No. 889,000. PATENTED MAY 26, 1908.

G. M. GRAHAM.

REINFORCED CONCRETE ROOF.

APPLICATION FILED DEC. 10, 1907.

6 SHEETS—SHEET 1.

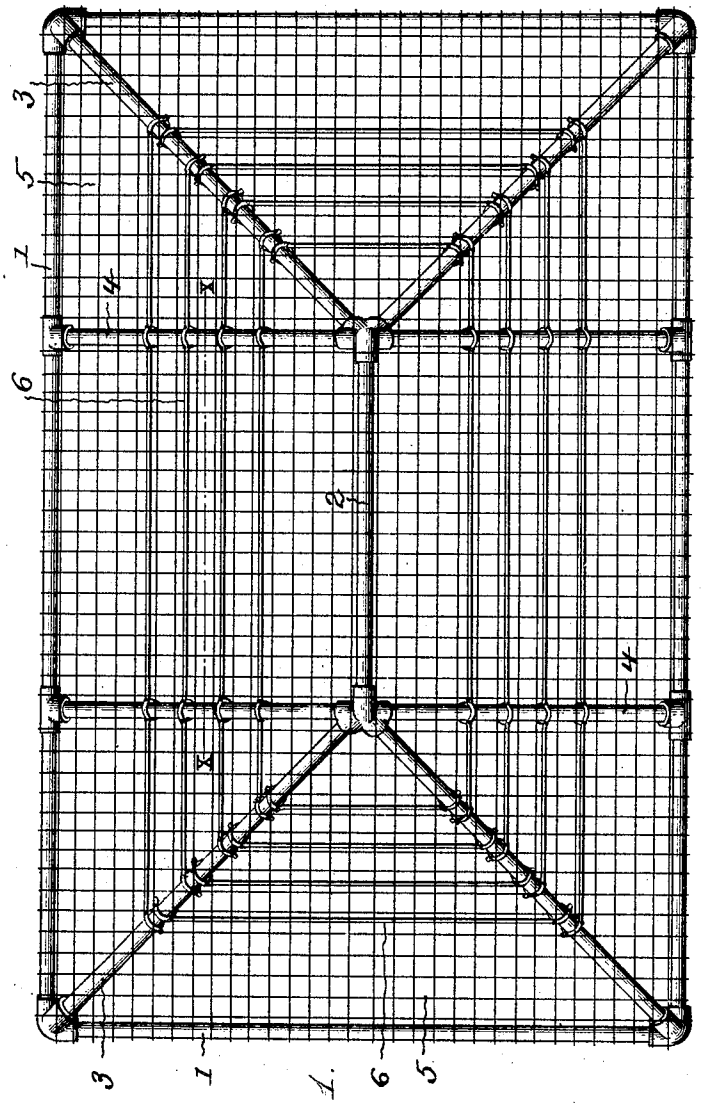


Fig. 1.

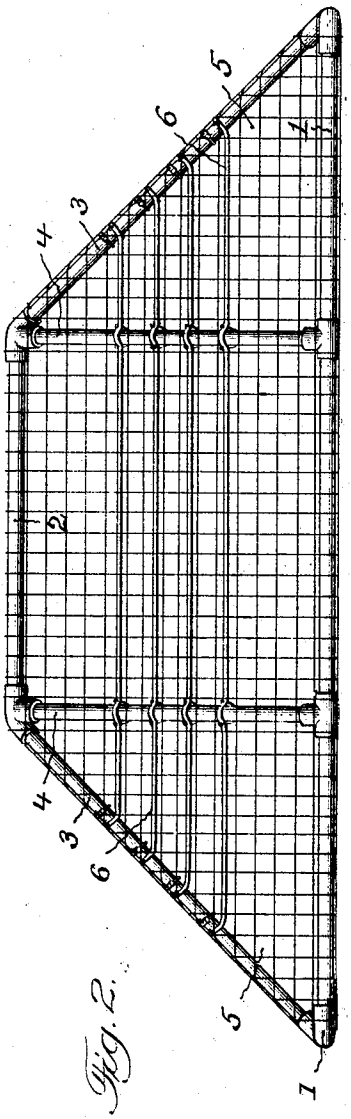


Fig. 2.

