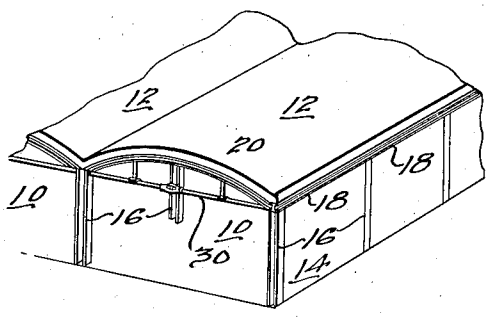
June 17, 1941. R. H. KRUEGER 2,245,690

ROOF STRUCTURE

Filed Dec. 19, 1940

FIG. 1.



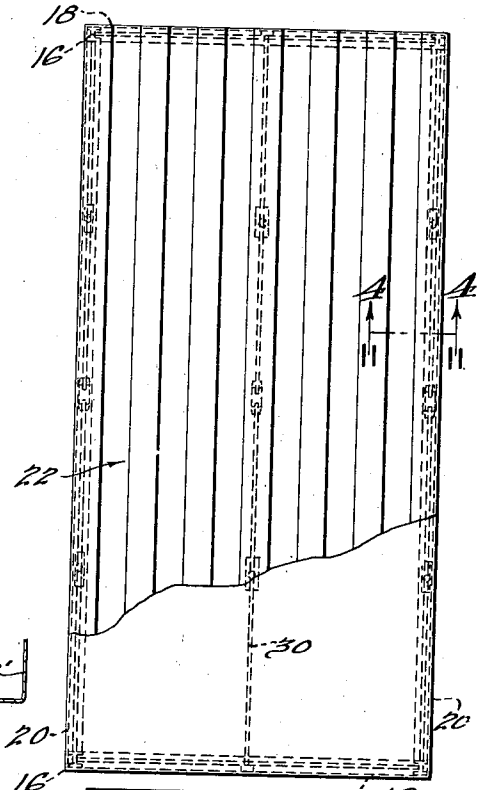


FIG. 2.

FIG. 6.

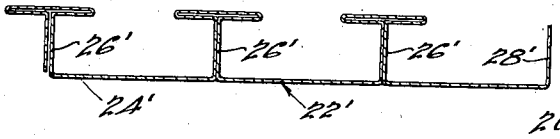
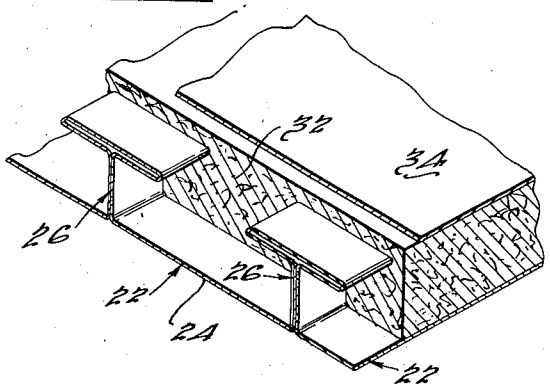


FIG. 3.



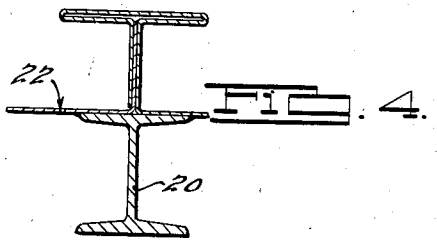


FIG. 4.

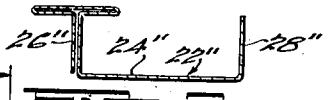


FIG. 7.

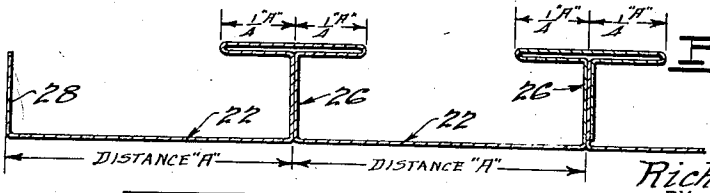


FIG. 5.

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UNITED STATES PATENT OFFICE

2,245,690

ROOF STRUCTURE

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Application December 19, 1940, Serial No. 370,746

13 Claims. (Cl. 108—1)

This invention relates to roof structures and is particularly adaptable to that type of roof structure required to extend over and cover a relatively long span, the principal object being the provision of a structure of this type that is simple in construction, light in weight and economical to build.

