July 19, 1932. C. D. BONSALL 1,868,134

CAR ROOF

Filed Feb. 26, 1931 2 Sheets-Sheet 1

Fig. 1.

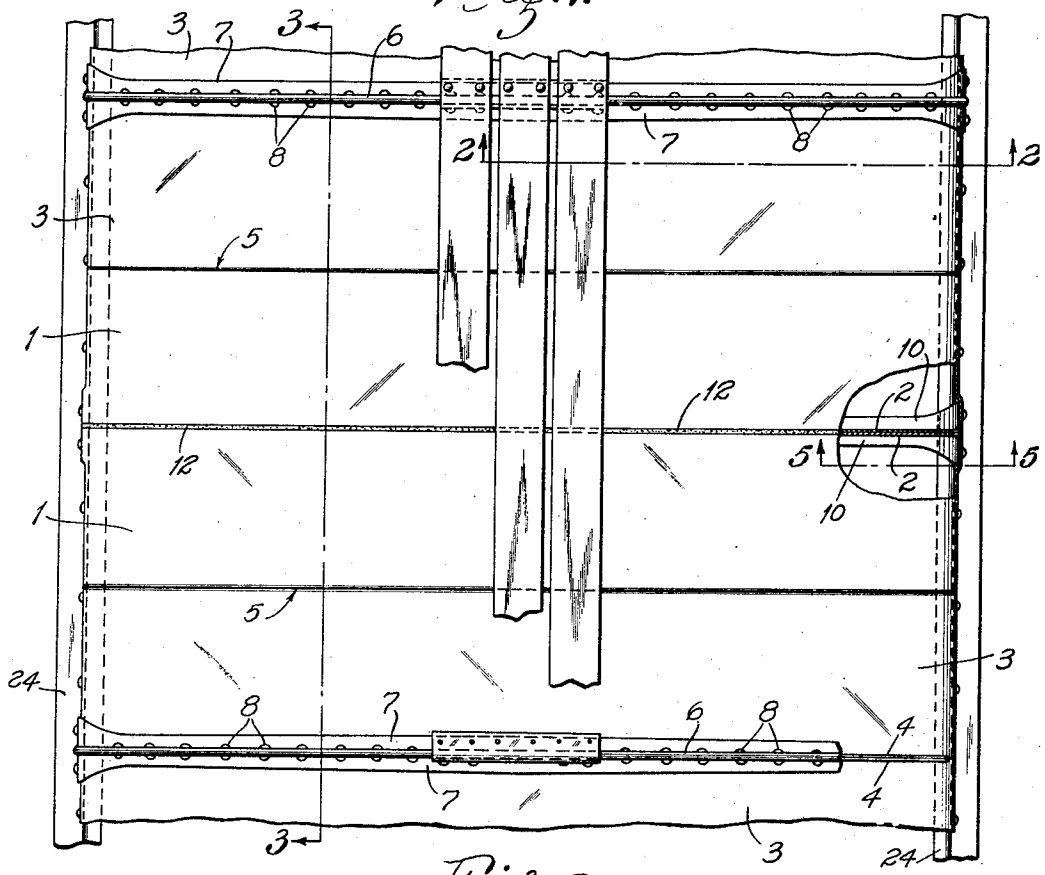


Fig. 2.

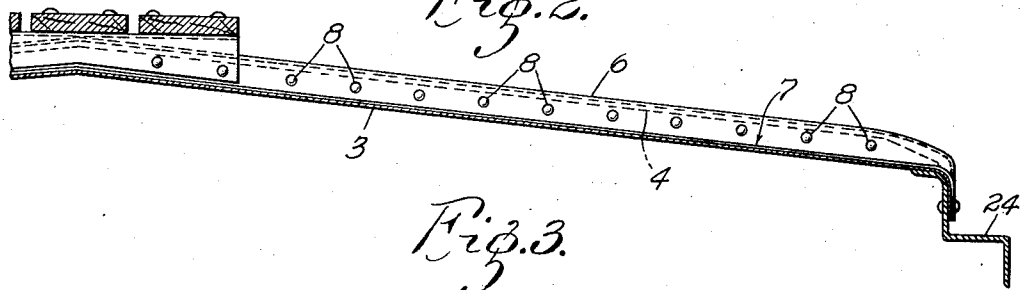


Fig. 3.

