To all whom it may concern:

Be it known that I, CHARLES DAVID BONSALL, a citizen of the United States, and a resident of the city of Pittsburgh, in the county of Allegheny and State of Pennsylvania, have invented a certain new and useful Improvement in Flexible Car Roofs, of which the following is a specification.

My invention relates to car roofs and has for its principal object to produce a roof of simple and economical construction that is easy of application and that will readily adapt itself to the distortions of the car body incident to service conditions. The invention consists in the parts and in the combinations and arrangements of parts hereinafter described and claimed.

In the accompanying drawing, wherein like numerals refer to like parts wherever they occur,

Fig. 1 is a plan view of a portion of a car roof embodying my invention;

Fig. 2 is a cross-section through a carline and the portions of the sheets adjacent thereto;

Fig. 3 is a fragmental section through the side plate and showing the adjacent portion of the roof sheet in section and the end portion of the carline in elevation; and

Fig. 4 is a view of a modified construction showing the roof applied to a car with wooden side plates.

The present roof comprises carlines 1 that extend from side plate to side plate 2 of the car and whose ends are fastened to said side plates. It also comprises metal roof sheets 3 which span the spaces bounded by said side plates and carlines and have their ends bent downwardly beyond said side plates without being fastened thereto or to said carlines or to any other portion of the framework of the car. The sheets are preferably made of thick enough gauge to be self-supporting and are stiffened by longitudinal ribs or corrugations extending through the body thereof. The side portions of said sheets are offset upwardly as at 5 and have upstanding flanges 6 at their margins; and the ends of the sheets have depending flanges 7.

Each of the carlines comprises an upper member 8 and a lower member 9 riveted or otherwise rigidly fastened together with their side edge portions spaced apart approximately the thickness of a roof sheet throughout their length. Throughout the greater portion of its length, the greater portion of the form of the lower member 9 is that of an inverted channel with wide horizontal flanges 10 along its lower edges; but the end portions 11 of said lower member are first bent downwardly and then outward horizontally so that the lower flanges 12 of said lower carline member will rest flatwise on the top of the side plate, to which they are secured by vertical rivets 12. Preferably the side plate is of Z section with its top flange 13 extending inwardly horizontally and preferably the lower member 9 of the carline does not extend beyond the vertical web 14 of the side plate.

Throughout the greater portion of its length, the upper member 8 of the carline is also of inverted channel shape with wide horizontal flanges 15 at its lower side edges; but the end portions 16 of said upper member are bent downwardly beyond the vertical planes of the vertical webs 14 of the side plates but within the vertical planes of the outer edges of the horizontal flanges 17 of said side plates; and the endmost portions of said lateral flanges of the downturned portions of said upper carline member are offset inwardly (as at 18) and riveted flatwise against said vertical web of the side plate. By this arrangement, a space is provided between the web 14 of the side plate and the downturned portion 16 of said upper member sufficient to receive the end flanges 7 of the roof sheets and permit play thereof. The upper and lower members of the carline are so proportioned that, when the upper member is superposed on the lower with their flat web portions in contact, the horizontal flanges of the upper member are spaced from the horizontal flanges of the lower member a distance substantially equal to the thickness of the roof sheet; and so that the spaces between the vertical legs of the channels will not only receive the upturned flanges of the roof sheets but will permit said flanges to play to a reasonable extent back and forth between said vertical legs.

As stated above, the roof sheets extend from side plate to side plate and have their ends flanged downwardly beyond the vertical webs of the side plates. In the normal position of the roof sheet, the downturned end thereof is spaced outwardly a sufficient
distance beyond the vertical web of the side plate and a sufficient distance inwardly from the downturned ends of the upper member of the carline to permit the roof sheet to accommodate itself to the distortions of the roof by sluing thereon. In such sluing movement, two diagonally opposite corners of the roof sheet tend to move outwardly or away from the side plates, while the other two diagonally opposite corners tend to move toward the side plates, these movements being incidental to the sliding of the opposite side margins of the roof sheets in opposite directions endwise of the carlines adjacent to said edges respectively.

The ordinary operation of shearing sheet metal produces a draft or rounding of the edge on the punch or shear surface of the sheet and a fin on the edge of the opposite surface of the sheet. In the manufacture of my carline, I shear suitable rectangular blanks or sections from the sheet material, taking care that the side fins of the blank are on the same side or surface; and the blanks are pressed or struck up in such manner that the lower edges of the upper member of the carline and the upper edges of the lower member of the carline are the rounded edges. By this contrivance and arrangement, the roof sheets suffer much less abrasion than they would suffer if they rubbed over the fin edges of the carline members.

In practice, the lower member of the carline is set in place and secured to the side plates, the roof sheet is then located in proper relation to said lower member of the carline, and the upper member of the carline is then set in place and riveted to the lower member and to the side plates of the car; and this operation is repeated at the next carline and so forth.

It is noted, that by reason of the above described construction, the roof sheets are kept in proper position to exclude the weather and that their frictional engagements with the horizontal flanges of the carlines prevent undue movement thereof, but that in case of the distortion of the car frame, the sheets are free to move to the extent necessary to prevent undue stress thereon. At the same time, the downturned ends of the upper member of the carline keep the sheets from sliding crosswise of the car to an excessive extent.

Among the advantages of the present construction are the great simplicity of the roof sheets and their freedom from severe stresses; also the cheapness and simplicity of the construction of the carlines, their great strength for a given amount of metal, and the facility with which they adapt themselves to the application of the roof. It is particularly noted that the downward deflection of the end portions of the lower member of the carline serves to introduce a truss action that greatly increases the capacity of the carline for carrying vertical load; and it is also noted that the cross section of the carline is such as to afford it great strength for resisting the other stresses to which the carline is subject in practice.

