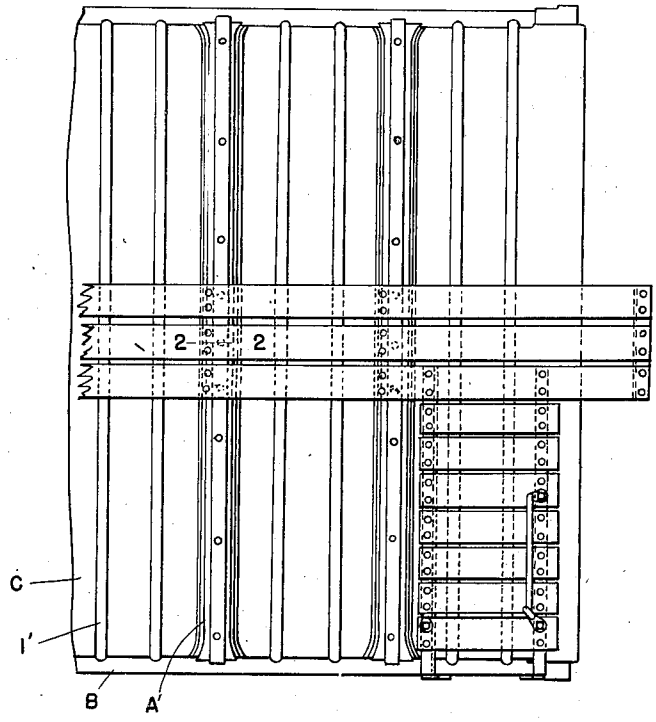
March 29, 1938. D. W. HAWKSWORTH 2,112,809

CAR ROOF

Filed May 20, 1935 2 Sheets-Sheet 1

FIG.1.



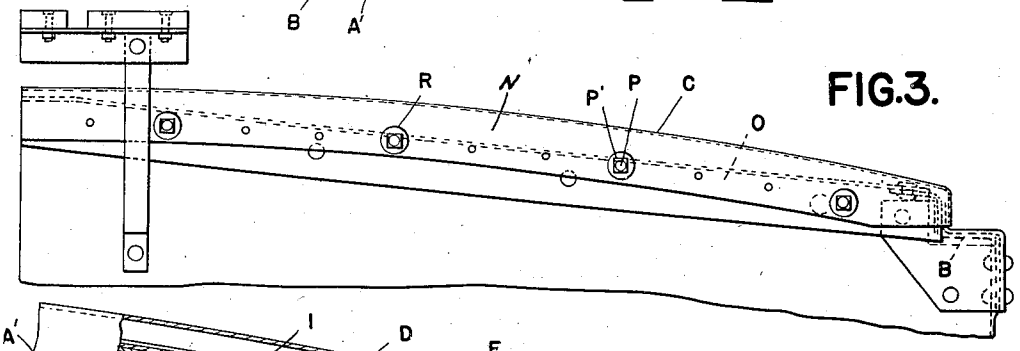




FIG.3.

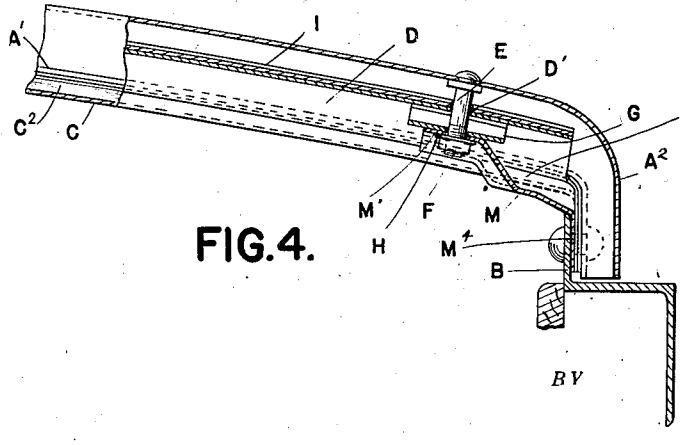



FIG.4.

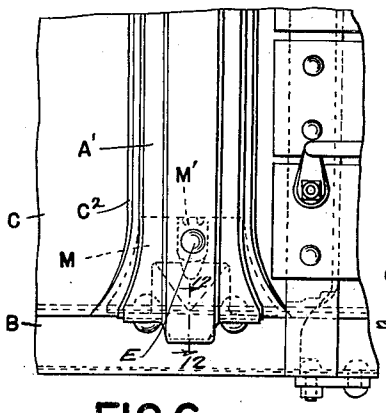
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DAVID W. HAWKSWORTH
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ATTORNEYS

March 29, 1938. D. W. HAWKSWORTH 2,112,809

CAR ROOF

Filed May 20, 1935 2 Sheets-Sheet 2

FIG.5.



