

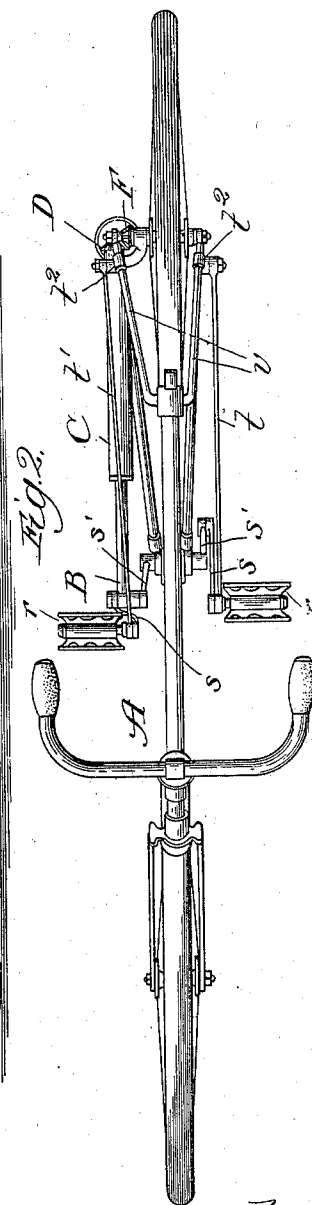
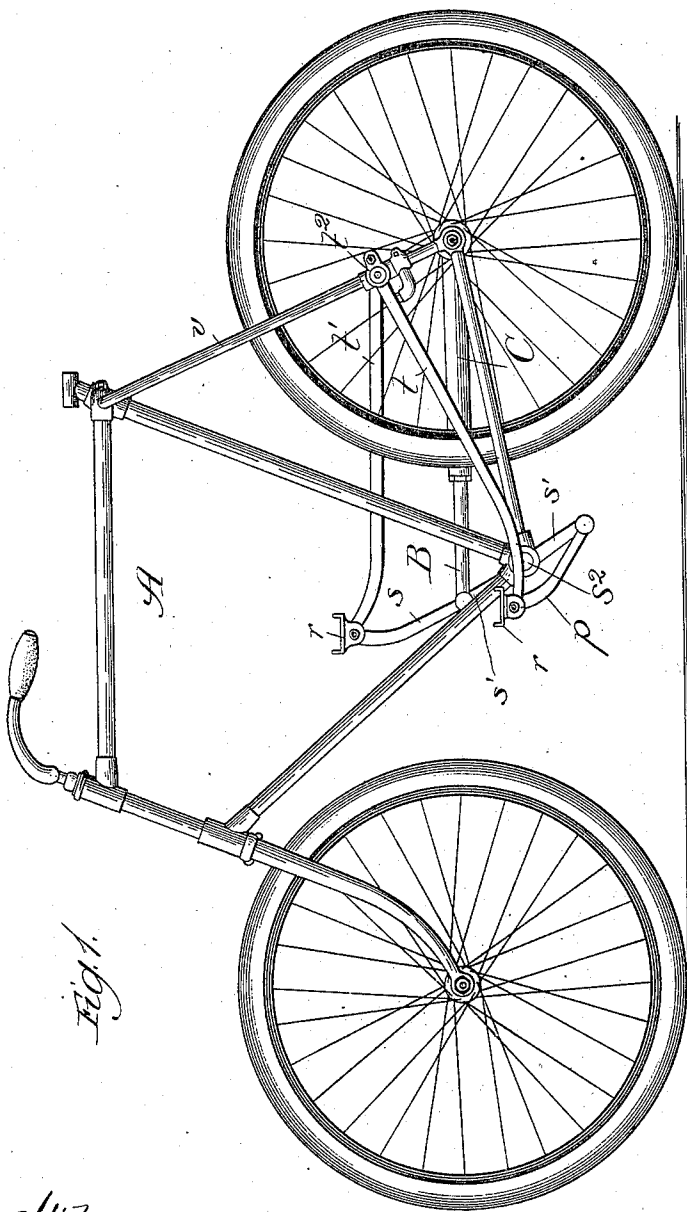
(No Model.)

