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FRICTIONAL DRIVING MECHANISM.

No. 546,650. Patented Sept. 24, 1895.

Fig. 1.

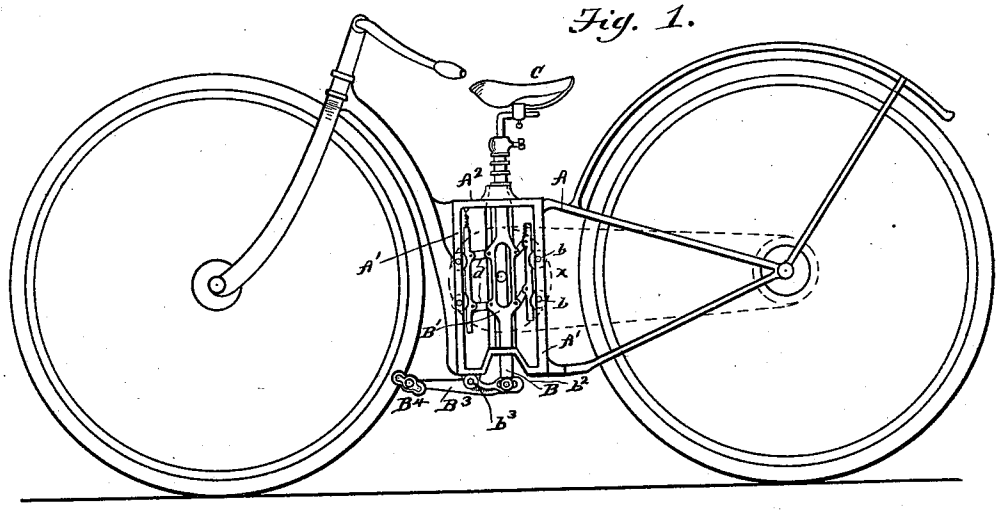


Fig. 5.

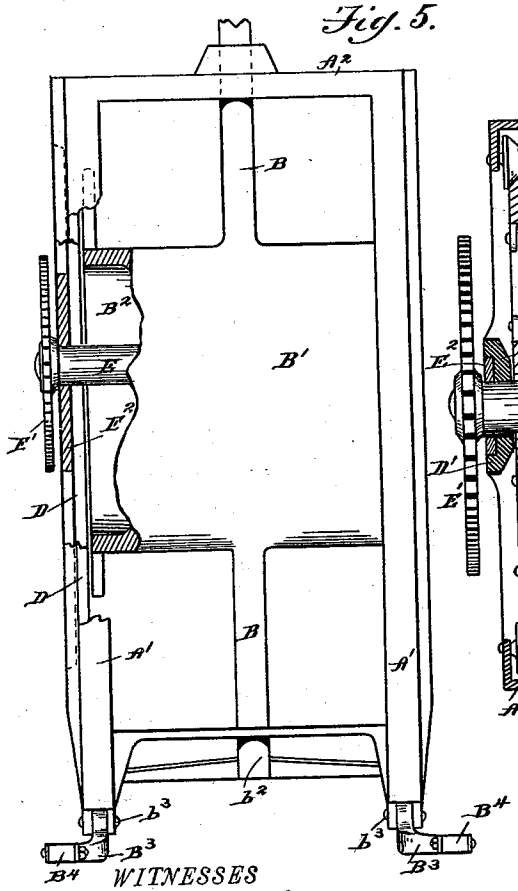
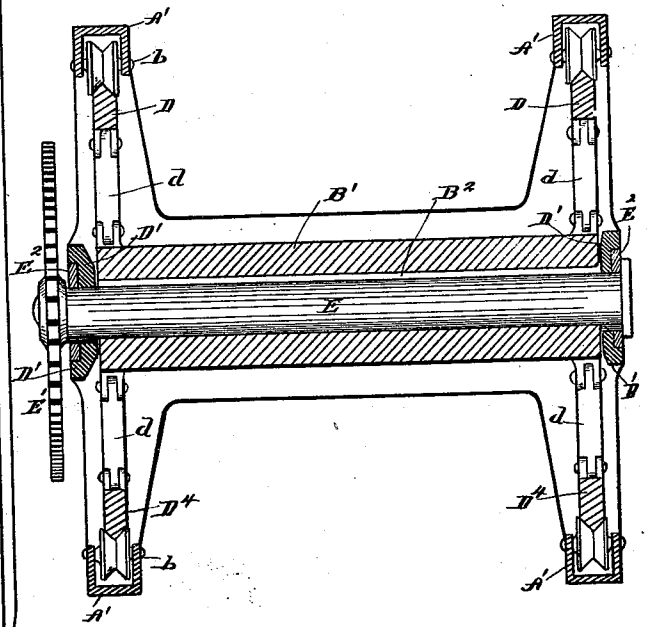


