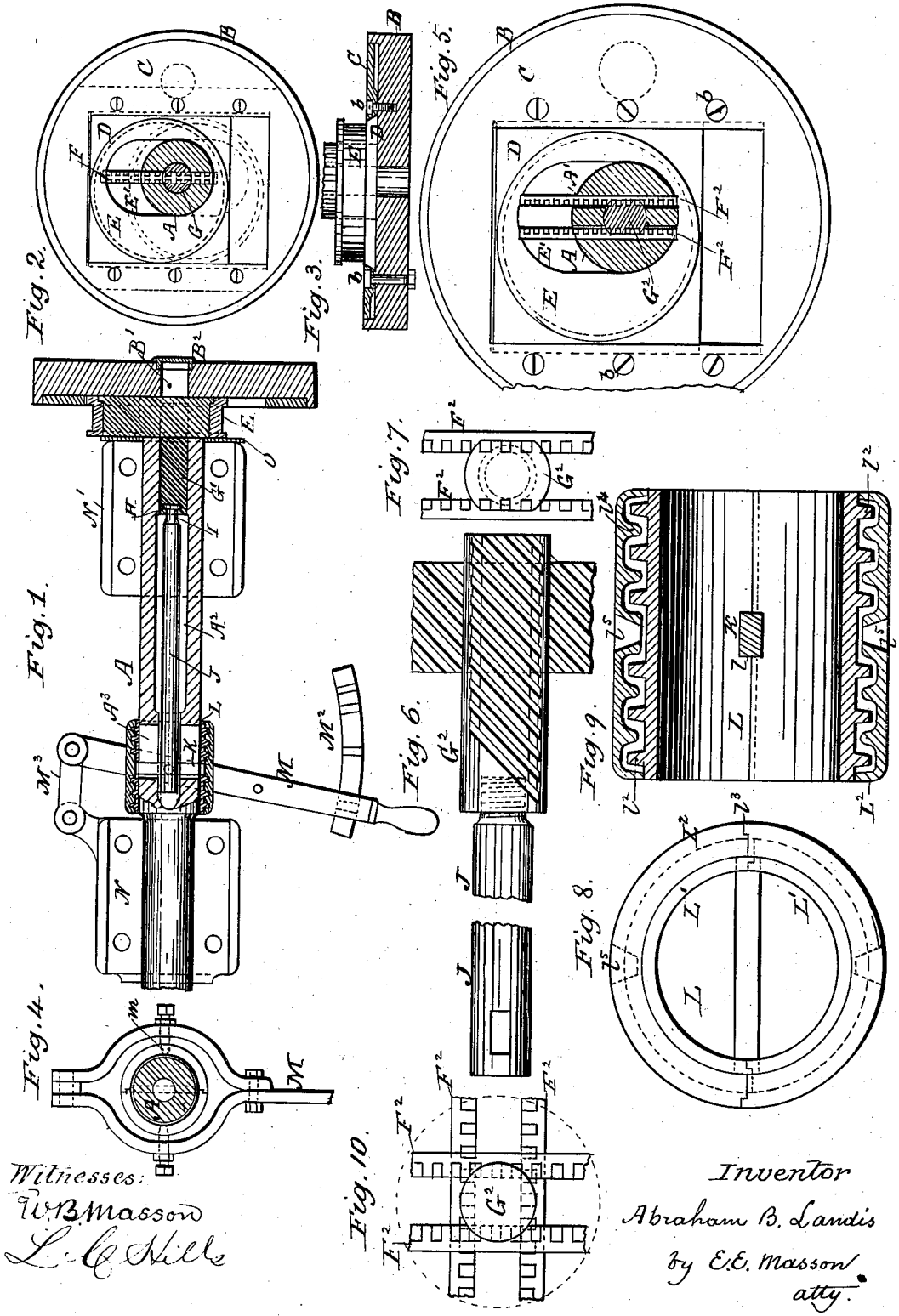
(No Model.) 2 Sheets—Sheet 1.

# A. B. LANDIS.

## VALVE GEAR.

No. 321,117. Patented June 30, 1885.



