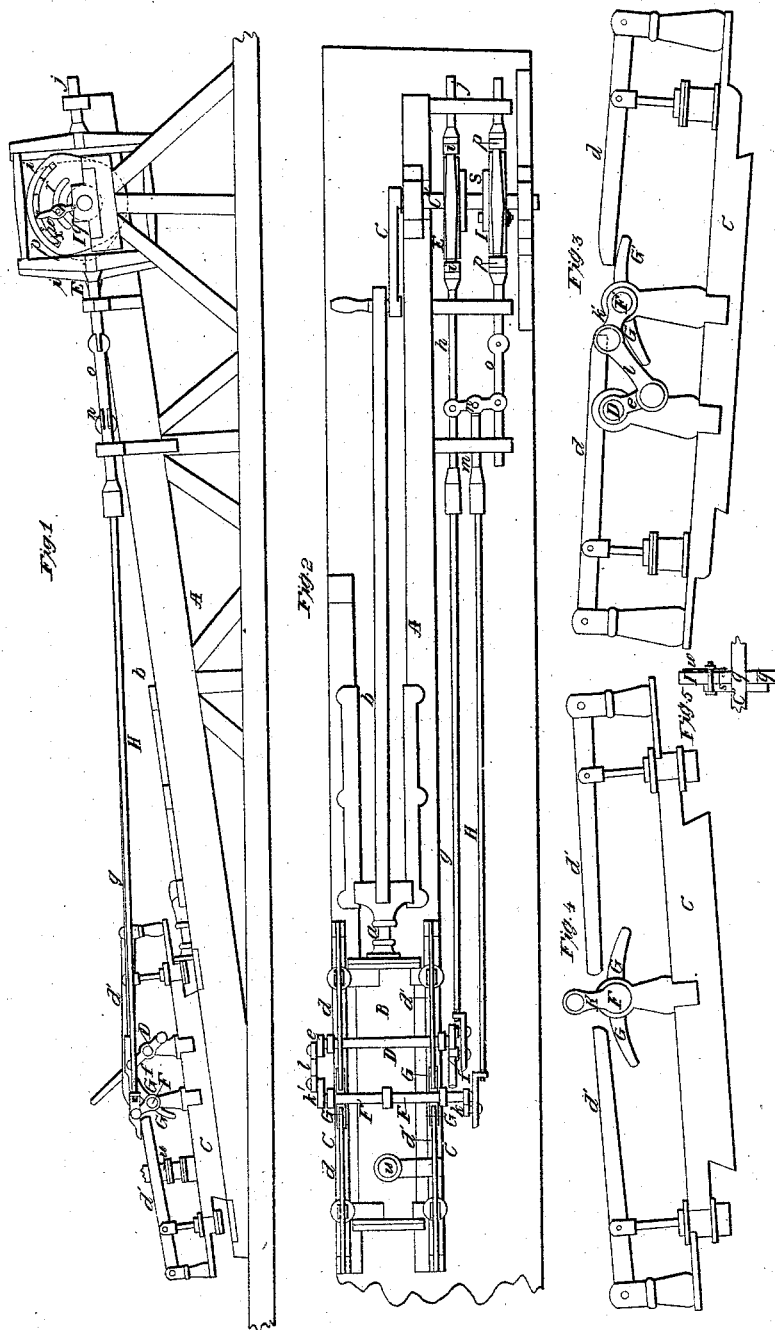


G. B. Milner,
Steam-Engine Valve-Gear.
N^o 7,529. *Patented July 30, 1850.*



UNITED STATES PATENT OFFICE.

GEO. B. MILNER, OF HOUSTON, TEXAS.

VALVE-GEAR FOR STEAM-ENGINES.

Specification of Letters Patent No. 7,529, dated July 30, 1850.

To all whom it may concern:

Be it known that I, GEORGE B. MILNER, of Houston, in the county of Harris and State of Texas, have invented a new and useful
5 Improvement in the Cut-Off of Steam-Engines, which is described as follows, reference being had to the annexed drawings of the same, making part of this specification.

- 10 Figure 1, is a side elevation of part of a reciprocating engine with the improvement attached. Fig. 2, is a top or bird's eye view of ditto. Fig. 3, is a section of the cranks on the extremities of the rock shafts, and
15 connecting rod, on an enlarged scale. Fig. 4, is a side elevation of the chamber through which the steam passes to the cylinder, steam chests at the ends of the same, levers for raising the valves &c., on an enlarged
20 scale.

Similar letters in the figures refer to corresponding parts.

