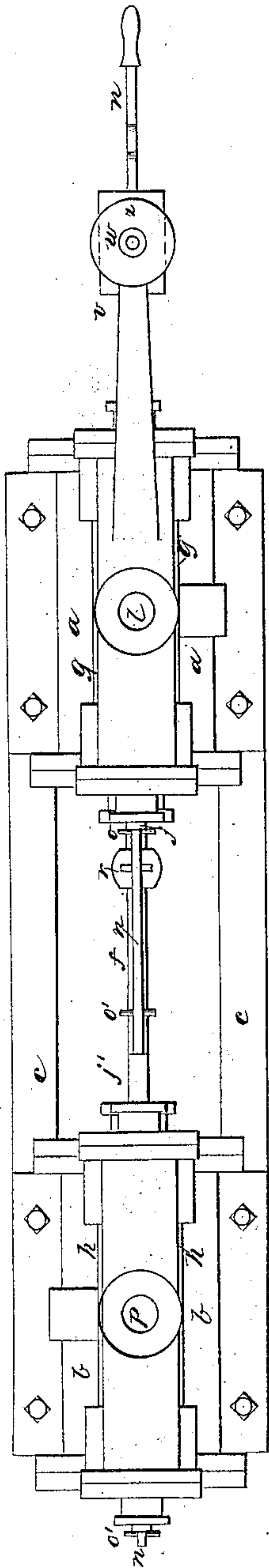


*T. Hanson,*  
*Steam Pump.*

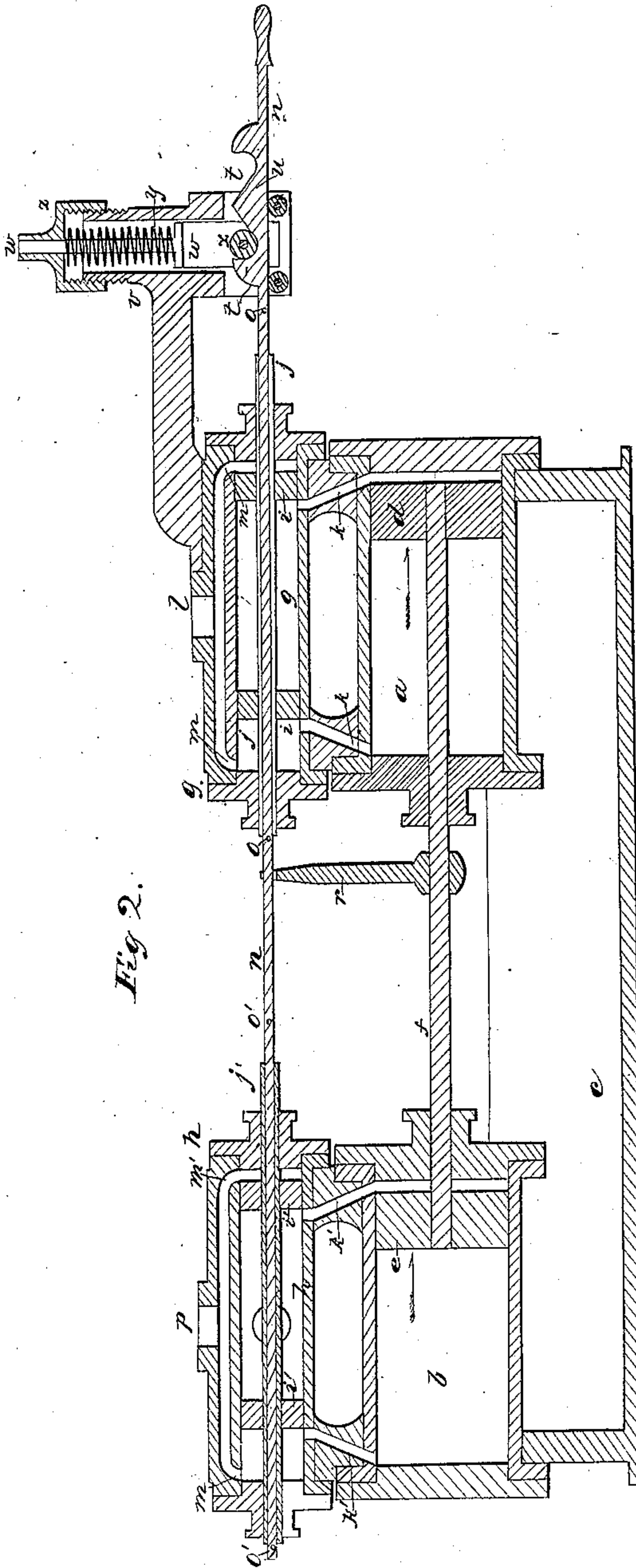
*N<sup>o</sup> 40,749.*

*Patented Dec. 1, 1863.*

*Fig. 1*



*Fig. 2.*



*Witnesses:*  
*W. H. H. H. H.*  
*A. A. A.*

*Inventor:*  
*Thomas Hanson*



# UNITED STATES PATENT OFFICE.

THOMAS HANSON, OF NEW YORK, N. Y.

## IMPROVEMENT IN DIRECT-ACTING ENGINES.

Specification forming part of Letters Patent No. 40,749, dated December 1, 1863.

*To all whom it may concern:*

Be it known that I, THOMAS HANSON, of the city, county, and State of New York, have invented a new and useful Improvement in Engines and Pumps; and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, making part of this specification, in which—

Figure 1 is a plan, and Fig. 2 a longitudinal vertical section.

The same letters indicate like parts in all the figures.

