

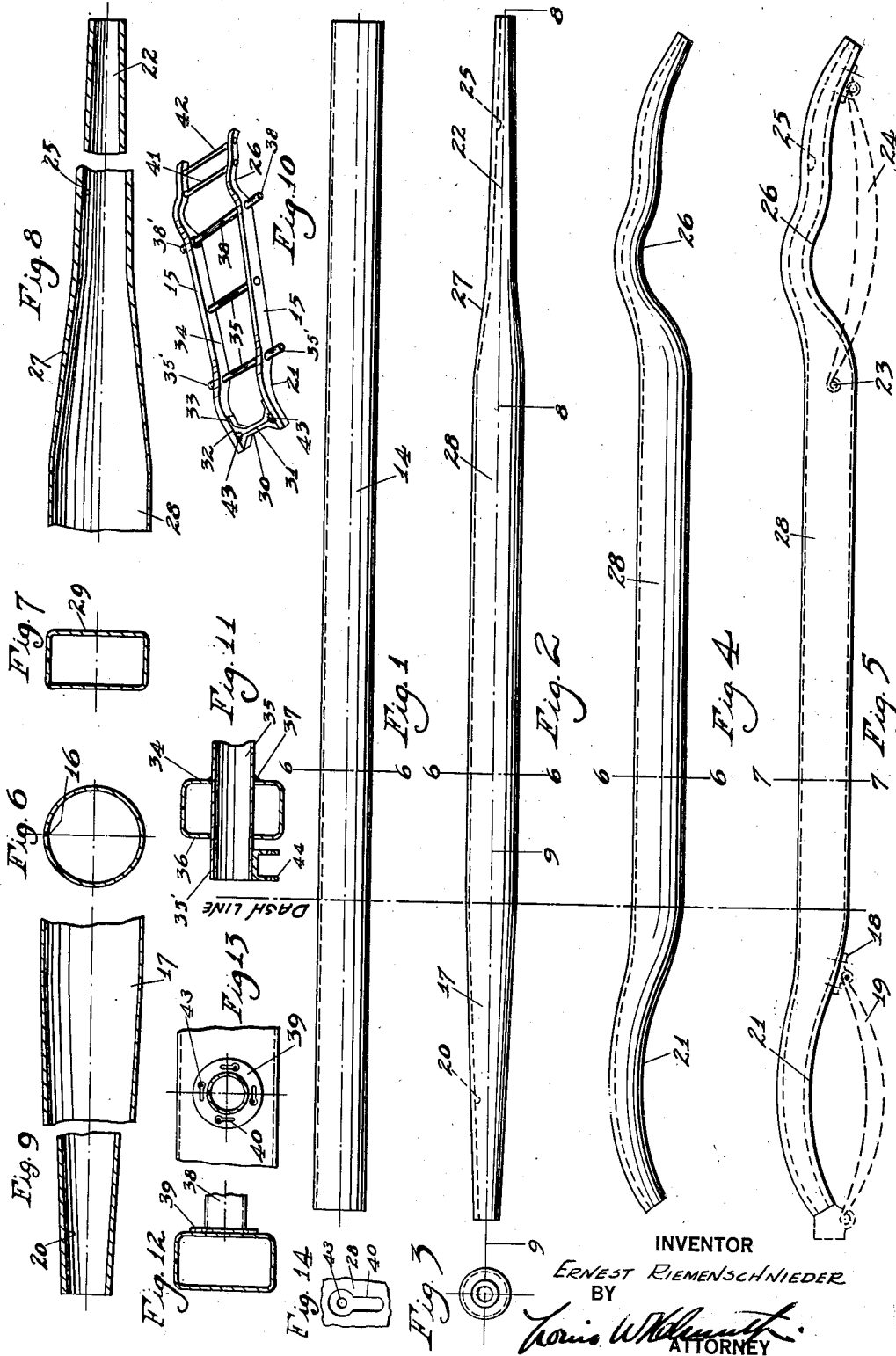
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METHOD OF MAKING AUTOMOBILE FRAMES

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METHOD OF MAKING AUTOMOBILE FRAMES

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This invention relates to new and useful im-
provements in the manufacture of automobile
frames and more particularly the type in which
the component parts are of tubular or box sec-
tion.