Objects of the invention include the provision of a roof structure capable of use over relatively long spans but which will be materially lighter in weight than conventional roof structures of an equivalent span and yet will be amply strong for the purpose required; the provision of a roof structure of the type described in which the principal elements consist of angularly sectioned sheet metal members extending longitudinally of the span; the provision of a roof structure of the type described in which the roof has a continuous thickness determined by the depth of the angularly sectioned sheet metal members extending longitudinally of the same; the provision of a curved roof structure formed from sheet metal members of such construction that the center of gravity of the section coincides with the neutral axis thereof; the provision of a roof structure in which the principal members are constructed of sheet metal and formed to provide T-sectioned elements the legs of which are connected together; and provision of a roof structure of the type described in which the T-sectioned elements are so proportioned that equal masses of metal are provided along the inner and outer faces of the roof sections; and the provision of a roof structure of the type described in which the sheet metal members are formed for marginal cooperation with each other in such a manner as to enhance the strength of the structure, facilitate the assembly of the sheet metal members to one another and to facilitate the securement of the sheet metal members to one another.

The above being among the objects of the present invention the same consists in certain novel features of construction and combination of parts to be hereinafter described with reference to the accompanying drawing, and then claimed, having the above and other objects in view.

In the accompanying drawing which illustrates a suitable embodiment of the present invention and in which like numerals refer to like parts throughout the several different views,

Fig. 1 is a fragmentary perspective view of a building provided with a roof constructed in accordance with the present invention;

Fig. 2 is an enlarged plan view of one of the sections of the roof shown on the building in Fig. 1, with a portion of the covering and filling material removed to better illustrate the construction;

Fig. 3 is an enlarged fragmentary, partially broken, partially sectioned perspective view of a portion of the roof structure shown in Figs. 1 and 2;

Fig. 4 is a still further enlarged fragmentary vertical section taken on the line 4—4 of Fig. 2 and illustrating a preferred method of securing the longitudinally extending sheet metal members to a roof beam where the latter is employed;

Fig. 5 is a fragmentary transverse sectional view taken through a pair of the sheet metal members employed in the construction shown in the preceding views to more clearly bring out the construction and relative dimensions of the parts;

Fig. 6 is a transverse sectional view taken through a modified form of sheet metal member; and,

Fig. 7 is a transverse sectional view taken through a still further modified form of sheet metal member.

Roof structures required to span a relatively great distance without support have, in accordance with conventional practice, involved a considerable amount of structural steel necessarily involving great weight and running into considerable cost in their construction. In addition, in conventional constructions when the space below the roof requires heating, it requires the application of insulating material to the roof which has no material value from the standpoint of increasing the strength thereof but serves primarily, from a structural standpoint, as an additional dead load which must be carried by the roof structure. It is the main purpose of the present invention to provide a roof structure in which the use of structural steel members is minimized to a great extent and may even be eliminated entirely, the structural steel members of conventional constructions being replaced by sheet metal members of angular cross-sectional configuration, the whole being so constructed and arranged as to provide a roof with ample factor of safety and yet weighing only a fraction of the corresponding roof constructed in accordance with conventional practice. Additionally, with a structure of the present invention heat insulating material may be readily applied to the roof structure in a simple and economical manner and where such insulation material is of a desired type it actually serves to further stiffen the structure and increases the factor of safety thereof.

One of the principal features of the present invention is that it provides a sheet metal member of such cross-sectional configuration that its center of gravity coincides with its neutral axis and particularly when used for a curved or arched roof where the stresses will be evenly applied under such conditions, it enables an extremely light roof to be produced with a minimum amount of steel but with ample factor of safety.

Referring to Fig. 1, a fragment of a building is there illustrated as comprising a plurality of adjacent sections or bays indicated generally at **10**, each section or bay having its own convexly curved or arched roof indicated generally at **12**. It will, of course, be understood that the equivalent of one section or bay **10** of one roof may, when provided with side and end walls, constitute an individual building all by itself, the multiple type being shown by way of illustration. In the particular building structure shown the type of structure includes a side wall indicated generally at **14**, an open front which may or may not be closed by suitable walls, doors, or the like, a suitable back wall (not shown) and being open on the side opposite the side **14** into the next section or bay **10**.

