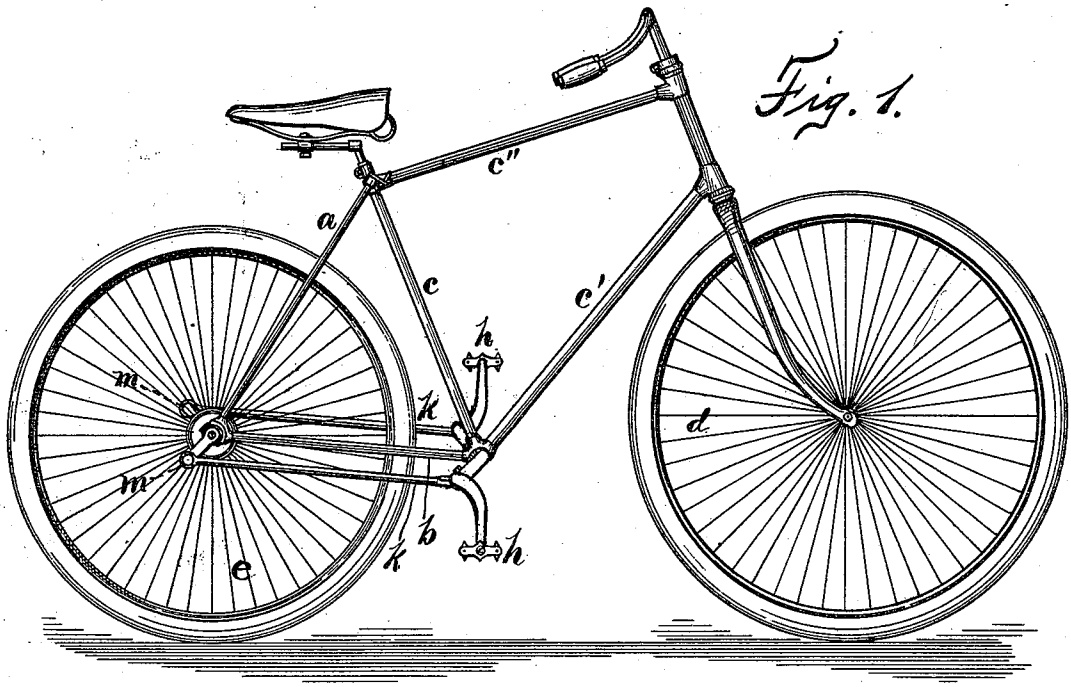
(No Model.) 5 Sheets—Sheet 1.

C. E. LIPE & A. T. BROWN.

VELOCIPEDE.

No. 510,606. Patented Dec. 12, 1893.

Fig. 1.



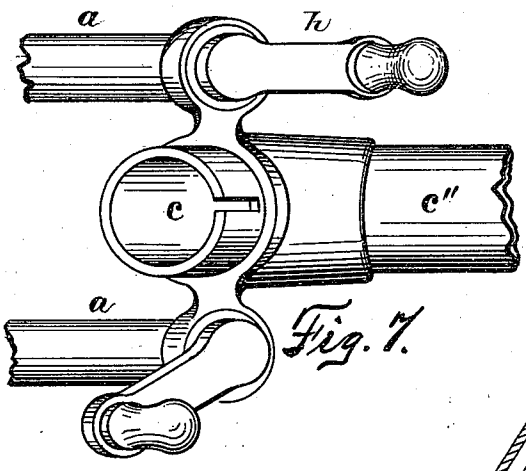


Fig. 7.

