J. W. RAPP AND J. VANORIO.

TENSIONED FRAME.

APPLICATION FILED DEC. 28, 1917.

1,381,659.

Patented June 14, 1921.

2 SHEETS—SHEET 1.

Fig. 1.

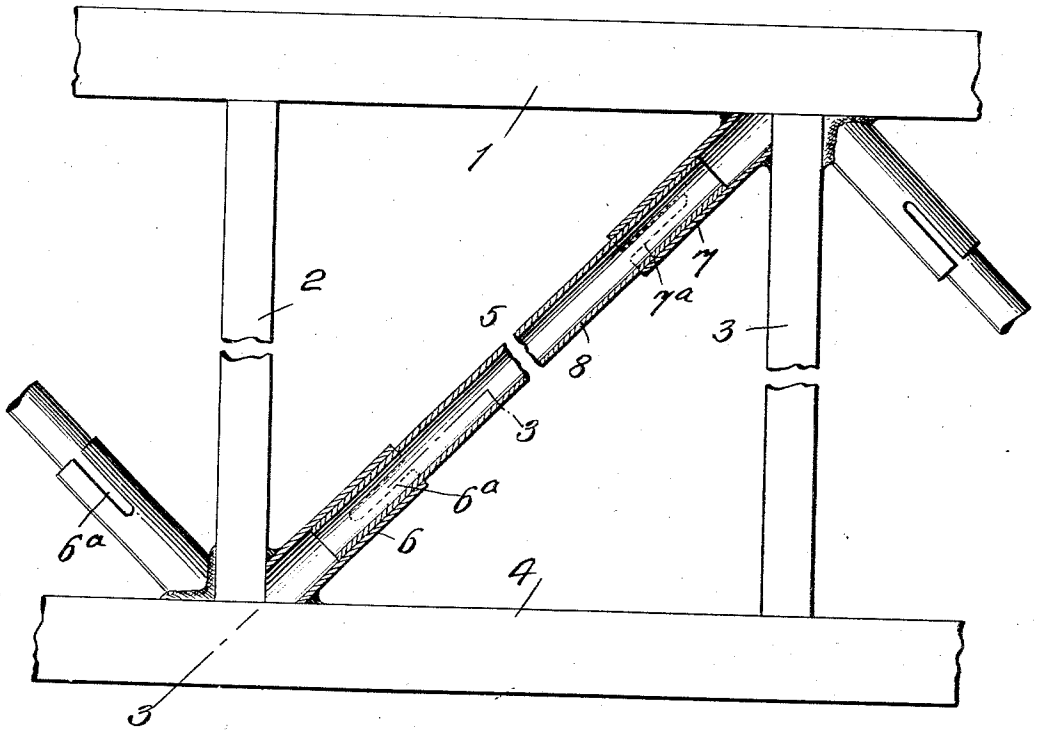


Fig. 2.

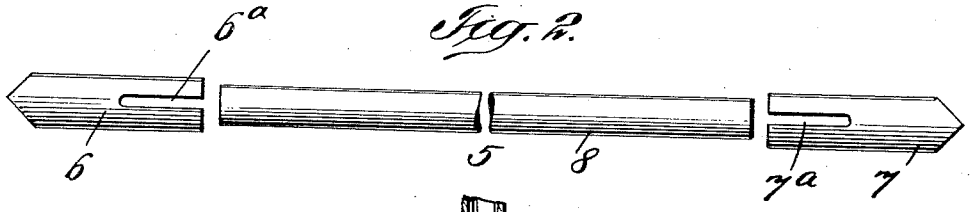
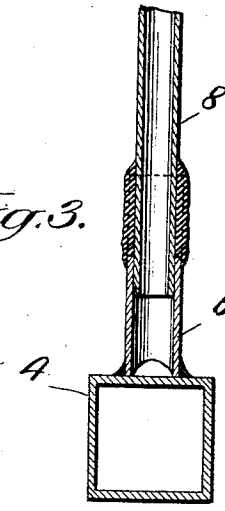


Fig. 3.



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2 SHEETS—SHEET 2.

Fig. 4.

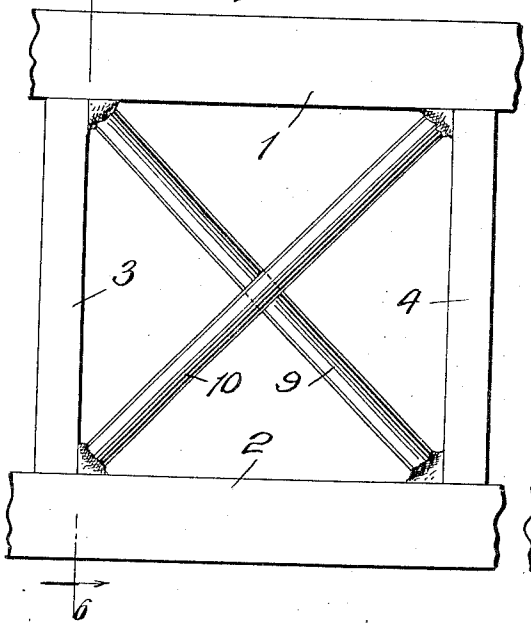


Fig. 5.