It may be assumed for the purpose of description that sections or bays **10** are of relatively great width, for instance in the neighborhood of 100 feet, and that no supporting columns are permitted between the side walls in the main portion of the building. Accordingly, along each side of each section or bay **10** columns **16** are provided. These columns are connected at the top by structural steel members such as channels or I-beams **18** rigidly secured thereto. Although not necessary in the broader aspects of the present invention, it will sometimes be desirable that corresponding columns **16** on opposite sides of each section **10** be connected together by a structural steel member such as I-beams **20** curved in conformance with the curvature of the roof. Accordingly, between each pair of adjacent structural members **20** a roof section constructed in accordance with the present invention is provided.

In the preferred form of the structure illustrated in Figs. 1 to 5, inclusive, it will be noted that the roof is made up of a plurality of main longitudinally extending members indicated generally at **22** longitudinally curved into conformance with the desired curvature of the roof and arranged parallel with the corresponding structural members **20** at each side of the section. In referring to the members **22** as extending longitudinally it will, of course, be appreciated that by "longitudinally" is here meant longitudinally of the corresponding sections between columns **16**, for instance as illustrated in Fig. 2, and, accordingly, they extend transversely of the roof structure as a whole in the construction illustrated in Fig. 1.

Each of the members **22** is formed from sheet metal, the gauge usually depending upon the span of the roof and the weight to be supported thereby, and each member is formed to provide a substantially flat, in transverse section, base portion **24** and at least one upwardly projecting continuous T-sectioned portion indicated generally at **26** formed integrally therewith. Although, as will be readily appreciated by those skilled in the art, the base portion **24** may be positioned either on the outer side or the inner side of the structure, it is preferable under most circumstances and particularly for reasons hereinafter brought out that it is positioned on the inner side of the structure as illustrated and it is, therefore, shown in this position for the purpose of illustration. Also for the purpose of illustration it is assumed that the members **22** in the construction illustrated in Figs. 1 to 5, inclusive, each include a pair of upwardly extending T-sectioned portions **26**, as illustrated in Fig. 5. Referring to Fig. 5 it will be noted that each T-section portion **26** is formed by bending or otherwise forming a portion of the metal of the original strip upwardly to form a double thickness leg for the T-section and a double thickness head or cross for the T-section, the two thicknesses of the head of the T preferably being slightly spaced from each other as indicated. One of the T-sectioned portions **26** is formed at and along one side margin of the sheet, as indicated in Fig. 5, with the leg portions thereof separated by a distance substantially equal to the gauge of the sheet. The opposite marginal edge of the sheet is bent upwardly as at **28** to form a continuous flange extending perpendicularly with respect to the plane of the sheet and of a height substantially equal to the height of the legs of the T-section **26**. The sections are assembled together as illustrated in Figs. 3, 4 and 5 with the flange **28** along the margin of one member received between the separated leg portions of the T-section along the margin of the next adjacent member and the flange is rigidly secured to such leg portions as by means of welding, riveting, or the like.

In the preferred form of construction, which is illustrated in Fig. 5, the distance between adjacent T-sections **26**, and between the flange **28** and the adjacent T-section **26** of each member, is illustrated by the distance A. The width of the head of each T-section **26** is equal to one-half A and is arranged in equally balanced relation on each side of the corresponding leg of its T-section. From this it will be appreciated that the head of each T-section **26** being half the distance between adjacent T-sections **26** and being of double thickness, results in a construction in which the same amount of metal is present in the upper surface of each member as in the lower surface thereof and, because of the fact that the legs of the T-sections **26** are of constant thickness throughout their height, it provides a roof section in which the center of gravity of the section coincides with its neutral axis. As will be appreciated where this type of member is employed for a curved or arched roof the loading on the roof is applied evenly to both the upper and lower surfaces of the section, thus enabling the smallest amount of metal to be employed in the structure consistent with the strength required.

