

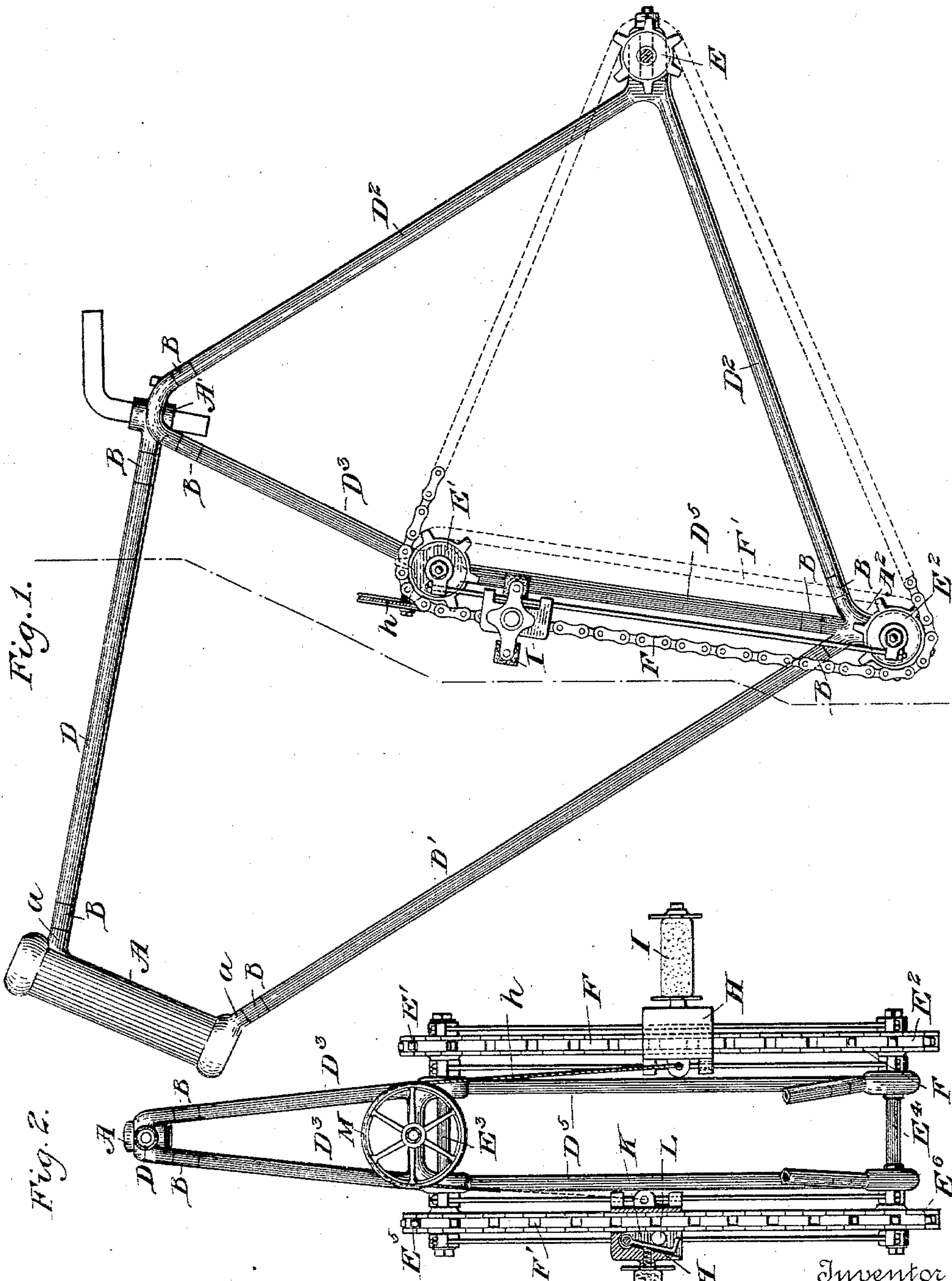
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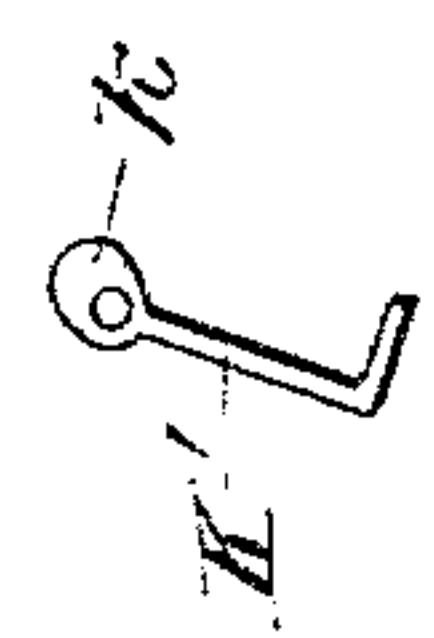
H. L. BOYLE.  
BICYCLE.

