# S. Maltby,

## Steam-Engine Valve-Gear.

No. 17,689. Patented June 30, 1857.

Fig. 1.

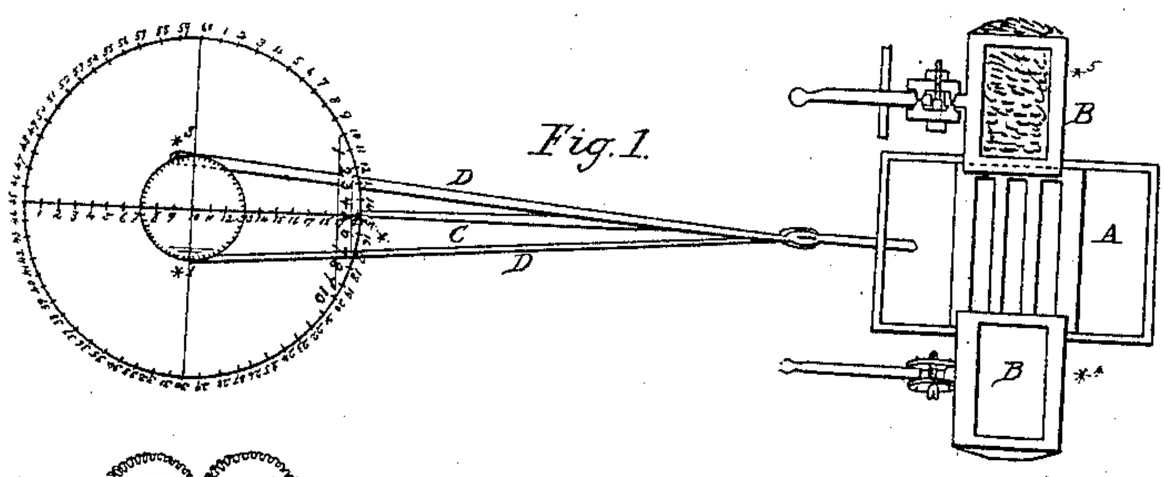



Fig. 2.

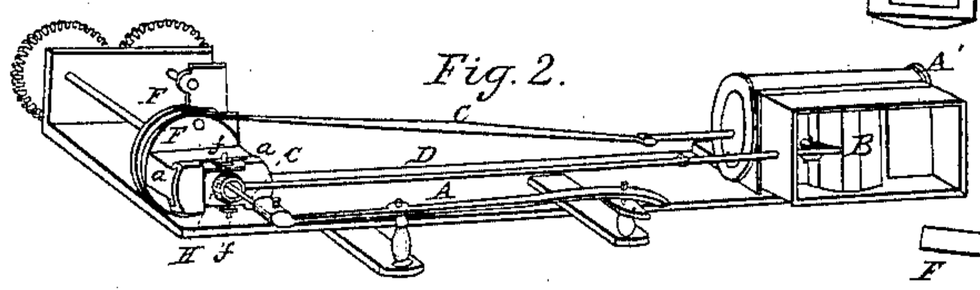



Fig. 3.

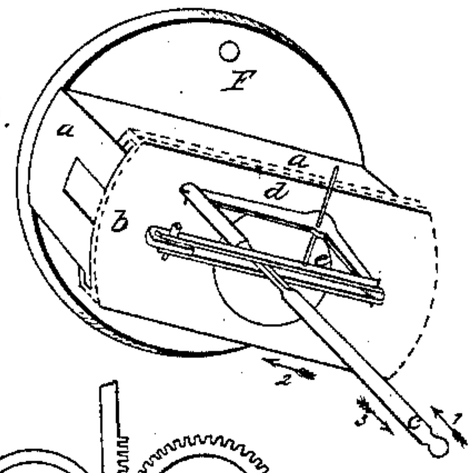



Fig. 7.

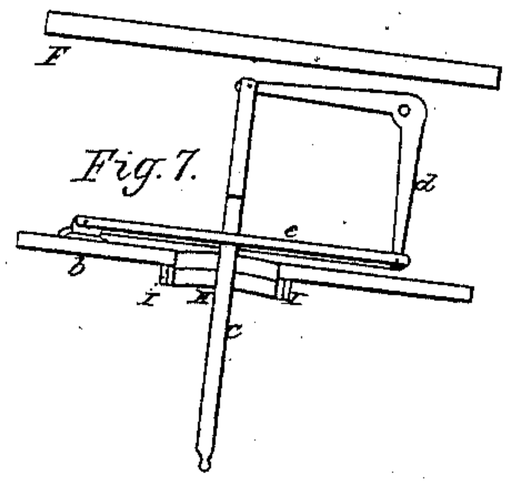



Fig. 5.