Each member **22** as thus described is, of course, formed from a single piece of metal over its entire width but ordinarily it will not be formed from a single strip of metal over its entire length particularly where the length of the section is in the neighborhood of 100 feet as assumed in the particular case illustrated. Rather the members **22** will be made in sections of shorter length, as for instance 25 feet, and sufficient sections joined together in end-to-end relationship to provide the required overall length. In such case it will be advisable that the joints between longitudinal portions or sections of each member **22** do not align with the joint between longitudinal sections of the next adjacent members **22**, but rather are preferably centrally overlapped by a longitudinal section of the next adjacent member **22**, thereby to prevent the possibility of aligned joints

from creating a line of weakness in the roof structure.

The members 22 are preferably formed in flat condition from suitable sheets or strips of metal to the sectional configuration described and then passed through suitable rolls or the like to bring them to the curvature desired in the roof structure before assembly thereto. This is particularly true in the heavier sections and where the curvature or arch of the roof is material, but it is possible where the gauge of the metal is relatively light and the section of moderate thickness and the roof structure is not arched to a high degree, to allow the flat members to sag, or to be pressed to the desired curvature, without the necessity of passing them through rolls to preform them.

It will, of course, be appreciated that the members 22 extend longitudinally of the section illustrated in Fig. 2 and in parallelism with the curved side structural members 20 where the latter are employed. Furthermore, where the members 20 are employed it is preferable to arrange a joint, such as illustrated in Fig. 4, centrally of the members 20 as illustrated in Fig. 4.

In constructing a roof section of the type described, after the structural steel members 16, 18 and 20 are erected and fixed together, one member 22 is first applied to one of the end structural members 20 of the roof and is rigidly fixed thereto. That edge of the member 22 being applied to such end member 20 will be the one having the T-sectioned portion 26 thereon and it will be applied centrally of the member 20 and rigidly fixed to the member 20 as by welding, riveting, or the like. It will be understood that the roof will always be built from one end of the building toward the other and that after the first member 22 has been applied as described, then the next adjacent member 22 will in turn be applied, the flange 28 of the first applied member 22 being received between the spaced legs of the T-sectioned margin of such next adjacent member and rigidly fixed thereto as by welding, riveting, or the like. The members 22 in being applied will, of course, be rigidly secured to the end members 18 and will be applied in turn one after the other until the entire length of the roof has been covered thereby.

With the type of roof structure described it will be found that the structure is of such rigidity that there will be but a minor tendency for the end of each section to bulge outwardly between the adjacent columns 16 under load but, if desired, suitable tension members may be extended between the opposite sides of the roof structure as between opposed columns 16 on the opposite sides of the building and at desired points between the columns 16. Such tension members are illustrated in the drawing as tension rods 30.

After the roof has been constructed as thus far described it may, if desired, be covered in the state described with a suitable weather repellent covering or sheathing of any suitable or desirable type. However, in accordance with a further phase of the present invention, it is preferable to fill the space between the T-sections 26 with some material such as 32, illustrated in Fig. 3, that may have either one or the other or both of two characteristics. One characteristic which the material 32 may have is the character of insulation against transfer of heat therethrough in which case the material 32 may be of any suitable or conventional heat insulating material capable of being readily applied between and over the T-sectioned portions 26 and may be either of a loose type of material or some type capable of being formed into a more or less integral mass. On the other hand the material 32 may be of a character which will reinforce the members 22 against buckling, warping, or the like and in such case the material 32 may be concrete or the like simply poured or cast into place. The material 32 is preferably applied to a depth sufficient to imbed the T-sections 26 a material distance therein as brought out in Fig. 3. It will be appreciated that where a material such as concrete or other cementitious material is employed the entire roof structure assumes a form similar to that of a reinforced concrete roof but including metallic members of a new form through which the principal strength of the roof is obtained. Concrete, of course, does not have a high degree of resistability to transfer of heat through it and, accordingly, where concrete is employed some material of a higher insulating value is preferably provided over the upper surface of the same to enhance the heat insulation qualities thereof when desired.

On the other hand cement, such as Portland cement, may be mixed with a suitable material of high heat insulation qualities and be employed for the material 32, in which case the material 32 not only will reinforce the metallic portion of the structure against forming or distortion under load, but will also serve as a heat insulation material for insulating the roof against the transfer of heat therethrough. One material which is ideally suitable to mix with cement for this purpose is vermiculite which, when mixed with a suitable quantity of Portland cement, may be cast into place and thereafter not only enhance the strength of the roof itself, but due to the air cells which the vermiculite causes to be distributed throughout the mixture, forms an excellent heat insulation for the roof.

