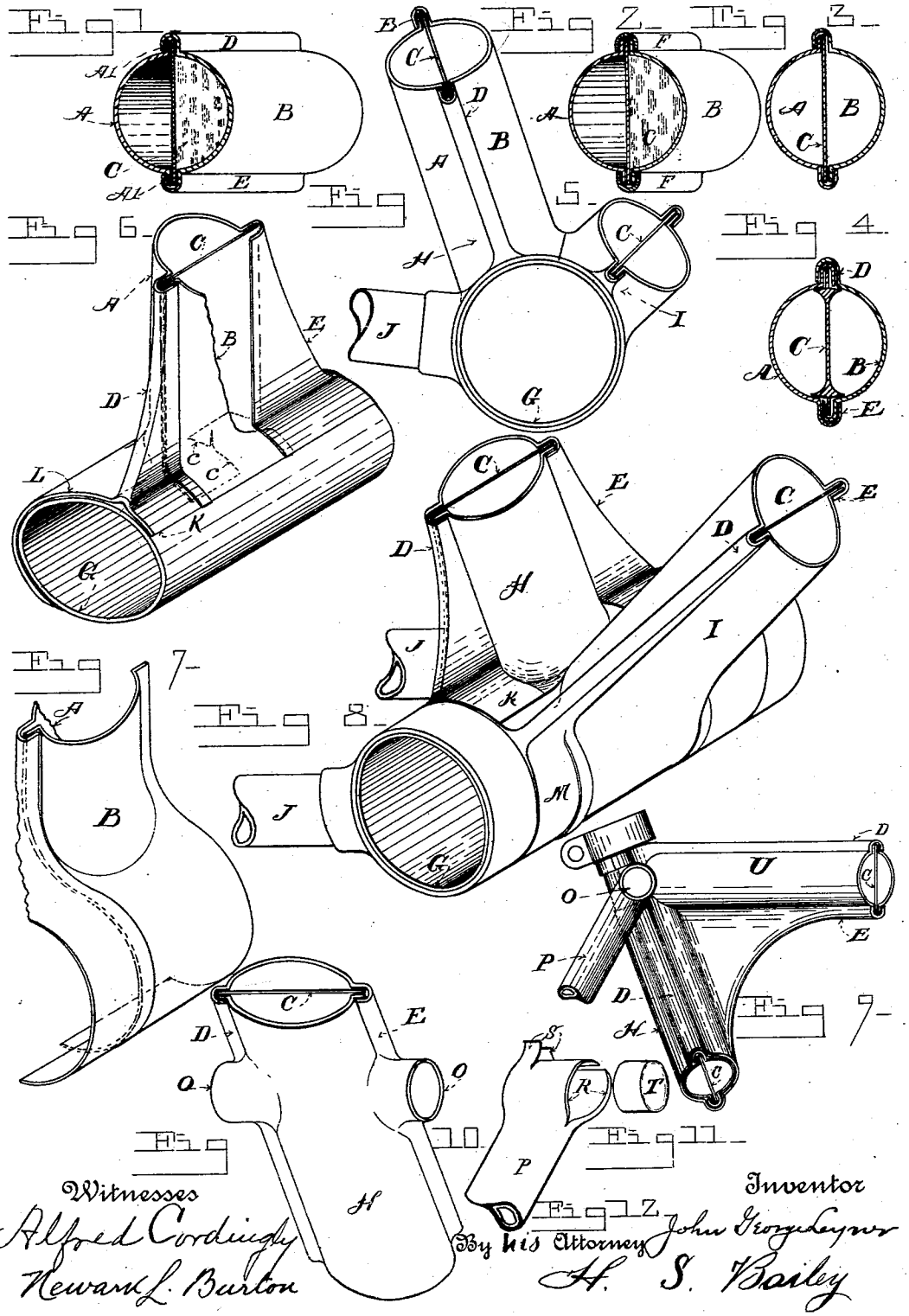
(No Model.) 2 Sheets—Sheet 1.

J. G. LEYNER.

BICYCLE FRAME.

No. 564,627. Patented July 28, 1896.



Witnesses
Alfred Cordingly
Newark L. Burton

Inventor
John George Leyner
By his Attorney
H. S. Bailey

(No Model.) 2 Sheets—Sheet 2.