2 Sheets—Sheet 1.

D. BREMER & C. A. LUNDGREN.
BICYCLE PROPELLING MECHANISM.

No. 579,218.

Patented Mar. 23, 1897.



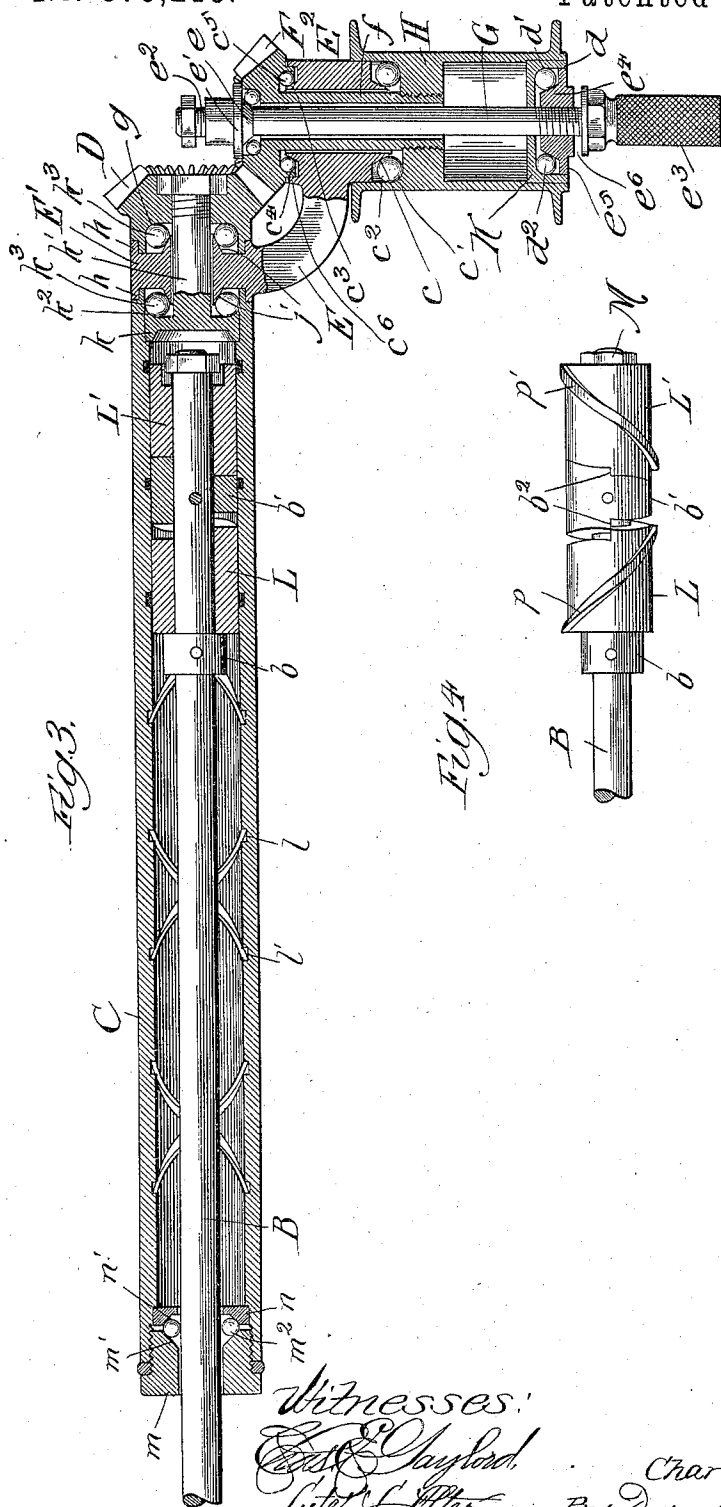
Witnesses:
Edw. C. Chapin,
Att'y & S. Atty.

