2 Sheets – Sheet 1.

A. S. Cameron's Imp.d Valve Gear.

Fig: 1.

112015

PATENTED FEB 21 1871

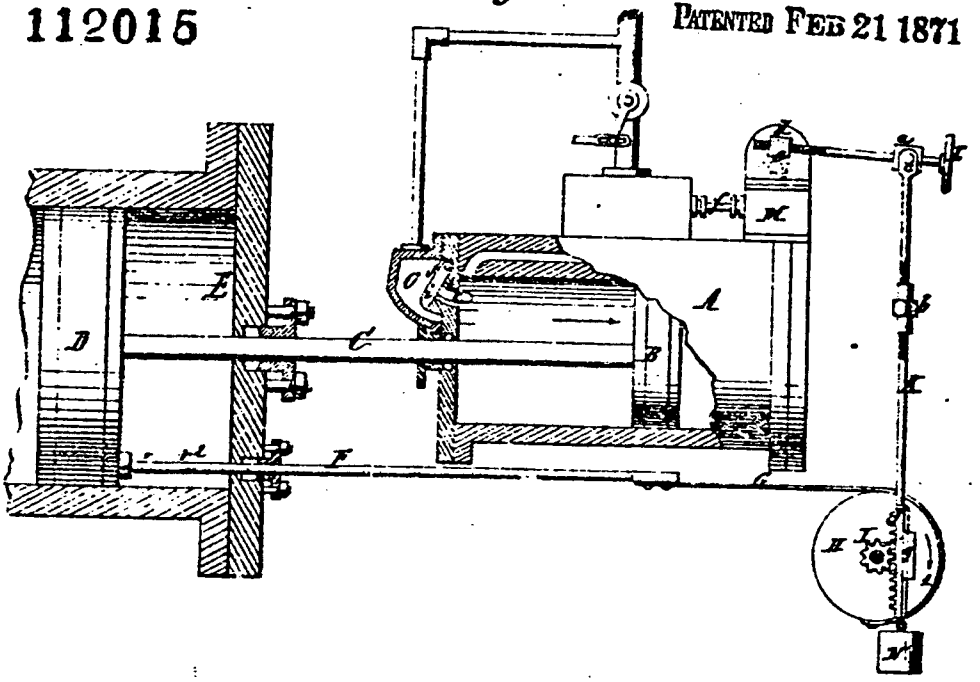
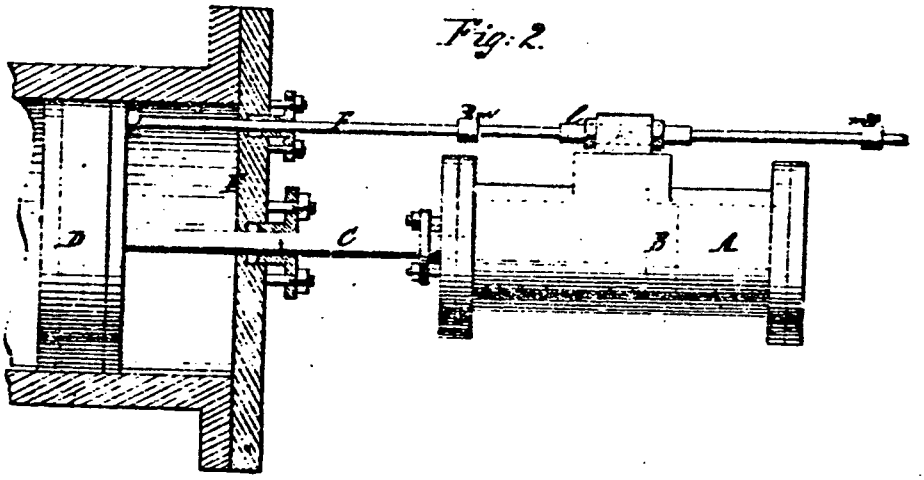


Fig: 2.



Witnesses:
C. Wahlers
E. F. Hastenbeck

Inventor:
Adam S. Cameron
per
Van Santvoord & Hopkins
Attys.

2. Sheets, Sheet 2.

A. S. Cameron,

Valve Gear.

No. 112,015. Patented Feb. 21. 1871.

Fig: 3.