In the modified construction illustrated in Fig. 4, the side plate is a wooden timber, and a wooden sheathing extends to the top of the side plate and is provided with a wooden fascia whose upper portion is rabbed or narrower than the lower portion. In this construction, the roof sheets and the lower member of the carline are the same as hereinbefore described in connection with the Z-bar side plates; but the end portion of the upper member of the carline is bent vertically downward with its lateral flanges flush with the thicker portion of the fascia against which it is secured flatwise by bolts that extend horizontally through the side plate. This arrangement provides ample space for the downturned flange of the sheet between the narrow portion of the fascia and the downturned portion of the top member of the carline.

What I claim is:

1. A carline adapted to extend from side to side of a car and comprising a lower member of inverted channel-shaped section having horizontal lateral flanges and an upper member of inverted channel-shaped section having horizontal lateral flanges, located above the flanges of said lower member, the web portions of said members being secured together flatwise in direct contact with each other, and said members being of such dimensions that their flanges are spaced apart substantially the thickness of a roof sheet.

2. A carline adapted to extend from side to side of a car and comprising a lower member of inverted channel-shaped section having horizontal lateral flanges and an upper member of inverted channel-shaped section having horizontal lateral flanges, located above the flanges of said lower member, the web portions of said members being secured together flatwise in direct contact with each other, and said members being of such dimensions that their flanges are spaced apart substantially the thickness of a roof sheet, and their sides being spaced further apart.

3. A carline comprising a lower member of inverted channel-shaped section having lateral flanges and an upper member of inverted channel-shaped section having lateral flanges, the web portions of said members being secured together flatwise, and said members being of such dimensions that their flanges are spaced apart substantially the thickness of a roof sheet throughout the greater portion of their length, and their...
sides being spaced further apart, the end portions of said lower member diverging downwardly from said upper member.

4. A pressed sheet metal carline of a length to span from side frame to side frame of a car comprising a lower member of inverted channel-shaped section having horizontal lateral flanges and an upper member of inverted channel-shaped section having horizontal lateral flanges located above the flanges of said lower member, the web portions of said members being secured together flatwise, and said members being of such dimensions that their flanges are spaced apart substantially the thickness of a roof sheet, the adjacent edges of said members being rounded.

5. A carline comprising a lower member of inverted channel-shaped section having lateral flanges and an upper member of inverted channel-shaped section having lateral flanges, the web portions of said members being secured together flatwise, and said members being of such dimensions that their flanges are spaced apart substantially the thickness of a roof sheet throughout the greater portion of their length and their sides being spaced further apart, the end portions of said lower member diverging downwardly from said upper member, and the end portions of said upper member being bent substantially vertically downwardly beyond the ends of said lower member.

6. A car roof construction comprising Z-bar side plates with their upper flanges extending inwardly, carlines comprising upper and lower members secured together and to the side plates with the marginal portions of the lower member extending laterally below the sides of the carline channel members and spaced vertically therefrom to receive the roof sheets and the side portions of said members being spaced apart sufficiently to receive the roof sheets and movably mounted roof sheets extending across the car and having downturned flanges at their ends and upturned flanges along their sides, said side portions of the sheets being interposed between the upper and lower members of the carlines and the end flanges being interposed between the side plates and the downturned portions of the upper members of the carlines with sufficient clearance for the side and end flanges of the sheets to allow movement of such sheets.

7. A car roof construction comprising side plates whose lower portions extend further outwardly than their upper portions, carlines comprising upper and lower members secured together and to the side plates, said members being of inverted channel shape with vertically aligned horizontal flanges along the lower margins thereof and having their side portions spaced apart sufficiently to receive the roof sheets and the end portions of said upper members being turned downwardly and spaced from the upper portions of the side plates, and movably mounted roof sheets extending across the car and having downturned flanges at their ends and upturned flanges along their sides, said side portions of the sheets being interposed between the upper and lower members of the carlines and the end flanges being interposed between the side plates and the downturned portions of the upper members of the carlines with sufficient clearance for the side and end flanges of the sheets to permit said sheets to move when the car frame distorts.

8. A car roof construction comprising Z-bar side plates with their upper flanges extending inwardly, carlines comprising upper and lower channel-shaped members secured together and to the side plates but having their side portions spaced apart sufficiently to receive the roof sheets and movably mounted roof sheets extending across the car and having downturned flanges at their ends and upturned flanges along their sides, said side portions of the sheets being interposed between the upper and lower members of the carlines and the end flanges being interposed between the side plates and the upper members of the carline, with sufficient clearance for the side and end flanges of the sheets to permit said sheets to move when the car frame distorts, the end portions of said lower carline member diverging downwardly from said upper member and being secured to the side plates, and the end portions of said upper member being bent substantially vertically downwardly far enough beyond the end flanges of said roof sheets to allow movement of such sheets.

9. A carline adapted to extend from side to side of a car and comprising a lower member of substantially inverted channel-shaped section having horizontal lateral flanges and an upper member of substantially inverted channel-shaped section having horizontal lateral flanges located above the flanges of said lower member, the web portions of said members being rigidly secured together flatwise in direct contact with each other, and said members being of such dimensions that their sides and lateral flanges are spaced apart.

Signed at New Kensington, Pa., this 27th day of March, 1924.

CHARLES DAVID BONSALL.