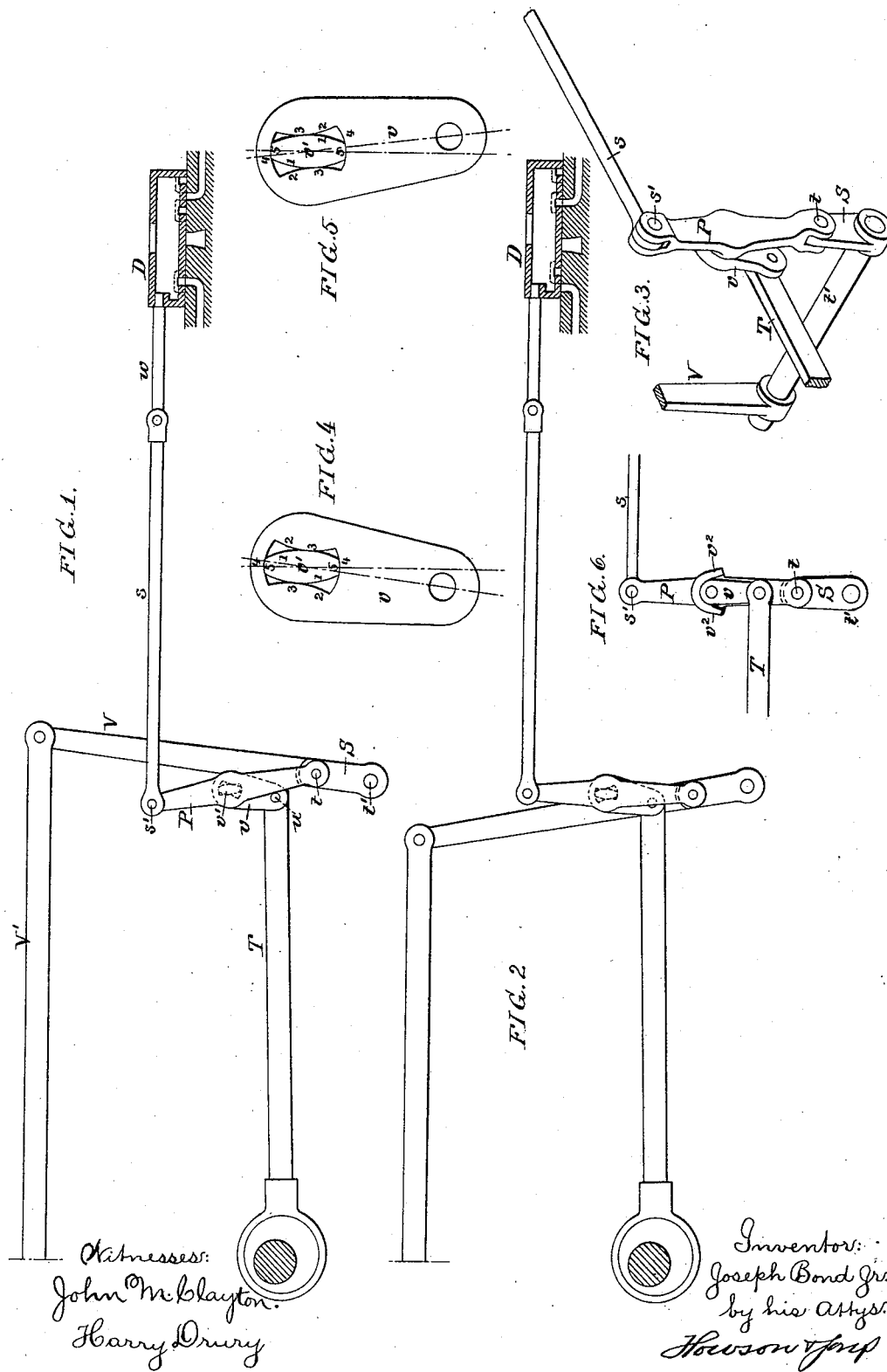


(No Model.)

J. BOND, Jr.
VALVE GEAR.

No. 307,009.

Patented Oct. 21, 1884.



UNITED STATES PATENT OFFICE.

JOSEPH BOND, JR., OF PHILADELPHIA, PENNSYLVANIA, ASSIGNOR OF ONE-HALF TO CHARLES M. SWAIN, OF SAME PLACE.

VALVE-GEAR.

SPECIFICATION forming part of Letters Patent No. 307,009, dated October 21, 1884.

Application filed June 2, 1884. (No model.)

To all whom it may concern:

Be it known that I, JOSEPH BOND, Jr., a citizen of the United States, and a resident of Philadelphia, Pennsylvania, have invented certain Improvements in Valve-Gear for Steam-Engines, of which the following is a specification.

One object of my invention is to dispense with the usual link-motion reverse-gear for the valves of steam-engines, and a further object is to impart a quick throw to the valve. These objects I attain in the manner hereinafter set forth, reference being had to the accompanying drawings, in which—

Figures 1 and 2 are views in different positions of the valve driving and reversing gear forming the subject of my invention; Fig. 3, a perspective view of the same; Figs. 4 and 5, diagrams illustrating the action of part of the valve-gear, and Fig. 6 a modification of the latter.

