(No Model.) 2 Sheets—Sheet 1.

L. M. COTTLE.

METHOD OF MAKING VELOCIPEDE FRAMES.

No. 414,194. Patented Nov. 5, 1889.

Fig. 1.

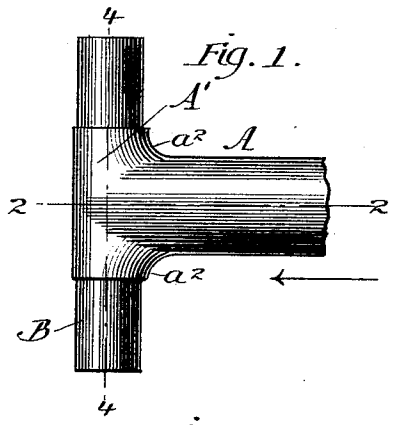


Fig. 2.

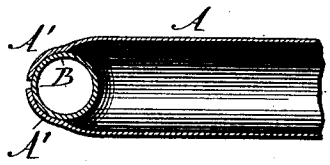


Fig. 3.

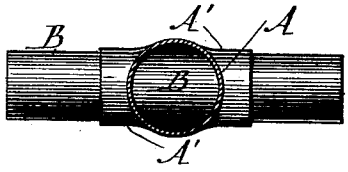


Fig. 4.

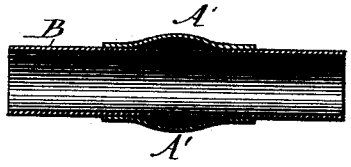


Fig. 6.

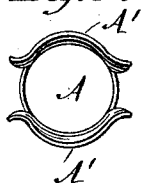


Fig. 5.

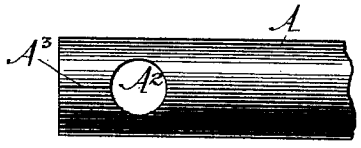


Fig. 7.

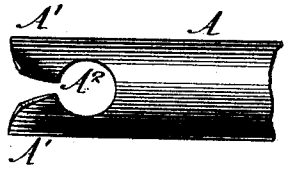


Fig. 8.

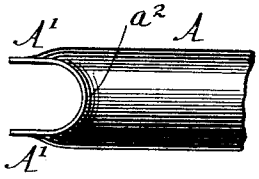
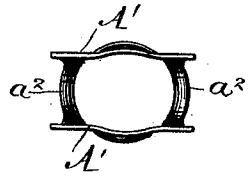


Fig. 9.



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Their Attorneys.

(No Model.) 2 Sheets—Sheet 2.

L. M. COTTLE.

METHOD OF MAKING VELOCIPEDE FRAMES.

No. 414,194. Patented Nov. 5, 1889.

Fig. 10.

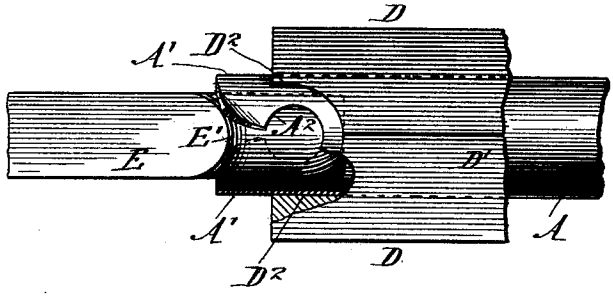


Fig. 11.

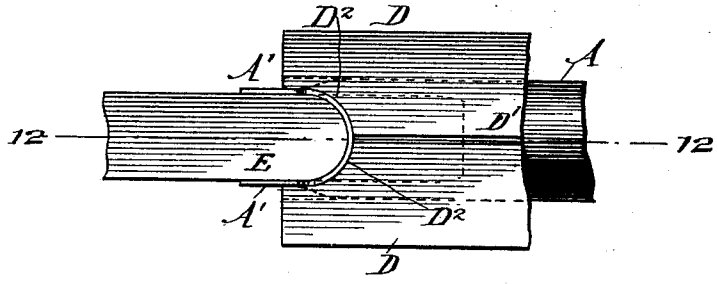
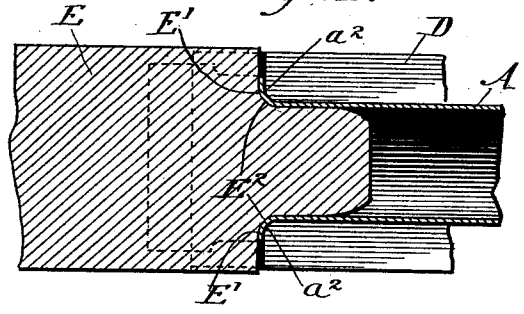


Fig. 12.



