

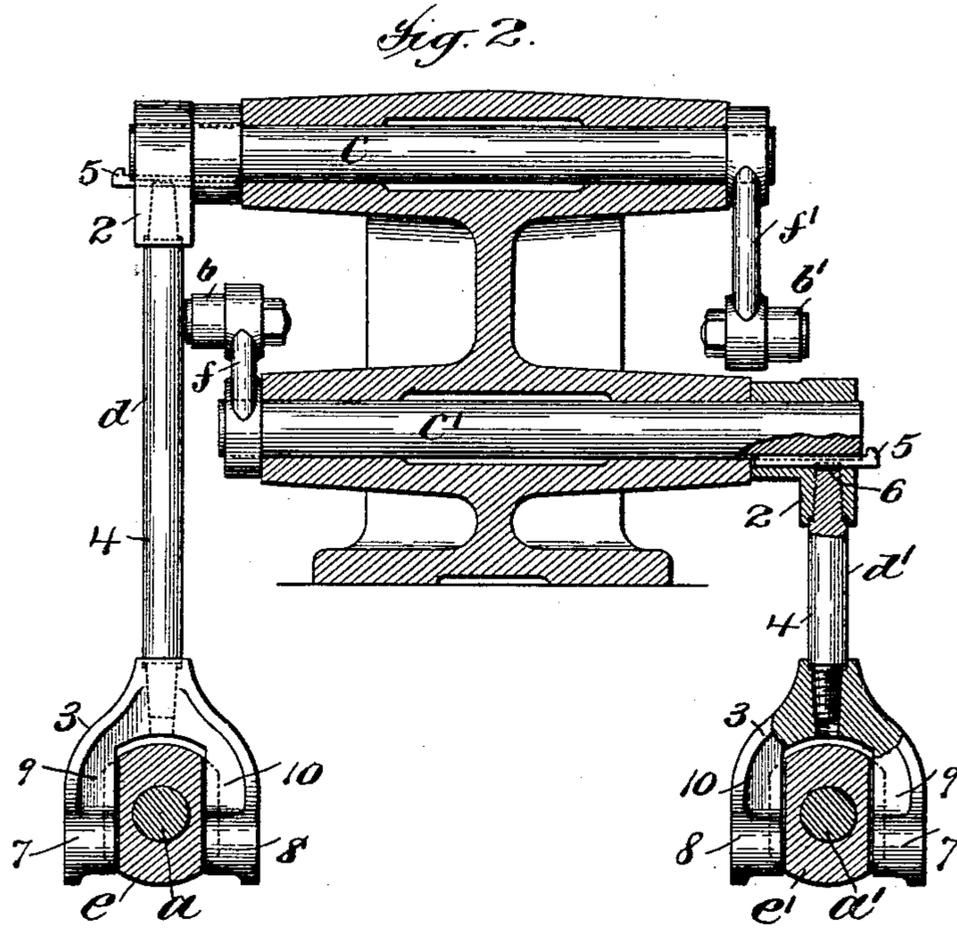
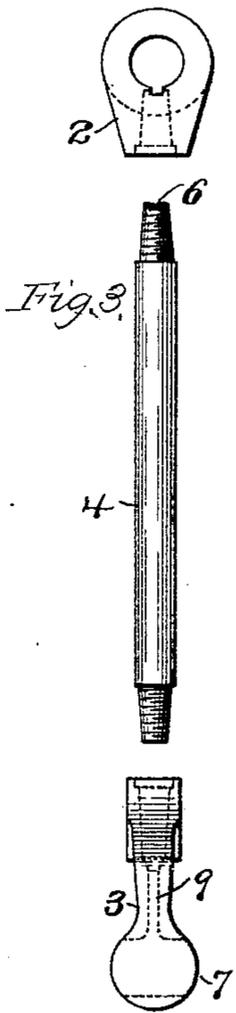
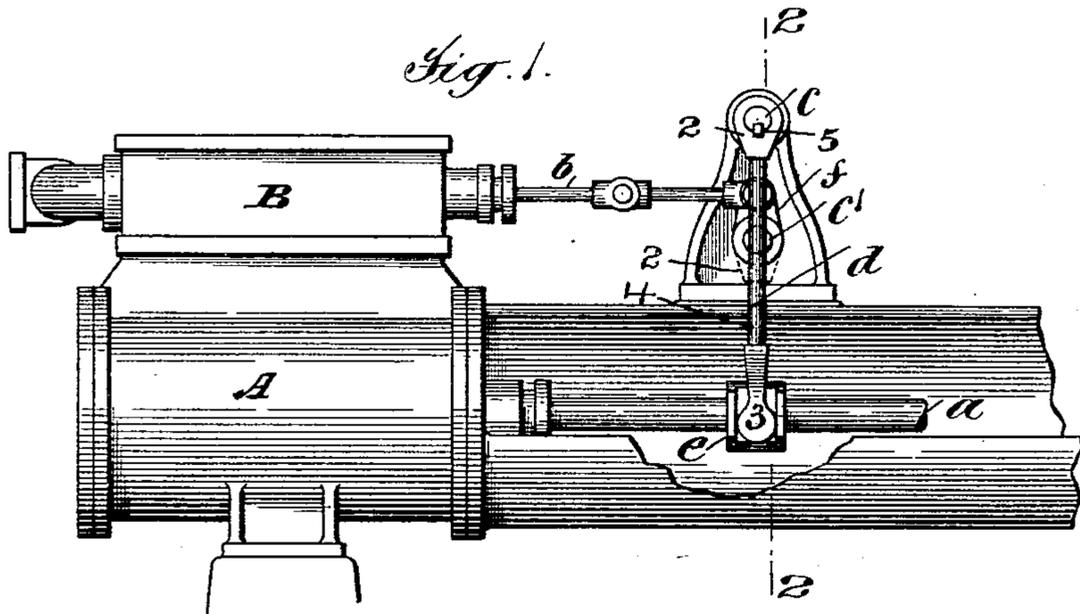
No. 684,336.

