(No Model.)

J. C. HAUGER.

SPROCKET CHAIN.

No. 581,988. Patented May 4, 1897.

Fig. 1.

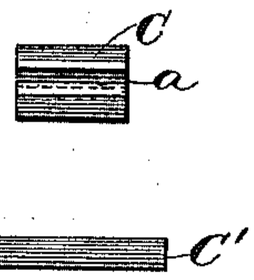

Fig. 1a.

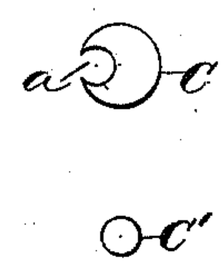

Fig. 2.

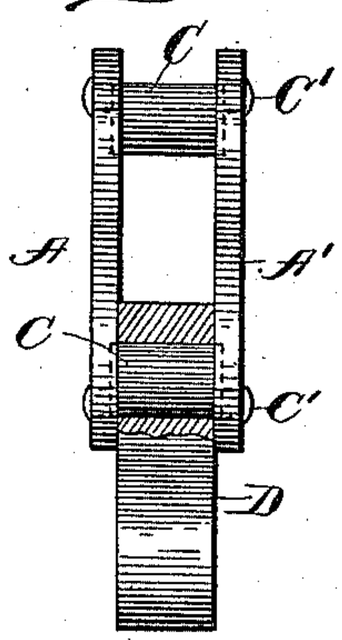

Fig. 3.

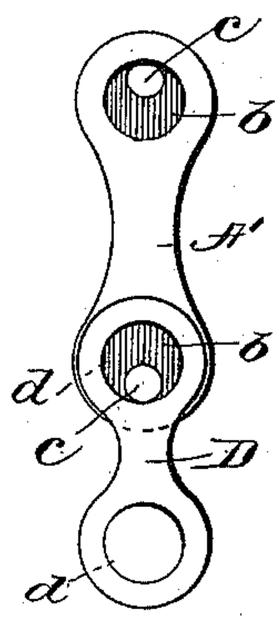

Fig. 4.

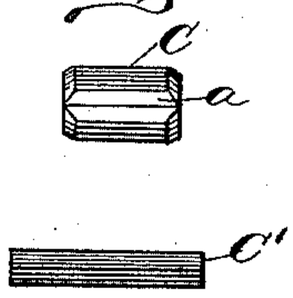

Fig. 4a.

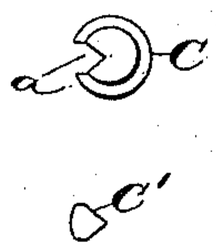

Fig. 5.

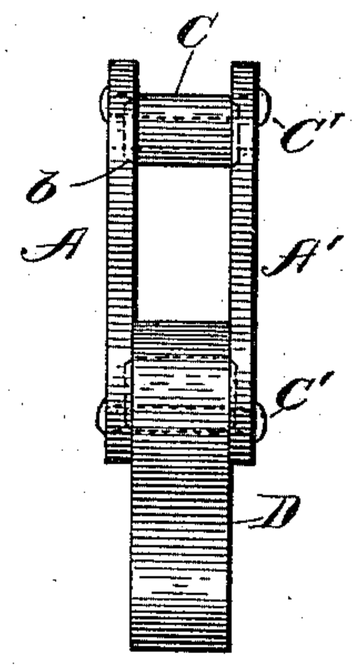

Fig. 6.

Witnesses:
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Inventor:
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UNITED STATES PATENT OFFICE.

JOSEPH C. HAUGER, OF SHEPHERDSTOWN, WEST VIRGINIA.

SPROCKET-CHAIN.

SPECIFICATION forming part of Letters Patent No. 581,988, dated May 4, 1897.

Application filed August 13, 1896. Serial No. 602,623. (No model.)

To all whom it may concern:

Be it known that I, JOSEPH C. HAUGER, a citizen of the United States of America, residing at Shepherdstown, in the county of Jefferson and State of West Virginia, have invented certain new and useful Improvements in Sprocket-Chains; 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.

