(No Model.)

2 Sheets—Sheet 1.

W. H. DONALDSON.

VALVE GEAR.

No. 324,094. Patented Aug. 11, 1885.

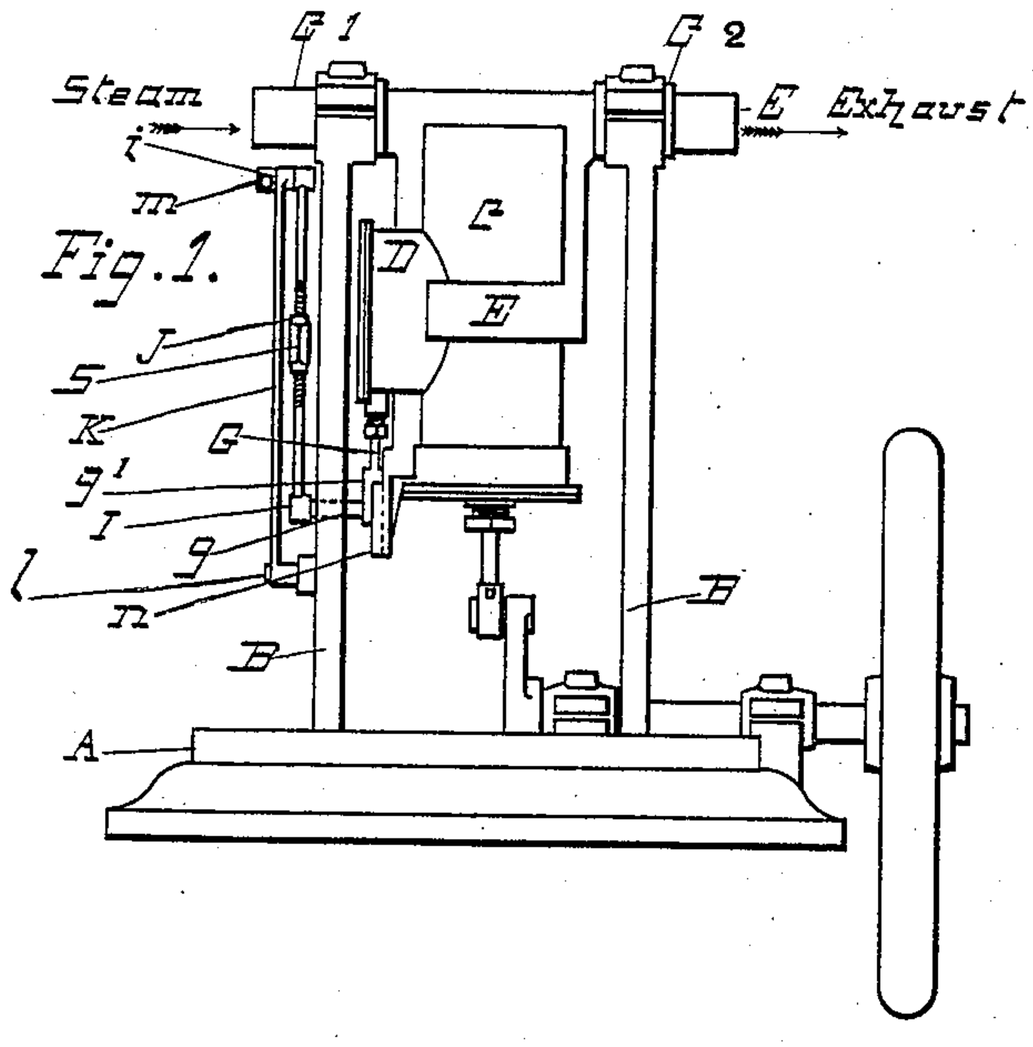

Fig. 1.

