

J. F. Allen,

Steam-Engine Valve-Gear.

N^o 35,071.

Patented Apr. 29, 1862.

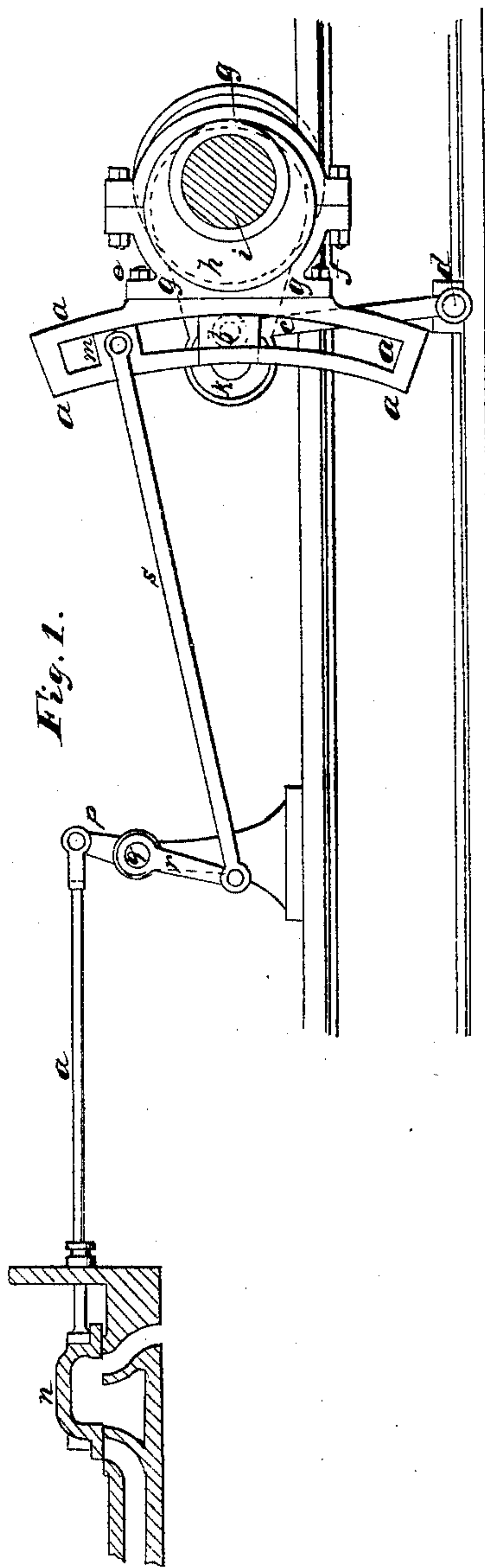


Fig. 1.

