PATENT SPECIFICATION

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PROVISIONAL SPECIFICATION
No. 4578 A.D. 1949.

Improvements in, and in the Method of Manufacture of, Cycle Frames

We, WALTON AND BROWN LIMITED, a Company registered under the laws of Great Britain, of Phoenix Works, Downing Street, Handsworth, Birmingham, 21, do hereby declare the nature of this invention to be as follows:—

This invention relates to tubular cycle frames, and the object of the invention is to provide a cycle frame of an improved and strong construction, and of an attractive appearance, which may be cheaply manufactured.

Cycle frames hitherto constructed usually comprise junction-pieces, consisting of corner lugs and a bottom-bracket shell, having sockets which receive, and fit around, the ends of main tubular members of the frame. A frame of this construction necessitates brazing or otherwise securing the tube ends within the sockets, and there is usually left a small clearance, on the inside, between the root ends of the sockets and the extremities of the respective ends of some of the tubes, which feature may be regarded as undesirable. Also, difficulty is generally experienced in fitting the tube ends into the sockets of the last junction-piece which is to be assembled. Moreover, when it is desired to cut away the sockets of the lugs, in cycle frames made up in this manner, to provide "feature cuts," the shaping of such sockets involves a separate time-consuming operation and adds to the cost of production.

The present invention avoids the above disadvantages, and according to the invention a cycle frame comprises a junction-piece having a tubular part, and an adjacent tubular member, the said tubular part and adjacent tubular member being secured together end to end by welding preferably flash butt welding. Thus, the cycle frame may comprise main tubes connected together by a plurality of junction-pieces, one of which consists of a bottom-bracket shell, the junction-pieces having tubular parts suitably disposed to abut against the adjacent main tubes end to end, the abutting ends being united together by welding. To provide strong joints at the corners the walls of the said tubular parts of the junction-pieces are of a thickness equal to, or greater than, the combined thicknesses of lug and frame tube in the normal construction employing socket-type lugs, whilst the extremities of the said tubular parts are reduced to the same thickness and diameter as the ends of the main tubes to which they are to be welded.

Also, according to the invention, a cycle frame is formed in two main parts each comprising a main tubular member or members welded, preferably flash-butt welded, to the tubular ends of hollow junction-pieces, one of which is formed by one longitudinal half or part of a bottom-bracket shell, the cycle frame being completed by bringing the edges of the two said main parts of the frame together and uniting them by flash-butt-welding.

Further, according to the invention, a junction-piece, for use in the manufacture of a cycle frame made in the manner described in either of the last two preceding paragraphs, comprises a tubular part or branch with an integral outer end portion made thinner than the inner or main portion of the said tubular part or branch, to leave externally adjacent such thinner portion a raised-up edge, the said edge being shaped to any desired contour.

Thus, in carrying out the invention, as described in connection with a cycle frame having three main tubes namely a top cross-bar, disposed horizontally or at a suitable angle, and two converging down-tubes, the said main tubes are con-

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nected to junction-pieces by flash-butt-welding, instead of their ends fitting into sockets in junction-pieces, in known manner. Three of these junction-pieces are in the form of hollow angular tubular elements, and comprise top and bottom steering-head junction-pieces and a seat junction-piece, whilst the remaining junction-piece consists of a bottom-bracket shell. The latter is formed with two diverging tubular extensions whose upper end edges are arranged to abut against the lower end edges of the two down-tubes. The seat junction-piece and the top and bottom steering-head junction-pieces each comprise two integral tubular parts disposed at a suitable angle to one another, according to the disposition of the main tubes to which the junction-pieces are to be connected, but tubular parts of the seat and head junction-pieces, and the tubular extensions of the bottom-bracket shell, which are to be connected to the main tubes, are of the same diameter and thickness as the said main tubes, so that the end edges of the latter may be brought into abutting relationship with the end edges of the respective parts of the said junction-pieces and bottom bracket shell. The top and bottom steering-head junction-pieces have integral branch tubes extending at suitable angles from tubular front parts, which are made longer than usual, the opposed ends of these tubular front parts being adapted to abut together, so that they form the head-tube of the cycle frame, without any intermediate part. The branch tubes of the said top and bottom steering-head junction-pieces on the other hand, are arranged to abut respectively against the forward end of the main top tube and the forward end of the front main down-tube.