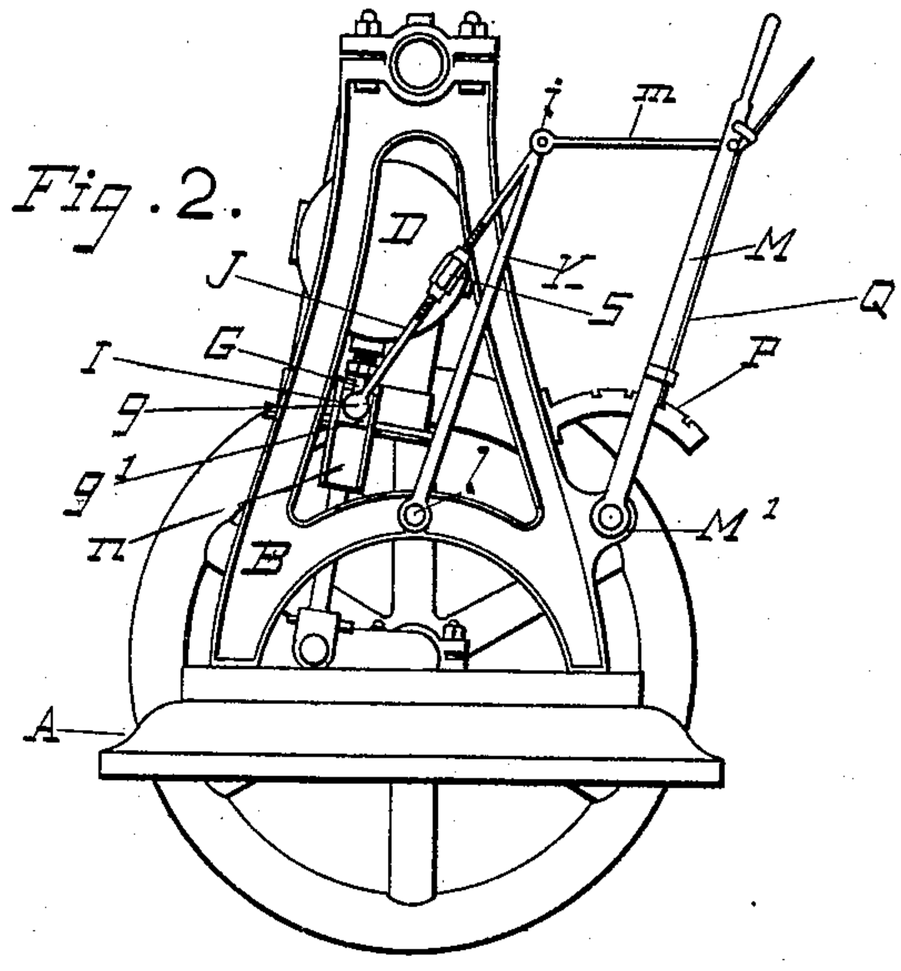

Fig. 2.

Witnesses:

J. A. Owen.

B. J. Burns.

Inventor:

Walter Hallowell Donaldson

By his Atty.,

Alphonso Stuart

(No Model.)

2 Sheets—Sheet 2.

W. H. DONALDSON.

VALVE GEAR.

No. 324,094. Patented Aug. 11, 1885.

