Gates, Fraser & Chalmers,

Steam Cut-Off.

No. 21,668. Patented Oct. 5, 1858.

Fig. 1.

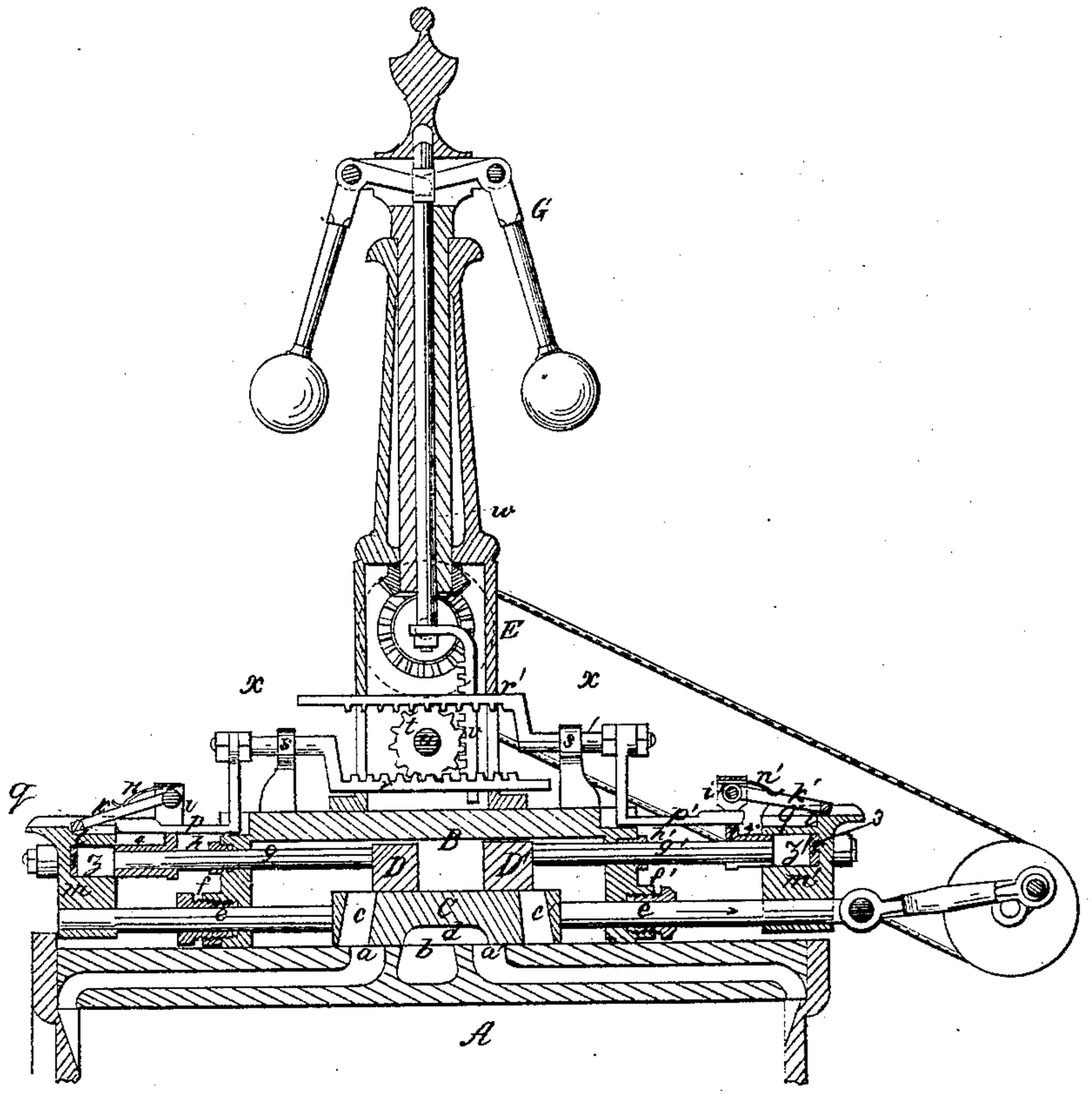
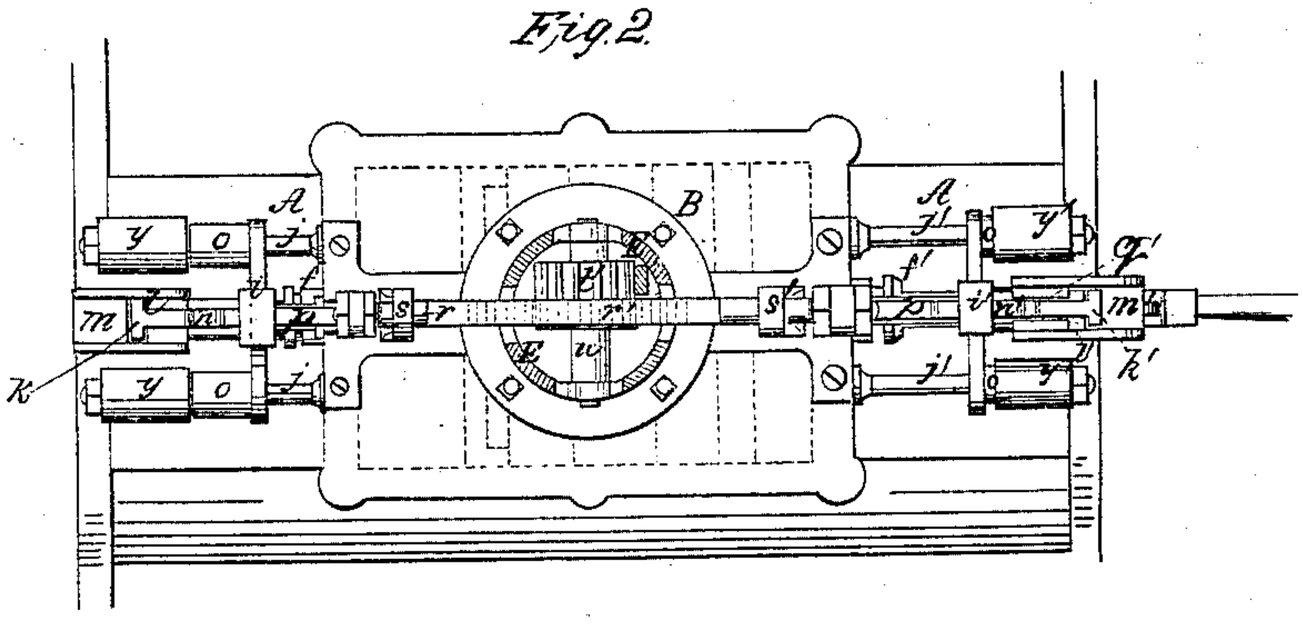


