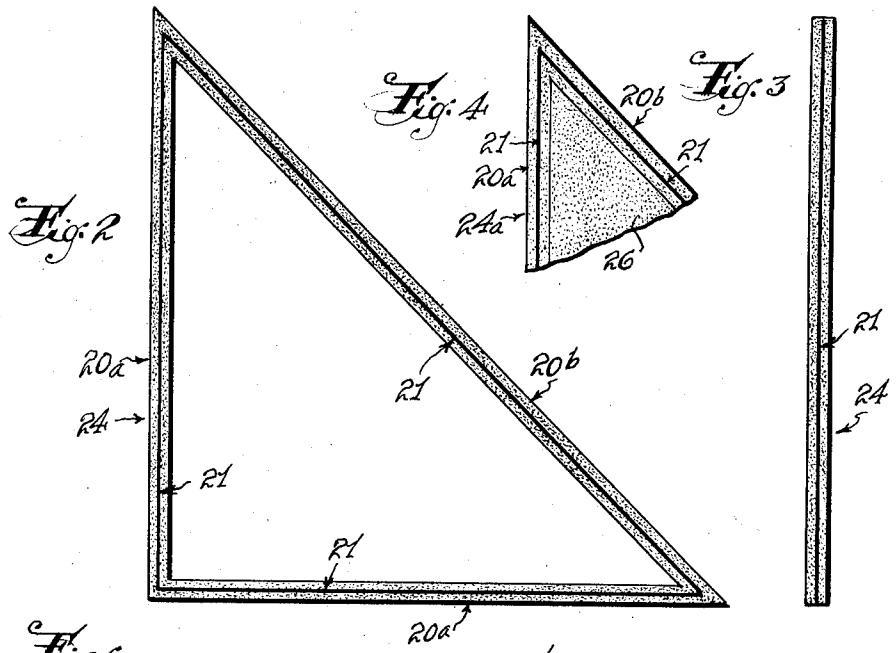
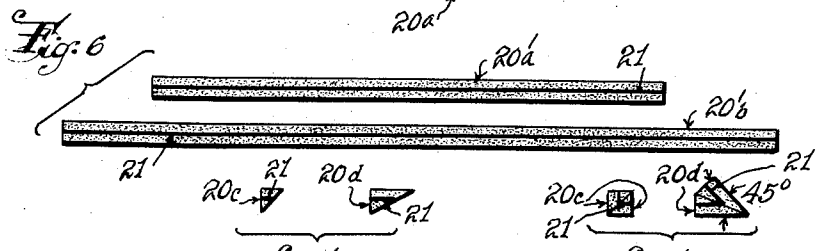
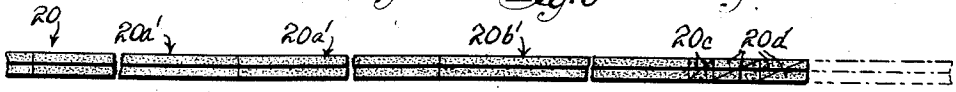
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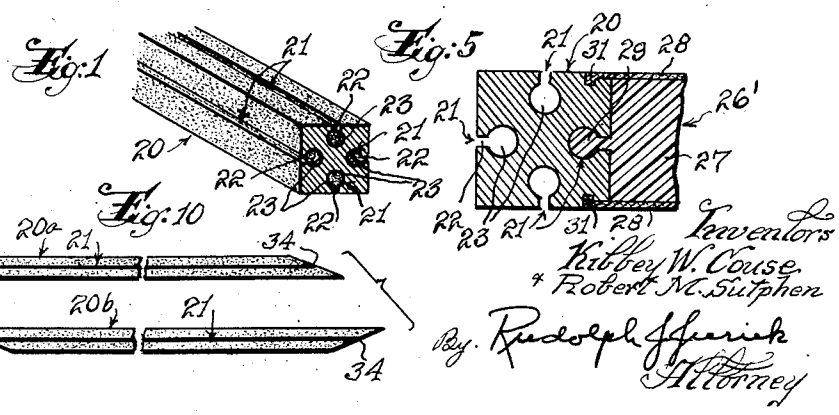
STRUCTURAL BUILDING ELEMENT

