(No Model.)

W. H. DE VALIN.

VARIABLE CRANK OR ECCENTRIC.

No. 312,709. Patented Feb. 24, 1885.

FIG. 1.

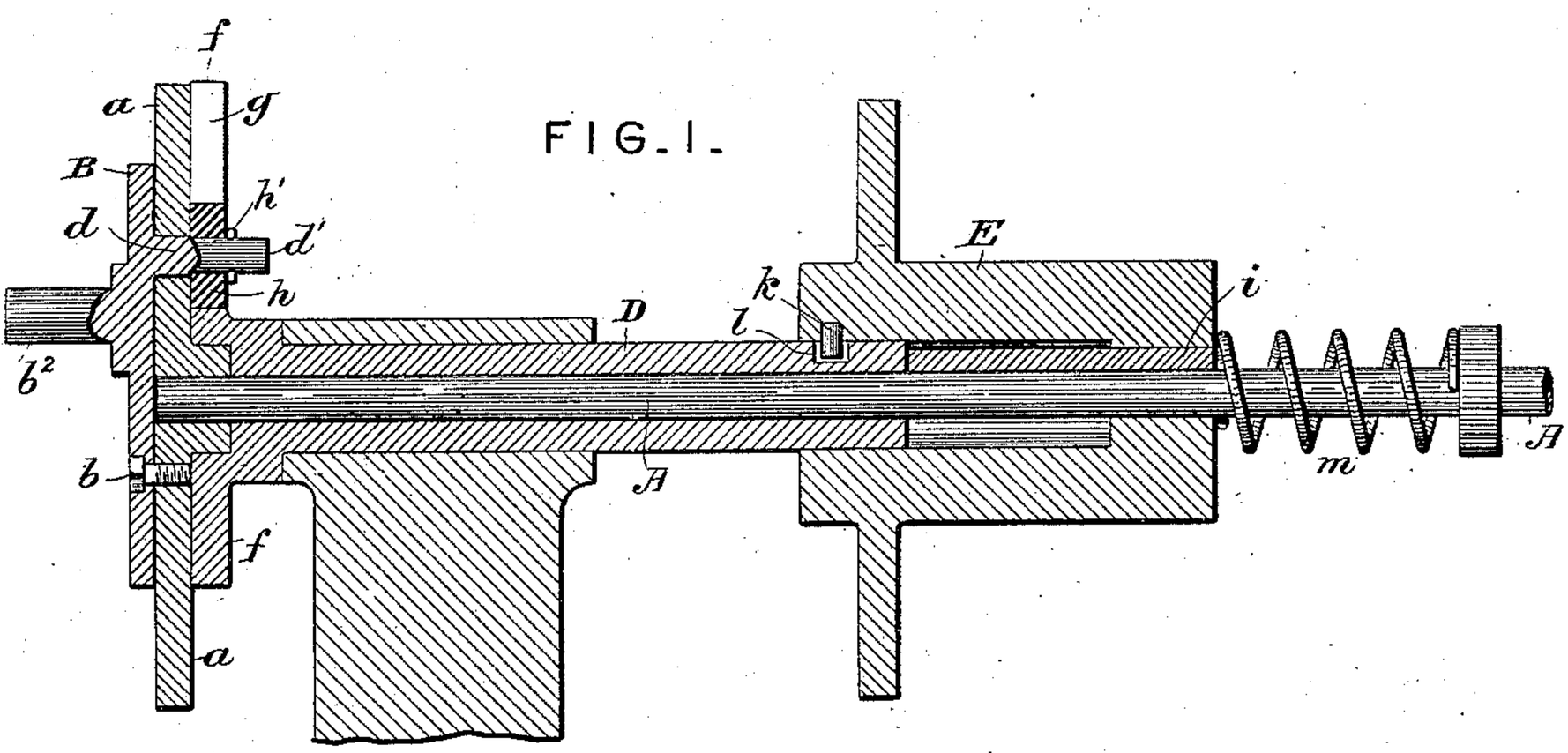
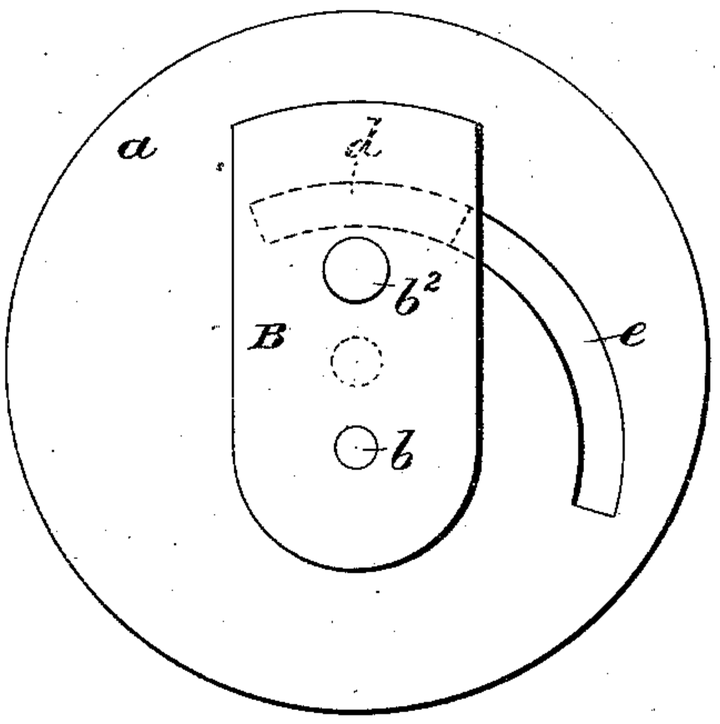