An important object of the invention is to
construct the side rails of automotive frames
from very light gauge tubular stock; the inven-
tion also comprehending the provision of kick-up
portions in the rails of less diameter than the
mid-section but possessing greater wall thick-
ness to better withstand loads and stresses inci-
dent to its use.

Another object of the invention is to provide
improved means for connecting cross members to
the tubular side rails.

A further object is to provide spring hanger
supports on the extended ends of certain cross
members.

A still further object is to provide a pressed
metal cross member of box section with means
providing box section joints with the side rails.

Other objects and advantages of the invention
will become apparent during the course of the
following description.

In the accompanying drawing forming a part
of the application and wherein like numerals are
employed to designate like parts throughout the
several views,

Fig. 1 is a side elevation of a length of tubular
stock employed in the formation of a side rail,

Fig. 2 is a top plan of the same illustrating the
first step of reducing the diameter of the ends and
increasing their wall thickness,

Fig. 3 is an end elevation of the same,

Fig. 4 is a side elevation of the side rails after
the ends have been bent to provide the kick-up
portions,

Fig. 5 is a similar view showing the side rail
after the flattening step to provide a true closed
box section, with the springs shown in dotted
lines to illustrate their relative association with
the rails or frame,

Fig. 6 is a transverse section taken on the lines
6—6 of Figs. 1, 2 and 4.

Fig. 7 is a transverse section taken on the line
7—7 of Fig. 5,

Fig. 8 is a longitudinal section taken at one end
of the rail along the line 8—8 of Fig. 2,

Fig. 9 is a similar section taken along the line
9—9 of Fig. 2,

Fig. 10 is a perspective view showing the pre-
ferred frame assembled,

Fig. 11 is a transverse section through the rail
and one end of a tubular cross member illustrat-

ing one way of attaching the cross members to
the side rails,

Fig. 12 is a similar section showing a modified
form of fastening the cross members to the box
section side rails,

Fig. 13 is a transverse section through one of
the cross members looking toward the side rail
illustrating the manner of key welding a flange
of the cross member to the inner web portion
of the rail.

Fig. 14 is an enlarged plan showing the con-
struction of parts employed in key welding.

Referring now to the drawing for details, the
numeral 14 designates a length of tubular stock
appropriate for the formation of a complete
side rail 15 of an automotive vehicle. This stock
is preferably very light gauge such as $\frac{1}{8}$ " stock,
due in a measure to the torsion resisting abil-
ity of a tubular section over the channel section
and the additional strength which is built into
the rails with my herein disclosed method of man-
ufacture and type of cross members. The stock
for the side rails is preferably circular in cross
section as shown in Fig. 6 and is preferably, but
not necessarily, obtained from a continuous
method of producing welded tubing from flat
stock rolled up into tubular formation and then
welded along a single longitudinally extending
seam 16 as disclosed in my co-pending appli-
cations. However, it is to be understood that
any kind of tubing, seamless or otherwise, may
be employed in the method and the sections of
the stock may be circular, oval, rectangular or
otherwise. In the present instance, I will de-
scribe the method using the stock which is cir-
cular in cross section.

After the stock has been cut to the required
length, one end 17, constituting the forward end
of the side rail is reduced in diameter and
tapered from its free end to a point back to the
approximate locality of the dash line or at least
to a point where the rear hangers 18 of the front
springs 19 are secured to the rail. The taper
at this end is gradually back into the original
diameter of the stock and is accomplished by
running the end into a swaging machine or any
other suitable apparatus which will give the end
17 the contour illustrated and at the same time
substantially increase the wall thickness of the
tapered end as indicated by the dotted line 20.
This tapering and reduction of the ends of the
tubing is sufficiently extensive to take in the
entire front kick-up or offset portion 21.