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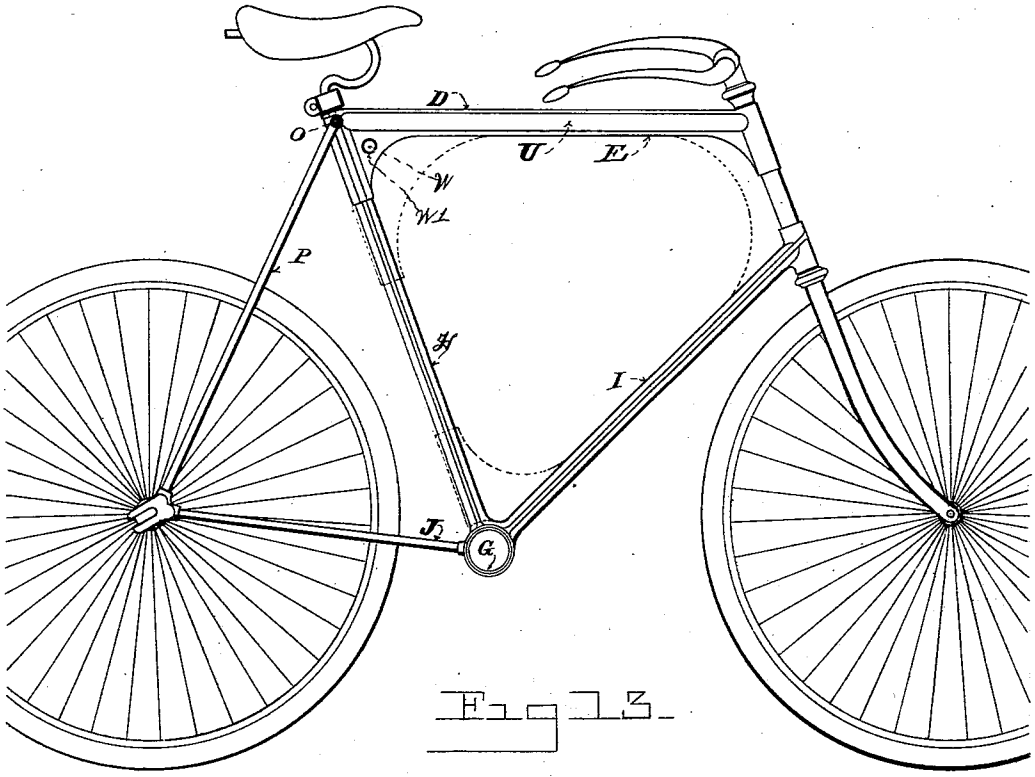

Fig 13.

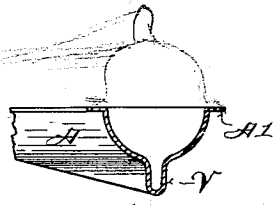

Fig 15.

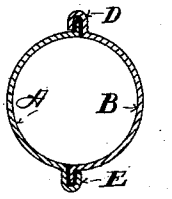

Fig 16.

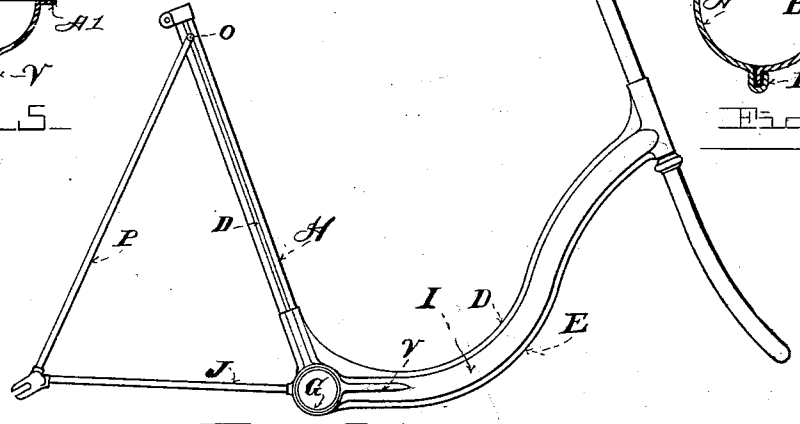

Fig 14.

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UNITED STATES PATENT OFFICE.

JOHN GEORGE LEYNER, OF DENVER, COLORADO.

BICYCLE-FRAME.

SPECIFICATION forming part of Letters Patent No. 564,627, dated July 28, 1896.

Application filed July 8, 1895. Serial No. 555,326. (No model.)

To all whom it may concern:

Be it known that I, JOHN GEORGE LEYNER, a citizen of the United States of America, residing at Denver, in the county of Arapahoe and State of Colorado, have invented certain new and useful Improvements in Bicycle-Frames; and I do 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, reference being had to the accompanying drawings, and to the letters of reference marked thereon, which form a part of this specification.

My invention relates to an improved method of constructing bicycle-frames, and especially to a new and ingenious method for constructing the principal members thereof and their connections with one another.

