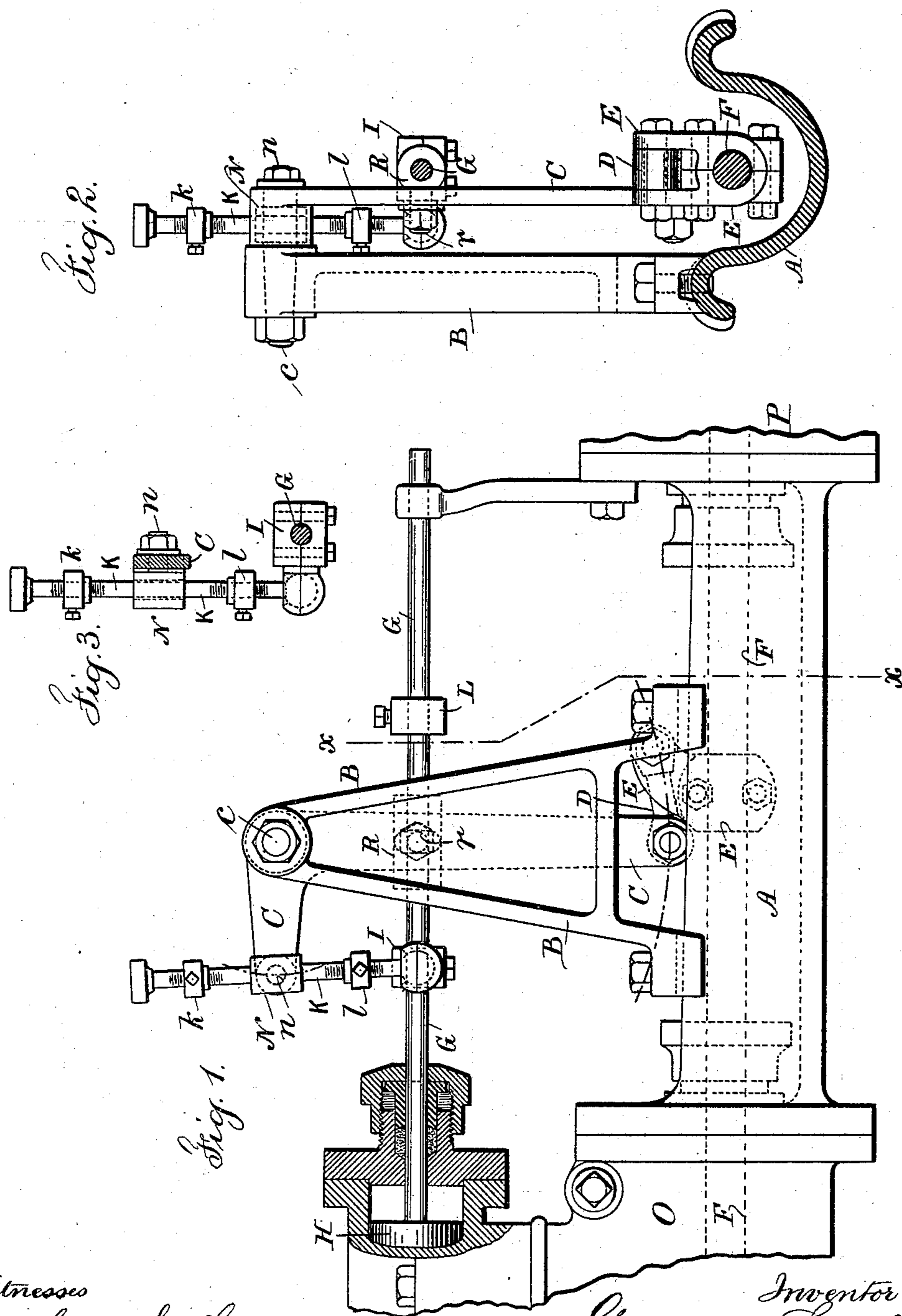


(No Model.)

G. DE LAVAL.
VALVE MECHANISM FOR STEAM PUMPS.

No. 604,475.

Patented May 24, 1898.



Witnesses
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UNITED STATES PATENT OFFICE.

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VALVE-MECHANISM FOR STEAM-PUMPS.

SPECIFICATION forming part of Letters Patent No. 604,475, dated May 24, 1898.

Application filed August 2, 1897. Serial No. 646,753. (No model.)

To all whom it may concern:

Be it known that I, GEORGE DE LAVAL, a citizen of the United States, residing at East Cambridge, in the county of Suffolk and State of Massachusetts, have invented an Improvement in Valve Mechanism for Steam-Pumps, of which the following is a specification.

In Letters Patent No. 428,449, granted May 20, 1890, to William H. Blake, an automatic valve-motion is represented for steam-engines especially available for direct-acting pumping-engines, and the valve is moved by a piston which is cylindrical and slides endwise in the valve-chest and gives motion to the valve, and to this valve-moving piston a partial revolution is given to bring into action ports that allow the steam to give end motion to the valve-moving piston in either one direction or the other. With a valve-moving piston of this character a valve-rod has in some instances been used extending axially from the valve-moving piston and acted upon by a rocker mechanism and short arm that give the necessary turning motion; but this has not always been found reliable and easily adjusted.

The present invention is for giving to the rod of the valve-moving piston a partial turning motion and also for giving to such rod and the valve-moving piston a positive endwise motion in cases where the steam or other pressure fails to give the necessary motion to the valve; and the present invention relates to the peculiar mechanism hereinafter described and claimed.

In the drawings, Figure 1 is a side elevation representing the present improvement and portions of the ends of the cylinders. Fig. 2 is a cross-section at the line $x x$, and Fig. 3 is a detached view of the tappet-rod and arm connecting with the valve-rod.