No. 566,838.

Patented Sept. 1, 1896.



Witnesses  
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Chas E. Reardon



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Homer L. Boyle  
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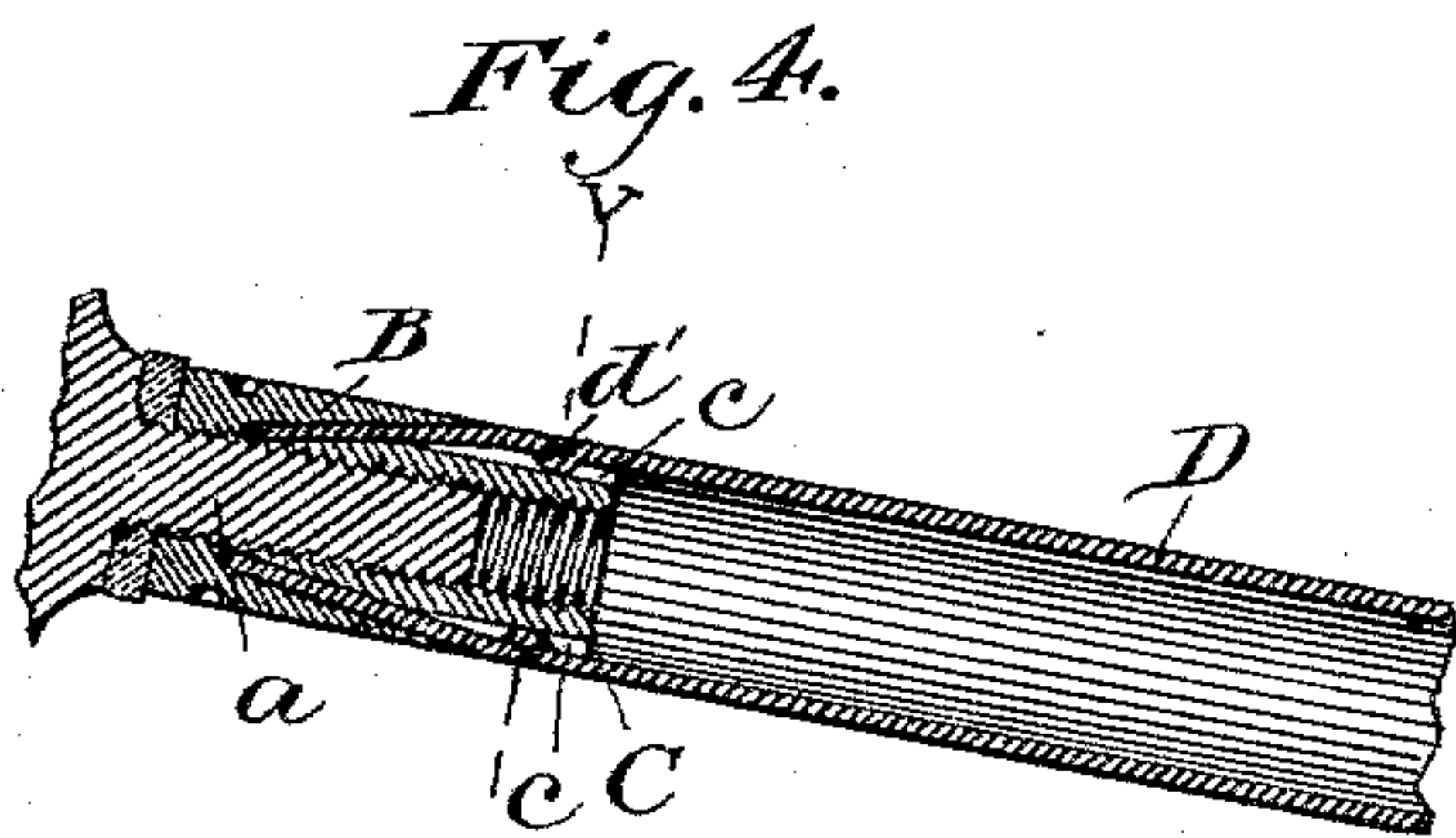