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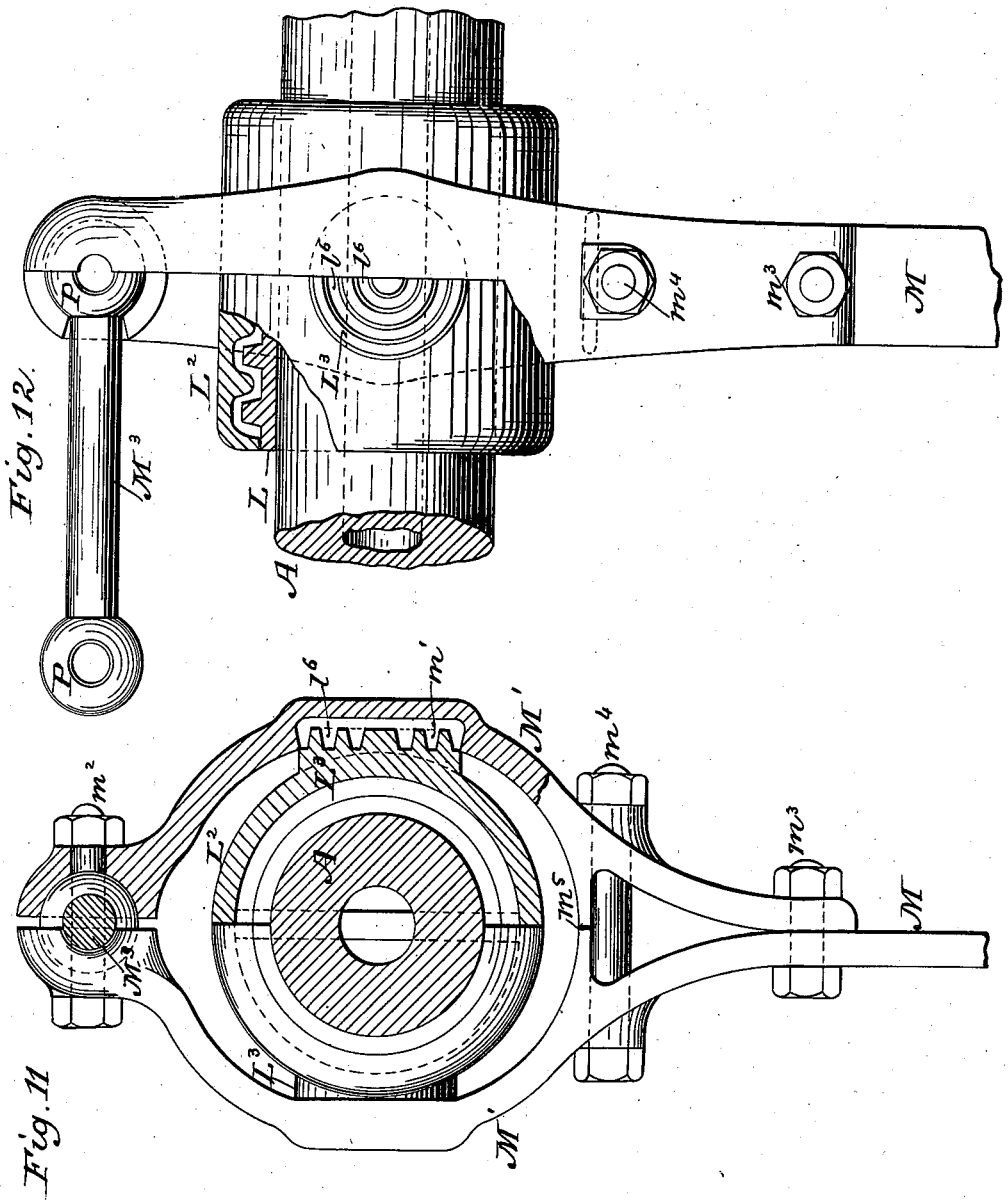


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# UNITED STATES PATENT OFFICE.

ABRAHAM B. LANDIS, OF WAYNESBOROUGH, PENNSYLVANIA.

## VALVE-GEAR.

SPECIFICATION forming part of Letters Patent No. 321,117, dated June 30, 1885.

Application filed February 4, 1885. (No model.)