The center piece A is usually in the form of a casting bolted to the heads or ends of the steam-cylinder O and to the pump-cylinder P. This center piece may be of any desired character, and upon it a triangular frame B is firmly bolted at its base, and at the upper part of this frame the pivot c carries the bent lever C, and upon the piston-rod F is a two-part head-piece E, clamped by screw-bolts, and the link D is pivoted at one end to the

lower end of the bent lever C and at the other end to the head-piece E, so that the bent lever C swings upon its pivot c as the piston-rod is reciprocated by the piston.

The valve-rod G is connected at one end to the valve-moving or chest piston H, so that such piston H and valve-rod reciprocate together, and the chest-piston receives a turning movement through the valve-rod, as hereinafter described, and in this turning movement the pressure is admitted to act through ports to give end motion to the chest-piston and to the valve, and as these parts are substantially similar to those that have been patented, as aforesaid, it is unnecessary to give a detailed description of the construction and operation of such parts.

Upon the valve-rod G an arm I is clamped and projects at one side, and the tappet-rod K has a ball at its lower end, received into a socket at the end of the arm I, and this rod K is screw-threaded and receives upon it the tappets k and l , and these can be adjusted as may be required from time to time even while the engine is running.

The tappet-rod K passes freely through the valve-rod tappet N, so that the tappet may be moved up and down upon the rod K, and the stud n and nut form a pivotal connection for the valve-rod tappet N to the short arm of the bent lever C.

It will now be understood that as the bent lever C is swung upon its pivot c by the movement of the pistons and piston-rod, as aforesaid, the short arm of the bent lever C moves the tappet N up and down upon the tappet-rod K and through the ball-joint and clamp-arm I the valve-rod G receives a turning motion, which is communicated to the chest-piston for admitting steam to act at one end or the other and give motion to such chest-piston and to the valve of the engine, and in so doing the valve-rod G also receives an end motion, which is unobstructed in consequence of the ball-joint of the tappet-rod turning in the arm I and the valve-rod tappet N turning upon its stud n , and according to the position of the tappets k and l , so the chest-piston will receive a turning motion sooner or later in the stroke of the engine-piston, and thereby the valve will be moved at the proper time to admit

steam for cushioning the piston and for giving a turning movement to the same, as usual in direct-acting steam-engines.

In order to guard against the possibility of the chest-piston not being moved by the action of the pressure and thereby permitting the piston to strike against the cylinder-head, I provide around the valve-rod G a sliding tappet R, having a stud *r* passing through a slot in the bent lever C, such stud being provided with a nut to retain it in position, and upon the valve-rod is a clamp-collar L, and the positions of this clamp-collar L and the clamp-arm I upon the rod G are such that the sliding tappet R will engage either I or L in case the chest-piston and valve are not fully moved, and in so doing insure the proper end movement to the valve-rod and the parts therewith connected.

By the construction hereinbefore set forth the chest-piston is reliably moved and the parts can be adjusted with ease and accuracy even while the engine is running and the engine-valve is positively moved even in cases where the parts may have become rusty, obstructed, or difficult to move.

I claim as my invention—

1. The combination with the valve-rod and chest-piston or valve-moving piston and piston-rod, of a head upon the piston-rod, a bent-lever and link connection between the same and the head on the piston-rod, an arm upon the piston-rod, a tappet-rod and universal-joint connection between the same and the arm on the valve-rod, and adjustable tappets upon said rod acted upon by the short arm of the bent lever, substantially as set forth.

2. The combination with the engine and valve-moving piston and its rod, of a head and means for clamping the same to the piston-rod of the engine, a stationary frame and pivot, a bent lever supported by the pivot and a connection between the lower end of the bent lever and the head on the piston-rod, an arm extending out from the valve-rod, a tappet-rod and ball connection to the arm, adjustable tappets on the rod and a tappet surrounding and sliding upon the tappet-rod and a pivotal connection between the

same and the short end of the bent lever, substantially as set forth.

3. The combination with the engine and valve-moving piston and its rod, of a head and means for clamping the same to the piston-rod of the engine, a stationary frame and pivot, a bent lever supported by the pivot and a connection between the lower end of the bent lever and the head on the piston-rod, an arm extending out from the valve-rod, a tappet-rod and ball connection to the arm, adjustable tappets on the rod and a tappet surrounding and sliding upon the tappet-rod and a pivotal connection between the same and the short end of the bent lever, a tappet surrounding and sliding freely on the valve-rod and having a stud projecting into a slot in the bent lever, and a collar upon the valve-rod for insuring the movement of the valve by the direct action of the bent lever and connection to the piston-rod, substantially as set forth.

4. The combination with the engine and its valve-moving piston, of a two-part head clamped to the piston-rod, a stationary triangular frame and a pivot carried thereby, a bent lever upon the pivot, a link pivoted at one end to the lower end of the bent lever and at the other end to the two-part head on the piston-rod, a rod extending from the valve-moving piston and an arm upon the same, a tappet-rod and ball connection to the arm, adjustable tappets on the rod, a tappet surrounding and sliding freely upon the rod and a pivotal connection for the same to the short end of the bent lever, a tappet surrounding the valve-rod and a stud thereon extending into a slot in the bent lever, and an adjustable collar upon the valve-rod against which and the arm, the sliding tappet is caused to act by the swinging movement of the bent lever, if the valve-moving piston and valve are not moved by the pressure, substantially as set forth.

Signed by me this 27th day of July, 1897.

GEORGE DE LAVAL.

Witnesses:

JOHN J. FINLEY,
ALLEN S. CROCKER.