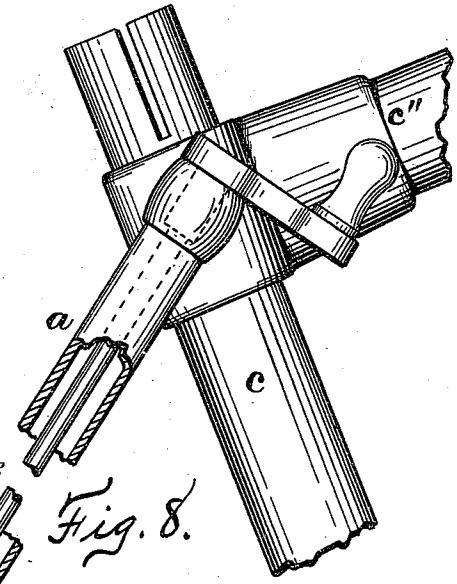
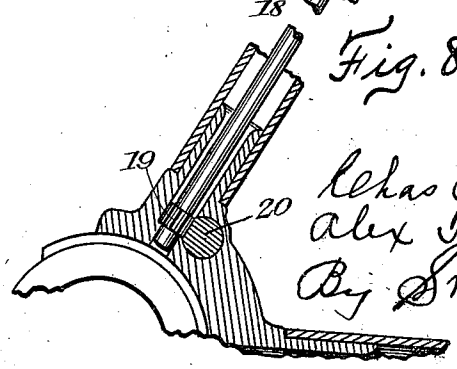


Fig. 8.



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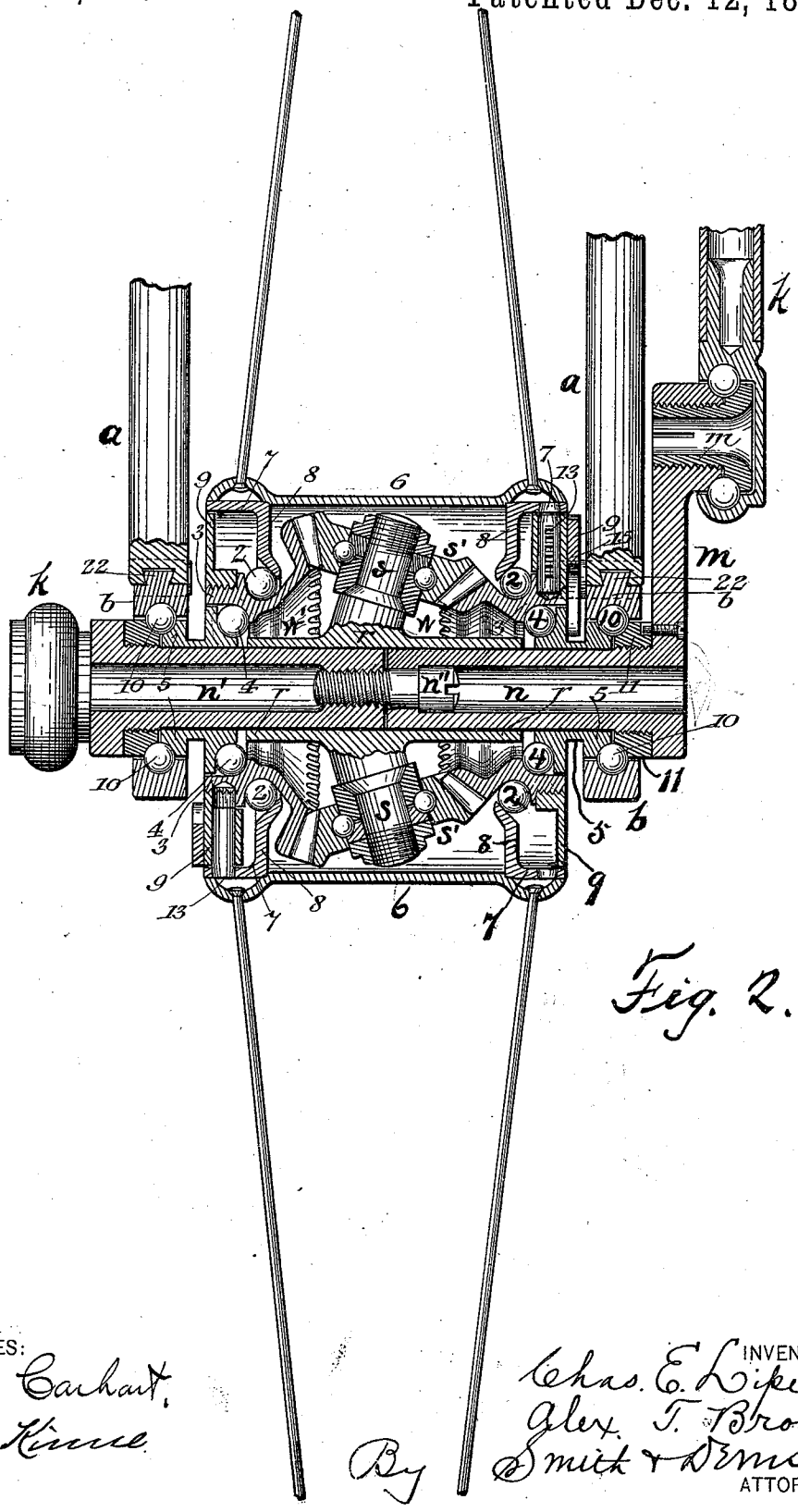

