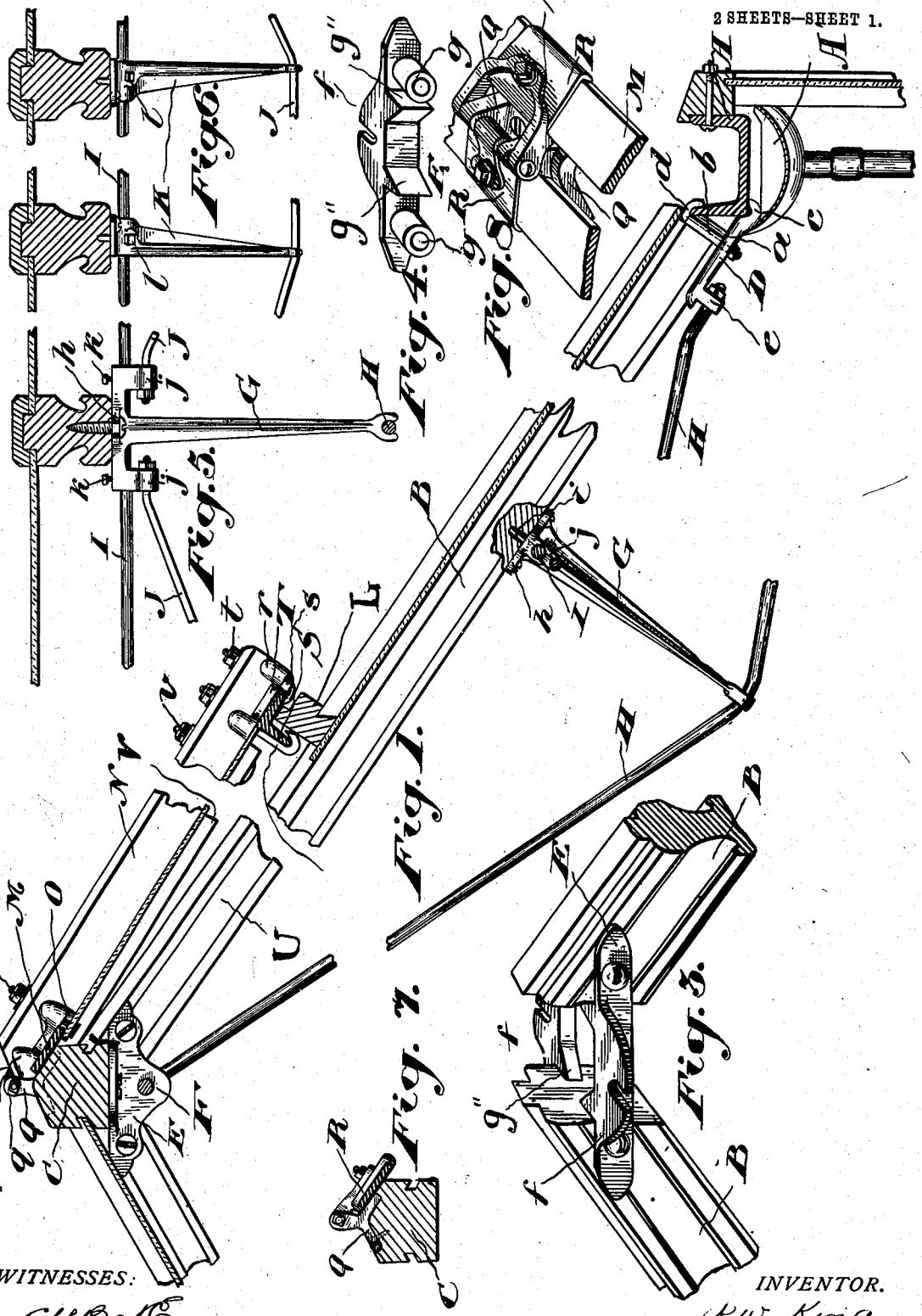
No. 858,459. PATENTED JULY 2, 1907.

R. W. KING.

ROOF CONSTRUCTION.

