

F. J. SCHISLER.
 REINFORCED TUBULAR BUILDING UNIT.
 APPLICATION FILED JAN. 27, 1913.

1,090,171.

Patented Mar. 17, 1914.

2 SHEETS-SHEET 1.

FIG. 1

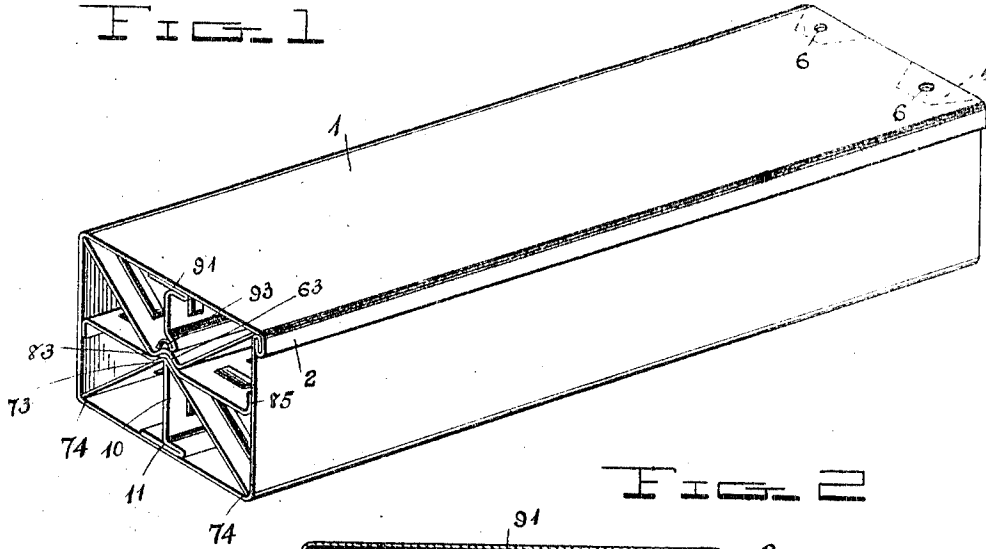


FIG. 2

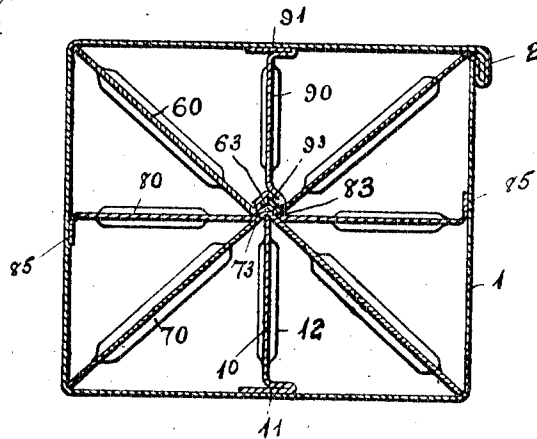


FIG. 4

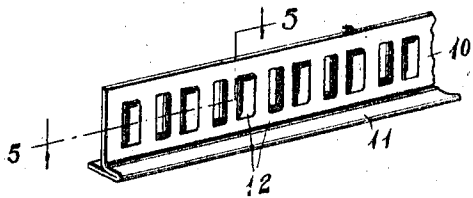


FIG. 3

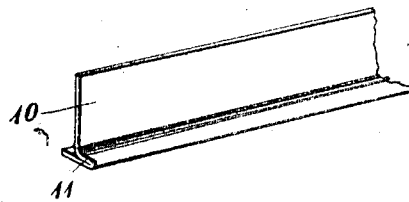
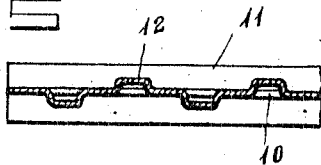