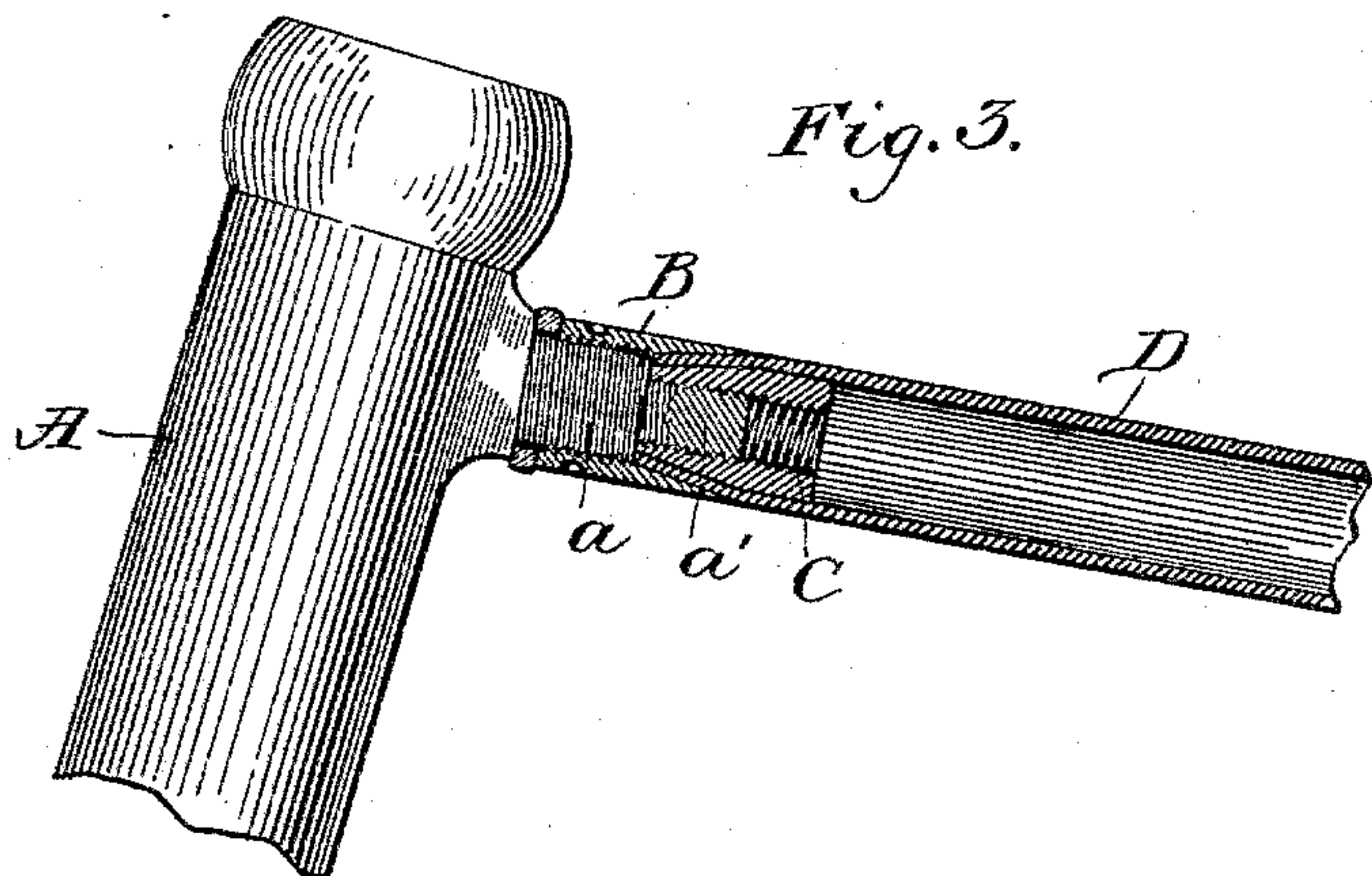
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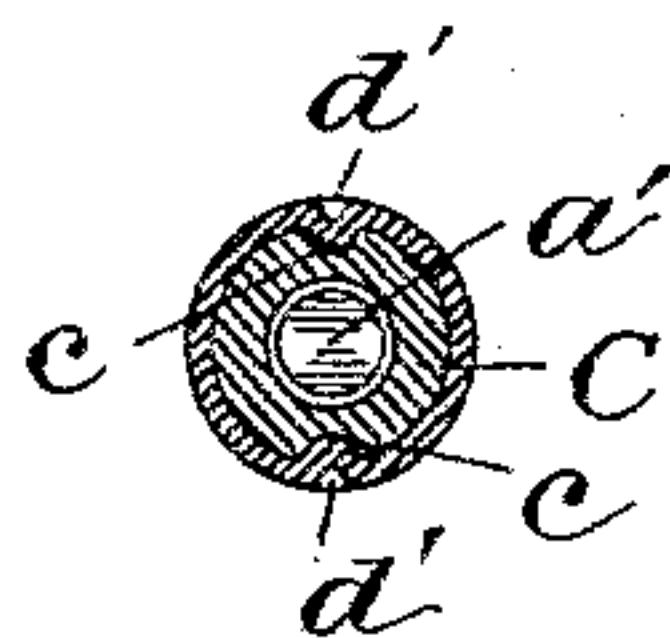
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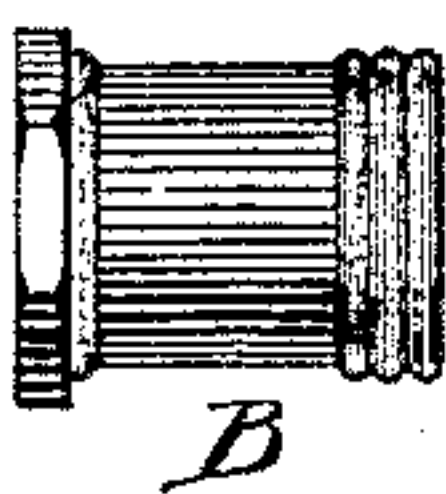
*Fig. 5.*



