THOMAS HANSON.

Direct Acting Engines.

No. 116,051.

Patented June 20, 1871.

Fig: 1.

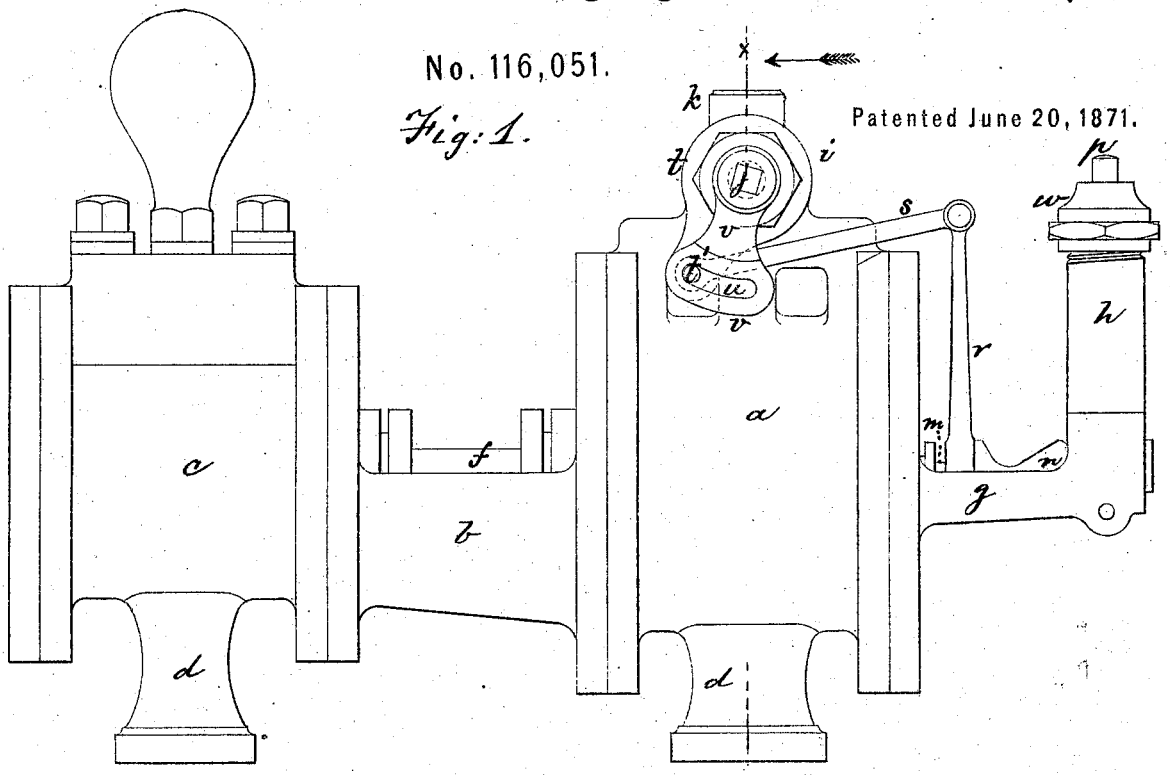


Fig: 3. x x.

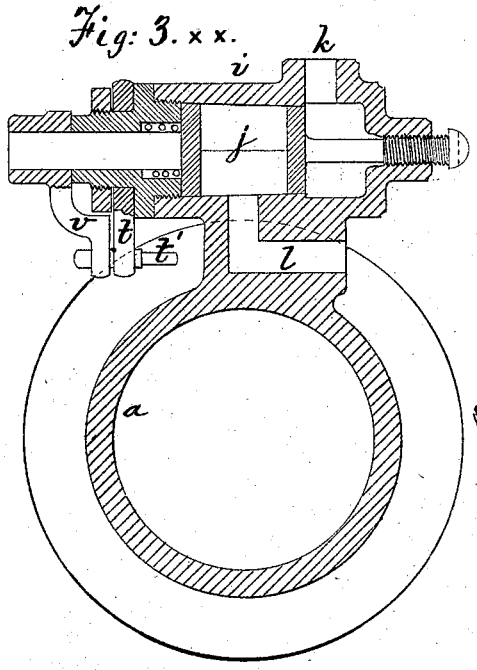
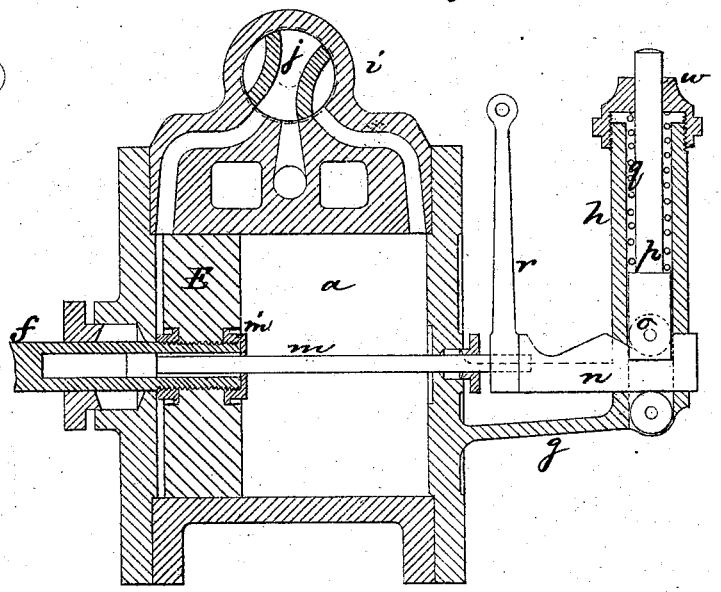


Fig: 2.



Witnesses
W. H. Bishop
F. L. Matthews

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. 116,051, dated June 20, 1871.

