March 28, 1961 R. C. LINCK 2,976,648

METAL ROOF CONSTRUCTION

Filed July 3, 1957 3 Sheets-Sheet 1

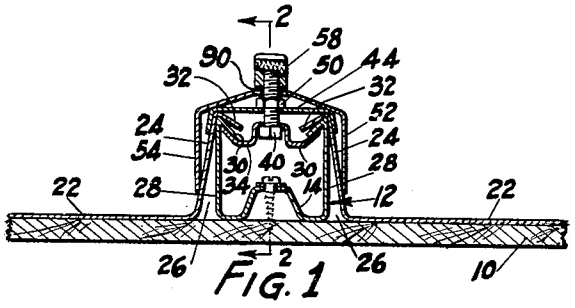


FIG. 1

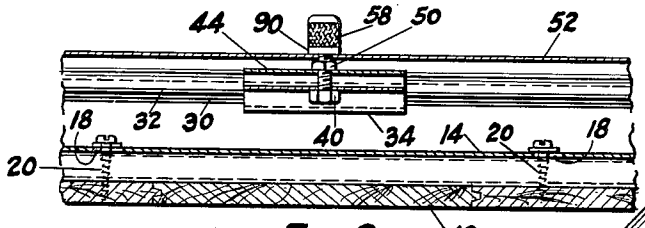


FIG. 2

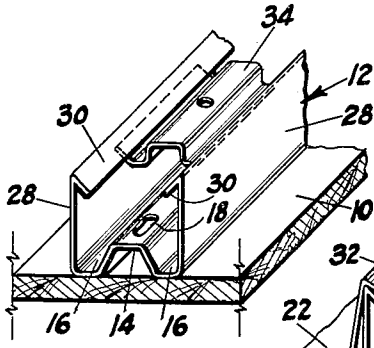


FIG. 3

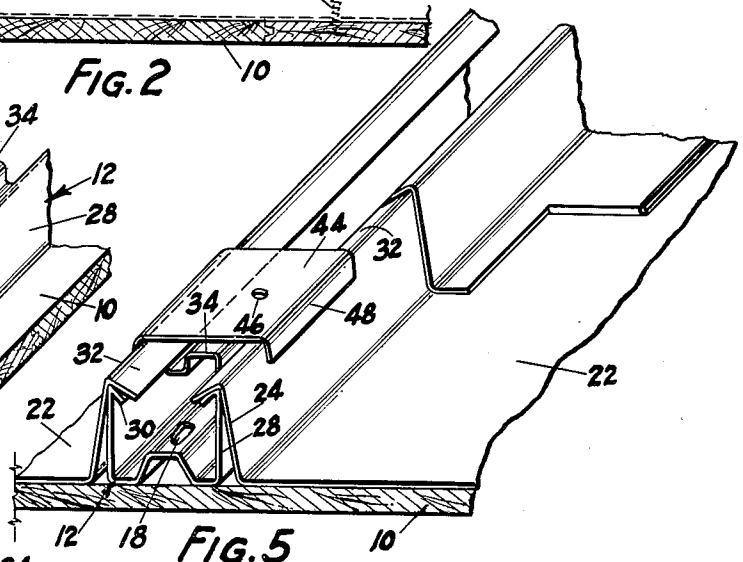


FIG. 5

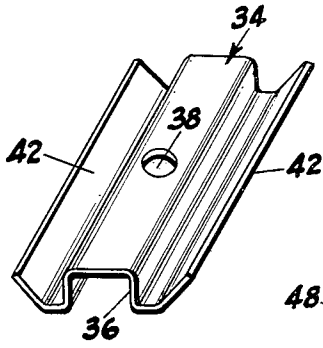


FIG. 4

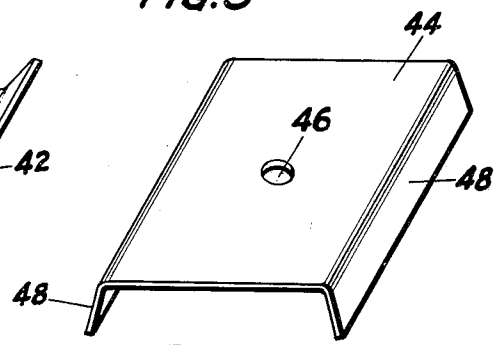


FIG. 6

INVENTOR.
ROBERT C. LINCK
BY
ATTORNEY

March 28, 1961 R. C. LINCK 2,976,648

METAL ROOF CONSTRUCTION

Filed July 3, 1957 3 Sheets-Sheet 2

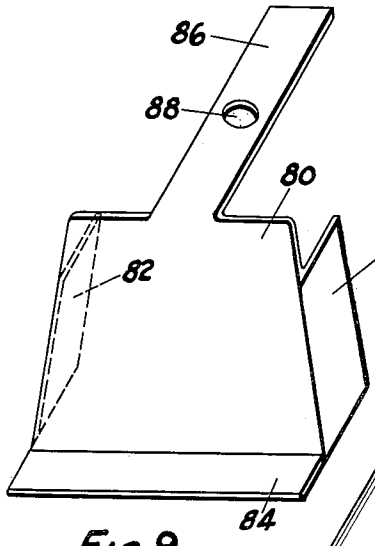


FIG. 9

FIG. 7

FIG. 8

INVENTOR.
ROBERT C. LINCK
BY
ATTORNEY

March 28, 1961 R. C. LINCK 2,976,648

METAL ROOF CONSTRUCTION

Filed July 3, 1957 3 Sheets-Sheet 3

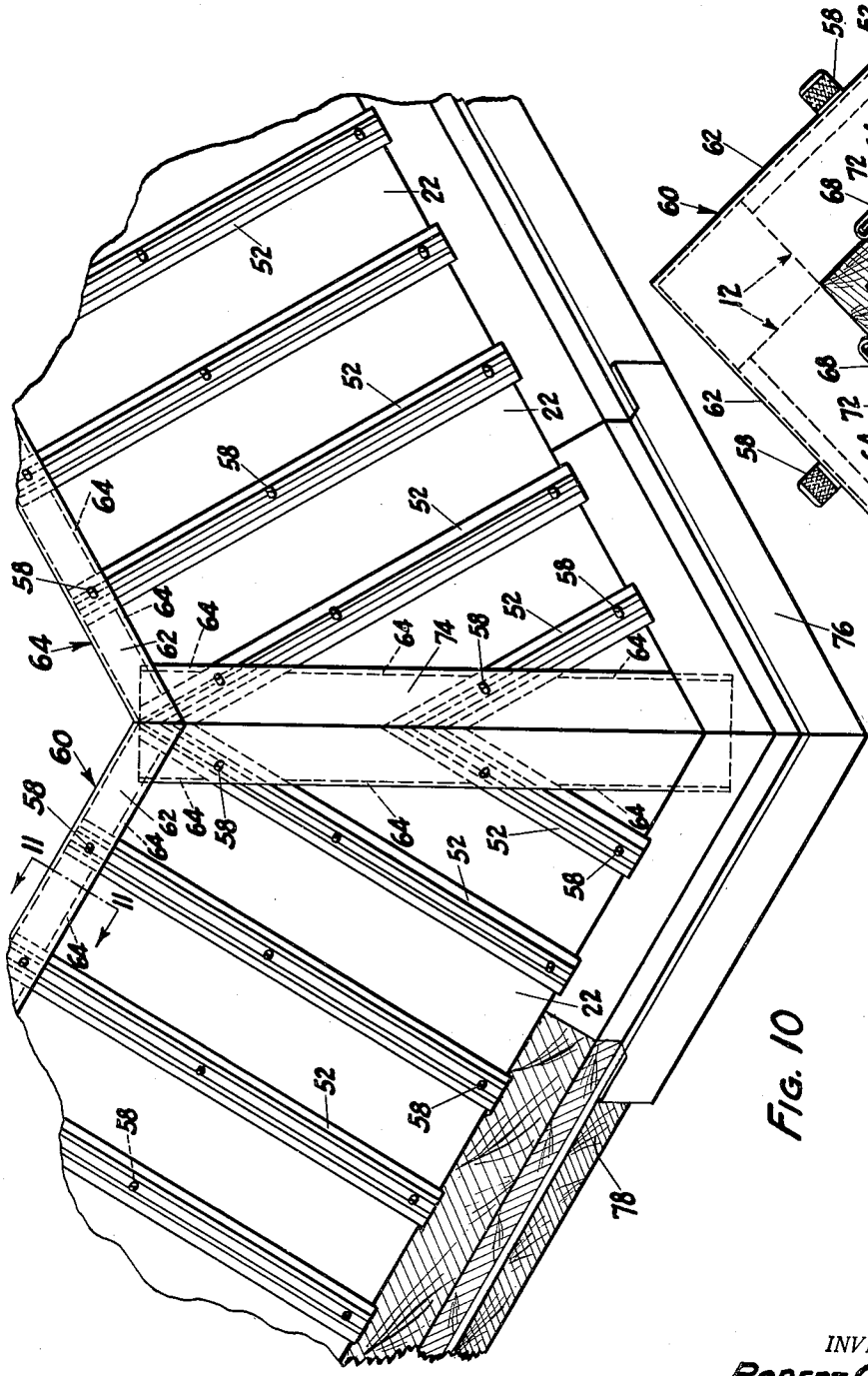


FIG. 10

FIG. 11

INVENTOR.
ROBERT C. LINCK
BY
ATTORNEY

United States Patent Office

2,976,648

Patented Mar. 28, 1961

2,976,648

METAL ROOF CONSTRUCTION

Robert C. Linck, Mount Pleasant and Panorama Roads, Villanova, Pa.

Filed July 3, 1957, Ser. No. 669,805

2 Claims. (Cl. 50—211)

This invention relates to improvements in metal roof constructions and more particularly, it pertains to metal roofs utilizing parallel battens between which sheets of roofing metal extend and to which the opposite edges of said roofing metal sheets are attached.

It has been common practice for many years to apply metal sheets to roofs by means of the use of battens of various kinds. Such roofs, incidentally, usually are applied to buildings of substantial size such as institutions, public buildings of various kinds, office buildings, churches, and the like, but also may be applied to individual houses used for residential purposes. Roofs of the type to which the present invention pertain are more expensive to construct