The objects of my invention are, first, to produce a bicycle-frame, of tubular bicycle-frame members, better adapted to resist the transverse, torsional, and tension strains to which they are subjected than those in use without sacrificing the lightness of the frame or gracefulness and beauty of design; second, to arrange said tubular members in the frame so that each piece will best resist the strains to which it is subjected, and particularly to arrange, secure, and adapt them to the crank bearing or hanger in such a manner as to make the frame at this point practically rigid. In the present state of the art bicycle-frames are weakest adjacent to their terminal connection with one another. The frames are also too elastic at and adjacent to the crank-axle bearing, owing partially to the small bearing the tubes have on it and the lack of lateral bracing and partially to the leverage of the crank-pedals and alternate application of power to them at opposite sides of the frame at a short distance from it. A bicycle-frame under a mounted rider in action is subjected to severe torsional strain, first in one direction and then in the other laterally, as each downward stroke of the crank under the pressure of the rider's foot springs the lower part of the frame laterally to one side away from it, thus alternately twisting the frame between the crank-bearing and the top rail or upper parts and more or less swinging the whole frame on the wheel-axles, producing a constant reciprocating motion of the frame, which causes it in time to crystallize and break, as at present constructed, at or near the joints which connect the pieces together; third, to provide a bicycle-frame which will not break and cannot be broken by riding use. I attain these objects by the mechanism illustrated and described in the accompanying drawings and specification, in which—

Figure 1 represents a section of my improved bicycle-frame tubing. Fig. 2 represents a similar section, but with a different arrangement of the joints. Fig. 3 represents a similar section, but with a different arrangement of the joints from that shown in Figs. 1 and 2. Fig. 4 represents a similar section with a different form of joint for connecting the parts of the tube from those shown in Figs. 1, 2, and 3. Fig. 5 represents a fragment in elevation of a bicycle-frame, showing the crank-shaft hanger with my improved tube and frame construction at this point of the frame. Fig. 6 represents a fragment in perspective, showing the manner in which I preferably secure the tube-sections to the crank-shaft bearing. Fig. 7 represents a fragment in perspective, showing the manner of forming and arranging the terminal ends of the tube-sections to conform and braze or weld the same to the crank-axle hanger. Fig. 8 represents a perspective view of the crank-axle bearing with a fragment of all the tubes leading therefrom, showing the arrangement of my improved frame and tubes at this point. Fig. 9 represents a fragment of the frame, showing the seat-supporting corner of the frame. Figs. 10, 11, and 12 represent fragments of the frame. Fig. 13 represents a gentleman's diamond bicycle-frame embodying my improved frame construction. Fig. 14 represents a complete drop or lady's bicycle-frame embodying my improved construction. Fig. 15 represents a fragment of one of the tubes. Fig. 16 shows a modified section of the tubing.

Similar letters of reference refer to similar parts throughout the several views.

I illustrate in Fig. 1 a cross-section of my improved form of tubing for bicycle-frame construction. This tubing comprises two independent semicircular halves A and B, between which I place a web-plate C. This plate

is wider than the diameter of the tube and is arranged between the two halves to extend an equal distance from it at its opposite sides. The semicircular half A is provided with outwardly-turned ends A′, which fit flat against the plate C. The half B is also provided with outwardly-extending ends of greater length, which also fit against said plate and are adapted to be folded over the ends of the plate C and also over the ends of the opposite half A and down against or to its semicircular surface, the outwardly-projecting ends of the three parts of which the tube is composed thus forming continuous projecting ribs D and E on opposite sides of the tube. The three pieces are then carefully brazed or welded together so as to form an integral tube. In Fig. 2 I illustrate a similar section, but form the ribs by flanging both the semicircular halves alike and to extend only to the ends of the web-plate and fold an independent strip of metal F over them and then braze them all together. In Fig. 3 one flange of each half is formed to extend only to the end of the center plate C, while the opposite end is extended to fold over the adjacent ends of the center plate and the opposite half of the tube. The halves are consequently arranged with their like ends opposite one another. In Fig. 4 one end of each semicircular half is folded at one end over one edge of the center plate, and these ends are oppositely arranged. The opposite ends of each half are then folded over the first folded ends and all are brazed together. The center plate or web C in this view is rolled in the form of an I-beam, which is better adapted to resist transverse strains than those shown in Figs. 1, 2, and 3. The arrangement of the rib and center plate in this figure produces a tube of great strength and stiffness with lightness of weight, and one well adapted for tandem-frames, and especially that class of tandems used for military service.

The halves of the tubes are easily rolled, stamped, or pressed into correct and true form from flat steel, which retains fully its normal strength and properly treated with rolls or dies.

