

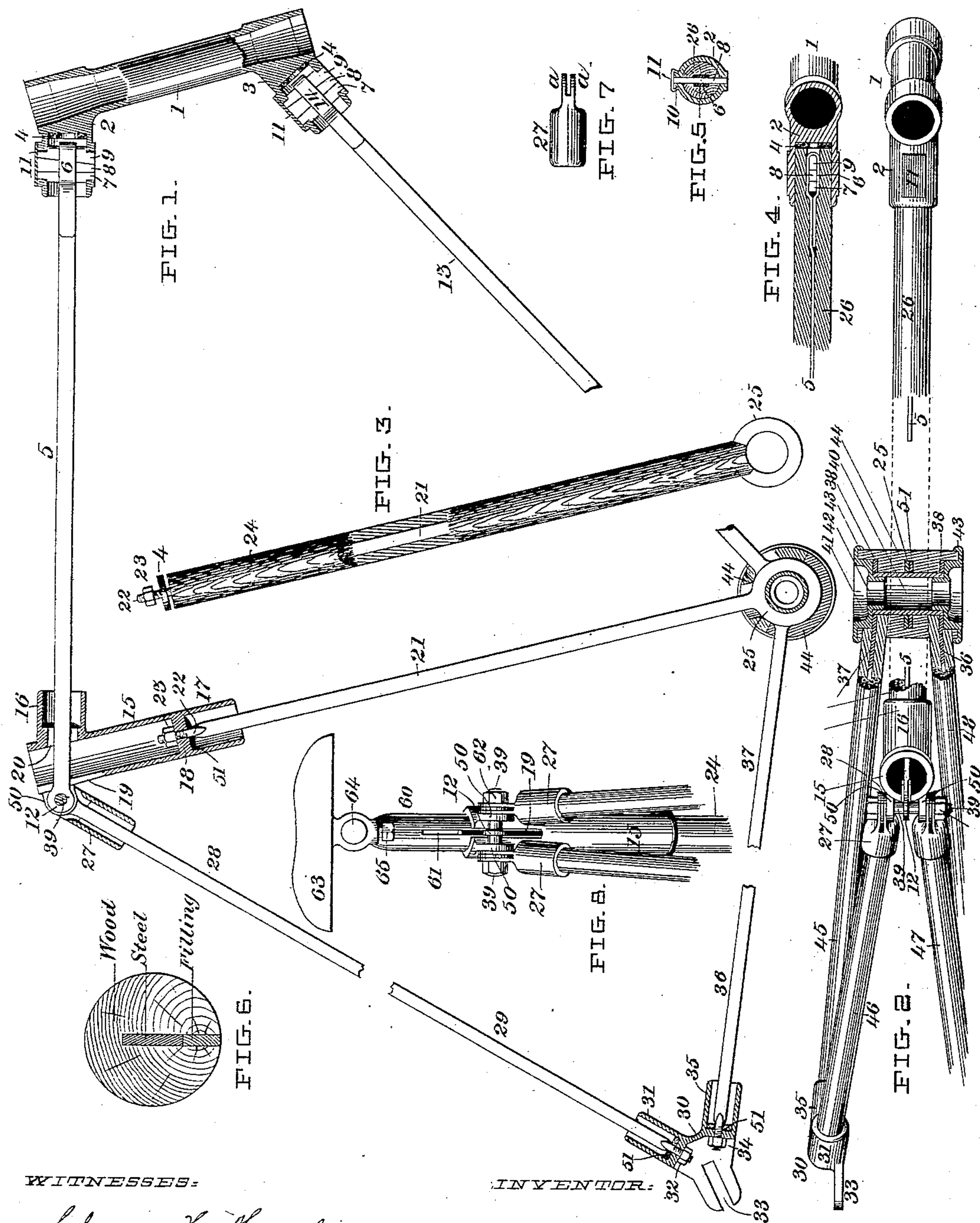
No. 616,681.

Patented Dec. 27, 1898.

G. W. MILTIMORE.  
BICYCLE FRAME.

(Application filed Sept. 21, 1897.)

(No Model.)



WITNESSES:

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# UNITED STATES PATENT OFFICE.

GEORGE W. MILTIMORE, OF ARLINGTON, VERMONT.

## BICYCLE-FRAME.

SPECIFICATION forming part of Letters Patent No. 616,681, dated December 27, 1898.