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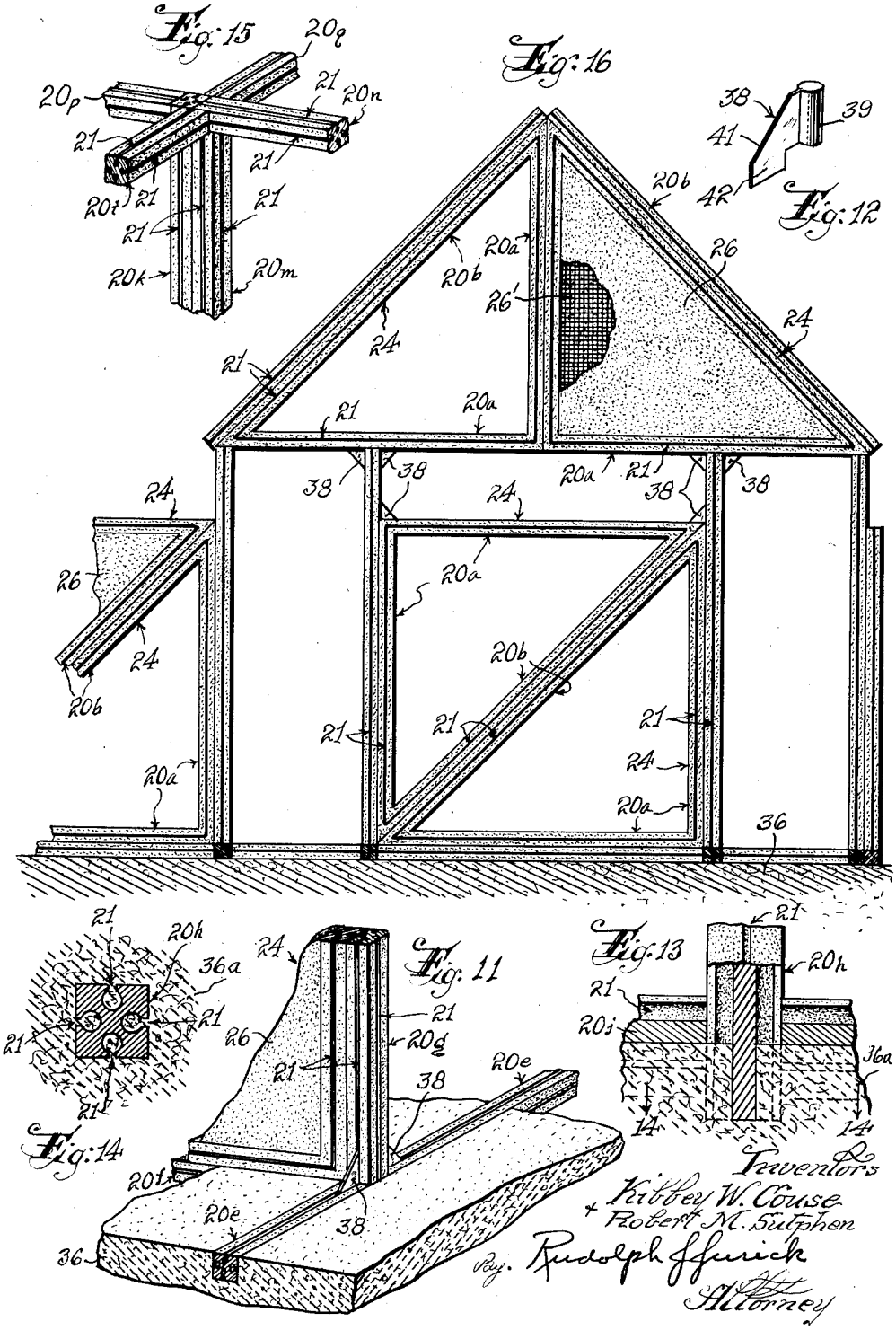


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STRUCTURAL BUILDING ELEMENT

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STRUCTURAL BUILDING ELEMENT

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7 Claims. (Cl. 20—15)

This invention relates to a structural building element and more particularly to an elongated square cross-sectional shaped element having an elongated, enlarged bottomed groove extending from end-to-end at each side thereof.