FIG. 2.



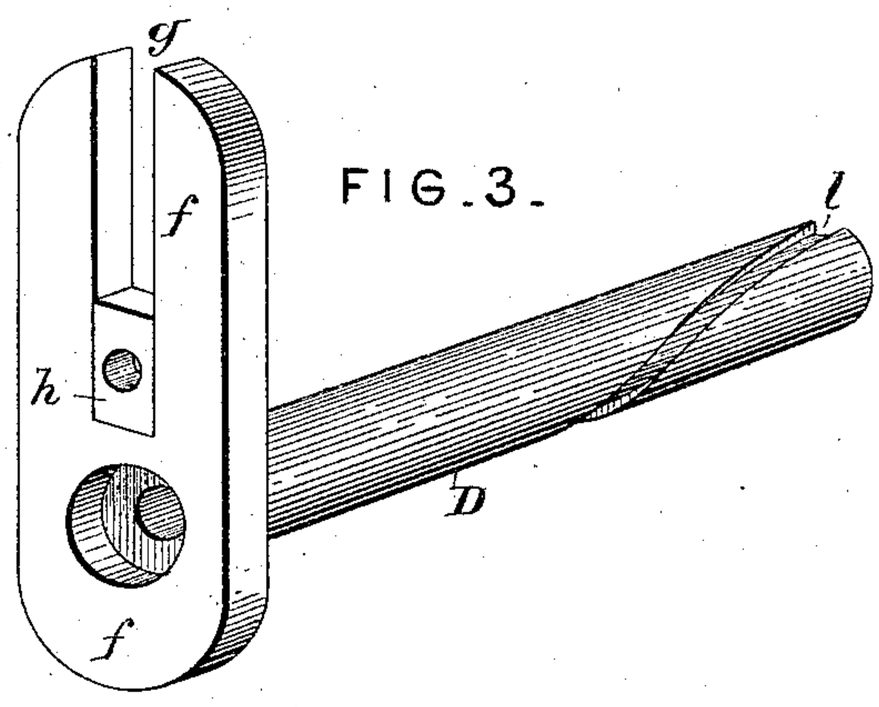


FIG. 3.

FIG. 4.