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6 SHEETS—SHEET 2.

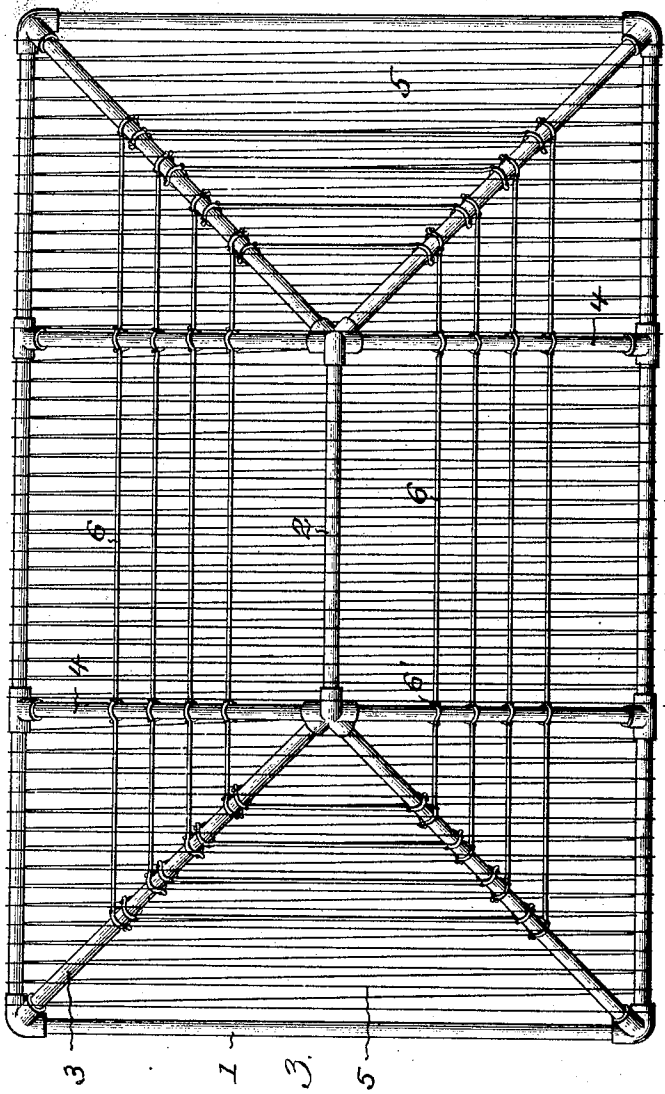


Fig. 3.

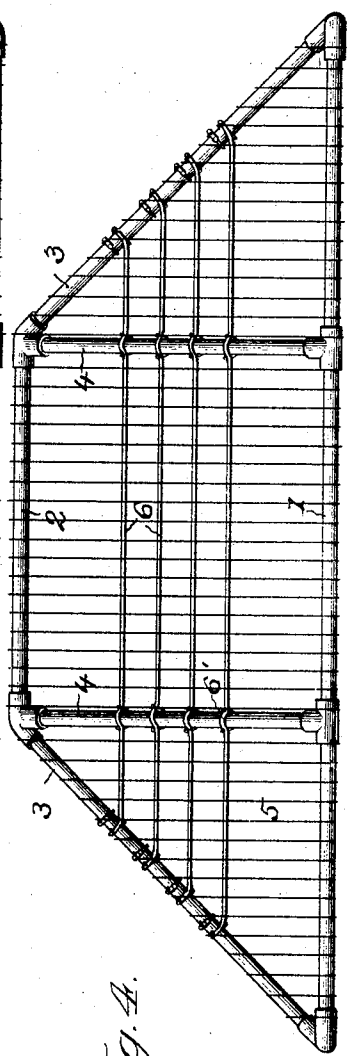


Fig. 4.

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6 SHEETS—SHEET 3.