The inner or main portions of the walls of the tubular parts or branches of the hollow steering-head and seat junction-pieces may be of a thickness equal to, or greater than, the combined thicknesses of lug and main tube in the normal construction employing socket-type lugs, so that whilst the outer ends of these tubular parts or branches which abut against the main frame-tubes are left the same thickness as the latter, being both internally and externally of the same diameter, they are thinner than the inner or main portions of the tubular parts or branches of which they are integral parts, leaving adjacent each thinner portion a raised-up or shouldered edge. This edge may be shaped to any desired contour, to provide "feature cuts." Similarly, the outer end portions of the tubular extensions of the bottom-bracket shell whilst being of a thickness equal to that of the main tubes, and of an equal diameter, may be thinner than the inner parts of such tubular extensions, leaving external raised or shouldered edges which may be shaped as desired. External raised or shouldered edges may also be left, if desired, around the opposed end portions of the front tubular parts of the steering-head junction-pieces.

The bottom-bracket shell is divided vertically into two longitudinal halves, in accordance with the invention described in the Specification of our Patent Application No. 1537/48, each half carrying one of the tubular extensions which is to abut against one of the down-tubes.

In assembling the parts of the frame, the upper and lower ends of the rear down-tube are flash-butt-welded respectively to the lower tubular end of the seat junction-piece and to the upper end of the tubular extension of the rear half of the bottom-bracket shell. The opposed ends of the top and bottom steering-head junction-pieces are flash-butt-welded together and the front-down tube is flash-butt-welded at its upper and lower ends respectively to the end of the branch tube of the bottom steering-head junction-piece and to the end of the tubular extension of the front half of the bottom-bracket shell. The one end of the top tube is then flash-butt-welded to the adjacent end of the branch tube either of the top steering-head junction-piece or of the seat junction-piece. The cycle frame is now in two main parts, each of which carries one half of the bottom-bracket shell, and these two parts are now brought together to cause the end of the top tube on the one part to approach the opposed end edge of the junction-piece on the other part, and so that the edge of the one half of the bottom-bracket shell approaches the opposed edge of the other half of the latter, the opposed edges of the parts being united together by flash-butt-welding.

Instead of the cycle frame being made up initially to form two main parts secured together in the above manner, the several elements of the frame may be secured together, preferably by flash-butt-welding, in any desired order.

The top tube may be horizontal or disposed at any suitable angle, and in the case of cycle frames for ladies' machines it may be flash-butt-welded at its rear end to the end of a junction-piece carried by the rear down-tube below the seat junction-piece.

If desired, the front tubular parts of the steering-head junction-pieces may be made shorter, and their ends may be flash-

butt-welded to the ends of an intermediate tube, instead of the said parts of the steering-head junction-pieces being directly welded together, as described.

The parts of the cycle frame may be of steel, or of any other suitable metal or metal alloy which allows the parts to be joined together by welding.

Dated this 18th day of February, 1949.

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PROVISIONAL SPECIFICATION
No. 4579 A.D. 1949.

Improvements in, and in the Method of Manufacture of, Cycle Frames

We, WALTON AND BROWN LIMITED, a Company registered under the laws of Great Britain, of Phoenix Works, Downing Street, Handsworth, Birmingham, 21, do hereby declare the nature of this invention to be as follows:—

This invention relates to steering-heads for cycle frames. Hitherto, such steering-heads have comprised top and bottom lugs connected together by a separately-formed intermediate part in the form of a tube passing up into or through the lugs, and the object of the present invention is to provide a steering-head of a simpler form which may be cheaply manufactured and which dispenses with the necessity for a separate connecting part between the lugs, and which, at the same time, is of a strong and rigid construction.

According to the invention, a steering-head for a cycle frame comprises top and bottom lugs or junction-pieces having opposed tubular end portions drawn out or extruded to the lengths required to form the middle portion of the steering-head, the ends of the said drawn-out or extruded portions abutting together and being secured by welding, preferably flash-butt welding. The walls of the two lugs or junction-pieces are of sufficient thickness to permit of the opposed end portions being drawn out to the extent required, depending on the size of the cycle frame.

In carrying out the invention, the improved cycle frame steering-head comprises top and bottom lugs, each having an open-ended, substantially vertical, main tubular portion, with a branch tube arranged at an angle thereto, the two main tubes, which are of a circular section, being disposed in axial alignment, with the branch tubes suitably disposed to receive, or for connection to, the top and down tubes, or (in the case of a lady's machine) two down tubes, of the cycle frame. Instead, however of the opposed ends of the aligned main tubular portions of the top and bottom lugs of the steering-head being connected together by a separate tube to form the middle portion of the steering-head, the said opposed ends are formed, for example, by a drawing process, with integral tubular extensions of such lengths that the outer extremities of the drawn-out portions will meet at the centre of the steering-head, thereby avoiding the necessity for a separate intermediate part. The opposed ends of the main tubes of the two lugs may be drawn out, by suitable tools, to similar lengths, the lengths of such drawn-out portions depending on the size of the cycle frame, that is on the desired distance between the branch tubes of the two lugs.

