

No. 609,828.

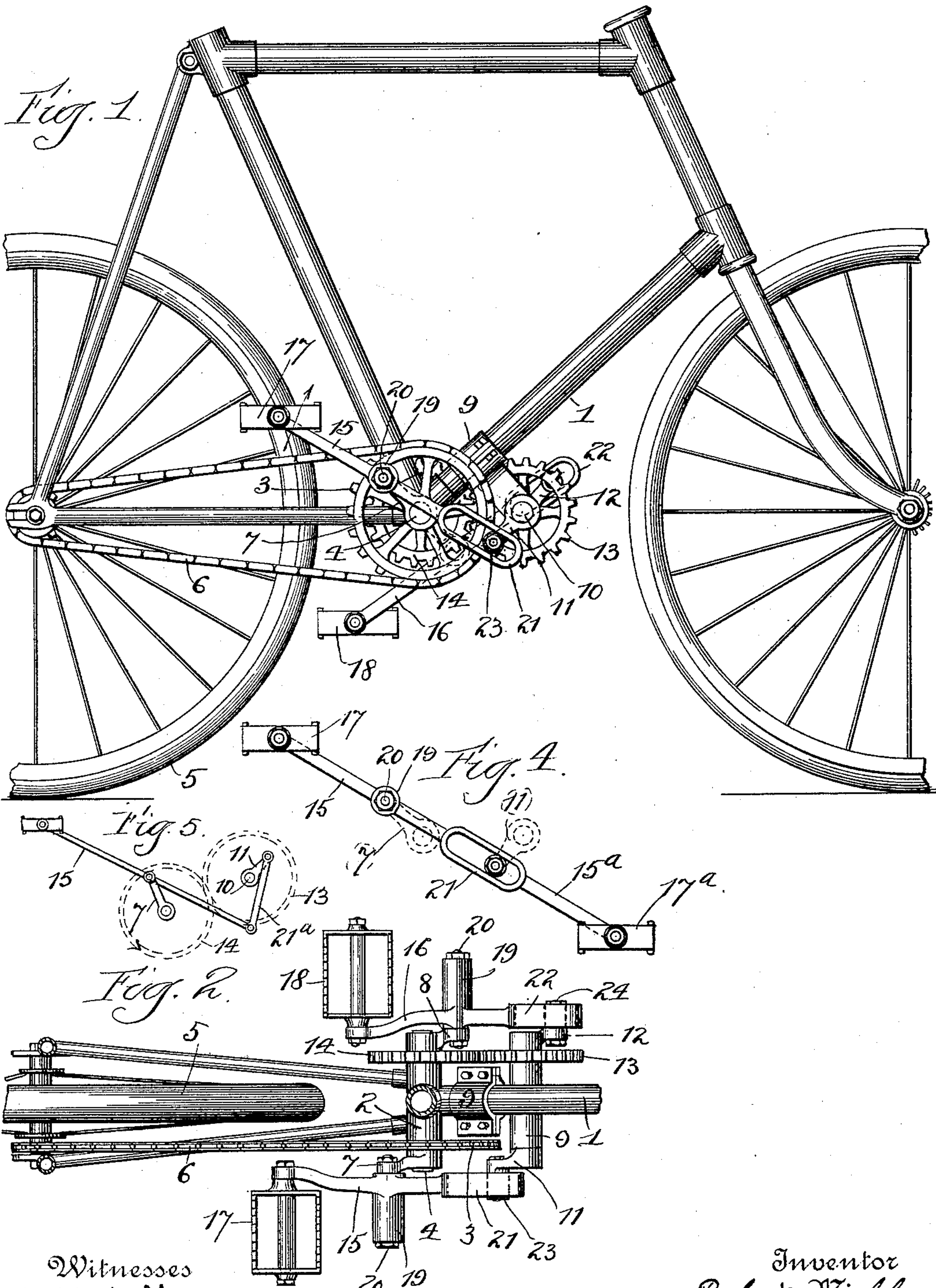
Patented Aug. 30, 1898.

R. MIEHLE.  
VELOCIPED.

(Application filed Oct. 23, 1895.)