APPLICATION FILED DEC. 15, 1905.

2 SHEETS—SHEET 1.



WITNESSES:

C. S. Barker

F. G. Fendrick

INVENTOR.

R. W. King

BY Ridout & Maybee

ATTORNEYS.

No. 858,459. PATENTED JULY 2, 1907.

R. W. KING.

ROOF CONSTRUCTION.

APPLICATION FILED DEC. 15, 1905.

2 SHEETS—SHEET 2.

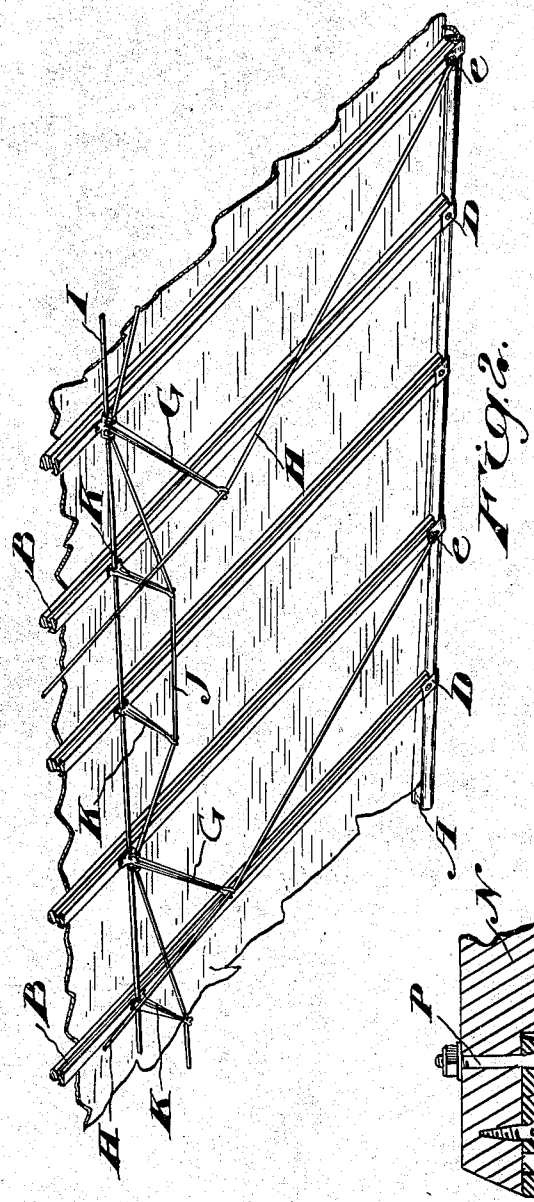


Fig. 2.

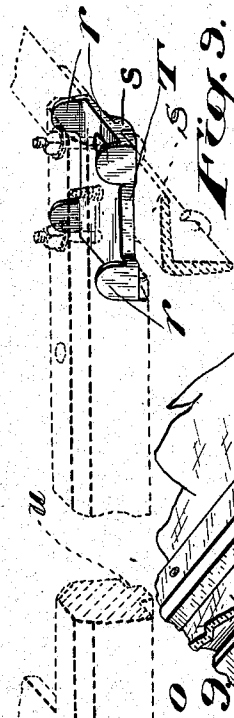


Fig. 9.

Fig. 10.

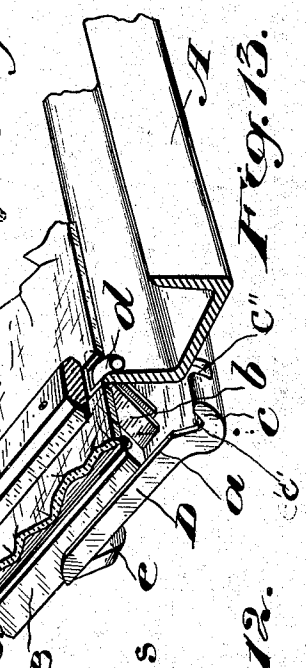


Fig. 13.