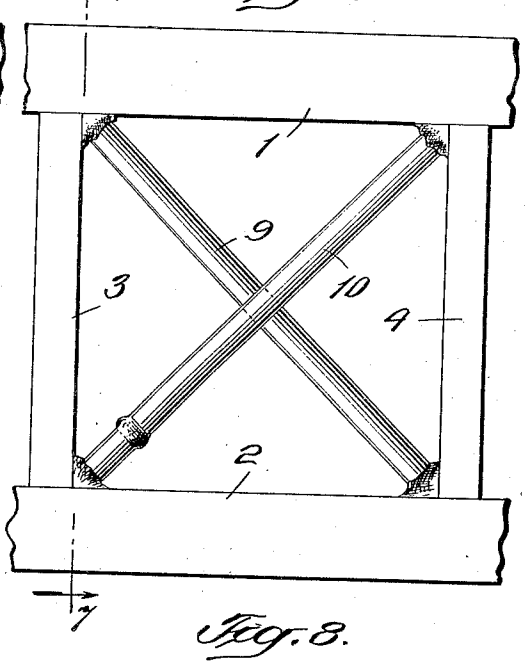


Fig. 6.

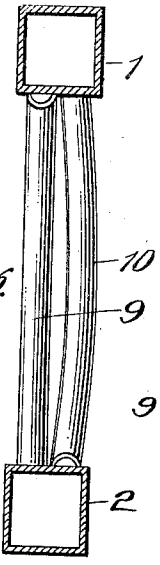


Fig. 7.

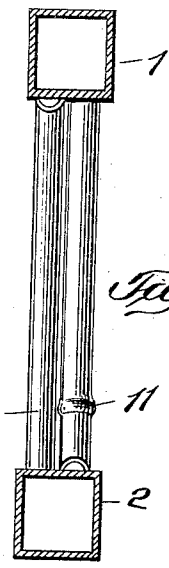
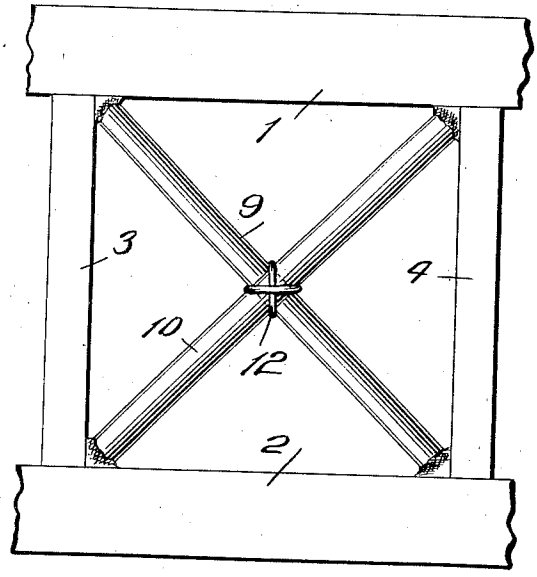


Fig. 8.



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UNITED STATES PATENT OFFICE.

JOHN W. RAPP, OF FLUSHING, AND JOSEPH VANORIO, OF BROOKLYN, NEW YORK; SAID VANORIO ASSIGNOR TO SAID RAPP.

TENSIONED FRAME.

1,381,659. Specification of Letters Patent. Patented June 14, 1921.

Application filed December 28, 1917. Serial No. 209,355.

To all whom it may concern:

Be it known that we, JOHN W. RAPP and JOSEPH VANORIO, both citizens of the United States, and residing at Flushing and Brooklyn, respectively, in the counties of Queens and Kings and State of New York, have invented a new and Improved Tensioned Frame, of which the following specification is a full disclosure.

This invention relates to improvements in tensioned frame.

This invention deals with the tensioning of a frame or structure, particularly adapted for use in airplanes, the parts of which are placed under tension by means of a heat-expanded tension element which is characterized by the fact that two or more of its parts are caused to be "telescoped," using the said word in its broadest sense, or moved relatively into one another for the purpose of taking up and retaining in expanded relation the portion of the element which has been subjected to heat, thus placing the frame members to which the plural parts of the device are attached under tension.