Inventors:
Donn Bremer,
Chas. A. Lundgren,
By *Dyckman & Dyckman*
Att'ys

D. BREMER & C. A. LUNDGREN.
BICYCLE PROPELLING MECHANISM.

No. 579,218.

Patented Mar. 23, 1897.



Witnesses:
Edw. J. Lloyd
John J. Allen

Inventors:
Donn. Bremer &
Charles A. Lundgren,
By *Dymprich & Dymprich*
Attys

UNITED STATES PATENT OFFICE.

DONN BREMER AND CHARLES A. LUNDGREN, OF CHICAGO, ILLINOIS, ASSIGNORS OF ONE-HALF TO JOHN S. HALLSTROM, OF SAME PLACE.

BICYCLE-PROPELLING MECHANISM.

SPECIFICATION forming part of Letters Patent No. 579,218, dated March 23, 1897.

Application filed April 13, 1896. Serial No. 587,259. (No model.)

To all whom it may concern:

Be it known that we, DONN BREMER and CHARLES A. LUNDGREN, citizens of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented a new and useful Improvement in Bicycle-Propelling Mechanism, of which the following is a specification.

Our invention relates to an improvement in that type of bicycles or tricycles in which motion is communicated from a pedal-shaft to the driving-wheels by suitable connecting means; and our object is to provide for this purpose a construction, not involving the use of a chain or belt connection, which shall overcome the objections hitherto urged against gearing of this kind.

A further object of our invention is to furnish such an attachment of the pedals to the cranks, through the medium of links, as will give to the crank-shaft the required rotary motion, while the cranks themselves shall have practically a vertical movement.

We are aware that efforts to accomplish the aims above indicated have been made, but the constructions heretofore used have generally proved clumsy and inefficient to such a degree that the chain is still practically the only gearing used on cycles. By the use of mechanism of the following generally-stated description we secure a chainless gearing of light construction, neat appearance, and most perfect action. A plunger-rod is pivoted to one of the pedal-cranks and is thereby given a reciprocating motion within a cylinder which extends backward to and is geared to the rear axle, on which it is free to swing and to which it communicates a rotary motion by means of beveled gears. The cylinder itself is given a continuous rotary motion in one direction by the plunger-rod in a manner to be hereinafter described, while the pedals are given practically a vertical movement by means of peculiar link attachments, both of which features are illustrated in the accompanying drawings.

In the drawings, Figure 1 is a view in side elevation of a bicycle provided with our improvements; Fig. 2, a top plan view of the same; Fig. 3, an enlarged section of the rear hub and the cylinder containing the plunger-

rod, showing the method of converting the reciprocating motion of the plunger-rod into rotary motion to turn the wheel; and Fig. 4, a detail of the connection between the plunger-rod and cylinder.

For convenience we describe our improvements in connection with a bicycle, though it will be evident from the description that they may be applied to any foot-driven vehicle with equally good results.

A represents the frame of a bicycle of any ordinary construction, to the rear-inclined forks *v* of which are pivoted at one end arms or links *tt'*, as by means of the collars *t²*. These arms *t* and *t'* are pivotally connected at their free ends to links *s s'*, which in turn are pivoted to the cranks *s' s'*, carried by the crank-shaft *s²*. Were no provision for offset made the point of connection between the links *t'* and *s* would be carried farther from the center line of the bicycle on the right than on the left hand side, on account of the location there of the transmission mechanism. Hence it is desirable to make the link *s* on the right side to curve inward, in order that the pedals *r r*, which we prefer to provide at the joint of the links *t'* and *s*, may be symmetrically placed with reference to the center line. To the right crank *s'* is pivoted at one of its ends a plunger-rod B, which is thereby given a reciprocating motion under the pedal action. The plunger-rod B works within a cylinder C and gives to it a continuous rotary motion, which it in turn communicates to the rear wheel.

