(No Model.)

W. H. DE VALIN.

VARIABLE CRANK AND ECCENTRIC.

No. 335,745. Patented Feb. 9, 1886.

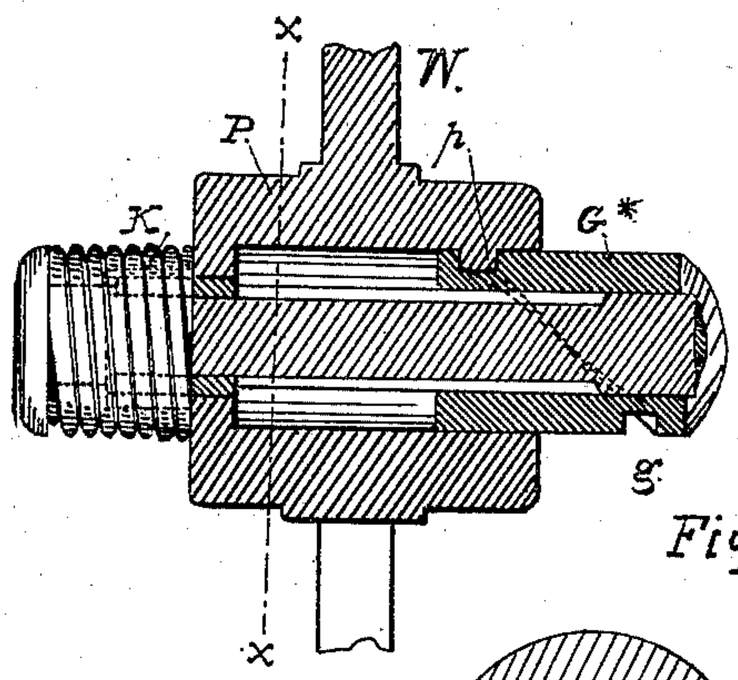
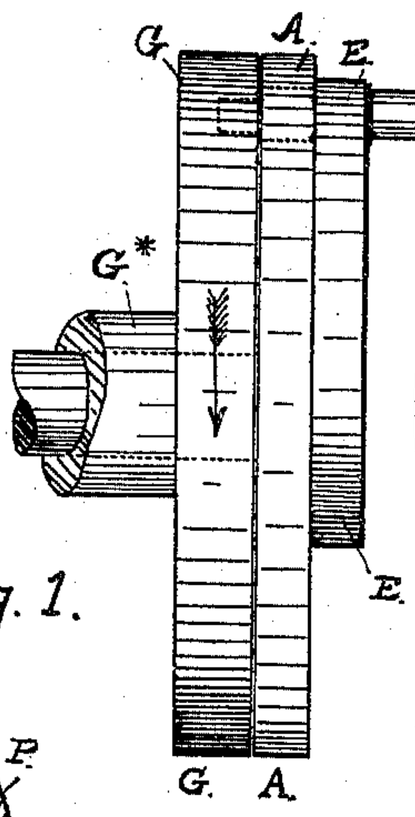


Fig. 1.