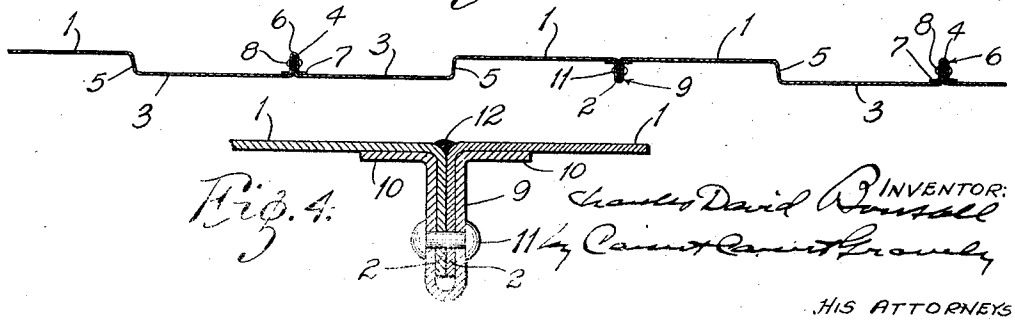


Fig. 4.

Charles David Bonsall INVENTOR:

by Cairns Cairns & Crowley

HIS ATTORNEYS

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CAR ROOF

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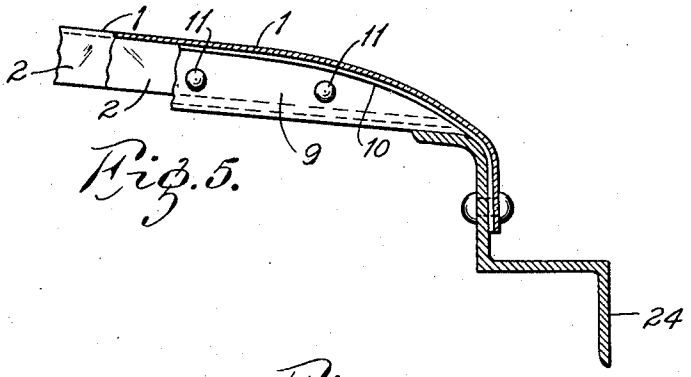


Fig. 5.

Fig. 6.

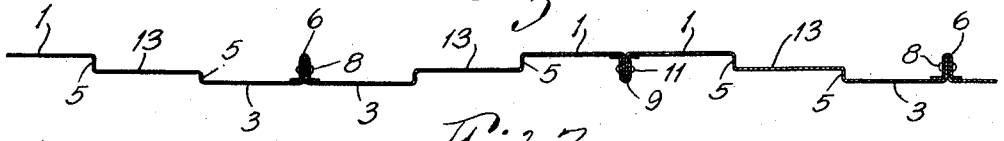


Fig. 7.

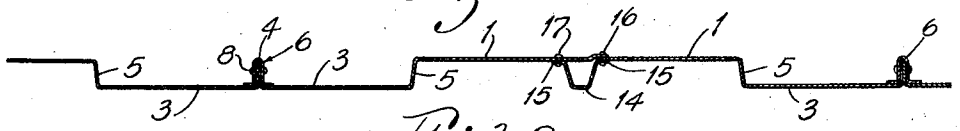


Fig. 8.

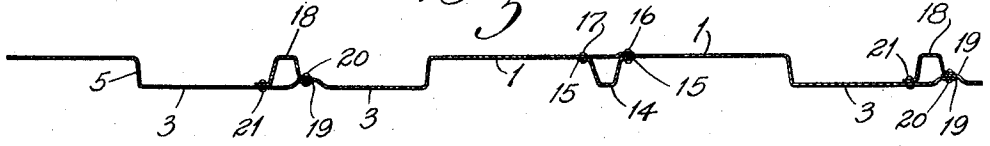
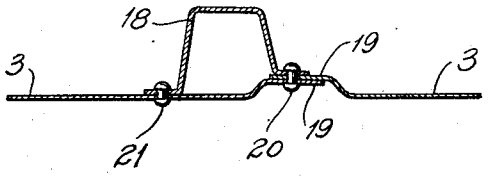


Fig. 9



Charles David Bonsall INVENTOR

by Cameron & Cameron Its Attorneys.

HIS ATTORNEYS.

Patented July 19, 1932 1,868,134

UNITED STATES PATENT OFFICE

CHARLES DAVID BONSALL, OF PITTSBURGH, PENNSYLVANIA, ASSIGNOR TO P. H. MURPHY COMPANY, OF NEW KENSINGTON, PENNSYLVANIA, A CORPORATION OF PENNSYLVANIA

CAR ROOF

Application filed February 26, 1931. Serial No. 518,431.