The cylinder C is provided at its free end (see Fig. 3) with a washer *n*, affording the annular ball-bearing surface *n'*, and a cap *m*, affording an annular bearing-surface *m'*, the two surfaces together affording a groove for the balls *m²*. On its interior the cylinder is provided with rapid-pitch right and left handed spiral grooves *l l'*, respectively. At its opposite end the cylinder carries a bevel-gear D and has means for connecting the cylinder with the rear axle, to leave the cylinder free to rotate about its own axis and to swing about the axis of the rear wheel, in order to keep in line with the plunger-rod at whatever angle the latter may be under the action of the pedals. A head *k*, having inte-

gral with it a bolt k' , is set firmly into the end of the cylinder. The bolt k' receives loosely upon it the collar E' of a tie-rod E , which is bent into the arc of a circle and provided at its other end with a similar collar E^2 , loose upon the rear axle G . The collar E' is provided with the ball-bearing surfaces j and flanges h . The beveled pinion D is firmly attached to the bolt k' and is provided with an annular ball-bearing surface g , while the head k is similarly provided with a bearing-surface k^2 . The surfaces j , g , and k^2 afford the bearings for balls k^3 . The flanges h fit loosely about the parts which they encircle, so that the binding force is transmitted through the ball-bearing surfaces, though they are necessarily given little longitudinal play, in order they may the more effectively exclude the dust from the ball-bearings. The bevel-gear D meshes with a similar gear F , which fits loosely upon the rear shaft G and is provided with a sleeve f , which is firmly fitted into the hub H of the rear wheel, thus really forming an extension of the hub. The shaft G is provided at the end adjacent to the bevel-gears with a cone e , a dust-excluding flange e' , and means for attaching the fork of the frame, as at e^2 . At its opposite end it is provided with a step e^3 and a bearing-cone e^4 , having a dust-excluding flange e^5 , and shown as screwed onto the shaft.

Forced into the end of the hub H or formed integral therewith is an annular ring K , having a flange d , provided with an annular bearing-surface d' , thus forming the inner race member of the bearing for balls d^2 , of which bearing the cone e^4 forms the outer member. At the opposite end of the hub the bevel-gear F acts similarly as an outer race member and in connection with the cone e forms the race-course for the wheel-bearing at that end of the hub. The portion e^6 of the shaft G receives one of the forks of the bicycle-frame. The collar E^2 of the tie-rod E fits loosely upon the sleeve f of the bevel-gear F . One end of said collar fits loosely into that end of the hub proper that is adjacent to the bevel-gears and is provided with a cone c , which, together with the annular surface c' on the inner surface of the end of the hub, forms the race-course for balls c^2 . At its opposite end the collar E^2 is provided with the bearing-surface c^3 to form, with the bearing-surface afforded by the flange c^4 upon the bevel-gear F , a race-course for balls c^5 . A flange c^6 upon the collar E^2 serves to exclude dust from the bearing.

With a joint of the above description the desired freedom of movement is secured, while all of the principal bearings are ball-bearings, thus insuring but little friction.

In Fig. 4 is shown a detail of the connection between the plunger-rod and cylinder, by means of which continuity of rotation is secured. Near its free end the plunger-rod B is provided with a relatively stationary collar or stop b and a relatively stationary clutch member b' . Confined between the collar b

and clutch b' is a loose clutch member L , short enough to rotate on the plunger-rod clear of the clutch b' when properly held. The member L is provided on its outer surface with a right-handed feather or raised thread p , which fits into a corresponding right-handed groove in the cylinder. Confined between the clutch member b' and a nut M on the end of the plunger-rod is a second loose clutch member L' , having the same longitudinal play as the member L , but provided with an oppositely or left-handed feather or raised thread p' , which works within a corresponding groove in the cylinder. It will be seen by reference to Fig. 4 that the surfaces, where the loose clutch members bear against the stationary clutch member, are helical surfaces terminating abruptly to afford shoulders b^2 b^2 .

