

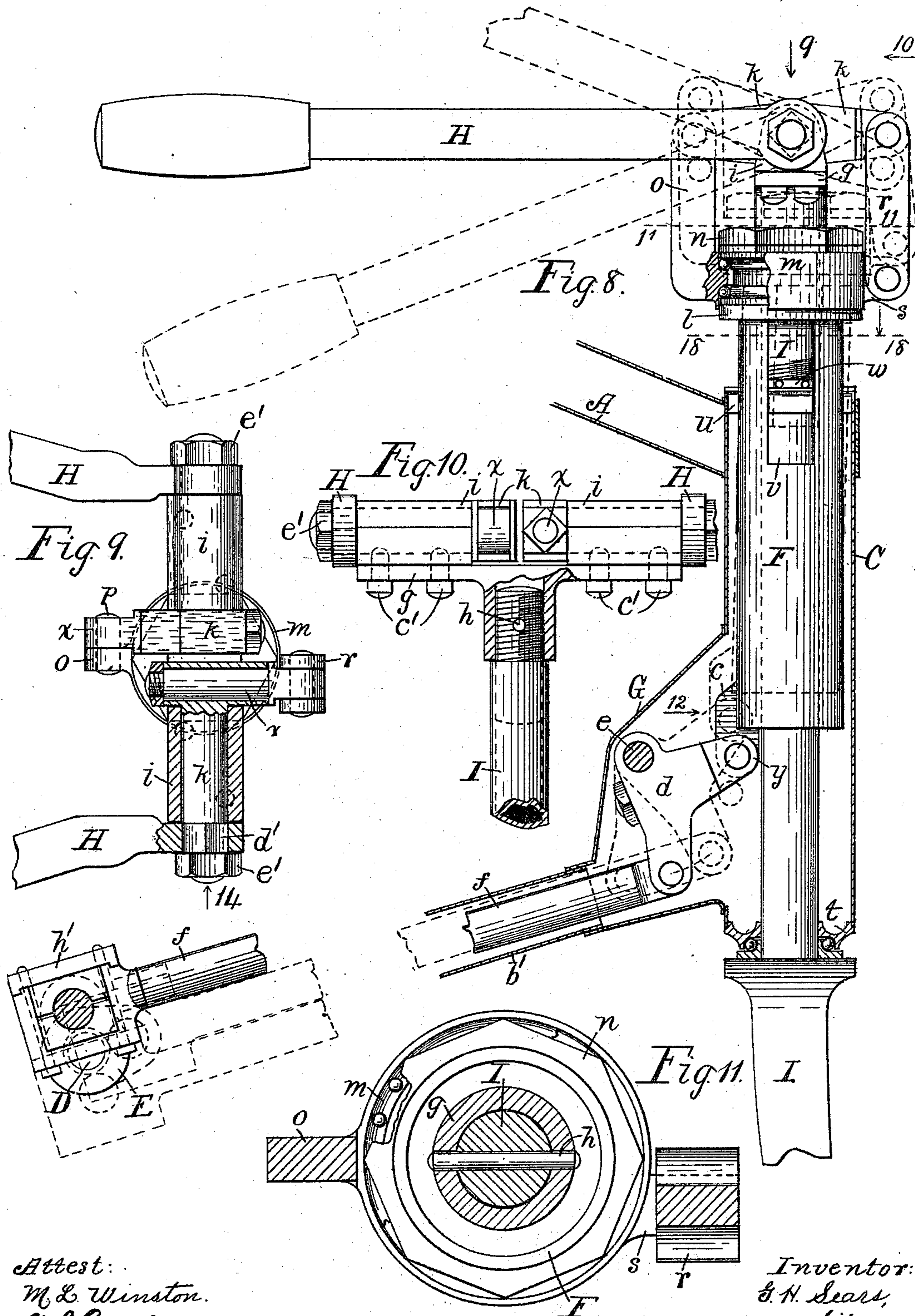
(No Model.)

3 Sheets—Sheet 2.

G. H. SEARS.
BICYCLE.

No. 570,271.

Patented Oct. 27, 1896.



Attest:
M. L. Winston.
M. J. Crossman

Inventor:
G. H. Sears,
By C. B. Whitmore,
Atty.