Fig. 2.



UNITED STATES PATENT OFFICE.

P. W. GATES, D. R. FRASER, AND THOMAS CHALMERS, OF CHICAGO, ILLINOIS.

GEARING OF CUT-OFF VALVES FOR STEAM-ENGINES.

Specification of Letters Patent No. 21,668, dated October 5, 1858.

To all whom it may concern:

Be it known that we, P. W. GATES, D. R. FRASER, and THOMAS CHALMERS, all of Chicago, in the county of Cook and State of Illinois, have invented a new and useful Improvement in Variable-Cut-Off Gear for Steam-Engines; and we do hereby declare that the following is a full, clear, and exact description of the same, reference being had to the accompanying drawings, forming part of this specification, in which—

Figure 1, is a longitudinal central section of part of the cylinder and valve-chest of a horizontal steam-engine, exhibiting the application of our improvement. Fig. 2, is a plan of all the parts below the line x, x, in Fig. 1.

Similar letters of reference indicate corresponding parts in both figures.

This invention consists in certain improved mechanism for operating two cut-off valves which are applied to the back of a slide valve which effects the induction and eduction of steam to and from an engine and which is capable of liberating the said cut-off valves at such point in the stroke of the engine-piston as may be determined by the operation of a governor or by a permanent adjustment as to allow them to be closed instantaneously to cut off the steam from the cylinder, either by the pressure of steam in the valve-chest or by other suitable means.

To enable others to make and use our invention, we will proceed to describe its construction and operation.

A, is the cylinder; B, is the valve chest.

a, a, are the steam ports, and b, the exhaust port of the cylinder.

C, is the main slide valve of the kind known as the "short slide," having two passages c, c', through it of a size to correspond with the ports a, a', and the usual exhaust cavity d, in its face. This valve has two stems e, e', one at each end, which pass through the ends of the valve chest and are packed by stuffing boxes f, f', therein and it may be operated by an eccentric or in any other well-known manner.

D, D′, are the two cut-off valves consisting of solid plates fitted to slide on the back of the valve and provided with separate stems g, g', passing through stuffing boxes h, h', in the ends of the valve chest. These are furnished outside the valve chest with cross-heads i, i', which work on fixed guide rods j, j, and j', j', and which carry two pawls k, k', one each, which pawls are capable of engaging respectively in notches l, l', in two blocks m, m', attached to the stems e, e', of the main valve. The said pawls have springs n, n', applied to force them into the notches as they arrive over them, and through their aid the cut-off valves are caused to be moved by and along with the main valve.