This invention relates to the general type of roof wherein the sheets or portions thereof alternate at different levels. Heretofore, the seams of roofs of this type have usually consisted of the marginal portions of adjacent sheets riveted together flatwise without any reinforcement therefor, and with the rivets extending inside of the car. The principal objects of the present invention are to reinforce and strengthen the seam construction and to adapt it by its structure and position to increase the strength and load carrying capacity of the roof, also to avoid having the rivets extend from the outside to the inside of the car; and also to avoid increasing the over-all depth or thickness of the roof. The invention consists in the parts and arrangements and combinations of parts hereinafter described and claimed.

In the accompanying drawings 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 vertical transverse cross-section through one-half of said roof on the line 2—2 in Fig. 1,

Fig. 3 is a vertical longitudinal cross-section through said roof on the line 3—3 in Fig. 1,

Fig. 4 is an enlarged vertical cross-section through one of the inside roof seams,

Fig. 5 is a vertical transverse cross-section through the eaves portion of the car on the line 5—5 in Fig. 1,

Figs. 6, 7 and 8 are vertical longitudinal cross-sections similar to Fig. 3, showing roofs of modified form; and

Fig. 9 is an enlarged vertical cross-section through one of the outside seams shown in Fig. 8.

In the construction illustrated in Figs. 1 to 5, inclusive, the roof is made up of a series of similar roof sheets offset vertically at or adjacent to the medial line so as to form an upper panel 1 with a downturned flange 2 along its side margin and a lower panel 3 with an upturned flange 4 along its side margins, the two panels being connected together by an upstanding web 5. Near the eaves of the car, the height of the web decreases till the two panels merge into a common plane at the side plates 24 of the car, over which they are turned down and secured thereto. The sheets are so arranged that the downturned flanges of adjacent sheets abut and the upturned flanges of adjacent sheets abut, this arrangement being effected by reversing the position of alternate sheets.

The upstanding flanges 4 of adjacent sheets are covered by a rebent or U-shaped cap 6 whose lower margins are preferably provided with flanges 7 that rest on the body portions of the lower panels of adjacent sheets; and the caps and the sheet flanges straddled thereby are rigidly clamped together by rivets 8 that extend through them horizontally. It is noted that the rivets are wholly outside of the car so that they are readily accessible and easy to drive. The seam cap is preferably of heavier gage metal than the roof sheets and may be made deepest at the ridge and tapering toward the eaves. It is also noted as an advantage of this design that the caps on top of the roof extend upwardly from the level of the lower panels and need extend very little or not at all above the upper level.

The downturned flanges 2 of adjacent sheets are straddled by a rebent or inverted U-shaped member 9 hereinafter referred to as an inside seam cap. This inside seam cap is preferably provided with lateral flanges 10 along its upper edges which rest respectively against the undersides of the upper panels of adjacent sheets. The inside seam cap and the downturned sheet flanges are clamped together by horizontal rivets 11 which are wholly inside the car, where they are readily accessible and easy to drive. The exposed crack or crevice between adjacent sheets is effectively closed by a suitable filler 12 such as bituminous paint. The inside seam caps 9 operate in the same manner as the outside seam caps 6 and are preferably made of thicker material than the sheets and preferably taper from a maximum depth at the ridge towards the eaves. However, it is an advantage of the design that the inside seam caps

need extend very little or not at all below the lower level of the roof sheets.

In the construction illustrated in Fig. 3 each roof sheet has a single offset. In the design of Fig. 6 each sheet has two vertical offsets, that is panels 1, 3, 13 at three levels connected by substantially vertical web portions 5. This design has the advantage that, for a given distance between the upper and lower levels of the roof, it uses two shallow webs instead of one deep web and thereby greatly increases the resistance to buckling.

In the construction illustrated in Fig. 7 the sheets are offset longitudinally and have upstanding flanges 4 on their lower panels 3 and said upstanding flanges abut flatwise and are straddled by a seam cap 6 secured thereto by horizontal rivets 8, all after the manner of the construction shown in Fig. 3. The margins of the upper panels 1, however, are not flanged but simply lap each other and are reinforced by a channel-shaped member 14 with lateral flanges 15, one of said flanges being below the lapped portions of the sheets and secured thereto by a row of vertical rivets 16 and the other flange being secured to the underside of the overlying sheets by a row of rivets 17. Preferably, the bottom of this channel-shaped member projects very little or not at all below the level of the lower panels.