(No Model.)

2 Sheets—Sheet 1.



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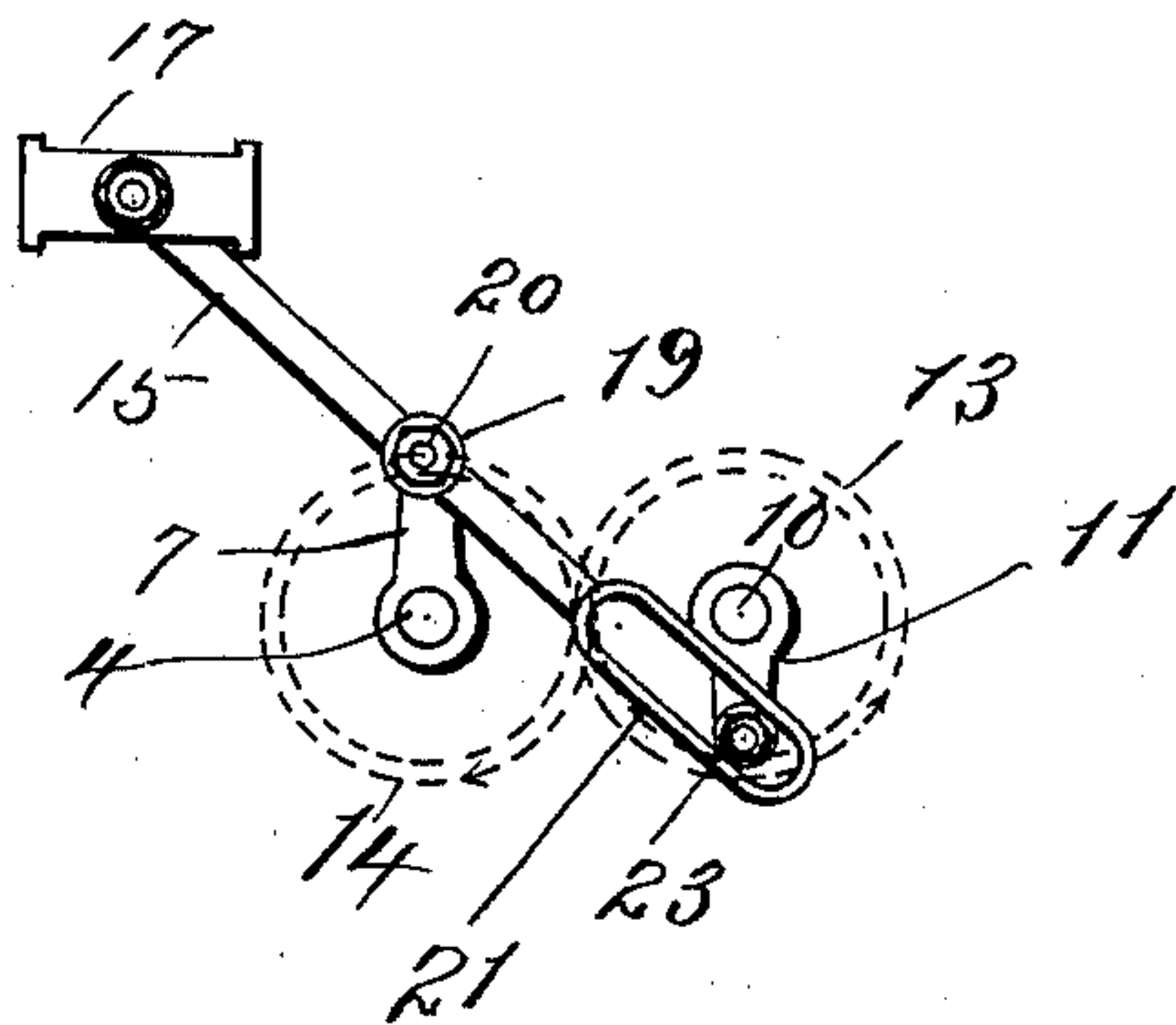
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2 Sheets—Sheet 2.

