J. Broughton,

Steam-Engine Valve Gear.

No. 22,344. Patented Dec. 21, 1858.

Fig. 1.

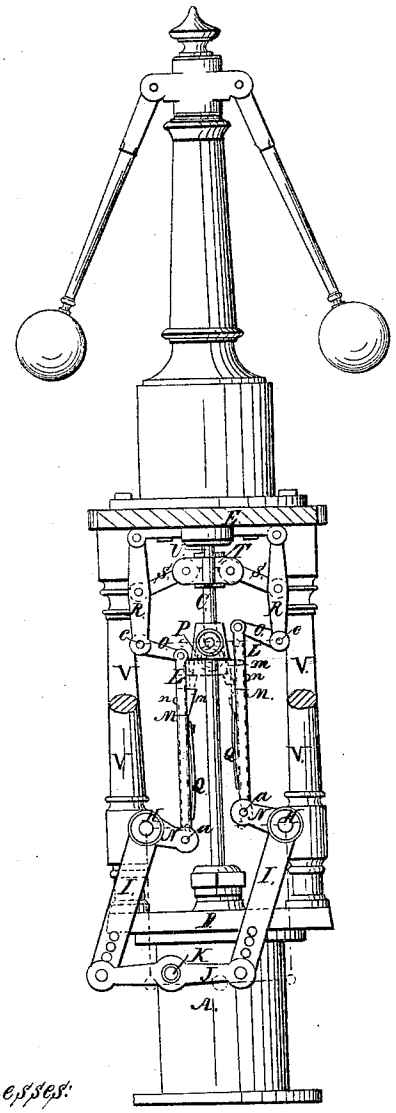
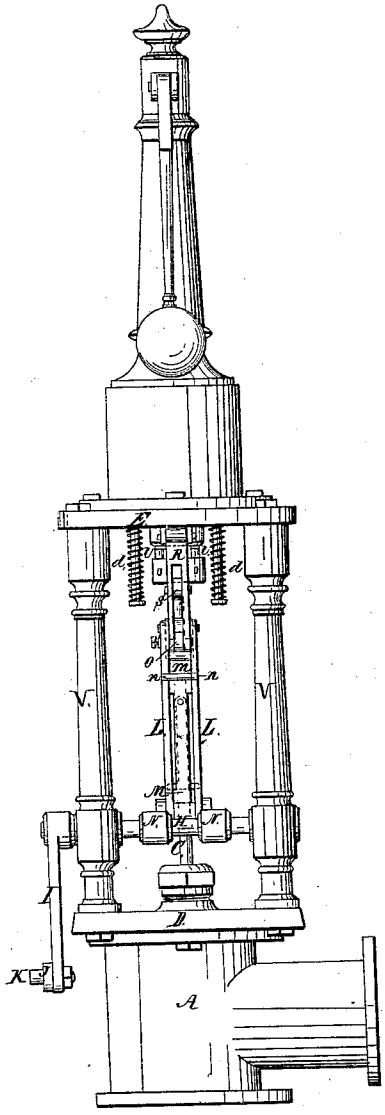


Fig. 2



Witnesses:

W. Tusch

W. Hauff

Inventor:

John Broughton

UNITED STATES PATENT OFFICE.

JOHN BROUGHTON, OF NEW YORK, N. Y.

CUT-OFF GEAR FOR STEAM-ENGINES.

Specification of Letters Patent No. 22,344, dated December 21, 1858.

To all whom it may concern:

Be it known that I, JOHN BROUGHTON, of the city, county, and State of New York, have invented a new and Improved Cut-Off Gear for Steam-Engines; and I do hereby declare that the following is a full, clear, and exact description of the same, reference being had to the accompanying drawings, making part of this specification, in which—

Figures 1 and 2 are elevations at right angles to each other of a cut-off and governor.

Similar letters of reference indicate like parts in both figures.

This invention consists in a certain combination of vibrating arms, vibrating links, rods, and lifters, whereby the cut-off valve is opened and subsequently tripped by a continuation of the same inherent movement by which the opening is effected. It further consists in certain devices operating in combination with the said lifting and tripping apparatus for the purpose of rendering the trip-motion variable to cut off the steam within the first half of the stroke of the engine.

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

A, is a hollow casting or box in which is the seat for the cut-off valve which may be of the balanced puppet, piston, slide or any other kind; said box having a flanch at the bottom by which it is to be attached to the steam chest of an engine, and having an opening in one side furnished with a flanch with which to connect the steam pipe. In the cover D, of this box A, there is a stuffing box through which passes the upright stem C, of the valve; said stem passing up through a guide in the center of a horizontal plate E, supported some distance above the box A, by pillars V, V, erected upon the said box. In case of the valve being of such character that it does not stop in closing, like a puppet valve, I intend to provide an elastic cushion in or above said plate E, and a cross-head or collar on the upper part of the valve stem above the said cushion for the purpose of arresting the valve in its descent when closed.

H, H, are rockshafts arranged horizontally and parallel with each other on opposite sides of and at equal distances from the valve stem in bearings attached to or supported by the pillars V, V. These rockshafts are furnished with arms I, I, connected together at equal distances from their respective rockshafts by a link J, of such length as to keep them always parallel; and the said link has attached to it a wrist pin K, which is intended to connect with an ordinary eccentric gear or with other suitable means of imparting motion from the crankshaft to the rockshafts. Each rockshaft H, carries a pair of arms N, which are connected by a pair of parallel rods L, L, with one of two links O, O, of a length corresponding with said arms; said links being pivoted to two pendulous rods R, R, attached to the plate E; said rods being connected by links S, S, with a slide T, that is fitted to work up and down the valve stem C, and is connected by two rods U, U, with the slide of a governor or with any apparatus that is capable of moving it up and down the valve stem. Each pair of parallel rods L have fitted between them a lifter M, attached by its lower end to their respective arm N, by means of the same pin *a*, which connects the rods themselves, and having at its upper end a toe *m*, which projects from between the rods toward the valve stem, for the purpose of lifting the said stem C, by their action upon a double tappet P secured to the said stem. These lifters have springs Q, Q, so applied as to throw them toward the valve stem, and have stops *n*, *n*, attached to their backs for the purpose of limiting the action of the said springs by coming in contact with the backs of the rods. The upper faces of the toes *m*, *m*, are in the form of arcs described from the centers *a*, *a*, and the lower faces of the tappet P are formed to correspond; and the faces of the said toes which are toward the stem C, and the outer faces of the tappet P, are beveled as shown in Fig. 1.