The structural building elements of our invention are adapted for use as vertical, horizontal and diagonally extending posts or beam members in building structures. In addition, the building elements may be used to form a framework of a triangular-shape within which panel members of various types and compositions may be supported. The structural building elements are particularly useful in the construction of portable buildings of the type which are easily set-up and knocked down again for use at another location.

The building element comprises an elongated member having a generally square cross-sectional shape. A groove is provided in each of the four sides, and extends from one end to the other. The grooves have a relatively narrow throat portion which terminates in a lower enlarged bottom portion which is preferably of a generally cylindrical shape. The cross-sectional shape is such that the element may be easily formed by an extrusion process. Although the element may be made of metal, wood, plastic or other structural material, it will be understood that if it is to be manufactured by an extrusion process, metal and/or plastic are preferred, as they are easily extruded. The extruded member may be cut into any desired length and at any angle.

An object of this invention is the provision of a structural building element for use in forming a building structure framework.

An object of this invention is the provision of a structural building element of a generally square-shaped cross section and having an elongated groove on each side extending from end-to-end thereof.

An object of this invention is the provision of a triangular-shaped building member comprising a pair of perpendicularly oriented equal-length frame members connected together at one end thereof, a diagonal frame member interconnecting the free ends of the said equal-length frame members, each of the said frame members being of a square cross-sectional shape and having an elongated enlarged bottomed groove along the center of each edge thereof, the outer and inner edge grooves extending about the entire outer and inner periphery, respectively, of the building members, the said face grooves forming a continuous groove on each of the framework faces.

An object of this invention is the provision of a connecting device for joining a pair of elongated structural elements, the said structural elements having elongated grooves therein which grooves have a narrow throat portion and an enlarged bottom portion, the said connecting device comprising an elongated enlarged member of substantially identical cross-section as the enlarged bottomed portion of the said elongated grooves, a thin plate member of substantially the same thickness as the said narrow

throat portion of the said grooves and attached to the said enlarged member, the said plate member having a projecting member extending longitudinally beyond the end of the said elongated enlarged member, the said elongated enlarged member being adapted to longitudinally slide within the enlarged bottomed portion of the said groove in one of the said structural elements whereby the said plate member extends outwardly of the said groove through the said narrow throat portion thereof, the said longitudinally projecting plate member being adapted to be inserted into the groove in the other said structural element positioned at right angles to the said first structural element, thus completing the connection between the said structural elements.

These and other objects and advantages will become apparent from the following description when taken with the accompanying drawings. It will be understood the drawings are not to be construed as defining the scope or limits of the invention, reference being had for the latter purposes to the appended claims.

In the drawings wherein like reference characters denote like parts in the several views:

Figure 1 is an enlarged fragmentary sectional perspective view of our novel structural element;

Figure 2 is a front view of a novel triangular-shaped structural building member made with the structural elements of our invention;

Figure 3 is a side view of the member shown in Figure 2;

Figure 4 is a fragmentary front view of the building member shown in Figure 2 and including a solid interior panel member;

Figure 5 is a fragmentary sectional view of a building member having a plastic panel attached thereto;

Figure 6 is an exploded view of two building elements which may be used to form sides of the building member shown in Figure 2;

Figure 7 is an exploded view of portions of two building elements which may be used to form the corners of the building member shown in Figure 2;

Figure 8 is an exploded view of the portions of elements shown in Figure 7, and showing the elements joined together to form complete corners;

Figure 9 is a fragmentary front view of an extruded structural building element cut into various length and size sections;

Figure 10 is an exploded view of two building elements with the ends properly beveled to form a portion of the building member of the type shown in Figure 2;

Figure 11 is a fragmentary perspective view of a building structure erected upon a concrete slab;

Figure 12 is a perspective view of a connecting device for joining building elements;

Figure 13 is a fragmentary vertical sectional view of several of our novel structural building elements attached to a concrete base;

Figure 14 is a sectional view taken on line 14—14 of Figure 13;

Figure 15 is a fragmentary perspective view of a plurality of building elements joined together; and

Figure 16 is a fragmentary sectional view of a building structure made of our structural building elements.

Reference is now made to Figure 1 of the drawings wherein a structural building element designated **20** is shown. The building element is of an elongated and generally square cross-sectional shape. Each side of the building element is provided with an elongated groove **21** which extends longitudinally of the element along the center of each side. Each of the grooves has a relatively narrow throat portion **22** terminating in an enlarged bottomed portion **23** which is of a generally cylin-

drical-shaped form. The structural building elements may be made in any desired lengths and the ends cut, or beveled, at any desired angle.

