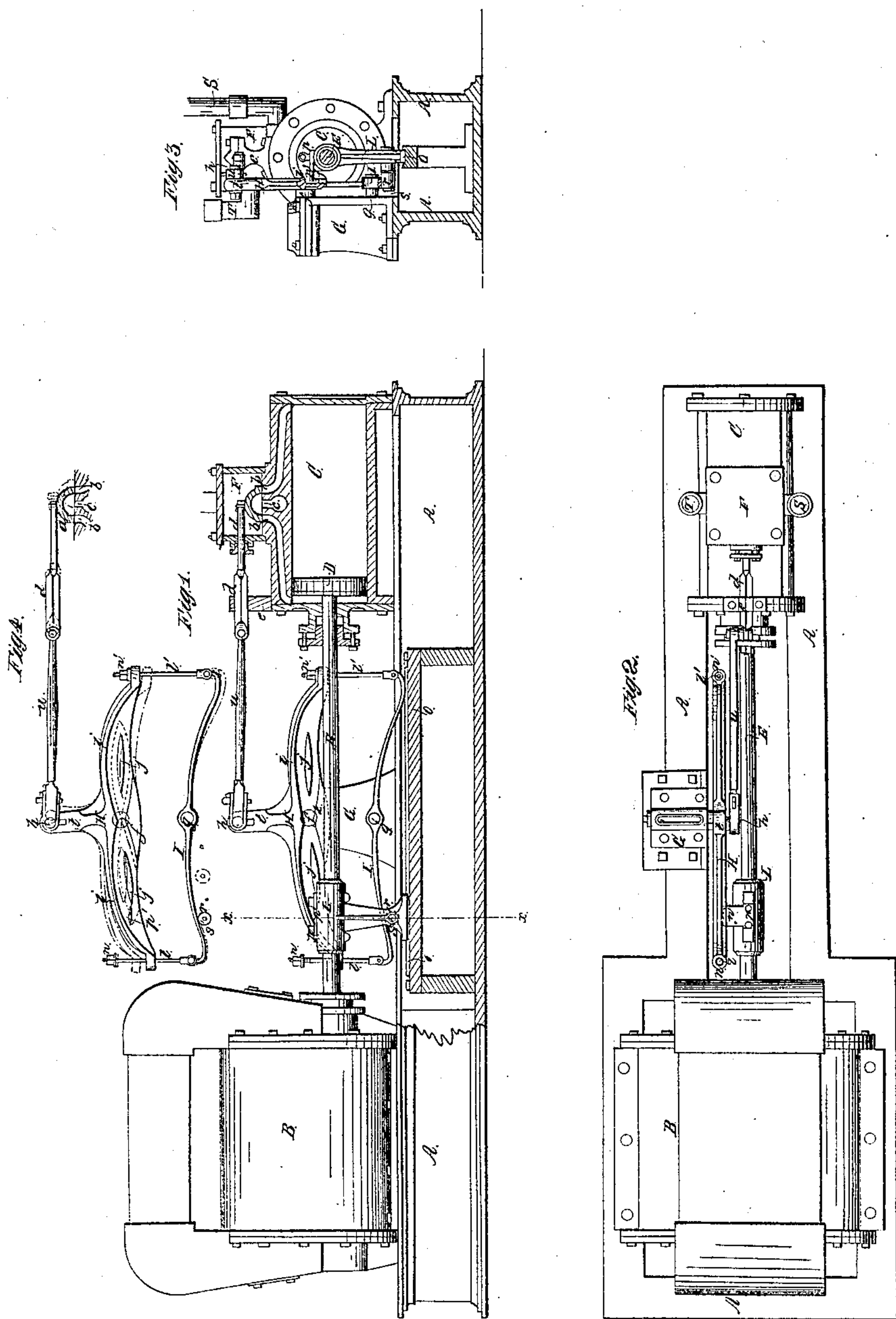


J. P. Ross,
Steam-Engine Valve-Gear.
No 16,809. Patented Mar. 10, 1857.



UNITED STATES PATENT OFFICE.

J. P. ROSS, OF LEWISBURG, PENNSYLVANIA.

VALVE-GEAR OF DIRECT-ACTION STEAM-ENGINES.

Specification of Letters Patent No. 16,809, dated March 10, 1857.