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UNITED STATES PATENT OFFICE.

LUTHER M. COTTLE, OF CHICAGO, ILLINOIS, ASSIGNOR TO THOS. B. JEFFERY AND R. PHILLIP GORMULLY, OF SAME PLACE.

METHOD OF MAKING VELOCIPEDE-FRAMES.

SPECIFICATION forming part of Letters Patent No. 414,194, dated November 5, 1889.

Application filed March 6, 1889. Serial No. 302,188. (No model.)

To all whom it may concern:

Be it known that I, LUTHER M. COTTLE, a citizen of the United States, residing at Chicago, county of Cook, and State of Illinois, have invented a certain new and useful Process of Forking and Joining Tubular Metal, which is set forth in the following specification, reference being had to the accompanying drawings, forming a part thereof.

In the drawings, Figure 1 is a plan of a joint formed by the process which constitutes this invention. Fig. 2 is a section through the same at the line 2 2 on Fig. 1. Fig. 3 is an elevation of the same as seen looking in the direction of the arrow marked 3 on Fig. 1. Fig. 4 is a section at 4 4 on Fig. 1. Fig. 5 is a side elevation of a piece of tubular metal upon which the first step of my process has been performed. Fig. 6 is an end elevation, and Fig. 7 is a side elevation, of the same piece of metal after the second step has been performed. Fig. 8 is a side elevation, and Fig. 9 is a plan, of the same piece of metal after the next succeeding step is completed. Fig. 10 is a partly-sectional side elevation of the tubular endwise-abutting part in the dies in which it is formed, the punch which assists in forming it being shown partly entered, the process being at the second stage illustrated in Fig. 8. Fig. 11 is a side elevation of the same parts in the position occupied at the instant of completing the stage of the process illustrated in Fig. 8. Fig. 12 is a section at the line 12 12 on Fig. 11.

This invention is particularly applicable to and especially useful in the manufacture of frames of light machinery, and especially vehicles—such as velocipedes—wherein great rigidity is necessary, and wherein extreme lightness is desirable. In making such frames heretofore it has been customary to form the junctions of the several pieces of tubular metal which are employed in making up the frame by means of forgings of solid metal provided with suitable lugs or projections, to which the tubular metal parts are fitted and united by brazing or equivalent process. These forgings require to be accurately machined, and, besides the expense of forming them, are objectionable on account of the weight which they add to the structure on account of their solidity. My process dispenses with the necessity of such forgings by providing a method of joining the tubular metal parts directly to each other, so that the junction is as strong as any other part of the frame in proportion to the strain to which it is subjected.

Nearly all joints or junctions between two pieces of tubular metal constituting such a frame may by a little contriving be made to take the form of the abutment of one piece endwise against the side of another piece; and my process relates to a joint having that characteristic, the endwise-abutting piece being tubular, the other piece being of any form, tubular or solid.

The joint when finished has the appearance illustrated in Fig. 1, the endwise-abutting piece A being forked endwise, forming lugs A′, which clasp the transverse piece B. The process of forming this joint involves, therefore, the subordinate process of forking the endwise piece preparatory to clasping its forks or lugs about the transverse piece to perfect the joint.

The process consists, first, in cutting two opposite holes A^2 through the shell of the tube at a short distance from one end, and then splitting the tube longitudinally from the holes, respectively, to that end, thus dividing the tube from the holes to the end into two forks, which as yet, however, are not spread.

The second step consists in spreading the forks A′ thus formed by folding the edges of the slits A^3 outward. This is accomplished most conveniently by means of a punch, which will be hereinafter described in connection with the die with which it operates at subsequent stages of the process.