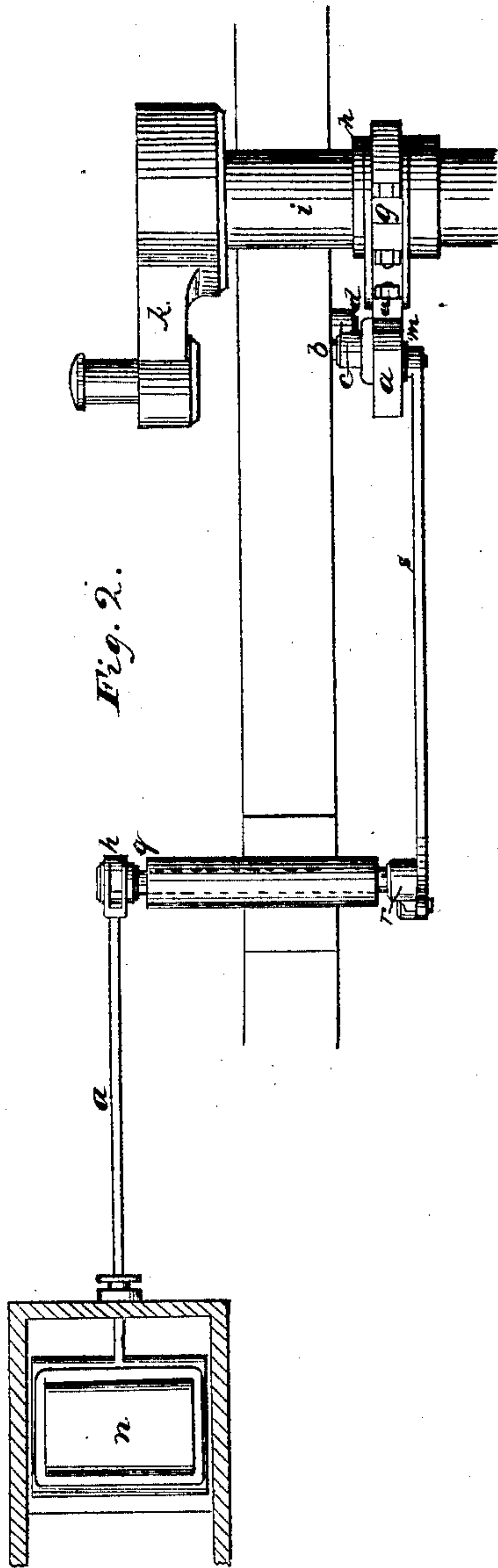


Fig. 2.

Witnesses:
Horace Andrew.
C. B. Richards.

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UNITED STATES PATENT OFFICE.

JOHN F. ALLEN, OF NEW YORK, N. Y.

IMPROVED VALVE-GEAR FOR STEAM-ENGINES.

Specification forming part of Letters Patent No. 35,071, dated April 29, 1862.

To all whom it may concern:

Be it known that I, JOHN F. ALLEN, of New York, in the county and State of New York, have invented a new and useful Improvement in the Valve-Gear of Steam-Engines; and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, making part of this specification, and to the letters of reference marked thereon.

My invention relates to a device for giving proper movements to the valves which govern the admission and release of steam to and from the cylinders of steam-engines.

In steam-engines, especially in those having rapid motion, it is desirable to employ a variable cut-off gear which shall open and close the valve with positive movements, and in view of this consideration the well-known "Stephenson" or "Howe" link-motion, actuating a lap slide-valve, is extensively used, especially in locomotive-engines, the said valve deriving its movements from the vibratory or rocking lever, termed "the link," which is actuated by two eccentrics and receives from them a complex motion which adapts its different parts, as points of connection, to communicate those movements to the valve, which respectively effect the cut-off at different points of the piston's stroke.

It is the object of my invention to furnish a substitute for the above-specified link-motion, which will produce in the valve or valves with which it is connected movements similar to those derived from the said link-motion, and which shall at the same time possess greater simplicity and also certain facilities of application by reason of its compactness; and to this end my said invention consists in the combination of the hereinafter-described vibratory or rocking valve-driving lever *a*, or its equivalent, with a single eccentric when these are so arranged that the horizontal and perpendicular "throws" of the eccentric combined produce in the lever aforesaid movements possessing the characteristics of the movements of that part of the well-known Stephenson link-motion, which is termed "the link," substantially in the manner hereinafter set forth.

To enable others skilled in the art to make

use of my invention, I will proceed to a description thereof.

In the accompanying drawings I have shown only those parts of a steam-engine which a description of my invention requires, in which—

Figure 1 represents a side elevation of my invention as applied to a steam-engine and actuating a lap slide-valve, and Fig. 2 shows a plan view of the same.

Similar letters of reference denote the same parts in both the figures, in which—

a is a curved vibratory or rocking lever which is pivoted centrally, by the fulcrum-pin *b*, to the upper end of a sustaining-rod, *c*, which is hinged at its lower end to a fixed pin, *d*. The curved lever *a* is attached by the bolts *e* and *f* to the strap *g* of an eccentric, *h*, which eccentric is secured to the main shaft *i* of the engine, of which *k* is the main crank.

The rocking lever *a* is slotted or mortised through nearly from end to end and carries a sliding block, *m*, which may be moved to and held in any part of the lever. From this block *m* the movement of the lap slide-valve *n* is derived through the rod *o*, arm *p*, rock-shaft *q*, arm *r*, and rod *s*.

