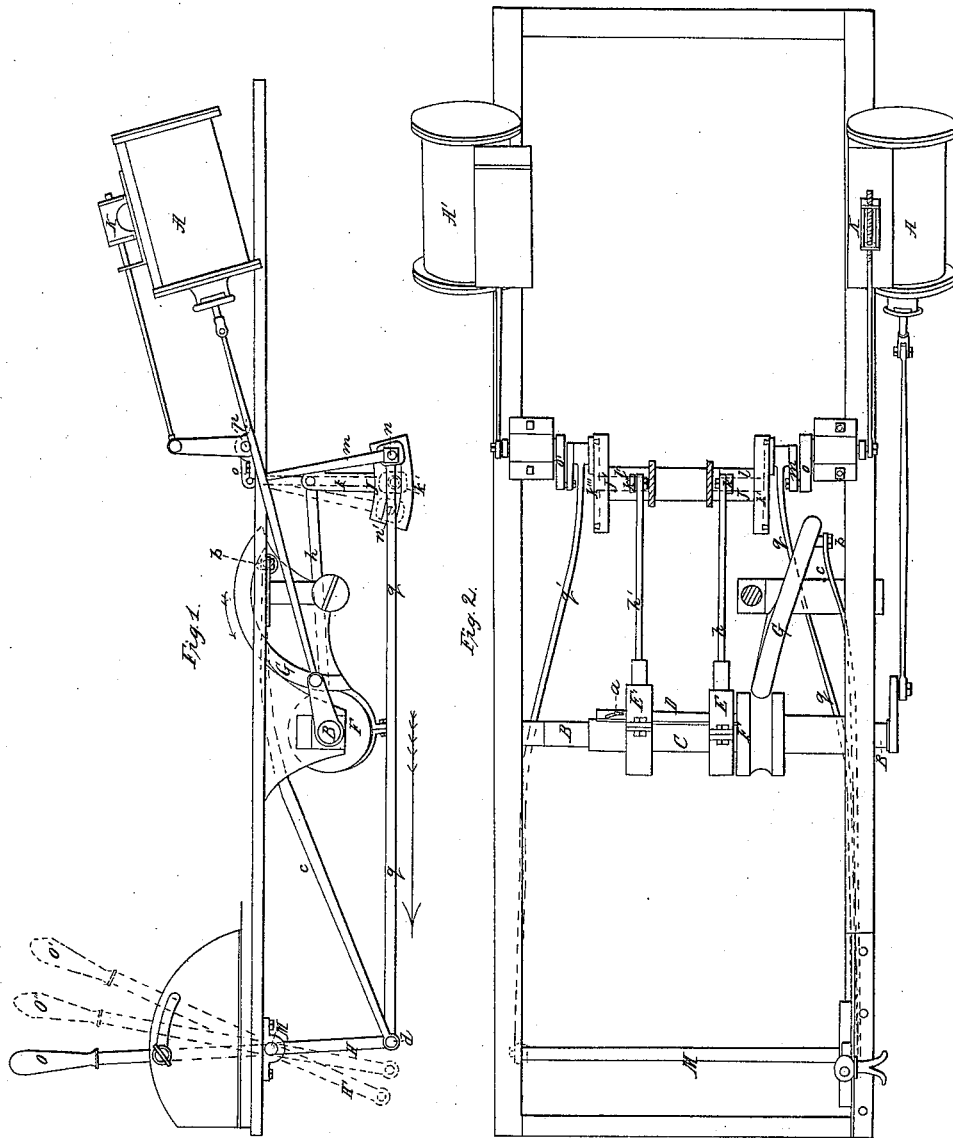


J. Cunningham,
Steam-Engine Valve-Gear.

N^o 7,730.

Patented Oct. 22, 1850.



UNITED STATES PATENT OFFICE.

JAS. CUNNINGHAM, OF READING, PENNSYLVANIA.

APPARATUS FOR REVERSING OR STOPPING LOCOMOTIVE-ENGINES.

Specification of Letters Patent No. 7,730, dated October 22, 1850.

To all whom it may concern:

Be it known that I, JAMES CUNNINGHAM, of Reading, in the county of Berks and State of Pennsylvania, have invented a new and useful Improvement in the Valve-Motions of Locomotive-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 drawing, which forms part of this specification, and in which—

Figure 1 is an elevation of my valve motion attached to the frame of a locomotive and Fig. 2 is a plan of the same.

My invention consists in a device by the use of which a single movement of the hand of the engineer is sufficient to throttle or to shut off the steam in its passage to the steam cylinders, or to reverse the motions of the valves of both cylinders while the proper lead is preserved in the reversal.

