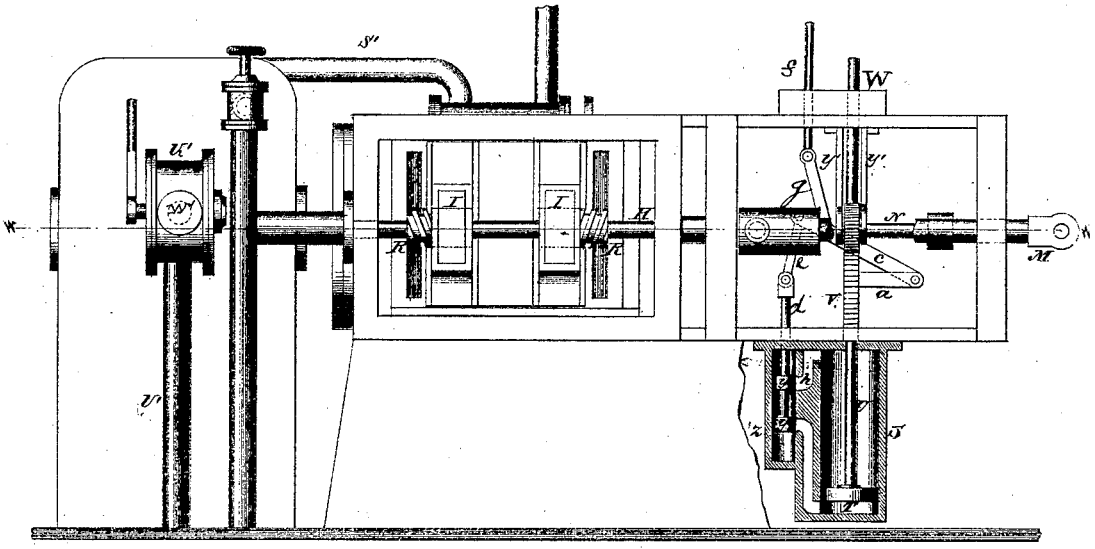
F. E. Kirby,

Cut Off Valve.

No. 108,156. Patented Oct. 11, 1870.

Fig. 1.



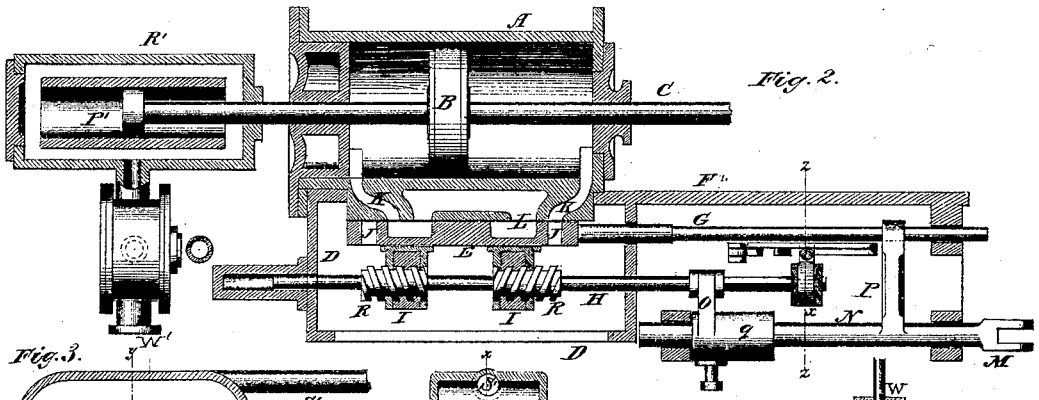


Fig. 2.

Fig. 3.

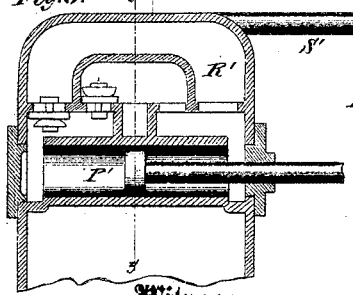


Fig. 4.

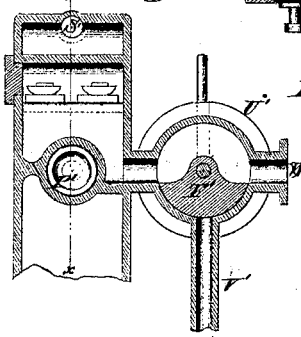
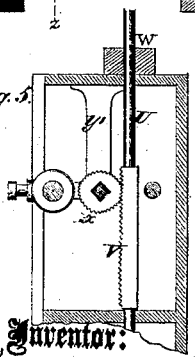


Fig. 5.



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FRANK E. KIRBY, OF NEW YORK, N. Y.

Letters Patent No. 108,156, dated October 11, 1870.

IMPROVEMENT IN STEAM-ENGINES.

The Schedule referred to in these Letters Patent and making part of the same

To all whom it may concern:

Be it known that I, FRANK E. KIRBY, of the city of New York, in the county and State of New York, have invented a new and useful Improvement in Steam-Engines; 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.

The object of this invention is to provide simple and efficient means for varying, according to the load or speed of the engine, the position of the cut-off valves over the ports, and on the back of the main slide valve, by means of which the requisite quantity of steam may be measured out for each stroke of the engine, according to the load or power required; and the invention consists in the application of an auxiliary cylinder and piston, for the use of either steam or liquid, the valve of which is actuated by the governor of the steam-engine, the piston-rod of which auxiliary cylinder is a cogged rack, engaging with a pinion on the cut-off valve-rod, or the equivalent of a rack and pinion, by means of which that valve-rod may be revolved, or otherwise moved, and by such revolution or movement to vary the position of the cut-off valves, the whole arranged and operating as hereinafter more fully set forth and described.