Fig. 2.

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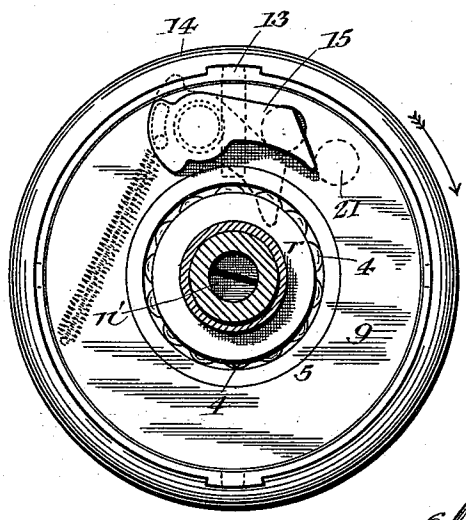

Fig. 4.

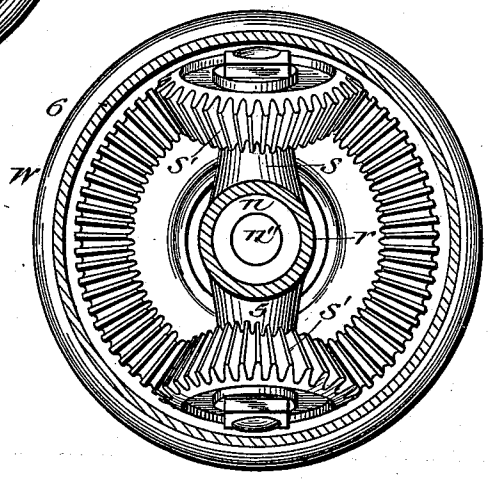

Fig. 3.

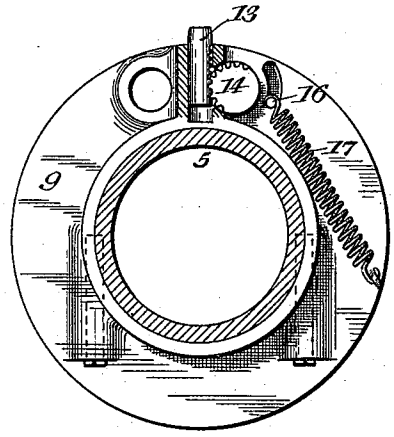

Fig. 5

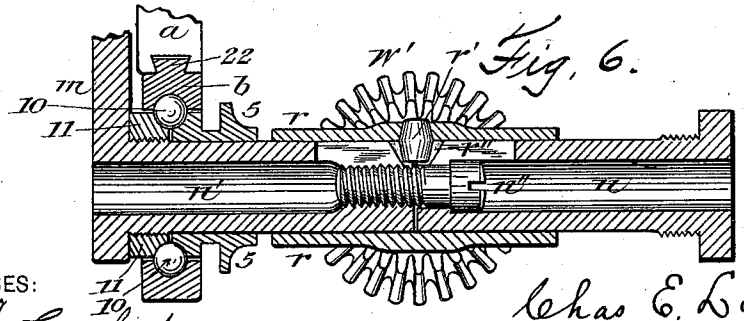

Fig. 6.