In the construction illustrated in Fig. 8 a hollow seam reinforcing member 14 like that of Fig. 7 is used under the seam that joins the upper panels of adjacent sheets; and a similar but inverted hollow reinforcing member 18 is used to reinforce the seam that joins the lower panels. Preferably, the marginal portions 19 of the lower panels are offset slightly upwardly to afford better protection of the seam against leakage and to provide for drainage and strengthen the joint; and accordingly the adjacent side of the hollow channel member is narrower than the other side thereof. In this seam construction, the inverted channel-shaped member 18 is secured by one row of rivets 20 that extend vertically through the lapped margins of the roof sheets and the flange of the narrower side of the channel-shaped member, and by a second row of rivets 21 which extend vertically through the flange on the deeper side of the channel-shaped member and the underlying roof sheet.

In the construction of Fig. 8 as in the other constructions, the hollow channel-shaped member 14 that reinforces the seam at the upper level is on the inside of the car; and the inverted channel-shaped member 18 that reinforces the seam at the lower level is above and outside of the car, both reinforcing members being mainly or entirely within the space between the upper and lower levels of the roof sheets. Considering the roof as a series of hollow ribs alternating with a series of channels, the seams, of whatever construction, are on the undersides of the ribs and on the upper sides of the channels, respectively, and add little or nothing to the vertical dimensions of the roof.

It is a great merit of the roof above described that all the metal in the roof sheets participates in taking care of the load after the manner of action of a beam supported by the side plates, and at the same time the seam caps both reinforce the seams and relieve the sheets of a large part of the stresses which they would otherwise have to assume. By reason of the seam caps being located mainly between the upper and lower levels of the roof, they do not materially increase the vertical thickness of the roof and avoid subjecting any portion of the structure to excessive stress.

What I claim is:

1. A car roof comprising roof sheets that are offset vertically lengthwise and are provided with an upstanding flange along the lower side and a downturned flange along the upper side, the downturned flanges of adjacent sheets being secured together flatwise and the upstanding flanges of adjacent sheets being secured together flatwise.

2. A car roof comprising roof sheets that are offset vertically near their longitudinal medial lines and are provided with an upstanding flange along the lower side and a downturned flange along the upper side, the downturned flanges of adjacent sheets being secured together flatwise and the upstanding flanges of adjacent sheets being secured together flatwise.

3. A car roof comprising roof sheets that are offset vertically lengthwise into upper, lower and intermediate panels and are provided with an upstanding flange along the lower panel and a downturned flange along the upper panel, the downturned flanges of adjacent sheets being secured together flatwise and the upstanding flanges of adjacent sheets being secured together flatwise.

4. A car roof comprising roof sheets that are offset vertically along longitudinal lines and are provided with an upstanding flange along the lower side and a downturned flange along the upper side, the downturned flanges of adjacent sheets abutting flatwise and the upstanding flanges of adjacent sheets abutting flatwise and seam caps straddling abutting flanges and rigidly secured thereto.

5. A car roof comprising roof sheets that are offset vertically near their longitudinal medial lines and are provided with an upstanding flange along the lower side and a downturned flange along the upper side, the downturned flanges of adjacent sheets abutting flatwise and the upstanding flanges of adjacent sheets abutting flatwise and seam caps straddling abutting flanges and rigidly secured thereto.

6. A car roof comprising roof sheets that

are offset vertically near their longitudinal medial lines and are provided with an upstanding flange along the lower side and a downturned flange along the upper side, the downturned flanges of adjacent sheets abutting flatwise and the upstanding flanges of adjacent sheets abutting flatwise, and seam caps straddling abutting flanges and rigidly secured thereto.

7. A car roof comprising roof sheets having longitudinal portions at different levels with the higher portions of adjacent sheets overlapping, and channel-shaped members secured to the underside of the overlapping sheet and underlapping the lapped portion of the underlapping sheet, and the lower portions of adjacent sheets having upstanding flanges that abut flatwise, and a rebent seam cap straddling and riveted to said flanges.

8. A car roof comprising roof sheets having longitudinal portions at different levels with the margins of the higher portions of adjacent sheets overlapping, and channel-shaped members secured to the underside of the overlapping sheet and underlapping the lapped portion of the underlapping sheet, and the lower portions of adjacent sheets being rigidly secured together.

