

(No Model.)

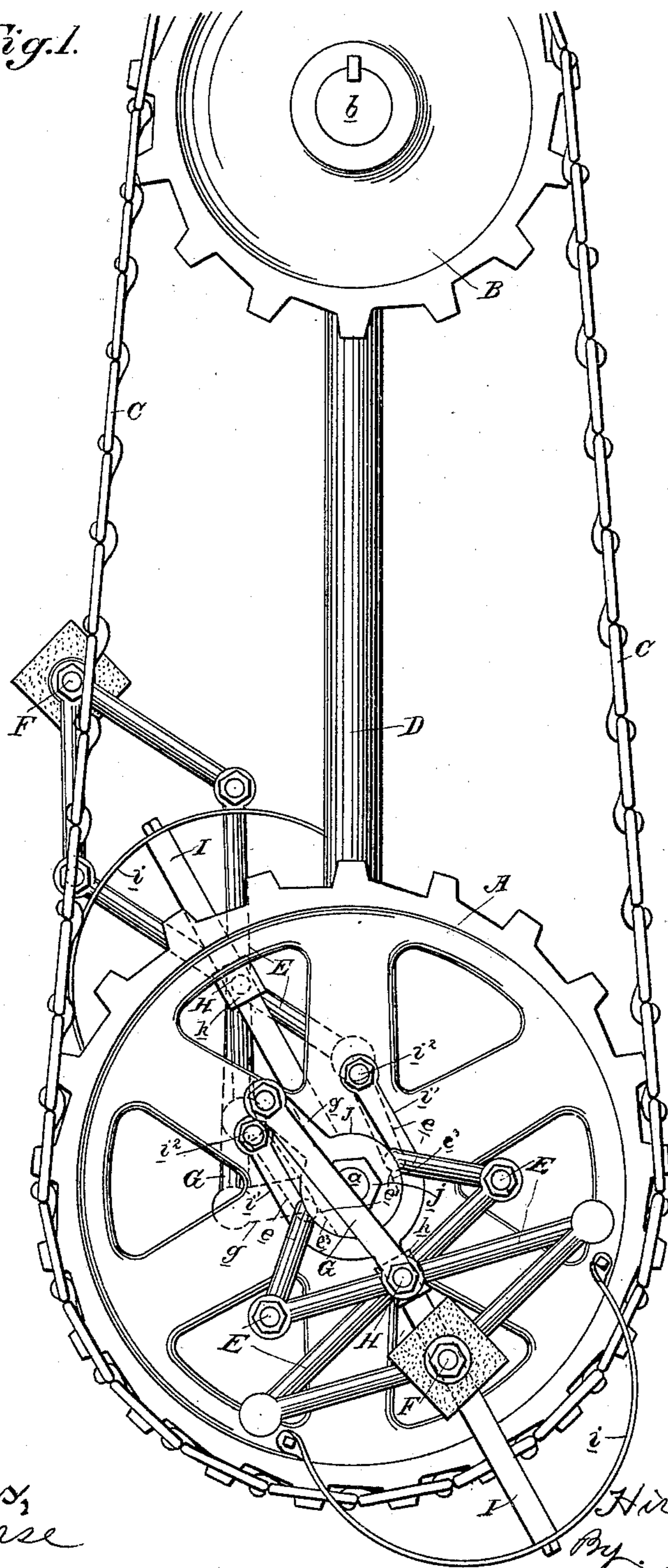
2 Sheets—Sheet 1.

H. E. LEWIS.  
VARIABLE CRANK FOR VELOCIPEDES.

No. 422,086.

Patented Feb. 25, 1890.