Fig. 4.



WITNESSES

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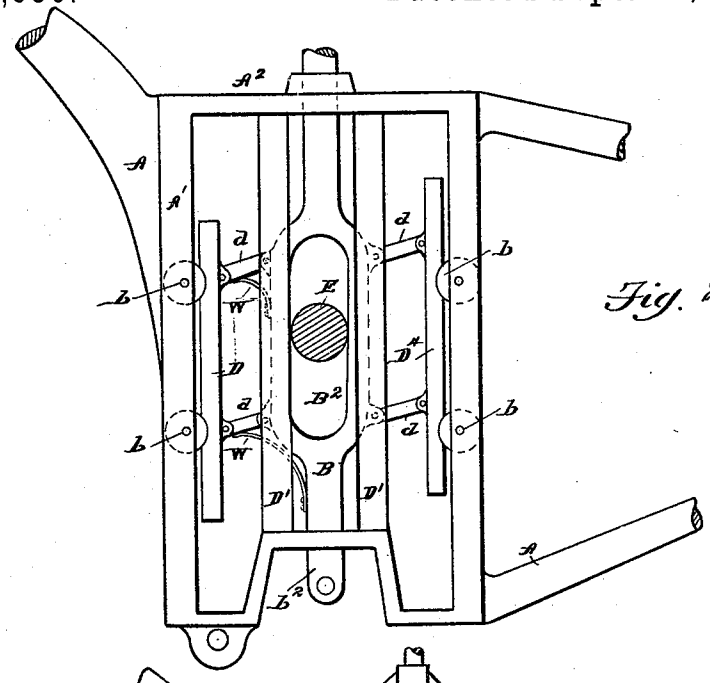
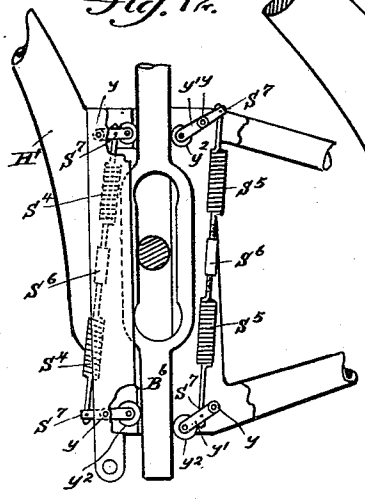


Fig. 2

Fig. 12.