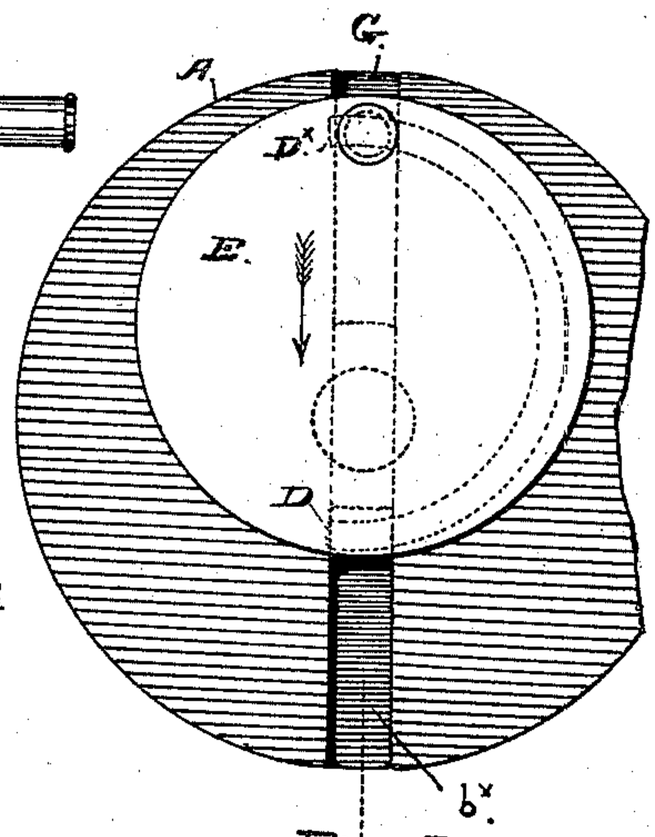


Fig. 2.

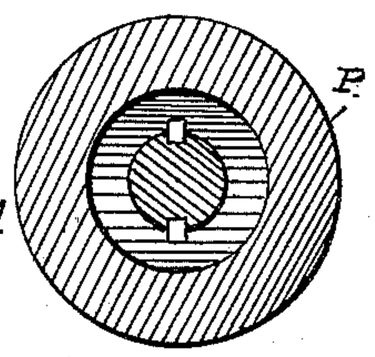


Fig. 3.

Section x.x. fig. 1

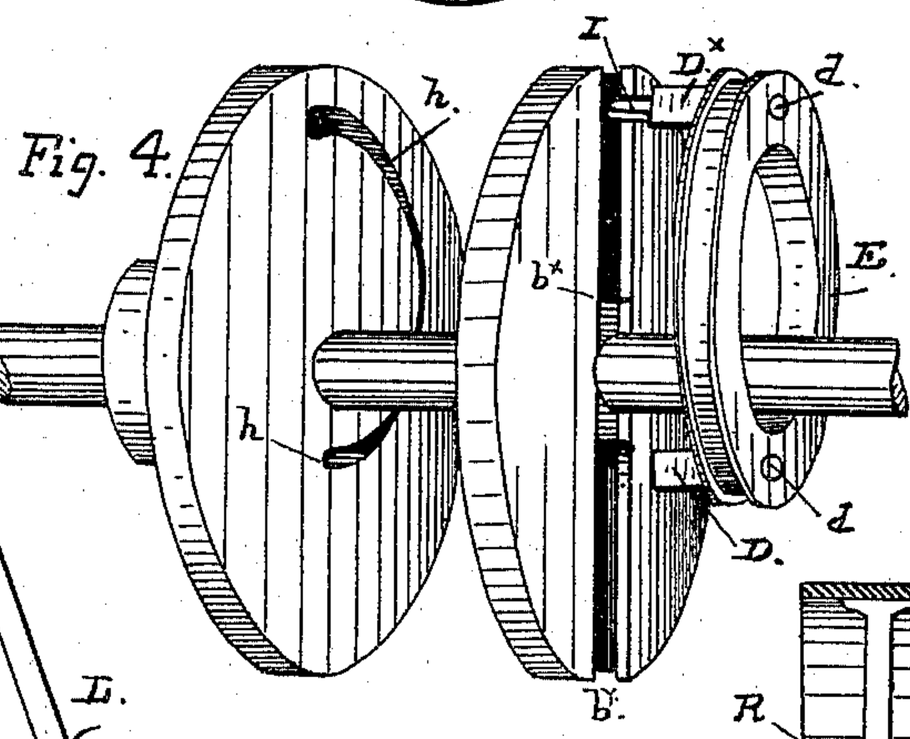


Fig. 4.