*Fig. 1.*



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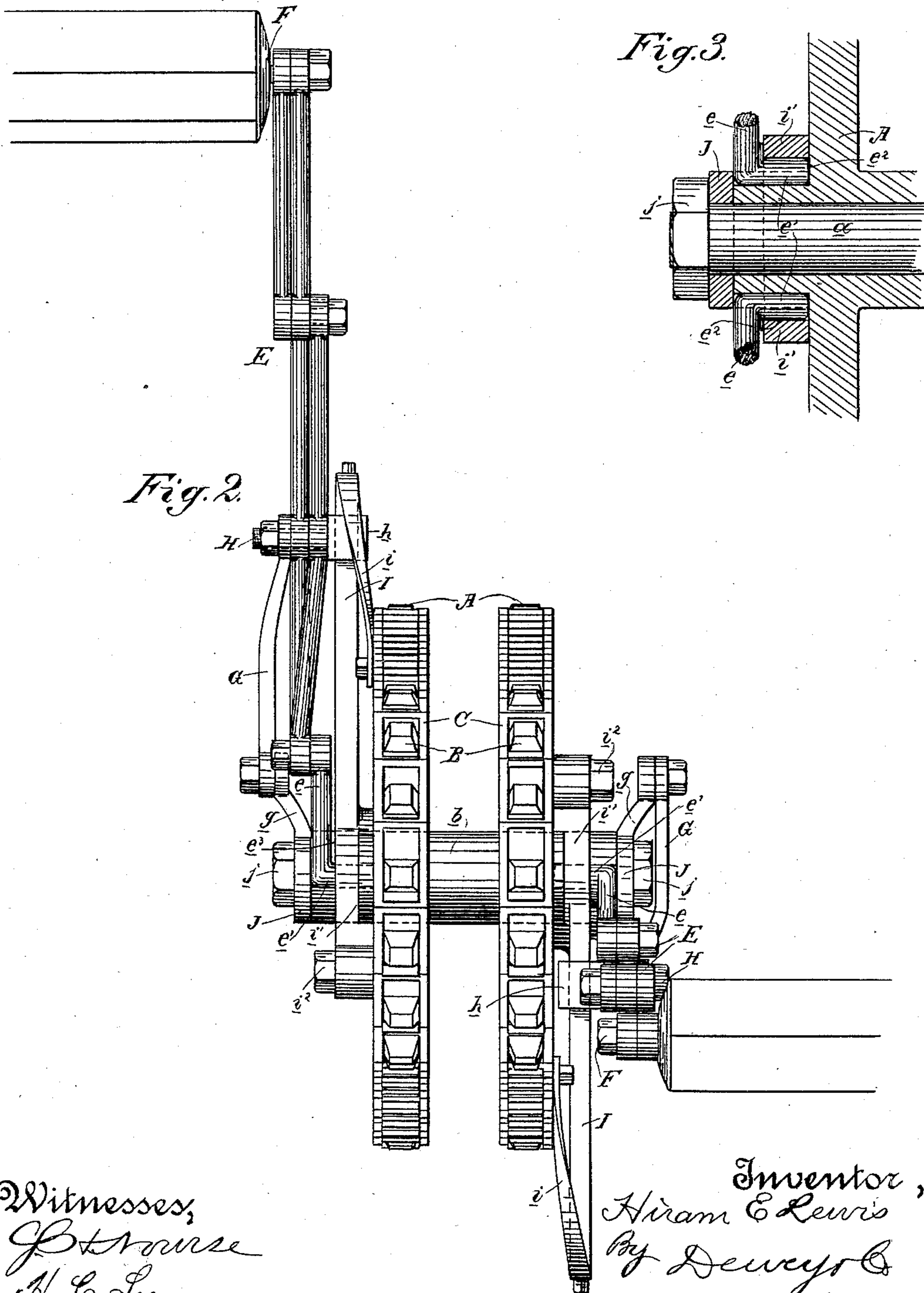
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# UNITED STATES PATENT OFFICE.

HIRAM E. LEWIS, OF GOLD HILL, NEVADA.

## VARIABLE CRANK FOR VELOCIPEDES.

SPECIFICATION forming part of Letters Patent No. 422,086, dated February 25, 1890.

Application filed June 24, 1889. Serial No. 315,415. (No model.)

*To all whom it may concern:*

Be it known that I, HIRAM E. LEWIS, of Gold Hill, Storey county, State of Nevada, have invented an Improvement in Variable Crank-Movements; and I hereby declare the following to be a full, clear, and exact description of the same.

My invention relates to the class of mechanical movements, and especially to that class in which a crank having a variable or eccentric throw is employed.

My invention consists, essentially, in a lazy-tongs connected at one end about the true center of motion and carrying in the other end the crank-pin, and an eccentrically-located lever connected with said lazy-tongs, whereby they are extended and contracted and their crank-pin thus made to move in an eccentric course.

My invention further consists in the details of arrangement and construction hereinafter fully described.

The object of my invention is to provide a crank-movement of this character for use in connection with any machine to which it may be found applicable, but especially in connection with foot-power machines—such, for example, as bicycles, tricycles, and velocipedes generally. Its advantage is in the saving of lost motion by reducing the distance of movement at the same time that the length of crank may be increased to give the necessary or desired power.

Referring to the accompanying drawings for a more complete explanation of my invention, Figure 1 is a side elevation of my variable crank-movement. Fig. 2 is a plan of same. Fig. 3 is a detail showing the connection of the lazy-tongs with the wheel.

I have deemed it sufficient to show my invention as applied to two driving chain-wheels A, two driven chain-wheels B, and intervening chains C, and these parts may be readily understood as applicable to various forms of velocipedes.

The wheels A are shown as journaled on a short shaft *a*, supported by a frame or standard D, and the wheels B are shown as fast on the shaft *b*, which is to be driven. Connected at their inner ends about the centers of the wheels A, in a manner presently to be described, are the lazy-tongs E, one on each side,

and each carrying in the outer end a crank-pin F, arranged relatively one hundred and eighty degrees apart, as is usual with the cranks of velocipedes.

