

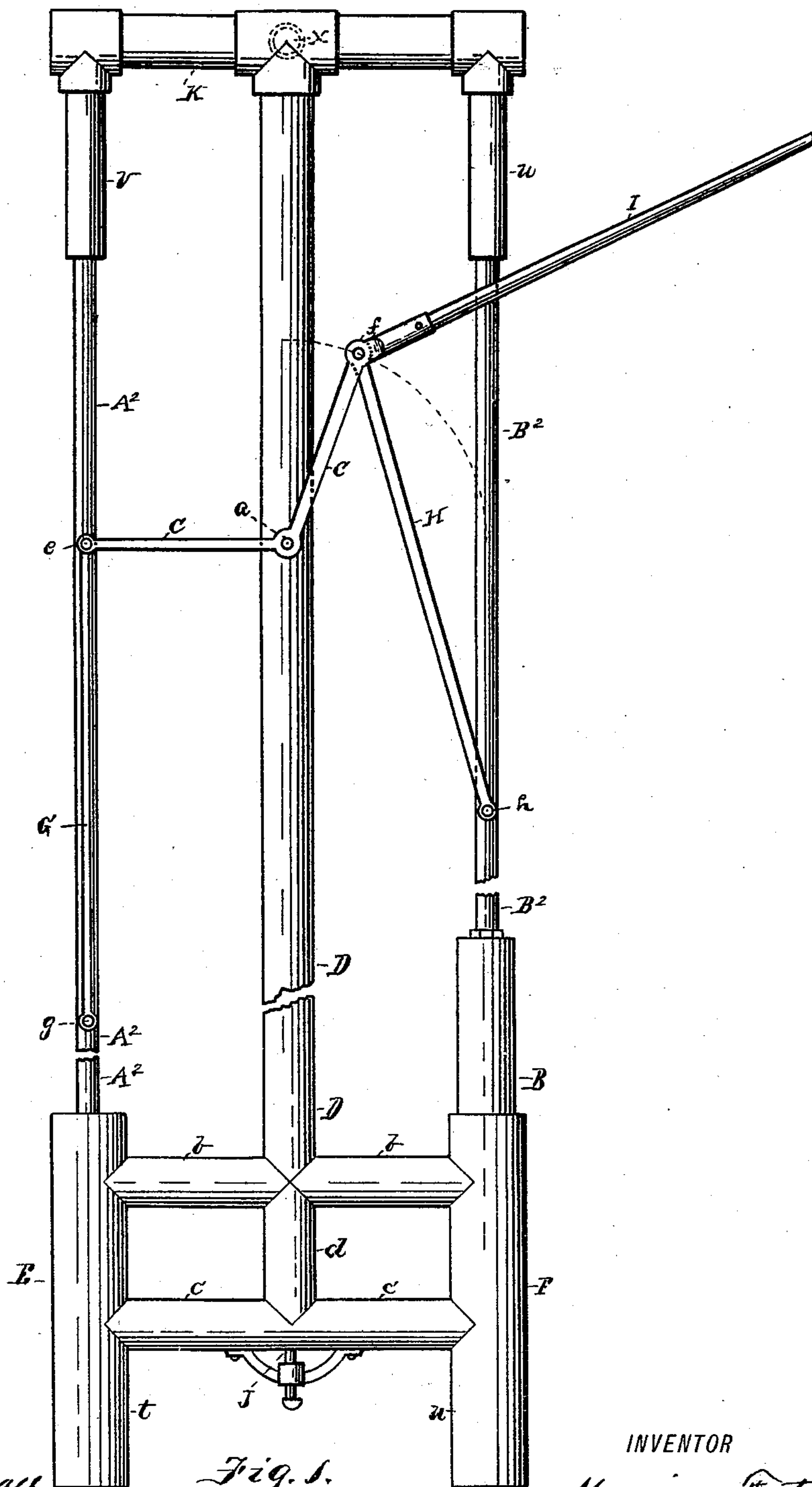
(No Model.)

2 Sheets—Sheet 1.

M. FOSTER.  
PUMPING MACHINERY.

No. 517,449.

Patented Apr. 3, 1894.



WITNESSES:

R. C. Wainshall

Jos. P. Raupen

Fig. 1.

INVENTOR

Morrison Foster

(No Model.)

