No. 669,542. Patented Mar. 12, 1901.

J. C. MOORE.

CRANK MECHANISM.

(Application filed Aug. 14, 1899.)

(No Model.) 2 Sheets—Sheet 1.

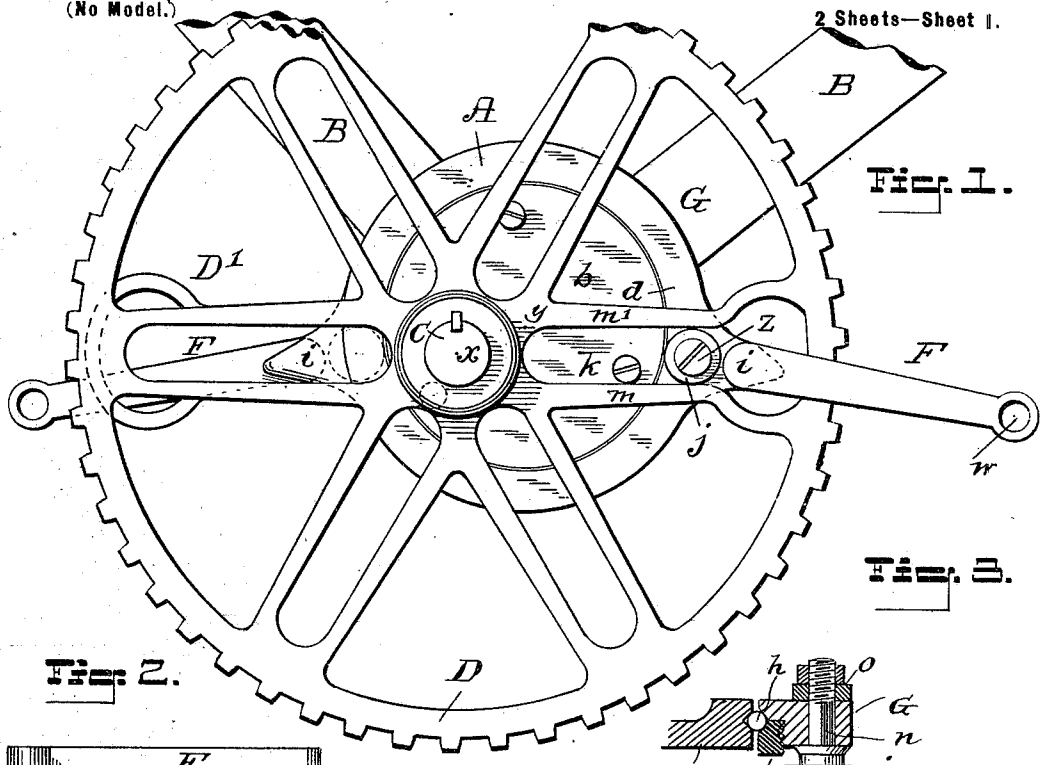
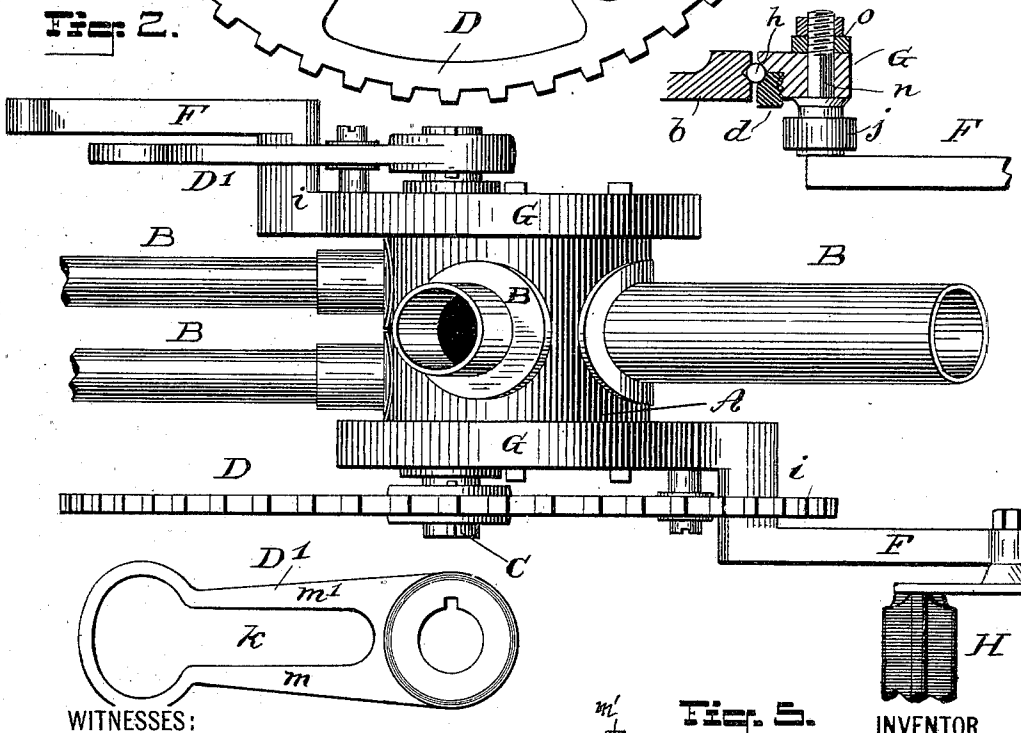