and apply than the roofs commonly used on residences. Further, roofs of this type such as are used on institutions and other similar types of buildings are very durable and usually are installed for purposes of lasting many years without repair or attention of any kind.

Batten type roofs used heretofore and also as presently constructed embody various types of battens which are fastened to the roof sheathing in parallel relationship to each other, usually being positioned within parallel planes perpendicular to the ridge of the roof. Under some circumstances, the battens are formed wood stock and are of the order of two inches square in cross-section. Such battens are nailed or bolted directly to the roof sheathing. The sheet metal roofing sheets are disposed flat against the roof sheathing and the opposite edges of the roof sheets adjacent the battens are bent upwardly to provide vertical flanges which are positioned adjacent the vertical walls of the battens and a variety of different means are available and used to cover the upper surfaces of the battens and also overlie the edge flanges of the roof sheets to prevent leakage.

In more recent years, the battens have been formed from bent or extruded structural metallic members of various shapes in cross-section, such battens also being fastened directly to the roof sheathing, by nails or screws, and the roof sheets are disposed between the battens similarly to the arrangement employed in regard to that described above in connection with wooden battens. The use of metal battens however presents problems relative to connecting covering and clamping members to the battens and little if any possibility of adjustability between the battens and the securing means has been provided.

It is the principal object of the present invention to provide a metallic roof construction which includes the use of channel shaped battens of indefinite length which are fastened directly to roof sheathing in spaced parallel relationship to each other, the base of the channel shaped battens being secured against the roof sheathing and the substantially parallel sides of the channels extend vertically upward from the sheathing. The principal improvement afforded by the present invention is that means are provided which are longitudinally adjustable relative to the battens, whereby elongated, channel shaped batten

covers may be disposed over the battens and the upstanding edge flanges of the roof sheets, and clamping comprising part of the longitudinally adjustable means connected to the battens so as to secure the batten covers in operative position to afford a water-tight roof which is capable of many years of trouble-free service.

Another object of the present invention is to provide clamping and securing means for the batten covers which are not only movable longitudinally along the battens so as to dispose them at any desired position therealong, but said clamping and securing means are relatively inexpensive and are simple to install and operate, due primarily to the fact that such clamping and securing means are connected to and adjustable along the battens only, as distinguished from being connected to the roof sheathing as is common practice at present.

Still another object of the invention is to provide finishing elements of several different kinds which are utilized in the metallic roof comprising the present invention, particularly for purposes of facilitating the application of ridge caps in an attractive and water-tight manner, as well as closing the ends of the channel shaped battens in an effective manner.

