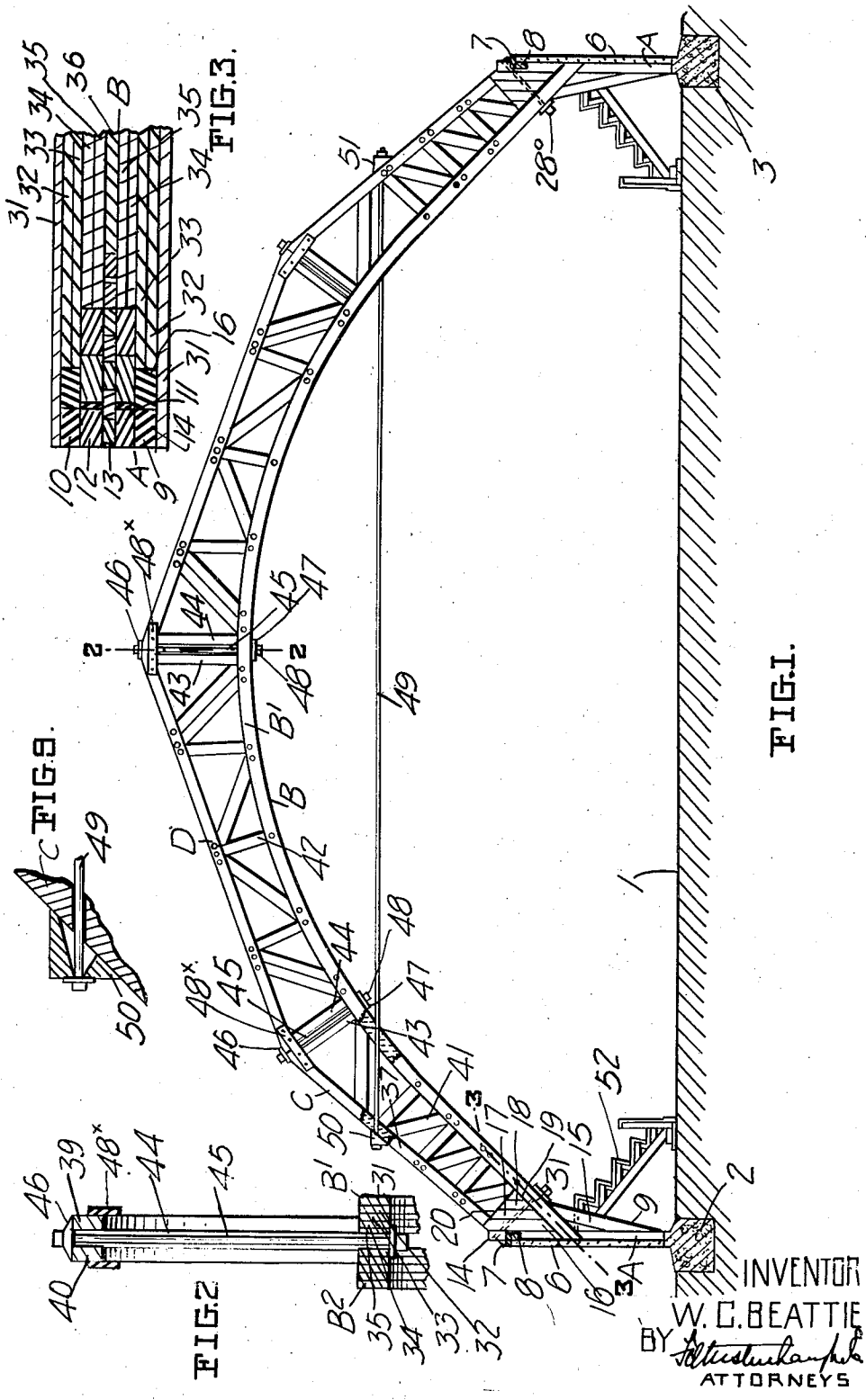
Jan. 16, 1940. W. C. BEATTIE 2,187,009

WOODEN TRUSS FOR ROOFS

Filed Jan. 30, 1939 2 Sheets-Sheet 1



Jan. 16, 1940. W. C. BEATTIE 2,187,009

WOODEN TRUSS FOR ROOFS

Filed Jan. 30, 1939 2 Sheets-Sheet 2

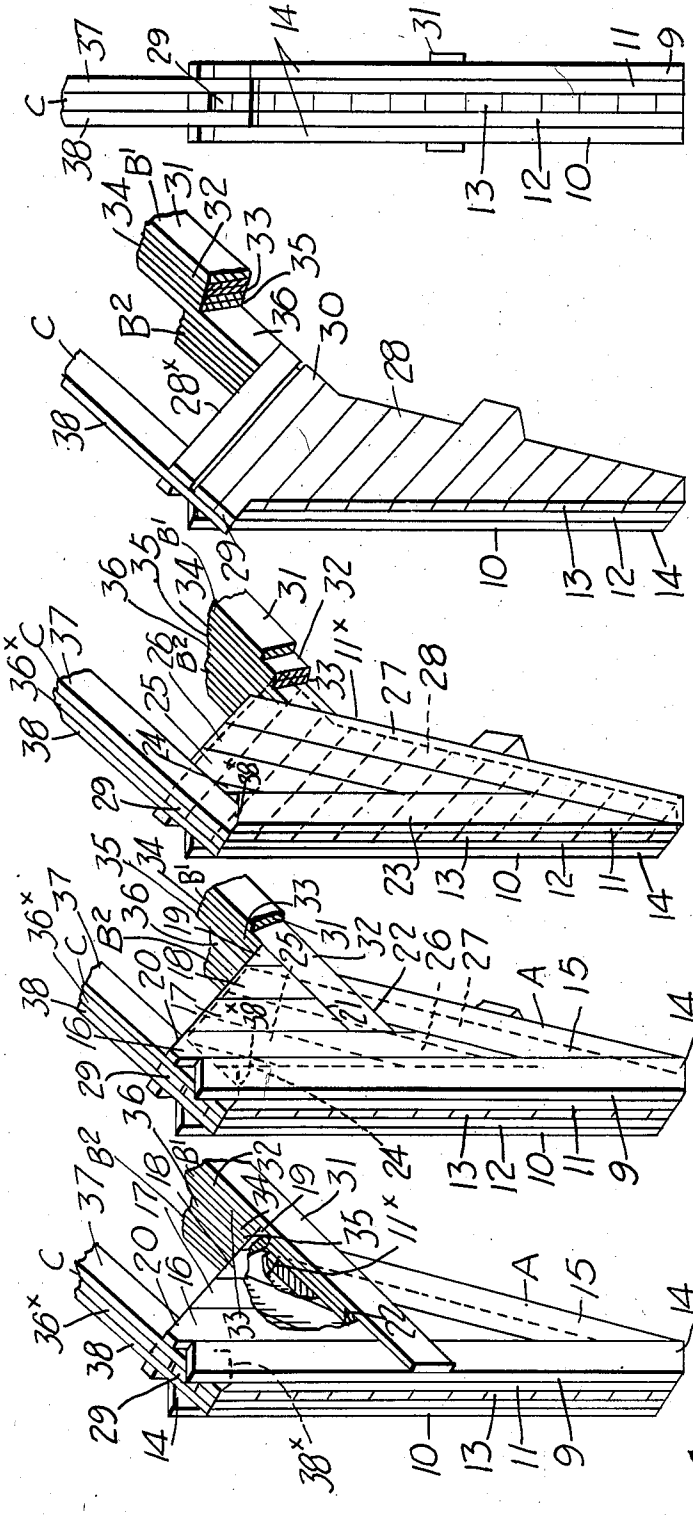


FIG. 8.

FIG. 7.

FIG. 6.

FIG. 5.

FIG. 4.

INVENTOR
W. C. BEATTIE.
BY
ATTORNEYS

Patented Jan. 16, 1940 2,187,009

UNITED STATES PATENT OFFICE

2,187,009

WOODEN TRUSS FOR ROOFS

William Cockburn Beattie, Preston, Ontario, Canada, assignor to N. O. Hipel, Limited, Preston, Ontario, Canada, a company duly incorporated under Joint Stock Companies Act of the Province of Ontario

Application January 30, 1939, Serial No. 253,490
In Canada February 1, 1938

2 Claims. (Cl. 108—23)

My invention relates to improvements in wooden trusses for roofs adapted for use in rinks, arenas, storage and other large buildings, and the object is to devise an economical structure which will embody therein all the advantages obtained severally in the various types of structures hitherto employed such as, in a rink, providing a maximum amount of ventilation by free air circulation through the freeze doors and over the ice surface to rise rapidly to the ventilators at the peak of the roof to prevent the heat, by means of the rapid circulation of air and high roof, from banking down from the underside of the roof and melting the ice thus increasing the length of the skating season and producing a quicker production of ice and thereby increasing revenue, saving time and labour, eliminating the fogging of the ice causing poor vision which results from the heat produced by the breath and body heat of the players and spectators, providing unobstructed vision for the spectators both transversely and longitudinally of the rink, and providing a structure which is sufficiently high to permit the lighting bulbs and reflectors being placed in a proper position to increase the lighting effect to a maximum and so that the diffusion of such light will not be obstructed by members of the trusses and will be equalized over the ice surface and, at the same time, providing a structure in which the members thereof are compact yet strong and durable and have a maximum load carrying capacity both for the dead load and for live loads such as snow, ice and wind loads, which is easily constructed and at a comparatively low cost, and it consists essentially of the arrangement and construction of parts all as hereinafter more particularly explained.