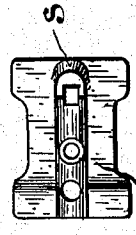


Fig. 12.

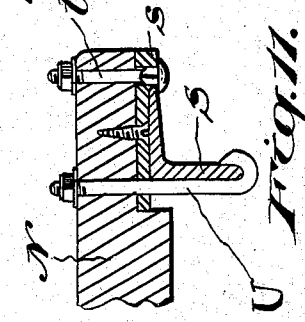


Fig. 11.

WITNESSES:

C. F. Burke

F. W. Hendrick

INVENTOR.

R. W. King

BY Ridout & Maybee

ATTORNEYS

UNITED STATES PATENT OFFICE.

ROBERT W. KING, OF TORONTO, ONTARIO, CANADA.

ROOF CONSTRUCTION.

No. 858,459. Specification of Letters Patent. Patented July 2, 1907.

Application filed December 15, 1905. Serial No. 291,930.

To all whom it may concern:

Be it known that I, ROBERT W. KING, of the city of Toronto, in the county of York, Province of Ontario, Canada, have invented certain new and useful Improvements in Roof Construction.

This invention relates particularly to a roof construction for green-houses and the like which will possess a sufficiency of strength with a minimum of material to obstruct the light.

A further object is to secure a construction which will permit of the building being erected as far as possible without skilled labor and which will admit of the sash bars being quickly and easily adjusted laterally to fit the glass.

With these objects in view my invention consists essentially in the constructions hereinafter specifically described and then definitely claimed.

Figure 1 is a cross sectional elevation of part of a green-house roof constructed in accordance with my invention. Fig. 2 is a perspective inside view of part of the same roof. Fig. 3 is a perspective detail showing the connection between the upper ends of a pair of rafters. Fig. 4 is a perspective view of the rafter-to-ridge connection. Fig. 5 is a cross section of one of the sash bars and a principal truss post. Fig. 6 is a similar view showing two sash bars and purlin truss posts. Fig. 7 is a cross section of the ridge showing a single hinge for a ventilator. Fig. 8 is a perspective view showing a double hinge for ventilators. Fig. 9 is a perspective view partly in dotted lines of the fittings of the ventilator sash bars. Fig. 10 is a cross section through the upper end fitting of the ventilator sash bar showing part of the sash bar. Fig. 11 is a similar view of a lower sash bar fitting. Fig. 12 is a plan view of the under side of the lower end fitting of a ventilator sash bar. Fig. 13 is a perspective detail view showing the connections between the rafter and the wall beam.

In the drawings like letters of reference indicate corresponding parts in the different figures.

Referring particularly to Fig. 1, A is a beam ordinarily employed at the upper end of a green-house wall. This beam is usually formed as a trough, as shown.

B are the rafters of the roof, generally employed as sash bars and C is the ridge. The rafters are connected with the beam by means of a supporting bracket or clamp shown particularly at the lower end of Fig. 1 and Fig. 13. This bracket or clamp comprises a plate D suitably secured to the under side of the rafter by screws or otherwise. Each side of the plate is provided with lugs or lips *a* between which the end of the sash bar is fitted. The lower end of the sash bar rests against a hollow post *b* in such a manner as to give air free access around the end of the rafter and affording no pocket for the collection of moisture. The lower end of the plate D is provided with a suitable rabbet or notch *c* adapted to engage the lower corner of the beam A. At the bottom of this rabbet *c* a drip groove *c'* is formed having a drip exit *c''* formed therein preferably at the center. The drip exits discharge into the gutter A' which is made wide enough to receive not only the drip from the sides and bottom of the trough A but also from these drip exits.

