(No Model.)

A. F. PRICE.

BICYCLE.

No. 540,686. Patented June 11, 1895.

Fig. 1.

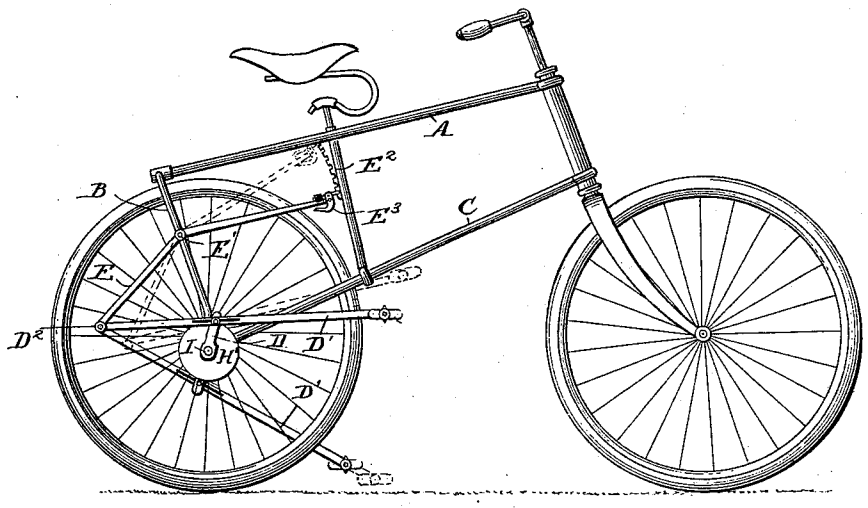


Fig. 2.

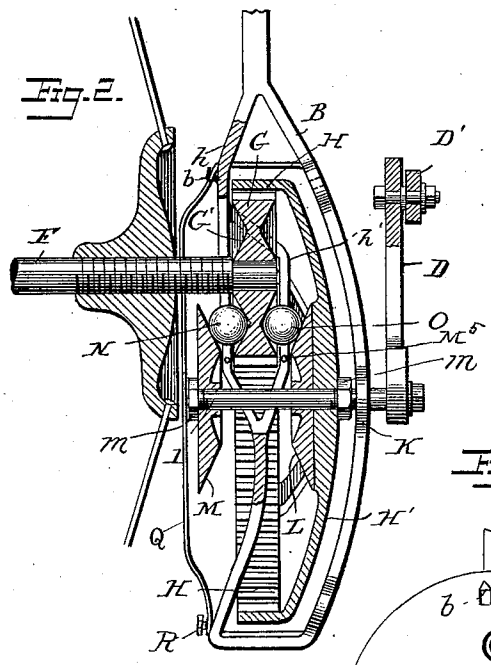


Fig. 5.

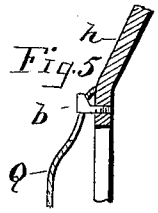
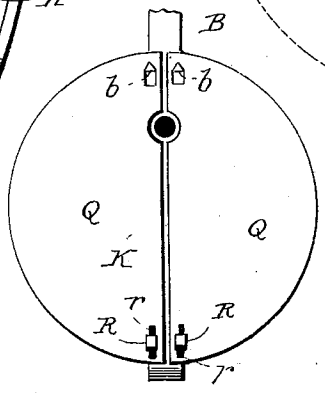


Fig. 3.

Fig. 4.



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UNITED STATES PATENT OFFICE.

ABEL F. PRICE, OF WASHINGTON, DISTRICT OF COLUMBIA.

BICYCLE.

SPECIFICATION forming part of Letters Patent No. 540,686, dated June 11, 1895.

Application filed June 28, 1894. Serial No. 516,011. (No model.)

To all whom it may concern:

Be it known that I, ABEL F. PRICE, of Washington, District of Columbia, have invented certain new and useful Improvements in Bicycles; and I do hereby declare the following to be a full, clear, and exact description of the same, reference being had to the accompanying drawings, forming a part of this specification, and to the letters of reference marked thereon.

This invention has for its object to provide an improved driving gear for bicycles, particularly designed for application to bicycles of the safety type, although as will be apparent from the following specification, features of the invention are applicable to any vehicle of this class adapted to be driven by foot power.