In any event after the material 32 has been applied to the roof structure, its outer surface is then preferably covered by a suitable roofing material such as 34 applied in any suitable or conventional manner for protection of material 32 against the effects of weather thereon.

It will be appreciated from the foregoing that the structure provided in accordance with the present invention enables a roof of extended span to be constructed with a relatively simple, efficient and unusually light and, therefore, in an economical manner, and that it may be easily and efficiently insulated against the transfer of heat therethrough.

As previously mentioned where a roof span shorter than that assumed in connection with the structure shown in Figs. 2 to 5, inclusive, is to be provided with a roof constructed in accordance with the present invention, it is possible to use a lighter gauge of metal with a section of less depth and in such case each member equivalent to the member 22 previously described may be provided with more than two T-sectioned portions if desired. An illustration of such construction is shown in Fig. 6 in which parts equivalent to the parts previously described are indicated by the same numerals except that such numerals bear a prime mark. It will be noted that in this case the cross-sectional configuration of the member 22' is generally the same as the member 22 except that instead of having one T-sectioned portion 26 intermediate the opposite margins of the member 22', two T-sectioned portions 26' are provided between the margins, an additional T-sectioned member 26' being provided along one margin and a flange 28' along the

opposite. Except for the above described change and the possibility of the use of lighter gauge metal, the structure is otherwise the same as that first described and will incorporate all of the benefits thereof.

On the other hand if the span of the roof is greater than that assumed in connection with the construction illustrated in Figs. 2 to 5, inclusive, then it will ordinarily be desirable to employ a deeper section for the sheet metal members and to form them of heavier gauge material. In such case it may be preferable to form each member with but a single T-sectioned portion. Such construction is illustrated in Fig. 7 where the parts equivalent to the parts first described are indicated by the same numerals except that such numerals bear a double prime mark. As will be observed in this case one T-sectioned portion 26'' is provided along one margin of the member 22'' and a flange 28'' along the opposite side but with no T-sectioned portions intermediate the opposite margins. The single T-sectioned portion 26'' is, of course, formed with the two portions of the legs separated for reception of the flange 28'' of an adjacent section. With the further possible exception that the member shown in Fig. 7 may be formed of heavier gauge material, the construction is otherwise the same as that previously described and, of course, incorporates all of the advantages thereof.

Formal changes may be made in the specific embodiments of the invention described without departing from the spirit or substance of the broad invention, the scope of which is commensurate with the appended claims.

What is claimed is:

1. A roof structure comprising, in combination, a plurality of sheet metal members arranged in parallel and adjacent relationship and extending in approximate parallelism with opposite sides of said structure, each of said members comprising a base portion substantially flat in cross-sectional view, an outwardly directed flange integral with one margin thereof, and an integral outstanding sheet metal T-sectioned portion along the opposite margin thereof, said T-sectioned portion being of double thickness with the legs thereof spaced from one another and receiving the flange of the next adjacent member on one side thereof.

2. A curved or arched roof structure comprising, in combination, a plurality of longitudinally curved sheet metal members extending in approximate parallelism with opposite sides of said structure, each of said members comprising a transversely flat base portion, a substantially continuous flange integral therewith and projecting perpendicularly from one side margin thereof, and a substantially continuous T-sectioned portion projecting outwardly from the opposite side margin thereof with the leg thereof substantially perpendicular to the plane of the base portion, said T-sectioned portion being of double thickness with the two thicknesses in the leg portion thereof separated by a distance substantially equal to the gauge of the metal, the marginal flange of one member being received between the two portions of the leg of the marginal T-sectioned portion of the next adjacent member and rigidly fixed thereto.

3. A curved or arched roof structure comprising, in combination, a plurality of longitudinally curved sheet metal members extending in approximate parallelism with opposite sides of said structure, each of said members comprising a transversely flat base portion, a substantially continuous flange integral therewith and projecting perpendicularly from one side margin thereof, a substantially continuous T-sectioned portion projecting outwardly from the opposite side margin thereof with the leg thereof substantially perpendicular to the plane of the base portion, said T-sectioned portion being of double thickness with the two thicknesses in the leg portion thereof separated by a distance substantially equal to the gauge of the metal, the marginal flange of one member being received between the two portions of the leg of the marginal T-sectioned portion of the next adjacent member and rigidly fixed thereto, and at least one additional substantially continuous T-sectioned portion projecting outwardly from the base of each of said members with its leg substantially perpendicular to the plane of the base and located intermediate said flange and the first mentioned T-sectioned portion.