*Fig. 6.*



*Fig. 7.*



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# UNITED STATES PATENT OFFICE.

HOMER L. BOYLE, OF GRAND RAPIDS, MICHIGAN.

## BICYCLE.

SPECIFICATION forming part of Letters Patent No. 566,838, dated September 1, 1896.

Application filed March 2, 1894. Serial No. 502,119. (No model.)

*To all whom it may concern:*

Be it known that I, HOMER L. BOYLE, a citizen of the United States, residing at Grand Rapids, in the county of Kent and State of Michigan, 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 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 bicycles.

The principal objects of the invention are to provide a simple and efficient bicycle-frame which may be readily taken apart or "knocked down" when desired for storage or transportation, and in which a broken or injured portion may be readily replaced by the user without rendering it necessary to send the machine to a repair-shop, and also to avoid the necessity for heating and welding or brazing the metal, thus injuring the enamel or nickel-plate and destroying the rigidity and temper of the metal.

Another object is to provide an improved coupling device for connecting the parts of the frame, so as to adapt them to be readily connected or disconnected when desired, and at the same time give a smooth and finished appearance without projections or rough surfaces at the joints.

A further object is to provide improved driving mechanism for the bicycle.

The invention will first be described in connection with the accompanying drawings, which form a part of this specification, and then pointed out in the claims at the end of the description.

Referring to the drawings, in which similar letters of reference are used to denote similar parts of the machine, Figure 1 represents a side elevation of a bicycle-frame constructed in accordance with my invention and having my improved propelling mechanism secured thereon. Fig. 2 is a front elevation of the same. Fig. 3 is a sectional side elevation of the head-piece, showing my improved coupling device in section. Fig. 4 is a detail sectional view of another form of the coupling device. Fig. 5 is a transverse section on the line V V of Fig. 4. Figs. 6 and 7 are details.

Fig. 8 is a detail sectional view of a modification of the gripping mechanism.

