July 19, 1932. C. D. BONSALL 1,868,191

CAR ROOF

Filed Feb. 27, 1931

Fig. 1.

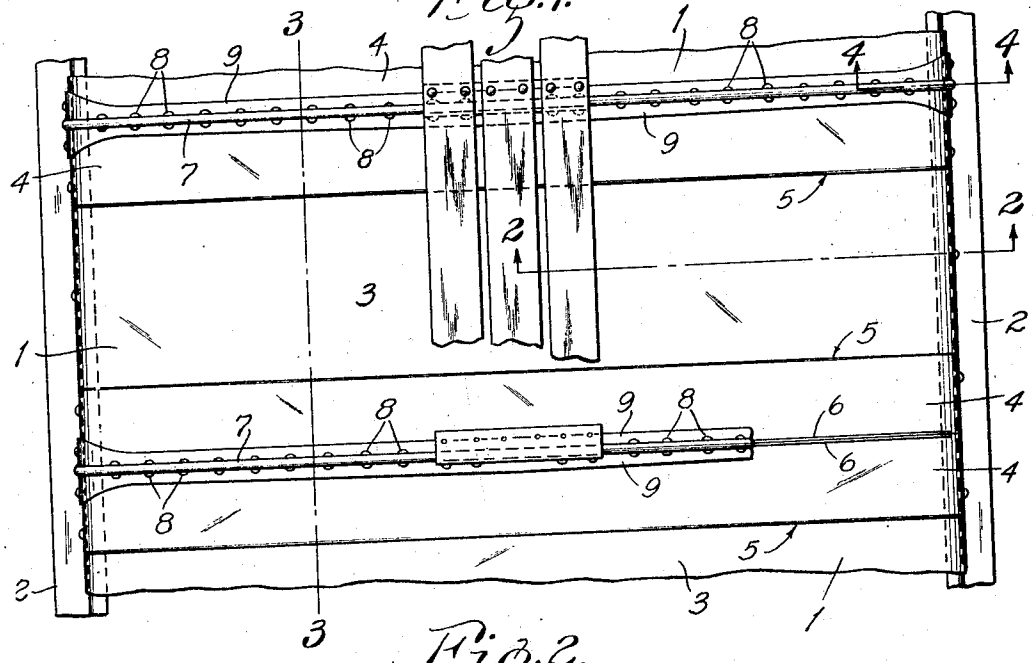


Fig. 2.

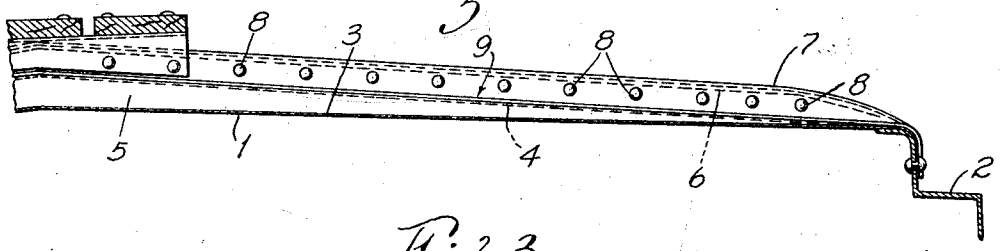


Fig. 3.

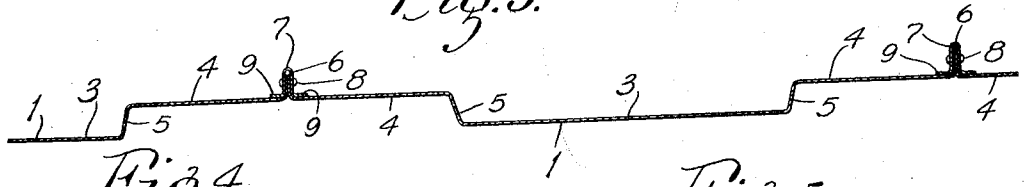


Fig. 4.

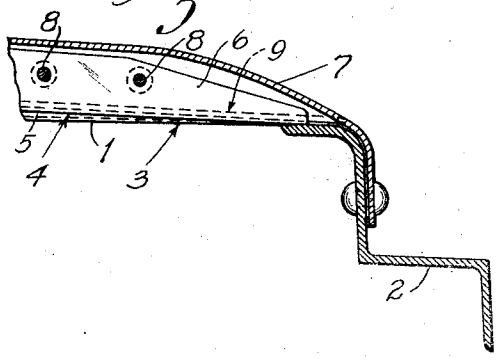
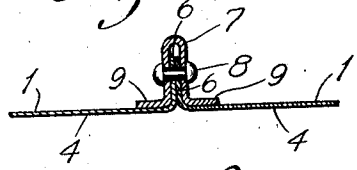


Fig. 5.



Charles David Bonsall INVENTOR:

by Cameron Cameron

HIS ATTORNEYS.