The invention consists, primarily, in an improved gearing or speed increasing gear for causing the driving ground wheel to rotate at a greater speed than the crank to which the power is applied.

The invention further consists in an improved power lever construction provided with a shifting fulcrum carried by a lever extending up within reach of the rider, whereby the leverage may be regulated at will to suit the existing conditions of the road or to vary the speed.

The invention further consists in certain novel details of construction and combinations and arrangements of parts, all as will be now described, and pointed out in the appended claims.

Referring to the accompanying drawings, Figure 1 is a side elevation of a bicycle embodying my present invention. Fig. 2 is a vertical section taken transversely through the driving-gear, with portions in elevation. Fig. 3 is a section at right angles to Fig. 2, with the body portion of the large internally-toothed gear indicated in dotted lines. Fig. 4 is a detail of the dust-guard. Fig. 5 is a detail of the fastening for the upper portion of the dust-guard.

Like letters of reference in the several figures indicate the same parts.

So far as my present invention is concerned, the particular character of the framing and wheels is quite immaterial and may be of any desired pattern, except around the driving gearing where it must be modified somewhat as will hereinafter appear, but in the preferred arrangement the frame is provided with a long top bar A, connected at the front end to the head of the machine at an intermediate point connected to the seat standard, and at the rear end connected by an upright B with a bottom bar C extending from the lower portion of the head diagonally downward to a point in proximity to the hub of each wheel.

By reference to Fig. 1, it will be seen that the driving cranks D project at each side in proximity to the center of the wheel and driving levers D′ resting thereon, being fulcrumed at D^2 and project forward into position for receiving the rider's foot. If desired, they may be downwardly inclined at the forward end in order to lower the center of gravity of the rider as much as possible and, in order that at the will of the rider their leverage may be increased or diminished, their fulcrums D^2 are carried on the rearwardly projecting ends of levers E pivotally connected to the upright B at E′ and projecting thence forward to a point beneath the rider's seat, where their forward ends are adapted to be locked in any desired position of adjustment by means of the rack or toothed bar E^2 and locking bolt or catch E^3, all as shown clearly in Fig. 1. With this arrangement, the rider can by simply reaching down and grasping the forward ends of the shifting levers E, move the fulcrum forward or back, as desired, and proportionately increase or diminish the power of the driving levers.

Referring now more particularly to Figs. 2 and 3, it will be seen that on each end of the axle F there is rigidly secured a relatively small externally toothed gear wheel G having conical recessed bearings G′ extending entirely around it, on each side between the axle and toothed periphery. Suspended upon and meshing with this gear wheel G is a relatively large internally toothed wheel H which is through the medium of its concave disk-like body H′ rigidly but adjustably mounted on a crank shaft I, which latter projects through a bearing K in the side framing B where its crank D is adapted to receive the lever D′ as before mentioned. The portion B of the frame extends down beneath the large inter-

nally toothed wheel H, then is bent back upon itself and brought up within said wheel to the point in proximity to the crank axle I, where it is subdivided or formed with four loops or branches, two of which *h* pass up in rear of the small gear wheel G and are united to the frame B above the gear wheels, and the other two *h'* of which, pass up in front of the gear wheel G to a point approximately opposite the axle, where they spread apart and passing around the edge of said wheel G extend out to the rear of the large gear wheel and are brought together and united to the other arms or loops *h*. The crank axle I passes between the arms of each pair *h h'* without touching the same however, and the point of bifurcation is preferably a short distance below the said crank axle in order to permit of the employment of larger or smaller gear wheels to increase or diminish the ratio of speed between the large and small gear wheel.

Upon the crank axle and within the internally toothed gear wheel, there is arranged a relatively large conical bearing L and upon the inner end of said axle is a similar but oppositely arranged conical bearing M, said two bearings being adapted to engage and co-operate with two relatively large balls N, O, traveling in the bearings G' of the wheel G. These balls N and O are held against movement toward the front or rear by the arms *h h* of the frame which are arranged substantially parallel and have their inner surfaces flat and hardened to form bearings for the balls, adjustable by means of set bolts M^5 as shown.

The conical bearings L and M are adjustable on the crank shaft by nuts M or any other suitable means, it being desirable to adjust them because of the necessity of taking up wear in the bearings and preventing undue rattling of the parts.