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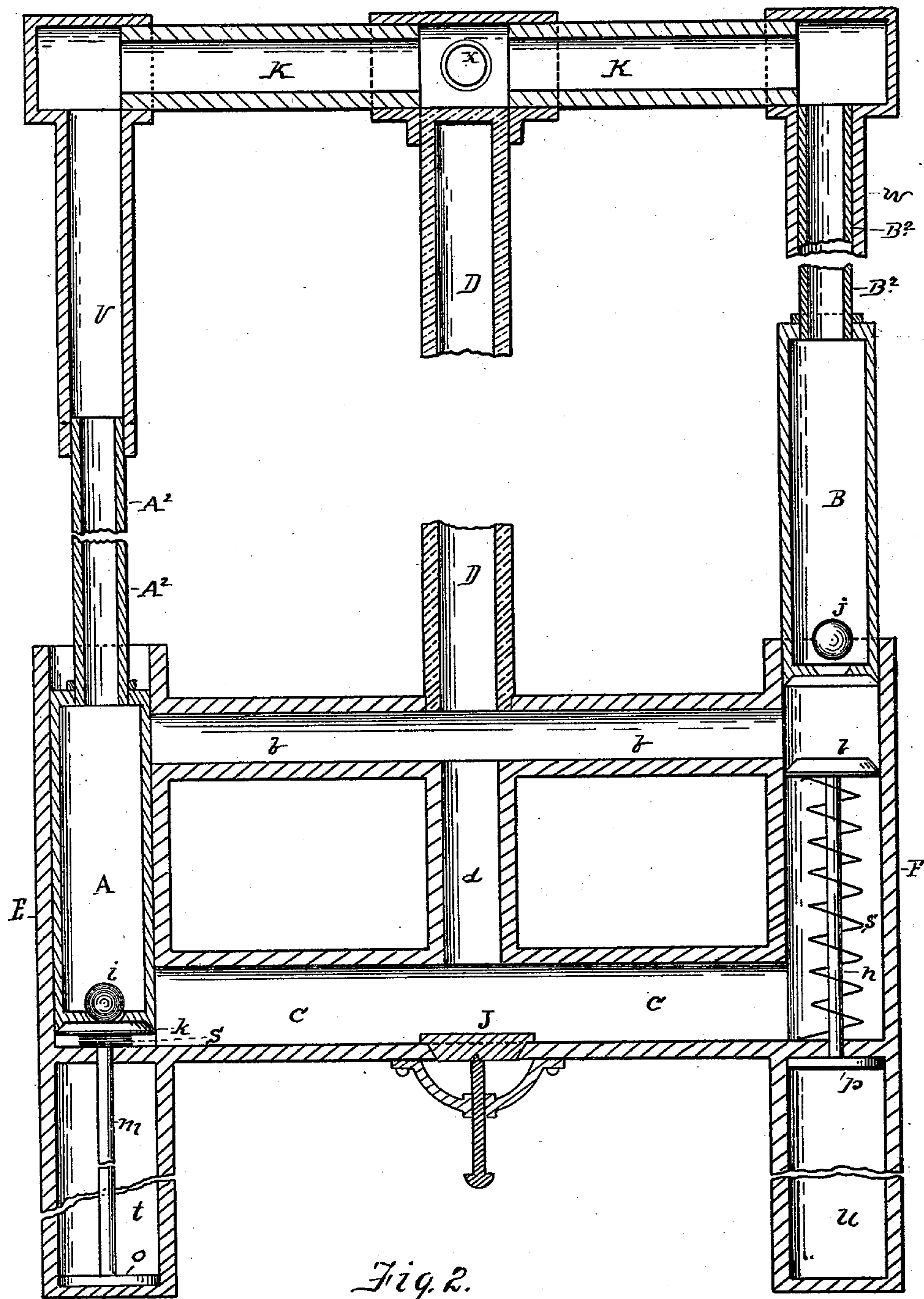


Fig. 2.

WITNESSES:

R. C. Wrenshaw  
Jos. P. Rankin

INVENTOR

Morrison Foster



# UNITED STATES PATENT OFFICE.

MORRISON FOSTER, OF SEWICKLEY, PENNSYLVANIA.

## PUMPING MACHINERY.

SPECIFICATION forming part of Letters Patent No. 517,449, dated April 3, 1894.