*To all whom it may concern:*

Be it known that I, ABRAHAM B. LANDIS, a citizen of the United States, residing at Waynesborough, in the county of Franklin and State of Pennsylvania, have invented certain new and useful Improvements in Valve-Gears, of which the following is a specification, reference being had therein to the accompanying drawings.

This invention has relation to means employed for shifting an eccentric for the purpose of varying the throw of a valve or for reversing an engine; and the invention consists in certain features of construction, hereinafter described, and specifically set forth in the claims.

Referring to the drawings, Figure 1 is a plan, partly in section, of details of a shifting eccentric and its adjuncts sufficient in extent for a clear understanding of the invention. Fig. 2 is a face view of the eccentric, showing the shaft in section. Fig. 3 is a transverse section of the same. Fig. 4 is an end elevation of the left-hand portion of Fig. 1, the shaft being shown in section. Fig. 5 is a face view of the eccentric, showing the shaft in section, with two governing-plates, ribbed on only one of their sides and passing through said shaft, and a central bar, partly cylindrical but having opposite sides flattened and ribbed. Fig. 6 is an enlarged detail in elevation of the ribbed bar and one of the ribbed plates. Fig. 7 is an end elevation of the ribbed bar and plates. Fig. 8 is an end view of the sliding collar and its sleeve. Fig. 9 is a longitudinal section of said collar and sleeve. Fig. 10 is an end elevation of the ribbed bar, with two pairs of ribbed plates to operate two eccentrics in a double engine. Figs. 11 and 12 represent in section and side view the sliding collar, sleeve, and operating-lever.

Like letters indicate like parts in all the figures.

The object of this invention is approximately the same, but in some particulars is an improvement upon the invention for which a patent was granted to me November 18, 1884, No. 308,079, the object of the two governing-plates and of the ribbed collar being to present an extensive bearing-surface, and consequently durability to the frictional surfaces against both end thrust and side thrust.

In the drawings, A represents a driven shaft of an engine, on which is mounted a crank or other disk, B, having upon its face a frame, C, the inner faces of which are beveled to receive a bevel-edged sliding base-piece, D, secured to or formed as a part of the eccentric E. The frame C is adjusted to the disk B and base-piece D by means of liners placed under the frame C, and the latter is secured to the disk by bolts *b* or screws *b'*, so that some of the liners can be easily removed when a closer adjustment is required, owing to the wear of the parts. The side through which the bolt *b* passes entirely through the disk is without liners thereunder, and by tightening the nut or drawing upon this bolt the frame C springs and binds tightly the eccentric. This eccentric is held thus when the engine is doing such work that it does not require reversing, consequently taking all the wear off the collar; but when used as a reversing-engine, as in a traction-engine on the road or a hoisting-engine, the bolt *b* should be slack to allow the eccentric to move freely by operating the lever M.

The eccentric E and base-plate are slotted, as at E', in order that they may be thrown across a shaft to vary the throw of the valve, or to reverse the engine by means of the usual eccentric-strap and connecting-rod, mounted upon the eccentric E and connected with the valve of an engine. The means shown in Figs. 1 and 2 for varying the position of the eccentrics are similar to those in my Patent No. 308,079, and consist of a bar, F, having ribs upon two of its sides, and extending diagonally across the same. This bar passes through a slot formed in the shaft, and is arranged within the eccentric E, so that when the bar is moved within the slot and across the shaft the eccentric and plate D are also moved therewith. The shaft A is bored centrally and longitudinally, as at $A^2$, for the reception of the means employed for moving the bars F across the shaft. The devices employed for that purpose, and shown in Figs. 1 and 2, are two semi-cylindrical bars, G, ribbed diagonally upon their flat surfaces, as at G', to mesh with the ribs of the bar F.