Reference is now made to Figure 2 of the drawings wherein there is shown a triangular-shaped building member **24** constructed of structural building elements of the type shown in Figure 1. Triangular-shaped building members constructed with building elements of a different cross-sectional shape are described in our copending patent application Serial No. 616,298, filed October 16, 1956, and entitled Structural Panel Member. The building member **24** is in the form of a right isosceles triangle having two equal length sides **20***a* and a long diagonal side **20***b*. The sides may be of any desired length; as for example, from several inches to several feet. It will be noted that the corners of the triangular-shaped building member are formed in such a manner that the grooves **21**, on the face of the building member, interconnect to form a continuous triangular-shaped groove, and that none of the grooves **21** in the face of the building member extend to the edge of the member. The construction illustrated is stronger than the type wherein the face grooves extend to the edge of the member. Two different types of corner constructions which may be used to form the triangular-shaped building member of Figure 2 are described below.

Reference is now made to Figure 3 of the drawings, wherein there is shown an edge view of the triangular-shaped building member **24** shown in Figure 2. It will be noted that the groove **21** on the edge of the member extends the entire length of the edge. It will be understood that the grooves in the other two edges of the building member also extend the entire length of the edges.

The building member **24**, made of the elongated building elements **20***a* and **20***b*, is in the form of an open triangular-shaped framework. If desired, the framework may be enclosed with a panel, or screen, or other suitable member. Referring to Figure 4 of the drawings, a building member **24***a* is shown, which includes a solid center panel member **26**, which fits within the inside edge groove **21** (not shown in Figure 4), and is supported therewithin. The panel member **26** may be made of metal, wood, plastic, or any other suitable material.

Reference is now made to Figure 5 of the drawings, wherein there is shown a connection between an elongated building element **20** and a panel member **26'**. This type of connection may be used to connect the center panel member **26** of Figure 4 to the triangular-shaped framework. The panel member **26'** comprises a solid plastic center member **27** and a pair of face members **28** attached thereto. The center member **27** is provided with an elongated arm member **29** having a cross-sectional shape which is substantially the same as the cross-section of the groove **21** in the element **20**, and which fits therewithin. A strong joint is thus formed between the center member **27** and building element **21**. The face members **28**, which may be made of plastic impregnated fiber glass cloth, cover the center member **27** and extend over the face of the building element **20**. The edges of the face members **28** fit in the grooves **31** in the building element **21** and, in this manner, further strengthen the connection between the building element **20** and panel member **26'**.

Reference is now made to Figures 6, 7 and 8 wherein there are shown exploded views of various shapes and lengths of building elements which may be joined together to form a triangular-shaped building member **24** of the type shown in Figure 2. Referring first to Figure 6, two lengths of building element **20** are therein shown, which elements are designated **20***a'* and **20***b'*. The building elements **20***a'* and **20***b'* may be used to form the sides of the building member **24** shown in Figure 2. Two of the building elements **20***a'* and one of the building elements **20***b'* are needed; the two shorter elements **20***a'* forming the short perpendicularly oriented sides, while the larger element **20***b'* forms the long diagonal side. The building elements **20***a'* and **20***b'* have substantially square-shaped ends. Corners for the triangular-shaped building member are formed by the use of the building elements **20***c* and **20***d* shown in Figure 7. Referring to Figure 7, the building element **20***c* is in the form of a right isosceles triangle while the building element **20***d* is of a right triangular-shape. As seen in Figure 8, a pair of the building elements **20***c* are joined together along their long diagonal side to form a square-shaped corner member. The resulting square-shaped corner member, shown in Figure 8, is used to form the right-angle corner connection between two of the short side members **20***a'* shown in Figure 6. Each of the corner connections between the short sides **20***a'* and the long side **20***b'* is formed by joining two of the corner members **20***d* together along their long diagonal sides to form a quadrangular-shaped member, which member includes a forty-five (45) degree angle corner, as shown in Figure 8. The two short sides of the resulting corner member are fastened to the ends of the side members **20***a'* and **20***b'* to form the corner connection therebetween.

