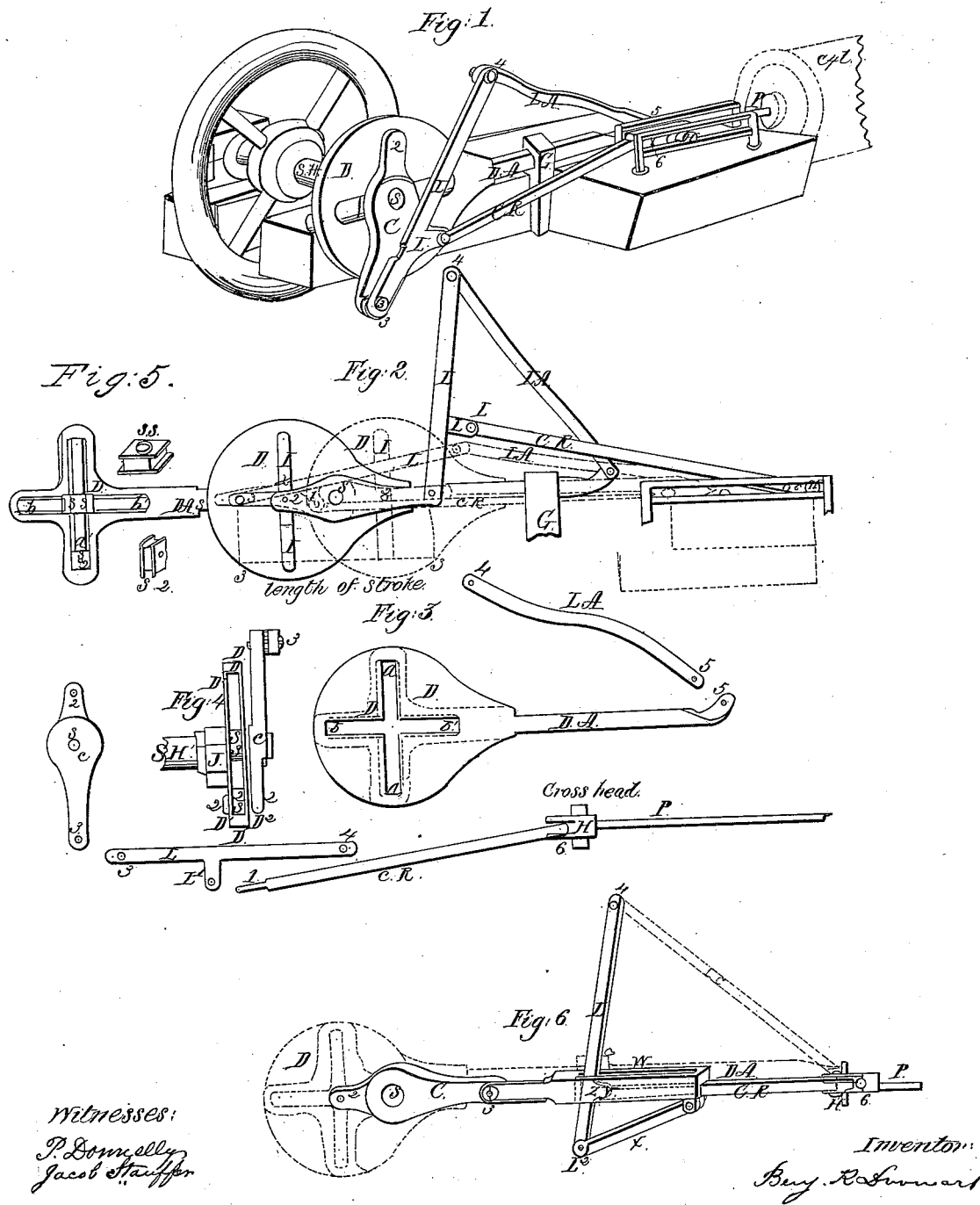


B. K. Dormart,
Reciprocating Steam Engine,
No. 50,695, *Patented Oct. 31, 1865.*



UNITED STATES PATENT OFFICE.

BENJAMIN K. DORWART, OF LANCASTER, PENNSYLVANIA.

IMPROVEMENT IN RECIPROCATING CRANK-MOTIONS.

Specification forming part of Letters Patent No. 50,695, dated October 31, 1865.

To all whom it may concern:

Be it known that I, BENJAMIN K. DORWART, of the city and county of Lancaster, in the State of Pennsylvania, have invented a new and Improved Reciprocating Crank-Motion, applicable to stationary or locomotive engines in order to lengthen the stroke one-third over the ordinary crank, thereby gaining power by the increased leverage employed; and I do hereby declare that the following is a full and clear description of the construction and operation of the same, reference being had to the accompanying drawings, making a part of this specification.

Figure 1 is a perspective view of the right-angled self-forming crank or cross-slot or disk, crank, lever, and connecting-rods in place in one position. Fig. 2 illustrates the various parts in two positions on the horizontal plane, in red, when the piston is pushed out to its full extent, and in the black outlines when drawn into the cylinder to its full extent. Fig. 4 is a vertical cross-section of the disk D and the crank-lugs s and s^2 between the plates D' D^2 . Fig. 5 shows a modification of the cross-slots and lugs without the external disk-plates, D' D^2 , shown by Figs. 1 and 2, 3, and 4. Figs. 6 shows a modification of the lever L and combined connections which actuate the crank, producing a double-crank motion in like manner.