*Fig. 3*



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# UNITED STATES PATENT OFFICE.

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## VELOCIPEDÉ.

SPECIFICATION forming part of Letters Patent No. 609,828, dated August 30, 1898.

Application filed October 23, 1895. Serial No. 566,616. (No model.)

*To all whom it may concern:*

Be it known that I, ROBERT MIEHLE, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Velocipedes, of which the following is a full, clear, and exact specification.

My invention relates more particularly to the driving mechanism for velocipedes, and, in fact, for any other form of machinery; and it has especial reference to that class of driving mechanism in which the crank is acted on through the intermediary of a lever having a floating or shifting fulcrum.

My invention has for one of its objects to cause the pressure exerted against such fulcrum to react directly in propelling the machine instead of being expended on a mere dead resistance, as heretofore.

Another object of my invention is to cause the pressure which is ordinarily expended without effect against the dead-center of the crank to react on the crank in a different line of force from the line of the driving force and thus carry the crank past dead-center.

A further object of my invention is to cause the leverage of the propelling-lever to automatically increase when going down or making its driving stroke and to decrease when going up or returning.

With these ends in view my invention consists in certain features of novelty by which the said objects and certain other objects, hereinafter described, are attained, all as fully described with reference to the accompanying drawings, and more particularly pointed out in the claims.

In the said drawings, Figure 1 is a side elevation of a portion of a bicycle provided with my improvements. Fig. 2 is a plan view thereof, certain parts of the frame being broken away. Fig. 3 is a detail view showing the return movement of the driving-lever and two of the cranks, as hereinafter described. Fig. 4 is a detail view of a modified form of driving-lever, showing the cranks in dotted lines, hereinafter described; and Fig. 5 is a further modification illustrating diagrammatically a different form of shifting connection between the driving-lever and one of the cranks, as hereinafter described.

1 represents a bicycle-frame of ordinary

construction; 2, the crank-hanger; 3, the sprocket-wheel, secured to the crank-shaft 4 and geared to the ground driving-wheel 5 by means of chains 6 in the ordinary manner, and 7 8 are cranks secured to the crank-shaft 4 at opposite ends thereof, as usual.

9 is an additional crank-hanger which is shown detachably secured to the frame 1 in front of the crank-hanger 2, but of course, if desired, may be formed as a part of the frame or of the regular crank-hanger. Journaled in this crank-hanger 9 is a second crank-shaft 10, whose opposite ends are provided with cranks 11 12, respectively. The crank-shaft 10 is geared with or to the crank-shaft 4 in any suitable manner, such as by a pair of cog-wheels or pinions 13 14, the former being secured to the crank-shaft 10 and the latter to the shaft 4, so that the two shafts 4 and 10 will be compelled to rotate in unison.

15 16 are the driving-levers, provided at their rear ends with pedals 17 18, respectively, and pivoted at an intermediate point to the cranks 7 8, respectively. This pivotal connection between the levers 15 16 and the cranks 7 8 may be conveniently effected by providing the levers with laterally-elongated bearings 19, provided, if desired, with anti-friction devices (not shown) which bear upon the wrist-pins 20 of the cranks, as will be understood. The opposite end of each of the levers 15 16—that is, the end opposite the pedal—has a shifting or sliding connection, or what might also be termed a “movable connection,” with one of the cranks 11 12, which latter acts as a fulcrum for the lever. This sliding connection may be conveniently effected by providing each of the levers 15 16 with a loop or slot 21 22, respectively, which slots receive the wrist-pins 23 24, respectively, of the cranks 11 12, such wrist-pins, if desired, being in the form of antifriction-rollers provided themselves with suitable antifriction-bearings on the cranks 11 12, whereby their travel back and forth in the slots 21 22 will produce but a minimum friction.

The crank 11 is a trifle shorter than the crank 7 and is so arranged and proportioned with reference to it that when the latter has reached the dead-center, or that position where the pressure on the pedal ceases to be effective, the crank 11 will be substantially trans-



verse to the line of movement of the slotted end of the lever 15, and hence the pressure of such slotted end of the lever against the wrist-pin of the crank 11 will impart positive forward movement to the gear-wheel 13, which through the intermediary of the gear 14 will continue the rotation of the crank-shaft 4, and consequently carry the crank 7 past dead-center or beyond its inactive position. The same relative arrangement of the cranks 8 12 is carried out on the opposite side of the machine.