The head-piece A may be of the form shown and is provided with rearwardly-projecting lugs or studs which are formed in two diameters, that is to say, with a main portion *a* and an outer reduced portion *a'*, forming an extension of the larger portion *a*, both of said parts being screw-threaded, as shown.

B denotes a coupling piece or sleeve which is formed a portion of its length with an interior cylindrical screw-thread adapted to be screwed upon the portion *a* of the stud, and the outer interior portion thereof is made conical or tapering.

C denotes an interiorly-screw-threaded cylindrical and conical or tapered plug adapted to be screwed upon the extension *a'*.

D denotes a tubular frame-bar or pipe-section having a tapered end adapted to fit within the conical end of the sleeve B, so that when the plug is inserted in the tube and screwed upon the extension *a'* the tapered or conical end of the frame-bar or pipe-section will be firmly clamped between the sleeve and plug, as shown more clearly in Figs. 3 and 4. Instead of tapering the ends of the pipe D its ends may be notched or cut, as at *d*, Fig. 6, so as to permit the prongs or projecting portions to be bent so as to taper the end of the pipe-section.

To unite the parts of the coupling, the sleeve B is first screwed upon the plug *a*. The tapered end of the tubular bar or pipe D is then inserted in the tapered portion of the sleeve, and the plug, previously inserted in the tube, is screwed upon the extension *a'* by rotating the pipe, the latter being formed with a teat or teats or indentations *d'*, which take into a groove or grooves *c* in the plug, so as to cause the latter to rotate with the pipe, while permitting independent longitudinal movement thereof. The plug preferably projects beyond the extension *a'* sufficiently to permit a wrench or clamp to be applied to the pipe, so as to grip the plug and revolve the same with the pipe, and the teats and grooves may be dispensed with, if desired. Other means may also be employed for securing the plug to the pipe, so as to cause the two to rotate together. When the frame-bar is pro-



vided with a coupling at each end, the plugs in that case may be oppositely threaded, so that the parts will be drawn together when said bars are rotated. This form of coupling device provides an efficient connection and at the same time gives a finished and neat appearance, avoiding any surface projection upon the frame where the joints are formed, and it is preferably employed for uniting each of the sections D D' with the head-piece, and also the angle-piece or rearwardly-converging bars D<sup>2</sup> and the intermediate upright portion D<sup>3</sup>, as indicated in the drawings, though other forms may be employed, if desired. Inasmuch as the same construction of coupling is used at the several points indicated, it is deemed necessary to specifically describe only one connection.

A' A<sup>2</sup> denote union coupling-pieces, each provided with a plurality of projecting studs of the construction hereinbefore described, with which the frame-bars D, D', D<sup>2</sup>, and D<sup>3</sup> are connected as shown. At the intersection of the converging bars D<sup>2</sup> bearings are provided for the axle of the driving-wheel, and on said axle is fixed a sprocket-wheel or pulley E, over which passes the driving chain or belt F. Said chain also passes over sprocket-wheels or pulleys E' E<sup>2</sup>, secured to shafts E<sup>3</sup> E<sup>4</sup>, which are journaled in bearings supported, the one upon the uprights D<sup>3</sup> or other suitable part of the frame, at or about the angle formed by a bend in the said bars D<sup>3</sup>, and the other at or near the angle formed at the intersection of the frame-bars D' D<sup>2</sup>, thus supporting the drive-chain in a triangular position for imparting motion to the driving-wheel. A corresponding pair of sprocket-wheels and drive-chain may be provided at the opposite side of the machine, if desired, but I preferably use but one triangularly-arranged chain connecting directly with the driving-gear or sprocket-wheel upon the shaft of the driving-wheel and in connection therewith. I may employ an endless belt or chain F', which connects pulleys or sprocket-wheels E<sup>5</sup> E<sup>6</sup>, secured to the shafts E<sup>3</sup> and E<sup>4</sup>, respectively, at the ends thereof opposite the wheels E' E<sup>2</sup>, so that when power is applied to either chain rotary motion may be imparted to said shafts and through the same and the propelling-chain F to the drive-wheel. For the purpose of applying the power direct to said chain or chains I employ foot-pedals having a reciprocatory movement and provided with wedge or cam gripping devices acting on the forward or downward movement only to propel the chain and riding freely up or back on the reverse movement, the two pedals being thus adapted to act alternately in propelling the respective endless chains with which they engage.