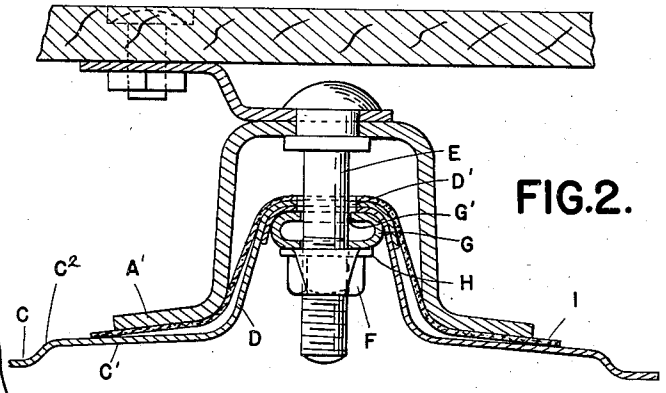
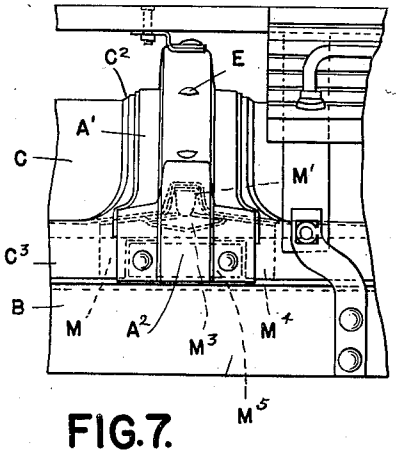




FIG.2.

FIG.6.



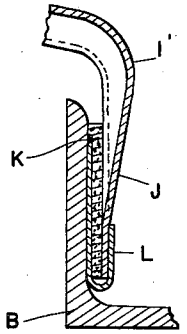
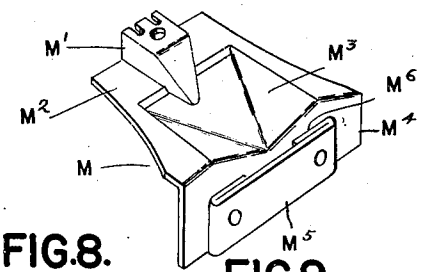




FIG.12.

FIG.7.



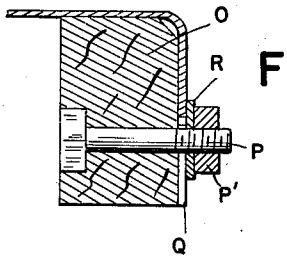




FIG.11.

FIG.8.

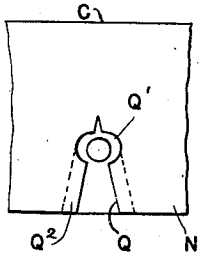
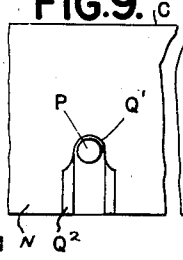



FIG.9.



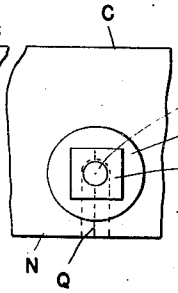




FIG.10.

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Patented Mar. 29, 1938 2,112,809

# UNITED STATES PATENT OFFICE

2,112,809

## CAR ROOF

David W. Hawksworth, Birmingham, Mich., assignor to Chicago-Hutchins Corporation, a corporation of Delaware

Application May 20, 1935, Serial No. 22,461

12 Claims. (Cl. 108—5.4)

The invention relates to car roofs of that type in which the roofing sheets are arranged beneath the carlines and are weatherproofed by nested return bent flanges housed within the channel of the carlines. In the present state of the art various constructions of roofs of this general type have been devised, in all of which the weatherproofing is effected as above described, and in which the sheets are supported by hangers depending from the carline and passing through apertures in the nested flanges of the sheets. It has been found that in commercial manufacture there are certain irregularities so that the sheets do not always exactly conform to the flanges of the carlines which may result in leaving an opening through which rain may be driven. Water entering through any opening between the carline flange and the sheet will run down on the latter towards the eaves, where it is permitted to drain out through downturned ends of the channel carline. However, it has been discovered that water draining to this point frequently finds access to the interior of the car by passing through the open lower ends of the nested sheet flanges.

To avoid the defects above referred to, as well as to obtain various other features of advantage, I have devised a novel construction of car roof as hereinafter set forth.

