P. F. POWERS.

Improvement in Hydraulic Apparatus.

No. 114,339. Patented May 2, 1871.

Fig. 1.

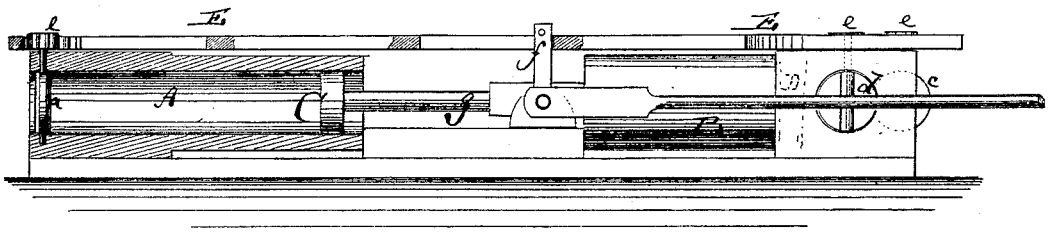
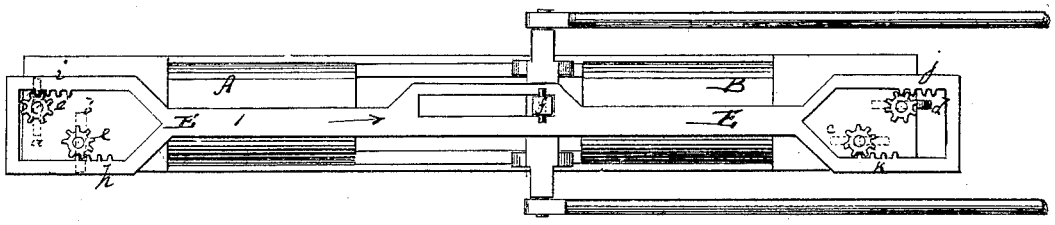


Fig. 2.



Witnesses:

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UNITED STATES PATENT OFFICE.

PHINEAS FRANKLIN POWERS, OF GENOA, NEVADA.

IMPROVEMENT IN HYDRAULIC APPARATUS.

Specification forming part of Letters Patent No. **114,339**, dated May 2, 1871.

To all whom it may concern:

Be it known that I, PHINEAS FRANKLIN POWERS, of Genoa, in the county of Douglas and State of Nevada, have invented a new and Improved Hydraulic Engine; and I do hereby declare that the following is a full, clear, and exact description thereof, which will enable others skilled in the art to make and use the same, reference being had to the accompanying drawing, forming part of this specification, in which—

Figure 1 represents a side view of my improved hydraulic engine. Fig. 2 is a plan or top view of the same.

Similar letters of reference indicate corresponding parts.

This invention relates to a new apparatus for operating the inlet and exhaust valves of all kinds of hydraulic engines, with a view of obtaining absolute exactness in their operation.

The invention consists in the use of a reciprocating rack, which is, by toothed segments or pinions, connected with the pivots of the several valves, so as to operate them all at once.

A B in the drawing are the two cylinders of a double-acting engine or pump. C D are the pistons in the same. They are connected by a rod, *g*, to move simultaneously.

The cylinder A is provided with the inlet-valve *a* and outlet-valve *b*, while the cylinder B has the inlet-valve *c* and outlet-valve *d*. Each of these valves is made in form of a plate or disk, turning on a vertical arbor. The upper end of each valve-arbor carries a toothed segment or pinion, *e*.

E is a longitudinal bar, arranged to slide on the two cylinders, a pin, *f*, which projects from the rod *g*, passing through a slot of the same. The ends of the bar E are provided with double racks, as shown in Fig. 2, to mesh into the pinions of the inlet and outlet valves, respectively.

The operation is as follows: When the pistons have moved in the direction of the arrow shown in Fig. 2 the pin *f* has, at the end of the stroke, carried the bar E in the same direction, thereby causing the rack *h* to open the valve *b*, while the rack *i* closes the valve *a*, and the rack *j* opens *d*, while *k* closes *c*, the position of the several valves being so indicated by dotted lines in Fig. 2. The valves are thereby set to let the course of the pistons be reversed, and will remain so until the end of the next stroke has been reached, when the valves *b* and *d* will be closed, while *a* and *c* are opened, to again reverse the motion of the pistons.

The pinions *e* or segments are sufficiently small to let the action of the racks upon the valves be rapid, so that they will be moved only at the very end of each stroke.

Having thus described my invention, I claim as new and desire to secure by Letters Patent—

The slide E, carrying the quadruple rack for setting simultaneously the inlet and outlet valves of two cylinders, substantially as herein shown and described.

PHINEAS FRANKLIN POWERS.

Witnesses:

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