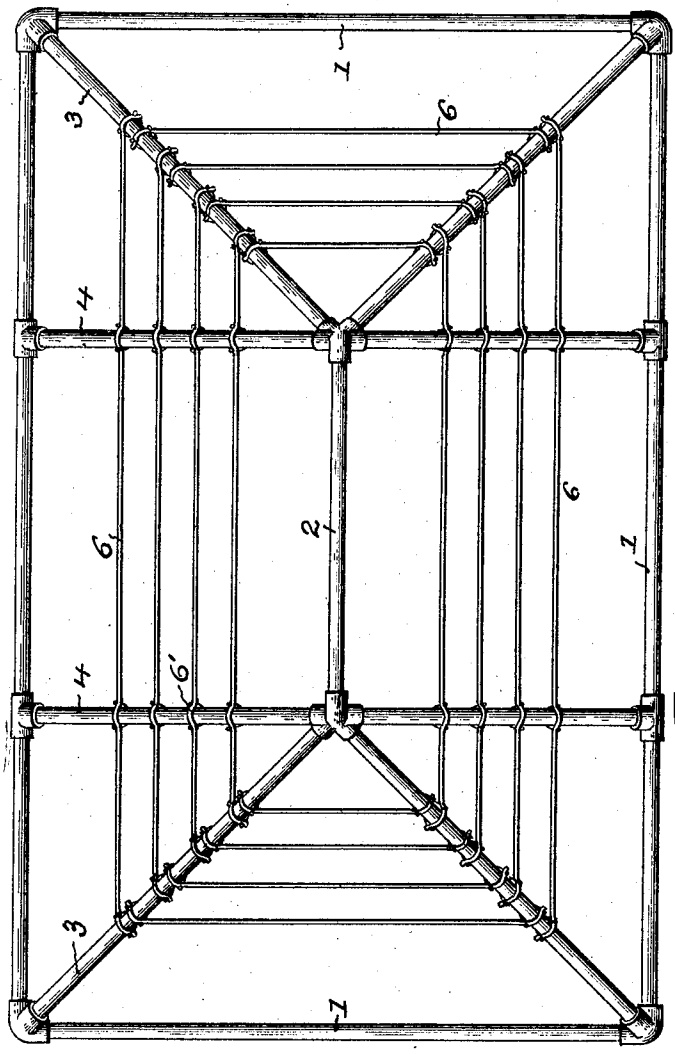


Fig. 5.

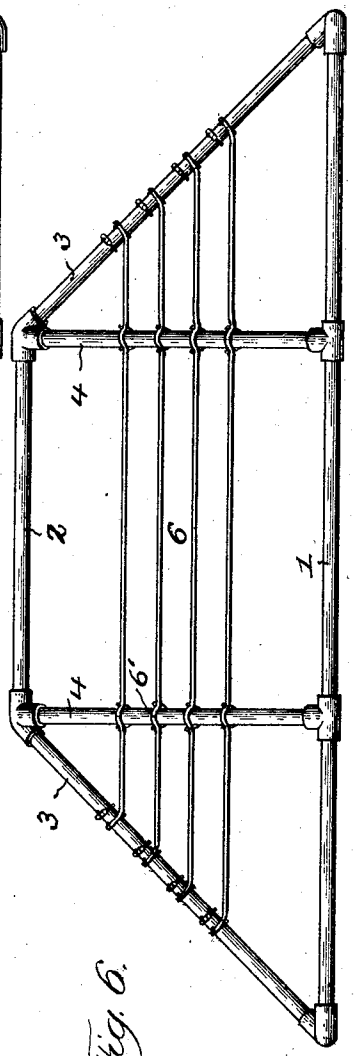


Fig. 6.

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6 SHEETS—SHEET 4.

Fig. 7.

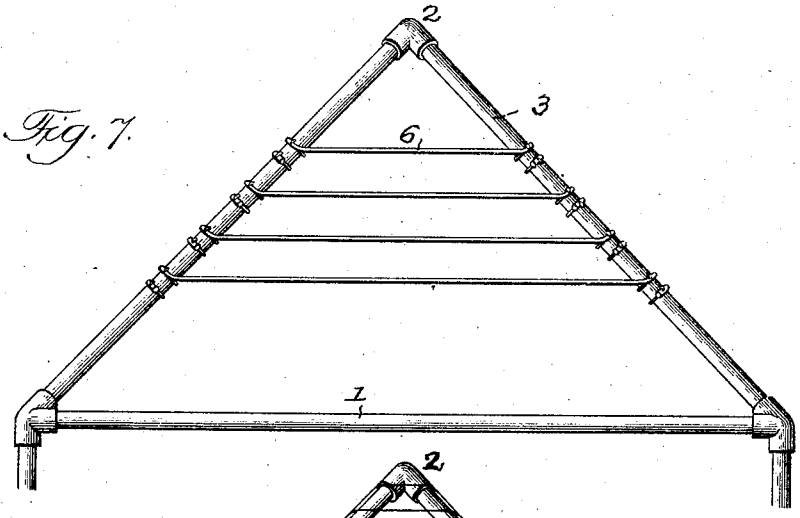


Fig. 8.