Application filed January 2, 1892. Serial No. 416,900. (No model.)

*To all whom it may concern:*

Be it known that I, MORRISON FOSTER, of the borough of Sewickley, in the county of Allegheny and State of Pennsylvania, have invented a new and useful Improvement in Pumping Machinery, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming part of this specification, in which—

Figure 1 represents a side elevation, and Fig. 2 a vertical longitudinal section of a pump constructed on my new plan.

Like symbols of reference indicate like parts in each.

My invention relates to machinery or pumps for elevating water or other liquids. Two vertical tubular pump plungers and working chambers are used, the plungers rising and falling alternately, and the object of my invention is to utilize the weight of the water or liquid in the one column as a counterpoise to the weight of liquid in the other column, and to thereby reduce to the minimum the amount of power necessary to raise a given quantity of liquid to a higher level.

In the drawings the upright parts of the pump are shown broken, as they will necessarily be constructed of variable lengths according to the height the liquid is to be elevated.

I will now proceed to describe my invention so that others skilled in the art can make and use the same. The pump is constructed of iron or other suitable material.

In the accompanying drawings A and B represent two vertical hollow plungers having hollow stems  $A^2 B^2$  of smaller diameter. These are hung at either end of a cross-arm or rocking beam C, which is pivoted at the center upon a working journal  $a$  the bearing of which is a stud fixed to a stationary stand-pipe D. The cross arm C is in this case bent at an angle of about seventy degrees. The stand pipe D rests upon and communicates at its lower end with the cross-pipe  $b$  and being closed at the top acts also as a fixed air chamber for regulating the action of the pump.

E and F are the working chambers of the pump, in which the plungers A—B work. These working chambers are connected by horizontal cross-pipes  $b—c—$ , which are in turn connected by a perpendicular pipe  $d$ .

G and H are extension rods connected at top with the working journals  $e, f$ , at either end of the cross-arm or rocking beam C and at bottom with the working journals  $g, h$  on the hollow stems  $A^2 B^2$  of the plungers A, B. These extension rods cause the plungers to work up and down when C is operated by power applied to the handle I.

$i, j$ , are check valves in the hollow plungers A, B., smaller in area than the inside of the plungers. Ball valves are shown in the drawings.  $k, l$ , are beveled stoppers or valves which fit in the chamfered ends of the hollow plungers A, B; closing the latter respectively when either descends below cross-pipe  $b$ . These stoppers are preferably of same area as that of the hollow plungers. The stoppers  $k, l$ , are fixed to the tops of stems  $m, n$ , which work perpendicularly in the chambers E, F, through holes in the bottom of cross-pipe  $c$ .

$o, p$ , are heads upon the lower ends of the stems  $m, n$ , to prevent them from passing upward beyond the bottoms of the chambers E, F.

$s, s$ , are spiral springs attached to the stoppers  $k, l$ , to aid in raising them as the plungers A, B, alternately recede from them.

J is a supply valve through which the liquid to be elevated is admitted to the pump chambers.

$t, u$ , are recesses into which the stems  $m, n$ , sink when the stoppers  $k, l$ , are depressed by the plungers A, B.

K is a cross-pipe attached to top of stand-pipe D (but not communicating therewith) having right angle extensions or branches  $v, w$ , depending from either end of it; and an orifice  $x$  through which the elevated water or liquid escapes. Into these depending pipes  $v, w$ , the upper ends of the hollow stems  $A^2 B^2$  of the plungers work and by  $v, w$ , are guided vertically.

The operation of these devices is as follows: The working chambers of the pump are placed in the water or liquid to be elevated so that the valve J shall be well below the surface or indeed the cross-pipe  $b$  may be below the surface. Hollow plunger A being at bottom of chamber E and plunger B at top of chamber F the handle I is depressed which causes the plunger A to rise and plunger B to move downward. I wish it to be observed that at this stage of operations plunger A rises much