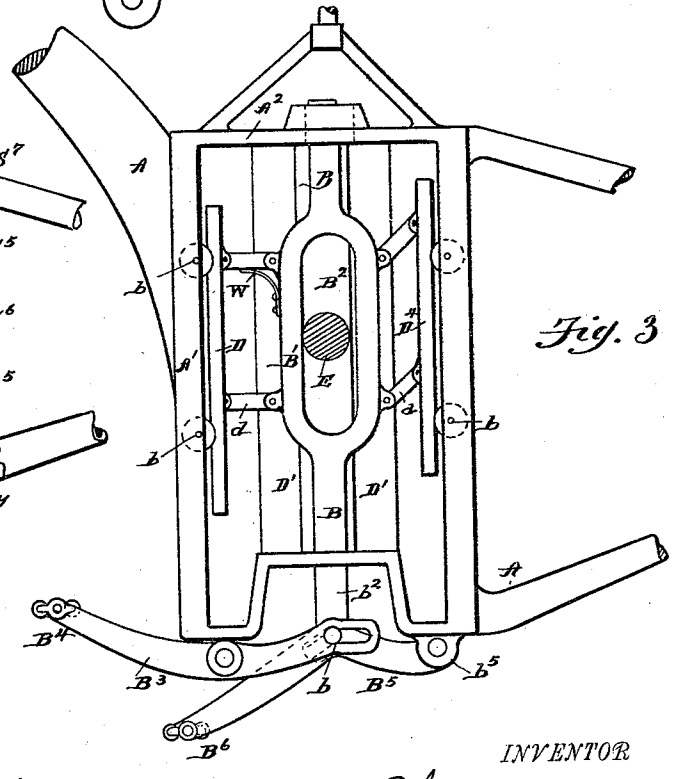


Fig. 3

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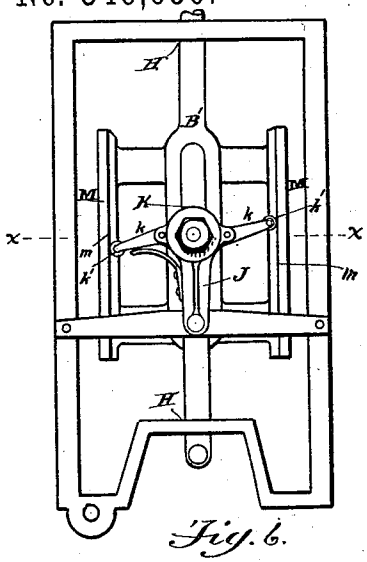

Fig. 6.

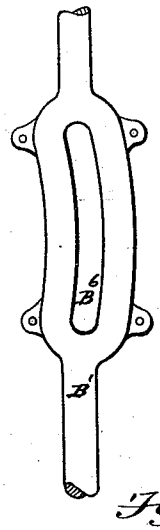

Fig. 11.

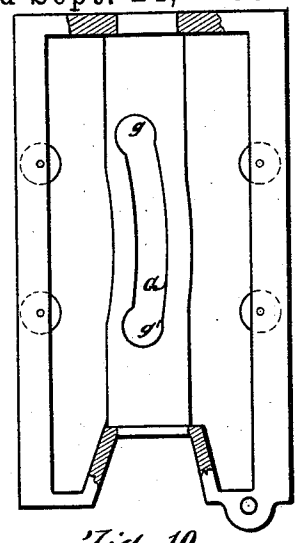

Fig. 10.

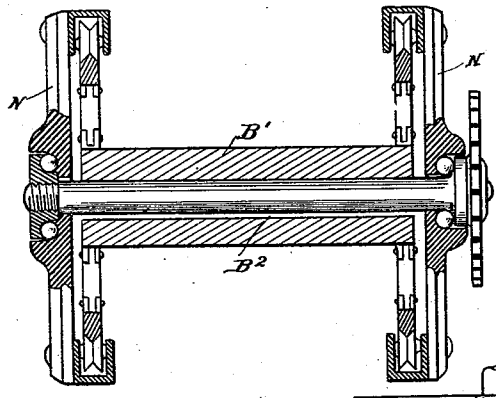

Fig. 9.

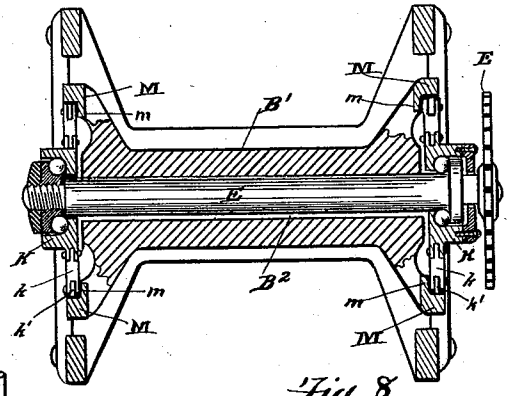

Fig. 8.