To permit of the opposed end portions of the two main tubular parts of the top and bottom lugs being drawn out to the lengths required, according to the size of the frame, the walls of the said opposed end portions are sufficiently thick initially to permit of the drawing operation or operations necessary to provide the required tubular extensions. These drawn-out tubular extensions may be of external diameters smaller than the external diameters of the main tubular portions of the top and bottom lugs, leaving annular external shoulders around the opposed ends of the said main tubular portions, so that the improved steering-head has an appearance resembling the usual construction employing socket type lugs and an intermediate connecting tube. After the main tubes of the two lugs have been drawn out to the extent required, the ends of the drawn-out extensions are united together by flash-butt welding, thereby completing the formation of the steering-head. If desired, the edge of the shouldered portion may be fashioned to any required shape to provide "feature cuts."

The top and bottom lugs or junction-pieces may be formed in any suitable way, provided they may be extruded or drawn out to the extent required.

By providing initially a sufficient

thickness in the walls of the main tubular parts of the two lugs or junction-pieces, lugs or junction-pieces of the same pattern and size, and produced from standard blanks by the same tools, may be used in the manufacture of cycle frames of different sizes, the only difference being that the thickened parts are extruded or drawn out to a greater extent for larger frames. The cost of production is consequently decreased.

Dated this 18th day of February, 1949.
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COMPLETE SPECIFICATION

Improvements in, and in the Method of Manufacture of, Cycle Frames

We, WALTON AND BROWN LIMITED, a Company registered under the laws of Great Britain, of Phoenix Works, Downing Street, Handsworth, Birmingham, 21, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

This invention relates to tubular cycle frames, and an object of the invention is to provide an improved and cheaper method of manufacturing a cycle frame, or part of a cycle frame, which provides a frame, or frame part, of a strong construction, and of an attractive appearance. A further object is to provide an improved method of manufacturing a cycle frame steering head.

Cycle frames hitherto constructed usually comprise junction-pieces, consisting of corner lugs and a bottom-bracket shell, having sockets which receive, and fit around, the ends of main tubular members of the frame. A frame of this construction necessitates brazing or otherwise securing the tube ends within the sockets, and there is usually left a small clearance, on the inside, between the root ends of the sockets and the extremities of the respective ends of some of the tubes, which feature may be regarded as undesirable. Also, difficulty is generally experienced in fitting the tube ends into the sockets of the last junction-piece which is to be assembled. Moreover, when it is desired to cut away the sockets of the lugs, in cycle frames made up in this manner, to provide " feature cuts," the shaping of such sockets involves a separate time-consuming operation and adds to the cost of production. The steering-heads of cycle frames have hitherto comprised top and bottom lugs connected together by a separately-formed intermediate part in the form of a tube passing up into the lugs.

Not only does the present method simplify the construction of the steering-head portion of the frame, and enable the steering-head to be more cheaply manufactured, but the difficulty in assembling the parts of the complete frame is avoided, and, according to the preferred form of the invention, the provision of sockets for receiving tubular frame members are entirely dispensed with.

According to the invention, a method of manufacturing part of a cycle frame comprising a tubular lug or junction-piece and a separately formed tubular part, consists in forming the said lug or junction-piece with an integral tubular branch by a pressing and/or drawing operation, and butt-welding the end of such pressed and/or drawn out tubular branch to the end of the separately-formed tubular part. The branch of the lug or junction-piece may be drawn out to any desired extent to form either a portion, or the whole, of the tubular part which, in a cycle frame, connects together two lugs or junction-pieces, and which has hitherto consisted of a separate tube. The drawn-out branches of two lugs or junction-pieces may, for example, be drawn out to form each substantially one half of such tubular part, the two drawn-out branches being disposed in axial alignment and having their opposed ends secured directly together by electric resistance butt-welding; or, if desired, the drawn-out parts of two lugs or junction-pieces may be butt-welded to the opposite ends of a separate tube. The complete frame may be formed initially in two separate main parts, each comprising at least two junction-pieces joined by a tubular part, and one of the junction-pieces of each separate main part of the frame consisting of one longitudinal part of a divided bottom bracket shell, the frame being completed by bringing the upper portions of the two said main frame parts, and the two parts of the bottom bracket shell, together and securing them by electric flash-butt welding or by electric percussion welding.