G is a lever, the inner end of which is mounted eccentrically to the center of the wheel A. I have here shown it as pivoted to an arm *g*, which extends rigidly from the shaft *a*. The outer end of lever G is connected with the lazy-tongs, and said tongs are connected with the wheel A by a pivot-bolt H common to both lever and tongs. This bolt, though it might be fitted to and slide in a radial slot or groove in the wheel, is here shown as fitted to a sliding collar *h*, mounted upon a radially extending bar I, the outer end of which is connected with the wheel by braces *i*, and its inner end *i'* is forked, and, fitting over the hub of the wheel, is secured by bolts *i''* to said wheel.

The innermost members (designated by *e*) of the lazy-tongs are connected with the wheel by a pivotal connection, so that they may have their necessary vibratory movement. This connection is effected by bending their inner ends *e'* at right angles and fitting them in sockets *e''*, half of which is formed in the hub of the wheel and half in the forked arms of the bar I, said hub being cut out, as shown at *e'''*, to permit the necessary vibration of the members *e*. In order to house this connection and keep the members in place, I have the plate J fitting over the end of the wheel-hub, said plate being secured in place by a nut *j*.

The operation of my device is as follows: As the crank-pin passes the vertical plane above the lazy-tongs are extended by the eccentrically-located lever, so that when the crank-pin reaches the horizontal plane in front it has reached its farthest limit on account of the forward location of the eccentric-lever. As the pin moves on down toward the vertical plane below the lever draws back the lazy-tongs, contracting them until, having passed the vertical lower center and come to the horizontal plane on the back-stroke, said tongs are retracted to their innermost limit. The devices on the other side operate alternately to those on the first side, being set oppositely. The effect of this construction is that when the cranks are used as a foot-

power the leverage begins to be increased just beyond the top of the stroke, and thence increases where the power is most needed down to the horizontal plane on the forward stroke. At this point, where the power of the foot can no longer be expended to the best advantage, the leverage begins to decrease and continues drawing toward the center eccentrically until it passes the back horizontal plane, so that the foot does not have to follow a circle having a radius equal to the extreme limit of the leverage; but the usual lost motion of the foot coming up on the back-stroke is thus saved by making it describe a much smaller circle, and yet on the forward stroke, where the power can be expended to the best advantage, the leverage is extended to the greatest limit.

It is obvious that the manner of mounting the various parts in connection with the wheel is but one form of several which may be adopted. The particular object in the form described is that where a smaller wheel is used the crank-leverage may be extended beyond the periphery of the wheel, as is shown in the drawings, for the bar I, it will be seen, extends beyond the wheel and allows for a longer crank than if the connection was formed directly in a slot in the wheel.

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

1. A variable crank-movement consisting of the combination of the lazy-tongs connected at one end about the true center of motion, and an eccentrically-located lever connected with said lazy-tongs, whereby they are extended and contracted, substantially as described.

2. A variable crank-movement consisting of the combination of the lazy-tongs connected at one end about the true center of motion and carrying in the other end a crank-pin, and the eccentrically-located lever connected with said lazy-tongs, whereby they are

extended and contracted and the crank-pin moved through an eccentric course, substantially as described.

3. A variable crank-movement consisting of the rotary wheel, the lazy-tongs connected at one end about the center of said wheel, and a lever pivoted at one end at a point eccentric to the center of said wheel and at its other end connected with the lazy-tongs, substantially as described.

4. A variable crank-movement consisting of the combination of the rotary wheel, the lazy-tongs connected at one end about the center of said wheel, a crank-pin carried by the other end of said tongs, and a lever having one end pivoted at a point eccentric to the center of the wheel, and its other end connected with the lazy-tongs, substantially as described.

5. A variable crank-movement consisting of the combination of the rotary wheel, the lazy-tongs connected at one end about the center of said wheel, a crank-pin carried in the other end of said tongs, a lever pivoted at one end at a point eccentric to the center of the wheel and connected at its other end with the lazy-tongs, and a sliding radially-directed connection between said lazy-tongs and the wheel, substantially as described.

6. A variable crank-movement consisting of the combination of the rotary wheel, the lazy-tongs connected at one end about the center of the wheel, the crank-pin carried by the outer end of said tongs, the radially-extending bar fast to the wheel, the sliding collar on said bar, the bolt in the collar and on which the lazy-tongs are pivoted, and the lever connected at one end at a point eccentric to the center of the wheel and at the other end to said bolt, substantially as described.

In witness whereof I have hereunto set my hand.

HIRAM E. LEWIS.

Witnesses:

S. H. NOURSE,  
H. C. LEE.