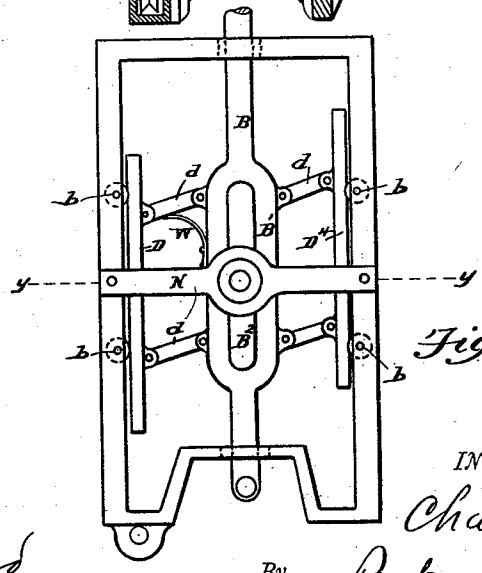

Fig. 7.

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UNITED STATES PATENT OFFICE.

CHARLES H. BROWN, OF JACKSON, MICHIGAN.

FRICTIONAL DRIVING MECHANISM.

SPECIFICATION forming part of Letters Patent No. 546,650, dated September 24, 1895.

Application filed February 9, 1894. Serial No. 499,582. (No model.)

To all whom it may concern:

Be it known that I, CHARLES H. BROWN, a citizen of the United States, residing at Jackson, county of Jackson, State of Michigan, have invented a certain new and useful Improvement in Frictional Driving Mechanism; and I declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it pertains to make and use the same, reference being had to the accompanying drawings, which form a part of this specification.

My invention relates to bicycles or other vehicles propelled by the rider; and it consists in a novel arrangement of the frictional driving mechanism, all of which is hereinafter described, and specifically pointed out in the claims.

In the drawings, Figure 1 represents an elevation of a bicycle with one form of my driving mechanism. Fig. 2 is an enlarged view of the same in elevation. Fig. 3 represents a modification. Fig. 4 is a cross-sectional view through the actuating mechanism on the line *x x* of Fig. 1. Fig. 5 is an elevation transversely of Fig. 1, with a portion broken away to show the relation of the parts. Fig. 6 is an elevation of a modification. Fig. 7 is an elevation of another modification. Fig. 8 is a cross-section of Fig. 6 on the line *x x*. Fig. 9 is a cross-section of Fig. 7 on the line *y y*. Fig. 10 shows a slightly-modified form of the ways or guides. Fig. 11 is a corresponding form of the plunger. Fig. 12 shows a modification of the same principle.

Similar letters refer to similar parts.

In the drawings, A represents the frame of an ordinary bicycle, carrying the operative mechanism. This frame is of peculiar construction. As shown in Figs. 1 and 5, it consists of an arrangement of bars A′ A′, united at top and bottom by cross-pieces A^2 A^2, thus forming a box-like skeleton, within which the operative mechanism is inclosed. This skeleton is joined to the frame carrying the wheels in any appropriate manner and is located between the wheels, as shown in Fig. 1. As shown in Fig. 12, this frame is modified into a casing.

As shown in the form illustrated in Fig. 1, there is centrally located in the skeleton frame referred to a plunger B, carrying at its upper end a seat C. The central portion of this plunger is enlarged into a sliding block B′. (Shown in cross-section in Figs. 4, 8, and 9.) This block is hollowed out perpendicularly and transversely, thus forming a transverse elongated slot B^2 and the two opposite frictional contact-surfaces. Journaled within the perpendicular side bars of the frame at *b b* are friction-rollers. These rollers preferably have a V-shaped groove in their peripheries. Engaging these grooves are perpendicular blocks D D^4. As there are four sets of rollers, one in each corner of the skeleton frame, there are four corresponding blocks D D^4. These blocks are connected by pivoted toggle-links *d d*, one to each of the four corners of the block B′. Springs *w w* tend to raise the block D, while the block D^4 has a tendency to fall by gravity, which secures the results hereinafter described. This construction is shown in enlarged form in Fig. 2. Centrally located upon either side of the frame are perpendicular guideways D′ D′. These are rigidly attached at top and bottom to the upper and lower cross-pieces of the skeleton frame hereinbefore described. The plunger B is extended below at b^2 and pivotally engages a lever B^3. This is fulcrumed at b^3 to any convenient portion of the skeleton referred to. Its outer end at B^4 carries an ordinary treadle, adapted to receive the foot of the operator. One of these levers may be joined to either side, or the construction shown in Fig. 3, if preferred, may be adopted, in which an additional lever B^5 is fulcrumed at b^5 and is pivotally connected to the plunger at *b* and has a corresponding treadle at B^6. It is obvious that the motion of the treadles at the extremities of the two levers B^3 and B^5 upon the same upward and downward motion of the plunger B would be reversed. In such case the plunger does not carry upon its upper end the saddle hereinbefore referred to, the saddle being fixed to a portion of the frame in any convenient manner.