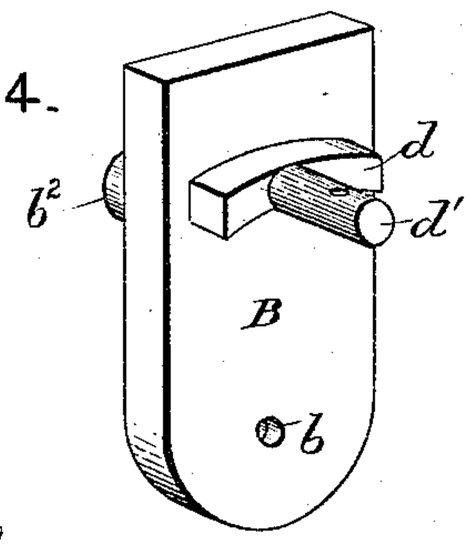
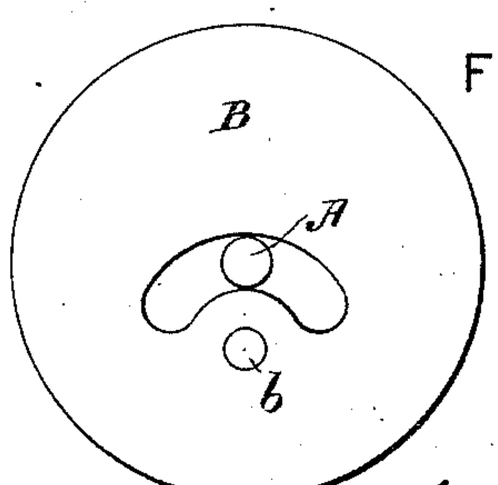


FIG. 5.



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

VARIABLE CRANK OR ECCENTRIC.

SPECIFICATION forming part of Letters Patent No. 312,709, dated February 24, 1885.

Application filed November 22, 1884. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM H. DE VALIN, of San Rafael, Marin county, State of California, have invented a new and useful Improvement in Variable Cranks or Eccentrics, which improvement is fully set forth in the following specification.

The present invention relates more particularly to that class of cranks or eccentrics which are secured to the shaft in such way as to be adjustable at will nearer to or farther from the center thereof, and comprises certain improvements hereinafter described, whereby such adjustment may be effected with greater certainty and facility than heretofore, or may be effected automatically, and whereby, also, a sufficient strength and steadiness in operation are insured. It is well known that the strain upon the crank-pin in steam, wind, or other engines is very great, and that such pin is liable to work loose and to give way altogether, even when rigidly fixed in place. Obviously this liability to yield or break is greatly increased in the case of a crank-pin designed to be adjustable at will relatively to the shaft. According to the present invention the ring, disk, or plate to which the crank-pin is attached (or which constitutes the eccentric) is given a large bearing against the face of a disk rigidly secured to the end of the shaft, and is firmly held in contact therewith by the adjustable connections. This construction effectually prevents rocking or twisting of the pin, which is liable to occur when the latter is made adjustable in a slot, as is common. The wrist-plate carrying the crank-pin is preferably pivoted to the said fixed disk, so that in adjusting it the said plate moves in a curved line, whereby a gradual and certain adjustment may be effected. The improvements, however, or some of them, are applicable as well to a wrist-plate or eccentric adapted to move across the shaft in a straight line. The device by which the adjustment is directly effected is or may be a plate or disk carried at the end of a sleeve which is capable of turning freely on the crank-shaft. This plate has a slot or groove which engages a pin projecting from the crank-shaft through an opening in the fixed disk. The rotation of the sleeve upon the shaft moves the wrist-plate or disk, varying its eccentricity. This motion of the sleeve is preferably effected by means of a hub or similar device mounted partly on the sleeve and partly on the inclosed shaft, and connected with the latter by a feather-key taking into a groove thereon. The hub is thus prevented from turning independently of the shaft, but can move longitudinally thereon. The sleeve has a spiral groove into which projects a pin on the hub, so that the longitudinal movement of the latter turns the sleeve, and the adjusting-plate with it, in one direction or the other. The construction outlined above has the advantage of great strength, coupled with simplicity and facility of adjustment. The adjusting-plate firmly holds the wrist-plate or eccentric in place while in operation, preventing its slipping or yielding to the strain which is likely to occur when such plate is held only by a pinion engaging a rack thereon, or by a set-screw or similar known means. The adjustment may be effected by hand, a lever or other device being for that purpose connected with the hub; or the device may be constructed to vary the stroke of the eccentric or crank-plate automatically in proportion to the amount of power applied. This automatic adjustment is specially useful in pumping by wind-engines, and I have shown, described, and claimed herein means for effecting it.

In the accompanying drawings, which form a part of this specification, is illustrated what is deemed to be the best manner of carrying the invention into effect.

Figure 1 is a longitudinal section of the apparatus; Fig. 2, a front elevation; Fig. 3, a perspective view of the sleeve and adjusting-plate; Fig. 4, a similar view of the wrist-plate, and Fig. 5 a face view of an eccentric.