9. A car roof comprising roof sheets having portions at different levels, with the margins of the higher portions of adjacent sheets rigidly secured together, and the lower portions of adjacent sheets having their marginal portions raised and lapped, and an inverted channel-shaped member secured to the body portion of one of said sheets and having a flange resting on and secured to the lapped portions of said sheets.

10. A car roof comprising roof sheets having longitudinal portions at different levels with the margins of the higher portions of adjacent sheets overlapping, and channel-shaped members secured to the underside of the overlapping sheet and underlapping the lapped portion of the underlapping sheet, and the lower portions of adjacent sheets having their marginal portions raised and lapped, and an inverted channel-shaped member above and secured to the body portion of one of said sheets and having a flange resting on and secured to the lapped portions of said sheets.

11. A car roof comprising roof sheets rigidly secured together along their side margins by rigid seams, the construction of some of said seams comprising marginal portions of adjacent sheets raised and lapped, and a channel-shaped member secured to the body portion of one of said sheets and having a flange resting against and secured to the lapped portions of said sheets.

12. A car roof comprising roof sheets that are offset vertically lengthwise and are provided with an upstanding seam flange along the lower side and a downturned flange along the upper side, the upstanding flanges of adjacent sheets being connected together and the downturned flanges of adjacent sheets being connected together.

13. A car roof comprising roof sheets that are offset vertically lengthwise and are provided with an upstanding seam flange along the lower side and a downturned flange along the upper side, said sheets being so arranged that the upstanding flanges of adjacent sheets are adjacent to each other and the downturned flanges of adjacent sheets are adjacent to each other, and seam caps straddling the flanges of adjacent sheets.

14. A car roof having alternating ribs and channels formed therein, said roof consisting of roof sheets that are connected along their adjacent side margins by vertical seams located on the undersides of the ribs near the middle and on the upper sides of the channels, near the middle respectively.

15. A car roof having alternating ribs and channels formed therein, said roof consisting of roof sheets that are rigidly connected together along their adjacent side margins by vertical seams located intermediate the sides of said ribs and channels, respectively, and on the undersides of the ribs and on the upper sides of the channels, respectively.

16. A car roof having alternating ribs and channels formed therein extending crosswise of the car, said roof consisting of roof sheets that are connected along their adjacent margins by vertical seams located on the undersides of the ribs and on the upper sides of the channels, respectively, said seams being mainly within the planes of the tops of said ribs and the bottoms of said channels.

17. A car roof comprising a series of similar roof sheets offset vertically lengthwise to form an upper panel along one side margin of a sheet and a lower panel along the other side margin thereof, said sheets being so arranged that the upper panels of adjacent sheets are adjacent to each other and the lower panels of adjacent sheets are adjacent to each other, the margins of adjacent sheets being connected by vertical seams located mainly within the levels of the upper and lower panels of said sheets.

18. A car roof having alternating ribs and channels formed therein extending crosswise of the car, said roof consisting of roof sheets connected along their adjacent margins and alternating inside and outside carlines secured to the undersides of said ribs and to the upper sides of said channels, respectively.

19. A car roof having alternating ribs and channels formed therein extending crosswise of the car, said roof consisting of roof sheets connected along their adjacent margins and alternating inside and outside carlines secured to the undersides of said ribs and to

the upper sides of said channels, respectively, said carlines being mainly within the planes of the tops of said ribs and the bottoms of said channels.

20. A car roof comprising roof sheets connected together along their adjacent margins, and carlines secured to said sheets, some of said carlines being located outside of said roof and other of said carlines being located inside of said roof.

21. A car roof comprising roof sheets rigidly secured together along their adjacent margins, said roof having hollow ribs forming upper panels alternating with channels forming lower panels, the distance between such upper and lower panels being such that the roof will act as a beam, and means extending lengthwise of the upper panels for increasing the compressive strength thereof.

22. A car roof comprising roof sheets secured together along their adjacent margins, said roof having hollow ribs alternating with channels, the distance between the tops of said ribs and the bottoms of said channels being such that the roof will act as a beam, and reinforcing members located within and rigidly secured to the undersides of said hollow ribs, said reinforcing members being located near the middle of said hollow ribs.

Signed at New Kensington, Pennsylvania, this 23rd day of February, 1931.

CHARLES DAVID BONSALL.