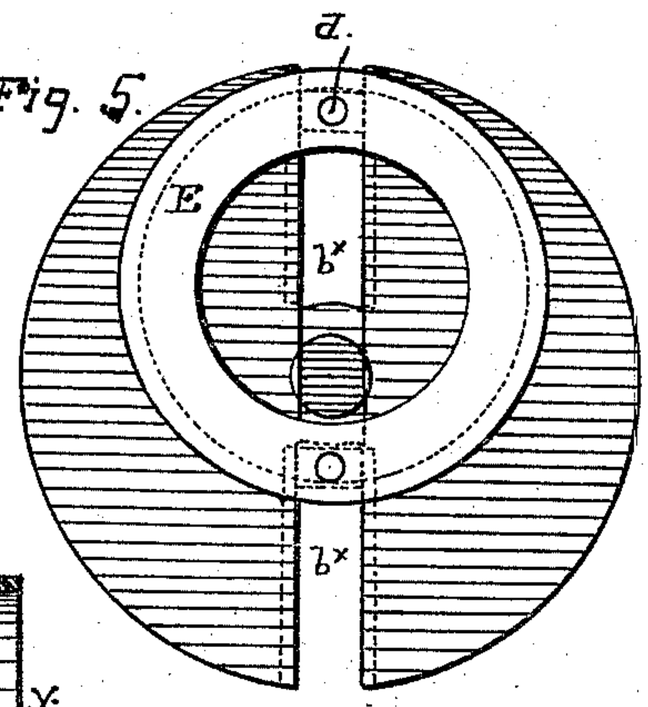


Fig. 5.

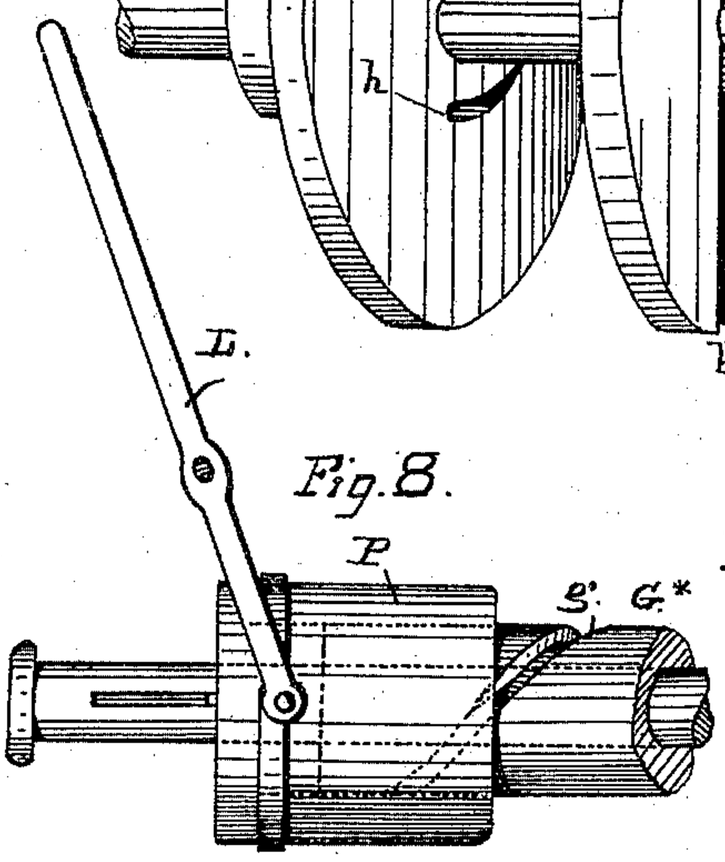


Fig. 8.