The post *b* is preferably so located that its upper end contacts with the beam at its upper edge. Through the post is passed a hook bolt *d* engaging the upper corner of the beam and set up with a suitable nut at the under side of the plate D. When this bolt is set up the supporting bracket is securely clamped to the wall beam, at the same time by slackening up the bolt the bracket may be adjusted laterally on the wall beam. On certain of the supporting brackets is formed a lug *e* for connection with a principal truss rod hereinafter described. Ordinarily the rafters or sash bars are connected to the ridge C by being butted against and secured to the sides of the latter. This means a deep ridge which obstructs a good deal of light and also means that the rafters cannot be laterally adjusted on the ridge. I overcome these difficulties by separating the ends of each pair of rafters, as shown in Figs. 1 and 3, and suitably securing them together, the connections forming with the rafter ends seats adapted to receive the ridge. The method of connecting the ends which I prefer is by means of the rafter-to-ridge connections shown in Figs. 1, 3 and 4 each comprising a plate E provided with a lug *f* formed thereon and adapted to butt against the under side of the ridge. The plate E has hollow studs G projecting therefrom adapted to fit into holes in the sides of the rafter ends. Through these hollow studs I pass the screws which hold the plates in position on the rafters. The plates E are provided on their inner sides with the ribs *g''* against which the ends of the rafters abut, and which take part of the end thrust of the rafters. With my construction the lower parts of the ends of the rafters are exposed to the air and therefore will not retain moisture and rot and being exposed are easily painted as a further protection. The lugs *f* are provided with screw apertures through which screws may be passed to clamp the lugs to the ridge. These screw apertures are preferably formed as slots as shown in Fig. 3 to permit of a slight lateral adjustment of the rafters on the ridge after the screws have been inserted. Certain of the plates E will be provided with lugs F for engagement with the principal truss rods as hereinafter described.

It will now be seen that the rafters are laterally adjustable both on the wall beam and the ridge so that they may be quickly set in position and adjusted to exactly fit the glass used which is a very important matter particularly when the green-house is to be set up largely by means of unskilled labor. As the rafters or sash bars must be made of as small dimensions as possible to avoid obstructing an undue amount of light

it is necessary to employ principal trusses at certain regular intervals.

In Figs. 1, 2 and 5 I show principal truss posts G connected with certain of the rafters. Each truss post forms a strut adapted at its outer end to receive a truss rod H, the ends of which are connected with the lugs *e* and F respectively of the supporting bracket and rafter-to-ridge connection of the rafters. The truss post is integral with a base *h* provided with holes for screws whereby it may be secured to the under side of the rafter. An integral stud *i* is formed on the base adapted to enter a hole in the under side of the rafter to give strength to the connection. Through the truss post is formed a hole for the passage of the purlin rod I and the post is also provided with lugs *j*. Set screws *k* are provided whereby the truss posts G may be clamped on the purlin rod in any desired position. This is essential in order that the rafters or sash bars may be adjusted on the purlin rod at the same time that they are adjusted on the wall beam and ridge. The rafters intermediate of the principal rafters are provided with the purlin truss posts K, each comprising a base adapted to be secured to the rafters in the same manner as the bases of the principal truss posts and provided with a suitable aperture for the passage of the purlin rod. A set screw *l* is provided in each purlin truss post whereby it may be clamped on the purlin rod. These rafters to which the purlin truss posts are secured may be laterally adjusted on the purlin in the same manner as the principal rafter. The purlin truss rods J pass around the ends of the purlin truss posts and are secured to the lugs *j* of the principal truss posts preferably by being passed through apertures in the same and set up with nuts threaded on their ends.

This system of trussing which I have just described gives great strength to the roof with material of minimum dimensions obstructing a minimum amount of light. It also lends itself readily to setting up with a minimum of labor and permits of the greatest possible freedom of lateral adjustment of the rafter.