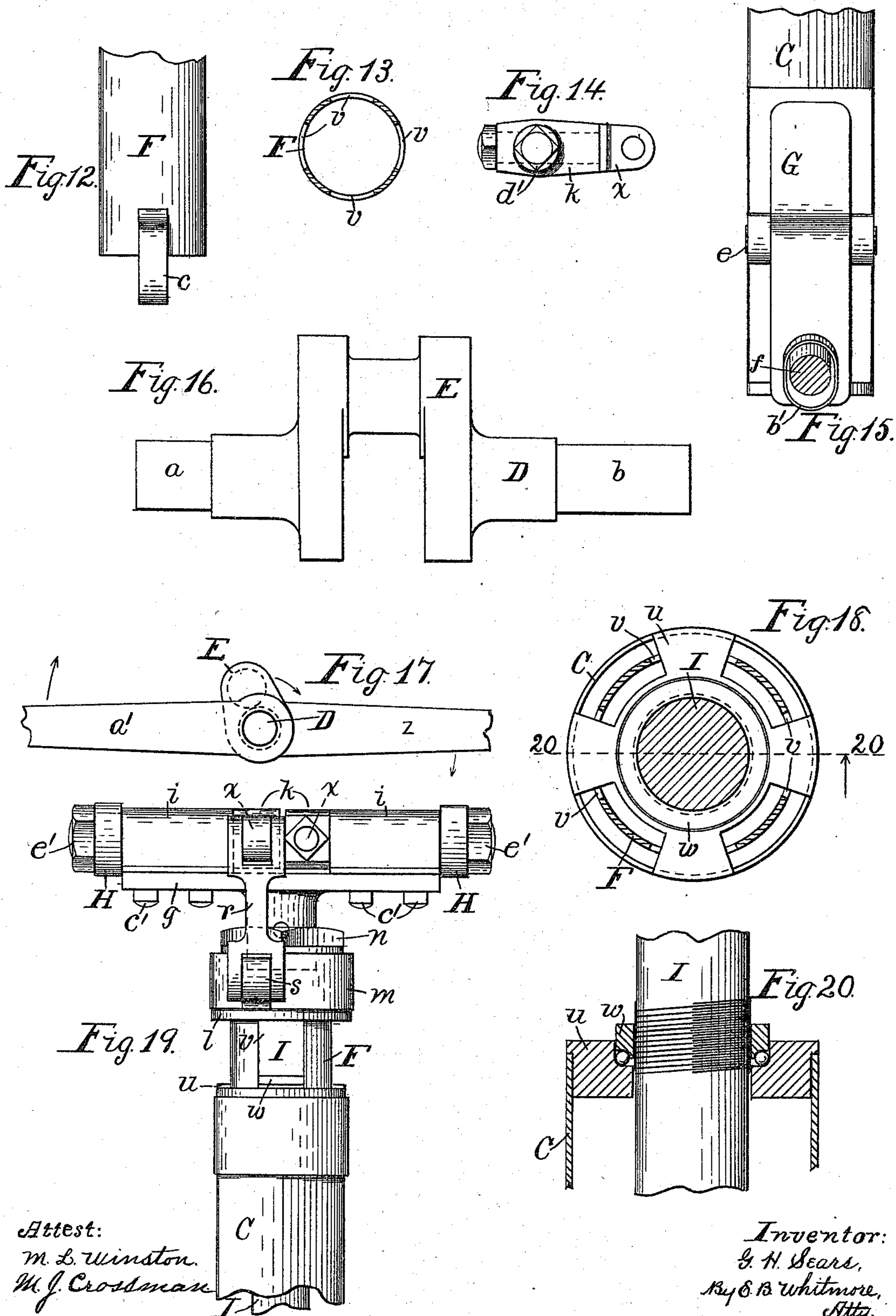
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UNITED STATES PATENT OFFICE.

GEORGE H. SEARS, OF ROCHESTER, NEW YORK, ASSIGNOR OF ONE-HALF
TO GEORGE HAHN, OF SAME PLACE.

BICYCLE.

SPECIFICATION forming part of Letters Patent No. 570,271, dated October 27, 1896.

Application filed January 18, 1896. Serial No. 576,007. (No model.)

To all whom it may concern:

Be it known that I, GEORGE H. SEARS, of Rochester, in the county of Monroe and State of New York, have invented a new and useful
5 Improvement in Bicycles, which improvement is fully set forth in the following specification and shown in the accompanying drawings.

My invention relates more particularly to speed or racing bicycles, and has for its object
10 the providing of an improved mechanism by means of which the hands, together with the feet, may be employed to propel the vehicle. This improved mechanism involves a triple-
15 crank-pedal axle, a pitman for turning the middle crank, and mechanism or gearing connecting the pitman with the handle-bars so the latter may be used as levers to aid in propelling the bicycle. A plunger is employed
20 within the head of the frame, which is connected with the pitman by means of a bell-crank. Provision is made for allowing for the parts between the handle-bars and the plunger a swivel motion around the latter, so the guiding of the bicycle is not interfered
25 with.