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 Direct-Acting Engines; and I do hereby declare that the following is a full, clear, and exact description of the same, reference being had to the annexed drawing forming a part of this specification, in which—

Figure 1 is a side elevation. Fig. 2 is a partial vertical longitudinal section through the center of the steam-cylinder, and Fig. 3 is a vertical cross-section at the lines *x x* of Fig. 1.

In the several figures the same part is designated by the same letter of reference.

Various means have been adopted for working the steam-valve by motion derived from the reciprocation of the piston of the steam-cylinder, and various kinds of valve-gear have been employed.

My invention has for its object a simple and efficient construction or combination of devices by which the valve, through which the steam is admitted to and exhausted from each end of the cylinder alternately, is worked directly from the piston-rod; and to this end my invention consists in the combination, with the piston and valve, of a valve-rod, which has a reciprocating motion imparted to it by the combined action of the piston at each stroke and an automatic spring-cam, as hereinafter more fully explained, and which, through suitable connections, operates the steam-valve, and thus regulates the passage of the steam to and from the steam and exhaust ports of the cylinder, all as hereinafter more fully explained.

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

In the annexed drawing, *a* represents the steam-cylinder, which is made about as usual, and it is shown connected, by a casting, *b*, to the pump-cylinder *c*, the whole being supported and secured, by suitable castings *d d*, to any desired foundation. The pump-cylinder *c* is operated, with its piston, induction and eduction pipes, and valves, in the usual way. E is the steam-piston, and *f* the piston-rod, which, as is customary in direct-acting steam-pumps, passes from the steam-cylinder into the pump-cylinder. From the outer head of the steam-cylinder *a* there projects an arm, *g*, which supports at its outer end a hollow vertical standard, *h*, in which are formed the bearing of and in which work the valve-actuating mechanism, as will be presently explained. On the top of the steam-cylinder is a hollow casting or pipe, *i*, the interior of which communicates with the steam and exhaust ports of the cylinder, and in which is arranged and works a cylindrical valve or three-way cock, *j*. This pipe *i* constitutes really the steam-chest, and from it extends the exhaust-pipe *k*, and it receives steam through the cock *j* from the steam-pipe *l*. The end of the piston-rod which operates the steam-piston is bored out a sufficient depth—say about nine inches in depth for a cylinder ten inches in length—for the reception of one end of a valve-rod, *m*, the inner end of which is formed with a short head, and it passes through a nut, *m'*, screwed onto the end of the piston-rod, and thence it passes out through the head of the steam-cylinder, as shown, being provided with a suitable stuffing-box. This rod *m* is so fitted into the bore of the piston-rod as to have a certain amount of end-play, and its outer end is attached to a double-cam bar, *n*, the form of which is clearly shown in Fig. 2. This cam-bar *n* is in the form of a double-inclined plane, and it is operated upon by a caster-wheel or roller, *o*, in the lower end of a rod, *p*, and this rod is forced continually downward by a pressure-spring, *q*. On the valve-rod *m* is keyed one end of an arm, *r*, which extends upward, and has connected to it one end of a bar, *s*, which at its other end is pivoted to the lower portion of a crank-plate or arm, *t*, that is hung loosely on the axis of the steam-valve or three-way cock *j;* and a pin or tappet, *t'*, projects from the said crank-plate and works in a curved slot, *u*, of another arm or plate, *v*, which is secured fast on, and which serves to turn, the cock or steam-valve. The pump and steam-valves and pistons may be packed in any effective manner well known to engineers, and therefore not necessary to be described or represented.

The operation of my improved engine may be thus explained: When steam is admitted through the cock *j* to one end of the steam-cylinder, and the piston, with its rod, moved to-

ward the other end, the piston, after having made a portion of its stroke, brings the bottom of the bore in the piston-rod against the short head on the inner end of the rod *m*, and hence carries along with it the said rod *m*, which carries the double-cam bar *n;* and when the latter has been forced so far as to bring the apex of the double-inclined cam beneath the pressure-roller *o*, the latter acts upon the opposite inclined face of the said cam, and causes it to complete its motion or stroke in the direction in which it was moved by the piston-rod at a greater velocity than that of the steam-piston, or to run ahead of the piston; and this accelerated motion of the said cam-bar and its rod *m* effects the shifting of the steam-valve *j* by the time the piston has reached the end of its stroke, for during this last part of the stroke of the rod *m*, or that part of its stroke which is accelerated by the action of the pressure-roller on the cam, the pin or tappet *t'* passes up to the end of the slot *u* and moves the plate *v* about one-sixth of a revolution, or so as to turn the steam-cock or valve *j* about one-sixth of a revolution and change the supply of steam to the opposite end of the cylinder. The steam-piston is now driven in the opposite direction, and after having made a portion of its stroke the nut *m'* acts against the short head on the inner end of the rod *m* and carries along with it the said rod and its cam-bar, which, before the steam-piston reaches the end of its stroke, are forced ahead by the pressure-roller *o* acting on the inclined surface of the cam, and thus again shifting the valve. In this way the operation is repeated at each stroke of the piston.

The pressure of the spring, which forces the roller *o* down onto the cam-plate, may be regulated by a cap-piece, *w*, or in any other desirable manner; and the details of construction and the proportion of the different parts may, of course, be varied at the discretion of the constructor.

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

In combination with the steam-piston and valve, the employment of the valve-rod *m*, working in the semi-hollow piston-rod for the purpose of operating the steam-valve mechanism, and which receives its motion at each stroke of the piston partially from the piston-rod and partially from a driving-spring and cam, substantially in the manner described.

In testimony whereof I have hereunto set my hand this 1st day of May, 1871.

THOMAS HANSON.

Witnesses:

WM. H. BISHOP,

F. L. MATHEWS.