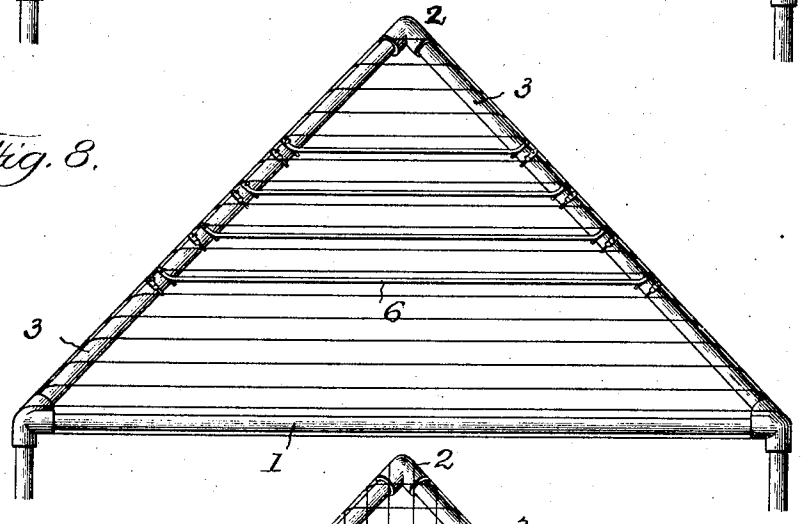
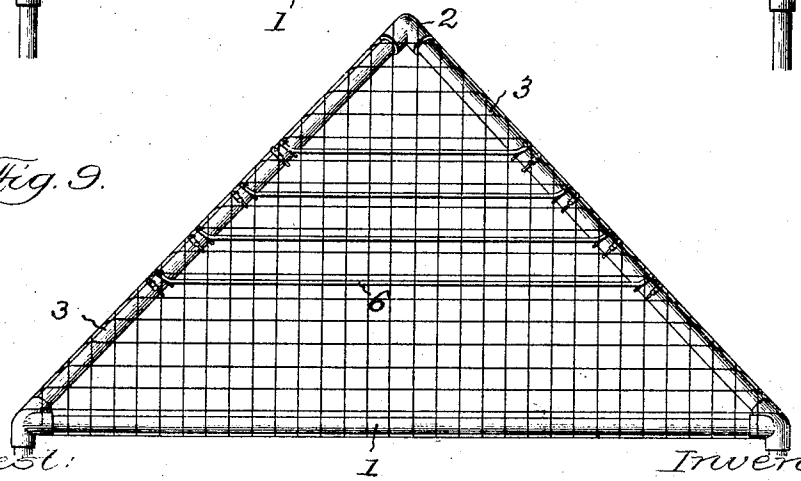


Fig. 9.



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6 SHEETS—SHEET 5.