- The nature of this invention and improvement consists in attaching the end of the connecting rod which operates the valves for admitting steam to the cylinder, to the center of
25 a transverse traversing bar or lever attached by bolts, at its extremities to parallel sliding rods, one of which operates the escape valves, and both being provided with square frames at their ends surrounding D, shaped
30 cams or eccentrics secured on the main shaft, one of which is made movable and provided with a segmental slot through which is
35 passed a bolt so as to enable said cam or eccentric to be secured in such relation to the other cam or eccentric as to cut the steam off when the piston has reached any desired point in its stroke, and to cause the
40 steam admitted to the cylinder to expand and exert its force on the piston the remainder of its stroke.

- To enable others skilled in the art to make and use my invention I will proceed to describe its construction and operation.
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- A, is an inclined frame consisting of two inclined parallel beams supported by upright and inclined timbers made of suitable size, strength, and material, to contain and
50 support the several parts of the engine.

- B, is the cylinder secured within this frame near its lower end in an inclined position provided with the usual piston rod (a), pitman rod (b), crank (c), secured to
55 a horizontal shaft, turning in suitable boxes, at the proper elevation.

C, are steam chambers arranged on the sides of the cylinder B, and extending parallel to the same from one end to the other. These chambers, communicate at their ends, through steam chests and branch trunks, with the ends of the cylinder, which steam chests are provided with puppet valves, secured to the lower end of rods attached at their upper ends to lever (d), turning on bolts at their ends passing through them and through ears, formed at the upper end of upright posts, resting on pieces projecting beyond the ends of the steam chamber.
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D, is a transverse rock shaft oscillating in openings in suitable uprights secured to the steam chambers and having a crank (e), secured to one of its extremities and an arm (f), terminating in a handle above and provided at equal distances from the center with two wrists one above and the other below the rock shaft, to the upper one of which is attached a connecting rod (g), having a notch near one of its ends, by which it is fastened to said wrist and otherwise made similar to the eccentric rod used in steam engines for moving the valves. Its opposite end extends toward the crank shaft and on a line with the center of the same, and is secured to an inclined sliding rod or shaft (h), passing through metallic boxes secured to the side of the frame, for guiding it, in its reciprocating movements, which sliding rod, is secured to an upright square frame (i), composed of two upright beams connected together at their ends by rods or bars, and supported by the rod (h), and by a short rod (j), secured to one of the beams and passing through a box secured to the frame A, in which it moves.
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E, is a cam wheel secured on the crank shaft (c'), inside the square frame (i). This cam is made in the form of a segment of a circle, scribed from the center of the crank shaft, on part of its edge, and the remainder of its edge is made in the form of a semi parabola, so as to somewhat resemble in its side elevation the letter D.
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F, F', are horizontal transverse rock shafts, arranged on a line with each other over the cylinder and steam chambers, and turning in openings in upright posts erected on the steam chambers, and in an opening in a post rising from the top of the cylinder midway between its ends. These rock shafts F, F', have cranks (k, k'), secured to their outer ends, similar to the crank (e),
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on the rock shaft D, one of which cranks, (the one (*k'*), on the shaft F',) is connected to the crank (*e*), by a connecting rod (*l*).

5 G, G', are curved toes or lifters, projecting from the rock shafts F, F', immediately under the ends of the levers (*d*), on the sides of the cylinder, for alternately lifting the ends of said levers and raising the valves
10 in the steam chests to admit and discharge the steam to and from the cylinder.

H, is a connecting rod, similar to the rod (*g*), except that it is longer, and connected to the crank (*k*), on the rock shaft F, by
15 means of a notch in its end, in which the wrist of said crank fits, and arranged outside the rod (*g*). This rod H, extends toward the main crank shaft parallel to the rod (*g*), and the same distance and is secured at its end to the end of a rod or shaft
20 (*m*), passing through a box in one of the projections on the side of the frame A, in which it slides, and connected by a pin to the center of a traversing lever or bar (*n*),
25 attached by a pin at one of its ends to the sliding rod or shaft (*h*), and at its opposite end by a pin to a similar rod or shaft (*o*), passing through boxes in the projections on the side of the frame and jointed
30 and attached at its end to a square frame (*p*), formed and supported in a similar manner to the frame (*i*).

I, is a cam wheel similar in size and form to the cam wheel E, and mounted on the
35 main crank shaft within the square frame (*p*). This cam I, is bored to fit loosely over a hub (*q*), secured permanently on the crank shaft so as to enable it to be turned on said hub in order to bring its segmental and semi parabolic edges in any
40 desired relation to the segmental and semi parabolic edges of the cam E, for the purpose of regulating the cut off of the steam from the boiler, and contains a segmental slot (*r*), at its widest part midway between its rounded corners, scribed from the
45 center of the crank shaft, and can be clamped against a circular rim (*s*), surrounding the crank shaft against which it rests by means of a screw bolt passing
50 through said rim and through the segmental slot (*r*), and through a pointer or hand (*w*), secured by a pin to the hub (*q*), and extending toward the segmental edge of
55 the cam radial with the center of the crank shaft, and having a nut on its end by which said cam is forced against the rim (*s*).