As mentioned above, the structural building element **20** of our invention may be made of metal, wood, plastic, or other suitable material, but, preferably is made of metal or plastic material, which may be extruded into the desired form. Reference is now made to Figure 9 of the drawings, wherein there is shown a long section of building element **20**, which is cut up into smaller sections for use in forming a building member **24** of the type shown in Figure 2. The length of building element **20**, shown in Figure 9, includes two side members **20***a'*, one long side member **20***b'*, two corner elements **20***c* and four corner elements **20***d*; all of which may be used to form the building member **24** shown in Figure 2 in a manner described above. It will be noted that there is no waste when the various members are formed in this manner.

Reference is now made to Figure 10 of the drawings, wherein there are shown two side members **20***a* and **20***b*, which may be used to form the sides of a building member **24** of the type shown in Figure 2, without the need for corner members of the type shown in Figures 7 and 8. Then ends of the members **20***a* and **20***b* are properly beveled to form mitered joints between the members. (The short side **20***a* is provided with a 45 degree beveled end **33** and a 22.5 degree beveled end **34**, while the diagonal side **20***b* is provided with two 22.5 degree beveled ends **34**.) Two short side members **20***a* are joined together at the 45 degree bevel **33** to form a right angle corner and a diagonal **20***b* is connected between the ends thereof at the 22.5 degree bevels **34**. The members **20***a* and **20***b* may be cut from a long length of building element **20** with no waste by alternately cutting two short length sides **20***a* and a long side **20***b*. When the side members **20***a* and **20***b* are used to form a triangular-shaped building member **24**, fewer parts are used than when the building member is formed of the side members **20***a'* and **20***b'*, and include corner elements **20***c* and **20***d*, as shown in Figures 6, 7 and 8. This, then, results in an inherently stronger construction.

Reference is now made to Figure 11 of the drawings, wherein there is shown a fragmentary perspective view of a building structure utilizing the building elements **20** of our invention. A firm, permanent foundation for a building may be formed by embedding the elements **20***e* and **20***f* in a concrete slab **36**. In Figure 11, one of the elements **20***e* is positioned perpendicularly to the second embedded element **20***f*. An upright element **20***g* is supported upon one of the elements **20***e* by means of connecting devices **38**. A triangular-shaped building member **24**, having a center panel member **26**, is mounted upon

the one element **20***f* in the concrete and against the upright element **20***g* and attached thereto by any suitable means.

Reference is now made to Figure 12 of the drawings, wherein there is shown an enlarged perspective view of the connecting device **38**. The connecting device comprises an elongated enlarged member **39**, which is of a generally cylindrical shape and which is adapted to fit in the enlarged bottomed portion **23** of a groove **21**. A thin plate member **41**, which is somewhat thinner than the width of the throat portion **22** of a groove **21**, is attached longitudinally of the elongated enlarged member **39** and extends radially therefrom. The plate member **41** has integrally formed therewith, and extending longitudinally of the elongated member **39**, a projecting member **42**. The projecting member **42** is adapted to extend through the narrow throat portion **22** of a groove **21**, in one building element **20**, while the elongated enlarged member **39** extends longitudinally within the enlarged bottomed portion **23** of the groove in a perpendicularly extending building element **20** to form a completed connection of the type shown in Figure 11.

Reference is now made to Figure 13 wherein a vertically extending building element **20***h* is shown supported in a concrete base **36***a*. The post **20***h* is embedded in the concrete base and therefore needs no additional support. In Figure 14 of the drawings, wherein there is shown a sectional view taken on line **14—14** of Figure 13, it is seen that the concrete fills the grooves **21** in the building element **20***h* thereby firmly supporting the building element. Referring again to Figure 13 of the drawings, it will be noted that the horizontally extending building element **20***j* may be only partially embedded in the concrete base **36***a*, if desired.

In Figure 15 of the drawings, a fragmentary perspective view of a vertically extending post having four horizontally extending arms attached adjacent the top thereof, is shown. Referring to Figure 15, a pair of building elements **20***k* and **20***m* are shown joined together in a side-by-side manner to form a vertically extending post. (The building elements **20***k* and **20***m* are joined together by any suitable means. A generally dumb-bell shaped connecting member may be used, which member is inserted longitudinally of the abutting building elements forming a connection therebetween.) The building element **20***k* is the width of a building element longer than the building element **20***m*. A horizontally extending building element **20***n* rests upon, and is fastened to, the top of the building element **20***m*. A second horizontally extending building element **20***t* extends perpendicularly from the side of the building element **20***n* while a pair of building elements **20***p* and **20***q* extend from the side of the vertically extending building element **20***k*.