Reference is made to the accompanying drawings, forming a part of this specification, in which—

Figure 1 shows side views of my improved pivot formed in two pieces or parts C and C′, and Fig. 1ª shows end views of the same. Fig. 2 is an elevation, partly in section, showing a portion of the sprocket-chain assembled, comprising two adjacent links. Fig. 3 is an inside view of the links A′ and D, showing the apertures and countersinks, the outside link A and the pivots being removed. Figs. 4 and 4ª illustrate a modification of the two-part pivot. Fig. 5 is an elevation of a portion of the assembled chain, showing the same modification as Fig. 4. Fig. 6 is a modification showing an end view of pivot C in another form.

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

In the said figures, A A′ are the side links.

C is the wearing portion of the pivot. C′ is the riveting portion of the same, and D is one of the intermediate or auxiliary links.

a is the channel, provided in the portion C for the reception of the riveting portion C′.

b is the countersink, provided in the side link for the reception of the extremity of the pivot C.

c c are the apertures, formed in the side links for the reception of the riveting portion C′ of the pivot.

d d are the apertures, formed in the auxiliary links D for the reception of the entire pivot C C′.

My invention relates to improvements in sprocket-chains, particularly that species of chain now extensively used on bicycles and similar vehicles propelled by the rider. These chains are subjected to great strain and wear by reason of the severe usage to which they are subjected, and being required to be of extreme lightness they must necessarily be made in the most perfect manner consistent with a reasonable cost. The parts most subjected to wear are the auxiliary links D, both where they encounter the sprocket-wheels and in the parts which turn on the pivots. The pivots also are subjected to great friction and wear on the turning surfaces. Both the auxiliary links and the pivots accordingly have been made very hard on the wearing-surfaces to meet these demands; but a difficulty arises in the case of the pivots, which require to be riveted into the side links, but which riveting cannot be accomplished in an integral pivot after the whole has been hardened, the hardening process rendering the tenons brittle and incapable of being upset or headed down in the process of riveting. My improvement is designed to remedy this difficulty without material increase of cost. To this end I make the pivots in two parts C C′, as illustrated in the several figures of the drawings.

The part C, which is the pivot proper and which takes the wear, is made cylindrical, of a diameter to fit accurately the aperture in the auxiliary link D, which turns upon it, and of a length sufficient to accurately fit the requisite space between the side links A A′ with the countersunk depression added. This portion C has no function in holding the parts together, that function being relegated to the rivet portion C′. The said portion C is designed, mainly, to take the wear, and to that end is made extremely hard over its cylindrical or wearing surface. Before being hardened, however, it is perforated or channeled, as illustrated at *a*, for the reception of the rivet portion, which conforms to the shape of the perforation or channel and rests therein when the chain is assembled. This channel or perforation may be of any desired shape in cross-section, either round, oval, or polygonal, as preferred; but in all cases it is eccentric in relation to the axis of the cylinder, for reasons which will presently be explained.

The pivot C may be made of any suitable material which is of sufficient strength and hardness, usually of wrought, rolled, or drawn

iron or steel of good quality, and preferably cut from cylindrical rods into blanks of the proper length.

When made of iron, the blank is prepared, as in the process known as "case-hardening," by being placed in a muffle closely packed in pulverized carbonaceous material, such as ivory blank, bone-black, or any suitable animal, vegetable, or mineral charcoal in pulverulent form, and highly heated therein for a period of time sufficient to carbonize the surface to a suitable depth, so that when suddenly chilled from the highly-heated condition the carbonized surface takes on a high degree of hardness. At some period before hardening, however, the blank should be channeled as aforesaid and properly finished, as it is easier to work in the soft condition. When made of steel, the steps are the same except that no case-hardening of the surface is necessary, the steel containing a sufficient amount of carbon throughout its substance to be hardened.

The rivet portion C′ is ordinarily made of good rolled or drawn iron or steel of the proper cross-sectional form and size to fit the channel in the pivot portion C and cut to the proper length. It may, however, be of any material or metal suitable for rivets, such as good hard rolled or drawn brass, as its function is not to take the wear or a considerable portion of the strain, but simply to retain and bind the parts together firmly against spreading when assembled in the chain, being upset in the apertures *c c* or headed down on each side, where it projects beyond the side links through the said apertures a sufficient distance for the purpose. This rivet portion should be of similar form in cross-section to that of the channel in the portion C and substantially fit the same, though this is not absolutely necessary. The two, when assembled, form a perfect cylinder, the rivet portion completing the cylindrical outline where it was cut away in the channeling process.