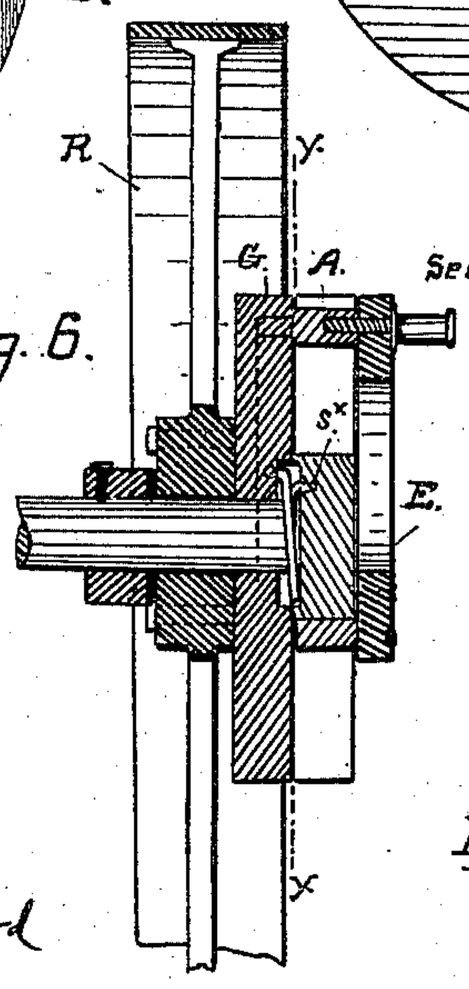


Fig. 6.

Section at y.y, fig. 6.

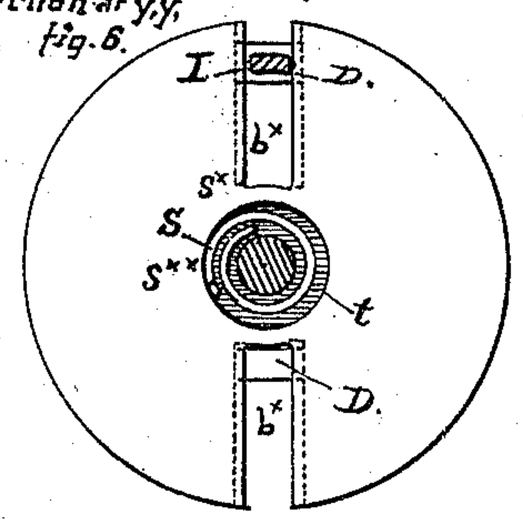


Fig. 7.

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By E. E. Osborn Atty.

UNITED STATES PATENT OFFICE.

WILLIAM H. DE VALIN, OF SAN RAFAEL, CALIFORNIA.

VARIABLE CRANK AND ECCENTRIC.

SPECIFICATION forming part of Letters Patent No. 335,745, dated February 9, 1886.

Application filed February 27, 1885. Serial No. 157,228. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM H. DE VALIN, a citizen of the United States, residing in San Rafael, Marin county, State of California, have invented certain new and useful Improvements in Variable Cranks and Eccentrics; and I do hereby declare that the following is a full, clear, and exact description of my said invention, reference being had to the accompanying drawings.

My invention has reference to improvements applicable to cranks and eccentrics for producing a change in the length of stroke without varying the time or the relation of the movements of the crank or eccentric to the other moving parts of the mechanism.

The improvements provide for altering the stroke of a crank or an eccentric while it is at work, and without interfering with the regular movement or operation; and they also provide for effecting such change of stroke automatically by or from the variation in the speed of the working parts, whereby the relations between the power and the resistance at the crank or eccentric become disturbed, and the one becomes greater or less than the other. This self-regulating mechanism is caused to change the length of stroke without interrupting the general movement of the parts, and to keep the length of the stroke at all times in such proportion to the power as to secure as nearly as practicable a uniform action.

The following description fully explains the construction and combination of parts constituting my said improvements, and illustrates the manner in which I apply and operate the same, the following figures of drawing being referred to and forming a part of the specification.