In Figure 16 of the drawings, a peaked-roof type of building is shown, which is made of our novel building elements. Referring to Figure 16, the building comprises, building elements **20***a* and **20***b*, which are joined together to form the triangular-shaped building members **24**. Two of the building members **24** are provided with center panel members **26**. One panel member having a screen type panel member **26'**, is shown through a portion of a panel **26** which is broken away. It will be understood that many different types of buildings may be constructed with our novel building element and that the building shown in Figure 16 is merely illustrative.

Having now described our invention in detail, in accordance with the patent statutes, various changes and modifications will suggest themselves to those skilled in this art, and it is intended that such changes and modifications shall fall within the spirit and scope of the invention as recited in the following claims.

We claim:

1. A triangular-shaped building member comprising a pair of perpendicularly oriented, equal-length, building elements connected at one end thereof; a diagonally extending building element interconnecting the outer ends of the said equal length building elements, each of the said building elements being of a square cross-sectional-shape and having an elongated, enlarged bottomed groove along the center of each edge, thereof; the outer and inner edge grooves extending about the entire outer and inner periphery, respectively, of the said building member, the said face grooves in each face of the building member forming a continuous groove on each of the building member faces.

2. The invention as recited in claim 1 including a plane triangular-shaped panel member having edge portions extending into the inside edge grooves of the said building member.

3. A structural building member comprising three elongated and generally square-shaped cross-sectional building elements, each of the elements having an elongated groove on each side which extends from end-to-end thereof, each of the said grooves having a narrow throat portion and an enlarged bottomed portion, and means joining the said building elements together in a triangular shape.

4. The invention as recited in claim 3, wherein two of the said building elements are of equal length and the third element is longer than the other two, each of the said two equal length building elements having one 45 degree beveled end and a 22.5 degree beveled end, the said third building element having both ends beveled at 22.5 degrees, the said 45 degree beveled ends of the said equal-length building elements being joined to form a mitered joint, the said 22.5 degree beveled ends of the said long building element being joined to the said 22.5 degree beveled ends of the said equal-length building elements forming mitered joints thereat.

5. The invention as recited in claim 5, wherein the said building elements terminate in perpendicular ends and the said means joining the said elongated building elements together comprises a pair of triangular-shaped building lements at each joint.

6. A connecting device for joining a pair of elongated structural building elements, the said structural building elements having elongated grooves therein along the sides thereof which grooves have a narrow throat portion and terminate in an enlarged bottom portion, the said connecting device comprising an elongated enlarged member of substantially identical cross-section as the enlarged bottom portion of the said grooves, a thin plate member of substantially the same thickness as the narrow throat portion of the said groove and attached to the said elongated enlarged member, a projecting member integrally formed with the said plate member and extending longitudinally past the end of the said elongated enlarged member, the said elongated enlarged member being adapted to longitudinally slide within the enlarged bottom portion of the said groove in one of the said building elements whereby the said plate member extends outwardly of the groove through the said narrow throat portion thereof, the said integrally formed projecting member being adapted to extend into the groove in the other said structural building element thereby forming a joint therebetween.

7. A method of forming a right-isosceles triangular-shaped building member of an elongated square cross-sectional-shaped member having an elongated groove in the center of each side and extending from end-to-end thereof, the said method comprising cutting off from the elongated member two equal length side elements with flat ends for use in forming the equal length sides of the triangular-shaped building member, cutting off from the elongated member a side element longer than the two equal length elements and with flat ends for use in forming the long diagonal side of the building member, cutting off two right isosceles triangular-shaped corner elements from the elongated member for use in forming the right angle corner of the building member, cutting

off four substantially identical quadrangular-shaped corner elements each having a pair of sides extending at an angle of 22.5 degrees, joining a corner element to each flat end of the said side elements, and joining the corner elements together to form a right-isosceles triangular-shaped building member.

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