In the drawings:

Fig. 1 is a plan view of a portion of the car roof to which my improvements are applied;

Fig. 2 is a section on line 2—2, Fig. 1;

Fig. 3 is an end elevation of the roof;

Fig. 4 is a transverse section through the roof adjacent to the eaves end of the carline and nested sheets, showing the construction of flashing for weatherproofing the same;

Fig. 5 is a plan view of the portion shown in Fig. 4, indicating the flashing in dotted lines;

Fig. 6 is a side elevation of a portion of the roof;

Fig. 7 is a perspective view of the flashing member;

Fig. 8 is an elevation of a portion of the downturned flange on the end sheet illustrating the goring of this flange to permit of bending the sheet into curved form;

Figs. 9 and 10 are views similar to Fig. 8 after the curving of the sheet showing the manner of engaging the flange with the securing bolts;

Fig. 11 is a section through the end facia and flange of the end sheet showing the securing bolts and the weatherproofing means for the gored portion of the sheet;

Fig. 12 is a cross section through the side plate on line 12—12 of Figure 5, illustrating the manner of weatherproofing the sheet in engagement therewith.

In the type of roof above referred to, it is usual to extend the roofing sheets continuously from eaves to eaves of the car and to bend these sheets and the carlines to which they are attached into a curved form. In other words, instead of having a uniform pitch from a central ridge to the opposite eaves, there is one continuous curve, or what is termed in the art a radial construction. The carlines are of inverted channel cross section provided with outwardly extending side flanges A′ which are inclined slightly downward towards their outer edges. At opposite ends of this carline are downturned portions $A^2$ secured to the side plates B which as shown are Z-bars. The roofing sheets C extend between carlines and from eaves to eaves, being formed with portions C′ which are inclined to correspond in inclination to the flanges A′ of the carlines and which are in a slightly higher plane than the body portion of the sheet, being connected thereto by the portion $C^2$. The portions C′ are provided with upwardly extending return bent flanges D which are arranged to nest within each other, that is, the return bent portions of the sheet on one side of the carline nest with the return bent flange of the sheet on the opposite side of the carline. E are bolts or studs riveted or otherwise secured to the top web of the carline at spaced points in the length thereof and depending centrally within the channel thereof, passing through apertures D′ in the nested flanges D and threaded at their lower ends to engage clamping nuts F. The sheets are supported on members G, preferably formed of sheet metal bent into a C-shaped cross section and having a central aperture G′ for engaging the bolt or stud E. The lower portion of this member forms a shoulder against which the nut F will bear but preferably with a lock washer H interposed between the same. A plastic sheet I is arranged to cover the nested flanges of the roofing sheets and to extend between the portions C′ of the latter and the flanges A′ of the carlines.

With the construction just described, in assembling the roof the sheets C are placed beneath the carlines with their nested flanges extending upward into the channel and with the bolt or stud E extending through the apertures in said nested flanges. The supporting member G may then be placed on the stud, after which the lock washer H and nut F are engaged with the stud and the latter is screwed up until the clamping is effected. This clamping is not, however against any shoulder within the channel of the carline, but is against the flanges A′ and in case these are somewhat irregular in shape, the sheets when drawn upward will be conformed thereto. As a result the plastic material I clamped between the flanges A′ and portions C′ of the sheets will effectively seal the joint so that neither water, dust nor cinders can enter.

To reinforce and stiffen the roofing plates,

intermediate the nested flanges thereof beads I' are pressed in said sheets to extend from eaves to eaves. At the eaves the sheets C are turned downward at $C^3$ to overlap the side plate of the car and to form a weatherproof joint therewith. This is rendered more effective by tapering out the beads I' after passing around the curve between the top portion and depending flange J of the sheet so that the lower end of said flange is in a single plane to make contact with the side plates. I find, however, that even with this construction the weather is not excluded from the interior of the car, and I have therefore provided a packing K between the downturned flange and the upturned flange B' of the side plate B. This packing material is preferably felt impregnated with suitable plastic compound and to secure it to the flange of the sheet I provide U-shaped clamping clips L as indicated in Fig. 12.