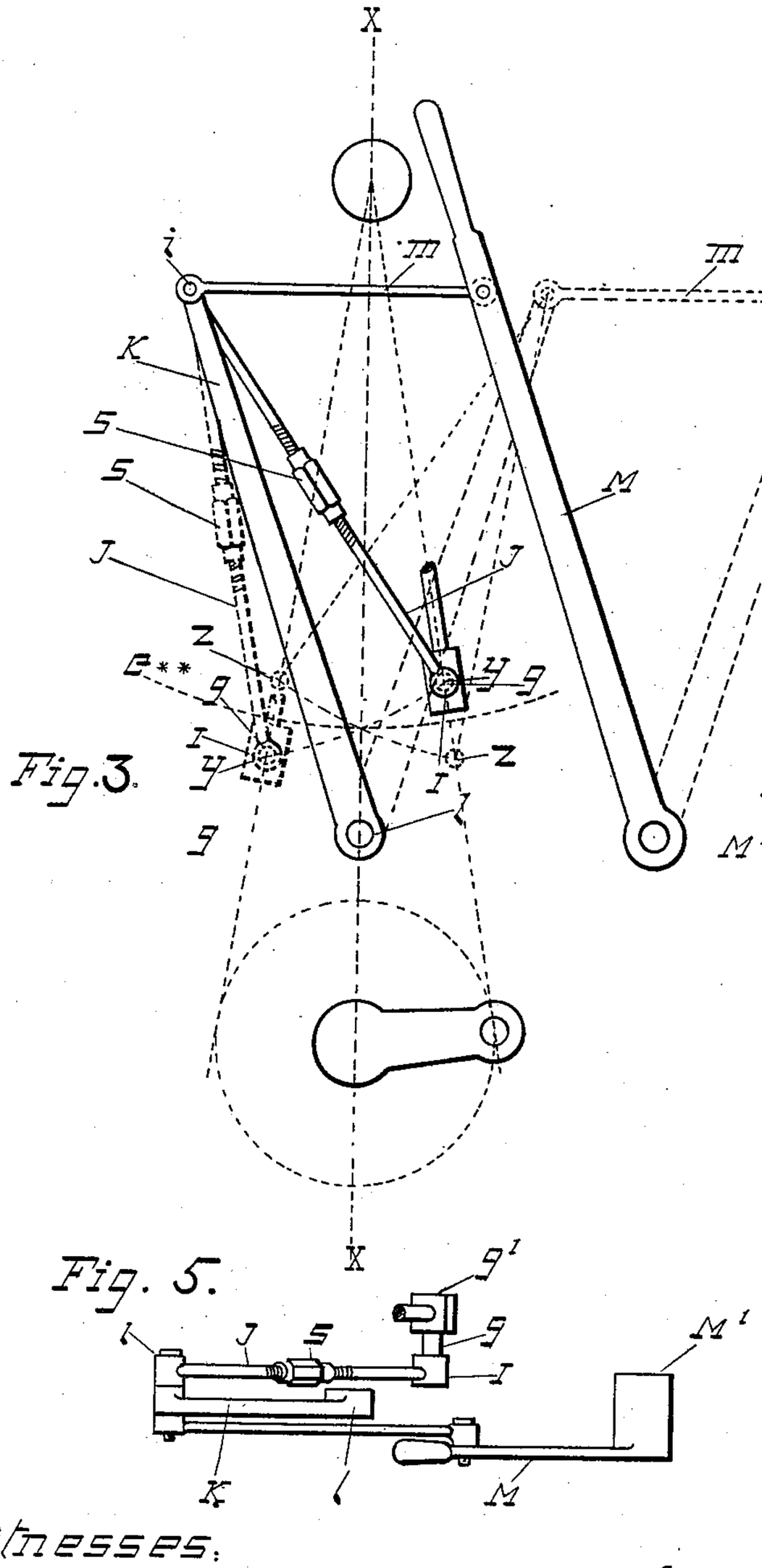

Fig. 3.

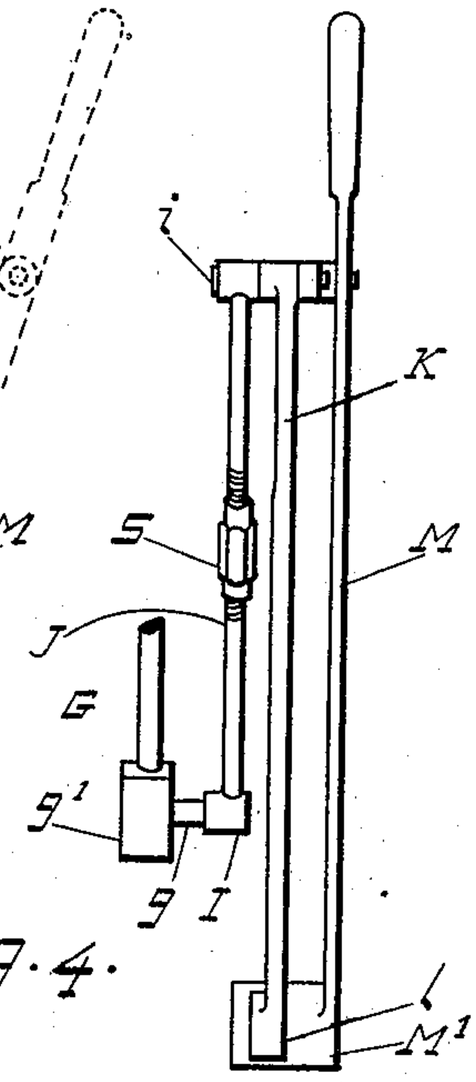

Fig. 4.

Fig. 5.

Witnesses:

S. A. Owens

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UNITED STATES PATENT OFFICE.

WALTER HALLOWELL DONALDSON, OF SAN FRANCISCO, CALIFORNIA.

VALVE-GEAR.

SPECIFICATION forming part of Letters Patent No. 324,094, dated August 11, 1885.