The crank-shaft A is supported in suitable bearings, and has firmly fixed on one end a disk, *a*. The wrist-plate (or eccentric) B is pivoted to this disk at *b*, and has on the rear face a curved projection or flange, *d*, which works in a groove, *e*, in disk *a*, concentric with the axis of plate B. The hollow sleeve D is mounted loosely on shaft A, and has firmly fixed on one end the part *f*, which is herein termed the "adjusting-plate." This may be in the form of a disk or of any other suitable form. As shown, it consists of an elongated bar or block provided with a slot, *g*.

Instead of having a slot, the adjusting-plate

may be grooved, the groove being either straight or curved. The latter construction is employed when the wrist-plate or eccentric is arranged to be adjusted in right lines, as shown in my application filed November 22, 1884, Serial No. 148,618. A continuation, *d'*, of the projection or flange *d* projects through the slot *g*. The part *d'* is round, and fits closely in a corresponding perforation in the sliding block *h*, which works in the slot *g*. This block is not strictly necessary, since the pin *d'* could be acted on directly by the edges of the slot *g;* but its use is recommended both for the sake of imparting greater rigidity to the parts, and of conducing to smoothness and facility of adjustment. The curved flange or arc *d* has a large bearing in the slot *e*, which contributes to the steadiness of plate B, and the parts are firmly held together by a pin, *h'*, as shown, or by a nut or other suitable device. The hub E incloses a portion of sleeve D and a portion of shaft A. It is bored the greater part of its length to fit over the former. While free to move longitudinally of said shaft and sleeve, it is prevented from turning independently thereof by a feather-key, *i*, on said shaft taking into a groove in the hub. Near its forward (left-hand) end the hub is provided with a pin or projection, *k*, which enters the spiral groove *l* in sleeve D. It will thus be seen that the position of the hub E on shaft A determines the throw of the crank or eccentric. If the hub be moved away from the eccentric, the action of pin *k* in groove *l* causes the sleeve D and adjusting-plate *f* to turn, carrying the wrist-plate B to the right, Fig. 2, and thereby increasing the eccentricity of the crank-pin b^2. The reverse movement of hub E produces a contrary effect.

Any desired means for shifting the hub E may be adopted. For example, a lever may be attached thereto, or any other contrivance may be used whereby the position of the hub can be changed by hand, whether the engine is stationary or in operation. In many cases, however, it is desirable that the adjustment of the eccentric or crank pin should be effected automatically, so that when little power is available the throw of the connection-rod may be proportionately decreased. I accomplish this in the following way: Suppose, for example, that the invention is applied to the crank-shaft of a wind-engine, in that case the part E would be the hub of the wind-wheel, and whenever the pressure on said wheel increases above the normal the hub E would be pushed along the shaft, overcoming the pressure of spring *m*. Thus the eccentricity of the crank-pin is increased. Should the force of the wind diminish below the normal, the spring *m* would push hub E to the left, Fig. 1, causing the crank-pin to approach the center. The crank may operate the valve-rods of a steam-engine, and the whole device may be utilized as a reversing apparatus or for other purposes.

In Figs. 1 to 4 the improvement is illustrated in connection with a crank-pin; but it is of course obvious that it applies equally to an eccentric, as readily understood by referring to Fig. 5, in which the part B is an eccentric disk provided with a slot for the shaft A. The eccentric B is pivoted at *b*, as described with reference to the wrist-plate, and has on its rear face (not shown) similar projections, *d d'*. As readily seen, by turning the disk on its pivot the amount of its eccentricity may be varied.

It is obvious that other modifications in details of construction besides those already indicated may be made without departing from the spirit of the invention, and it is equally obvious that parts of the invention described may be used without the others, it being understood that the constructions described herein, and illustrated in the accompanying drawings, are given merely as explaining one mode of carrying the invention into effect, and not as limiting the same to the precise details explained and shown.

Having now fully described my said invention and the manner in which the same is or may be carried into effect, what I claim is—

1. The combination of the crank-shaft, the wrist-plate or eccentric connected therewith, and means, as specified, whereby the longitudinal movement of a hub or similar device along said shaft will shift said wrist-plate or eccentric in a curved line, substantially as described.

2. The combination, with the shaft and the pivoted wrist-plate or eccentric, of the adjusting-plate engaging a projection of said wrist-plate or eccentric, and means, as specified, whereby the longitudinal movement of a device along said shaft will turn said adjusting-plate on its center, substantially as described.