In the drawing A A' are the two steam cylinders of a locomotive and B the crank or driving wheel shaft. The two eccentrics E, E', are secured to a sleeve C which is loose upon the shaft but connected thereto by a sliding key D one of whose extremities is pierced with a helical slot which is fitted to a pin *a* fixed to the crank shaft. The opposite extremity of the sliding key has a drum F secured to it whose periphery is grooved to receive the rim of the segment G of a helical wheel hung upon an axis parallel with the crank shaft. A pin *b* projects from the outer face of the helical segment which is connected by a rod *c* and pin *d* with the extremity of an arm H depending from one extremity of a horizontal shaft crossing the locomotive in front of the fire box. The rod *h* of the eccentric E is connected with one arm of a bell crank J, of peculiar construction from which the valve of the cylinder A is worked. This bell crank is composed of two arms *k*, *k'*, secured to a short sleeve *l* hung upon a horizontal axis; the arm *k* with which the eccentric rod is connected projects upward from the sleeve; the other arm *k'* is double, that is it extends equally in opposite directions from the axis of the sleeve, it has the form of an arc of a circle whose center is in the line passing through the middle of the upright arm *k*. This curved double arm is grooved to receive a sliding pin, *n*, from which two rods proceed, the one, *m*, upward to the arm *o*, of a rock shaft *p*, whose opposite arm is con-

nected with the slide valve K, and the other rod *q* connects the sliding pin with the arm H of the horizontal shaft M in front of the fire box. A similar arrangement of eccentric rods and bell cranks the various members of which are designated by the letters E', *h'*, *k''*, *k'''*, *l'*, *m'*, *o'*, *q'*, corresponding with the letters E, *h*, *k*, *k'*, *l*, *m*, *o*, *q*, of the arrangement just described constitutes the valve motion of the other steam cylinder on the opposite side of the locomotive, the last rod *q'* in the arrangement being connected with an arm depending from the horizontal shaft M.

In the drawing the valve motion is shown in the position required to move the valves with their proper lead when the locomotive is moving in the direction indicated by the arrow. If now the engines are to be reversed the hand of the engineer is applied to force a hand lever O, projecting upward from the horizontal shaft M in front of the fire box, forwards to the position represented by the red lines O'. By this operation the rods *q*, *q'*, acting upon the sliding pins in the curved arms of the bell cranks change their position as shown in red lines *n'* from the front to the hinder extremities of the arms, which moving in a direction the reverse of the front extremities, reverse the motion of the valves; while at the same time the helical segment G is turned on its axis by the rod *c* and acting through the drum F upon the sliding key D draws it along the crank shaft, in which movement the pin *a* on the shaft, acting upon the helical slot turns the key and with it the eccentrics E, E', partially round the shaft, thus changing their position with respect to the cranks and reversing the lead.

If the supply of steam to the cylinders is to be stopped entirely, the hand lever is to be moved to a position (as shown in red lines O'') intermediate between the two positions occupied by it when the engines are propelling the locomotive backward and forward. By this operation the sliding pins *n* are brought to the center of the curved arms *k'*, *k'''*, immediately in their axis of motion, and the rods connecting them with the cranks *o*, *o'*, remain motionless, even though the crank shaft continues to revolve, while the valves being drawn to their central positions, cover the steam passages and prevent the steam from entering the cylinders. If the steam is to be throttled or partially cut off when the locomotive is moving in the

direction of the arrow the sliding pin is to be moved by the hand lever from the front extremity of the curved arm toward its center of motion, and the nearer it is drawn to this center the smaller will be the quantity of steam admitted to the cylinders. While if the steam is to be throttled when the locomotive is moving in the opposite direction to the arrow, the sliding pin is to be moved by the hand lever from the hinder extremity of the curved arm toward its center of motion, and the same result will be produced as in the former instance.

It will thus be perceived that the motion of the locomotive is completely controlled by the single hand lever O, and that the engineer by a single movement of his hand can throttle or shut off the supply of steam from the boiler, or can reverse the engines with a precision and quickness unattainable by any other device now in use, thus greatly decreasing the chances of collision, which generally arise from the inability of the engineers to move with sufficient promptness the several hand levers usually employed to cut off the steam and reverse the engines.

I have thus far described my valve motion as it has been constructed by me but it is obvious that any person having sufficient knowledge of the principles and practice of mechanics will be able to modify the invention to suit the particular locomotive to which it is to be applied without a material

deviation from its essential characteristics. Thus for example the curved arm k' may have an upright instead of a horizontal position, the eccentric rod being connected with its upper or lower extremity while a jointed valve rod is connected directly with the sliding pin without the intervention of the crank o' , and the rock shaft to which it is secured, but in this case as the pin would be arranged to slide upward and downward instead of forward and backward, a bell crank or some equivalent device would be required to impart to it the movement of the hand lever O.

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

The arrangement and connection of the system of devices, consisting substantially of a rockshaft (M) with its hand-lever (O) and arms (H), link-rods (e and g), helical-segment (G), drum (F), sliding-key (D), and oscillating arms (k'), together with the eccentrics and valves with their respective rods, by means of which the movement of the steam valves of a locomotive-engine can be arrested, or reversed with proper lead to reverse the motion of the locomotive, by a single movement of the hand.

JAMES CUNNINGHAM.

Witnesses:

WILLIAM COLLIER,
WYLLYS BUELL.