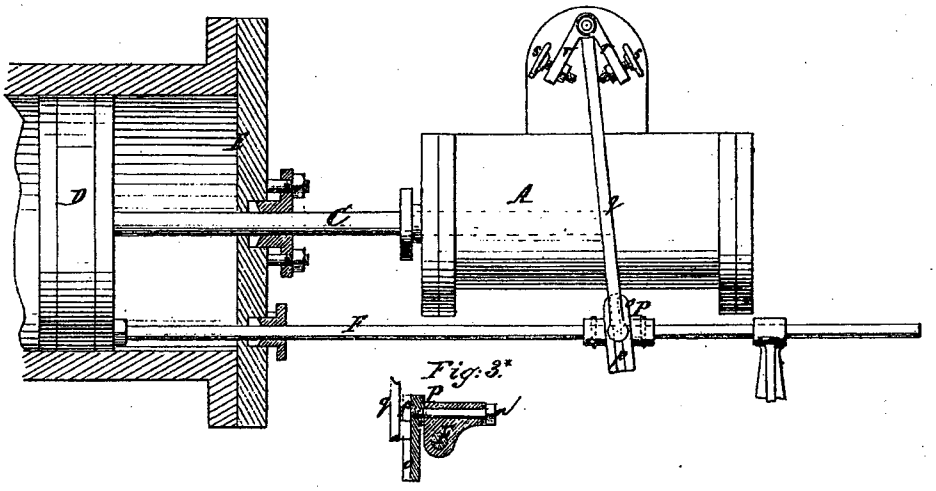
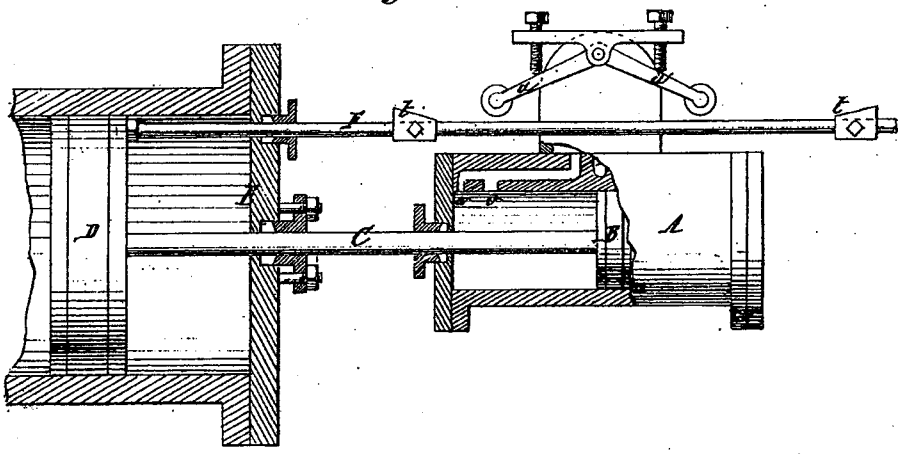


Fig: 4.



Witnesses:
C. Wahlers
E. F. Kastenhuber

Inventor:
Adam S. Cameron
by
Van Santvoord & Hamp
Attys

M. PETERS, PHOTO-LITHOGRAPHER, WASHINGTON, D. C.

UNITED STATES PATENT OFFICE.

ADAM S. CAMERON, OF NEW YORK, N. Y.

IMPROVEMENT IN VALVE-GEARS FOR DIRECT-ACTING ENGINES.

Specification forming part of Letters Patent No. **112,015**, dated February 21, 1871.

To all whom it may concern:

Be it known that I, ADAM S. CAMERON, of the city, county, and State of New York, have invented a new and Improved Valve-Gear for Direct-Acting Engines; and I do hereby declare the following to be a full, clear, and exact description thereof, which will enable those skilled in the art to make and use the same, reference being had to the accompanying drawing, forming part of this specification, in which drawing—

Figure 1 represents a sectional side view of my invention. Figs. 2, 3, and 4 represent modifications of the mechanism illustrated in Fig. 1.

Similar letters indicate corresponding parts.

This invention relates to a direct-acting engine in which the valve of the auxiliary or main steam-cylinder is actuated by means of a rod secured to the piston of the pumping-cylinder and extending alongside of the steam-cylinder, or vice versa, in such a manner that the steam-cylinder and the pumping-cylinder can be placed as close together as may be desired, and at the same time a positive motion is imparted to the steam-valve.

This invention also relates to the arrangement of steam-chambers in the heads of the steam-cylinder, said heads being provided with seats for valves, which are situated in the steam-chambers, and from which extend arms in the interior of the cylinder in such a manner that, whenever the piston approaches the end of its stroke, one of said valves is opened, and the steam admitted to the cylinder serves to cushion the piston.

In carrying out this invention I use, by preference, a mechanism such as shown in Fig. 1; but it is obvious that this mechanism may undergo various modifications—such, for instance, as I have shown in Figs. 2, 3, and 4.

In the drawing, the letter A designates the steam-cylinder of a direct-acting engine, which is provided with a piston, B, connected by means of a rod, C, with the piston D of the pumping or blowing cylinder E. The diameter or bore of this last-named cylinder is usually much greater than that of the steam-cylinder, so that a rod, F, secured to the piston D, can be made to extend alongside of the steam-cylinder. To this rod I secure one end of a flexible band, G, of metal or other suitable material, and this band is carried round a drum, H, and fastened at its other end to the circumference thereof. With the drum H is connected a cog-wheel, I, which gears in a toothed rack, J, and a rod, K, extends from this rack to a sleeve, *a*, which is fitted on a hand-screw, L. The rod K is made in sections, which are united by a screw-coupling, *b*, so that it (the rod) can be lengthened or shortened, as may be desired; and the connection between said rod and the sleeve *a* is effected by a pivot, *c*, so as to allow the same to accommodate itself to the varying positions of the sleeve, said sleeve being attached to the screw, so that it turns freely thereon without being permitted to move in the direction of its axis. The screw L is tapped into the head *d* of the spindle *e*, from which extends a toe, intended to impart motion to the valve of the auxiliary cylinder M, the piston of this auxiliary cylinder being connected by a rod, *f*, to the main valve.