The invention is hereinafter more fully described, and particularly pointed out in the claims.

Referring to the drawings, Figure 1 is a side
30 elevation of the frame of the bicycle with parts sectioned and broken away. Fig. 2 shows the plunger and associated parts, parts being vertically sectioned and broken away. Fig. 3 shows the rear side of the bell-crank, as indicated by arrow 3 in Fig. 2. Fig. 4 is a top
35 view of the bell-crank, indicated by arrow 4 in Fig. 2. Fig. 5 shows a method of connecting the handle-bars with other parts. Fig. 6 is a view of a part of a handle-bar, indicated by arrow 6 in Fig. 5. Fig. 7 shows a toothed washer, seen as indicated by arrow 7 in Fig. 5. Fig. 8 is an axial section of the head of the frame, showing the plunger and other associated parts, parts being broken away and
45 other parts shown in two positions by full and dotted lines. Fig. 9 is a plan of parts above the head, seen as indicated by arrow 9 in Fig. 8, parts being horizontally sectioned. Fig. 10 is a front view of the cross-head and other
50 associated parts, seen as indicated by arrow 10 in Fig. 8, a part being vertically sectioned.

Fig. 11 is a horizontal section of parts taken on the dotted line 11 11 in Fig. 8, a part being broken away. Fig. 12 is a view of the lower part of the plunger, indicated by arrow
55 12 in Fig. 8. Fig. 13 is a cross-section of the plunger, taken on the dotted line 13 13 in Fig. 2. Fig. 14 is a view of a crank-arm, indicated by arrow 14 in Fig. 9. Fig. 15 shows the bell-crank chamber, viewed as indicated by arrow
60 15 in Fig. 1. Fig. 16 is an outline elevation of the triple-crank axle. Fig. 17 is an end view of the triple-crank axle with associated parts. Fig. 18 is a horizontal cross-section on the line 18 18 in Fig. 8. Fig. 19 is a front ele-
65 vation of the upper part of the head and parts above it, seen as indicated by arrow 10 in Fig. 8. Fig. 20 is an axial section of the upper part of the head and associated parts on the dotted line 20 20 in Fig. 18. Fig. 1 is
70 drawn to a scale one-fifth full size, Figs. 6, 7, 11, 16, 18, and 20 full size, and the remaining figures to a scale one-half full size.

Referring to the parts shown, A is the frame of the bicycle, B the driving-sprocket, and C
75 the head.

The pedal-axle D, Figs. 1, 16, and 17, is formed with a seat *a* for the left-hand pedal-crank *z* and a similar though longer seat *b*
80 for the sprocket, which also forms a part of the right pedal-crank *a'*. In addition to these this axle is formed with a central crank E of short stroke between the pedal-cranks. (See also Fig. 8.)

Within the head C is placed a loose cylin-
85 drical plunger F, Figs. 2 and 8, capable of having a reciprocal axial motion in the head. The lower end of the plunger, which is hollow, is formed with a thickened part or lug *c*, (see also Fig. 12,) connected with a bell-
90 crank *d*, the latter being connected with the axle-crank E by a pitman *f*, Figs. 1, 2, 8, and 15. The bell-crank is inclosed in a chamber or housing G, extending out from the rear side of the head, the pivot-pin *e*, upon which
95 the bell-crank turns, being held in the walls of said chamber; also, the pitman is wholly inclosed in an enlarged part *b'* of the frame, tapered and made oval in cross-section, as appears in Fig. 15, to provide for the vibrations
100 of the pitman. Now it will be understood that by giving the plunger an endwise recip-

recal motion the axle D will be turned in a manner to propel the bicycle.

The plunger or driver for the pitman and the crank E is moved reciprocally in longitudinal 5 directions by means of the handle-bars II. The fork I, which extends within and through the center of the plunger or driver F, is provided at its upper end with a cross-head *g*, Figs. 1, 2, 10, and 19, preferably secured to 10 the fork by being threaded thereon, as shown, a simple holder, as a straight or tapered pin *h*, Figs. 10 and 11, being passed through both parts to keep the head from turning. To this cross-head is secured by bolts *c'* two 15 horizontal bearings or holders *i*, Figs. 2, 9, and 19, for the handle-bars and crank-arms *k*, (see also Fig. 14,) these holders being the fulcrum-bearings for the crank-arms and the handle-bars.

