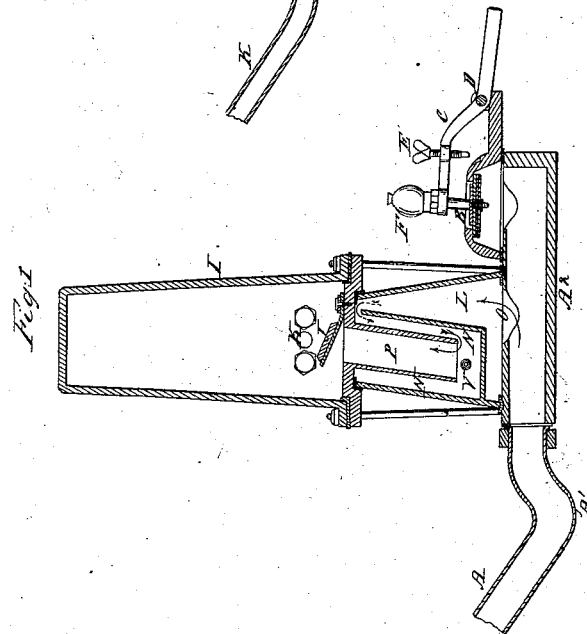
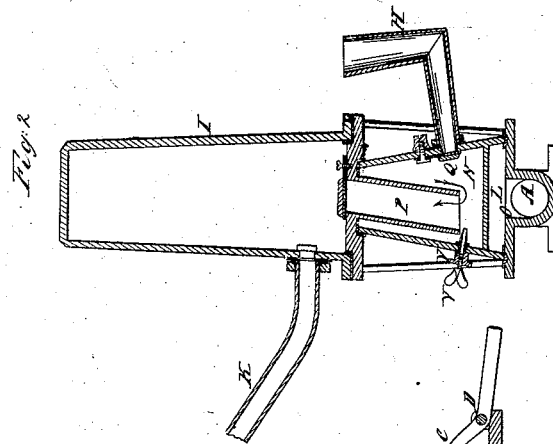
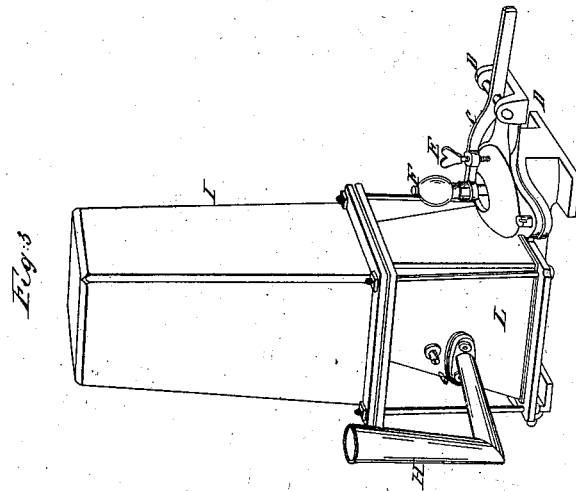


*J. C. Strode,*  
*Hydraulic Engine,*

*N<sup>o</sup> 5,037.*

*Patented Mar. 27, 1847.*



# UNITED STATES PATENT OFFICE.

JOSEPH C. STRODE, OF EAST BRADFORD TOWNSHIP, CHESTER COUNTY, PENNSYLVANIA.

## HYDRAULIC RAM.

Specification of Letters Patent No. 5,037, dated March 27, 1847.

*To all whom it may concern:*

Be it known that I, JOSEPH C. STRODE, of East Bradford township, in the county of Chester and State of Pennsylvania, have invented new and useful Improvements in Machines for Raising Water, called "Strode's Pneumato Hydraulic Engine," which is described as follows, reference being had to the annexed drawings of the same, making part of this specification.

The nature of my invention and improvement consists in making use of a column of condensed air between the propelling fluid and the fluid that is to be raised—said air being condensed in a pyramidal shaped chamber by means of the momentum of a descending column of water—said chamber having a communication by a small opening at its top with another chamber into which the spring water, or fluid to be raised, is introduced called the spring water chamber, and upon which the condensed air in the first named chamber is made to act, causing said fluid to rise through a tube placed in the spring water chamber (open at its lower end and closed alternately at its upper end by means of a valve) into a large air vessel or receiver of the usual form and construction being conducted thence to its place of destination by pipes or hose in the usual manner.

Figure 1 is a longitudinal section. Fig. 2 is a transverse section. Fig. 3 is a perspective view.

Similar letters in the several figures refer to corresponding parts.

A is the main pipe for conducting the propelling water from the head or reservoir to the pyramidal air chamber. This pipe descends below the level of that portion of it which connects with the air chamber just before it reaches the said chamber and then ascends in a curved line to it forming a curved bend in the pipe as at A' for the purpose of preventing the air received at the valve B during the time in which the vacuum is produced in the air and water chamber as hereafter described, from filling the pipe A; as the air will not descend at said bend in the tube so that the surplus of said air after having filled the condensing chamber L may be carried off by the current of water, through the valve B. The pipe A is enlarged below the air chamber L as at A<sup>2</sup>, and has an opening O into the air chamber

L, through which the water passes when the valve B is closed.