Patented July 19, 1932

1,868,191

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 27, 1931. Serial No. 518,705.

This invention relates to car roofs of the type wherein the metal roof sheets or parts thereof are offset longitudinally and secured together at their side margins so as to constitute a construction that is entirely self-supporting between the side plates of the car. The object of the present invention is to increase the strength and decrease the weight of the roofs of this type. It consists principally in making the sheets with a wide middle panel and narrow side panels at a higher level, the side panels being provided with upstanding flanges, and the upstanding flanges of adjacent sheets being straddled by seam caps secured thereto by horizontally disposed rivets.

In the accompanying drawing which forms part of this specification and wherein like numerals refer to like parts wherever they occur,

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

Fig. 2 is a cross-section of a part of the car roof on the line 2—2 of Fig. 1;

Fig. 3 is a longitudinal sectional view on the line 3—3 of Fig. 1;

Fig. 4 is an enlarged cross-sectional detail at the eaves of the car; and

Fig. 5 is an enlarged section through the seam construction.

The present roof comprises metal sheets 1 that extend from side plate to side plate 2 of the car and have their ends bent down and riveted to the side plates. The individual roof sheets are offset vertically along longitudinal lines to form a wide middle panel 3 at one elevation and narrower side panels 4 at a higher elevation, the upper and lower panels being connected continuously by web members 5 which preferably decrease in height from a maximum at the ridge to a minimum at each eaves end. Along the side margins of the upper panels are upstanding flanges 6, and the upstanding flanges of adjacent sheets abut against each other. Such abutting flanges are straddled by a rebent seam cap 7 whose sides are firmly clamped against the upstanding flanges by horizontal rivets 8 that extend through said seam cap and said flanges. Preferably the seam caps are thicker than the sheets and have lateral flanges 9 at their lower edges that rest on the marginal portions of the roof sheets.

It is noted that the present roof is designed to function as a beam supported on the side plates, in which case the middle panels of the roof sheets are under tensile stress and the upper panels are under compression. In designing such a roof, the capacities of the web members and of the compression member for taking care of the stresses that tend to buckle them are the principal limiting factors; and in turn, the strength of the web against buckling is dependent upon its height, and the strength of a compression panel against buckling is dependent upon its width. In the present construction, the compression strength of the roof is greatly augmented by the seam construction due not only to its consisting of the upstanding flanges and the thick rebent seam cap rigidly clamped together but due also to its location above the upper level of the roof sheets and consequently at the greatest distance above the neutral axis. The compression strength of the seam cap is further increased by making it thicker than the sheets and of greater depth midway of the car and by making it of angular section, that is, with lateral flanges. Not only does the seam construction itself very greatly increase the compressive strength of the roof considered as a beam, but such compressive strength is also increased by making the upper panels of the individual sheets relatively narrow, such a panel being stiffened on one side by the continuous web which joins it to the lower panel and on the other side by the seam construction. These several factors may be varied individually and permit the webs to be made narrower and consequently more resistant to buckling. As the roof is thus greatly strengthened against compression and buckling stresses, it becomes feasible to make the lower panels wider than would otherwise be practicable for proper beam action; and likewise it becomes feasible to use sheets of lighter gage than would otherwise be practicable.

In practice, it is convenient and desirable to make the side panels of a sheet equal to

each other and together equal to the middle panel; but when the sheets are quite wide or thin, it is preferable to make the side panels narrower and rely on the seam cap to make the compressive strength of the roof commensurate with the tensile strength of the lower panels.

What I claim is:

1. A car roof comprising roof sheets rigidly secured together at their side edges by upstanding seams, each sheet having its longitudinal middle portion at one level and its side portions at a higher level, the distance between such levels being such that the roof will act as a beam and the tensile strength of the lower portions being substantially commensurate with the compressive strength of the upper portions including the seam constructions.

2. A car roof comprising roof sheets whose side portions are at one level and whose middle portions are at a lower level, said sheets having abutting upstanding flanges along their side margins and seam caps that straddle said flanges and are rigidly secured thereto, the distance between such levels being such that the roof will act as a beam and said seam caps being thicker than said sheets and having base flanges whereby they are adapted to strengthen the roof against buckling and compression stresses.

3. A car roof comprising roof sheets whose longitudinal middle portions are at one level and whose side portions are at a higher level, the distance between such levels being such that the roof will act as a beam and the cross-sectional area of the middle portion of a sheet being substantially equal to the cross-sectional area of the two side portions thereof, adjacent sheets being rigidly secured together by upstanding seams.

4. A car roof comprising roof sheets whose side margins have upstanding flanges that are rigidly secured together flatwise, the side portions of each sheet being at one level and the middle portion being at a lower level, the distance between such levels being such that the roof will act as a beam and said side portions being substantially equal in width and their aggregate width being substantially equal to the width of the middle portion.

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

CHARLES DAVID BONSALL.