It has been suggested to connect the tubes of bicycle frames to angle-pieces by electric resistance welding of the faces of the parts, with simultaneous compression of the welding place, the latter being externally strengthened, such as by a sleeve. It has not been proposed, however, to butt-weld the ends of the tubes to the ends of pressed and/or drawn out tubular branches of angle-pieces.

Also, according to the invention, a cycle frame steering-head, comprising top and bottom lugs, is made by forming each lug with an integral tubular extension by a drawing operation, each extension being drawn out to such a length that the drawn-out parts, when aligned, together constitute the tubular middle part of the steering-head; arranging the drawn-out extensions of the two lugs or junction-pieces in alignment and butt-welding their opposed ends together.

Figure 1 of the accompanying drawings represents a side elevation of a cycle frame constructed in accordance with this invention.

Figure 2 is an elevational view showing two portions of the partly completed frame before the final welding operation.

Figure 3 is a cross-section on the line III—III, Figure 1.

Figure 4 represents, upon a larger scale, a sectional view of the separated frame elements, prior to welding.

Figure 5 is a sectional view of the top steering-head lug, after the drawing operations, upon a larger scale.

Figure 6 is a perspective view showing how the lugs may be made initially in two parts.

Figure 7 shows how the drawn-out parts of the lugs or junction-pieces may be shaped to provide "feature-cuts."

Figure 8 is a cross-section through the separate parts of a modified construction of cycle frame.

Figures 9 and 10 illustrate the preferred method of forming the top steering-head junction-piece, when it is to be drawn out to form substantially the entire top tube of the cycle frame.

Figure 11 shows the top steering-head junction-piece, formed in the manner illustrated in Figures 9 and 10, after it has been drawn out to form the top tube.

Figure 12 shows how the seat junction-piece may be formed when it is to be drawn out to form substantially the entire down-tube of the frame.

Figure 13 illustrates the seat junction-piece, formed as in the preceding figure, after it has been drawn out to form the down-tube.

Figure 14 illustrates another frame construction.

Figure 15 is a sectional view of the parts of a modified form of steering-head

Referring to Figures 1 to 5 of the drawings, the improved cycle frame comprises three main tubes, namely a top tube 1, disposed horizontally, and two converging down-tubes 2 and 3, and the said main tubes 1, 2 and 3 are connected to junction-pieces by butt-welding, instead of their ends fitting into sockets in junction-pieces, in known manner. Three of these junction-pieces are in the form of hollow angular tubular elements, and comprise top and bottom steering-head lugs 4 and 5 and a seat lug 6, whilst the remaining junction-piece 7 consists of a bottom-bracket shell. The latter is formed with two diverging tubular branches 8 and 9 which are drawn out to provide extensions 8^a and 9^a, the end edges of which are arranged to abut respectively against the lower end-edges of the two down-tubes 2 and 3 of the frame, being adapted to form parts of such frame tubes, when welded thereto, and being internally and externally of the same diameters. The seat lug or junction-piece 6 comprises a main tubular portion 6^a provided with a forwardly-extending drawn-out tubular branch 6^b, whilst the top and bottom steering-head lugs 4 and 5 comprise respectively a main tubular part, 4^a or 5^a, having a drawn-out tubular branch 4^b or 5^b disposed at a suitable angle thereto, according to the disposition of the tubes 1 and 2 to which they are to be connected. The tubular branches 4^b, 5^b and 6^b of the respective lugs are formed, during the drawing operation, with integral eqtension 4^c, 5^c, and 6^c, whilst an integral extension 6^d is also drawn out from the main part of the seat lug 6. The ends of these drawn out parts 4^c, 5^c, 6^c and 6^d, are subsequently butt-welded to the opposed ends of the respective frame tubes 1, 2 and 3, being of the same diameters as the latter, both internally and externally, so that they form virtually parts of these tubes after being brought into abutting relationship, in alignment, and welded together. The tubular front parts 4^a and 5^a of the top and bottom steering-head lugs or junction-pieces 4 and 5 are made longer than usual by a drawing operation to provide tubular extensions 4^d and 5^d respectively, and the opposed ends of these drawn-out parts are adapted to abut together, as shown, so that they form the middle portion of the head-tube of the cycle frame, without a separate intermediate part.