4. A curved or arched roof structure comprising, in combination, a plurality of longitudinally curved sheet metal members extending in approximate parallelism with opposite sides of said structure, each of said members comprising a transversely flat base portion, a substantially continuous flange integral therewith and projecting perpendicularly from one side margin thereof, and a substantially continuous T-sectioned portion projecting outwardly from the opposite side margin thereof with the leg thereof substantially perpendicular to the plane of the base portion, said T-sectioned portion being of double thickness with the two thicknesses in the leg portion thereof separated by a distance substantially equal to the gauge of the metal, the marginal flange of one member being received between the two portions of the leg of the marginal T-sectioned portion of the next adjacent member and rigidly fixed thereto, the width of the head of the T-sectioned portion being substantially equal to one-half the width of the base portion of said member.

5. A curved or arched roof structure comprising, in combination, a plurality of longitudinally curved sheet metal members extending in approximate parallelism with opposite sides of said structure, each of said members comprising a transversely flat base portion, a substantially continuous flange integral therewith and projecting perpendicularly from one side margin thereof, a substantially continuous T-sectioned portion projecting outwardly from the opposite side margin thereof with the leg thereof substantially perpendicular to the plane of the base portion, said T-sectioned portion being of double thickness with the two thicknesses in the leg portion thereof separated by a distance substantially equal to the gauge of the metal, the marginal flange of one member being received between the two portions of the leg of the marginal T-sectioned portion of the next adjacent member and rigidly fixed thereto, and at least one additional substantially continuous T-sectioned portion projecting outwardly from the base of each of said members with its leg substantially perpendicular to the plane of the base and located intermediate said flange and the first mentioned T-sectioned portion, the combined width of the heads of said T-sectioned portions being substantially equal to one-half of the width of said base portion.

6. A curved or arched roof structure comprising, in combination, a plurality of longitudinally

curved sheet metal members extending in approximate parallelism with opposite sides of said structure, each of said members comprising a transversely flat single thickness base portion, an upstanding integral and substantially continuous flange along one side margin thereof, and at least two integral laterally spaced continuous T-sectioned portions extending longitudinally thereof and integrally therewith, said T-sectioned portions being arranged with their legs perpendicular to the plane of said base and with their heads transversely aligned with each other, the combined width of the heads of said T-sectioned portions being substantially equal to one-half the width of said base portion whereby equal amounts of metal exists in the top and bottom surfaces of said members.

7. A curved or arched roof structure comprising, in combination, a plurality of longitudinally curved sheet metal members extending in approximate parallelism with opposite sides of said structure, each of said members comprising a transversely flat base portion, a substantially continuous flange integral therewith and projecting perpendicularly from one side margin thereof, a substantially continuous T-sectioned portion projecting outwardly from the opposite side margin thereof with the leg thereof substantially perpendicular to the plane of the base portion, said T-sectioned portion being of double thickness with the two thicknesses in the leg portion thereof separated by a distance substantially equal to the gauge of the metal, the marginal flange of one member being received between the two portions of the leg of the marginal T-sectioned portion of the next adjacent member and rigidly fixed thereto, and a mass of heat insulation material filling the space between adjacent T-sectioned portions.

8. A curved or arched roof structure comprising, in combination, a plurality of longitudinally curved sheet metal members extending in approximate parallelism with opposite sides of said structure, each of said members comprising a transversely flat base portion, a substantially continuous flange integral therewith and projecting perpendicularly from one side margin thereof, a substantially continuous T-sectioned portion projecting outwardly from the opposite side margin thereof with the leg thereof substantially perpendicular to the plane of the base portion, said T-sectioned portion being of double thickness with the two thicknesses in the leg portion thereof separated by a distance substantially equal to the gauge of the metal, the marginal flange of one member being received between the two portions of the leg of the marginal T-sectioned portion of the next adjacent member and rigidly fixed thereto, at least one additional substantially continuous T-sectioned portion projecting outwardly from the base of each of said members with its leg substantially perpendicular to the plane of the base and located intermediate said flange and the first mentioned T-sectioned portion, and a mass of heat insulation material filling the space between adjacent T-sectioned portions.