To all whom it may concern:

Be it known that I, JAMES P. ROSS, of Lewisburg, in the county of Union and State of Pennsylvania, have invented a new and useful Improvement in the Valve-Gear of Direct-Action 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 a part of this specification, in which—

Figure 1 is a side view, partly in section of a blowing engine, with my improved valve gear. Fig. 2 is a plan of the same. Fig. 3 is a transverse vertical section of the same, in the line *x, x*, of Fig. 1. Fig. 4 is a side view of the principal parts of the valve gear, detached from the engine.

Similar letters of reference indicate corresponding parts in each of the several figures.

This invention consists in the combination, with an oscillating yoke of similar character to that described in the specification of Letters Patent granted to me on the 22nd day of January, 1856, of an elastic lever, by whose action on the yoke, a movement is suddenly given to start or give a lead to the valve or valves, just at the termination of the stroke of the piston in either direction, to admit steam to the cylinder for the return stroke of the piston. This elastic lever performed this duty in a more efficient manner than the two counterpoise levers and the weights described in my former patent above referred to, and makes the construction of the valve gear more simple.

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

A, is the framing of the engine, supporting at one end the blowing cylinder B, and at the other the steam cylinder C, which are arranged in line with each other.

D, is the piston of the steam cylinder, connected by the piston rod E with the piston of the blowing cylinder.

F, is the steam chest of the cylinder C, containing a valve *a*, of the kind generally known as the short slide valve.

T, is the steam pipe.

S, is the exhaust pipe.

*b, b*¹, are the two steam passages leading from the valve seat to opposite ends of the steam cylinder; and *c*, is the exhaust passage.

d, is the valve stem, working in a guide *e*, attached to the cylinder.

G, is a standard, erected upon one side of the framing A, about midway between the two cylinders, for the support of the oscillating yoke, H, and the elastic lever I, operating in connection with it. The oscillating yoke H is attached, at the center of its length, to a short horizontal axle *f*, which is fitted to oscillate in a bearing at the top of the standard G; said axle occupying a position transverse to the piston rod; and the elastic lever I is fitted, at the center of its length, to oscillate upon a stud *g*, which is secured in the standard G, directly under the axle *f*. The yoke H, has a short arm *t*, standing perpendicularly or nearly so to the main portion of it, which is considerably longer than the intended length of stroke of the piston; said short arm carrying a stud *h*, to which the valve stem *d*, is connected by a rod *w*. The main portion of the said yoke has, on the side next the piston rod, a rim *i*, which extends the whole length thereof, close to its upper edge; and below this rim there are two cams *j, j'*, of similar elliptic form, projecting from the same side of the yoke, one on each side of its center of oscillation (*viz.*, the axle *f*); and below these cams, under the center *f*, there is a projecting piece *k*, the upper side of which has two inclinations, which form continuations of the curves of the upper sides of the cams *j, j'*. The elastic lever I, which is of about the same length as the main portion of the oscillating yoke, is curved somewhat like the rim *i*, on the yoke. It may be made of iron or steel; but iron will afford sufficient elasticity, as the lever is of considerable length in proportion to the amount of flexure to which it is submitted to develop its elasticity. It has, jointed to one end, a rod *l*, which passes through a hole in the corresponding end of the yoke; and the end of this rod *l*, has a screw-thread cut on it to receive a nut *n*, above the yoke; and at the opposite end of the elastic lever, there is a similar rod *l'*, which passes through the corresponding end of the yoke, and is fitted with a nut *n'*, above the yoke. The nuts *n, n'*, are so set that, though the elastic lever and yoke may derive an oscillating motion from each other through the rods *l, l'*, either the yoke or lever is capable of moving some extent independently of the other. L, is a cross-head, secured firmly to the

piston rod E, and working in a guide o, o, attached to the framing, as the piston rod moves back and forth. This cross-head has secured to it a plate p, one side of which is
 5 extended (as shown at p^1) to form what may be termed a traveler, which passes between the rim i, the cams j, j', and the projecting piece k, of the yoke; the said traveler, as the piston works back and forth, describing the line indicated in Fig. 4, by the
 10 dots. The same head-piece has also attached to it a stud s, which is fitted with a roller r, which travels under the elastic lever I.