20 The outer end of each crank-arm is preferably formed into a square part *d'*, Fig. 9, upon which the handle-bar may be seated, as shown, a nut *e'*, threaded onto the extreme end of the arm, serving to hold the handle-bar 25 in place; but I prefer to place a washer *f'*, Figs. 5 and 7, on the square part *d'* and have the handle-bar occupy a reduced cylindrical part of the crank-arm outside of the square part, as shown. The contiguous faces of the 30 washer and the handle-bar being formed with radial teeth *g'*, Figs. 6 and 7, will effectually prevent the handle-bar from turning independently of the crank-arm when the holding-nut *e'* is brought up snugly against the 35 handle-bar. This construction of the parts admits of the handle-bars being vertically adjusted for the convenience of the rider.

Near its upper end the plunger or driver F is formed with a collar *l*, Figs. 2, 8, and 19, 40 above which it is larger in diameter than below the collar. Upon this enlarged part, above the collar, a ring *m*, Figs. 8, 11, and 19, is placed and adapted to turn thereon, as with a swivel motion. This ring is preferably 45 constructed to have a ball-bearing of ordinary kind upon the part F; but this is not essential to my invention. The upper end of the driver or plunger is threaded to receive a holding-nut *n* to keep the ring in 50 place. The crank-arms *k* extend outward in opposite directions, as shown in Fig. 9, one reaching forward and the other backward. The ring *m* is formed with a rigid arm or standard *o*, (see also Figs. 1 and 8,) extending 55 upward and connected by means of a pivot-pin *p* to the rear crank-arm; also, a link or arm *r*, of equal length with the part *o*, connects the ring on its opposite side with the forward crank-arm, a lug *s* on the ring 60 being provided for the purpose, said link being pivoted to the contiguous parts at both ends.

As shown in Fig. 9, the right handle-bar is connected with and operates the forward 65 crank-arm, and the left handle-bar is connected with and operates the rear crank-arm,

on account of which it will be understood that when the right handle-bar is pressed downward it will tend to raise the plunger, and when raised it will tend to depress the 70 plunger, this handle-bar with its associated crank-arm together acting as a lever of the first order; also, that the plunger will move up or down with the left handle-bar, said handle-bar and its crank-arm together acting 75 as a lever of the second order, or, in other words, if the right handle-bar be pressed downward, for example, and the left handle-bar simultaneously pulled upward the plunger will be raised by the combined action of 80 both handle-bars, or if the directions of motions of the handle-bars be reversed the plunger will be depressed by their joint action.

The ring *m*, together with the arms *o* and *r* and the crank-arms *k*, constitute connectors 85 for the handle-bars and the plunger or driver F, by means of which the action of the handle-bars tends to and aids in propelling the vehicle. This particular arrangement of the handle-bars and the crank-arms need not 90 necessarily be followed, that is to say, the crank-arm acting with the right handle-bar may extend backward and the left handle-bar may actuate the crank-arm extending forward, if in any case this be found to be 95 the better arrangement of the parts. In either case the handle-bars will move simultaneously in opposite directions.

The front fork I is centered within the head C of the frame by means of a ring *t*, Fig. 8, 100 at the lower end of the head, at which point a ball-bearing is provided for the parts. At the upper end of the head the fork is centered by means of a star-piece *u*, Figs. 8 and 18, fitted snugly upon and within the head, as 105 shown. The body or central portion of this star-piece is in the space within the tubular plunger F and has parts extending radially outward in various directions, through vertical openings *v* in the sides of the plunger, to 110 meet the walls of the head. These openings in the plunger are of sufficient vertical length to allow the plunger free axial motion, as above described. This centering-piece is hollowed out next the fork to hold balls for the 115 purpose of providing a ball-bearing thereat. The fork is threaded within and above the centering-piece *u*, as shown, and a threaded ring *w* placed thereon to form the upper bearing for the balls. The fork is thus held securely within the head C by the centering- 120 pieces and the ball-bearings at the upper and lower end of the head.

As shown in Fig. 18, the openings *v* in the plunger for the centering-piece *u* are sufficiently large to allow free motion laterally as well axially to the plunger.

When in use, the plunger is carried slightly in lateral directions forward and backward at its lower end on account of the swinging of 130 the bell-crank *d*, (observing Fig. 8,) while at its upper end it is swung alternately slightly

forward and backward on account of the rocking of the crank-arms *k*. The link *r*, being pivoted at both ends, permits of free and easy motions of this nature for the plunger at its upper end. The plunger being tubular, there is sufficient space within it to admit of these lateral motions without its encountering the fork.