Figure 1 is a side view of the parts of a crank constructed according to my improvements. A crank shifting device is shown in connection with it, such as would be applicable to the wind-wheel in a windmill for changing the length of stroke from the varying pressure or force of the wind. This mechanism is shown in section. Fig. 2 is a front view of the crank-disk, the view being taken from the right-hand end of Fig. 1. Fig. 3 is a cross-section taken at *x x*, Fig. 1. Figs. 4 and 5 show the parts of the crank in detail. They also show such change in the parts as I make in applying the improvements at any point in the length of a shaft. Figs. 6 and 7 show the application of an automatic governor-wheel to the parts of the crank, by the action of which the crank is made self-regulating. Fig. 7 is a view of the back face of the disk and a cross-section at *y y*, Fig. 6. Fig. 8 illustrates the manner in which I apply a shifting-lever for moving the crank by hand.

The disk A is fixed on the shaft B, and has two guide slots or grooves, $b^{\times}$ $b^{\times}$, formed on the diameter, and extending from circumference toward the center. These slots may be carried clear to the center of the disk, as shown at Figs. 4 and 5, so that practically one slot is formed. D $D^{\times}$ are two blocks fitted to slide in these guides on either side of the center, and so formed as to move freely along the guides with the smallest amount of play. Either a tongue and groove, as shown, or a dovetailed fitting to the edges of the guide, may be employed.

E is a disk fixed by screws *d d* to the blocks D $D^{\times}$, and setting closely against the face of the disk A. This disk E is a wrist-plate or an eccentric, according to the situation of the parts on a shaft, whether they are placed at the end of the shaft or at some point in its length. When employed as an eccentric, the center of the disk will be open to let the shaft pass through, and the rim will be suitably shaped to take the strap of an eccentric-rod. The disk will then have the form of a ring, as shown in Figs. 4 and 5; but this annular form will be serviceable also in the other application in place of a solid disk or wrist-plate, and will be preferable where it is an object to reduce the weight of parts, for it is only the outer portion or margin of the disk that, resting against the face of the disk A, gives support laterally and resists the tendency of the wrist-pin to twist under the lateral strain or pushing force. Therefore the center of the disk may be removed, so far as any advantage therefrom in securing steadiness of the wrist-pin block or carrier $D^{\times}$ is concerned.

When the movable disk is an eccentric, its movement to or from the center will diminish or increase the eccentricity, and in like manner, when a wrist-pin is secured to the front of

the block D×, the length of the crank is changed as the block is moved to or from the center.

The shank of the wrist-pin is made long enough to take through the disk and into the block D×. This not only gives a stiff connection of the wrist-pin to the carrier, but it also fixes the disk to that part.

A disk, G, set loose on the shaft and placed against the back of the fixed disk A, constitutes the means for moving the sliding disk E across the opposite face of the fixed disk, and it is connected with the block D× by the projecting stud or tongue I on the back of the block, and a groove, *h*, in the face of the disk, into which the tongue I fits. The form of this groove may be that of a regular spiral running from the center out toward the margin, or it can be a regular curve, as shown in Fig. 2. By rotating the disk G on the shaft the block D× will therefore be moved radially to or from the center of the fixed disk, and the length of the stroke will be changed in degree according to the amount and the direction of this rotation.

Figs. 1 and 3 show the application and combination of mechanism to and with the disk G, for changing the position of the wrist-pin by the variation in the force or power operating to turn the shaft; but as this mechanism has been fully described and explained by me in a former invention, which has been made the subject of an application for Letters Patent, and as its operation in this case is exactly the same, I do not consider it necessary to give a more particular description of its construction. The disk G, being fixed to or a part of the sleeve G×, is caused to turn upon the shaft by the action of the sliding hub or block P, which has a spline or feather, *p*, taking into a spiral groove, *g*, in the sleeve, and the part P being the hub of a wind-wheel, W, its lateral movement along the shaft in the direction of the arrows, Fig. 1, will move the block or carrier D× outward from the center, and thus increase the length of the crank. The spring K is applied behind the sliding hub P to produce the opposite movement, and as it is compressed by the lateral pressure against the wind-wheel its reaction, when this pressure falls or is reduced, causes the hub to move back, and thereby turn the disk G in the opposite direction.