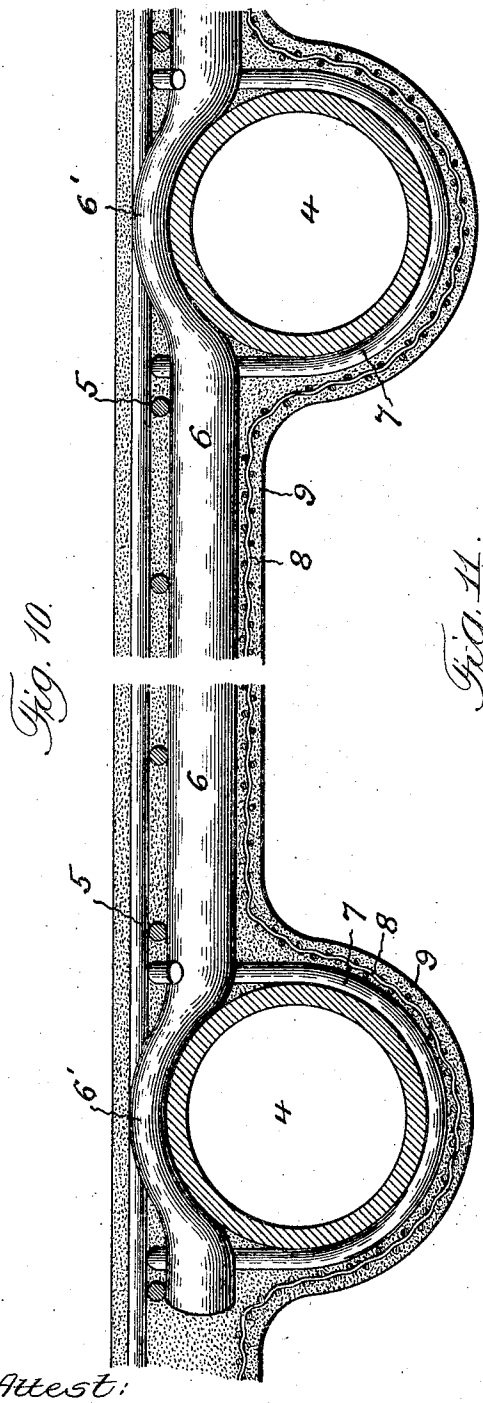


Fig. 10.

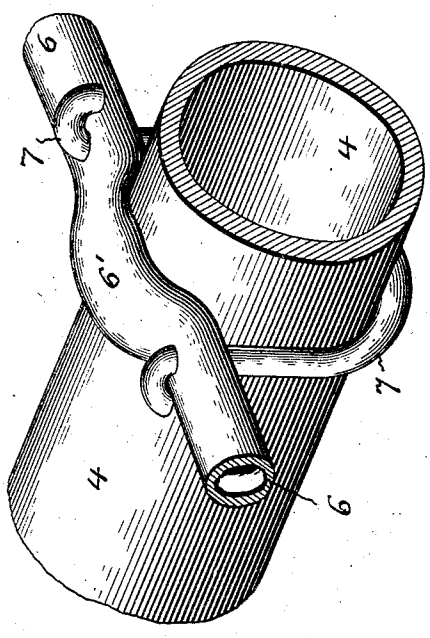


Fig. 11.

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6 SHEETS—SHEET 6.