In the accompanying drawing—

Figure 1 represents a longitudinal back-side view of an engine-frame with the valve-gear exposed to view and showing my improvement.

Figure 2 is a horizontal section of fig. 1 on the line W W.

Figure 3 is a vertical section of fig. 4 on the line X X.

Figure 4 is a vertical section of fig. 3 on the line Y Y.

Figure 5 is a vertical section of fig. 2 on the line Z Z.

Similar letters of reference indicate corresponding parts.

A represents the cylinder of the engine.

B is the piston.

C is the piston-rod.

D is the steam-chest.

E is the slide valve.

F represents the engine-frame.

The mode of connecting the cylinder A with the frame, so as to project the cylinder into the steam-chest, and shorten the posts or passages, is seen in fig. 2.

G is the slide-valve rod.

H is the cut-off valve-rod.

I I represents the cut-off valve which works on the back of the main slide-valves.

J J are the steam-ports through the slide-valves, over which the cut-off valves work.

K K are the steam passages to the cylinder.

L represents the exhaust.

The rods G and H are actuated by a connection attached to the jaw M of the rod N, by means of the arms O and P.

The former is a portion of the sleeve *g*, which sleeve is adjustable on the rod N. The latter takes directly hold of the rod G.

It will be seen that the main slide-valves and the cut-off valves have the same longitudinal movement.

The cut-off valves are connected with the rod H by a right and left-hand screw, R R, and the valve-rod H is arranged so that it may, with the screws R R, be revolved, or partially revolved, as may be required, by which revolution, or partial revolution in either direction, the position of the valves is varied.

This arrangement of cut-off valves, operated by right and left-hand screws, on a valve-rod susceptible of rotary motion, I am aware is not new. Efforts have been made to rotate this valve-rod, and thereby make the proper adjustment of the valves automatic, by connecting it directly with the governor, but such connection has been found to interfere so materially with the proper action of the governor, and the governor itself being so imperfectly adapted for the purpose, when so connected, that such efforts have not proved successful. The method now, where this description of variable cut-off valve is used, is to rotate the rod and adjust the cut-off by hand.

My object has been to render the variable cut-off valves automatic, according to the requirements of the engine, by means of the governor, but in a manner which does not interfere with or entirely depend upon its action. For this purpose I provide the auxiliary cylinder S, placed in any convenient position.

T is the piston in this cylinder, and

U is the piston-rod, on which is a cogged rack V.

The upper end of the rod U passes up through the engine-frame, as seen at W, where it is supported in a vertical position, and so that it may be raised or lowered by hand, if desired.

X is a pinion, supported between the two hangers *y'*, from the frame of the engine.

This pinion has a square hole through it, and the end of the valve-rod H is made square, to fit the pinion loosely, so that there shall be no friction to interfere with the longitudinal movement of the rod. The rack V engages with the pinion X, and the valve-rod is given a rotating movement by the rise and fall or vertical movement of the rack. This vertical movement is produced by means of steam or water acting in the cylinder S on the piston T.

The steam or water, under boiler pressure, is admitted to the cylinder by means of balanced valves *y y* in the chamber Z.

This valve is connected with the governor by an arrangement seen in fig. 1.

a is an arm, extending horizontally from the rack V.

c is a lever, one end of which is pivoted to the arm *a*. The other end is connected with the end of the valve-rod *d* by the connecting-link *e*.

f is a rod, connected directly with the governor and with the lever *c* by the connecting-link *g*.

The steam or water is admitted to the ends of the valve-chest and exhausted between the valves *y y*, as indicated in the drawing.

By means of the lever *c*, any movement of the piston T causes a movement of the valve, which instantly closes the ports, and holds the piston and cut-off valves stationary, as regards the relation of the latter to the ports of the main valve. Any variation of the speed of the engine is manifested in the balls of the governor, which cause a movement in the valves *y y*, admitting steam or water, either above or below the piston T, causing a movement of that piston which varies the position of the cut-off valves, and also the position of the valves *y*, closing the ports of its own cylinder, without the intervention of or any variation in the balls of the governor.

The effect of varying the pressure on the piston T is to instantly vary the position of the cut-off valves, letting on or cutting off steam, and measuring it out for each stroke, to meet the requirements of the engine. This action, to be perfect, must be automatic.

The common centrifugal governor, unaided by other mechanism, is, at best, but a poor regulator of the steam-engine. When connected directly with a cut-off valve it cannot change its action with sufficient rapidity or uniformity to render it of any material value. By my arrangement, it will be seen, that the first slight variation of the balls does the work instantly and perfectly.

The left-hand portion of the figs. 1 and 2, and the detail views, figs. 3 and 4, illustrate a device for converting the air-pump P′ into an engine for extinguishing fires and forcing water.

P′ is the air-pump of the condenser R′, which connects with the exhaust of the steam-engine by the pipe S′.

By closing the exhaust-pipe S′ and lowering the valve T′, so as to close the water-induction pipe V′, and attaching a hose to the tube W′, I have a water-forcing engine of any required power.

Having thus described my invention,

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

1. In combination with the cut-off valve of a steam-engine, the auxiliary cylinder S, piston T and valves *y y*, for varying the position of the cut-off valves, substantially as described.

2. The valve-gear, composed of the lever *c*, arm *a*, and connections *e* and *g*, when the same are arranged to operate in connection with the governor and piston T, substantially as and for the purposes described.

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