By applying a hub or block, P, with a hand-lever, L, for throwing it, the disk G can be turned and set by hand while the crank or eccentric is at work, and any length of stroke obtained from time to time as required. Fig. 8 shows a construction for this purpose.

The hub P in these two devices is connected by a groove and feather to the shaft, so that it slides freely, while always turning with the shaft.

Figs. 6 and 7 show the application of a governor-wheel to the disk G, for shifting the wrist-pin automatically to and from the center by the changes that take place in the relative speed of the shaft. In this construction the disk G is fixed to or is made a part of a fly-wheel, R, and the wheel is loose on the shaft. A certain position of the two disks A G together will give what might be called a "normal" length of crank, and so long as the two travel together in this position the length of crank will remain unchanged; but when from any cause the speed of the shaft changes, a corresponding change will be produced in the crank by virtue of the inertia of the revolving wheel R. This inertia will change the relative positions of the two disks A G and move the crank-pin radially in or out. The position of the two disks together to keep a normal length of crank is regulated by attaching a coil-spring, S, by its ends S× S×× to the two disks, one end being fixed to the disk A, and the other to the disk G. The reaction of the spring, both on the recoil after compression and after expansion as well, will bring the two disks back to position when the speed of the shaft, after any disturbance, returns to its proper rate again.

When the speed of the shaft increases over the resistance at the crank, the inertia of the wheel R turns one disk upon the other, and moves the carrier D× out from the center, and in like manner, when the speed drops below a given rate, the crank is shortened by the inertia of the wheel acting in the opposite direction and turning the disk G backward.

From the foregoing description any person skilled in the construction of cranks and eccentrics can apply and carry out my improvements without further experiment.

It will be seen that the spiral groove may be made on the shaft and the feather on the sleeve, as well as the reverse way, as hereinbefore described.

Having thus described my invention, what I claim, and desire to secure by Letters Patent, is—

1. The combination of a rotating shaft, the guide-disk A, fixed on the shaft, the disk E, confined to the face of the guide-disk, but movable diametrically across the face thereof, the grooved disk G, loose on the shaft and engaging with a projection on the back of the movable disk E, and a hub connected with the disk G, and operating means therefor, substantially as described, for rotating said grooved disk, whereby the movement thereof on the shaft will cause the disk E to slide diametrically, substantially as and for the purpose set forth.

2. In a variable crank, the combination, with a slotted wrist-plate, as A, fixed on the shaft, and having a wrist-pin carrier, D×, movable radially in a guide-slot, *b*×, of the disk E, set against the face of the wrist-plate and fixed to the carrier D× and to a point, D, diametrically opposite, which is also held in and is movable along a guide-slot, *b*×, in the wrist-plate, substantially as described.

3. The combination, with the wrist-plate A, having the guide-slot *b*×, of the ring or disk E, the sliding blocks D× D, the projection I, the independently-turning disk G, having a cam-

groove, *h*, to engage with said projection, and mechanism, substantially as described, applied to said disk G to rotate it in either direction, substantially as herein described.

4. In a variable crank or eccentric, the combination, with parts A and E, constructed substantially as described, and the independently-turning disk G, of the wheel R, loose on the shaft and fixed to the disk G, substantially as described, for operation as set forth.

5. In a variable crank or eccentric, the combination, with the independently-turning disk G, adapted to engage with and operate on the sliding disk E, as described, of the wheel R, loose on the shaft and fixed to the disk G, and the spring S, applied to operate substantially as set forth.

6. In a variable crank wherein the crank-pin is movable to and from the center of rotation by being mounted on a sliding block held in a radial guide-slot in the wrist-plate, the combination, with this block, of the ring or disk E, which is attached both to the block and to the face of the disk at a point diametrically opposite, beyond the shaft, which point is also movable across the disk in line with the sliding crank-pin block $D^{\times}$, substantially as described, for the purpose set forth.

WILLIAM H. DE VALIN. [L. S.]

Witnesses:
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