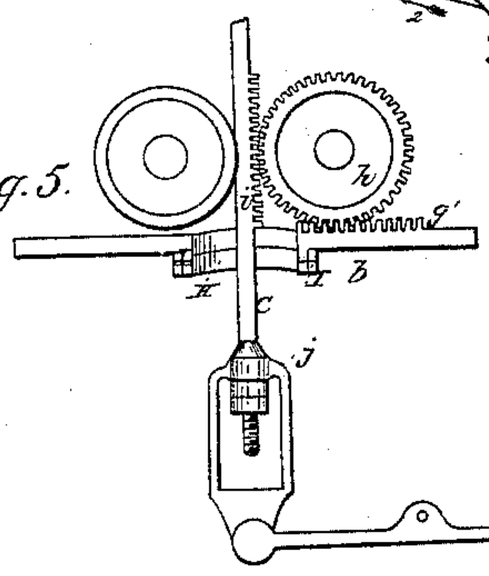



Fig. 6.

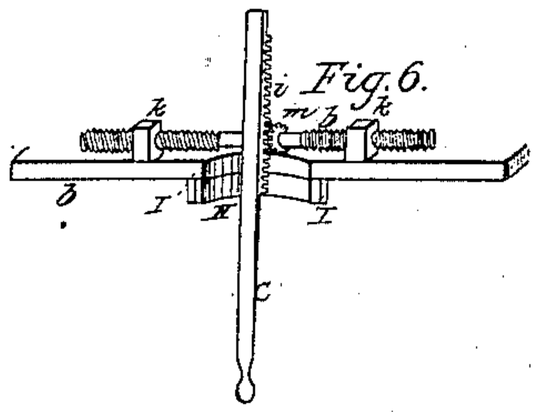



Fig. 4.

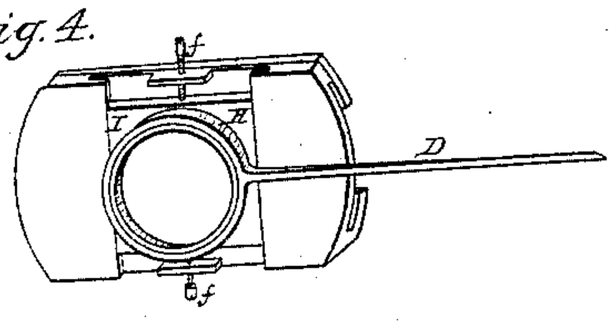
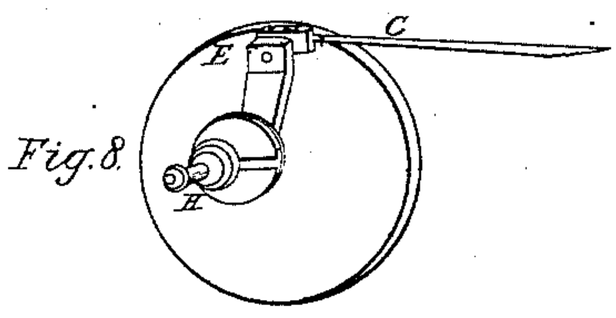



Fig. 8.



# UNITED STATES PATENT OFFICE.

SIDNEY MALTBY, OF DAYTON, OHIO.

## VALVE-GEAR FOR STEAM-ENGINES.

Specification of Letters Patent No. 17,689, dated June 30, 1857.

*To all whom it may concern:*

Be it known that I, SIDNEY MALTBY, of Dayton, in the county of Montgomery and and State of Ohio, have invented a new and Improved Gear for Effecting the Reverse Motion of the Engine and Regulating the Cut-Off and Lead of the Valve; 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, forming part of this specification, in which—

Figure 1 is a side view of an ordinary seat and valve with connecting straps and rod. Fig. 2 is a perspective view of the same connected with the gear which effects the reverse motion of the engine and regulates the cut off lead of the valve. Fig. 3 is a detached perspective view of the gear which regulates the cut off and lead, the sliding plate which carries the wrist of the valve crank having been removed, and the position it occupied indicated by dotted lines; Fig. 4, a detached perspective view of the siding plate which carries the wrist of the valve crank, the valve connecting rod being attached to the wrist. Figs. 5, 6, and 7 represent mechanical means for operating the crank wrist sliding plate. Fig. 8 shows a modification of the reversing, cut off, and lead gear, adapted for use on a stationary engine where it is not necessary to reverse the engine or change the cut off while in motion.

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

The nature of my invention consists in having the valve wrist adjustable by means of a sliding plate which plays over a hollow box seat attached directly to the wrist of the engine crank, and which in connection with said box answers in place of the ordinary return crank, whereby while the engine is running the motion of the engine can be conveniently and easily reversed in an instant, and the cut off regulated as perfectly as when is used the independent, complicated, common link motion; consisting of eccentrics, their connections to the link, the shaft on which the link is hung in a central position, counterbalance shaft and its weight double rocker shaft of the link, fixtures for moving to and from the center and rods running from the rocker shaft to the valve rod, etc.