The operation of this cut-off gear is as follows. Steam being admitted to the engine, and the wrist pin K, being connected with the eccentric or other driving gear motion will be imparted to the two rockshafts H, H, by the link J, and arms I, I, and said rockshafts will vibrate the two arms N, in opposite directions, so that one will ascend

while the other descends, and will thus cause the rods under the guidance of the links O, O, to receive a combined vertical and horizontal motion; the links O, O, vibrating on the pins *c*, *c*, which connect them with the rods R, R, in a corresponding manner to their respective arms N, N. In the above-described motion of the rods L, L, their ascent brings the toes of their lifters M, M, into contact with the tappet P, on the valve stem and causes the valve to be lifted to admit steam to the steam chest of the engine, till the toe which is in operation on the tappet is by its horizontal movement caused to pass the extremity of the tappet, or in common phrase to "trip" it, when the valve is instantly closed by its own weight, by the pressure of steam, by the action of springs *d*, *d*, applied to operate on its stem or by weights properly applied. The lines described by the arms N, N, links O, O, and rods L, L, being the same in their return or descending as in their ascending motions, the toes of the lifters M, M, are brought into contact with the sides of the tappet P, but the springs Q, Q, allow them to yield till they have passed the extremities of the tappet, when the springs re-act and return them to a position to lift the tappets when they ascend again.

The eccentric or driver is intended to be so set that the stroke of the arms N, N, and links O, O, will terminate as the crank of the engine is at half-stroke; and by varying the position of the centers of motion *c*, *c*, of the links O, O, in planes corresponding or parallel with the planes of movement of said links and the arms N, N, the valves may be made to trip at any point in the stroke of the engine from the commencement to half-stroke, or may even be prevented tripping altogether, if it should be desirable at any time to run the engine under a full head of steam. It is to effect such variation of position of the centers *c*, *c*, that the said points of suspension are arranged in pendulous rods R, R. When said rods R, R, occupy such a position that the horizontal movement of the rods L, L, and lifters M, permits the escape of the lifters from the tappet at the precise moment that their upward movement terminates, the steam is cut off at half-stroke; but if the said rods R, R, occupy a position which brings the points *c*, *c*, closer to the valve stem, the lifters will not escape at all, but after lifting the valve stem, will gradually lower and close it; or if said rods occupy positions which bring the points *c*, *c*, farther from the valve stem, the lifters will escape and permit the tripping of the valve before their vertical movement terminates, and thus cut off the steam at a point earlier than half-stroke. The rods R, R, are adjusted to vary the cut-off by sliding the slide T, up or down the valve stem, which movement causes the links S, S, to act as a toggle upon the pendulous rods R, R, and thus draw them toward or force them from each other. The said slide T may be adjusted by hand gear to effect the cutting-off permamently at such point in the first half stroke of the engine as may be desired and to vary such point as may be desired; but I have represented it as connected with a governor, for the purpose of employing the cut-off as a regulator of the speed of the engine; the connection being such that any increase of speed of the engine will cause the rods R, R, to carry the centers of motion *c*, *c*, away from the valve-stem to make the valves trip earlier in the stroke and vice versa. In case of the valve employed being of such kind or having such arrangement that the upward continuation of the stem C, cannot be used in the manner represented, to lift the valve, a rod arranged like C, relatively to the operating gear, may be employed connected with the valve by arms, links, bell cranks, levers, or other devices in a suitable manner to cause the operating gear to control it in the manner described.

The peculiar advantages which characterize this cut-off gear are as follows:—1st. By means of the combined vertical and horizontal action of the lifting rods L, L, and lifters M, the lifters are caused alternately to connect and disconnect with the valves by their own inherent and continuous motion, without the use of stops, cams, or other appendages commonly employed to effect their tripping or disengagement. 2nd. Owing to the rods L, L, remaining throughout the whole lifting movement parallel or at the same angle with the rod or stem C, the lines of the surfaces of contact of the lifters and tappet are always in the same direction and coincide with each other; thus rendering them but little liable to wear. 3rd. As a governor attachment, it renders the governor capable of exerting great power to effect the variation of the cut-off, while the power required to effect such variation is comparatively insignificant, hence it allows the governor to retain the sensitiveness due to an almost unimpeded action.

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

1. The combination of the two rock-shafts H, H, their arms N, N, the vibrating links O, O, the rods L, L, and the lifters M, M; the whole applied substantially as described to operate upon a tappet or tappets on the valve stem E, or its equivalent, for the purpose of lifting the valve and subsequently tripping it by the continued and inherent motion of the lifters.

2. In combination with the above specified lifting and tripping mechanism, I claim the combination of the pendulous rods R, R, the toggle-links S, S, and the slide T, or their equivalents connecting with a governor or other means of adjusting the same to vary the positions of the centers of motion *c*, *c*, substantially as described, for the purpose of varying the point of cutting-off the steam.

JOHN BROUGHTON.

Witnesses:
WM. TUSCHL,
W. HAUFF.