In Figs. 5, 6, and 7 the operating-bar $G^2$, within the hollow shaft A, is partly cylindrical, and has two opposite sides flattened and transversely ribbed, and two bars, $F^2$, are made to

pass through transverse openings A′ in the shaft A and bear against the ribbed sides of the bar $G^2$. The inner sides of the bars $F^2$ are also diagonally ribbed, and made to mesh with the two ribbed sides of the bar $G^2$. The advantages obtained with two bars, $F^2$, is that the bar $G^2$ has a full bearing at the top and bottom, and has not the apparent tendency to hug the governing-bars shown in Fig. 2. The bar $G^2$ may also be entirely cylindrical, and the ribs be cut deeper therein. In place of using two bars, $F^2$, Fig. 5, only one of them might be used, (although not so good,) in which case the central bar, $G^2$, might be ribbed on one side only.

To operate two eccentrics in a double engine, wherein the eccentrics would be placed side by side and at right angles to each other, the bar $G^2$ would be ribbed on four sides to mesh with two pairs of ribbed bars, $F^2$, as shown in Fig. 10. The bar $G^2$ could then be square or other shape in cross-section, being made cylindrical simply for convenience in manufacturing or boring the shaft A. The inner end of the bar $G^2$ is formed either with a countersunk recess, adapted to receive the cylindrical head H, Fig. 1, and the reduced portion I of the operating-rod J, located within the central bore of the shaft A, or the inner end of the bar $G^2$ may be recessed and screw-threaded Fig. 6 to receive the screw-threaded end of the bar J, so that the length of the operating-bar J $G^2$ may be adjusted; but these parts J $G^2$ may also be made in one continuous piece. The opposite end of the rod G is slotted for the reception of a key, K, which is passed through a slot, $A^3$, formed in the shaft A, and said key is held in place by means of a sliding collar, L. This collar is made in two halves, L′, notched in the joint, as at *l*, in each half for the ends of the key K to fit into. The two halves, L′, are fitted to come together firmly without binding on the shaft. The length of the collar is sufficient to keep the slot $A^3$ covered in all positions. This collar L is provided with a suitable number of circumferential ribs $l^2$ on its outside surface, and is surrounded by a sleeve, $L^2$, made also in two halves fitting together at the joint $l^3$ in a manner similar to the collar L. The sleeve $L^2$ has internal corrugations, $l^4$, and two conical holes $l^5$ for the reception of the screws *m*, forming the trunnions in the operating-lever M, the free end of which runs over a notched sector $M^2$, serving to hold the lever in different positions to determine the extent of the longitudinal movement of the bar $G^2$ within the shaft, and the consequent position of the eccentric by reason of said movement.

The pivotal end of the operating-lever M is connected by a link, $M^3$, to a bearing, M. A second bearing, N′, is shown near the eccentric; but it is evident that my improvements are equally adapted to shafts of engines having the eccentric between the bearings. The space between the ribs $l^2$ and the corrugations $l^4$ of the sleeve $L^2$ is for the reception of Babbitt or anti-friction metal which will form the bearings for the ribs $l^2$, thus giving a large amount of bearing for the end thrust of the lever on the collar, and thus adding to their durability, and at the same time keeping the slot closed in all positions. The inner end of the lever M that goes around the collar is made in two halves, so that the whole device can be removed from the shaft and taken off without disturbing the shaft of the engine.

Now it will be noticed that by first entering the rod J partly within the bore of the shaft A, and applying to the screw-threaded end thereof the bar $G^2$, and then entering said bar within the bore of the shaft through the opening B′ formed in the disk B, that said bar $G^2$ is provided with a long bearing within the shaft, and that the ribbed bars $F^2$ may then be inserted through the slots A′ in the shaft, and be made to mesh with the ribs and grooves of the central bar, $G^2$, and, being forced entirely through the shaft, the bearings moving longitudinally therein as the bars $F^2$ are forced against them. A dust-guard, O, is also placed between the bearing N′ and the eccentric E, the dust-guard being a plate of suitable material apertured to fit the shaft loosely, and extending beyond the opening in the body of the eccentric, so as to exclude all dust and dirt from getting within the eccentric. A cap, $B^2$, is screwed or otherwise secured within the opening B′ to prevent the entrance of dust therein at the end, and the collar L covers the slot $A^3$ and excludes dust therefrom. The frame C is now secured to the face of the disk by the screws or bolts *b*. The key K is inserted in the slot $A^3$ and through the slot in the connecting-rod J, its ends resting in the slots of the collar L. The sleeve $L^2$, having its interior properly babbitted, is then put in position upon the collar L, and the trunnions of the lever M inserted in the cavities $l^5$ of the sleeve. The parts are now in operative position. By throwing the free end of the lever along the sector, the bar $G^2$ is reciprocated, and, by reason of the inclined ribs thereon meshing with the similar ribs on the bars $F^2$, the eccentric is thrown across the shaft to any desired extent, and is retained in such position by means of the notches in the sector.