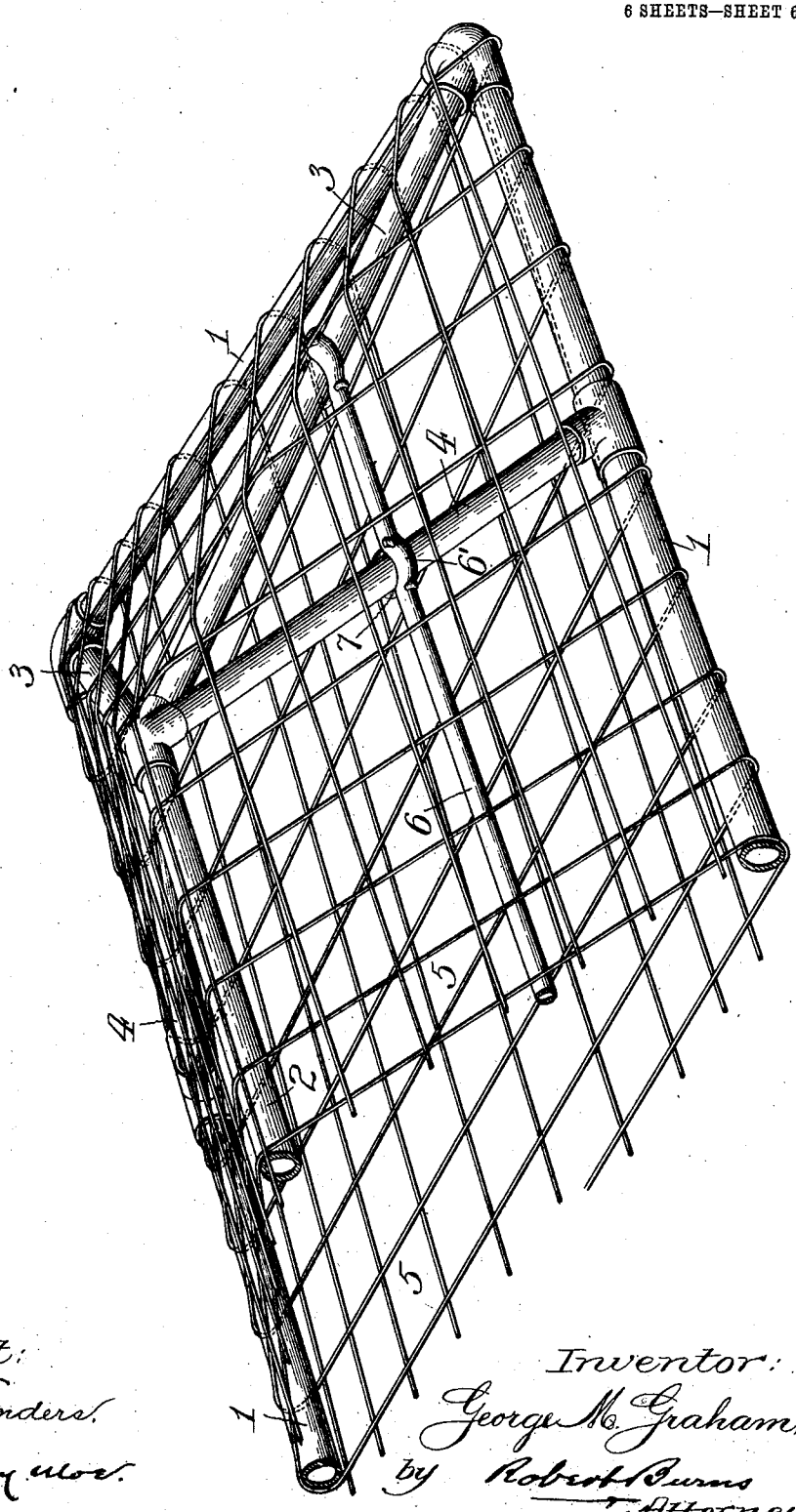


Fig. 12.

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UNITED STATES PATENT OFFICE.

GEORGE M. GRAHAM, OF CHICAGO, ILLINOIS, ASSIGNOR TO G. A. EDWARD KOHLER, OF CHICAGO, ILLINOIS.

REINFORCED CONCRETE ROOF.

No. 889,000. Specification of Letters Patent. Patented May 26, 1908.

Application filed December 10, 1907. Serial No. 405,889.

To all whom it may concern:

Be it known that I, GEORGE M. GRAHAM, a citizen of the United States of America, and a resident of Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Reinforced Concrete Roofs, of which the following is a specification.

This invention relates to that type of reinforced concrete structures which constitute the subject matter of my prior patent No. 865,490 of Sept. 10, 1907; and has for its object to provide a simple and efficient structural arrangement and combination of parts whereby a reinforced concrete roof is formed possessing the very desirable requisites of strength, lightness and durability, all as will hereinafter more fully appear.

In the accompanying drawings illustrative of the present invention: Figure 1, is a plan view of a skeleton reinforcing frame for concrete roofs, completely wound. Fig. 2, is a side view of the same. Fig. 3, is a plan view of the frame partly wound. Fig. 4, is a side view of the same. Fig. 5, is a plan view of the frame before being wound. Fig. 6, is a side view of the same. Fig. 7, is a front view of the frame in an unwound condition. Fig. 8, is a similar view in a partly wound condition. Fig. 9, is a similar view in a fully wound condition. Fig. 10, is an enlarged detail section on line x—x Fig. 1, with the concrete mass in place. Fig. 11, is a detail perspective view of the connection between the rafters and the intermediate horizontal members. Fig. 12, is a detail perspective view illustrating the two crossed wire windings of the present invention.

Similar numerals of reference indicate like parts in the several views.