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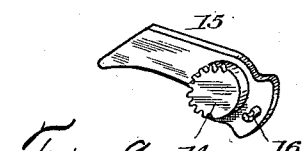

Fig. 9.

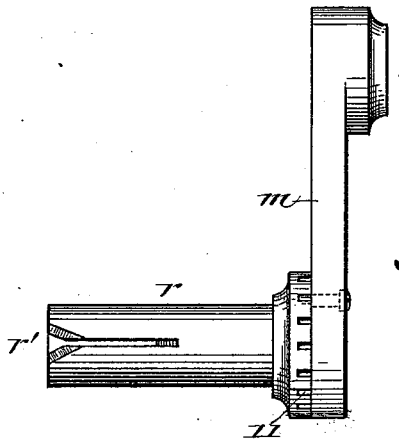

Fig. 10.

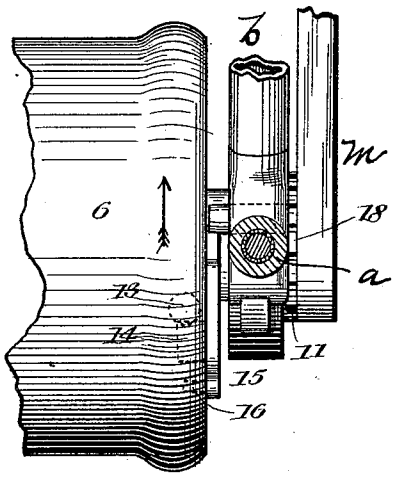

Fig. 11.

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C. E. LIPE & A. T. BROWN.

VELOCIPEDE.

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Fig. 12

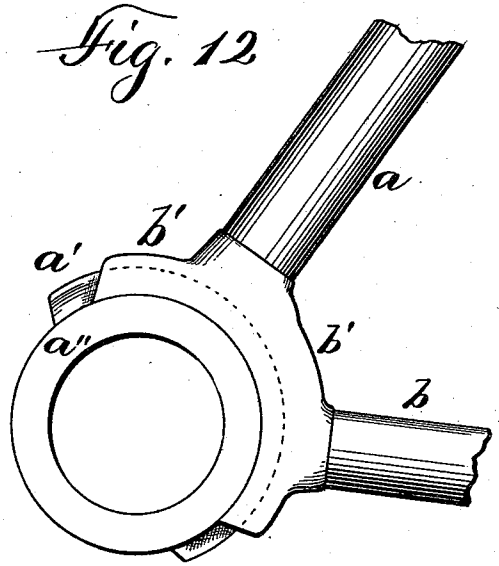

Fig. 13.

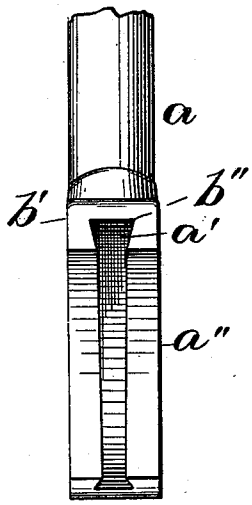

Fig. 14.

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UNITED STATES PATENT OFFICE.

CHARLES E. LIPE AND ALEXANDER T. BROWN, OF SYRACUSE, NEW YORK.

VELOCIPEDE.

SPECIFICATION forming part of Letters Patent No. 510,606, dated December 12, 1893.

Application filed September 21, 1892. Serial No. 446,476. (No model.)

To all whom it may concern:

Be it known that we, CHARLES E. LIPE and ALEXANDER T. BROWN, of Syracuse, in the county of Onondaga, in the State of New York, have invented new and useful Improvements in Velocipedes, of which the following, taken in connection with the accompanying drawings, is a full, clear, and exact description.

Our invention relates to velocipedes and particularly to anti-friction ball-bearings and to mechanisms for changing, increasing or reducing the speed of the vehicle.