The yoke receives the oscillating movement by which it operates the valve, through
 15 the action of the traveler p' , upon the yoke itself, and the action of the roller r, upon the elastic lever I, in the following manner:—In the several strokes of the piston,
 20 the traveler p' , passes first under one of the cams j, j', and then over the other, as indicated by the arrows in Fig. 4. In passing under either cam, it raises one end of the yoke, according to the direction of the piston,
 25 and depresses the other end; and by that means it causes the arm t, to move the valve; but as the valve must have made half its stroke, and a little beyond for lead, before the piston commenced the stroke, the
 30 movement thus given by the action of the traveler only completes the stroke, and gives a full opening to the port. The first portion of the stroke of the valve,—viz., a portion sufficient to close the one steam pas-
 35 sage and give the valve a lead to open the port of the opposite passage,—is effected by the action of the roller r, on the under side of the elastic lever I, during the time the traveler is passing over the cams; the
 40 said roller forcing up that end of the elastic lever against which it comes in contact, and depressing the other end; thus causing the rod l, or l' , and the nut n, or n' , at the latter end, to pull down the end of the yoke
 45 with which it is connected, as far as is permitted by the upper side of the cam over which the traveler is passing, which cam is pressed up against the traveler by the lever I; the form of the said side of the cam
 50 controlling the movement of the yoke produced by the lever, and regulating the movement of the valve in closing the port. The roller r, by its action on the curved under side of the elastic lever I, as aforesaid,—
 55 while an uncontrolled movement of the yoke, under the influence of the said lever, is prevented by the cam bearing against the traveler,—strains and bends the lever I, and causes it to assume the character of a
 60 spring; and as soon as the traveler passes the outer extremity of the cam, the yoke, being left free to the influence of the lever, derives, from the elastic action which the latter exercises in resuming its condition
 65 of rest, a very sudden movement, that is

sufficient to carry the valve far enough to give sufficient opening to the port of the passage which has previously been exhausting, to admit steam to commence the return
 stroke of the piston. To illustrate this op- 70
 eration, the valve, the yoke, the elastic lever, and their connections, and the traveler, are all shown in two positions in Fig. 4. In the position shown in bold outline, which
 corresponds with the position shown in Fig. 75
 1, the piston is near the end of its stroke; the roller r, is forcing up the left hand end of the elastic lever, whose opposite end is consequently pulling down the correspond-
 ing end of the yoke, and moving the valve 80
 to shut off the steam from the right hand port b' ; the movement of the yoke, and consequently that of the valve, being controlled by the action of the traveler upon
 the upper side of the cam j. The closing of 85
 the port b' , is completed at or before the arrival of the traveler at the outer extremity of the cam j; and as the traveler passes the said extremity of the cam, the yoke, no
 longer having its movement controlled by 90
 the cam, suddenly has its right hand end thrown up, and its left hand end thrown down, by the elastic action of the lever, far enough to carry the valve over the outer
 edge of the port b; by which steam is ad- 95
 mitted to the left hand side of the piston C, which then commences its stroke to the right. The traveler now moves under the
 cam j^1 , completing the opening of the valve as it does so, as illustrated by the red dia- 100
 gram in Fig. 4. The action of the traveler on the cam j, and the action of the roller on the right hand end of the elastic lever, is precisely the same as that above described
 and illustrated in Fig. 4, only that the move- 105
 ments are in opposite directions. The length of the stroke of the piston is determined by the distance between the most distant extremities of the two cams and the
 length of the traveler from point to point; 110
 the sum of the above distance and length giving the exact length of stroke.

The amount of lead given to the valve, by the action of the elastic lever on the yoke, can be increased or diminished by 115
 screwing the nuts n, n^1 , lower down or higher up the rods l, l^1 .

The invention, when applied to pumping engines, or to engines for driving reciprocating saws by a direct connection with the 120
 piston, or to any other direct-action engines, is applied in the same manner as to the blowing engine above described. It will work equally well on a horizontal, upright, or inclined engine, and with a long slide 125
 valve, two short valves, or with a rolling valve or valves; but no particular description of its application to other valves than that shown is necessary, as the description
 already given is sufficient to enable the 130

skilled engineer to adapt it to any other valve to which it may be applicable.

Instead of arranging the elastic lever to work on a fixed center *g*, below the working
5 center of the oscillating yoke, it may be arranged to work upon the same center as the yoke, or on a pin or stud attached to the yoke, below the working center thereof.

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

The elastic lever I, applied and operating substantially as described, in combination with the oscillating yoke H, the traveler *p*¹, and the roller *r*, or its equivalent, for the purposes set forth.

J. P. ROSS.

Witnesses:

HUNTER PARDOE,
JOHN KALER.