The inner portions of the walls of the main tubular parts and of the branches of the hollow steering-head and seat lugs 4,

5 and 6 are, as shown, thicker than the drawn-out extensions 4^e, 5^e, 6^e and 6^d, being of a thickness equal to the combined thicknesses of lug and main tube in the normal construction of cycle frame employing socket-type lugs, and leaving at the inner end of each extension 4^e, 5^e, 6^e and 6^d an annular external shoulder 10, whilst an annular external shoulder 12 is left at the inner end of each of the extensions 4^d and 5^d of the steering head lugs. Likewise the inner parts of the branches 8 and 9 of the bottom-bracket shell 7 are thicker than the tubular extensions 8^a and 9^a, leaving external shoulders 11.

The bottom-bracket shell 7 is divided vertically into two longitudinal halves 7^a and 7^b, each half carrying one of the tubular extensions or branches 8 or 9.

The branches 4^b, 5^b and 6^b of the steering-head lugs 4 and 5 and seat pillar lug 6 may be drawn out to any desired length, and to facilitate the drawing operations each lug is preferably formed initially in two pressings in the manner described and claimed in the Specification of our Patent Application No. 635,883. Figure 6 shows the two pressings from which the top lug 4 is formed, after the drawing out of the branch tube 4^b and extension 4^e. By forming the lugs or junction-pieces 4, 5 and 6, in this manner the branch tube may be readily drawn out to the length required, since the part of the lug from which it is to be drawn may be placed in a die and a drawing tool or mandrel may be readily introduced for the drawing operation. The same applies to the bottom bracket 7, since the latter being initially in two parts or halves does not hinder in any way the free insertion of the drawing tool. The parts 4^d and 5^d of the steering head lugs, and also the part 6^d of the seat lug are drawn out after the two parts or pressings of the respective lugs have been welded together, the drawing tool being inserted through the main tubular part of the lug. During the drawing of the branch tubes and of the main tubes of the lugs or junction-pieces the parts are held in suitable dies shaped to provide the shoulders 10, 11 and 12 at the outer ends of the inner thicker portions of the lugs or junction-pieces, and the edges of such thicker parts may be given any desired undulatory or other contour, such as is shown, by way of example, in Figure 7, to provide what are known as "feature-cuts."

By forming the junction-pieces or lugs initially in two parts or pressings, as stated, the parts may be made of any desired thickness, according to the extent to which the branch tube or the main tubular part of the lug or junction-piece is to be drawn out. The branch tubes may be formed by a pressing or drawing operation, or by a combined pressing and drawing operation.

In assembling the parts of the frame, the upper and lower ends of the rear down-tube 3 are united, by electric flash-butt welding, respectively to the lower end of the drawn-out part 6^d of the seat junction-piece and to the upper end of the tubular drawn-out part 9^a of the rear half 7^b of the bottom-bracket shell 7. The opposed ends of the drawn-out parts 4^d and 5^d of the top and bottom steering-head junction-pieces 4 and 5 are flash-butt-welded together and the front down-tube 2 is flash-butt-welded at its upper and lower ends respectively to the end of the part 5^c of the drawn-out branch tube of the bottom steering-head lug 5 and to the end of the drawn-out part 8^a of the tubular portion 8 of the front half 7^a of the bottom-bracket shell. The front end of the top tube 1 is then flash-butt-welded to the end of the part 4^c of the drawn-out branch tube 4^b of the top steering-head junction-piece 4. The cycle frame is now in two main parts, as shown in Figure 2, each part carrying one half of the bottom-bracket shell 7. These two parts are now brought together to cause the rear end of the top tube 1 on the one part to approach the opposed end edge of the tubular extension 6^c of the branch 6^b of the seat lug 6 of the other part, and so that the edge of the one half 7^a of the bottom-bracket shell 7 approaches the opposed edge of the other half 7^b of the latter, the opposed edges of the parts being united together by electric flash-butt-welding.

Instead of the cycle frame being made up initially to form two main parts secured together in the above manner, the several elements of the frame may be secured together, such as by electric flash-butt-welding, in any other desired order. Also, the parts may be united by electric percussion butt-welding, if desired.