Fig. 1.

Fig. 3.

Fig. 2.




WITNESSES:

Fig. 4.

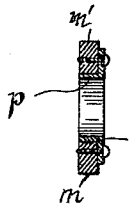



Fig. 5.

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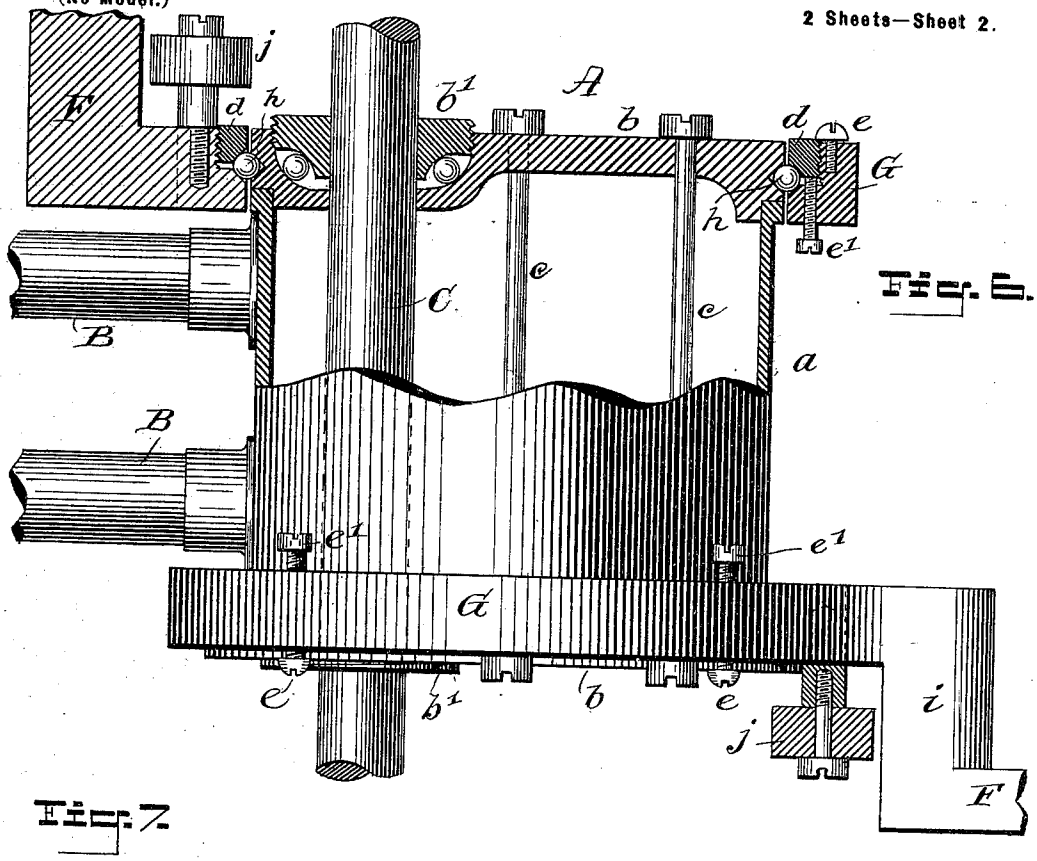



Fig. 6.

Fig. 7.

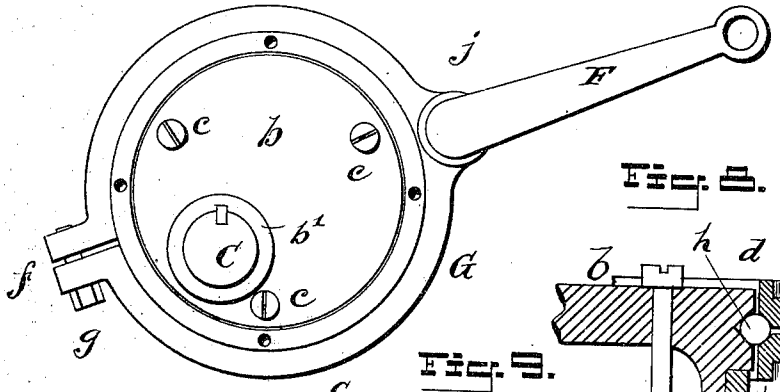



Fig. 8.