I have also devised a lighter form of ventilator framing which also obstructs a minimum amount of light. The upper framing bar M of the ventilator is, formed of a flat bar of metal. Each ventilator sash bar N is provided at its upper end with a connection comprising a plate O having lugs or lips *m* at its sides between which the end of the sash bar fits. The plate is also screwed to the end of the sash bar as shown particularly in Fig. 10. The under side of the plate at the upper edge is provided with an integral hook *n*, which engages the edge of the framing bar. The opposite end of the connection is provided at the under side with a lug *o*, in front of which is formed a bolt hole. Through this bolt hole is passed a bolt P provided with a tapered head and set up on top of the ventilator sash bar with a suitable nut. When this bolt is set up its tapered head draws the hook on the connection into close engagement with the framing bar and forms a secure yet laterally adjustable connection between the sash bar and the framing bar. Connections for certain of the ventilator sash bars may also be provided with hinge lugs *p* adapted to co-operate with the lugs *q* of the other parts Q of the hinges, which are secured to the ridge where desired. As it may be necessary sometimes to provide hinges for the framing bar M at points where there are no sash bars, I provide in addition the hinges R which may be single as shown in Fig. 7 or double as shown in Fig. 8 for connection with a ventilator at each side of the ridge. These hinges are connected with the framing bars M in an ordinary manner.

The lower framing bar S of the ventilator is preferably formed as an L-angle bar set with its angle uppermost, the bar fitting over the upper outer angle of the seat strip L of the ventilator opening. Thus the bar S and the seat strip L are but little wider or thicker than the seat strip alone and but little light is obstructed with either a high or low sun. Further a tighter joint is provided than when the sash bar and seat strip engage at one surface only as in ordinary constructions. The lower connections for the ventilator sash bars each comprise a plate T provided at its sides with lugs or lips *r* between which the end of the sash bar fits. The plate is also screwed to the under side of the sash bar, as shown particularly in Fig. 11. At the lower end of the plate is formed a lug *s* and immediately in front of it a hole is formed in the plate for the passage of a carriage bolt *t*, the front of the lug being suitably shaped to engage the squared portion of the head of the carriage bolt. The head of the carriage bolt it will also be seen engages the under side of the horizontal part of the framing bar S. At the upper end of the plate T a hole is formed for the passage of the hook bolt U which engages the lower edge of the vertical part of the framing bar and is set up on top of the sash bar with a suitable nut.

The construction described affords a secure connection between the ventilator sash bar and the framing bar and yet one which is readily adjustable laterally. As the upper end is also laterally adjustable the sash bars may be readily adjusted in their spacing to suit the glass employed.

It will be noted on reference to Figs. 1 and 9 that a rabbet *u* is formed near the lower edge of each ventilator sash bar to receive the glass, and this rabbet is completed by a cap V held in position by suitable bolts *v*. It will be seen that this rabbet is just below the upper surface of the lower framing bar L, so that by slackening up the bolts *t* and U of the lower connections of the ventilator sash bars the sash bar may be raised sufficiently to bring the rabbet above the upper surface of the framing bar so that the glazing may be slid in from the lower end. This is an important feature with my connections as otherwise with the style of ventilator framing employed great difficulty would be experienced in glazing the ventilator frames.

What I claim as my invention is:—

1. In building construction a wall-beam; a purlin; and a ridge in combination with sash bars or rafters laterally adjustably secured on the ridge, purlin and wall-beam.

2. In building construction a wall-beam and a purlin in combination with sash bars or rafters; a clamp secured to each rafter and secured to and laterally adjustable on the wall-beam; and a clamp secured to each rafter and secured to and laterally adjustable on the purlin.

3. In building construction two wall-beams, two purlins; and a ridge in combination with sash bars or rafters arranged in pairs; claimps secured one to each rafter and secured to and laterally adjustable on a wall-beam; clamps secured one to each rafter and laterally adjustable on a purlin, and connecting plates securing together the ends of each pair of rafters and provided with means of connection to the ridge.

4. In building construction two wall-beams, two pur-

lins; and a ridge in combination with sash bars or rafters arranged in pairs; clamps secured one to each rafter and secured to and laterally adjustable on a wall-beam; clamps secured one to each rafter and secured to and laterally adjustable on a purlin; and connecting plates securing together the ends of each pair of rafters and provided with means of connection to the ridge, the ends of the rafters having seats formed between them to receive the ridge.

5. In building construction two wall-beams, and a ridge in combination with sash bars or rafters arranged in pairs and having their lower ends secured to and laterally adjustable on the wall-beams; and connecting plates securing together the upper ends of each pair of rafters and provided with means of connection to, and having lateral adjustment on the ridge.