The other or rear end 22 of the stock is sim-
ilarly reduced but to a greater degree from its

free end to a point in proximity to the front hanger 23 of the rear spring 24 so that the wall thickness of a considerable rear end portion of the rail is materially increased as indicated in dotted lines 25. The diameter of the rear end 22 of the side rail is reduced over a greater distance or length than the forward end, to obtain greater clearance for the rear axle without the necessity of too severe a kick-up or offset portion in the rail. This also provides for the introduction of greater wall thickness at the rear kick-up than at the forward one, but of course the wall thickness of both offset or kick-up portions can be made uniform or proportioned as desired. It will be noted that the taper of the major portion of the rear end 22 is more gradual than the forward end from the free end just beyond the kick-up from which point the taper increases to cause the rear end to more gradually merge into the mid-section 28 of the rail.

After the ends of the rail have been reduced in diameter and increased in wall thickness as shown in Fig. 2, they are run into suitable tube bending equipment to provide the forward and rear ends with the offset or kick-up portions 21 and 26. During the foregoing steps, it will be appreciated that the stock remains circular or approximately so in cross section. Of course if the original stock is other than circular in cross section to start with, it will possess the same cross section when it reaches the condition as shown in Fig. 4 in the operations, with of course, the ends reduced and their wall thickness increased. Obviously, if the stock is originally box or rectangular in cross section with substantially flat side walls 29, as shown in Fig. 7, the side rail requires no further forming operation and at this stage is ready for the assembly of the cross members.

However, when the original stock is circular in cross section, it is desirable to flatten the rail shown in Fig. 4 to bring it to closed box section for additional strength as shown in Fig. 7 and this may be accomplished by flattening the entire length of the rail by subjecting the rail shown in Fig. 4 to the action of suitably contoured flattening dies in the well known form of press or by subjecting the rail to inward pressure on all sides between suitably contoured pressure rolls.

Two rails thus formed are connected in the desired relation by tubular cross members as shown in Fig. 10. The front cross member is formed by two oppositely facing channel members 30, with the longitudinal edges of the flanges welded together as at 31. The ends 32 of the channel members adjacent the side rails diverge outwardly and are provided with flanges 33 which are welded in any desired manner to the inner web portion 34 of the side rails. Triangular gussets 43 are positioned in between the diverging ends of the channel members at the top and bottom thereof in the planes of the top and bottom flanges, to be welded to the edges of the flanges and to the side rails to form the ends of the cross member into closed box cross section. In case this type of cross member is incorporated in a frame having the usual channel section side rails, the edges of the gussets 43 are welded to the edges of the inwardly extending flanges of the side rails.

The second and third cross members 35 are tubes and their opposite ends are extended through registering openings provided in the spaced web portions 34 and 36 of the side rail. The inner web 34 is secured to the tubular cross

member 35 by a weld 37 extending circumferentially around the entire circumference of the tube, while the outer end of the tube projects a distance beyond the outer web 36 and in the case of the third cross member, is melted down and fused to the outer web 35 by any suitable welding equipment. If desired, the webs of the rails may be provided with inwardly or outwardly projecting annular flanges surrounding the opening through which the ends of the cross member extend and the ends of these flanges may be fused to the ends of the tubular cross member. The second tubular cross member 35 may have its two ends 35' extended beyond the outer webs of the side rails and have spring hangers 44 secured thereto as shown in Fig. 11.