It is now known that the ordinary crank fully transmits the power which is communicated to it—*i. e.*, the mechanical power of the steam or its mechanical effect—and at what is called the “position of the centers” no loss of power can really take place has been demonstrated.

The object of my invention is to increase the stroke over and beyond the length of cylinder employed by increase of leverage, augmenting the force of the power or effect of the steam in the same ratio. This effect is produced by the intervention of a lever, L, applied to the long arm of the crank c' at 3, Fig. 1.

The main crank c is connected to the shaft S H or driver (shown on a fly-wheel) at s , having a shorter arm continued to its connection, with a sliding lug at 2 or s^2 , Fig. 4. There is a similar sliding lug, s , to the intermediate portion, s , of the crank-arms. These lugs are either flanged, as s^2 , Fig. 5, when the slotted cross, Fig. 5, is employed, which is essentially

the same, only that the flanges embrace the sides externally, whereas when the disk-plates are applied, D' D^2 , Fig. 4, the lugs are held by the disk-plates and require no flanges, moving to and fro between them.

The prolonged arm D A, connected to the cross-slot or disk D, passes through a stationary guide, G, in which it slides back and forward. This arm D A is connected, at 5, with an arm, L A, which latter again connects (all by means of pivots) to the lever L, which is in connection with the long arm of the crank at 3; or it may be carried through a slot in bar W, shown by Fig. 6, and connected beneath to a kind of toggle-joint, X, which comes from a boss-joint, 7, on lower side and outer end of the slotted bar W. This arrangement will keep the connecting-rod in a horizontal position and in line with the crank-pin. In either case, however, the lever L has a short projecting arm, L' , at such a point as to yield the desired increase of stroke, when employed in connection with the slotted bar W, which has an opening in front through which the connecting-rod C R enters, and is attached to the short arm L' within the slot, and in which both the lever L and connecting-rod C R slide to and fro by the action of the piston and several connections shown, with the motions induced by the means of the sliding lugs and cross-slot or disk and projecting arm, in connection with the lever, as specified, producing a reciprocating or double-crank motion.

Both devices I consider substantially the same, and at a loss which to adopt, having experimented with both, as well as using an eccentric on the short end of the crank or applying the disk directly behind the crank-pin or in the rear of the first pedestal. By attaching the lower pivot, 5, of rod L A to a fixed point, a somewhat similar result might be produced through the crank and lever motion, subjecting it, however, to considerable resistance and consequent loss of the power applied. This resistance is overcome by the yielding motion applied to its connection with the elongated arm D A of the disk D or cross-slotted movable head, Fig. 5.

The operation is such that while the piston is acted upon in the ordinary manner within the cylinder it presses upon the lever L and imparts its motion to it and the crank, by means

of the connecting-rods, simultaneously on the prolonged arm of the disk or cross-slot, also, by the connection of the lever L with the connecting-arm L A, as shown, reciprocally, forming, as it were, a double-crank motion with increase of stroke in the ratio of six to four over the ordinary crank, or one-third the length of cylinder.

The horizontal movement of the prolonged arm D A in its guide G is admirably adapted for operating the valve-rods without any special change in the working of steam-engines of the most improved or ordinary kinds, so that the eccentrics now used for that purpose may be wholly dispensed with.

It is confidently believed that this arrangement of crank-and-lever motion is a decided improvement and of great efficacy on stationary or locomotive engines, and when properly tested cannot fail to be adopted.

I am aware that cross-slots with sliding plugs have been used to produce elliptic motion or vertical motion, but not in the manner and for the purpose herein set forth, and, in fact, substantially different in its action. I am not aware of its use before in combination with a crank arm and prolongation, as shown.

It may be deemed proper to give a brief explanation of the action of the lugs $s s$ s^2 in the cross-slotted head or disk D. This is seen in the trammel used by joiners for drawing ovals, only that the arm to which the lugs are attached moves around the disk, while that remains stationary. In this case, however, the lugs are fixed to the crank, one, $s s$, at the con-

nection of the crank, at s , to the shaft S H, where it is, of course, stationary, as is the lug s^2 on the shorter opposite prolongation of the crank. Consequently the disk or cross-slotted head is moved horizontally, as indicated by the red and black lines, Fig. 2. The lug $s s$ traverses, or is, rather, made to traverse, the horizontal slot from b to b' , Fig. 3, while the lug s^2 on the short end of the crank actually rises and falls in the vertical slot from a to a' , or moves up and down as the disk or cross-slotted head travels back and forward on the horizontal plane, the lug s^2 just clearing lug $s s$ as the latter has crossed the center by the revolution of the crank, impelled and operated jointly, as already set forth.

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

1. The cross-slotted head or disk D, with its prolonged arm D A, in combination with a double-ended crank, c , and lugs $s s$ and s^2 , constructed and operating substantially in the manner and for the purpose specified.

2. The lever-arm L, with its short side arm, L', in combination with the connecting-rod C R, constructed and operated substantially as and for the purpose specified.

3. The rod L A, in combination with the lever L and prolonged arm D A, of the disk or slotted cross-head D, arranged in the manner and for the purpose specified.

BENJ. K. DORWART.

Witnesses:

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JACOB STAUFFER.