It is apparent that when the cranks 11 and 7 are in a horizontal line and the point 20 is on the left of the shaft 4 the points 20 23 will be farther apart than when the cranks are in the opposite position on the other side—that is to say, when the cranks are horizontal, but with the point 20 on the right of the shaft 4. This difference is due to the difference in the lengths of the cranks, and it brings about a shorter and a more direct movement of the pedal in descending than in ascending, in the manner which I will now describe.

It will be seen that while the cranks are in the position shown in Fig. 3 the main crank 7 is just about to enter its downward or propelling stroke, and the leverage at this stage is shortest because the point of application of the work, which is the point 20, and the fulcrum, which is the roller 23, are at their maximum distance apart. This distance between the work and the fulcrum, it will be seen, is gradually decreased throughout the first quarter of the downward stroke, at the completion of which first quarter the points 20 23 are at their minimum distance apart, and then the points 20 23 begin to recede from each other and thus continue to increase the distance between the work and the fulcrum until the main crank has reached the limit of its downward stroke, whereupon the distance between the points 20 23 begins to decrease; but during the first quarter-upstroke of the main crank this decrease occurs less rapidly per given travel of the crank than it does during the travel of the main crank from the position shown in Fig. 3 down to the completion of the first quarter of the downward stroke, and consequently during the return or upstroke the leverage is decreased by reason of the fulcrum failing to approach the work as near as it did at the completion of the first quarter of the downward stroke. From the point of completion of the first quarter of the upward stroke the distance between the points 20 23 increases until the position of the crank shown in Fig. 3 is reached.

By this construction it will be seen that both the direct and indirect or reactionary pressures of the driving-lever act positively in propelling the machine, and neither of these forces is expended on a dead or inactive fulcrum, as heretofore.

The modification shown in Fig. 4 consists

simply in providing the driving-lever with an extension 15<sup>a</sup> for the provision of an additional pedal 17<sup>a</sup>, whereby the machine may be used as a tandem.

In Fig. 5 I have illustrated a different form of movable or shiftable connection between the lever 15 and the crank 11, it being of course understood that Fig. 5 is an illustration of but one side only. In this form instead of providing the lever 15 with a slotted end I employ a link 21<sup>a</sup>, which is slightly longer than the crank 11 and which has its ends pivoted to the lever 15 and to the crank 11, respectively, so that the oscillation of the lever 15 will be imparted to the crank 11, and thereby cause the rotation of the crank-shaft 10.

It will be observed that in both forms of my invention the wrist-pin of the crank 11 constitutes the fulcrum for the end of the driving-lever which projects beyond the pivotal point of said lever, and in both instances this fulcrum is what might be termed a "shifting" or "floating" fulcrum—that is to say, its position changes with reference to the length of the driving-lever, and the strain exerted by said driving-lever upon this fulcrum is transmitted to the main crank-shaft and assists the main crank in rotating said shaft.

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

1. In a driving mechanism for the purpose described, the combination with a crank-shaft having a crank, of a lever pivoted to said crank, and a second crank-shaft geared to said first crank-shaft and having a crank provided with movable connection with said lever, said crank-shafts being geared to rotate in opposite directions substantially as set forth.

2. A driving mechanism for the purpose described having in combination a crank-shaft provided with a crank, a lever pivoted to said crank and having a pedal located at one side of said pivot and a loop or slot at the other side thereof, a second crank-shaft having a crank and being geared with and rotating in the opposite direction from said first crank-shaft, said second crank having a stud running in said loop or slot, substantially as set forth.

3. A driving mechanism for the purpose described having in combination a crank-shaft provided with a crank, a second crank-shaft having a crank of less length than said first crank, said crank-shafts being geared together, and a lever connected to said first crank and having sliding connection with said second crank, substantially as set forth.

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