The preferred form of gripping device is shown in Fig. 2, wherein I have shown boxes or sleeves H H, to which the foot-pedals I I are secured and through which the respective chains F F' pass. The opening through each

sleeve H at one side of the chain is recessed, and within said recess is pivoted a retaining-lever or detent K, between which and the side of the chain is interposed a ball or roll L. The lever K is pivoted within the recess, so as to retain the ball therein in contact with the side of the chain F or F' and cause the ball to act as a wedge, firmly binding the sleeve to the chain, so as to propel the latter on the downward movement, but allowing free upward movement of the sleeve and pedal without binding. The ball L is pressed normally into binding contact with the chain by a spring acting on the detent, as shown in Fig. 2. The sleeves H H are connected by a chain or belt h, which extends up and over a band wheel or pulley M, suitably journaled upon the frame of the machine, so that when pressure is applied to one pedal for the purpose of depressing the same the opposite pedal will be simultaneously raised or moved in the opposite direction.

A slight modification is shown in Fig. 8, wherein the construction is the same as shown in Fig. 2, except that the detent is provided with a projection or cam k on the end thereof opposite its bent pendent portion, said cam projection being adapted to impinge against the side of the chain when the sleeve or pedal is depressed and cooperate with the ball in binding the sleeve to the chain.

It will be understood, of course, that the application of the invention is not restricted to a bicycle of any specific construction, the propelling mechanism being adapted to be applied to bicycles of the usual or any preferred construction, and the coupling device being also adapted to be used for connecting the frame-bars of any desired shape for bicycles or similar purposes, and hence I do not desire to be limited in the application of the invention to any particular type of machine.

In some cases it may be desirable to form the stud or studs  $\alpha$  of a uniform diameter, as shown in Fig. 4, in which case the reduced extension  $\alpha'$  is dispensed with, this construction being less expensive and easier to make than the construction shown in Fig. 3, and especially adapted for larger-sized pipes or frame-bars. The detent K, Fig. 2, may also in some cases be dispensed with by causing the spring seated in the wedge-shaped recess in the sleeve to act directly on the ball or other gripping device, the wedge-shaped formation of the recess adapting the ball to bind upon the chain when the sleeve is depressed and to drop to the bottom of the recess on the upward movement thereof, thus releasing the chain. If desired, the sleeve may be recessed on both sides of the chain and provided with one or more spring-pressed balls or gripping devices at either side thereof.

Having thus fully described my invention, what I claim as new, and desire to secure by Letters Patent of the United States, is—

1. In combination with the detachable tubular frame-bar having the tapered or conical



end, the screw-threaded stud or projection constructed in two diameters, the interiorly-screw-threaded tapered sleeve adapted to be screwed upon the larger screw-threaded portion of said stud, and the cylindrical interiorly-screw-threaded tapered plug fitting within said tubular frame-bar and means for causing said plug and frame-bar to rotate together, for the purpose of tightening the coupling, substantially as described.

2. In a bicycle, the combination with the propelling-chain, of the flexibly-connected interiorly-recessed sleeves carrying the foot-pedals, a lever or detent pivoted and housed within the recessed sleeve, a ball interposed between said lever and chain and a spring tending to normally press the lever toward the chain so as to bind the sleeve to the chain on the forward or downward movement of the pedal and release the sleeve on the reverse movement, substantially as described.

3. In a bicycle, the frame-coupling comprising the detachable tubular frame-bar having the tapered or conical end, the interiorly-screw-threaded tapered plug fitting

within said tubular frame-bar, the screw-threaded stud or projection from an adjacent frame-piece, and the interiorly-screw-threaded tapered sleeve adapted to be screwed upon said stud, and means for causing said plug and frame-bar to rotate together, for the purpose of tightening the coupling, substantially as described.

4. In a bicycle, the combination with the propelling-chains, of the flexibly-connected interiorly-recessed sleeves to which the foot-pedals are secured, the lever or detent pivoted and housed within said recess, and the ball confined between said lever and chain so as to bind the sleeve to the chain on the forward or downward movement thereof and release the sleeve on the reverse movement, substantially as described.

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

HOMER L. BOYLE.

Witnesses:

CHAS. E. RIORDON,  
J. A. E. CRISWELL.