Application filed September 21, 1897. Serial No. 652,481. (No model.)

*To all whom it may concern:*

Be it known that I, GEORGE W. MILTIMORE, a citizen of the United States, residing at Arlington, in the county of Bennington and State of Vermont, have invented certain new and useful Improvements in Bicycle-Frames; and I do hereby 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 appertains to make and use the same.

This invention relates to improvements in bicycle-frames; and it consists in a combination of wood and metal, whereby a skeleton frame made up of thin tubular sockets and thin flat metallic bars to resist tensile strain, reinforced by a light stiff wood covering to resist vibration of the metal bars and lateral strains, is produced which is extremely light and very stiff and strong.

The invention is fully illustrated in the drawings, in which—

Figure 1 shows a side elevation of the metallic parts of the frame with the wood portions detached. Fig. 2 shows a broken plan of the frame, a part of the top bar being removed to let into view a horizontal section of the crank-axle hanger and box. Fig. 3 shows a side view of the saddle-post as detached and shows the mode of embedding the metallic bar in the wood. Fig. 4 shows a horizontal section, taken on line *xx* of Fig. 1, of the upper socket of the steering-head, with the straining-loop of the top bar, straining-keys, and cushion for the wooden part of that bar to abut against all in position. Fig. 5 is a transverse vertical section, taken on the line 6 8 of Fig. 4, of the top socket of the head. Fig. 6 is a cross-section taken through the middle of one of the bars of the frame. Fig. 7 is a view of the top socket of one of the braces. Fig. 8 is a rear view of the seat-bracket and saddle-stem and shows the slit in the stem and its position astride the top bar 5.

The structure will first be described with reference to the drawings, after which the specific features of invention will be particularly pointed out in the claims.

For clearness of description I have designated the various members of the frame as follows: The upper horizontal member I call the "top bar," the part which carries the front-wheel fork the "head," the part which car-

ries the crank-axle the "crank-hanger," the member which supports the seat the "seat-bracket," the connection between the crank-hanger and the seat-bracket the "saddle-post," the rear castings which carry the bearings for the hind wheel the "wheel-housings," the connections between the seat-bracket and the wheel-housings "braces," the connections between the wheel-housings and the crank-hanger "reaches," and the connection between the head and the crank-hanger the "under bar."

The head consists of a tube 1, internally flared slightly at its ends to receive the fittings which constitute the bearings for the front fork, which are not shown. From its top extends rearwardly the top-bar socket 2 and from its bottom the under-bar socket 3. These sockets are alike and are slotted through their upper and lower sides for the introduction of two gibs 7 and 9 and the key 8. On the upper side around this slot is a dovetail-edged boss 10, Fig. 5, over which a cap 11 is fitted to slide tightly to cover the ends of the gibs and key and prevent their displacement. Each of these sockets is fitted to receive an elastic washer or cushion 4, against which the wooden parts of the top bar and the under bar abut when drawn up by the action of keys 8, as will be explained farther on.

The seat-bracket 15 consists of a tube, from the top of which projects the top-bar socket 16 and in the bottom portion of which is a diaphragm 18, which is perforated to receive the screw-stem 22 of the saddle-post. Between the interior of the tube 15 and socket 16 is a vertical slot 20 for the passage of the eye 12 of the top bar 5. Its rear side is slitted from the top downwardly, as at 19, for the same purpose. From the top of the bracket on each side of this slit two ears project, which carry the bolt 39. By means of this bolt the rear braces are connected with the seat-bracket and with the top bar. The top bar consists of a thin flat bar, preferably of steel, having its rear end formed in the shape of an eye, as at 12, Fig. 1, to take in the bolt 39, and its forward end doubled back upon itself, so as to form a loop 6, as shown in Fig. 4. This bar is incased in a cylindrical wood covering or jacket, of which



a cross-section on an enlarged scale is shown at Fig. 6, which is fitted to enter and fill the sockets 2 and 16, its ends bearing against the shoulder at the bottom of socket 16 and the cushion 4 at the bottom of socket 2. This member as well as the under bar, braces, and reaches are all constructed by cutting a groove or saw-kerf of proper depth and breadth lengthwise in a round piece of stiff hard wood, like hard maple, and inserting therein the steel bar, after which the remaining gap is closed with a spline of the same wood, which is glued or otherwise firmly fastened therein, so as to make a practically solid structure. In the construction and use of the frame the woods carry all the compressive strains and the steel bars all the tensile strains. The end of the wood of the top bar which takes in the loop 6 of bar 5 is mortised through for the gibs and key to pass. The edges of the gibs 7 and 9 are slightly rabbeted in the usual way to prevent displacement, and when all the parts are in position the driving home of the key 8 tends to force the wood bar toward the bottom of the head-socket 2 or 3, as the case may be, and against the cushion 4.