In the construction shown in Figs. 1, 2, 3, 4, and 5 there is a transverse shaft E passing through the slot B^2 in the block B′, and also through the perpendicular slot in the guides D′, D′, upon either side adjacent thereto. This shaft E in the form shown in the drawings now referred to does not turn in journals

as such, but simply passes through slots in the block and guides, respectively, as described. It carries upon its outer end a sprocket-wheel E′, adapted to receive the chain, of the usual construction, and from which motion is transmitted to the axle or wheels of the cycle in the usual and ordinary manner.

The operation of this device in order to compel the rotation of the shaft E is as follows: Assuming that the shaft E is in the position shown in Fig. 1, with the rider upon the seat of the cycle tending to depress the plunger B with the block B′, and through the links the blocks D D upon the forward side of the block B′, it is evident that by the engagement of the blocks D D with the friction-rollers described and the tendency of the toggle-links *d d* to assume at the connecting ends with the block B′ a horizontal position, due, on one hand, to their weight, and, on the other, to the springs *w w*, the distance between the blocks D and B′ is thereby increased, and that increased distance necessarily brings one of the friction-surfaces into frictional contact with the shaft E, as the shaft E is held at its extremities and upon its opposite side by the slots in the framework, which thus tends to compress the shaft between the interior face of the slot D^2 and the guides described. The descent of the rider, forcing the plunger and the block B′ downward, would compel the shaft E to rotate upon the inner face of the slot in the block B′, and correspondingly upon the inner faces of the guides D′ D′. Upon reaching the lower portion of the block B′, and the weight of the rider being brought upon the lever B^3, the tendency is to force the plunger B upward, and in forcing it upward a contrary action takes place. This action tends to relieve the strain upon the forward side through the toggle-links *d d* and to correspondingly raise the toggle-links upon the rearward side to a horizontal position, thereby creating a compressive strain against the shaft from the rear side, and also to bring the outer ends and face of the shaft against the opposite guides, and as the plunger B ascends it compels the shaft to rotate in an exactly similar manner as it did in descending between the inner face of the slot B^2 and the guides hereinbefore described. It is obvious that the rotation would be in the same direction as that when the plunger descended with the compression in the opposite direction, and that, therefore, the continued reciprocation of the plunger by means of the weight of the rider transmitted through the saddle, upon the one hand, and his weight transmitted through the lever B^3, upon the other, alternately, would produce a continued rotation upon the shaft E, carrying a sprocket-wheel E′ in the same direction, and, as this motion is transmitted through the driving-wheel of the cycle, the consequence would be a propulsion of the cycle. In order to prevent the shaft E from assuming other than a horizontal or transverse position with reference to the block B′ and the guides D′ D′, collars are inserted at the ends, (marked E^2,) which, as they encircle the shaft, move up and down with it in slots *e e* in the guides. It will be observed that this is a novel means of transmitting reciprocating into a rotary motion by means of a shaft which not only rotates in one direction, but reciprocates during that rotation. As reciprocations of the shaft are perpendicular to the line of the transmission of power through the sprocket-chain, and as they are short, they do not interfere with the proper operation of the chain. However, in case it should be deemed that they interfere I have shown in Figs. 10 and 11 a means whereby such reciprocations can be in the line of the arc of a circle on which the axis of the wheel is a center. In these figures the block B′ has a curvilinear transverse slot B^6 in it, and the guides have a corresponding curvilinear slot G, with this single exception: In Fig. 10 I have shown in the guide a means of freeing the motion at the end of each stroke, which can be applied in all the other devices without further change. This consists of an enlargement at the upper and lower ends of the slot in the guides at *g g′*.