The mode of operation is as follows: The steam from the boiler being admitted to the
60 chamber on one side of the cylinder, through the pipe (*u*). The engineer raises one of the levers (*d*), situated over the chamber into which the steam is admitted, and allows the steam to pass through the steam
65 chest and trunk into the cylinder so as to

cause it to act on the piston, and give motion to the crank shaft and cams E, I, on the same. The cam E, is so fixed on the shaft as to bring its rounded corners in the proper relation to the wrist of the crank
70 (*e*), as to move the square frame (*i*), at the required time to operate on the rock shaft D, and move the rock shafts F', by the cranks (*e*, *k'*), and connecting rod (*l*), so
75 as to raise the end of the levers (*d*), and alternately open the escape valves to let off the steam from the cylinder about the time the piston has reached the terminus of its stroke.

Before introducing the steam to the cylinder in the manner before stated, the engineer unclamps the cam I, and turns it on the hub (*q*), so as to bring the pointer (*w*), opposite the desired number on the graduated plate (*x*), on its face indicating the
80 points to set opposite the pointer (*w*), to cut off the steam, at any required point of the stroke of the piston, and clamps it by turning the nut. It may be well to observe here that when the pointer or hand (*w*), is
85 opposite the figure "1" on the graduated plate or index the two cams will be exactly in the same relation to the crank and in their revolutions with the same will be caused to move the square frames (*i* and *p*),
90 simultaneously and operate the several valves so as to employ the full force of the steam the whole extent of the stroke; and that when the cam I, is turned on the hub
95 so as to bring any of the succeeding numbers of the graduated plate or index (*x*), opposite the pointer or hand (*w*), the steam will be cut off after the piston has proceeded on its stroke to a point corresponding with
100 the number on the graduated plate or index, at which the pointer or hand is situated, and the distance between said number and number one. This effect is produced in the following manner: Supposing the pointer to
105 be opposite number 4 as represented in the drawing and the engine to be in operation. The escape valves will be moved at the terminus of each stroke by the cam E, moving the frame (*i*), and its attachments. At the
110 time this movement takes place the segmental edge of the cam I, is next one of the upright beams of the square frame (*p*), which for the present is held stationary causing likewise the end of the lever or traversing
115 bar (*n*), attached to the rod or shaft of said frame to be held stationary. When the rod or shaft (*h*), is moved by the cam E, the connecting rod is also caused to move by the lever, or traversing bar (*n*), causing one
120 of the valves in the steam chests to be opened by the lifters G', raising the end of one of the levers (*d*), and the steam to be admitted to one side of the piston at the instant the steam is allowed to discharge from the opposite side of said piston. The admission
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valve will be kept raised so as to admit the full force of steam to the piston until the rounded corner of the edge of the cam I, where the segmental and parabolic parts join each other, which is situated some distance in advance of the same corner of the cam E, owing to the movement of the cam I, on the hub (*g*), strikes the upright of the frame (*p*), when the frame (*p*), will be moved, carrying with the pointed rod or shaft (*o*), and causing the connecting rod H, to be moved by the lever or traversing bar (*n*), and the lifter G, to be lowered from under the lever (*d'*), and the valve attached to the same to be closed so as to cut off the steam from the boiler and the steam within the cylinder to expand itself until the piston reaches the terminus of its stroke when the cam E, will cause one of the escape valves to be opened and the other closed, and the valve attached to the other lever (*d'*), to be raised to admit the steam to the opposite side of the piston, and at the same point of the return stroke of the piston the steam will be again cut off by the cam I. In this manner the steam can be cut off at any point of the stroke, by simply

moving the cam I, over the hub (*g*), and the engineer is enabled to make his engine at all time exert a uniform power, by regulating the point at which the steam is cut off and commences working expansively, according to the pressure of the steam employed.

Having thus fully described my improvement, what I claim as new and desire to secure by Letters Patent is—

The combination of the fixed cam E, with its frame and rods, and the adjustable cam I, with its frame and rods, to which latter are attached the traversing and oscillating bar *n*, having secured to one end of the rod *g*, and at or near its center the rod H, which actuate respectively the eduction and induction valves, substantially in the manner herein described, forming together a simple valve motion and one which enables the engineer to regulate the degree of cut off at will.

GEORGE B. MILNER.

Witnesses:

L. B. BRAGG,
THOS. MILNER, Jr.