B is a valve attached to a curved vibrating lever C turning on gudgeons D in boxes as its fulcrum having a set screw E for regulating the descent of the valve and a counter balance F for adjusting the valve. When this valve B is down as shown in Fig. 3 the water from the head flows through the opening which it closes. When it is up as shown in Fig. 1, the water rises into the pyramidal chamber L through the opening O and condenses the air therein.

H is a pipe for conveying the spring water to the spring water chamber. I is the air chamber into which the water is forced. J is the valve for holding it. K is a pipe or hose for conveying the water to its place of destination. The above named parts lettered from A to K inclusive are made and operated in the usual manner.

The improvements are as follows. L is a pyramidal chamber into which air is admitted through the valve B when it descends by the pressure of the external air to supply the partial vacuum created in the pipe A and chambers L and N. This pyramidal chamber has a communication by a small opening M at the top with another chamber N called the spring or pure water chamber; through which opening M the air so condensed is forced and presses on the spring or other water introduced into the same through the pipe H by which pressure the water in said spring water chamber is forced upward through a tube P reaching to near the bottom of said chamber, N, through the valve J into the air chamber I—said valve being represented as open in Fig. 1 and as closed in Fig. 2.

To raise water with this machine open the valve B and let the water flow out, then by closing the valve B the water which is now in motion in the pipe A will pass through the opening O into the pyramidal condensing chamber L and condense the air in the same as before, the condensed air will force the spring water up the tube P which had entered through the valve Q during the continuance of the partial vacuum above spoken of, into the air chamber I and condense the air therein until its density is equal to that in the condensing chambers L and N below; at this time the spring water will cease to flow into the air cham-

ber I the valve J closes and the air in the chambers I, L and N commences expanding, that in the lower chamber L giving motion to the propelling fluid and driving it backward  
5 producing a partial vacuum in the machine and the air in the upper chamber I forcing the spring water to its place of destination. The said partial vacuum in the machine caused by the reaction of the fluid as afore-  
10 said and the pressure of the external atmosphere on the valve B will cause it to open again. The water from the head then flows through this valve with an accelerating movement until it has acquired that degree  
15 of velocity as to cause the valve to close. The water having no longer any vent through the valve B passes through the opening O into the pyramidal air chamber L and repeats the operation above men-  
20 tioned successively. In this manner the operation will continue as long as the machine remains in order and there is a head of water, to propel it.

The valve V is for the purpose of supplying the chamber I with air by admitting  
25 said air into the tube P. The said air is admitted during the time that the partial vacuum above mentioned takes place. The air thus introduced into the tube P ascends  
30 to the top of the same and is forced into the chamber I at the next stroke of the machine—said valve V' is represented open in Fig. 2 and may be closed, or regulated by screwing in the thumb screw V.

35 The principal advantages this machine possesses over other machines are, 1st, in case of forcing up pure water by the propelling power of a running stream of water less pure there is no possibility of the im-  
40 pure water mixing with the pure, there being at that time a column of condensed air between the two waters. 2nd, the water being forced into the upper chamber I by the condensation of air in the lower chamber  
45 the valve J opens more slowly than when water alone is made the propelling medium and also shuts more slowly thereby preventing the water from escaping back through the valve J after it is forced up,  
50 the valve J being nearly closed when the water ceases to flow upward into the chamber L. This advantage upon trial is found to be of considerable importance—enabling

the machine thus operated to force with a given quantity of water several barrels more  
55 of water per day than it would otherwise do. 3rd, there being no valve between the condensed air in the lower chamber and the driving water or at the opening O said air is permitted to act a longer time in forcing  
60 back said driving water and thereby making a more complete vacuum than in other machines and rendering useless the spring for opening the outlet valve B as used in several machines.

65 It is not necessary that the spring water chamber N and the air chamber L should be inclosed by the same envelop; but they may form separate chambers and they may be arranged in any convenient way, or man-  
70 ner, most acceptable to the constructor, provided that the capacity of the air chamber does not exceed a due ratio between the propelling power and the water to be raised.

I wish it to be understood that in the con-  
75 struction of these machines I do not wish to confine myself to the form of a hollow frustum of a pyramid, cone, or other form for the several chambers &c.; but I desire the privilege to vary these as I may think  
80 proper in form, proportion, and material—provided in all cases that the surplus air be carried off through the valve B. I, however, prefer the forms above described when pure water is to be raised with impure  
85 water.

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

1. Making use of a column of condensed air between the propelling fluid and the  
90 fluid to be raised in the manner above described or other mode substantially the same by which analogous results are effected.

2. I claim the particular combination of  
95 ahe pyramidal air chamber L the internal spring water chamber N and the water tube P with the curved conducting pipe A' and valve B and the air chamber I and hinged valve J constructed and arranged in the manner and for the purpose substantially  
100 as set forth.

JOSEPH C. STRODE.

Witnesses:

WM. P. ELLIOT,  
ALBERT E. H. JOHNSON.