The nested flanges D extend continuously to the upper end of the depending flange J but terminate at this point. The carlines, however, have the channel portion thereof bent downward at the eaves into parallelism with the side plates, as indicated at $A^2$. This will permit any water which finds access to the channel of the carline to drain downward at the eaves and escape. This, however, as above stated does not form a full weatherproof construction for the water so drained may enter the outer ends of the nested flanges and find access to the interior of the car. To avoid such result I have provided a flashing M as shown in detail in Fig. 7 comprising a portion M' for fitting up in the nested flanges of the sheets against the member G and secured thereto by the bolt E and nut F. On opposite sides of the portion M' are lateral flanges $M^2$ which slope downward toward the eaves and are laterally flared towards the eaves end. The central portion of the members $M^2$ is depressed to form a trough shaped recess $M^3$ and a downturned flange $M^4$ overlaps and lies adjacent to the side plate of the car. The flashing is clamped to the side plate by the downturned portions $A^2$ of the carlines A and a spacer $M^5$ having the return bent flanges $M^6$ is placed between the flange $M^4$ and the flanges of the carline to increase the clearance between the latter and the side plate. This permits the downturned flanges $C^3$ of the sheets which overlap the eaves to have a slight freedom of movement, thereby providing flexibility in the roof, while the packing material K maintains a weatherproof joint. The flashing M will therefore intercept any water entering through the ends of the nested flanges which drops into the trough-shaped recess $M^3$ and drains over the flange $M^4$. The space between the flanges $M^6$ will normally provide a passage for the water but in case of stoppage of this opening the water can drain over the spacer $M^5$.

At the end of the car the last roofing sheet is provided with a downturned flange N which overlaps the end facia O and is secured thereto by bolts P. As the roofing sheets are of a curved form this end flange if integral throughout its length can not be bent downward without upsetting the metal. As this would be a difficult operation to perform, I preferably cut a series of gores Q in the edge portion of the sheet from which the flange N is to be formed, said gores being located at the points of engagement with the bolts P. The gores are also fashioned with recesses Q' on opposite sides thereof and when the flange is turned downward the edges of the gores will be brought together while the recesses Q' will form an aperture for the bolt P. To permit of engagement with the bolt the portions $Q^2$ between the aperture Q' and the edge of the sheet are turned outward as indicated in Fig. 9, which leaves an entrance slot for the bolt, and after the sheet is in position these flanges are turned down again, as shown in Fig. 10. A washer R is then placed on the bolt P to cover the greater portion of the slit formed by the meeting edges of the gores, and when the nut P' is tightened, this will form a weatherproof joint.

A roof constructed as described is free from any downward projections below the roofing sheets, and also dispenses with purlines, ridge poles, etc. It is also thoroughly weatherproofed, first, by conforming the sheets to the flanges of the carlines when the nested flanges are drawn upward by the bolts E and nuts F; second, by the flashings M which catch any water that may enter between the carlines and sheets and directs it over the eaves; third, by the packing material between the downturned flanges of the sheets and the side plate which seals the joint but still permits of movement of the sheet relative to the carlines and side plate. The end sheet of the roof is also provided with a downturned slotted flange which can be easily engaged with the bolts P for securing it to the facia and which when secured, permits of closing the slot and weatherproofing the same by the washer R.

What I claim as my invention is:

1. In a car roof, the combination with inverted channel carlines having outwardly projecting base flanges, of roofing sheets extending between and beneath said carlines, said sheets being provided with upstanding return bent flanges adapted to be nested within the channel of the carline, and means for supporting said sheets engaging said nested flanges and being adapted to draw the same upward without obstruction to conform said sheets including any irregular portions thereof to the flanges of the carline, and to effect a sealing engagement therewith.

2. In a car roof, the combination with inverted channel carlines having outwardly projecting base flanges, of roofing sheets extending between and beneath said carlines, said sheets being provided with upstanding return bent flanges adapted to be nested within the channel of the carline, hanger studs depending from said carline and passing through apertures in the nested flanges of said sheets, a sheet support sleeved upon said hanger and means adjustably engaging said hangers for raising said nested flanges and sheets without obstruction to conform the latter including any irregular portions thereof to the flanges of said carline and to effect a sealing engagement therewith.

3. In a car roof, the combination with inverted channel carlines extending from eaves to eaves of the car and having outstanding base flanges, of roofing sheets extending between and beneath said carlines, said sheets being provided with upstanding return bent flanges adapted to be nested within the channel of the carline, hangers depending from said carline within the channel thereof and passing through apertures in said nested flanges, a sheet support formed of sheet metal sleeved upon said hanger and a nut engaging a threaded portion of said hanger for adjusting upward said sheet support and nested flanges to conform said sheets including any irregular portions thereof to the flanges of said carline and to form a sealing joint therewith, said

carline flanges forming the sole means for limiting the upward adjustment of the sheets.