A fourth cross member 38 is secured to the two rails just in front of the rear kick-ups 26 and adjacent to where the latter merge into the mid-section of the rails. This cross member 38 is also preferably of tubular form and its ends 38' may be extended outwardly beyond the outer webs of the rails to have spring hangers mounted thereon. This cross member on the third one 35 may be provided with an integral flange 39 at each end for abutment with the inner web 34 of each side rail. This flange is provided with a series of circumferentially extending keyhole shaped slots 40 whereby they can be arc welded to the inner web of the rail. It will be noted that the slots 40 are not of uniform width throughout but terminate at one end in an enlarged end portion 43 whereby the flame of the welding torch can be entered to properly fuse the metal of the web simultaneously with the edges of the slots, after which the flame of the welding torch can be moved into the narrower portion of the slot to properly fuse the balance thereof to the web portion. An opening 44 substantially concentric with each enlarged end 43 of each slot is provided in the underlying web 34 to facilitate simultaneous fusion of the members to be joined, and some of the fused metal will be deposited in the opening 44 to additionally lock the parts together.

A fifth tubular or elliptical cross section cross member 41 connects the rails immediately behind the kick-up 26, or if desired, may be connected to the mid-portions of the kick-ups, with a sixth tubular or elliptical cross section cross member 42 tying the extreme rear ends of the rails together. While various methods of attaching the cross members to the side rails have been specified in connection with certain cross members, it will be understood that any of the modes of attachment herein disclosed may be employed for attaching any of the cross members to the side rails. The cross members may also be of any cross section or shape to provide clearances for other parts of the vehicle or for any other purpose. It will also be noted that the longitudinal weld 16 in the stock is shown disposed in the top of the rail, but it may of course be arranged so that it is arranged at the bottom of the rail, or in either side web thereof.

It is to be understood that various changes in the size, shape and arrangement of parts may be resorted to without departing from the spirit of the invention or the scope of the appended claims.

I claim:

1. The method of making an automobile side rail having kick-ups adjacent the ends consisting of reducing the ends of tubular stock to decrease their diameter and materially increase their wall thickness from the free ends to points beyond the kick-ups, bending the reduced ends

to provide the kick-ups in the thickened ends, and flattening the entire rail to impart closed box section thereto throughout its entire length.

2. The method of making an automobile side rail having a kick-up adjacent its end, consisting of reducing the end of tubular stock from its free end to a point adjacent the inner end of the kick-up to decrease its diameter and increase its wall thickness, bending the reduced end to provide the kick-up, and then flattening the reduced end to impart box section thereto.

3. The method of making an automobile side rail having a kick-up portion consisting of gradually tapering one end of tubular stock from its free end to a point adjacent the inner end of the kick-up portion while proportionately increasing the wall thickness thereof from said point outwardly to said free end, and bending the tapered and thickened end to provide a kickup portion having walls thicker than the original tubular stock.

4. The method of making an automobile side rail having a kick-up portion consisting of gradually tapering one end of tubular stock from its free end to a point adjacent the inner end of the kick-up portion while proportionately increasing the wall thickness thereof from said point outwardly to said free end, bending the tapered and thickened end to provide a kickup portion having walls thicker than the original tubular stock and then forming the rail to impart closed substantially rectangular box section thereto.

5. The method of making an automobile chassis frame which comprises bending two elongated sheet metal strips on longitudinal lines to form tubes each having a single longitudinal seam, welding each tube along the seam therein to form a tubular side-member for the frame, bending each side member longitudinally while maintaining its tubular structure, and securing the two side-members together in spaced relation by cross-members whose end portions are secured to the side members.

6. The method of making an automobile chassis frame which comprises bending two elongated sheet metal strips on longitudinal lines to form tubes, each having parallel side walls and a single longitudinal seam, welding each tube along the seam therein to form a tubular side-member for the frame, bending each side member longitudinally while maintaining its tubular structure, providing aligned openings in opposite side walls of each side-member at a plurality of points therein, and securing the two side-members together in spaced relation by cross-members each having each end extending through a pair of aligned openings in the side walls of a side-member and secured to both of said side walls.