The operation is briefly as follows: When the pedals are moved by the feet through arcs described by the links t t' , the effect is to communicate to the crank-shaft, through the medium of the links s , a continuous rotary motion, and through the crank s' to reciprocate the plunger-rod B . As shown in Fig. 3, the plunger-rod has about completed its backward stroke. As it begins to move in the other direction the member L' , under the friction between the feather and groove, as well as the inertia of the member itself, will allow the rod to be withdrawn till stopped by the nut M . The same influences will operate to retard the clutch member L' till engaged by the stationary member b' . Since the member L cannot turn upon the plunger-rod in this position, the effect is to revolve the cylinder to the right, (looking toward the rear end of the cylinder,) as though the cylinder were, in fact, a right-handed nut being turned onto a stationary bolt. When the plunger-rod has completed its forward stroke and starts on the return stroke, under the action described above, the member L drops out of engagement with the member b' , while the member b' is drawn into engagement with the member L' , and now the left-handed feather p' of the member L' will continue the revolving motion of the cylinder in the same direction as before, while the member L , bearing against the shoulder b , is rapidly revolved loosely upon the plunger-rod as the latter continues its backward movement.

In order that the pedals may be used as a means of stopping the wheel, in case it is desired to stop suddenly, the grooves l l' should be of just sufficient length to allow the plunger-rod to complete the stroke given it by the crank in making a complete revolution. In the position shown in Fig. 3, suppose the axle and cylinder to be in motion, while the plunger-rod is held firmly, the result would be that the member L' would be turned to the right (looking toward the rear end of the cylinder) by the engagement of the groove and spline, and by reason of the helical surfaces between the members b' and L' the latter member would be forced out till the spline

reaches the end of the groove, when it will be firmly bound between the end of the groove and the helical surfaces, thus stopping the wheel.

5 Of course any desired number of grooves and corresponding splines may be employed and various changes in details of construction may be made without departing from the spirit of our invention. Hence we desire to
10 be understood as not limiting ourselves to the particular construction shown and described.

What we claim as new, and desire to secure by Letters Patent, is—

15 1. In a bicycle, or analogous machine, the combination with the driving-wheel and operating-lever, or cranks, of a cylinder provided internally with a right and left spiral groove, and free to swing upon the axis of
20 the drive-wheel, a plunger-rod connected to the operating-lever, or crank, and movable within said cylinder, a stationary clutch member on said plunger-rod, and movable clutch members provided respectively with
25 right and left handed splines to move in said grooves, one operating in the movement in one direction of the plunger-rod to give to the cylinder a rotary motion and the other in the return movement to continue said rotary
30 movement, and means for transmitting said rotary motion to the drive-wheel, substantially as and for the purpose set forth.

35 2. In a bicycle, or like machine, the combination with the hub of the driving-wheel, of a cylinder and plunger-rod geared thereto and free to swing upon said hub, one of said members being attached to the operating lever or crank of the bicycle to be thereby given a reciprocating motion, and means upon the
40 cylinder and plunger-rod, whereby the recip-

rocating member shall impart to the other member a continuous rotary motion for rotating the drive-wheel, substantially as and for the purpose set forth.

3. In a driving mechanism for bicycles, &c., 45 the combination with the rear drive-wheel and frame, of a cylinder having a gear connection with the drive-wheel, and a vertically-swinging motion with relation to the hub of the drive-wheel, a piston and rod having a
50 spiral spline and groove connection with the cylinder, crank-arms rotating about a common axis, pedals connected with and driving said crank-arms, arms connecting the pedals with the frame, and a connection between a
55 pedal-crank and the piston-rod, whereby the pedal movement communicates a reciprocating action to the piston-rod, thereby rotating the cylinder and driving the wheel, substantially as described. 60

4. In a bicycle, or similar vehicle, the combination with the pedal-crank and the driving-wheel hub, of a rotary cylinder geared to the driving-wheel hub and provided with right and left hand worms, a plunger con- 65 nected with the crank and having means for engaging said worms, whereby the cylinder is rotated and oscillated in the movement of the crank, and a vertically-movable joint between the cylinder and hub, whereby the os- 70 cillation of the cylinder, while rotating under the pedal action, is permitted, without interfering with the gear connection of the cylinder with the hub, substantially as described.

DONN BREMER.

CHARLES A. LUNDGREN.

In presence of—

M. J. FROST,
J. N. HANSON.