In order to avoid the rectilinear motion of the shaft I have shown modifications of the device in Figs. 7 and 9, and a further modification in Figs. 6 and 8. In Figs. 6 and 8 the plunger B has no side motion, but moves in guides H H. The shaft E which traverses the plunger is carried at either end by swinging arms J. The upper ends of these swinging arms J carry an ordinary ball-bearing K K and are controlled upon the opposite side by links *k k*. The outer ends of these links carry friction-wheels *k′ k′*. The block B′ of the plunger B carries immovably fixed to it upon either side guides M M. Upon the inner faces of the guides M M are rabbeted ledges *m m*, upon which the friction-wheels *k′ k′* rotate. The ascent of the plunger B, carrying the block B′ and the guides M M, tends to bring the front arms *k k* to a horizontal position. This forces the swinging arm J, carrying the shaft E, over against the face of the block B′, and thus creates a frictional contact, and the continued ascent of the block B′ causes the shaft to rotate. The elevation of the plunger B′, carrying its accessories, relieves the pressure from the side already described, and upon its descent, through a similar action, creates a pressure upon the shaft upon the other side, and the frictional contact resulting in a continued rotation of the shaft in the same direction.

In Figs. 7 and 9 the shaft is shown as journaled in a rigid cross-bar N N, connecting the bars of the skeleton frame. As shown in Figs. 1 and 5, a similar plunger B, having a block B′, with a transverse slot B^2, is connected by links to blocks D D^4, engaging grooved rollers, as therein described. The shaft, however, being held rigidly, the opera-

tion is to alternately throw the frictional contact-surfaces toward the shaft on the one side in its descent and produce a frictional contact, and to relieve it upon that side and throw it into frictional contact upon the other side in rising, exactly the same as that described in Figs. 1, 4, and 5, with the exception that the side thrusts thus created are taken up by the journals and the bars N carrying them, the only difference, therefore, being, so far as the mode of operation is concerned, that the journal rotates in fixed bearings and has frictional contacts upon each side alternately and not upon both sides, as in Figs. 1, 4, and 5.

In Fig. 12 I have shown a modification in which the positions of the links are reversed, while the friction-rollers are located at their free extremities. In this figure, H′ is the frame; B^6, the slotted plunger carrying a seat and operated by a handle, as shown in Fig. 1. Pivotally connected at y y to the frame are swinging links y' y', carrying friction-rollers y^2 y^2, which impinge against the side faces above and below the slotted portion of the plunger, in which is located the axle of the sprocket-wheel, as already described. The action of the links y' y' is secured by means of springs S^4 S^4 S^5 S^5, united centrally by turnbuckles S^6 S^6, by which they can be drawn toward each other and thus the tension increased. As the springs act on reverse levers at S^7 S^7 of the upper and lower links, they operate at all times to keep the friction-wheels in contact with the plunger, and thus insure the proper action of the device.

It is obvious that the details of this apparatus may be very considerably modified and that it may be applied in very many places other than in cycles.

I do not desire to limit myself to the exact form shown, but I desire to cover, broadly, the principle of transmitting rectilinear motion into rotary motion by means of the principle of the toggle-joint thrust, producing frictional contact between a plane surface and a rotating shaft alternately, due to the reciprocations of the frictional planes.

It is obvious that the mode of operation need not be further described, but will be understood from the foregoing description.

What I claim is—

1. In a mechanism for transmitting rectilinear motion to rotary motion, the combination with a frame, of a plunger having two opposite frictional contact surfaces adapted to reciprocate in said frame, a shaft adapted to be rotated by alternate contact with said opposite frictional contact surfaces, links engaging with said plunger and means engaging said links whereby said opposite frictional contact surfaces are alternately forced to engage with said shaft, and means to reciprocate said plunger, substantially as described.

2. In a mechanism for transmitting rectilinear motion to rotary motion, the combination of a reciprocating plunger having two opposite frictional contact surfaces, a shaft adapted to be rotated by alternate contact with said opposite frictional contact surfaces, toggle links adapted to alternately cause said friction surfaces to contact with said shaft, and means to reciprocate said plunger, substantially as and for the purpose described.

In testimony whereof I sign this specification in the presence of two witnesses.

CHARLES H. BROWN.

Witnesses:

R. A. PARKER,

FRANCES CLOUGH.