FIG. 5



Witnesses
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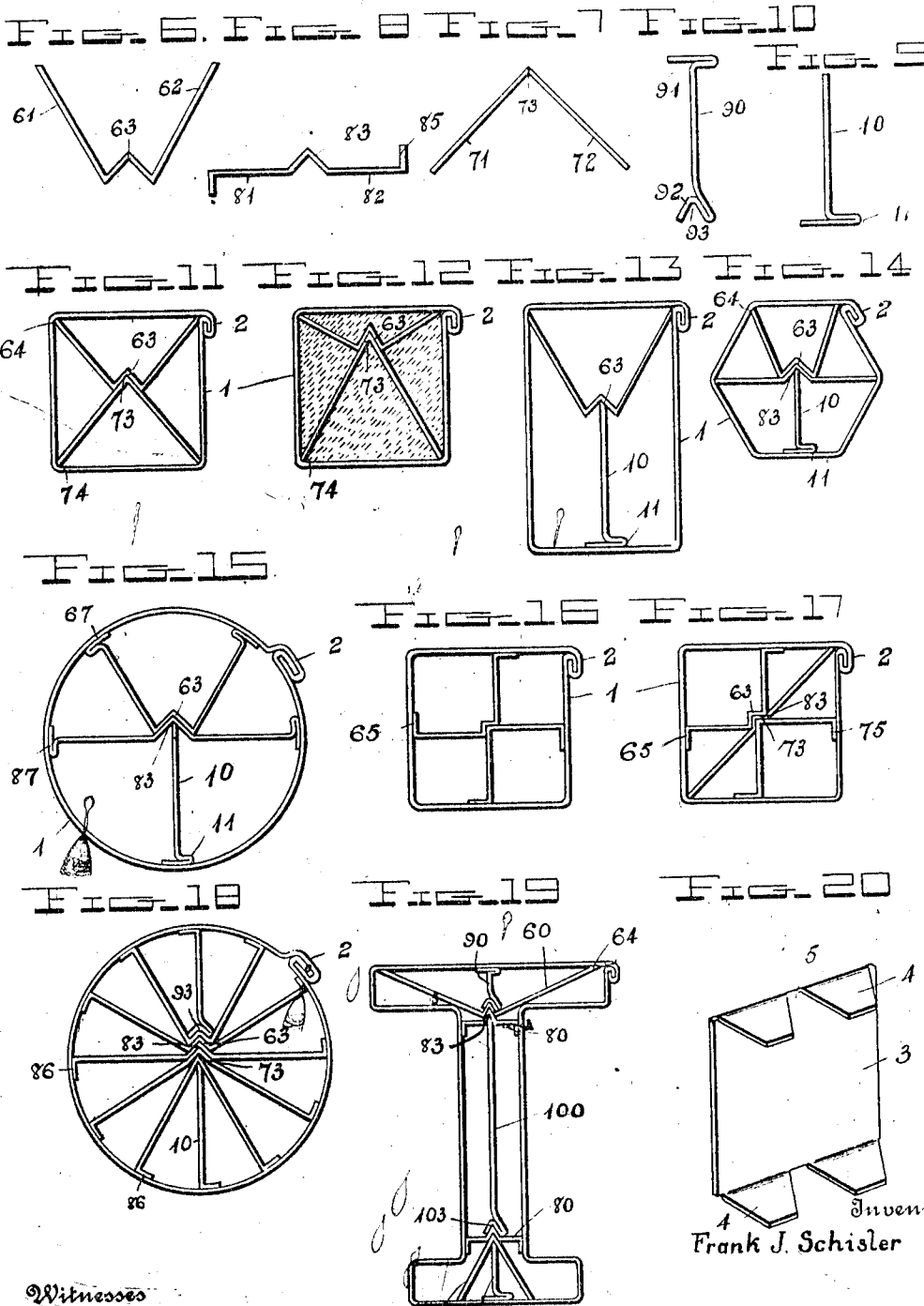
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 Attorney

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2 SHEETS—SHEET 2.

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Witnesses

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REINFORCED TUBULAR BUILDING UNIT.

1,090,171.

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Application filed January 27, 1913. Serial No. 744,503.

To all whom it may concern:

Be it known that I, FRANK J. SCHISLER, a citizen of the United States, residing at Winthrop, in the county of Sibley and State of Minnesota, have invented certain new and useful Improvements in Reinforced Tubular Building Units; and I do declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to metallic building structures, and more especially it is a unit capable of use as a girder or column; and the object thereof is to reinforce the tubular shell of such a unit by sheet metal bracing members engaged with each other and with the shell in such manner that no rivets or bolts are necessary, and the unit—if used as a girder—is strengthened against strains in a direction perpendicular or oblique to it. The object is carried out by forming the bracing members so that some of them by their peculiar construction extend completely across the interior of the shell, while others are complementary of the first; and the invention consists in the specific details of structure and in the manner of assembling the parts.