The auxiliary link D is made of any material capable of assuming the requisite hardness in all parts, usually steel. It may be integral or formed of a number of similar parallel plates assembled together and separately hardened, if desired. The side links A A′ are made of any suitable material, of the usual form, and all counterparts of each other. They are countersunk on the inner sides to receive the pivot ends, as shown at *b* in the drawings, Fig. 3, and are perforated, as at *c*, eccentrically to the countersink to receive the rivet portion C′, which is always located eccentrically in the pivot portion C. The object of this eccentric location will now be stated. The frictional wear upon the pivot portion C as the auxiliary link D turns upon it under great tension tends powerfully to rotate it in its bearings in the countersunk sockets of the links A A′, and would do so were the rivets C′ located concentrically with the axis of the pivots unless otherwise prevented, thus transferring the friction from its destined place between the hard surfaces of the pivot portion C and the aperture of the hard link D to the soft rivet portion C′; but by locating the rivet C′ eccentrically in the pivot C such rotation is impossible, being resisted by reaction between the rivets and the walls of the countersinks *b*. It is obvious, therefore, that the eccentric seat of the rivet C′ in the pivot C need not be a mere channel, except for economy of construction, since any eccentric passage whatever for the rivet in the pivot is the full functional equivalent of the channel. In Fig. 6 I have illustrated a form of eccentric passage which does not reach the surface. Since, however, the farther from the axis the better to resist the circular strain I prefer in practice to make the passage close to or in the actual circumference. The said rivet-passage need not even be parallel with the axis of the pivot, since it might subserve its function by crossing the said axis and passing diagonally through the pivot, but this involves less economy in construction. It is obvious that the eccentric passage or channel should be located away from the wearing side of the pivot, which, on account of the strain, is on the inside of the pivots where they face the sprocket-teeth, and this location is shown at *c*, Fig. 3.

The countersink *b* may be of any form of cross-section deemed convenient, and I have illustrated a second form in Fig. 5, but the square-shouldered form is the most efficient in practice. In any modification the pivot should be made to conform in shape thereto, as shown in Figs. 4 and 5. The depth of the countersink in the conical form (shown in Fig. 5) is also immaterial, and it may even reach the other side provided it does not interfere with the secure fastening of the portion C′ in its eccentric bearings.

I claim as my invention and desire to secure by Letters Patent—

1. In a pivot for sprocket-chains, the combination of a pivot-cylinder, hard upon its exterior, eccentrically perforated or channeled from end to end for the reception of a rivet, and a rivet portion of metal capable of being upset, headed or riveted, accurately fitting the said perforation or channel, and projecting at each end of the hardened portion a suitable distance to form tenons or rivets for assembling in the formation of the chain, substantially as specified.

2. A sprocket-chain comprising side links A A′, countersunk on the inner faces as at *b*, to form seats for the cylindrical pivots, eccentrically perforated within the countersinks as at *c* for the reception of the rivet ends, hard auxiliary links D, and compound pivots C C′, having wearing cylindrical portions C with hard surfaces, eccentrically perforated or channeled from end to end, and rivet por-

tions C′ formed of material capable of being upset, headed or riveted, located in the said perforations or channels, and projecting through the side links, and therein secured, substantially as specified.

3. In a sprocket-chain, the combination of side links A A′, countersunk on the inner faces and eccentrically perforated within the countersinks, auxiliary links D, hard on the wearing-surfaces, and compound pivots C C′, comprising cylindrical pivot portions, eccentrically perforated or channeled from end to end, fitted on their extremities to the countersinks *b*, and rivet portions of soft metal, fitted to the perforations or channels of the pivot-cylinders, extending beyond the latter to form rivet ends in the side links A A′, and located externally with relation to the sprocket-tooth space between the pivots, substantially as specified.

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

JOSEPH C. HAUGER.

Witnesses:
JOHN W. HART,
J. Q. FLEMING.