Details of the foregoing objects and of the invention, as well as other objects thereof, are set forth in the following specification and illustrated in the accompanying drawings comprising a part thereof.

In the drawings:

Fig. 1 is a vertical transverse sectional view through an exemplary roof embodying the present invention and showing details of a batten, clamping means, batten cover, and adjacent edges of roof sheets connected to the batten, in accordance with the principles of the present invention.

Fig. 2 is a longitudinal sectional vertical elevation taken on the line 2—2 of Fig. 1.

Fig. 3 is a perspective view of the construction shown in Fig. 1 but illustrating the batten and part of the clamping means incident to being installed upon the roof sheathing.

Fig. 4 is a perspective view of an anchor clip per se, made in accordance with the principles of the invention.

Fig. 5 is a perspective view similar to Fig. 3 but showing the preferred method of connecting roof sheets to the batten and the relative position of the clamping means to the roof sheets and the batten, prior to the application of the batten cover thereon.

Fig. 6 is a perspective view of a saddle member which cooperates with the anchor clip shown in Fig. 4 to comprise the principal elements of the clamping means.

Fig. 7 is a perspective view of an exemplary section of batten cover of the type illustrated in Figs. 1 and 2.

Fig. 8 is a perspective view of the lower end of a fragmentary portion of a roof and batten assembly employing the principles of the invention and also showing the application of a cover element for the end of the batten.

Fig. 9 is a perspective view of a cover element for the lower end of a batten as illustrated in the assembly shown in Fig. 8.

Fig. 10 is an exemplary illustration of two adjoining sections of a peaked roof, illustrated fragmentarily, formed in accordance with the invention and also illustrating a hip angle, the hip cover and ridge or peak cover basically being similar in construction.

Fig. 11 is a fragmentary, vertical sectional view taken on the line 11—11 of Fig. 10 and illustrated on a larger scale to show details of finishing means employed in connection with the peak and hip covers shown perspectively in Fig. 10.

An exemplary application of a metal roof construction

in accordance with the principles of the present invention is illustrated in the drawings, it being understood that the invention is not to be restricted to the specific details and proportions shown in the various figures. Referring to Figs. 1 and 2, it will be seen that the fragmentary portion of the roof illustrated therein comprises sheathing material specifically shown as boards **10** which are supported by suitable rafters, purlins, or the like, not shown. Board-type sheathing is highly suitable as a supporting surface for the various elements of the roof embodying the present invention, principally because nails or screws can be utilized to secure the battens directly to the board sheathing **10**. Other types of sheathing or supporting base may be used.

Referring particularly to Fig. 1, it will be seen that the roof comprises a plurality of channel shaped battens **12** which may be formed either by bending sheet metal, such as aluminum, or extruding aluminum or other similar material to provide the desired shape. The battens **12** preferably are formed with a central raised portion **14** in the base thereof to provide a pair of gutters **16** on opposite sides of the raised portion **14**.

At regular spaced intervals along the raised portion **14**, holes **18** are provided for purposes of receiving attaching means such as wood screws **20** in order to secure the battens **12** to the sheathing **10**. It will be understood of course that nails or any other suitable securing means may be used in lieu of the screws **20**. The holes **18** preferably are elongated to permit expansion and contraction.

A roof of this type preferably is applicable to a building requiring a sloping roof. When first applying the roof structure, the battens **12** are attached initially to the sheathing **10** by extending up the slope of the sheathing of the roof so as to be within parallel planes which are spaced apart and vertical to the ridge of the roof. It is essential that the battens **12** be quite accurately parallel to each other in order that the metallic roofing sheets **22** may, for example, be selected from standard widths of stock material such as stock aluminum, copper, or the like, and the edges **24** thereof are bent more or less vertically to the plane of the sheets **22**, as shown in Figs. 1 and 5 particularly. It is preferred however that the edges **24** not be exactly vertical in order to provide clearance spaces **26** between the inner surfaces of said edges and the outer surfaces of the sides **28** of the battens **12**. Said sides **28** preferably are substantially parallel to each other so as to be vertical to the plane of the sheathing **10**.

The upper ends of the sides **28** of battens **12** also are provided with terminal flanges **30** which extend inwardly toward each other and preferably downwardly at an angle as clearly shown in Figs. 1 and 3, for purposes to be described. Also the terminal edges **32** of the roofing sheets are bent relative to the edge portions **24** thereof so as to overlie the terminal flanges **30** of the battens approximately as shown in Fig. 1, primarily for purposes of providing seating of the terminal edges **32** against the upper edges of the battens. Such arrangement also affords water-tightness. The spaces **26** also afford latitude for expansion and contraction of the roofing sheets **22**.