Patented Oct. 8, 1901.

C. C. WORTHINGTON.  
VALVE MOTION FOR DUPLEX ENGINES.

(Application filed June 12, 1897.)

(No Model.)



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# UNITED STATES PATENT OFFICE.

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## VALVE-MOTION FOR DUPLEX ENGINES.

SPECIFICATION forming part of Letters Patent No. 684,336, dated October 8, 1901.

Application filed June 12, 1897. Serial No. 640,412. (No model.)

*To all whom it may concern:*

Be it known that I, CHARLES C. WORTHINGTON, a citizen of the United States, residing at Irvington, county of Westchester, and State of New York, have invented certain new and useful Improvements in Valve-Motions for Duplex Engines, fully described and represented in the following specification and the accompanying drawings, forming a part of the same.

The object of this invention is to provide an improved construction of valve-motions for duplex engines, and more particularly of the operating-levers for the crank-shafts through which the valves of one side of the engine are operated from the piston-rod of the other side of the engine.

The accompanying drawings show a construction embodying the invention in the preferred form as applied to a duplex pumping-engine of the well-known Worthington type.

In said drawings, Figure 1 is a broken side view of the steam end of such an engine. Fig. 2 is a section on line 2 of Fig. 1. Fig. 3 is a detail showing the parts of one of the operating-levers disconnected.

Referring to the drawings, A is one of the steam-cylinders, and B the corresponding steam-valve chest, *a a'* the piston-rods, and *b b'* the steam-valve-operating rods, of a duplex pumping-engine of the type above referred to.

*c c'* are rock-shafts rocked, respectively, by levers *d d'*, having forked ends engaged by spools *e e'* on the piston-rods *a a'*, respectively, and said rock-shafts actuating the valve-rods *b b'* through crank-arms *f f'*, respectively, all in the usual manner in the valve-motions of Worthington duplex pumping-engines.

It has been the practice heretofore to form the rocking or operating levers *d d'* by casting, since because of the peculiar form of the levers, with their crank ends for attachment to the rock-shafts and their forked ends for engaging the spools on the piston-rods, it has been impracticable on account of the expense and difficulty of construction to make these levers by forging. The present invention aims to provide a construction of operating-lever of this form which shall have the advantages of a lever formed in one piece by forging and which may be produced at a greatly-reduced

expense. In accordance with the invention the levers are formed, in the preferred form shown, of a forged crank end 2 and a forged forked end 3, separate from the crank end 2, these ends being connected by a shank portion 4, which may be formed in any suitable manner, but preferably of cold-rolled steel, and which has its ends preferably tapered and screw-threaded, as shown, to enter screw-threaded tapered sockets in the crank end and forked end, respectively. The end of the shank 4 extending into the socket in the crank end 2 preferably extends into the path of the key 5, by which the crank end in the preferred construction shown is keyed to the rock-shaft *c* or *c'*, as the case may be, and said end is slotted, as shown at 6, to permit the passage of the key. The shank 4 will thus be held by the key against turning when the parts are in position, and as the forked end 3 is prevented from turning by the spool *e* or *e'*, which its arms embrace, it will be impossible for the several parts forming the operating-lever to become separated or loosened after the parts have once been placed in position as a part of the valve-motion.

In the preferred construction shown the forked end 3 is provided with enlargements 7 and 8 on the ends of the fork, which serve as surfaces to roll or slide upon the sides of the cross-heads *e*, with which they engage, and extending from these enlargements are the webs 9 and 10, having parallel sides, which tend to hold the cross-heads *e* in a vertical position and to prevent the piston-rods of the pump from turning.

It is evident that other means may be employed for securing the parts of the operating-lever together and to the rock-shaft *c* and for preventing their separating or loosening—as, for instance, the parts may be forced or shrunk together, and the crank end may be thus secured to the shaft or formed integral therewith; but the form shown is preferred and in itself forms a part of the invention. Instead of providing a shank separate from the forgings forming the crank end and forked end of the levers, as in the preferred construction shown, either one or both of said forgings may be formed with an extended portion forming the shank of the lever or a part of the shank of the lever, the two parts

thus formed being secured together in any suitable manner.

5 It will be seen that by employing the built-up construction above described for the operating-levers I am enabled to construct with comparatively small expense the valve-motions of the general form shown without the necessity of forming any of the parts from castings.

10 What I claim is—

1. A rock-shaft-operating lever for duplex-engine valve-motions having a crank end and a forked end formed of two separate pieces, and a connecting-rod 4 having a screw con-  
15 nection with one or both of said ends, said forked end being formed with enlargements

7, 8 and webs 9, 10 extending from said enlargements, substantially as described.

2. A rock-shaft-operating lever for duplex-engine valve-motions having a crank end and  
20 a forked end formed of two separate pieces connected together, said forked end being formed with enlargements 7, 8, and webs 9, 10 extending from said enlargements, sub-  
25 stantially as described.

In testimony whereof I have hereunto set my hand in the presence of two subscribing witnesses.

CHAS. C. WORTHINGTON.

Witnesses:

ANDREW J. CALDWELL,  
BOWEN W. PIERSON.