p, p', are two metal slides, fitted to slide in grooves g, g', in the tops of the heads m, m', and under the pawls k, k', for the purpose of throwing said pawls out of the notches to allow the cut-off valves to be moved by the pressure of steam to proper positions to cut off the steam from the ports a, a', by the pressure of steam from in the steam-chest acting opposite to their stems g, g'. These two slides pass freely through the crossheads i, i', and are connected rigidly with two toothed rack bars r, r, which work in guides s, s', on the top of the steam-chest and which gear on opposite sides of a pinion t, on a shaft u, which works in suitable bearings in a stand E, ereceted above the valve-chest. This shaft u, when turned, moves the rack-bars in opposite directions and serves to adjust the two slides p, p', to throw out the pawls k, k', from the notches l, l', and thus disconnect the cut-off valves from the main valve earlier or later in the stroke of the piston. The said shaft might be adjusted by hand to cut off at any point in the stroke that may be desired, but I have represented it and prefer to use it in connection with a governor, and to this end I employ upon it another pinion t', or extend the same pinion t, to a sufficient length to gear with a toothed rack v, on the regulating rod w, of the governor G. The stand E, which contains the bearings of the shaft u, also serves to support the governor. y, y, are stops attached to the guide rods j, j, for the purpose of arresting the crossheads of the cut-off valves and thereby stopping the said valves in proper position for the pawls k, k', to take hold of them as the main valve completes its stroke. These stops y, y, and y', y', are made hollow to contain india-rubber cushions and the cross-heads are furnished with piston-like projections o, o, and o', o', to come in contact with the rubber cushions to prevent violent concussions when the valves are thus arrested. The heads m, m', of the main valve stems are also provided with cavities Z, Z, (Fig. 1) at the backs of which are

india-rubber cushions 3, 3*, against which strike the ends of piston-like projections 4, 4*, on the crossheads *i*, *i*, to stop the cut-off valves in positions to close the ports *c*, *c'*, when they return after their pawls have been liberated from the main valve stem.

To illustrate more fully the operation of the cut-off gear, I will first suppose the slide valve to be in the position shown in Fig. 1, moving to the right hand as indicated by the arrow on one of its stems. It will be seen that the cut-off valve D is locked to the main valve by its pawl *k*, in a position to leave the port *c*, open, and the other valve D', is free of the main valve C, and supposed to be stopped by the stops *y'*, *y'*, shown in Fig. 2 and the passage *c'*, of the main valve is being uncovered by the movement of C. Steam is being admitted to the cylinder through *c*, *a*, and exhausted through *a'*, *d*. The pawl *k*, of the valve D, is just being brought by the simultaneous movement of the valves C, D, into contact with the slide *p*, and about to be raised out of the notch *l*; and as soon as this takes place, the valve D, will be instantaneously driven by the pressure of the steam opposite its rod, over the passage *c*, and the steam is thus cut off from the port *a*, during the remainder of the stroke of the main valve C. As the main valve C completes its stroke, the notch *l'*, coming under the pawl *k*, connects the cut-off valve D', and locks it so that the passage *c'*, will remain open during its return stroke till the pawl *k'*, is disengaged by coming in contact with the slide *p'*. During so much of the return stroke of the valve C, as leaves the passage *c*, in communication with the port *d*, the said passage remains covered by the valve D; but the movement of the valve C being continued beyond the point where it closes the port *a*, the valve D is stopped by the stops *y*, and the so-continued movement of the valve C, uncovers the top of the passage *c*, and brings the notch *l*, in the head *m*, of the stem *e*, under the pawl *k*, which then drops in and locks it. The disengagement of the pawl *k'*, as above mentioned allows the steam to act upon the valve D', to make it cover the passage *c'*, in the same manner that the disengagement of the pawl *k*, caused the valve D to close the passage *c*, as before described. In this way the operation proceeds; the operation of the cut-off valves being the reverse in the opposite strokes of the main valve. As the governor rises, the slides *p*, *p'*, are moved apart; and as it falls they are drawn toward each other; in the first case causing the cut-off valves to be liberated and allowed to cover the ports *c*, *c'*, earlier, and in the latter case later, in the stroke of the piston. Or the shaft *u*, may be adjusted by hand, and set to cut off permanently at such point in the stroke as may be desired. The same mechanism may be used with two cut-off valves applied each to one of two separate main valves, the said main valves being arranged near the ends of the cylinder in separate steam chests or in the same one, both of which arrangements are well known; or it may be used in combination with two cut-off valves working on a stationary partition plate which separates them from the main valves.

What we claim as our invention, and desire to secure by Letters-Patent, is:—

Working the cut-off valves D, D', in combination with a main slide valve C or separate main slide valves of the character described, by means of the pawls *k*, *k'*, to lock the cut-off valves with the main valve or valves in an open condition, the variable or adjustable slides *p*, *p'*, to disengage the said pawls, the stops 3, 3*, to stop the said cut-off, valves in a closed condition after their liberation, and stops *y*, *y*, *y'*, *y'*, to stop and open them by the completion of the stroke of the main valve or valves; the whole operating substantially as described.

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Witnesses:
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