4. In a car roof, the combination with inverted channel carlines extending from eaves to eaves of the car and provided with outwardly extending base flanges slightly inclined downward towards their outer edges, of roofing sheets extending between and beneath said carlines being provided with portions conforming substantially to the angle of said carline flanges and also provided with upstanding return bent flanges adapted to be nested within the channel of the carline, a sheet of packing material between said carline flanges and the corresponding portions of said sheets, a hanger stud depending from said carline within said channel and passing through apertures in said nested flanges, a sheet support sleeved upon said stud, a clamping nut having a threaded engagement with said stud and a lock washer between said clamping nut and sheet support, said carline flanges forming the sole means for resisting upward movement of said sheets whereby the adjustment of said nut will conform said sheets including any irregular portions thereof to said carline and effect a sealing joint therewith.

5. In a car roof, the combination with inverted channel carlines having outwardly projecting base flanges, of roofing sheets extending between and beneath said carlines provided with upstanding return bent flanges nested within the channel of the carline and secured thereto and also provided with a downturned flange overlapping the side plate at the eaves, and packing material between said flange and side plate comprising a felt strip and clips for securing said strip to the inner surface of the flange.

6. In a car roof, a roofing sheet having a downturned flange overlapping the side plate at the eaves, a strip of packing material on the inner face of said flange and U-shaped clips for securing said packing material to the flange.

7. In a car roof of the type comprising inverted channel carlines having outwardly projecting base flanges, said carlines extending from eaves to eaves with downturned portions overlapping the eaves and secured thereto, and roofing sheets extending between and beneath said carlines having upstanding return bent flanges nested within the channel of the carline and downturned flanges at the eaves, a flashing for weatherproofing beneath the carlines at the eaves, said flashing having a portion extending upward into the nested flanges and secured thereto to intercept the passage of water inward therethrough, a portion sloping downward therefrom to the eaves and terminating in a downturned flange overlapping the eaves, said flange being clamped to the eaves by the carline.

8. In a car roof of the type comprising inverted channel carlines having outwardly projecting base flanges, said carlines extending from eaves to eaves with downturned portions overlapping the eaves and secured thereto, and roofing sheets extending between and beneath said carlines having upstanding return bent flanges nested within the channel of the carline and downturned flanges at the eaves, a flashing for weatherproofing beneath the carline at the eaves comprising a portion extending upward within the nested flanges and bolted thereto to intercept the passage of water inward therethrough, a portion sloping downward therefrom to the eaves and terminating in a downturned flange overlapping the eaves, said sloping portion being provided with a depressed central portion forming a trough for directing water falling upon the flashing to the center thereof and over the eaves.

9. In a car roof of the type comprising inverted channel carlines having outwardly projecting base flanges, said carlines extending from eaves to eaves with downturned portions overlapping the eaves and secured thereto, and roofing sheets extending between and beneath said carlines having upstanding return bent flanges nested within the channel of the carline and downturned flanges at the eaves, a flashing having a portion extending upward into the nested flanges and bolted thereto to intercept the passage of water inward therethrough, a portion sloping downward therefrom to the eaves terminating in a downturned flange overlapping the eaves, said sloping portion being centrally depressed to form a trough for directing water falling thereon towards the center and over the eaves, and a spacer secured to said downturned flange between the same and the downturned portion of the carline.

10. In a car roof of the type having curved roofing sheets extending from eaves to eaves, an end sheet provided with a downturned flange for overlapping the end facia, said flange having a closed gore therein with a bolt hole, a bolt engaging said facia and extending out through said bolt hole, a nut engaging said bolt and a washer between said nut and flange covering the slit of said closed gore.

11. In a car roof of the type having curved roofing sheets extending from eaves to eaves, an end sheet provided with a downturned flange for overlapping the end facia, said flange having a bolt hole therein with a slit in the portion between said hole and the edge of the flange permitting of bending the portions on opposite sides of said slit to form an entrance slot, a bolt projecting from the facia engaging said aperture and entering through said slot, a nut engaging said bolt and a washer on said bolt between said nut and flange covering and weatherproofing said slit.

12. In a car roof of the type comprising inverted channel carlines having outwardly projecting base flanges, said carlines extending from eaves to eaves with downturned portions overlapping the eaves and secured thereto, and roofing sheets extending between and beneath said carlines having upstanding return bent flanges nested within the channel of the carline and downturned flanges at the eaves; a flashing having a portion extending upward into the nested flanges and bolted thereto to intercept the passage of water inward therethrough, a portion sloping downward therefrom to the eaves terminating in a downturned flange overlapping the eaves, said sloping portion being centrally depressed to form a trough for directing water falling therethrough toward the center and over the eaves, and a spacer between said upwardly extending portion and said nested flanges overlapping said downwardly sloping portion to further intercept the inward passage of water.

DAVID W. HAWKSWORTH.