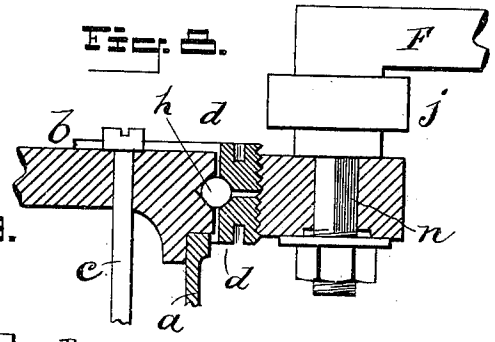
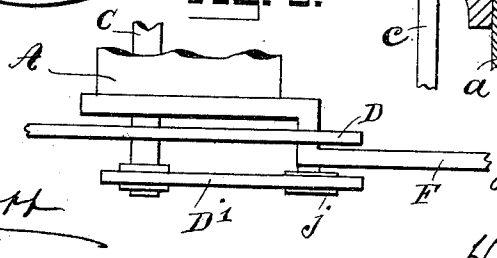



Fig. 9.




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# UNITED STATES PATENT OFFICE.

JEHU C. MOORE, OF BROOKLYN, NEW YORK.

## CRANK MECHANISM.

SPECIFICATION forming part of Letters Patent No. 669,542, dated March 12, 1901.

Application filed August 14, 1899. Serial No. 727,113. (No model.)

*To all whom it may concern:*

Be it known that I, JEHU C. MOORE, a citizen of the United States, residing in the borough of Brooklyn, in the county of Kings and city and State of New York, have invented certain new and useful Improvements in Crank Mechanisms, of which the following is a specification.

This invention relates to that class of crank mechanisms, mainly employed on velocipedes, wherein the pedal is made to travel in a circle eccentric to the shaft carrying the larger or driving sprocket-wheel and wherein the leverage of the crank is increased on the downstroke and correspondingly decreased on the upstroke. This increase of leverage has been heretofore obtained, and the object has been effected mechanically by providing the pedal-crank with a yoke which turns on a circular bearing eccentric to the shaft carrying the driving sprocket-wheel, the said pedal-crank having a radial sliding connection with an arm or part secured to the axle. In some of these mechanisms the only advantage gained and sought is the increase in crank length on the downstroke, and where the crank has a sliding connection with the driving-arm to form a compound lever the construction has been such that the driving sprocket-wheel must be placed at the inside, or between the crank-bearings, and such that the relative lengths of the arms of the crank-lever vary, as will be hereinafter explained. In my construction an increase in crank length is obtained on the downstroke, and the crank and driving-arm form a compound-lever device; but in my construction the relative lengths of the arms of the crank-lever do not vary, and the sprocket-wheel, where one is employed, is exterior to the crank-bearing, the crank having a lateral portion which passes outwardly through said wheel. Thus the inner or bearing portion of the crank is at the inside of the sprocket-wheel and the free end thereof, carrying the pedal, is at the outside of the said wheel.

In the accompanying drawings, wherein an embodiment of the invention is illustrated, Figure 1 is a side elevation of the crank mechanism, and Fig. 2 is a plan of the same. Fig. 3 illustrates one construction of the crank and driving-roller. Fig. 4 shows the slotted driving-arm detached. Fig. 5 is a cross-section of the slotted driving-arm, showing how it may be provided with wearing-plates. Fig. 6 is a view of the crank-hanger on a larger scale than the principal views and partly in section. Fig. 7 is a side elevation of the hanger, illustrating one construction of the crank-mounting; and Fig. 8 is a fragmentary sectional view of the same on a larger scale. Fig. 9 is a view, on a small scale, illustrating a slightly-modified construction.

A is the crank-hanger as a whole.

B represents the tubular members of a cycle-frame secured to the hanger in a well-known manner.

C is a shaft extending through the hanger and on which is fixed at one side the sprocket-wheel D and at the other side a driving-arm D'.

The hanger A will be constructed, by preference, of a cylindrical body *a* and two heads or end plates *b*, which fit onto the respective ends of the body and are held in place thereon by bolts *c*, extending lengthwise through the body. In the heads *b* will be fitted the ball-bearings *b'* for the shaft C. It will be noted that the body of the hanger A is larger in diameter than that of the ordinary hanger, that it is cylindrical from end to end, and that the shaft C is mounted eccentrically therein.