My preferred means for carrying out the invention is set forth in the following specification and claims, and shown in the drawings wherein—

Figure 1 is a perspective view of a girder made in accordance with my invention, the front end being open. Fig. 2 is an enlarged cross section through this girder, showing the preferred form of my invention. Fig. 3 is a perspective view of one end of one of the smaller or narrower bracing members (the strut in the following description), showing its body in the simplest form and illustrating more particularly the formation of its foot. Fig. 4 is a similar perspective view showing another form of the bracing member as stamped with stiffening irregularities, and Fig. 5 is a sectional detail on the line 5--5 of Fig. 4. Figs. 6 to 10 inclusive are diagrammatic end elevations of the several strengthening members hereafter described, Fig. 6 showing the V-shaped member, Fig. 7 the A-shaped member,

Fig. 8 the horizontal member, and Figs. 9 and 10 the two parts of the vertical or upright member, the former being the strut and the latter the brace in the following description. Figs. 11 to 19 are diagrammatic end elevations of different types of building units, all of which include the essential feature or features of the present invention but with the details differently disposed as hereinafter referred to. Fig. 20 is a perspective detail of one end plate.

The casing of this improved unit—be it girder or column—is by preference made of a sheet of metal rolled or bent into the proper cross sectional configuration so as to form what will hereinafter be called the shell 1, with the edges of the sheet secured to each other as by a seam or crimp along one corner at 2 if the shell be of rectangular cross section, or along one side if it be circular or oval, or of any other configuration desired. From this it will be gathered that I do not limit myself to the shape shown in Fig. 1, but have illustrated the shell as rectangular or angular because its corners are useful in the following description. At its ends the shell is closed by a plate which may well be constructed as shown in Fig. 20. The body 3 of this plate is flat, and at its edges it has inturned lips 4 spaced apart as at 5 for the admission of the bracing members hereinafter described, and these lips are intended to slip into the end of the shell as shown in dotted lines at the right of Fig. 1, the shell itself being pierced with holes 6 directly over said lips and into which a drop of solder may be placed to engage the end member and hold it in position. There will be little or no strain on this member, and its use is to exclude dust, drafts, and mice from the interior of the structural unit.

The detailed structure of an element on the interior of this shell is well illustrated in Fig. 3, 4, and 5, but is entirely optional with the manufacturer. Fig. 3 represents a simple form of the narrow bracing member, whose body 10 is flat, and whose lower edge in the present instance is provided with a right angular foot 11. In Fig. 4 the same blank has been stamped or formed with indentations 12 in its flat body, the indentations being punched first from one side and

then from the other in staggered or alternated relation to each other as seen in Fig. 5. This illustration is merely typical as showing one form of producing stiffening irregularities in the otherwise flat body portion of a member or leaf, whose edge extending into a corner or merging into an angle or having a foot would need no stiffening device.

The gist of the present invention lies in the provision of perpendicular and diagonal members within the shell, especially when the latter is rectangular in contour or nearly so and when it is to be used as a beam or girder to support some weight and hence will have lateral strain thrown upon it. On the assumption that the shell 1 is of oblong cross section as shown in Fig. 2, I will therefore hereinafter refer to its top and bottom and sides as seen in that figure, although I do not wish to be limited in this respect. I might also say at starting that, while I herein refer to sheet metal and prefer its use throughout, it is quite obvious that some or all of the members of this unit could be of cast metal, or in fact of other material than metal; and it is even possible that the unit could be filled with cement as indicated by the dotted lines in Fig. 12. I consider it highly desirable to avoid the necessity for any rivets or bolts, and if the shell be formed without the crimp 2 the same may be replaced by a line scratched or marked along one corner of the shell on its exterior so that (if its ends are closed or if it is filled with concrete) the workman may be guided by this indicator in determining the respective positions of the diagonals and perpendiculars. A glance at Fig. 13 will show the desirability of this feature; obviously the unit therein illustrated has greater strength to resist vertical strain in the position shown, than it would have if turned at right angles to this position and in which case there would be no bracing member then extending vertically within the shell. I might add that the stiffening irregularities, while described with reference to one of the bracing members only, might be applied to the shell, or might be employed in some part of the unit and omitted in others. In order to avoid the use of bolts, rivets, or other fastening means I prefer to make as many of the bracing members as possible of sheet metal and of such width that they will extend from the wall of the casing or shell to a point at or near its axial line, where they have interengaging angles so that one member may not slip upon another, and whence they are continued to another wall or angle of the shell; leaving as few of the members as possible to be made of narrower material or metal strips, and by preference these are disposed upright so that the lowermost constitutes a strut rising from the bottom of the shell to said common point and