In carrying out our invention, the parts which are to form the ends of the tension element are connected permanently to the frame to be tensioned, a part of the element is then subjected to heat and lengthened, and at a suitable point intermediate the said ends of the element, a telescoped joint is formed. This telescoped joint is so formed either by melting the metal of the element at a predetermined point intermediate the said secured ends to permit a movement of the heated and lengthened portion telescopically into the adjacent portion of the element, or the heated and lengthened portion of the element is permitted to move telescopically within a sleeve or the like which forms a part of the element. Said heated and lengthened or expanded element is then secured to said sleeve which has previously been secured to the frame.

In the accompanying drawings, in which similar reference characters designate corresponding parts throughout the several views,

Figure 1 is a side elevation, partly in section of a tensioned frame embodying our invention;

Fig. 2 is a side elevation of a tension element employed by us;

Fig. 3 is a section on the line 3—3 of Fig. 1;

Figs. 4 to 8 inclusive illustrate a modified form of our invention, Fig. 4 illustrating in side elevation a frame having two diagonally-crossed tension elements, each secured at its opposite ends to the frame; Fig. 5 a similar side elevation showing the joint in one of such elements after heating and lengthening; Fig. 6 is a section on the line 6—6 of Fig. 4 illustrating the bowed condition of one of such elements after heating and lengthening but before the telescoped joint is formed; Fig. 7 is a section on the line 7—7 of Fig. 5 showing the condition of the said element after the metal thereof has been melted at a suitable point to permit the formation of a telescoped joint, and Fig. 8 is a side elevation of a frame and elements after the surplus metal has been removed from the telescopic joint and the frame otherwise completed.

Referring now to Figs. 1 to 3 of these drawings 1, 2, 3 and 4 illustrate the walls of a frame which it is desired to tension and 5 is a tension element which in said Figs. 1 to 3 inclusive comprises three parts, viz. two end pieces of sleeves and an intermediate portion 8. Said sleeves are secured at their ends, preferably by welding, to the opposite corners of the frame and have their body portions provided with slots 6^a 7^a respectively to permit the secure welding thereto of an intermediate portion which is first inserted in the opposite sleeve portions, is secured, preferably by welding at one of its ends to a sleeve, after which said intermediate portion is heated in any suitable manner to compel expansion or lengthening thereof. This elongation causes the free end of the intermediate portion to telescope with the sleeve at such free end, whereupon the said free end and said sleeve are secured together by welding while the said intermediate portion is still expanded or lengthened by heat as aforesaid. Obviously, a tension will result between the opposite or connected frame parts when the tension element cools, and furthermore the amount of tension may be varied by varying the degree of heat and consequent lengthening.

Referring now to Figs. 4 to 8, which illustrate a modified form of our invention, 1, 2, 3 and 4 again indicate the walls of the frame it is desired to tension and 9 and 10 illustrate diagonally crossed tension elements for said frame. In carrying out our invention, the elements which preferably comprise tubes of metal, are welded at their opposite

ends to the corners of the frame. The element, or a portion thereof, is now subjected to heat in order to lengthen it, whereupon it assumes the bowed condition shown in Fig. 6. We thereafter melt the metal of the tube at the joint shown in Figs. 5 and 7 and thus permit the parts to telescope, thus forming the bulging joint 11 illustrated in said Figs. 5 and 7. The surplus metal is then removed at the joint 11 and after the opposite diagonal tension element is likewise treated, the two elements are wired together by wires 12 or the like.

Having described our invention, we claim:

1. A tensioned frame embodying a suitable frame; a tension element under tension therein and having a telescoped joint formed between adjacent parts, one of which parts has been linearly expanded by heat and permanently secured to the other part of said element in such expanded condition to provide tension in said element.

2. A tensioned frame embodying a suitable frame and a tension element under tension in said frame having its opposite ends permanently connected to opposite parts of said frame and comprising a plurality of parts permanently secured together and forming a telescoped joint at the juncture of the said parts.

3. A tensioned frame embodying a suitable frame and a tension element under tension comprising a sleeve portion and an expanded part adapted to fit within the same; a permanent joint between the frame and said sleeve; another permanent connection between said expanded part and the frame and a permanent telescoped joint between the said sleeve and expanded part.

4. A tensioned frame embodying a suitable frame and a tension element under tension comprising a sleeve having a permanent joint at one side of the frame, another sleeve having a permanent joint at the opposite side thereof, and an intermediate expanded portion having permanent telescoping joints with said sleeves, as and for the purpose set forth.

In witness whereof, we hereunto subscribe our names, as attested by the two subscribing witnesses.

JOHN W. RAPP.
JOSEPH VANORIO.

Witnesses:
W. G. LANG,
JOSEPH F. O'BRIEN.