On the respective ends of the hanger A are mounted the cranks F through the medium of circular or ring-like yokes G, which are either integral with or rigidly connected to the respective cranks. Fig. 6 illustrates one construction of ball bearing and mounting of the yoke G. In this construction there is a V-shaped ball-race formed in the edge of the head *b*, and a ring-cone *d* is screwed into the yoke to form, together with a bevel on the inner face of the yoke, an outer adjustable ball-race. The screws *e* and *e'* serve to hold the ring-cone *d* from movement in or out when it has been once adjusted. Figs. 7 and 8 show another construction of the crank bearing or mounting. In this construction the yoke is cut at *f* in Fig. 7 and provided with lugs and a clamping-screw *g*, and on said yoke are screwed two opposite ring-cones, one from each side. When these cones have been properly adjusted to the balls *h*, the screw *g* is set up and the yoke made to embrace the rings firmly and rigidly.

Referring now to Figs. 1 and 2, the crank F at the near side has in it, as represented in these views, a double-elbow bend at *i*, where it passes out through any suitable aperture in the sprocket-wheel and carries a stud-roller *j* for driving. This roller occupies a radial slot *k* in the sprocket-wheel and bears on a track-rail *m*, forming one margin or side of the slot, the rail *m'* along the other side of the slot forming a keeper or guard-rail. Fig. 2 shows a part of one of the pedals H, which may of course be of the usual kind or of any kind desired.

So far as its relations to the crank for driving are concerned the sprocket-wheel D is merely a slotted driving-arm, the power being applied through the roller *j*, and on the other side of the cycle-frame the roller *j* on the crank at that side actually drives through the medium of a plain slotted driving-arm D', (seen detached in Fig. 4,) which performs the same functions as the slotted arm of the driving sprocket-wheel D.

Figs. 1, 2, and 6 show the crank F as integral with the yoke G and connected with it at the bend *i*, just beyond the roller-stud *j*; but the crank-arm may be formed separately from the yoke and be connected with the latter through a lateral branch, which may form the journal of the roller *j*. This construction is illlustrated in Figs. 3, 7, and 8, wherein *n* is a lateral branch from the crank-arm, the end of which is square or polygonal where it passes through the yoke, its outer end being screw-threaded and provided with a nut or nuts *o*. The roller *j* rotates on a cylindrical part of the branch *n*. If desired, the rail *m* on the sprocket-wheel D and that on the slotted driver D' may be provided each with a wearing-plate *p*, as seen in Fig. 5, and the guard-rail *m'* may also have a similar plate made adjustable up to the roller *j*, so that it can be set close enough to the latter to avoid undue looseness and play.

In Fig. 1, *x* is the center about which the sprocket-wheel D turns, *y* is the center about which the crank F turns, *z* is the point where the power is applied to the sprocket-wheel or driver by the crank, and *w* is the point where the power is applied to the crank by the foot of the rider. On the downstroke of the crank the maximum increase in length of the latter equals the distance from *x* to *y*, and this is lost, of course, on the upstroke. The point *y* will be in front of the point *x* and preferably a little above the level of the latter, as shown in Fig. 1.

It is essential to the full attainment of the object of this invention that the distance along the crank from *y* to *z* shall be less than the distance from *z* to *w*, and in practice when the crank is used on a velocipede the outer arm of the crank *z* to *w* will be preferably about twice the length of the inner arm *y* to *z*, and it is also essential that this proportion between the lengths of the arms of the crank-lever shall remain constant, which result is obtained by slotting the driving-arm and mounting the roller-stud *j* on the crank. By this arrangement the simple element of the compound lever—that is to say, the slotted driver from *x* to *z*—will be the variable element, and after the crank passes the point of maximum leverage the decrease in leverage will come only from the gradual lessening of this distance, *x* to *z*. It may be proper to explain that if the crank were slotted and the roller *j* mounted on the driving-arm the crank would lose its leverage rapidly after passing the point of maximum leverage, although the length of the driving-arm from the shaft to the stud-roller would remain constant. Thus there would be a loss of effective leverage which would be much more rapid than with my construction.

In constructions where no sprocket-wheel is employed there would be two simple slotted driving-arms, such as the arm D'; but the slotted arm or spoke of the sprocket-wheel D is, in fact, a driving-arm corresponding exactly to the arm D'. Indeed there might be an arm similar to the arm D' on the same side of the frame as the sprocket-wheel, and this construction is illustrated in Fig. 9. In this view the crank passes out through the sprocket-wheel, and the stud-roller *j* thereon engages a slot in a driving-arm $D^{\times}$, fixed on the shaft C outside of the wheel D. There is no advantage in this arrangement except that it enables a sprocket-wheel of ordinary construction to be employed, as there need be no radial slot in it.