9. A curved or arched roof structure comprising, in combination, a plurality of longitudinally curved sheet metal members extending in approximate parallelism with opposite sides of said structure, each of said members comprising a transversely flat base portion, a substantially continuous flange integral therewith and projecting perpendicularly from one side margin thereof, a substantially continuous T-sectioned portion projecting outwardly from the opposite side margin thereof with the leg thereof substantially perpendicular to the plane of the base portion, said T-sectioned portion being of double thickness with the two thicknesses in the leg portion thereof separated by a distance substantially equal to the gauge of the metal, the marginal flange of one member being received between the two portions of the leg of the marginal T-sectioned portion of the next adjacent member and rigidly fixed thereto, and a mass of rigid material interposed between adjacent T-section portions and substantially imbedding said T-sectioned portions therein.

10. A curved or arched roof structure comprising, in combination, a plurality of longitudinally curved sheet metal members extending in approximate parallelism with opposite sides of said structure, each of said members comprising a transversely flat base portion, a substantially continuous flange integral therewith and projecting perpendicularly from one side margin thereof, a substantially continuous T-sectioned portion projecting outwardly from the opposite side margin thereof with the leg thereof substantially perpendicular to the plane of the base portion, said T-sectioned portion being of double thickness with the two thicknesses in the leg portion thereof separated by a distance substantially equal to the gauge of the metal, the marginal flange of one member being received between the two portions of the leg of the marginal T-sectioned portion of the next adjacent member and rigidly fixed thereto, at least one additional substantially continuous T-sectioned portion projecting outwardly from the base of each of said members with its leg substantially perpendicular to the plane of the base and located intermediate said flange and the first mentioned T-sectioned portion, and a mass of rigid material interposed between adjacent T-sectioned portions and substantially imbedding said T-sectioned portions therein.

11. A curved or arched roof structure comprising, in combination, a plurality of longitudinally curved sheet metal members extending in approximate parallelism with opposite sides of said structure, each of said members comprising a transversely flat base portion, a substantially continuous flange integral therewith and projecting perpendicularly from one side margin thereof, a substantially continuous T-sectioned portion projecting outwardly from the opposite side margin thereof with the leg thereof substantially perpendicular to the plane of the base portion, said T-sectioned portion being of double thickness with the two thicknesses in the leg portion thereof separated by a distance substantially equal to the gauge of the metal, the marginal flange of one member being received between the two portions of the leg of the marginal T-sectioned portion of the next adjacent member and rigidly fixed thereto, and a mass comprising a mixture of Portland cement and vermiculite filling the space between adjacent T-sectioned portions and substantially imbedding said T-sectioned portions therein.

12. A curved or arched roof structure comprising, in combination, a plurality of longitudinally curved sheet metal members extending in approximate parallelism with opposite sides of said structure, each of said members comprising a transversely flat base portion, a substantially continuous flange integral therewith and projecting perpendicularly from one side margin thereof, a substantially continuous T-sectioned portion projecting outwardly from the opposite side margin

thereof with the leg thereof substantially perpendicular to the plane of the base portion, said T-sectioned portion being of double thickness with the two thicknesses in the leg portion thereof separated by a distance substantially equal to the gauge of the metal, the marginal flange of one member being received between the two portions of the leg of the marginal T-sectioned portion of the next adjacent member and rigidly fixed thereto, at least one additional substantially contiuous T-sectioned portion projecting outwardly from the base of each of said members with its leg substantially perpendicular to the plane of the base and located intermediate said flange and the first mentioned T-sectioned portion, and a mass comprising a mixture of Portland cement and vermiculite filling the space between adjacent T-sectioned portions and substantially imbedding said T-sectioned portions therein.

13. A sheet metal roof section element comprising a transversely flat single thickness base portion, a continuous flange portion projecting perpendicularly with respect to the plane of said base portion along one side margin thereof, and a continuous T-sectioned portion along the opposite side margin of said base portion arranged with its leg perpendicular to the plane of said base portion and extending from said base portion in the same direction as said flange position, said T-sectioned portion being of double thickness with the two thicknesses of said leg portion generally spaced from one another, all of said portions being formed integrally with one another from a single sheet of metal.

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