Our object is to provide a velocipede with improved means for changing the speed, comprising two bevel-gears of unequal size in combination with an intermediate gear, said bevel-gears not being at a right-angle to said intermediate gear, and providing ball-bearings for all of said gears, and also providing means whereby either of said bevel-gears can at will, be locked, so that either one can be operated to make the speed, or both can be locked to create a single speed, and thereafter the smaller bevel gear can be unlocked to increase the speed, and thereafter the other bevel gear can be unlocked, and the smaller one either locked or left unlocked, to further increase the speed, whereby the velocipede is provided with mechanisms to give it three speeds.

Our invention consists in the several novel features of construction and operation hereinafter described and which are specifically set forth in the claims hereunto annexed.

It is constructed as follows, reference being had to the accompanying drawings, in which—

Figure 1 is an elevation of a velocipede, complete. Fig. 2 is a vertical sectional elevation of the hub of the driving wheel, part of the fork arms, spokes and crank arms. Fig. 3 is an enlarged sectional elevation of the hub, taken transversely, to its axis of rotation and looking at the larger bevel gear, and the intermediate gears, from the right in Fig. 2. Fig. 4 is a sectional elevation of the outer face of one of the heads in the end of the hub, showing the cam-faced pawl and the locking bolt operated by it, partly in elevation and partly in dotted lines. Fig. 5 is a like view of the inner face of said head, showing in elevation the geared head upon the pawl, the locking bolt provided with a rack with which said gear engages to actuate it, and the spring connected to said pawl, and operating to throw said bolt outward. Fig. 6 is a vertical longitudinally sectional elevation of the sectional arbor of the wheel, and the means for connecting both of the sections to the sleeve which carries the gears. Fig. 7 is a top plan of the connection by which the reach bars are connected to the front bar, and the main upright of the frame. Fig. 8 is a sectional detail of the mechanism in the bars of the rear fork of the frame, partly in elevation, for actuating the bolt for locking one of the bevel gears, independent of the like mechanism to lock the other bevel gear. Fig. 9 is a plan perspective of the cam-faced pawl. Fig. 10 is an elevation of the outer section of the wheel arbor, the crank arm integral therewith, or secured thereto, and the take-up nut upon the arbor section. Fig. 11 is a top plan view of part of the wheel hub (omitting the spokes) showing in section the fork rod and the rod within it for changing the speed by locking one of the bevel gears, and part of one reach rod, arbor section and adjusting nut thereon, and rear wheel crank arm in plan view. Fig. 12, is an enlarged plan of the connection of a fork bar, showing the dovetailing cam and its seat, partly in full and partly in dotted lines. Fig. 13, is an elevation of the lower end of a fork-bar looking into the dovetailing groove therein. Fig. 14, is an elevation of the reach-bar head and the ring having the cam-faced lug thereon.

In Fig. 1 we show, for illustration, mainly, a velocipede comprising a main frame, in which —*a*—*a* is one of the bars of the fork for the rear wheel; —*b*— is one of the reach bars; —*c*— is the upright between the front ends of the reach bars, and the upper end of the rear fork —*c'*— is its front bar of the frame, and —*c''*— the top bar; a front wheel —*d*— of any desired construction, a rear wheel —*e*— in which the felly tire and spokes are of any desired form of construction. Also the crank pedals —*h*— are mounted upon a transverse shaft, journaled in the frame and —*k*—*k* are the connecting rods between the pedals and the crank arms —*m*— connected to and driving the rear wheel. Sprocket

gears and chains of the usual construction may be used, driven by the pedals, in place of the connecting ribs and crank arms shown.