The valve D which I employ is similar to that described and claimed in my application filed February 14, 1884, Serial No. 120,700, and hence will not require full illustration or detailed description. It will suffice to say that the valve has ports so arranged in respect to those of the cylinder that the engine is reversed by longitudinally shifting the valve.

The present invention consists of a device for shifting the valve without interfering with the throw of the eccentric. The valve-stem *w* is connected by a rod, *s*, and pin *s'* to the upper end of an arm, P, the lower end of which is pivoted to a pin, *t*, carried by an arm, S, which is secured to a rock-shaft, *t'*, adapted to bearings in a bracket on the frame of the engine, or on some other available support, another arm, V, on this shaft being connected by a rod, V', to the usual reversing-lever. In the case of a locomotive or other double engine the shaft *t'* will be furnished with two arms, S, one for each engine, but both operated by the same reversing-lever. The eccentric-rod T is connected by a pin, *u*, to a link, *v*, which is hung to a projection, *v'*, on the arm P. It is advisable to impart a quick throw to the valve, and in order to effect this result with the usual eccentric I so construct the connection between said eccentric and the arm P as to permit a certain amount of play,

so that the first part of the throw of the eccentric in either direction, being a slow movement, is lost, the eccentric not beginning to act on the arm until it reaches that part of its throw where the movement is comparatively rapid. To accomplish this result the opening in the link *v* for the reception of the projection *v'* on the arm P is made flaring at each end, the sides 2 2 of the opening and the sides 1 1 of the projection being convex and touching each other at the two opposite points, 3 3, and the opposite ends, 4 4, of the opening being segmental and bearing on the ends 5 5 of the projection. By this means the first part of the throw of the eccentric in either direction will simply swing the link *v* without imparting any movement to the arm P, the latter not being brought under the control of the eccentric until the link reaches the position shown in Fig. 4, or that shown in Fig. 5, where the points 3 3 bind on the convex surfaces 1 1 and lock the link to the projection *v'*. The extent of this lost movement will depend upon the convexity of the surfaces 1 1. Thus the shorter the radius of the same the longer will be the movement, and vice versa. The movement of the arm P by the reversing-gear is effected by the movement of the arm S, which carries the pivot-pin *t* of the arm P, the movement being from the position shown in Fig. 1 to that shown in Fig. 2, or the reverse. When the pin *t* is shifted, the arm P first swings on the pin *s'* until the link *v* becomes locked to the projection *v'*, whereupon the pin *u* becomes the fulcrum, and there is a movement of the upper end of the arm P and of the valve-rod commensurate with the movement necessary for the reversal of the engine, as above described.

A slide or equivalent shifting carrier for the pivot-pin *t* may be employed, if desired, in place of the arm S. The reversing movement of the arm P is wholly independent of the movement imparted by the eccentric.

Various means of connecting the eccentric-rod to the arm P, so as to provide for the desired lost motion, may be adopted. In Fig. 6, for instance, I have shown a device in which the link *v* is pivoted at its upper end to the arm P, and swings between inclined lugs *v''* on said arm, the link failing to exercise any con-

trol over the arm until it comes into contact with one or other of the lugs. The device shown in Figs. 1 and 2 is, however, preferred, as it will work more smoothly, owing to the fact that the link *v* has at all times a bearing on the projection *v'*.

My improved reversing device can be used in connection with any valve having ports so arranged as to reverse the engine by longitudinally shifting the valve.

It will be observed that the reversal of the valve in my improved gear is effected by a simple movement of the pivot *t* in the direction of movement of the valve-rod and eccentric-rod, there being no vertical movement of the arm *P* in the operation of the gear, as in that class of gears in which a lever connected to the valve and eccentric rods is hung to a link so that the pivot swings in the arc of a circle.

I claim as my invention—

1. The combination of a valve, *D*, with a reversing device, consisting of the arm *P*, connected to the valve-rod and eccentric-rod, and a pivot, *t*, occupying a fixed position dur-

ing the working of the valve, but adjustable in the direction of movement of the valve-rod and eccentric-rod, in order to reverse the valve, as set forth.

2. The combination of a valve, *D*, the pivoted arm *P*, connected thereto, the eccentric-rod *T*, and the link *v*, connected to the arm, as described, whereby the first portion of the throw of the eccentric in either direction is without effect on the arm, as set forth.

3. The combination of the valve, the pivoted arm *P*, connected thereto, and having a projection, *v'*, with convex sides 1, the eccentric-rod *T*, and the link *v*, having an opening for the reception of the projection *v'*, said opening having a bearing on the convex sides of the projection *v'* at the opposite points, 3 3, as set forth.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

JOSEPH BOND, JR.

Witnesses:

JOHN M. CLAYTON,
HARRY SMITH.