The curvature of the slot in the lever *a*, in which the block *m* is held, is circular; described from the end of the arm *r* as a center, with the rod *s* for a radius, when the parts are in such positions that the centers of the eccentric *h*, the fulcrum-pin *b*, and the shaft *i* all lie in the same plane. This coincidence will occur twice in each revolution of the shaft. There will, therefore, be two points in each revolution when the lever *a* will be in such a position that the block *m* may be moved from end to end of the said lever without altering the position of the valve *n*; but the position of the valve at one of these points will be advanced from its position at the other by the amount of the eccentric's throw. The eccentric *h* is so set relatively to the engine's crank that these said points will coincide or nearly coincide with the commencement of each stroke of the piston, and the lap of the valve *n* is made such that at one of the said points the valve is about commencing to admit steam to the rear end of the cylinder, while at the other it is about commencing to

admit steam to the front end of the cylinder. The lever *a*, by reason of its rigid connection with the strap of the eccentric *h*, receives a rocking or tipping motion around the fulcrum-pin *b* from the perpendicular throw of the eccentric *h*, while at the same time the fulcrum-pin *b*, carrying the lever *a*, receives a reciprocatory horizontal motion from the horizontal throw of the same said eccentric *h*, whereby the parts of the lever *a* receive such movements that while if the block *m* occupies the central part of the lever (corresponding with the center of the fulcrum-pin *b*) it moves the valve *n* only the amount of its lap, and thus admits no steam to the cylinder, yet if the said block *m* be held in any other part of the lever *a* the valve *n* will be moved farther, on account of the tipping motion of the lever, so that the valve will open, and the portion of the piston's stroke during which the valve *n* will remain open will increase in proportion as the block *m* occupies parts of the lever *a* more remote from the fulcrum-pin *b*. The movements of the valve derived from the lower half of the lever *a* will cause the engine to run in an opposite direction from those derived from its upper half.

I prefer to set the eccentric with the crank, as shown in the drawings, rather than opposite to it, (although with the kind of valve represented this necessitates the employment of a rock-shaft and arms to reverse the movement of the valve,) because by this arrangement a more equal cut-off at the different ends of the cylinder will be produced. On the same account I prefer to have the distance between the centers of the eccentric and the fulcrum-pin *b* bear nearly the same proportion to the throw of the eccentric that the connecting-rod of the engine bears to the stroke.

If it be desired to run the engine in one direction only, the upper or lower half of the lever *a* (as the case may permit) can be dispensed with; and for an engine in which the point of cut-off may be fixed the end of the rod *s* may be hinged to a pin fixed in any part of

the lever *a*, which will effect the cut-off at the proper point, in which case the lever will be made solid.

The described complex movements of the valve-driving lever *a*, attained from the single eccentric *h*, are similar to the movements of the rocking lever termed "the link" in the Stephenson link-motion, and the application of my invention as a simpler and more compact substitute for the link-motion aforesaid is practicable, whatever may be the kind of valve or valves with which the said link-motion is connected. I have, however, particularly contemplated the employment of my herein-described invention as a substitute for the Stephenson link-motion in an application of the said link-motion which is the subject of an application for Letters Patent of the United States, filed simultaneously with this present and entitled "an improvement in the application of the link-motion to steam-engines."

Having thus described a mode of successfully putting my invention into practice, I disclaim as new a valve-driving lever which is actuated by a single eccentric when the said lever does not receive from the eccentric substantially the complex movements of the hereinabove-described lever *a*; but

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

The combination of the valve-driving lever *a* and a single eccentric, or of their respective equivalents, when, substantially in the manner hereinbefore described, the said lever receives from the single eccentric movements which are similar to the movements of the link in the Stephenson link-motion, adapting the device as a substitute for the link-motion aforesaid, as hereinbefore set forth.

In testimony whereof I have hereunto set my hand this 4th day of April, 1861.

JOHN F. ALLEN.

In presence of—

HORACE ANDREWS,
C. B. RICHARDS.