The employment and arrangement of the air-chamber S and passage  $q$  to the reservoir or discharge-pipe, in combination with the yielding head M, the whole operating, and for the purpose herein shown and described.

3. The combination and arrangement of the drop-valve  $r$  in the passage  $q$ , and with the yielding head M, operating in the manner and for the purpose herein described.

4. The employment of the delivery-valve  $n$ , arranged in the yielding head M, for the purpose of simplifying the construction in producing an air-tight joint between the yielding head and piston when brought together.

HENRY GOTTFRIED.

Witnesses:

M. M. LIVINGSTON,  
R. BOEKLEN.