Fig. 1 is a side elevation of my truss.

Fig. 2 is an enlarged sectional view on line 2—2 Fig. 1.

Fig. 3 is an enlarged sectional view on line 3—3 Fig. 1.

Fig. 4 is an enlarged perspective detail of one of the side posts supporting the ends of the truss and the ends of the members forming the ends of the truss and the end of the lower members of the upper chord supported thereby.

Fig. 5 is a similar view to Fig. 4 showing the outer lamination of the arch or lower chord broken away to more clearly exhibit the construction of the side post.

Fig. 6 is a similar view to Fig. 4 showing the first, second and third laminations of the arch or lower chord, broken away and the outer lamination of the near side of the side post removed.

Fig. 7 is a similar view to Fig. 4 showing the five laminations forming one side member of the arch or lower chord broken away and the outer and inner laminations of the near side of the side post removed.

Fig. 8 is an edge elevation of Fig. 4.

Fig. 9 is a sectional detail through one of the blocks carrying the tension member.

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

1 indicates the ground or ice surface of a rink or other building in which is embedded the footings 2 and 3 formed of concrete or other suitable material on which is carried the side posts A of the building to which is secured the sheeting 6 and horizontal top plates 7 carried on blocks 8 secured to the side posts A.

I will first describe the construction of the side posts A on which the arch structure is carried.

The side posts A are somewhat triangular in form, the lower end corresponding to the apex of the triangle being mounted on the concrete footings 2 and 3 at each side of the building. Each post A comprises outer laminations 9 and 10, inner laminations 11 and 12 and a central lamination 13, all suitably secured together. The outer laminations 9 and 10 each comprise (see Figs. 4 and 5) a vertical member 14, an inclined member 15 extending from the bottom of the member 14 to a point intermediate of the height of the side post, and vertical pieces 16, 17, 18 and 19 fitting the space between the members 14 and 15 and extending upwardly to form a downwardly and inwardly inclined upper edge 20 extending at an angle to the lower member of the lower chord hereinafter referred to, and a downwardly and outwardly lower edge 21 forming the upper edge of a slotted opening 22 inclined downwardly for a purpose which will hereinafter appear.

The inner laminations 11 and 12 each comprise (see Fig. 6) a vertical member 23 and the upwardly and inwardly inclined members 24, 25, 26 and 27 set at an angle to the members 16, 17, 18 and 19 of the laminations 9 and 10 as indicated by dotted lines in Fig. 5.

It will be noted that the members 23 of the laminations 11 and 12 are shorter than the members 14 of the laminations 9 and 10 to form a receiving recess for the lower ends of the inclined members of the upper chord hereinafter described.

The centre lamination or filler 13 comprises

(see Fig. 7) the upwardly and outwardly inclined members 28. The lower portion of the filler conforms in contour to the lower portions of each inner lamination 13, the upper portion projecting outwardly at 29 into the receiving recess formed by the upper ends of the members 14 and 23 and inwardly at 30. The members 28 extend at an angle to the members 23 to 27 as clearly indicated by dotted lines in Fig. 6.

I will now describe the arch member B extending between two transversely aligned side posts A, the upper chord of the arch being formed by the pitch members C and D and the lower chord of the arched supporting members B′ and B^2.

The arched members B′ and B^2 are spaced apart and each member comprises five laminations 31, 32, 33, 34 and 35 but may be any number to suit the span or strength.

The outer arch laminations 31 extend at their ends to the outside of the side posts A as clearly indicated in Figs. 4 and 8. The arch laminations 32 and 33 of the arch members B′ and B^2 fit into the slotted opening 22 of each outer post laminations 9 and 10 so as to bear against the end of the slotted openings to be supported by the outer laminations 9 and 10. The arch laminations 34 and 35 of the members B′ and B^2 bear at their ends against the inwardly and upwardly inclined edges 11x of the inner post laminations 11 and 12 adjacent the upper ends of such edges. Between the members B′ and B^2 are filled members 36 which bear at their ends against the edge 28^x of the filler or centre lamination of the post A as indicated in Fig. 7.

Note.—This arch which is the supporting structure for the roof which goes on top of it, consists of the lower arch-chord and the upper chord connected by angular and vertical strain members which may be in tension or compression.

I will now describe the roof supporting structure.

37 and 38 are members forming the lower section of the upper chord C which extend at their lower ends at each side of the filled portion 29 of the post and fit between the outer post laminations 9 and 10 and are chamfered off at 38^x so as to rest on the upper ends of the vertical members 23. 39 and 40 are members forming the upper section of the upper chord D (see Fig. 2) in a line with the members 37 and 38 of the lower section of the upper chord which they abut to form the roof hip and at their upper ends abut together to form the roof ridge.