The next step consists in stretching and thereby flaring the metal about the margin of the holes A^2, continuing this process, which, it will be observed, tends to further spread the forks and also to flatten them until the forks at the ends are substantially flat and the opening between them—ending at the two sides in the stretched and flared margin of the holes A^2—is of suitable size to receive the

transverse bar B. The form of the part A at this stage is illustrated in Figs. 6 and 7. The size of the holes A^2 will be greater or less, according to the size of the bar B, the ductility of the metal being also considered, for it will be observed that when the margin of the holes has been stretched until the form shown in Fig. 7 is attained almost the entire circumference of the hole A^2 is expanded and spread into an open curve, which is to fit and receive the bar B, and, as will appear from the further description, this open curve should half encircle the piece B when the latter is placed between the forks A'. The size of the hole A^2 will therefore be such that its circumference, when it has been stretched such degree as the ductility of the metal renders prudent or will permit without rupture, will extend so far as described about the piece B.

The next step in the process consists in placing the transverse piece B in the seat or shoulder thus provided for it by the process thus far described performed upon the tubular part A, said seats or shoulders being the flared margins a^2 of the holes A. Being thus placed, the forks A' clasp and may be folded down around the part B, and the two parts may then be securely brazed together. The shoulders or seats a^2 are advisedly broad enough—that is to say, the stretching of the margin of the holes A^2 is carried to such an extent—that there may be contact obtained between said shoulders and the transverse part B equal to at least three times the thickness of the metal of the tubular part A, the joint thus formed being as strong, if it has the extent stated, as any other part of the tube A.

I employ in performing this process, after the step of cutting the holes A^2 and making the slits A^3 therefrom, the two-part die D D and the punch or counterpart E. This die and punch are operated in mechanism of well-known construction, which is not herein shown, the movements only of said parts being hereinafter stated. The tube A, after being perforated with the holes A^2 and slits A^3, is placed between the two members D D of the die, which advance upon it and clasp it firmly by their rear portion D' a little back of the holes A^2. While it is thus held the punch E advances toward the protruding divided end. This punch is of suitable size to enter the tube A even before the latter is at all spread, and it tapers back from its point, so that as it advances it spreads open the forks A'. The slits A^3, being thus opened at the end, admit the round shoulders E' E' of the punch as it continues to advance, and said shoulders, as the punch moves on, spread the forks A. The upper and lower faces D^2 D^2 of the die limit the spreading of the forks A', and as the punch advances the shoulders E', which are rounded to substantially the form of the pipe B which is to be joined and which merge in the tongue or central part of the punch by curves forwardly concave as they collide with the margins of the holes A^2, tend to open up the same both by spreading the curved margin in the direction of the plane of the original opening, and also by flaring the metal outward, this latter being effected by the concave portions E^2 of the punch. This process continues as the punch advances until the metal thus stretched is conformed to the shoulders D^3 of the die, which correspond in outline to the shoulders E^2 of the punch, between which shoulders the seats a^2, formed by the stretched and flared margin of the holes A, as hereinabove described, are finally completely formed. The punch then withdrawing and the die opening, the part A is ready to be joined to the part B, as already described.

I do not confine myself to the particular mechanism shown and described for thus forming the part A, nor to making the fork ends long enough to fold around the transverse piece; but

I claim—

1. The process of making a joint between two pieces of metal, one of which is tubular and abuts endwise against the other piece, which consists in cutting away portions of metal to form two opposite holes in the tubular piece at a short distance from one end thereof, splitting the tube longitudinally from such holes, respectively, to the end to render it forked, spreading apart the forks thus formed by folding the edges outward to get access longitudinally to the holes, and by means of suitable dies stretching and thereby flaring outwardly the metal around the margin of the holes and simultaneously spreading the forks until the opening between them will admit the piece to be joined, and then inserting such piece transversely to the tubular piece, causing it to rest upon the flared margin of the holes between the fork ends, and brazing or otherwise securing the two pieces together as thus placed, substantially as set forth.

2. The process of forking a piece of tubular metal, which consists in first cutting away portions of the metal to form two holes in the shell at a short distance from the end; second, splitting the tube from the holes, respectively, to the end; third, spreading the forks thus formed by folding the edges outward, and, fourth, stretching and flaring the margin of the holes, and thereby further spreading the forks and partially flattening the same, substantially as set forth.

In testimony whereof I have set my hand, in the presence of two witnesses, at Chicago, Illinois, this 22d day of February, 1889.

LUTHER M. COTTLE.

Witnesses:
H. M. DUNLOP,
N. G. HARRIS.