Referring to the drawings, 1 represents a series of horizontal cylindrical beams secured together to form the base frame of a concrete roof of the present construction, and which frame may be provided with the usual intermediate braces where the size or particular use of the roof would indicate the use of such provision. 2, is the ridge pole of the roof, also of a cylindrical form, and which is connected to the base frame 1 aforesaid, by the series of main rafters 3 also of a cylindrical form, and which are preferably four in number and arranged at the respective corners of the roof. 4, are a series of supplementary rafters, also of a cylindrical form, arranged intermediate of the respective main rafters 3, and extending from the base frame 1 to the ridge pole 2, as shown, and forming the intermediate supports for the skeleton wire centers or webbings hereinafter described. Said roof parts are preferably formed from sections of commercial wrought metal tubing secured together at their meeting points in a firm and substantial manner by means of any usual and suitable pipe couplings, preferably however, the type of couplings or fittings which form the subject matter of my prior patent No. 865,489 of Sept. 10, 1907, and of my applications for Letters Patent Serial No. 397,848, filed Oct. 17, 1907, and Serial No. 405,891, filed Dec. 10, 1907. So united said roof parts form the skeleton border frames of the series of panels of the roof structure.

5, are the skeleton wire centerings or webbings above referred to, and which are formed by a continuous wrapping of a single wire around the cylindrical border members 1, 2 and 3 of the roof frame above described, in spaced relation and in crossed or opposite directions to afford open web like centers for the series of flat panels formed by said border members. Said wrappings of the wire will be in a continuous and serial order around the skeleton roof frame, and from panel to panel thereof, so as to provide a single skeleton web or center for each panel and including the base or horizontal panel of the roof structure as well as the slanting or other usual panels thereof.

With the continuous wrappings above set forth, and as in my prior patented construction No. 865,490, each individual strand thereof can be brought to a common and uniform tension, to bear in an even and uniform manner the normal stress or load imposed upon the roof structure as a whole, and in consequence of which a structure is provided having a maximum degree of strength with a minimum amount of material.

A material part of the present improvement consists in the combination with the before described skeleton reinforcing frame and skeleton wire centers or panels thereof, of means for affording said centers or panels intermediate support against the normal sag or dish of the same in the ordinary floor or ceiling construction set forth in my aforesaid

patent No. 865,490. Such intermediate supporting means by imposing a substantially straight or flat condition upon said centers or panels, permits of the mass of concrete which incloses said skeleton wire centers or panels, and forms the main body of the roof, being made very thin, and requiring a minimum amount of concrete for a given roof surface, thus permitting of the economical use of a high grade concrete mixture with the consequent strength and durability which follows such use. The preferred structural formation and arrangement of such intermediate support is as follows:—6, are a series of tubular members arranged horizontally and in spaced relation midway between the horizontal roof beams 1 and the ridge pole or beam 2, and secured to the rafters 3 and 4, by means of a series of stirrup clips 7 which embrace said rafters and have their ends bent over the members 6, as shown more particularly in Figs. 10 and 11. In the present construction such intermediate members 6 are on a common plane with the outer surface of the rafters 3 and 4, and in connection with said rafters are adapted to support the skeleton wire centers or panels 5 in immediate adjacent relation to the outer surface of the skeleton reinforcing frame of the roof. In the attainment of the above mentioned arrangement of the intermediate members 6 in a common plane with the outer surface of the rafters 3 and 4, such intermediate members will have their portions 6′ adjacent to said rafters, flattened and curved to fit the peripheries of the rafters as shown more particularly in Figs. 10 and 11, so as to avoid excessive projections at such points and at the same time afford a convenient connection for the stirrup clips 7 aforesaid.

8 are sheets of wire lathing attached to the aforesaid skeleton wire centers or panels 5, and adapted to aid in receiving and holding the concrete mass 9 forming the main body of the roof, during the setting and hardening of said mass.

Having thus fully described my said invention what I claim as new and desire to secure by Letters Patent, is:—

1. A skeleton reinforcing frame for concrete roofs, comprising a base formed of a series of round beams, a round ridge pole, a series of round rafters, and a continuous wrapping of wire around the outside of the entire frame comprising the base frame and rafters and tending to hold the rafters to the frame.

2. A skeleton reinforcing frame for concrete roofs, comprising a base formed of a series of round beams, a round ridge pole, a series of round rafters, and a continuous wrapping of wire around the outside of the entire frame comprising the base frame rafters and ridge pole, transverse to the ridge pole, and tending to hold the rafters to the frame.