6. In building construction a wall-beam; a ridge; and rafters connected to the wall-beam and ridge in combination with a truss post secured to one of the rafters; a truss rod connecting the ends of the rafter and the end of the truss post; a purlin rod passing through the truss post, and means for adjustably clamping the purlin rod in the truss post.

7. In building construction a wall-beam; a ridge; and rafters connected to the wall-beam and ridge in combination with a truss post secured to one of the rafters; a purlin rod passing through the truss post; a truss rod engaging the end of the post; and connecting pieces secured to two of the other rafters and to the purlin and provided with connections for the ends of the truss rod.

8. In building construction a wall-beam; a ridge; and rafters connected to the wall-beam and ridge in combination with a principal truss post secured to one of the rafters; a truss rod connecting the ends of the rafter and the end of the truss post; a purlin rod passing through the truss post; a purlin truss post secured to a rafter at each side of the principal truss post and each having the purlin rod passing through it; means for clamping the purlin in each of the truss posts; a truss rod for each purlin truss post, each purlin truss rod having one end suitably and adjustably connected with the purlin; and connecting means on the principal truss post for the other ends of each purlin truss rod.

9. In building construction a wall-beam; a ridge; and rafters connected to the wall-beam and ridge in combination with a principal truss post secured to one of the rafters; a truss rod connecting the ends of the rafter and the end of the truss post; a purlin rod passing through the truss post; a purlin truss post secured to a rafter at each side of the principal truss post and each having the purlin rod passing through it; means for clamping the purlin in each of the truss posts; a truss rod for each purlin truss post, each purlin truss rod having one end suitably connected with the purlin; lugs formed on the principal truss post and bored for the passage of the ends of the purlin truss rods; and nuts threaded on the ends of the said rods.

10. In building construction a wall beam or support and a sash bar, in combination with a supporting bracket or clamp for the sash bar, having a body portion provided with a rabbet at its lower end with means of connection to the wall beam or support, and with a post adapted to engage the lower end of the sash bar to hold it clear of the wall beam.

11. In building construction, a wall beam or support and a sash bar, in combination with a supporting bracket or clamp for the sash bar, having a body portion provided with a rabbet at its lower end adapted to engage a lower edge of the beam or support, with a post adapted to engage the lower end of the sash bar and with means passing through the post for holding the rabbet in engagement with the beam.

12. In building construction a beam or support; and a rafter or sash bar in combination with a supporting bracket or clamp for the rafter having a body portion adapted to receive the end of the sash bar and provided at its lower end with a rabbet adapted to engage a lower edge of the beam; a hollow post formed on the bracket and extending up into engagement with the beam near its upper edge; and a clip engaging the upper edge of the beam, passing through the hollow post and set up at the under side of the bracket with a nut.

13. In building construction a beam or support; and a rafter or sash bar in combination with a supporting bracket or clamp for the rafter having a body portion adapted to receive the end of the sash bar and provided at its lower end with a rabbet adapted to engage a lower edge of the beam; a hollow post formed on the bracket and extending up into engagement with the beam near its upper edge; a clip engaging the upper edge of the beam; passing through the hollow post and set up at the under side of the bracket with a nut; and a drip groove formed at the bottom of the rabbet, and having an exit opening leading from it.

14. In building construction, a wall beam or support and a sash bar, in combination with a supporting bracket or clamp for the sash bar, having a body portion provided with a rabbet at its lower end adapted to engage a lower edge of the beam or support, a drip groove formed at the bottom of the rabbet and having an exit opening from it with a post adapted to engage the lower end of the sash bar and with means passing through the post for holding the rabbet in engagement with the beam.

15. A principal truss post for greenhouse roofs comprising a base adapted for attachment to a sash bar or rafter, a strut extending therefrom, and lugs formed on the base for connection with purlin truss rods.

16. A principal truss post for greenhouse roofs comprising a base adapted for attachment to a sash bar or rafter a strut extending therefrom, and lugs formed on the base for connection with purlin truss rods, an opening being formed through the truss post for the passage of a purlin rod.