The handle-bars in this improved bicycle are used, as usual, to guide the bicycle as well as to aid in propelling it. To insure a free and easy motion for all the parts when the handle-bars are swung to one side or the other, the crank-arms *k k* are provided with swivel-jaws or eyepieces *x x*, Figs. 9, 14, and 19. These eyepieces, turning in their bearings in the crank-arms, prevent any cramping of the parts due to the lateral motions of the handle-bars in the act of guiding the bicycle. The plunger or driver *F* does not partake of these lateral swinging motions of the handle-bars, that is to say, it does not turn upon its axis as the handle-bars are turned, but maintains at all times its relative position within the head, except as to the axial motions above described.

When the handle-bars are turned laterally, the ring *m* turns with them upon its bearings on the plunger, but the latter is reciprocated with equal facility by the handle-bars in whatever position they may chance to be in guiding the wheel. Furthermore, to provide for a free motion of the parts in all the positions of the handle-bars the bell-crank *d*, Figs. 2, 3, and 4, is provided with a swivel-jaw *y*, which turns through small distances in its bearing in the bell-crank when the handle-bars are swung to either side. When, for instance, in rounding a curve the handle-bars are swung to one side, the lateral swaying of the upper end of the plunger due to the rocking of the arms will not be directly forward and backward in the plane of the frame, but in the vertical plane midway between the handles. On account of this the joint between the plunger and the bell-crank and between the latter and the pitman would be inclined to bind were the bell-crank in one rigid piece.

As has been stated, the arrangement is to have the hands work alternately—one moving up while the other is moving down—this being natural to them; but the relative timing of the motions of the hands and the feet is a matter of convenience.

As shown in Figs. 8 and 17, the middle crank *E* is at its upward position, while the pedal-cranks are substantially horizontal, the other parts being positioned correspondingly, with the right hand and left foot pressing downward and the left hand pulling upward, all acting together to turn the axle *D* forward; but this arrangement of the motions of the hands and feet need not necessarily be adopted if some other is found more convenient.

As a matter of convenience or necessity in putting the parts together the head *h'* of the

pitman, Fig. 8, is made removable from the tubular part or rod. This is effected by some simple means, as by brazing a short plug in the end of the tubular part, having its outer projecting end threaded to enter a threaded socket in the head. Any other simple method of joining the parts would answer the purpose equally well.

What I claim as my invention is—

1. In combination with the frame of a bicycle, the head of which is hollow, and one of the parts, *b'* is also hollow and taperingly enlarged, of a crank-shaft, a pitman within the enlarged part, a reciprocating driver within the head, and a connector between the driver and the pitman, substantially as set forth.

2. In combination with the handle-bars and the axle of a bicycle, a driving-plunger for the axle, held by the head of the bicycle, and connectors for the plunger and the axle and the handle-bars respectively, the latter being adapted to move simultaneously in opposite directions, one of the handles operating as a lever of the first class, and the other one as a lever of the second class substantially as specified.

3. In combination with the handle-bars and the axle of a bicycle, a driving-plunger for the axle, held by the head of the bicycle, and connectors for the plunger and the axle, and a ring or body on the plunger, and connectors for said ring or body and the handle-bars, said ring or body being adapted to turn upon the plunger, substantially as and for the purpose specified.

4. In combination with the front fork, the head, the driving-crank axle and pitman of a bicycle, a reciprocating driver for the pitman, in said head, and a centering-piece for the fork, held by the head, occupying openings in said pitman-driver, substantially as described.

5. In combination with the head of a bicycle provided with a housing, a crank-axle pitman, and a reciprocating driver therefor held by the frame, a bell-crank within the housing connecting said driver and the pitman, and means to operate the driver, and a swivel part for the bell-crank, substantially as shown and described.

6. In combination with the head, the handle-bars and the crank-axle of a bicycle, a reciprocating driver for said axle, held by the head, and connectors for said driver and the axle, and a ring or part adapted to turn upon the driver, crank-arms actuated by the handle-bars, a rigid standard and a pivoted standard connecting said crank-arms respectively with said ring, substantially as and for the purpose specified.

7. In combination with the head, the handle-bars and the crank-axle of a bicycle, a reciprocating driver for said axle, held by the head, and connectors for said driver and the axle, and a ring or part adapted to turn upon

the driver, crank-arms actuated by the handle-bars, a rigid standard and a pivoted standard connecting said crank-arms respectively with said ring, and swivel-jaws or parts between said standards and the crank-arms, substantially as set forth.

In witness whereof I have hereunto set my

hand this 24th day of December, 1895, in the presence of two subscribing witnesses.

GEORGE H. SEARS.

Witnesses:

ENOS B. WHITMORE,
M. L. WINSTON.