By mounting the battens **12** in parallel relationship, it is possible to prepare the edges of the roofing sheets **22** in a factory, contractor's shop, or the like prior to moving the same to the building where they are to be installed. After the battens **12** have been positioned on the sheathing **10** by screws **20** and the roofing sheets **22** with the pre-formed edges **24** and **32** thereon have been placed upon the sheathing **10** between the battens, whereby the terminal edges **32** of the roofing sheets overlie the terminal edges **30** of the battens as shown in Figs. 1 and 5, a plurality of anchor clips **34** are inserted within the battens between the terminal flanges **30** thereof. Without limitation thereto, it has been found practical to form the battens **12** so as to be approximately two inches wide and two inches high. Such arrangement will afford ample space between the terminal flanges **30** thereof for insertion of the anchor clips **34** from the top of the battens. Where the clips **34** are to be mounted near either end of the batten however, said clips may be inserted from the open ends of the battens.

Preferably, the anchor clips **34** are provided with a central recess **36** and, intermediately of the ends of said recess, a hole **38** is provided. The hole **38** receives a clamping bolt **40**, the head of which is received somewhat snugly within the recess **36** and opposite sides of the head of the bolt **40** engage the sides of the channels **36** to prevent the bolt from rotating when a nut is threaded thereonto. Also, if desired, the head of the bolt **40** may be staked or otherwise affixed to the clip **34** within the elongated recess **36** so that the two comprise an operable unit. Also, the opposite edges of the clip **34** extend oppositely and upwardly to provide clamping flanges **42** which preferably are complementary to the inner surfaces of the terminal flanges **30** of battens **12** so as to engage the same firmly when mounted in operative position. The clips **34** readily may be moved longitudinally along the battens **12** so as to be disposed at any desired longitudinally spaced position therealong. After the clips **34** have been positioned approximately as desired within the battens, a saddle member **44**, shown in detail in Fig. 6, which is provided with a central bolt receiving hole **46** is disposed so as to overlie the clip **34** with the bolt **40** projecting through the hole **46**. Further, opposite edges of the saddle member **44** are bent downwardly to provide ears **48** which overlie the edges **24** of the roofing sheet and accurately hold the same positioned relative to the upper edges of the battens **12**, as clearly shown particularly in Fig. 1. The saddle members **44** are secured in anchoring position by nuts **50**. The nut initially is only loosely threaded onto the bolt **40** so that the assembled clips **34** and saddle members **44** may be longitudinally moved relative to the battens **12** as desired. Then, when the bolts **40** supported by said clamping means comprising the clips **34** and saddle members **44** have been spaced longitudinally and preferably accurate even distances apart, the nuts **50** may be tightened.

The clamping means just described comprising the clips **34** and saddle members **44** comprise the principal means for clamping the edges **24** of the roofing sheets **22** to the battens **12**. However, in order to close the top of the batten and provide a generally water-tight arrangement for the assembly, a U-shaped batten cover **52**, formed either by bending from sheet metal stock or by extrusion, is mounted over the assembly previously described, as shown in Fig. 1. An exemplary perspective view of the batten cover member is shown in Fig. 7. It will be seen that said cover is provided with opposite substantially parallel sides **54** and the central portion between the sides is provided medially with a plurality of preferably evenly spaced holes **56** through which the bolt **40** projects. By mounting the clamping means and bolts **40** even distances along the battens **12** as described above, in accordance with the spacing of the holes **56** in cover **52**, it will be seen that the cover **52** accurately may be disposed over the assembly and the upper ends of the bolts **40** will project through the holes **56**, whereby preferably rust-proof thumb nuts **58** are threaded onto projecting ends of the bolts to secure the batten cover **52** in position wherein the lower edges thereof preferably firmly engage the outer surfaces of sides **24** of roofing sheets **22** as shown in Fig. 1, thereby forming a water-tight roof arrangement. In the preferred construction, thumb nuts **58** are the cap type having a closed top which prevents the entrance of moisture.