3. A skeleton reinforcing frame for concrete roofs, comprising a base formed of a series of round beams, a round ridge pole, a series of round rafters, and continuous wrappings of wire, in crossed relation, around the outside of the entire frame comprising the base frame and rafters and tending to hold the rafters to the frame.

4. A skeleton reinforcing frame for concrete roofs, comprising a base formed of a series of round beams, a round ridge pole, a series of round rafters, a continuous wrapping of wire around the outside of the entire frame comprising the base frame and rafters and tending to hold the rafters to the frame, and intermediate horizontal members extending from rafter to rafter to support the central parts of the wire wrapping against sagging.

5. A skeleton reinforcing frame for concrete roofs, comprising a base formed of a series of round beams, a round ridge pole, a series of round rafters, a continuous wrapping of wire around the outside of the entire frame comprising the base frame rafters and ridge pole, transverse to the ridge pole, and tending to hold the rafters to the frame, and intermediate horizontal members extending from rafter to rafter to support the central parts of the wire wrapping against sagging.

6. A skeleton reinforcing frame for concrete roofs, comprising a base formed of a series of round beams, a round ridge pole, a series of round rafters, continuous wrappings of wire, in crossed relation, around the outside of the entire frame comprising the base frame and rafters and tending to hold the rafters to the frame, and intermediate horizontal members extending from rafter to rafter to support the central parts of the wire wrappings against sagging.

7. A skeleton reinforcing frame for concrete roofs, comprising a base formed of a series of round beams, a round ridge pole, a series of round rafters, a continuous wrapping of wire around the outside of the entire frame comprising the base frame and rafters and tending to hold the rafters to the frame, and intermediate horizontal members extending from rafter to rafter to support the central parts of the wire wrapping against sagging and having flattened and curved portions for engagement with said rafters.

8. A skeleton reinforcing frame for concrete roofs, comprising a base formed of a series of round beams, a round ridge pole, a series of round rafters, a continuous wrapping of wire around the outside of the entire frame comprising the base frame rafters and ridge pole, transverse to the ridge pole, and tending to hold the rafters to the frame, and intermediate horizontal members extending from rafter to rafter to support the central parts of the wire wrapping against sagging and having flattened and curved portions for engagement with said rafters.

9. A skeleton reinforcing frame for concrete roofs, comprising a base formed of a series of round beams, a round ridge pole, a series of round rafters, continuous wrappings of wire, in crossed relation, around the outside of the entire frame comprising the base frame and rafters and tending to hold the rafters to the frame, and intermediate horizontal members extending from rafter to rafter to support the central parts of the wire wrappings against sagging and having flattened and curved portions for engagement with said rafters.

10. A skeleton reinforcing frame for concrete roofs, comprising a base formed of a series of round beams, a round ridge pole, a series of round rafters, a continuous wrapping of wire around the outside of the entire frame comprising the base frame and rafters and tending to hold the rafters to the frame, intermediate horizontal members extending from rafter to rafter to support the central parts of the wire wrapping against sagging and having flattened and curved portions for engagement with said rafters, and stirrup clips for attaching said horizontal members to the rafters.

11. A skeleton reinforcing frame for concrete roofs, comprising a base formed of a series of round beams, a round ridge pole, a series of round rafters, a continuous wrapping of wire around the outside of the entire frame comprising the base frame rafters and ridge pole, transverse to the ridge pole, and tending to hold the rafters to the frame, intermediate horizontal members extending from rafter to rafter to support the central parts of the wire wrapping against sagging and having flattened and curved portions for engagement with said rafters, and stirrup clips for attaching said horizontal members to the rafters.

12. A skeleton reinforcing frame for concrete roofs, comprising a base formed of a series of round beams, a round ridge pole, a series of round rafters, continuous wrappings of wire, in crossed relation, around the outside of the entire frame comprising the base frame and rafters and tending to hold the rafters to the frame, intermediate horizontal members extending from rafter to rafter to support the central parts of the wire wrappings against sagging and having flattened and curved portions for engagement with said rafters, and stirrup clips for attaching said horizontal members to the rafters.

Signed at Chicago, Illinois, this 29th day of November 1907.

GEORGE M. GRAHAM.

Witnesses:

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