To the bottom end of the toothed rack J is attached a weight, N, which has a tendency to turn the drum H in the direction of arrow 1, (marked thereon in Fig. 1,) and a bracket, *g*, which projects over the rear edge of said rack, prevents the same from getting out of gear with the cog-wheel I. This bracket, being made to swing on the axis of the drum H, accommodates itself to the angle of the rack J.

When the piston D moves in the direction of the arrow 2, Fig. 1, the rack J is carried down by its weight N, and the screw L turns down, causing the auxiliary valve to move and to change the main valve to admit steam at the outer end of the steam-cylinder.

When the piston D is moved in the direction opposite to arrow 2 the band G is unwound from the band H, and the said drum is turned in the opposite direction to the arrow 1. The rack J is raised and the screw L is swung up, causing the auxiliary valve to move so as to admit steam at the inner end of the steam-cylinder.

By turning the screw L in or out the distance between the pivot *c* and the head *d* of the valve-spindle can be shortened or lengthened, and the time when the steam is changed in the auxiliary and main cylinders can be ac-

commodated to the speed at which the main piston travels.

On the heads of the steam-cylinders I form chambers O, which are supplied with live steam from behind the throttle, and which communicate with the interior of the cylinder through apertures *h*. These apertures are covered each by a valve, *i*, which swings on a pivot, *j*, and from which extends a tappet, *k*, into the interior of the cylinder.

From this description it will be understood that the valves *i* are kept closed by the pressure of the steam acting on their backs; but if the piston strikes one of the tappet-arms *k* the appropriate valve is opened, and the steam admitted to the cylinder cushions the piston.

The distance to which the tappet-arms *k* extend into the cylinder may be greater or lesser, according to the desired mean speed of the piston; and, if desired, said tappet-arms may be made adjustable, so that the distance to which they project into the cylinder can be accommodated to different speeds.

The connection between the rod F, which extends from the piston D alongside the piston A, and the valve of the auxiliary or main cylinder may be modified in various different ways—such, for instance, as shown in Figs. 2, 3, and 4.

In Fig. 2 the rod F extends through a tube, *l*, which slides in stuffing-boxes in the valve-chest of the auxiliary cylinder and carries the auxiliary valve. On the rod F are secured two tappets, *m*, one on each side of the valve-chest, and, by the action of these tappets on the tubular slide *l*, the valve is changed.

In Fig. 3 the rod F carries a bracket, P, a side view of which is shown in Fig. 3*. This bracket is firmly keyed to the rod F, and it carries a pivot, *n*, on the outer end of which swings a socket-piece, *o*, the socket *p* of which is intended to receive the end of an arm, *q*, which swings loosely on the valve-spindle *c*. On this spindle are firmly secured two arms, *r*, provided with set-screws *s*, and as the rod F is moved back and forth by the piston D the arm *q* alternately strikes one and then the other of the set-screws *s*, and thereby the valve is changed.

In Fig. 4 the rod F is provided with two cam-pieces, *t*, which act on arms *u*, mounted in the valve-spindle *c*, so as to change the steam at the proper intervals.

In either of these cases the main piston may be cushioned, in the manner shown in Fig. 1, by means of hinged valves *i* with tappets *k*; or, instead of this arrangement, the steam-ports *v* (see Fig. 4) may be located at such a distance from the cylinder-heads that the exhaust of the steam is stopped some time before the piston has traveled to the end of its stroke, secondary steam-ports *w* being provided, which are so small that they check the exhaust, and a sufficient quantity of steam is retained in the cylinder to cushion the piston. These secondary steam-ports also serve to admit a small quantity of steam to the cylinder to start the piston on its return-stroke until the same passes the main port, when the full head of steam begins to act on it.

It is obvious that the rod F may be fastened in the steam-piston, as well as in the pump-piston, without changing the result.

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

1. The arrangement of a rod, F, secured in one of the pistons of a direct-acting engine and extending alongside the other cylinder, said rod serving to actuate the steam-valve of the auxiliary or main cylinder, substantially in the manner herein shown and described.

2. The steam-chambers O, receiving steam from behind the throttle and valves *i*, provided with tappets *k*, extending into the steam-cylinder A, for the purpose of cushioning or arresting the steam-piston, substantially in the manner herein set forth.

This specification signed by me this 21st day of January, 1871.

A. S. CAMERON.

Witnesses:
W. HAUFF,
E. F. KASTENHUBER.