The principal invention of the construction described hereinabove and particularly with regard to the longitudinal adjustability of the clamping means comprising clips **34** and saddle members **44** is that holes **56** may be provided wherever desired in the batten cover **52** and the

clamping means may be moved longitudinally along the batten to conform to the holes **56** in the cover. Further, it is desirable that such clamping means be disposed adjacent opposite ends of the battens **12** in order to provide means for securing finishing elements to be described hereinafter. It is simply necessary to drill the holes **56** and no threading or other finishing thereof is necessary, as distinguished from prior constructions, wherein the clamping means have not been adjustable longitudinally along the battens.

It will be understood that the battens **12** may be formed in conventional stock lengths of 20 feet or so and, particularly in roofs which extend upwardly a greater distance than the stock lengths of the battens, said battens may be mounted in end-to-end relationship so as to extend the same indefinitely. If preferred however, one end of each section of batten **12** may be swaged or otherwise bent so as to be contracted and thereby telescopically fit into the normal end of an adjacent section of batten in longitudinal alignment therewith, thus providing continuous battens and gutters for the entire vertical dimension of the roof. Concerning the batten covers **52**, the material from which the same are formed usually is sufficiently thin and flexible that adjoining ends of the batten covers may be disposed in overlapping relationship, shingle-fashion, so as to provide water-tight connections between adjacent ends of stock lengths of batten covers for example.

Referring to Figs. 10 and 11, wherein exemplary illustrations of portions of a complete roof are illustrated in accordance with the invention, it will be seen that the ridge of the roof is provided with a ridge cap **60**, angularly related flanges **62** of which are formed at an angle to each other corresponding to the angle of the ridge of the roof. The upper ends of the battens **12** extend substantially into meeeting engagement with each other as shown in Fig. 11. The flanges **60** overlie the batten covers **52**. In order to close the space between the sides of the batten covers, said space being substantially equal to the width of the roofing sheets **22**, the present invention contemplates the use of a finishing closure plate **64**, shown in cross-section in Fig. 11. Said closure plate is sufficiently long to extend between adjacent batten covers and is disposed beneath the flanges **62** of cap **60**, the height of the closure plate **64** being equal to the space between the inner surface of the flanges **62** and the upper surface of the roof sheets **22**. Closure plate **64** preferably is Z-shaped and has an outwardly directed upper flange **66** and an inwardly directed lower flange **68**. The lower terminal edge **70** of ridge cap **60** is bent around the flange **66** as shown in Fig. 11, while the upper end **72** of the roof sheets **22** are bent outwardly and downwardly over the lower flange **68** of closure plate **64**, thereby making a water-tight joint as well as blocking ingress to birds and insects.

When the terminal edges **70** of cap **60** and upper ends **72** of roof sheets **22** have been bent as described above, there is no need otherwise to anchor the closure plate **64** relative to the roof. Such anchoring prevents upward or downward movement of the closure plate. Otherwise, it is only necessary to provide a securing unit comprising clip **34** and saddle member **44** adjacent the upper end of each batten in order that holes may be formed in the ridge cap **60** to receive the bolts **40** to which the thumb nuts **58** may be connected to secure the ridge cap **60** firmly in operative position upon the roof.

Under circumstances where it is necessary to provide a ridge cap at a hip corner of the roof as shown in Fig. 10, a hip cap **74** may be used which is similar to the ridge caps **60** and the hip cap is connected to the roof by overlying the upper ends of the batten covers **52** similarly to the manner in which the ridge caps **60** overlie the same. Also, a closure plate **64** will extend at an angle between adjacent batten covers **52** and be connected to the assembly in the same manner as the closure plate **64**. It will

be understood that the thumb nuts **58** will secure the hip cap **74** firmly in operative position and the upper end of the hip cap **74** preferably will underlie the lower edges of the ridge caps **60**.

A roof of the type described usually will be finished suitably at the lower edge thereof by appropriate metallic gutter, coping or molding **76** which is mounted over wooden sheathing and framing **78** or otherwise. The upper edge of the molding or coping **76** preferably will underlie the lower edges of the roofing sheets **22** as shown in Fig. 10 and securing units including the bolts **40** will be mounted, preferably evenly spaced from the lower ends of the battens **12** as shown in Fig. 10. The bolts in these lower securing means not only will hold the batten covers **52** in operative position but the same also conveniently are utilized to secure cover members **80** over the lower ends of the battens **12**, as best shown in Fig. 8. A typical cover member **80**, constructed as contemplated in accordance with the invention, is shown in perspective in Fig. 9. The plate **80** in provided with side wings **82** which respectively overlie the upturned edges **24** of the roofing sheets **22**. The lower edge is provided with an outwardly extending flange **84** which will overlie either the roofing sheets or coping **76**. Also, a strap **86** having an aperture **88** therein will extend inwardly between the saddle member **44** and the cover member **52** in order that the hole **88** in strap **86** may receive bolt **40** and thereby hold the cover member **80** in operative position within the end of the batten assembly.