In the frame construction illustrated in Figure 8 of the drawings the tubular parts or branches of the lugs or junction-pieces are drawn out to a much greater extent, to dispense with separate frame tubes. Thus, referring to this Figure, the branch 4^b of the top steering head lug 4 is drawn out to form the front half 1^a of the top tube of the frame, whilst the branch 6^b of the seat lug 6 is drawn out to form the rear half 1^b of the said top tube. Similarly, the branch 5^b of the lower steering head lug 5 is drawn out to form one half 2^a of the front down-tube, the other half 2^b of the latter being drawn out from the branch 8 of the front

part 7 of the bottom bracket. The branch 9 of the other part 7^b of the bottom bracket is drawn out to form the lower half 3^a of the rear down-tube of the frame, and the top half 3^b of the said rear down-tube is drawn out of the main tube of the seat lug 6. The steering-head tube is formed, in this arrangement, in the manner previously described. The opposed ends of the drawn-out tubular parts thus formed are finally united, such as by electric flash-butt or percussion welding.

If desired, the branch or tubular part of any lug or junction-piece may be drawn out to any desired length, the metal of the blank or pressing from which it is drawn being made of the necessary thickness. Where however, the lug or junction-piece is to form the whole, or substantially the whole, of a frame tube it is desirable to adopt a different method of making the junction-piece. The preferred method, in this case, is illustrated in Figures 9 to 13 of the drawings. In the case of the top steering-head lug or junction-piece 4 (Figures 9 to 11) the lug or junction-piece comprises initially three pressings namely a front pressing 4^c of an open-ended trough shape, and two rear pressings, each of which consists of a half-tube 4^g integral with a half-trough part 4^f. The two said rear pressings are secured together, such as by electric flash-butt welding, to provide a tubular branch 4^b of substantial length and thickness and carried by an open-ended trough part, as illustrated in Figure 10 of the drawings, the said branch forming part of the top tube of the frame. Before the front trough part 4^c is applied, this tubular branch 4^b of the other trough part is submitted to a drawing operation, being drawn out, in several passes, to the length illustrated in Figure 11, so that it then forms substantially the entire top tube 1 of the cycle frame. The shoulder 10 may be formed during this drawing operation, if desired. After the drawing out of the branch of the junction-piece to form the top tube, the trough-part 4^c is welded to the trough part of the drawn-out branch 4^b, the tube formed by two trough parts being then drawn out, if desired, to form the middle of the steering-head, whilst the outer end of the drawn-out top tube 1 is butt welded to the branch tube 6^b of the seat lug or seat junction-piece 6, or to a short drawn-out extension 6^c thereof. The seat lug or seat junction-piece 6 may be drawn out to form the whole, or substantially the whole, of the rear down-tube 3 of the cycle frame, and it may be formed initially from two parts or pressings shaped as shown in Figure 12, the one part or pressing comprising a half-tube 6^e and the drawn-out branch tube 6^b, and the other part or pressing (which may be of a composite structure formed in accordance with our Patent Application No. 635,884) comprising a half-tube 6^f having the ears 6^g. The two half-tubes 6^e and 6^f are brazed together, edge to edge, being secured, for example, by electric flash-butt welding, and the tube, thus formed, and which constitutes part of the down-tube, is then drawn out to form the remainder of the down-tube 3, as shown in Figure 13 of the drawings, the lower end of the said down-tube being welded to the appropriate branch tube of the bottom bracket. The bottom steering-head lug or junction-piece may be formed in substantially the same way as the top steering-head lug or junction-piece, namely in three pressings comprising a front trough part and two rear half-trough parts each integral with a half-tube, the two half-tubes being welded together in the same way to form a tubular branch of a sufficient length and thickness to enable it to be drawn out to form the front down-tube of the cycle frame, the lower end of which is butt-welded to the front branch tube of the bottom bracket shell.

Instead of the top and bottom steering-head lugs or junction pieces 4 and 5 being drawn out to abut together and form the entire head-tube of the cycle frame, as previously described, they may be made shorter, as illustrated in Figure 14, the ends of the drawn out portions 4^d and 5^d of the said junction-pieces being flash-butt-welded to the adjacent ends of an intermediate tube 13, which may be of any desired length; or a steering-head may be used having an intermediate tube fitting into sockets in the top and bottom lugs, in known manner.

In the steering-head constructions shown in Figure 15, the main tubular parts of the top and bottom lugs 4 and 5 are drawn out to provide extensions 4^d and 5^d which constitute the middle part of the head, these extensions being butt-welded together, as described, but the branch tubes 4^b and 5^b of the top and bottom lugs, are, in this case, in the form of sockets into which the frame tubes 1 and 2 of the cycle frame are fitted.