In Figs. 11 and 12 are represented on a large scale a portion of the crank-shaft A, its sliding collar, sleeve, and operating-lever. The external bearing-surfaces of the sleeve $L^2$ that connect it to the lever M are more extensive than in the previously-described figures to reduce the wear of the parts. For this purpose each half of the sleeve has upon its surface a boss or trunnion, $L^3$, provided with series of concentric U-shaped grooves, $l^6$, and the two halves, M′, forming the inner end of the lever M, have cavities *m*′ to receive the bosses $L^3$, and a sufficient amount of Babbitt or anti-friction metal poured between them and the concentric grooves $l^6$. By this arrangement the frictional surfaces do not require any adjustment. The halves M′ are

united at one end by the bolt $m^2$ and at the other by the bolts $m^3$ $m^4$. The bolt $m^4$ may be used to adjust the parts after filing or fitting the joint $m^5$ adjacent to said bolt. The link $M^3$ is provided with a ball-shaped journal, P, at each end. One end enters a corresponding bearing in the inner end of the operating-lever, and the other end is received in a similar bearing projecting from the shaft-bearing N or some other fixed part. By means of this adjustable ball-joint connection no twisting-strain can be thrown on the lever, and the fitting of the parts need not be so accurate, and consequently it requires less time to properly connect the parts.

Having now fully described my invention and its operation, I claim—

1. In a shifting-eccentric, governing-bars arranged within and across the shaft and provided with diagonally-disposed ribs upon the sides thereof facing the axis of the shaft, in combination with a diagonally-ribbed bar located within the shaft, substantially as specified.

2. The combination of a centrally-bored shaft, an operating-rod, a ribbed bar arranged in the bore, and a governing-bar ribbed upon the side thereof facing the center of the shaft and arranged across the shaft and in engagement with the axial ribbed bar, substantially as and for the purpose described.

3. The combination of a bored and slotted shaft, an eccentric mounted thereon, governing-bars arranged within the eccentric and passing transversely through the shaft, a central bar having ribs adapted to mesh with the ribs of the governing-bars, an operating-rod connecting with the central bar and with a sliding collar mounted on the shaft, and a sleeve connected with a lever, substantially as and for the purpose described.

4. The combination of a bored and slotted shaft, an eccentric mounted thereon, a central bar provided with a transverse key, a sliding collar made in halves, and a sleeve therefor, whereby said collar is wholly inclosed, substantially as and for the purpose described.

5. The combination of the hollow shaft A, eccentric E, the transverse ribbed bars $F^2$, the central ribbed bar, $G^2$, rod J at the end thereof, the split collar L, its sleeve $L^2$, and the lever M, constructed substantially as described, and for the purpose set forth.

6. The combination of a centrally-bored shaft, an operating-rod, a ribbed bar arranged in the bore, and ribbed governing-bars arranged across the shaft and in engagement with the axial ribbed bars, with a disk, B, eccentric E, having dovetailed base-piece D, and recessed frame C, secured to the disk by bolts, substantially as and for the purpose described.

7. The combination of the hollow shaft A, central rod, J, and key K, the split collar L and its sleeve $L^2$, and bosses $L^3$ thereon provided with concentric grooves, with the lever M, made of two halves having cavities $m'$ to receive the bosses, substantially as and for the purpose described.

8. The combination of the hollow shaft A, central rod, J, and key K, the collar L, its sleeve $L^2$, and bosses thereon, with the lever M, having its inner end provided with ball-sockets, and the link $M^3$, having ball-journals at each end, substantially as and for the purpose described.

In testimony whereof I affix my signature in presence of two witnesses.

ABRAHAM B. LANDIS.

Witnesses:

D. M. GOOD, Jr.,

C. E. BESORE.