The arbor or drive shaft of the drive wheel is constructed in two sections —*n*—*n'*— each secured to or integral with one of the crank arms —*m*— and these sections are adapted to be secured together after their insertion in any ordinary manner, as by the internal screw —*n''*—. A sleeve —*r*— is mounted upon the drive shaft detachably, by means of an ordinary feather or spline within the sleeve, and a groove to receive the same, cut in one or both of the axle sections, so that said sleeve revolves with said shaft; or as shown in Fig. 6, a pin —*r'*— is secured in said sleeve, and a notch and slot —*r''*— is cut in the inner end of each axle section in which the pin fits when the sections are inserted into the sleeve, said notch and slot permitting the wedging action of said pin to expand the inner split ends of the axle sections and cause them to fit tighter in the sleeve. Upon said sleeve the studs —*s*— are erected opposite to each other, and standing at such an angle of inclination from a perpendicular to the sleeve as may be necessary to properly carry the beveled driving gears —*s'*— with reference to and in mesh with the intermediate bevel gears —*w*—*w'*. The gears —*s*— are mounted upon said studs by ball bearings of any ordinary construction, and rotate freely thereon.

The gears —*w*—*w'*— are of unequal size and are loose and free to rotate upon the sleeve —*r*— as an arbor therefor and both of the gears —*s*— mesh with both of these gears. Each of the gears —*w*—*w'*— has a peripheral concavity adapted to receive the balls —2—, a flange —3— upon its outer end within which is a concave seat for the balls —4— and it constitutes the other member of the ball bearing within the outer end of each of these gears.

Within the casing —6— of the hub, to which the inner ends of the spokes are connected, a ring —7— is secured provided with an inward flange —8—, the inner edge of which is adapted to bear upon the balls —2— and form one member of the ball bearing upon the exterior of each of these gears. The heads —9— of the hub consist of plates of metal adapted to be screwed onto the outer ends of the flanges —3— of the gears —*w*—*w'*— and close the ends of the casing within the rings —7—. The outer ends of the sleeve —5— are concaved as shown, to form part of the seat for the balls —10—; the nuts —11— are concaved in like manner and screwed onto the drive shaft sections forming another part of the seat for these balls; and the rear ends of the frame bars —*b*—, concaved interiorly constitute the remainder of the bearing for these balls, in the lower ends of the arms —*a*— of the rear fork. These nuts take up all of the wear upon the bearings of the balls —10—, —4— and —2— and also adjust the gears —*w*—*w'*— in proper engagement with the gears —*s'*— and the set screws —12— engaging with said nuts lock them at any desired point, said nuts being provided with cavities in their outer peripheries to adapt them to be adjusted by a pin as a wrench, as shown in Fig. 10.

In the rings —7— a series of holes are drilled, and in a suitable pocket, therefor, upon the inner face of each of the heads 9, a sliding bolt —13— is placed, provided on one side with a rack, with which the pinion —14— engages, said pinion projecting through the head from and forming the pivot for the pawl —15—, provided with a cam or inclined face on its free end, and having on its opposite end a pin —16— passing through a slot-way in the head to which pin the spring —17— is connected, the tension of said spring being normally to hold said bolt extended, or projecting into one of the holes in the ring —7—, and this bolt on the right of Fig. 2, when projected, will lock or connect the gear —*w*— to the ring —7— and to the casing, but is here shown not so connected, so that said gear is, therefore, disconnected from and its rotation will not rotate said casing. On the left, in Fig. 2, said bolt is shown in engagement with said ring and casing and connecting the gear —*w'*— thereto positively, so that the rotation of this gear, through that of the drive shaft, sleeve and drive gears will rotate the wheel at a speed proportional to the difference in size of the gears —*s*— and —*w'*—, and as here shown, at what we term the medium speed. When the gear —*w'*— is disconnected from the casing and the gear —*w*— is connected thereto, then the latter being the smaller, the wheel is rotated at high speed. When both of the gears —*w*—*w'*— are connected at the same time, then the wheel is rotated at single speed, viz: that of the rotation of the drive shaft.