Application filed October 15, 1884. (No model.)

To all whom it may concern:

Be it known that I, WALTER HALLOWELL DONALDSON, a citizen of the United States, residing in San Francisco, in the county of San Francisco and State of California, have invented certain new and useful Improvements in Valve-Gear of Oscillating Engines; and I do hereby declare that the following is a full, clear, and exact description of my said invention, reference being had to the accompanying drawings.

My invention relates to an improved valve motion for oscillating-cylinder engines; and the object sought to be attained is to obtain the required valve movements without the use of eccentrics.

To such end my invention consists in certain novel construction and combination of parts, by which a simple valve-gear without eccentrics is produced.

In the accompanying drawings, Figure 1 is a side elevation of an oscillating engine having my improved valve-gear applied. Fig. 2 is a front view taken from the left-hand side of Fig. 1. Fig. 3 is a diagram illustrating the various positions of the parts, both on the forward motion and when the engine is reversed. Fig. 4 is a side view of the parts shown in Fig. 3, and Fig. 5 is a plan or top view.

A B is the frame-work of an oscillating engine. C is the cylinder having trunnions C′ C², of which the one C′ has connections with the steam-supply through a suitable pipe, and the other one, C², is the outlet of the exhaust E. The steam-chest is seen at D. G is the valve-stem having a stud, *g*, and also a square head or block, *g′*, to fit and slide smoothly in a guide, *n*, provided on the cylinder. This end of the valve-stem is connected with a center, I, by means of the radius-rod J, and the point *i* is placed at the end of a lever, K, whose fulcrum or center of movement is below at a point, *l*, on the frame.

A hand-lever, M, of the same length as the lever K is connected to the point of the lever by a link, *m*, of a length equal to the distance between the two centers *l* M′ on which these levers rock, so that they move parallel.

The hand-lever is locked by means of a notched segment, P, and a pawl, Q, of any suitable construction, and by this device the position of the center *i* is controlled and fixed at any desired point to one side or the other of the vertical line that passes through the center of the arc traversed by the cylinder, or is set on this center. In one position of this point *i* the valve will have the forward motion, and in the opposite position it will be reversed, while on the center the vertical motion of the valve will be so small that the parts will not uncover, and no movement of the engine can take place.

The radius-rod J is in two parts having screw-threaded ends and a connecting right and left hand screw-threaded sleeve, *s*, to permit adjustment of the valve as required by wear of the parts.

The connection of the steam and exhaust pipes, the construction of valve, steam-chest, and other parts relating to the cylinder, piston, and packing are of no special character, and need not, therefore, be more definitely described.

Now, by the arrangement of the connections herein described it will be seen that the end of the valve-stem, being positively connected to the center I by the radius-rod, this point *g* is confined and caused to move in an arc of smaller radius than the cylinders are, and also that the position of this center I will determine the angular movement of the valve. The throw of the valve is then the result of the difference in the radii of the two arcs I *g* and C**, the latter being the one in which the valve-stem would travel with the cylinder if not confined, and the arc I *g* being the part of the point *g′* that the radius-rod produces.

By referring to Fig. 3 of the drawings the position of the valve-stem and connections at the beginning and retermination of stroke will be obtained, both for the forward motion and when the engine is reversed.

The position of the lever-arm K shown in full lines holds the center *i* for the forward motion; but when drawn over to the opposite side of the vertical line *x x*, as in the dotted lines, the point *g* will travel in the arc *z z* and reverse the throw of the valve.

The two positions of the valve-stem and radius-rod in the forward motion as shown in full lines and the difference vertically will represent the throw of the valve.

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

1. The combination, with the hand-lever and the parallel-moving lever connected thereto, of the adjustable radius-rod and means for connecting the same with the valve-rod, substantially as specified.

2. The herein-described valve-gear for oscillating-cylinder engines, consisting of the lever-arm K, connected to the frame at a center of movement, *l*, the radius-rod J, connecting the point I of this arm with the valve-stem, the guide for the valve-stem, and the hand-lever M and link *m*, and a locking mechanism for holding said hand-lever, substantially as described and shown.

In testimony whereof I have hereunto subscribed my name this 6th day of October, A. D. 1884.

WALTER HALLOWELL DONALDSON. [L. S.]

Witnesses:

PHINEAS SPRAGUE,

W. GREGG.