3. The combination, with the shaft and the wrist-plate or eccentric connected therewith, of the adjusting-plate having a slot or groove engaging a projection of said wrist-plate or eccentric, and means, as specified, for turning said adjusting-plate to any desired position, so as to vary the eccentricity of said wrist-plate or eccentric, substantially as described.

4. The combination of the pivoted wrist-plate or eccentric, the sleeve mounted on the crank-shaft and having a spiral groove, the hub movable lengthwise of said shaft, and the pin entering said groove, said sleeve being connected with said wrist-plate or eccentric in such manner that the movement of the former turns the latter on its center, substantially as described.

5. The combination, with the shaft and the pivoted wrist-plate or eccentric, of a hub movable lengthwise of said shaft, but prevented from turning independently thereof, said hub being connected with said wrist-plate or eccentric by devices substantially as described, so that its longitudinal movement on said shaft turns said wrist-plate or eccentric on its center, as set forth.

6. The combination of the shaft, the disk fixed thereon, the wrist-plate or eccentric piv-

oted to said disk, the adjusting plate or device mounted loosely on said shaft and having a slot or groove which receives a pin or projection on said wrist-plate or eccentric, and means, as specified, for turning said adjusting plate or device to shift said wrist plate or eccentric, substantially as described.

7. The combination of the shaft, the disk rigidly fixed thereon, the wrist-plate or eccentric in contact with said disk, and having a projection working in a slot therein, the slotted or grooved adjusting-plate mounted loosely on said shaft and engaging a projection on said wrist-plate or eccentric, whereby the latter may be adjusted, substantially as described.

8. The combination, with the shaft and the pivoted wrist-plate or eccentric, of an adjusting-plate loosely mounted on said shaft, and a sliding block working in a slot in said plate and connected with said wrist-plate or eccentric, substantially as and for the purposes set forth.

9. The combination of the shaft, the disk fixed rigidly thereon, the wrist-plate or eccentric pivoted to and in contact with said disk, the adjusting device mounted loosely on said shaft and having a spiral groove, a loose hub movable lengthwise only of said shaft, and a pin thereon taking into said spiral groove, so that the longitudinal movement of said hub acts through the devices specified to shift said wrist-plate or eccentric, substantially as described.

10. The combination of the shaft, the disk fixed thereon, the pivoted eccentric or wrist-plate, the adjusting-plate connected therewith by a slot and pin, and means, as specified, for regulating the position of said plate, substantially as described.

11. The combination of the shaft, fixed disk, wrist-plate or eccentric, adjusting-plate connected therewith by a slot and pin, loose sleeve secured to or in one piece with said plate and having a spiral groove, hub movable lengthwise only of said shaft and sleeve, and a pin carried by said hub and working in said spiral groove, substantially as described.

12. The combination, with the shaft and wrist-plate or eccentric adjustably connected therewith, of an adjusting plate or device capable of turning on said shaft, and means for automatically moving said wrist-plate or eccentric through said adjusting plate or device from or toward the center of said shaft as the power operating the latter increases or decreases, substantially as described.

13. The combination of the shaft, the pivoted wrist-plate or eccentric, the slotted adjusting-plate engaging a projection of said wrist-plate or eccentric and carried by a sleeve turning on said shaft, and means, as specified, for automatically regulating the position of said wrist-plate or eccentric through said adjusting-plate and sleeve, substantially as described.

14. The combination, with the shaft and the wrist-plate or eccentric adjustably connected therewith, of the hub through which said shaft is operated, capable of movement lengthwise of said shaft, and connected with said wrist-plate or eccentric through devices substantially as specified, so that the longitudinal movement of said hub acts to shift said eccentric or wrist-plate, as set forth.

15. The combination, with the shaft and the pivoted wrist-plate or eccentric, of the hub adapted to move longitudinally on said shaft in one direction when the power transmitted increases above the normal, and a spring tending to move said hub in the opposite direction when the power diminishes, said hub being connected with said wrist-plate or eccentric through devices substantially as specified, so that the motion of said hub automatically adjusts the said wrist-plate or eccentric, as set forth.

In testimony whereof I have signed this specification in the presence of two subscribing witnesses.

WILLIAM H. DE VALIN.

Witnesses:
U. M. GORDON,
GEO. MASON.