The top tube of the cycle frame may be horizontal or may be disposed at any suitable angle, and in the case of cycle frames for ladies' machines it may be flash-butt-welded at its rear end to the end of a junction-piece carried by the rear down-tube below the seat junction-piece.

The parts of the cycle frame may be of steel, or of any other suitable metal or metal alloy which allows the parts to be drawn out and joined together by welding.

~~Having now particularly described and ascertained the nature of our said invention, and in what manner the same is to be performed, we declare that what we~~ claim is:—

1. The method of manufacturing a part of a cycle frame comprising a tubular lug or junction-piece and a separately-formed tubular part, consisting in forming the said lug or junction-piece with an integral tubular branch by a pressing and/or drawing operation, and butt-welding the end of such pressed and/or drawn-out tubular branch to the end of the separately-formed tubular part.

2. The method of manufacturing part of a cycle frame comprising a pair of tubular lugs or junction-pieces, consisting in forming each lug or junction-piece by a pressing and/or drawing operation with an integral tubular branch, and butt-welding the pressed and/or drawn-out tubular branches of the two lugs or junction-pieces directly together, end to end, so that they together form a bar or tube of the frame.

3. The method of manufacturing part of a cycle frame comprising a pair of tubular lugs or junction-pieces and a separately-formed tubular member, consisting in forming each lug or junction-piece, by a pressing and/or drawing operation, with an integral tubular branch and butt-welding the ends of the said pressed and/or drawn out tubular branches to the opposite ends of the separate tubular member.

4. The method of manufacturing the steering-head of a cycle frame, comprising top and bottom lugs or junction-pieces, consisting in forming each lug or junction-piece with an integral tubular extension by a drawing operation, each extension being drawn out to such a length that the drawn-out parts, when aligned, together constitute the tubular middle part of the steering-head; arranging the drawn-out extensions of the two lugs or junction-pieces in alignment and butt-welding their opposed ends together.

5. The method of manufacturing part of a cycle frame, as claimed in claim 1 or 2, wherein the lug or junction-piece, or each lug or junction-piece, is formed from two welded-together parts, one having a tubular branch, as claimed and described in the Specification of our Patent Application No. 635,883, the tubular branch being drawn out to the length required prior to the welding together of the two parts of the lug or junction-piece.

6. The method of manufacturing part of a cycle frame, or a cycle frame steering-head, as claimed in any one of the preceding claims, wherein the end of the tubular branch of the lug or junction-piece, or of each lug or junction-piece, is joined to the adjacent tubular part by electric resistance-butt-welding, such as by electric flash-butt or electric percussion welding.

7. In a cycle frame having junction-pieces with drawn-out branches or extensions made as claimed in any one of the preceding claims, forming the cycle frame initially in two separate main parts, each comprising at least two junction-pieces joined by a tubular part, and one of the junction-pieces of each separate main part of the frame consisting of one longitudinal part of a divided bottom bracket shell, the frame being completed by bringing the upper portions of the two said main frame parts, and the two parts of the bottom bracket shell, together and securing them by electric flash-butt welding or by electric percussion welding.

8. A cycle frame or part of a cycle frame, or a cycle frame steering head, made according to the method claimed in any one of the preceding claims, wherein the branch of the lug or junction-piece, or of each lug or junction-piece, is externally of a stepped formation, having an outer part of an external diameter smaller than that of the inner part of the said branch, both parts being of the same internal diameters, and the outer part being of the same external diameter as the part to which it is welded.

9. A cycle frame, or part of a cycle frame, as claimed in claim 8, wherein the edge of the thicker inner part of the drawn-out branch of the lug or junction-piece is given an ornamental or undulatory contour during the drawing operation.

10. The method of manufacturing part of a cycle frame comprising a tubular lug or junction-piece and an adjacent tubular part, consisting in forming the said lug or junction-piece from sheet metal pressings and welding the pressings together edge to edge, the said pressings being so shaped and arranged that they provide, when welded together, a tubular part or branch which constitutes part of a frame tube; drawing out the said tubular part or branch to a greater length and butt-welding the end of such drawn-out part to the end of the aforesaid adjacent tubular part.

11. The method of manufacturing part

The parts of the cycle frame may be of steel, or of any other suitable metal or metal alloy which allows the parts to be drawn out and joined together by welding.