From the foregoing, it will be seen that the present invention provides a highly durable and effective roof formed preferably from non-corrosive metal which is capable of long years of use without attention. Due particularly to the longitudinal adjustability of the securing means, comprising anchor clips **34** and saddle members **44** and bolts **40**, relative to the battens **12**, much more latitude and mobility is provided than is available in existing structures for disposing such securing means wherever desired along the battens **12**. The particular design of the securing means and particularly of the anchor clips **34** provides highly effective means for retaining the roofing sheets assembled on the sheathing of a roof without necessitating the use of any nails or screws through the roofing sheets. The only outwardly exposed holes in the entire assembly are the holes **56** in the batten covers **52** and these effectively are covered by thumb nuts **58**. If preferred, rubber or resin washers **90**, see Figs. 1 and 2, may be disposed between the outer surface of the batten covers **52** and the undersurface of nuts **58** to insure absolute water-tightness.

Should it ever be necessary to replace any of the roofing sheets for example, it is only required that the thumb nuts **58** be removed from the batten covers **52** which are involved, following which the required saddle members **44** may be removed to permit the roofing sheets **22** which are to be replaced to be removed from the roof.

It will be understood that conventional means are employed for connecting upper and lower edges of adjacent roofing sheets **22** to each other in accordance with ordinary practice.

While the invention has been described and illustrated in its several preferred embodiments, and has included certain details, it should be understood that the invention is not to be limited to the precise details herein illustrated and described since the same may be carried out in other ways falling within the scope of the invention as claimed.

I claim:

1. A sheet metal roof construction to be applied to roof sheathing and comprising in combination, elongated metallic channel-shaped battens having substantially parallel planar sides terminating at the outer edges thereof in terminal flanges coextensive in length therewith and extending inward and downward therefrom, the bases of said battens being attachable to the roof sheathing in

spaced parallel relationship to each other and said planar sides extending substantially vertically from said bases when in use, whereby the terminal flanges are uppermost, anchor clips positionable selectively in longitudinally spaced positions along said battens and engaging the terminal flanges thereof, a saddle member for each anchor clip extending across and having opposite down-turned edges respectively overlying the upper edges of said battens to secure said anchor clips adjustably to said battens, metallic roof sheets extending between said spaced battens and the terminal edges thereof being flanged upwardly and overlying the sides of said battens, elongated channel-shaped batten covers disposed in inverted position over said battens and the sides of said covers extending downwardly over said terminal edges of said roof sheets in close engagement to render the engagement of said roof sheets with said battens water-tight, single bolts extending through each of said anchor clips and saddle members and extending above the same and through holes in said batten covers, a nut on each bolt engaging said saddle member to secure the same to said anchor clip and clamp said clip securely against the flanges of said battens, and a cap nut secured to the outer end of each bolt against the outer surface of the batten covers to secure said covers to said battens.

2. The sheet metal roof construction set forth in claim 1 further characterized by said anchor clips having opposed spaced walls intermediately of the sides thereof and substantially parallel to the sides of said batten, and said bolts having heads thereon provided with opposed side surfaces complementary in cross-section to said opposed walls of said anchor clips, whereby said bolt heads are positionable between and engageable with said opposed walls of said anchor clips to hold said bolts against rotation when threading the nuts thereon incident to assembling the saddle members to the clips and cap nuts against the batten covers.

References Cited in the file of this patent

UNITED STATES PATENTS

230,161	Walker	July 20, 1880
1,116,244	Conner	Nov. 3, 1914
1,427,943	Craig	Sept. 5, 1922
2,055,127	Goodwin	Sept. 22, 1936
2,183,844	Murphy	Dec. 19, 1939
2,408,557	Huntington	Oct. 1, 1946
2,552,092	Goodwin	May 8, 1951

FOREIGN PATENTS

1,146,249	France	May 20, 1957