The crank-hanger consists of a short section of tubing 40, into each end of which is pressed the hollow hub 42 of the ball-race 41. These hollow hubs form the bearings proper of the crank-axle. In constructing this hanger before both hubs are pressed into position the eyes of the bars 13, 21, 37, and 36 are slipped over the central tube 40, as seen in Fig. 1, the eyes of the reaches being placed next to the outside and those of the under bar and the saddle-post occupying the center of the hanger. Each of the ball-race fittings has a flanged rim 43, and after the hanger parts are all assembled the intervals between the under bar, saddle-post, and reaches are filled in with wood, as seen at 44, over the ends of which the flanges 43 project, so as to protect the same. Each of the rear braces is fitted at its top end with a socket-cap 27, (shown in detail in Fig. 7,) which receives the wood and is also perforated to allow the head of the bar to pass through it. It is also constructed with two eye-terminals *a a*, which take onto the bolt 39, by which means the braces are attached to the seat-bracket. The braces and reaches are similarly seated in sockets in the wheel-housings 30, as at 31 and 35, and their screw-stems pass through the bottoms of those sockets and are drawn up by the nuts 32 and 34. In the bottom of each of these sockets a cushion-washer 51 can be placed, against which the end of the wood impinges.

When the members are assembled as shown, the wood portions of the under bar, saddle-post, and the reaches abut against the center tube 40 of the crank-hanger, while their respective steel bars by means of their eyes or collars embrace that tube. When by means of the keys and nuts with which those members are provided each of them is strained, the steel

parts will be stretched against the compression of the surrounding wood. By reason of the steel bars thus being strained taut but little aid is required to reinforce them against lateral vibration, and when the top bar and braces are also put in position by inserting the bolt 39 through the cheeks *a a* of the sockets 27 the eyes of the braces 28 and 29 and the ears 50 of the seat-bracket, as shown in Fig. 2, and the loop 6 with the socket 2 of the head and the proper connections of the braces and reaches are made with the wheel-housings by means of the screw-stems and nuts, as shown, the under bar being also connected with the head, as before described, the whole frame may be strained to any desired degree of tension by tightening the keys 8 8 and the nuts 32 and 34. It is a condition precedent to this that the nut 23 of the saddle-post shall have first been properly strained, which is accomplished by means of a socket-wrench applied through the top of the tube 15 before bar 5 has been inserted through the socket 16. When properly strained, the cushion-washers in the bottoms of the sockets impart to the whole structure a very desirable degree of elasticity when the frame is subjected to violent shocks, while in no wise detracting from the proper degree of rigidity of the frame.

The use of thin steel bars set on edge vertically and strained as constituent members of a bicycle-frame, whereby a frame is secured capable of carrying an enormous burden on edge, the straining tension being sustained by the wood reinforcing members, effects a very substantial reduction in the weight of the frame, amounting to from three to five pounds, according to the style and grade of the bicycle.

One of the novel features of my invention resides in the means provided for preventing the saddle from turning in the seat-bracket and also for clamping it in its adjusted position. These matters are shown in Fig. 8. The saddle-stem consists of a rod 60, which just fills the upper part of the socket 15, and has its upper end bent backwardly to a horizontal position to take on the seat 63. This is held in its position by the set-screw 65 in the usual way. Inasmuch as the steel bar 5 of the top bar passes through the upper part of the socket 15, and thus bars the introduction of a solid saddle-stem, I have bifurcated the stem from the bottom upwardly a sufficient distance for all practical purposes for the admission of the bar 5. This provision enables the stem to be inserted in the socket by straddling the bar 5, and after the seat has been adjusted to the right height by screwing up the tightening-nut 62 on the bolt 39 the two ears 50 50 of the socket 15 will be pinched toward each other, whereby the upper parts of the socket 15 will be closed upon the two cheek-pieces of the saddle-stem and they in turn will pinch the bar 5 between them, and thus the top bar, the saddle-stem, and the upper part of the socket of the seat-



bracket will all be solidly clamped together. Thus confined it is manifest that it becomes impossible for the saddle to turn in the socket whether it is clamped or not.