~~Having now particularly described and ascertained the nature of our said invention, and in what manner the same is to be performed, we declare that what we~~ claim is:—

1. The method of manufacturing a part of a cycle frame comprising a tubular lug or junction-piece and a separately-formed tubular part, consisting in forming the said lug or junction-piece with an integral tubular branch by a pressing and/or drawing operation, and butt-welding the end of such pressed and/or drawn-out tubular branch to the end of the separately-formed tubular part.

2. The method of manufacturing part of a cycle frame comprising a pair of tubular lugs or junction-pieces, consisting in forming each lug or junction-piece by a pressing and/or drawing operation with an integral tubular branch, and butt-welding the pressed and/or drawn-out tubular branches of the two lugs or junction-pieces directly together, end to end, so that they together form a bar or tube of the frame.

3. The method of manufacturing part of a cycle frame comprising a pair of tubular lugs or junction-pieces and a separately-formed tubular member, consisting in forming each lug or junction-piece, by a pressing and/or drawing operation, with an integral tubular branch and butt-welding the ends of the said pressed and/or drawn out tubular branches to the opposite ends of the separate tubular member.

4. The method of manufacturing the steering-head of a cycle frame, comprising top and bottom lugs or junction-pieces, consisting in forming each lug or junction-piece with an integral tubular extension by a drawing operation, each extension being drawn out to such a length that the drawn-out parts, when aligned, together constitute the tubular middle part of the steering-head; arranging the drawn-out extensions of the two lugs or junction-pieces in alignment and butt-welding their opposed ends together.

5. The method of manufacturing part of a cycle frame, as claimed in claim 1 or 2, wherein the lug or junction-piece, or each lug or junction-piece, is formed from two welded-together parts, one having a tubular branch, as claimed and described in the Specification of our Patent Application No. 635,883, the tubular branch being drawn out to the length required prior to the welding together of the two parts of the lug or junction-piece.

6. The method of manufacturing part of a cycle frame, or a cycle frame steering-head, as claimed in any one of the preceding claims, wherein the end of the tubular branch of the lug or junction-piece, or of each lug or junction-piece, is joined to the adjacent tubular part by electric resistance-butt-welding, such as by electric flash-butt or electric percussion welding.

7. In a cycle frame having junction-pieces with drawn-out branches or extensions made as claimed in any one of the preceding claims, forming the cycle frame initially in two separate main parts, each comprising at least two junction-pieces joined by a tubular part, and one of the junction-pieces of each separate main part of the frame consisting of one longitudinal part of a divided bottom bracket shell, the frame being completed by bringing the upper portions of the two said main frame parts, and the two parts of the bottom bracket shell, together and securing them by electric flash-butt welding or by electric percussion welding.

8. A cycle frame or part of a cycle frame, or a cycle frame steering head, made according to the method claimed in any one of the preceding claims, wherein the branch of the lug or junction-piece, or of each lug or junction-piece, is externally of a stepped formation, having an outer part of an external diameter smaller than that of the inner part of the said branch, both parts being of the same internal diameters, and the outer part being of the same external diameter as the part to which it is welded.

9. A cycle frame, or part of a cycle frame, as claimed in claim 8, wherein the edge of the thicker inner part of the drawn-out branch of the lug or junction-piece is given an ornamental or undulatory contour during the drawing operation.

10. The method of manufacturing part of a cycle frame comprising a tubular lug or junction-piece and an adjacent tubular part, consisting in forming the said lug or junction-piece from sheet metal pressings and welding the pressings together edge to edge, the said pressings being so shaped and arranged that they provide, when welded together, a tubular part or branch which constitutes part of a frame tube; drawing out the said tubular part or branch to a greater length and butt-welding the end of such drawn-out part to the end of the aforesaid adjacent tubular part.

11. The method of manufacturing part

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of a cycle frame comprising a tubular lug or junction-piece and an adjacent tubular part, consisting in forming the said lug or junction-piece of the frame from three metal pressings, one of an open-ended trough form and the other two each comprising a half-tube and a half-trough part; welding the two latter pressings together, edge to edge to form a trough part having a branch tube which constitutes part of a frame tube; drawing out the said tubular part or branch to a greater length; welding the trough-shaped pressing to the trough part having the drawn-out branch tube, edge to edge, and butt-welding the end of the drawn-out branch tube to the end of the aforesaid adjacent tubular part of the cycle frame.

12. The method of forming a cycle frame, or a cycle frame steering head, substantially as herein described with reference to the accompanying drawings.

13. A cycle frame, or a cycle frame steering head, made as herein described with reference to the accompanying drawings.

Dated this 13th day of December, 1949.
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