In the accompanying drawings, *a* represents the steam-cylinder, and *b* the pump cylinder, both properly secured to the bed-plate *c*. The steam-piston *d* and the pump-piston *e*, properly fitted to their cylinders, are both secured to the same piston-rod *f*, so that the former shall work the latter, the said piston-rod working in suitable stuffing-boxes in manner well known to engineers. Above the steam-cylinder *a*, and parallel with it, there is a smaller cylinder, *g*, which is in fact the steam-chest, and there is a like small cylinder, *h*, above the pump-cylinder *b*, and bearing the same relations to it. These two small cylinders, *g* and *h*, are each provided with two small valve-pistons, *i i* and *i' i'*. The two piston-valves *i i* are attached to a tubular rod, *j*, and the piston-valves *i' i'* are in like manner attached to a similar tubular rod, *j'*, both rods being fitted to work in suitable stuffing-boxes in the ends of the two valve-cylinders *g* and *h*. Both ends of the steam-cylinder *a* communicate with its valve cylinder or steam-chest *g* by ports *k k*—one at each end—and in turn the valve-cylinder or steam-chest communicates with the exhaust-pipe *l* by two exhaust-ports, *m m*, which two latter are nearer the ends of the valve-cylinder than the ports *k k*, leading to the steam-cylinder. The exhaust-ports *m m* are at the extreme ends of the valve cylinder, and the induction ports *k k* are so far from the ends of the valve-cylinder that the piston-valves *i i*, when at that part of their stroke nearest the end of the valve-cylinder, will be between the induction and eduction ports and without covering either, so that in such position steam will pass from the steam chest or valve-cylinder into that end of the cylinder, the communication from the steam-cylinder to

the exhaust being shut off by the interposition of the piston-valve. At the other end, for the time being, the steam and the exhaust ports are in communication. The pump-cylinder *b* communicates with its valve-cylinder or water chamber *h* in like manner as the steam-cylinder by means of two water-ports, *k' k'*, and in turn this valve-cylinder in like manner communicates with the water-eduction pipe *p* by means of two eduction-ports, *m' m'*. A cam-rod, *n*, extends entirely through the two tubular valve-rods *j* and *j'*, and it is provided with two sets of tappets, *o o* and *o' o'*, and as the cam-rod reciprocates the tappets strike alternately against the opposite ends of the valve-rods *j* and *j'* to shift the piston-valves to reverse the motion of the steam-piston and to reverse the water-ways of the pump, as required. The piston-rod *f* carries a tappet-arm, *r*, the upper end of which is forked to embrace and slide on the cam-rod *n* and alternately strike the two inner tappets, *o* and *o'*, for the purpose of giving a reciprocating motion to the said cam-rod for the purpose of shifting the piston-valves at the end of each stroke. The position of the tappets *o o* and *o' o'* relatively to the tappet arm, and its range of motion with the steam and water pistons, and the length of the tubular valve-rods, must be such that at the end of each stroke the four piston-valves shall be moved the required distance for opening and closing the required ports, as above described.

To insure an efficient motion of the valves, and to avoid the violent concussions which would result if the entire valve-motion was given directly by the tappet of the steam-piston, and to avoid giving too great a range of motion to the valves, the rod *n* is provided with a cam-like projection, *t*, in the form of a double inclined plane, *u*. This part of the rod slides in a guide-mortise in a bracket-piece, *v*, and to suitable ways in this bracket is fitted a vertically-sliding rod, *w*, which carries a roller, *x*, that rides and is borne down upon the cam-like projection *t* of the rod by the tension of a helical spring, *y*, which surrounds the rod *w*, and which is held down and its tension regulated by a cap-nut, *z*. By this means so soon as the tappet-arm *r* of the piston-rod has moved the cam-rod *n* so far as to carry the apex of its cam-like projection under



the roller  $x$ , the pressure of this roller, acting on the opposite inclined face of the cam-like projection  $t$ , will move the rod to complete its motion, and with greater velocity than that of the piston. Just before the steam and water pistons complete their stroke in the direction of the arrow, and just before the apex of the cam-like projection  $t$  of the rod  $n$  reaches the central line of the roller  $x$ , the inner one of the tappets  $o$ , and the outer one of the tappets  $o'$  both come into contact with their corresponding ends of the tubular valve-rods  $j$  and  $j'$  to begin to shift the piston-valves, whose movements are then completed by the pressure of the roller  $x$  on the inclined face of the cam-like projection  $t$ . The like operation takes place in the reverse direction when the pistons  $e$   $d$  are operated in the reverse direction of the arrow. Were it not for the lost motion between the tappets and the tubular valve-rods after the tappet-arm strikes the tappets, the valve would have much too great a range of motion to work advantageously.

The steam, the pump, and the valve pistons may be packed in any suitable manner well known to engineers, and therefore not necessary to be herein described or represented.

By the simple arrangement above described a very cheap and efficient reciprocating pump

can be made, and one less liable to wear and tear than any heretofore made.

In any situation commanding a sufficient head of water the engine, instead of being worked by steam, may be worked by water.

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

1. The employment of two piston-valves attached to a tubular valve stem, substantially as described, in combination with the rod sliding in the said valve-stems and operated at first by a tappet-arm on the piston-rod, and then by pressure on its cam, and communicating motion to the valve-rods by a lost motion, substantially as described.

2. Combining the piston-valves of the pump with the piston-valves of the engine by a rod passing through and working in the tubular stems of the said valves to operate them, in combination with the mode of operating the said rod partly by a tappet on the piston rod and partly by pressure on the double inclined cam attached to the said rod, substantially as and for the purpose described.

THOMAS HANSON.

Witnesses:

A. DE LACY,  
WM. H. BISHOP.