In order to prevent the possible entry of any dust from the outside, I provide a dust-guard Q usually divided vertically into two semicircular sections which surround the large gear wheel and are held in place at the top by projections *b* fitting into corresponding recesses, thus permitting the said guards to be put in place and drawn down to a firm bearing. At the bottom, slots R are formed in the guards and bolts *r* passing through these slots and into an enlargement of the portion of the frame B, serve to hold the guards firmly in place and at the same time, permit them to be drawn down to a firm bearing as before stated, thus making it practicable to overcome the difficulties which have heretofore arisen and due to the defective means employed for securing the guards in place.

With the arrangement of gearing described, it will be seen that very little friction can occur under any circumstances. The weight of the frame and rider is suspended from the gear wheels. Thus there is little or no tendency to work loose at this point and any movement of the parts that might separate the gear wheels is absolutely prevented by the balls and inclined surfaces against which they are placed.

It will be readily seen that the conical bearings on each side of the balls are so constructed that there is no obstruction made to the descent of the large internally toothed gear on to the smaller gear wheel, nor is any of the weight of the rider or frame borne by this structure. It absolutely prevents any other motion of the gear wheels except that of their intended rotation.

When it is desired to have what is known as a higher gearing for the machine, it may be readily accomplished by substituting a larger outer or a smaller inner gear wheel and substituting other conical bearings, such change being easily made by mechanics familiar with this art, and what is of great importance, the machines may be all manufactured of a standard size and the gearing for any speed put therein without alteration of the surrounding parts.

By the lever arrangement, the rider may easily and without dismounting, at once increase his power for climbing hills or, on the other hand, in running on a level or good road, he may reduce the leverage and consequent distance necessary for his foot to travel.

The whole arrangement, it will be noted, is simple, easily adjusted and presents a neat appearance, there being no heavy or unwieldy parts.

Having thus described my invention, what I claim as new is—

1. In a bicycle, the combination with the frame, the ground driving wheel, the axle for said wheel and the relatively small gear wheel mounted thereon, of the large internally toothed gear wheel carried by the frame and suspended on the small gear wheel, the crank axle connected to said large gear wheel the oppositely arranged bearing disks rigidly mounted on said axle and bearings cooperating therewith carried by the ground wheel axle for holding the internally toothed gear in position; substantially as described.

2. In a bicycle, the combination with the frame, the ground driving wheel, the axle for said wheel and the relatively small gear wheel carried by said axle, of the relatively large internally toothed gear wheel carried in the frame and suspended on the relatively small gear wheel, the crank axle rigidly connected with the large gear, the bearing disks rigidly mounted on said crank axle, bearings carried by the axle of the ground wheel, balls interposed between said disks and bearings on the frame for holding said balls against lateral displacement; substantially as described.

3. In a bicycle, the combination with the ground driving wheel, its axle, the relatively small gear wheel mounted on the axle and the relatively large internally toothed gear wheel suspended on and in mesh with said small wheel, crank axle rigidly connected with the

large gear wheel, the bearing disks rigidly mounted on said axle, bearings carried by the axle of the ground wheel and balls interposed between said disks and bearings, of the frame passing on both sides of the large gear and having bearings on the inner side of said gear with which the balls cooperate, and whereby the balls are held against lateral displacement.

4. In a bicycle, the combination with the ground driving wheel, its axle, the relatively small gear wheel carried by the axle and having the recessed bearings therein, the relatively large internally toothed gear wheel and crank axle rigidly connected therewith of the bearing disks rigidly mounted on the crank axle, balls interposed between the bearing disks and bearings on the small gear wheel and the frame bifurcated to pass on each side of said balls and having bearings with which the balls cooperate and are held against lateral displacement; substantially as described.

5. In a bicycle, the combination with the ground driving wheel, its axle, the relatively small gear wheel carried by the axle and having the recessed bearings extending entirely around on each side thereof, the relatively large internally toothed gear wheel suspended on the small gear wheel and the crank axle rigidly connected with said large gear wheel of the conical bearing disks mounted on the crank axle and adjustable toward each other, the balls interposed between said bearing disks and bearings on the small gear wheel, and the frame passing around the larger gear wheel and on the inner side of said larger gear wheel provided with bearings cooperating with the balls on each side of the small gear wheel, whereby said balls are held against lateral displacement; substantially as described.

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