The parts may be stamped out the right length and of the correct form for each respective tube of the frame for different sizes of bicycle-frames, so that they can be put together as they come from the dies without additional work, and they may be brazed together in a manner commonly practiced in this class of work or be united by electric welding. At the lower ends of the tubes which connect to the crank-hanger G, I diverge the ribs outward, in order that they may extend along its surface parallel with its axis, and thus form on each side of each of the main tubes which connect with it, namely, the seat-tube H and the lower tie-tube I, lateral struts. These ribs may be extended to the ends of the hanger on each side of the tubes, as shown in Fig. 6, if desired; but in Fig. 8 they extend only to the lower tie-tubes J of the rear fork which connects to the hanger.

In order to firmly secure the tubes to the hanger, I split or saw the ends centrally of the tubes and through the center of the ribs, thus dividing them. One half of the tube and one half of each rib is then carried one way around the hanger and the opposite half around the opposite way a short distance. (See Fig. 6, in which a fragment of the tube is shown thus separated and carried in opposite directions around the crank-hanger.) The half K of the rib extends but a short distance around the hanger, as it is cut to meet half-way the rib part of the other tube, but the opposite part L is carried about half-way around the hanger and laps over the half M of the tube I, (see Fig. 8,) which is carried around in the opposite direction. The body of each half A and B of the tubes is also carried around the hanger in opposite directions. Thus the half A is carried around with the half L of the rib. The half B, of which a fragment is shown in Figs. 6 and 7, is carried around with its edges under the edges of the ribs, as shown. The center web-plate is carried down and split centrally, as at N, and one end turned on the hanger in one direction and the other turned in the opposite direction.

The letter C designates the opposite disposition of the ends of the plate on each side of the slit N and their position on the hanger, both ends being shown in dotted lines in Fig. 6. I preferably form the web-plates at these terminal ends and also the ends of the opposite half B to follow the divergence of the ribs, as shown in dotted lines in tube H of Fig. 8, and then turn them on the hanger, as above described, to which they are carefully brazed or welded.

In Figs. 9, 10, 11, and 12 I illustrate that corner of the frame which supports the seat and my method of constructing it. Fig. 10 represents the top end of the seat-supporting tube A.

The trunnions O, which support the rear fork-tubes P, I form by cutting through the ribs and spreading them, forming them into hollow hubs or trunnions, around which the ends R of the tubes P, which are split, are carried in opposite directions and welded. In order to make a neat job, I cut a strip S free from each side of the ends and lay it along the side and against the ribs and braze them to it. In the ends of the trunnions I secure a cap or plug T. The top rail U is set in the frame with its web-plate in a vertical position or at right angles to its position in the tubes H and I. This tube is cut at the seat end to pass around the trunnions, as shown. The web on the under side is curved downward and is carried around the tube, passing preferably over its ribs and is lap-welded to it. This rib is made to form a very substantial strut-bracket between the two tubes. I form one or more holes W through the ribs and turn a neat bur or thimble W′ over its edge

on each side. The joint of this tube with the head fork-tube is made in a similar manner, that is, by carrying the rib down on the fork-tube in the form of a bracket, then around it, and brazing it to it.

As the object of my invention is to produce a light frame which will not break and which cannot be broken by riding service I preferably adapt the amount of metal and its arrangement in the cross-section of the tubes and especially the depth of the ribs at the angles of the frames to secure frames of different degrees of strength and stability.

In frames as at present constructed considerable percentage of the power applied is lost, owing to the lateral movement of the frame away from the intermittent downward pressure of the rider's foot, which acts like an oblique blow first on one side and then on the other of the frame and from which the frame rebounds. I practically obviate this movement of the frame by varying the depth of the rib-brackets at the angles approximately as shown in dotted lines in Fig. 13, all of which are formed and connected to the tubes, as above described, except the rib-bracket V, which connects the tubes H and I together at their union with the crank-hanger. This rib V is formed by swaging, pressing, or stamping a portion of the metal out from the upper semicircular half of the tube to form the bracket, as shown in Fig. 15. At its opposite end it is split and folded around and brazed to the tube H.

In Fig. 14 I illustrate my improved frame adapted to a style which is known as a "drop-frame" for lady riders. The top rail U is dispensed with and the lower tie-tube I is curved. The tube I is arranged in the frame with the ribs D and E, and consequently its center plate in a vertical position and the joints with the tube H and head fork-tube are carried amply high to secure a rigid frame. The bracket-rib V is formed on both halves of the tube I in this frame, although but one is shown in this view, and these extend laterally on the crank-hanger and are split and secured to it, as above described.

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

A tube for bicycle-frame construction comprising two semicircular parts or halves having flanged ends, a web-plate sandwiched between said parts and flanges and extending beyond the circumferential surface of said semicircular halves, and ribs formed on opposite sides of said halves by folding one flange of one half over the flange of the other half and over the ends of said web-plate, and then welding or brazing all the parts into an integral tube.

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

JOHN GEORGE LEYNER.

Witnesses:

ALFRED CORDINGLY,

NEWARK L. BURTON.