I have called the stud on the crank which occupies the slot in the driving-arm a "roller-stud," as it will usually have a roller on it to avoid friction; but obviously a simple stud at the point where the crank applies the power could be employed.

I have used the words "inside" and "outside" to express in a simple way the relative positions of the sprocket-wheel or driving-arm and the crank-bearing. "Inside" herein means nearest to the frame, and "outside" means farthest from the frame. The bearing of the crank is inside of the sprocket-wheel, and the pedal-arm thereof is outside.

It has been stated that the heads *b* of the crank-hanger are connected and held in place on the cylindrical body or shell *a* by the through-bolts *c*. The advantage of this construction arises from the convenience it affords in setting the center *y*, about which the crank turns, with the center *x* of the shaft. By turning the heads *b* on the body *a* the center *y* may be raised or lowered to suit the needs of different riders, as some would require the cranks to stand at a greater angle when at the maximum than would others.

Having thus described my invention, I claim—

1. In a velocipede, the combination with a driving-shaft and radially-slotted drivers or driving-arms fixed thereon, of two cranks mounted eccentrically to the said shaft on the crank-hanger between said drivers, said

cranks having each a roller-stud which engages the slot in the adjacent driver, substantially as set forth.

2. In a velocipede, the combination with a crank-hanger, a driving-shaft rotatively mounted therein, two oppositely-arranged, radially-slotted driving-arms fixed on said shaft, and two cranks, rotatively mounted on the hanger eccentrically to said shaft and between said driving-arms, said cranks having each a roller-stud which engages the slot in the adjacent driver and said cranks having their outer arms, which are beyond said studs, exterior to the driving-arms, the distance along the crank from the crank-axle to the stud, being less than the distance from the stud to the pedal-shaft, substantially as set forth.

3. In a velocipede, the combination with a crank-hanger, of a crank mounted to turn on and concentrically with said hanger, a shaft rotatively mounted in and eccentrically to the hanger, and a sprocket-wheel fixed on said shaft exterior to the crank-bearing, and having in it a radial slot *k*, said crank extending through said sprocket-wheel and having a roller-stud *j* which engages the slot therein, substantially as set forth.

4. In a velocipede, the combination with a crank-hanger, and a shaft C extending through and mounted eccentrically therein, of the sprocket-wheel D, fixed on said shaft and having in it a radial slot *k*, of the crank F, having a bearing on the hanger inside of the sprocket-wheel, a portion extending out through said wheel at said slot, an outer, pedal-arm exterior to the sprocket-wheel, and a roller-stud *j*, which engages the slot in said wheel, substantially as set forth.

5. In a velocipede, the combination with the cylindrical body of the crank-hanger, to which the members of the frame are to be secured, the heads or ends mounted concentrically on said body, the bolts extending through said body and adapted for securing the heads thereto when set, the shaft mounted eccentrically in said heads, the ball-bearings on the edges of said heads, the cranks, having their yokes mounted on said ball-bearings and concentric with the body of the hanger and means for connecting said shaft and cranks, substantially as set forth.

6. In a velocipede, the combination with a driving-shaft and radially-slotted drivers or driving-arms fixed thereon, of two cranks mounted eccentrically to the said shaft on the crank-hanger between said drivers and provided with pedals at their outer ends, said cranks having each a roller-stud which engages the slot in the adjacent driver and which is situated between the middle point in the length of the crank and the center about which the latter turns, substantially as set forth.

7. In a velocipede, the combination with a crank-hanger having a cylindrical body and rotatable heads, the shaft mounted eccentrically in said heads, a radially-slotted driving-arm fixed on said shaft, a crank which has a yoke with bearing on the hanger and eccentric to the shaft-axis, and a roller-stud on said crank and engaging the slot in the driving-arm, substantially as set forth.

8. The hanger, comprising the cylindrical body, the heads mounted concentrically on said body, means for connecting said heads rigidly to the body when they are set, the shaft, mounted eccentrically in said heads, the cranks having bearings on said hanger and concentric therewith and means for connecting said shaft and cranks, all combined substantially as set forth.

In witness whereof I have hereunto signed my name, this 10th day of August, 1899, in the presence of two subscribing witnesses.

JEHU C. MOORE.

Witnesses:
PETER A. ROSS,
HERMAN PHILLIPS.