In constructing the crank-hanger the hubs of the ball-cups are made slightly tapering and the center tube is made of metal which is softer than that of the surrounding eyes of the metallic frame-bars. After the tube and the eyes of the bars have been positioned the hubs of the ball-cups are forced into the tube under pressure sufficient to expand the tube, so that its metal is forced out around the interior edges of the eyes of the frame-bars, thus leaving them slightly embedded in the metal of the tube, so that they are immovably seated thereon. This method of construction produces a structure of intense rigidity in which all parts are secured beyond the possibility of derangement except under most extraordinary conditions.

Having thus described my invention, what I claim, and desire to secure by Letters Patent, is—

1. As a constituent part of a bicycle-frame, a member consisting of a narrow thin bar or strip of metal set edgewise in the plane of the frame, having provisions at each end for attachment to its adjacent member, rigidly embedded in a reinforcing-bar of wood, in combination with sockets which are appurtenances of the adjacent members in which the ends of the reinforcing-bar are seated, and means connected with one end of the metal bar for straining it against the compression of the wood bar.

2. The combination with the tubular crank-axle box of a complement of connecting frame members, each of which consists of a thin metallic bar set edgewise in the plane of the frame and embedded in an incasement of wood, provided at its lower end with an eye to encircle the tubular part of the axle-box and at its other end with means in connection with the adjacent connecting member whereby the metal bar can be strained against the compression of the wood.

3. The combination with the tubular crank-axle box of a connecting frame member consisting of a thin metallic box set edgewise in the plane of the frame and embedded in an incasement of wood, provided at its lower end with an eye to encircle the tubular part of the axle-box, and at its other end with means

in connection with the adjacent connecting member whereby the metal bar can be strained against the compression of the wood.

4. The steering-head provided with sockets for receiving the front ends of the top and under bars, in combination with said bars, each of which consists of a thin metallic bar embedded in an incasement of wood, set edgewise in the plane of the frame and terminating at its front end in an elongated loop or eye, a set of gibs and keys which pass through mortises in said sockets and through the eyes of said metallic bars, substantially as shown and for the purposes specified.

5. The combination in a bicycle-frame with the crank-hanger and steering-head, of a top bar, saddle-post, back braces, reaches and under bar, each of which members except the steering-head and crank-hanger consists of a thin metallic bar set edgewise in the plane of the frame, has provisions at each end for attachment to its adjacent member, is embedded in an incasement of wood and is provided with means for straining the metallic bars against the compression of the wood, the top and under bars being connected with the steering-head by links, sockets, gibs and keys whereby the entire frame may be strained taut by driving down the keys.

6. The combination of the central hanger-tube, the under bar, saddle-post and reach bars connected therewith by the described eyes, such bars being of a metal harder than the tube, and the ball-cups hubs of slightly greater diameter than the bore of the hanger-tube, the eyes of the frame-bars being seated in the metal of the central tube as a result of forcing the hubs into the ends of the tube under pressure sufficient to expand the metal of the tube outwardly around the eyes of the frame-bars.

7. The combination of the central hanger-tube, the ball-cups each having an inwardly-projecting retaining-flange, and the wood filling provided with sockets for receiving and supporting the ends of the wood portions of the connecting frame members.

In testimony whereof I have affixed my signature in presence of two witnesses.

GEORGE W. MILTIMORE.

Witnesses:

FRANKLIN SCOTT,  
EMILY SCOTT.

It is hereby certified that in Letters Patent No. 616,681, granted December 27, 1898, upon the application of George W. Miltimore, of Arlington, Vermont, for an improvement in " Bicycle-Frames," an error appears in the printed specification requiring correction, as follows: In line 50, page 3, the word " box " should read *bar*; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed, countersigned, and sealed this 10th day of January, A. D., 1899.

[SEAL.]

WEBSTER DAVIS,  
*Assistant Secretary of the Interior.*

Countersigned:

C. H. DUELL,  
*Commissioner of Patents.*