faster than plunger B falls. When plunger  
 A has risen about two thirds of the way plun-  
 ger B has fallen only about one third of the  
 way. From this point plunger A rises more  
 5 slowly than it did and plunger B descends  
 more rapidly than it did so that when the  
 bottom of plunger A has reached the top of  
 its course plunger B is at the bottom of cham-  
 10 ber F. In this and the manner of its accom-  
 plishment consists one of the features of my  
 invention. The radius on which the journal  
 pins *e* and *f* move at the lower part of their  
 course is nearly on the perpendicular plane  
 15 on which the plunger stems  $A^2$ ,  $B^2$  move while  
 at the upper part of their course it inclines  
 rapidly away from that plane toward the  
 central stand pipe D. The plungers A and  
 B therefore move vertically much faster at the  
 20 lower part of their course than at the upper  
 part of it, whether ascending or descending.  
 The suction produced by plunger A in rising  
 causes the main valve J to open and the small  
 valve *j* in plunger B to shut, the small valve  
 25 *i* being already shut, and followed closely by  
 the stopper *k*. A supply of liquid rushes in  
 through valve J to fill the vacuum caused by  
 the suction of plunger A. The stopper *k*  
 rises with the plunger A until the former has  
 30 reached the lower side of the cross-pipe *b*  
 when it is prevented from rising farther by  
 the head, *o*, on the lower end of the stem *m*.  
 Plunger A continues to rise, but slowly now,  
 and the descending plunger B having reached  
 the stopper *l* (which closes up the lower end  
 35 of B) falls rapidly; valve J shuts and valve  
*i* opens. The pressure of plunger B in its  
 descent forces the liquid by way of pipes *c*,  
*d*, and *b*, up through valve *i*, the hollow plun-  
 ger A and the hollow stem  $A^2$ . As plunger  
 40 B is now descending faster than A is rising,  
 the pressure causes the surplus liquid to find  
 exit at the top of the hollow stem  $A^2$  by way  
 of the depending pipe *v* into the cross-pipe  
 K and out at the orifice *c*. By raising the

handle I the operation is reversed. Plunger 45  
 B rises drawing in more liquid through valve  
 J. Stopper *l* rises to lower side of cross-pipe  
*b*. Plunger A descends, valve *i* shuts, stop-  
 per *k* closes the mouth of plunger A, valve *j*  
 opens, and aided by the weight of liquid in 50  
 A and  $A^2$  another quantity of liquid is forced  
 by A out by way of pipes *c*, *d*, and *b*, valve  
*j*, hollow stem  $B^2$ , pipes *w* and K and orifice  
*x*. The flow of liquid continues from *x* as  
 long as the handle I is operated. 55

It is not essential to use hollow sucker rods  
 $A^2$ ,  $B^2$  in order to operate this system of pump-  
 ing liquids. It can be accomplished also by  
 carrying the working chambers E, F. up above  
 the full stroke of the tops of the plungers A. 60  
 B. thence by a side extension pipe attached  
 rigidly at top to cross pipe K and communi-  
 cating therewith, conveying the elevated liq-  
 uid to K; and operating the plungers through  
 holes in the caps of the working chambers by 65  
 means of ordinary solid sucker rods forked  
 at the lower end where they attach to the  
 plungers A, B. so that the liquid may pass  
 freely through the hollow plungers and out  
 at the upper part of the working chambers. 70

I claim as my invention—

In a pump, the combination, with two com-  
 municating cylinders, of valved plungers re-  
 ciprocating therein, valves in said cylinders  
 constructed to close the ports in said plun- 75  
 gers when engaged thereby, moving and lim-  
 iting devices applied to said valves whereby  
 they engage the plungers and move with the  
 same during part of their stroke, all substan-  
 tially as described, whereby each plunger acts 80  
 during such portion of its stroke as a forcing  
 plunger to force liquid through the other  
 plunger.

MORRISON FOSTER.

Witnesses:

JOS. P. RANKIN,  
 P. P. KNAPP.

Correction in Letters Patent No. 517,449.

It is hereby certified that in Letters Patent No. 517,449, granted April 3, 1894, upon the application of Morrison Foster, of Sewickley, Pennsylvania, for an improvement in "Pumping Machinery," an error appears in the printed specification requiring the following correction, viz: On page 2, in line 44, the reference letter "c" should be *x*; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed, countersigned, and sealed this 17th day of April, A. D. 1894.

[SEAL.]

Countersigned:

JOHN S. SEYMOUR,  
*Commissioner of Patents.*

JNO. M. REYNOLDS,  
*Assistant Secretary of the Interior.*