17. A rafter-to-ridge connection for a greenhouse roof comprising a plate having two hollow studs formed thereon for insertion one in each of two opposed rafters, and lugs at right angles thereto to fit under a ridge, screw apertures being formed in the said lugs.

18. In building construction an L-angle framing bar and a sash bar in combination with an end fitting for the sash bar comprising a plate; means for securing the plate to the under side of the sash bar; a hook bolt adapted to grip the lower edge of the vertical part of the angle bar and passing through the plate and angle bar; and a headed bolt adapted to grip the under side of the flat part of the angle bar and passing through the plate and sash bar.

19. In building construction an L-angle framing bar and a sash bar in combination with an end fitting for the sash bar comprising a plate; means for securing the plate to the under side of the sash bar; a hook bolt adapted to grip the lower edge of the vertical part of the angle bar and passing through the plate and angle bar; a headed bolt adapted to grip the under side of the flat part of the angle bar and passing through the plate and sash bar, and a lug on the under side of the plate behind the hole for the last named bolt.

20. An upper end fitting for a greenhouse ventilator sash bar comprising a plate having lugs at opposite sides between which a sash bar may fit; a hook formed integral with the plate at the under side of its upper end and adapted to grip the edge of a flat framing bar; and a lug at its lower end on the under side, a bolt hole being formed in the plate in front of the lug.

21. In building construction a flat framing bar; and a sash bar in combination with an end fitting for the sash bar comprising a plate; means for securing the plate to the under side of the sash bar; a hook formed integral with the plate at the under side of its upper end and engaging the upper edge of the framing bar; a headed bolt adapted to grip the other edge of the framing bar and passing through the plate and sash bar, and a lug on the under side of the plate backing up the bolt.

22. In building construction a flat framing bar; and a sash bar in combination with an end fitting for the sash bar comprising a plate; means for securing the plate to the under side of the sash bar; a hook formed integral with the plate at the under side of its upper end and engaging the

upper edge of the framing bar; and a taper headed bolt adapted to grip the other edge of the framing bar and passing through the plate and sash bar, and a lug on the under side of the plate backing up the bolt.

23. An upper end fitting for a greenhouse ventilator sash bar comprising a plate having lugs at opposite sides between which a sash bar may fit; a hinge lug formed at its upper end; a hook formed integral with the plate at the under side of its upper end and adapted to grip the edge of a flat framing bar; and a lug at its lower end on the under side, a bolt hole being formed in the plate in front of the lug.

24. In building construction a framing bar; a sash bar rabbeted at its under side to receive the edges of panes of glass; an end fitting let into and secured to the under side of the sash bar; a cap secured to the sash bar underneath and forming with the rabbets grooves for the glass; and releasable means securing the end fitting to the framing bar whereby the sash bar may be raised to permit the glass to be slid into the rabbet over the framing bar.

25. In building construction a framing bar; a sash bar rabbeted to receive the edges of panes of glass; an end fitting let into and secured to the under side of the sash bar; and releasable means securing the end fitting to the framing bar whereby the sash bar may be raised to permit the glass to be slid into the rabbet over the framing bar.

26. In building construction a beam or support; a sash bar or rafter; a supporting bracket or clamp secured to the sash bar having a rabbet at its lower end adapted to engage a lower edge of the beam; means for holding the bracket in engagement with the beam; a drip groove formed in the bottom of the rabbet and having an exit opening from it; and a gutter under the beam and bracket adapted to receive drip from both.

27. In building construction a framing bar; and a sash bar jogged at its end to fit on top of the framing bar and provided with grooves for the glass close to its under side below the level of the upper side of the framing bar.

28. In building construction a framing bar; and a sash bar jogged at its end to fit on top of the framing bar and provided with caps detachably secured underneath the sash bar to complete the groove for the glass.

Toronto, Dec. 12th, 1905.

ROBERT W. KING.

Signed in the presence of—
J. EDW. MAYBEE,
F. A. MCKENDRICK.