The fork rods —*a*— are tubular and through each a shifter rod —18— is inserted, provided at its upper end with a suitable handle, by which it may be rotated, and at its lower end with a pinion —19— engaging with the rack upon one side of the horizontal bolt —20— seated in the frame, which is adapted to slide in its seat, and to have its point projected inwardly to the heads and to be brought into contact with the cam point of the pawl —15— wedging it inwardly, as shown in Fig. 4, and then passing into the hole —21— in the head and locking that head, and the intermediate gear —*w*— or —*w'*— against any rotation, in which case that gear will be simply an idler upon which the gears —*s*— will rotate. When said bolt is withdrawn the spring will operate the pawl to throw the bolt out into re-engagement with the casing. When one of said bolts is thrown out to lock the head, as on the right in Fig. 2, then the gear —*w*— will be locked to the frame and the wheel will be driven by the gear —*w'*—, and when the gear —*w'*— is thus locked, as on the left in Fig.

2, by throwing the bolt out, and the gear —*w*— is unlocked, then the latter will drive the wheel, and when both gears —*w*—*w'*— are thus locked then the operation of the pedals will not rotate the wheel, as the drive shaft is not connected to the casing.

The reach bars —*b*— are shown in Fig. 12 and also the rear fork bars —*a*—, as secured in a curved head —*b'*— interiorly grooved, as at —*b''*— to receive the cam-faced lug —*a'*— upon the periphery of the ring —*a''*— said ring being interiorly grooved to create a seat for the balls —10— and constituting a member of the ball bearing for the drive shaft —*n*—*n'*— and said lug and groove constituting the connection between the reach and rear fork-bars and said ring.

The connecting rods —*k*— are connected to the cranks —*m*— by means of a ball bearing, substantially as shown in Fig. 2.

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

1. The combination with the hub, of a drive shaft consisting of sections, the inner ends of which are split, a sleeve encircling said sections and means to secure them together and to spread out the ends of said shaft sections within the sleeve.

2. The combination with the hub casing and its heads loose therein, of a sliding bolt in each head, a geared pawl in engagement with said bolt, and a spring connected to said pawl to throw said bolt outward to connect said head and hub casing together and means to actuate said bolt inwardly.

3. The combination with the hub casing, the heads loose therein, the sliding bolts in each head, the geared pawl in engagement with said bolt, and having a cam face upon one end, of a horizontal sliding bolt in each bar of the rear fork of the frame, a vertical shaft in each fork bar, a pinion upon said shaft, engaging with said bolt to reciprocate it in its seat.

4. The combination with the hub casing, the heads loose therein, and a bolt in each head adapted to detachably connect it to the casing, of a pawl having a geared pivot engaging with said bolt, and means to disconnect them and to lock either head against rotation.

5. In a vehicle, the combination with the hub, and its heads loose therein, of a bolt in the frame, a shaft in the fork rod, having a pinion engaging with the rack on said bolt to throw it into engagement with said head to lock it, or to retract it to unlock it.

6. In a vehicle, the combination with the driving sleeve, of a drive shaft consisting of sections, secured together within the sleeve, and expanded within said sleeve, whereby said sleeve and shaft are rotated together.

7. The combination with the sectional and expansible drive shaft, the sleeve thereon, the arbors upon the sleeve, the driving gears carried by the arbors, the intermediate gears and the bearings therefor upon the shaft, the fork bars and bearings therefor upon said shaft, of the nuts upon said shaft sections, bearing against a part of each bearing, whereby said bearings are adjusted.

8. In a velocipede frame, a connection between two members thereof, consisting of a dovetailed cam-faced lug on one member, and a groove of like form in the other member.

9. The combination with the pedals and their crank shaft, the parallel rods connecting them to the drive shaft, and the drive shaft, of multiplying gears within the hub of the driving wheel, of unequal sizes, and adapted to drive the wheel at varying speeds by the rotation of the drive shaft.

10. The combination with the pedals and their crank shaft, the pedal rods connecting them to the drive shaft, and the drive shaft, of multiplying gears within the hub of the driving wheel, of varying size, and adapted to drive the wheel at varying and changeable speed.

In witness whereof we have hereunto set our hands.

CHARLES E. LIPE.
ALEXANDER T. BROWN.

Witnesses:
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HOWARD P. DENISON.