7. The method of making an automobile chassis frame which comprises bending two elongated sheet metal strips on longitudinal lines to form tubes of rectangular cross-section each having a single longitudinal seam adjacent one of the corners of the rectangle, welding each tube along the seam therein to form a tubular side-member for the frame, bending each side-member longitudinally while maintaining its tubular structure, and securing the two side members together in parallel relation by cross-members whose end portions are secured to the side-members.

8. The method of making an automobile chassis frame which comprises bending two elongated sheet metal strips on longitudinal lines to form tubes, each having a single longitudinal

seam, welding each tube along the seam therein to form a tubular side-member for the frame, and securing the two side members together in spaced relation by cross-members whose end portions are secured to the side members.

9. The method of making an automobile chassis frame which comprises bending two elongated sheet metal strips on longitudinal lines to form tubes, each having parallel side walls and a single longitudinal seam, welding each tube along the seam therein to form a tubular side-member for the frame, forming aligned openings in opposite side walls of each side-member at a plurality of points therein, and securing the two side-members together in spaced relation by cross-members each having each end extending through a pair of aligned openings in the side walls of a side-member and secured to both of said side walls.

10. The method of making an automobile chassis frame which comprises bending two elongated sheet metal strips on longitudinal lines to form tubes, each of which is of rectangular cross-section and has a single lengthwise seam therein adjacent to one corner of the rectangle, welding each tube along the single lengthwise seam therein to form a tubular side-member for the frame, forming aligned openings in opposite side walls of each side-member at a plurality of points therein and securing the two side-members together in spaced relation by tubular cross-members, each having each end extending through a pair of aligned openings in the side walls of a side-member and secured to both of said side walls by being welded thereto.

11. The method of making an automobile chassis frame which comprises forming two sheet metal side-members which are of rectangular tubular form over certain portions of their length, forming aligned openings in the side walls of said rectangular tubular portions of the side members and securing the two side-members together in spaced relation by a tubular metallic cross-member having each of its ends extending through a pair of aligned openings in the side walls of a side member and secured to both of said side walls by being welded thereto.

12. The method of making an automobile chassis frame which comprises bending two elongated sheet metal strips on longitudinal lines to form tubes, each having a single longitudinal seam, welding each tube along the seam therein to form a tubular side-member for the frame, and securing the two side-members together in spaced relation by cross members, one of said cross-members having each of its ends extending through an opening in the inner side wall of a side-member and secured to both side walls of that side-member.

13. An automobile chassis frame comprising the combination of two side-members each formed from a single piece of sheet metal which is bent along lines extending longitudinally thereof to a tubular cross-section presenting a single lengthwise seam and having the seam edges welded together, and a plurality of cross-members connecting the side-members and each having each of its ends extending through openings in the inner and outer side walls of a side-member and secured to both of said side walls.

14. An automobile chassis frame comprising the combination of two side-members each formed from a single piece of sheet metal which is bent along lines extending longitudinally thereof to a tubular cross-section presenting a

single lengthwise seam and having the seam edges welded together and each of said side members being curved in the direction of its length, and a plurality of cross-members connecting the side-members and having each of its ends extending through openings in the inner and outer side walls of a side-member and secured to both of said side walls.

15. An automobile chassis frame comprising the combination of two side-members each formed from a single piece of sheet metal which is bent along lines extending longitudinally thereof to a rectangular tubular cross-section presenting a single lengthwise seam and having the seam edges welded together, each of said side members being curved in the direction of its length, and a plurality of cross-members connecting the side-members together in spaced relation and each having each of its ends passing

through a closely fitting opening in the inner wall of a side-member and passing through an opening in the outer wall of the side-member and secured to said outer wall.

16. In an automobile chassis frame comprising the combination of two side-members each formed from a single piece of sheet metal which is bent along lengthwise lines so that the metal of the piece from one lateral edge to the other forms the four sides of a rectangular tubular member presenting a single lengthwise seam and having the seam edges welded together, each of said side members being curved in the direction of its length, and a plurality of cross-members connecting the side-members together in spaced relation and each having each of its ends secured to a side-member.

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