The members 37 and 38 of the upper chord are supported on the arch B by the truss work 31, the members forming which, at their upper ends, extend between the members 37 and 38 or the lower section of the upper chord, and at their lower ends between the members B′ and B^2 of the lower chord of the arch B.

The filler pieces 36 extend between the lower ends of the lower chord members and similar pieces 36^x between the lower ends of the upper chord members. 42 is truss work similarly supporting the upper section or upper chord D upon the arch B.

At each hip when the arch is constructed with a hip and at the ridge of the roof, the ends of the upper and lower pitch chords are supported on the arch by parallel members 43 and 44 spaced apart to permit the passage of a bolt 45 which extends at its upper end through a casting 46 and at its lower end between the members B′ and B^2 of the arch and through a washer 47 and securing nut 48. The abutting ends of the upper chord members are connected together by the fish plates 48^x. The lower end is laminated and the lower fish plate is above the lower chord as a reinforcing member only and is not fastened to the lower chord but goes on each side of the two vertical members 43 and 44. 49 is a tension member extending transversely of the building and secured at the ends on the blocks 50 secured to the lower section C of the upper chord, the tension member extending between the members B′ and B^2 of the arch and the members 39 and 40 of the lower section of the upper chord. 28^o are bolts extending through the centre post lamination to connect the ends of the arch B and chord C together.

By this means the tension member 49 forms fulcrum points at its ends for the lower members C held together by the tension member 49, so that the load on the arch members above the fulcrum point tends to swing the arch members below the fulcrum point on both sides of the building around the fulcrum point and acts as a lever tending to carry the lower end of the arch and arch post inward. By this means lateral pressure at the foot of the arch of the building is counteracted, and in the case of dead and live loads, the weight of the load exerting excessive lateral strain on the post members tending to collapse the building is compensated for by the inward pressure exerted at the foot of the post by reason of the leverage exerted by the load above the fulcrum on the members of the arch below the fulcrum point.

The post construction hereinbefore described takes care of the different load reactions set up in the truss whereby they are carried finally in an almost vertical direction to the footing on which they stand. The two upper sections of the truss, that is the upper pitch members and the parts on which they are carried, have a key stone action on the lower sections of the truss, that is the lower section of the truss and the parts on which they are carried, producing a lever action in such lower sections and operate over the point where the tension member cuts the outer chord of the arch formed by the members of the lower pitch.

This lever action depends on the dead and live load to some extent but is controlled by the pitch and length of the upper chords of the arch formed by the members in the upper section of the arch.

The use of a tension member or rod passed through and extending between the opposing lower section of the arch to form a fulcrum at the proper point will, when the upper section of the arch and its opposing pitch members are in place, react on the ends of the posts around such fulcrum in such a way as to practically eliminate lateral pressure at the point of contact between the foot of the post and its foundation.

The angle and length of the upper chord, its pitch, and members must bear a proper relation to the same in the lower chord, its pitch and members together with the proper location of the tension member at the fulcrum point to produce the balance condition of reaction in the truss loads for the proper functioning of the structure so that it will not ail under dead or live loads.

It will be noted that the seats 52 for the spectators are almost entirely within the line of supporting posts so that a clear, uninterrupted view will be afforded.

What I claim as my invention is:

1. In a building construction as described, the combination with the opposing side supports of a

building and a roof supporting structure normally exerting outward pressure at the side supports and including an arch carried at its ends on the side supports and forming the lower chord of the structure and an upper chord formed by upper and lower members carried by the arch, of a tension member extending transversely of the arch and tying the lower members of the upper chord together and on which, adjacent its ends, the lower members of the upper chord fulcrum whereby such lower members tend to swing inward at their lower ends when subjected at their upper ends to outward pressure either due to the dead load in or wind load on the roof structure to neutralize the normal outward pressure at the side supports.

2. In a building construction as described, the combination with the opposing side supports of a building and a roof supporting structure normally exerting outward pressure at the side supports and including upper members extending at each side of the centre ridge of the roof to form a centre unit and lower inclined members abutting at the upper ends the lower ends of the upper members whereby the centre unit has a keystone action between the upper ends of the lower members tending to force such upper ends outward, of a tension member extending transversely of the structure and tying the lower members together and on which adjacent its ends the lower members fulcrum, whereby such lower members tend to swing inward at their inner ends when subjected at their upper ends to outward pressure either due to dead load in or wind pressure on the centre unit of the roof structure to neutralize the normal outward pressure at the side supports.

WILLIAM COCKBURN BEATTIE.