My invention consists, 2nd, for special use in connection with the above, in so arranging the valve wrist on the sliding plate that it shall be capable of being moved directly on the said plate in a line at right angles to the direction in which the plate moves, so as to stand more or less forward of a line at right angles with the engine crank wrist, and thereby caused to give the valve the usual or desired amount of lead to allow the steam to enter the cylinder just before the crank arrives at the dead center, and thereby arrest and remove the weight from the crank shaft of the engine and effect the reverse or return movement around the dead center, by means of the steam, as in the ordinary application of lead.

To enable others skilled in the art to make and use my invention I will proceed to describe its construction and operation.

A, represents a portion of the engine frame; $A^1$, represents an ordinary steam chest, and B, valve of the same.

C, is the connecting rod of the engine crank, and D, the connecting rod of the valve crank.

E, is the engine crank, and F, the valve crank. The engine crank is of usual construction and is arranged as ordinarily on the frame A. The valve crank is peculiarly constructed, but is connected with the engine crank in the same manner as the ordinary return crank, and takes the place of the same.

*a*, is an oblong hollow box seat attached fast to the outer face of the valve crank.

*b*, is the sliding plate, which carries the valve crank wrist H. It is dovetailed or otherwise suitably fitted to the outer face of the seat *a*, so as to be capable of sliding freely over it.

*c*, *d*, *e*, Fig. 3, represent an arrangement of mechanism for giving the sliding plate a parallel sliding movement in a line at right angles with the engine crank wrist. This mechanism is placed in the hollow box *a*, and is conected with the sliding plate as shown in Figs. 3 and 5. With this arrangement it may be obvious that by moving the rod *c*, in the direction of the arrow 1, the elbow link *d* will be caused to slide the plate in the direction of the arrow 2, and vice versa if the rod is moved in the direction of the arrow 3. By thus sliding the plate the cut off can be perfectly regulated and the reversing of the engine effected, for if the plate be moved and the wrist carried from the center of the crank to any point between said center and the pe-

riphery of the same the throw of the valve will be changed, and by moving the plate so as to carry the wrist from one point near the periphery to another point directly opposite the same the engine will be reversed and the lead transferred to the opposite motion of the engine.

I, is a plate arranged on the sliding plate *b*, and forming part of the valve crank wrist. This plate is arranged to slide with the wrist independently of the plate *b*, in a line at right angles with the direction in which said plate *b*, moves, but so as to necessarily move with the plate *b*, when it is adjusted. The object of the plate I, is to provide a convenient means in connection with the reverse and cut off plate whereby the lead of the valve may be adjusted with certainty and facility. With this arrangement it may be obvious that if the sliding plate I, is moved by the set screw *f*, in the direction in which the engine is running the wirst of the valve crank will be thrown forward of a point at right angles to the engine crank wrist. This may be more clearly understood by referring to the scale exhibited in Fig. 1, where the engine crank wrist, designated by *, is shown at the dead center and the valve rod wrist, designated by *1, is shown at right angles thereto, and the valve *4, working "square" over the ports and the lead given to the valve *5 indicated by the red dot or *3.

In Figs. 5 and 6 modifications of the means employed for effecting the sliding of the plate *b*, are shown. In one of these modifications teeth $g^1$ are formed on the backside of the plate *b*, and a pinion *h*, gears into said teeth and into a rack *i*, which is provided with a swivel joint *j*, by which it is connected to the adjusting lever. In the other modification the plate *b*, is provided with tapped lugs *k*, *k*, and a screw shaft *l*, works through said lugs. On the screw shaft a small pinion *m*, is fastened, into which a rack bar *i*, gears.

In the modification represented by Fig. 8 the wrist of the valve crank is arranged to slide over the face of a disk instead of being connected to a sliding plate. This arrangement is preferable for use on a stationary engine where it is not necessary to reverse or change the cut off while the engine is not in motion.

This cut off as a whole presents manifold advantages over others heretofore used, because it has fewer parts which cause friction and are liable to become deranged; 2nd, because it is more compact, durable and convenient for application to all ordinary known forms of engines, and, 3rd, because it is far less expensive than the well known and most approved link motion now in use.

I do not claim effecting the reverse and cut off by having the wrist adjustable on a link or slotted arm, because with the first device great complication is necessary in order to produce the desired results, and in the second a like complication is necessary in order to effect the reverse and cut off while running; but

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

The means herein described for effecting the reverse, cut off, and lead when said means are arranged directly on the wrist of the engine crank and used as a substitute for the common link and hook motions, substantially as and for the purposes set forth.

SIDNEY MALTBY.

Witnesses:
GOODWIN Y. AT LEE,
ELI R. BROWN.