the uppermost constitutes a brace rising from said common point to the top of the shell. In the forms of this device shown in Figs. 11 to 19 inclusive, different combinations of the different elements are wrought out, but in my preferred construction illustrated in Fig. 2 I employ all of the bracing members now to be described.

The principal bracing element (shown in Fig. 6) is what I call a V-shaped member, and by preference it is formed from a single piece of metal having two leaves 61 and 62 standing in planes at an angle to each other and integrally united with each other at their contiguous edges by an angle whose vertex is bent upward so as to form a reentrant angle 63. Ordinarily this member will be disposed with the edges 64 of its leaves standing within the corners of the shell as seen in Figs. 11, 14, and 19, but it is quite within the spirit of my invention that said edges could be turned aside into feet 65 as seen in Fig. 16 where the V-shaped member is differently disposed within the shell.

The member of next greatest importance is of A-shape as seen in Fig. 7, and it is formed from a sheet of metal bent into two leaves 71 and 72 with a plain or external angle 73 between them, the edges 74 of said leaf by preference standing within the lower corners of the shell as seen in Figs. 1 and 11, although here again they could be otherwise disposed and possibly provided with feet 75 as seen in Fig. 17. In assembling these two members it is essential that the external angle 73 of the A-shaped member enter the reentrant angle 63 of the V-shaped member, and the simplest arrangement of these two members within a rectangular shell is possibly best seen in Fig. 11. The interengagement of the angles at the centers of the width of these members prevents them from slipping on each other without the use of bolts or rivets, and the fact that their edges engage the corners of the shell prevents them also from slipping. A beam as thus constructed would have great strength with comparatively little weight, and if the shell were square it would withstand horizontal strain as well as it would vertical strain, but it would withstand oblique strain better than either. In Fig. 12 the point where the angles interengage is not coincident with the true axis of the shell, but this also is contemplated by my present invention. I consider the beam a little stronger with the V-shaped member disposed above the A-shaped member, because pressure from above does not tend to separate the interengaging angles, and if the unit shown in Fig. 11 were given a one-quarter turn to the left I should not consider it so strong. However, the presence of the crimp 2 will guide the workman in properly setting the beam.

In many cases it is desirable that the unit

should resist lateral strain, and in that instance I provide it with a horizontal bracing member best seen in Fig. 8. This also is made of sheet metal formed into two flat strips or leaves 81 and 82 standing in a single plane and united by an upstruck angle 83 which, when assembled with the members above described, fits under the reentrant angle 63 of the V-shaped member and over the exterior angle 73 of the A-shaped member. As this transverse member will not have the outer edges of its leaves extending into corners of the shell, I provide them with feet 85 which may well be formed by simply turning the sheet metal aside—at right angles to the leaves if the upright sides of the shell be flat as seen in Fig. 2, possibly curved a little as seen at 86 in Fig. 18 if the shell be circular, and in some cases possibly being given a double bend first to one side and then to the other as seen at 87 in Fig. 15. Finally, one of the perpendiculars is what might be called the upright or vertical member, but as the other perpendicular (the horizontal member) extends completely across the interior of the shell it is impossible for the vertical member to extend completely across it at right angles thereto, and therefore I make this member in two parts as by forming each of strip metal so that in effect it is about as wide as one of the leaves of one of the sheet metal members. The lowermost part or "strut" is well shown in Fig. 9, and comprises an upright body 10 with a foot 11 at its lower end adapted to rest upon the bottom of the shell. The uppermost part or "brace" is well shown in Fig. 10 wherein it is illustrated as having a similar flat body 90 with a foot 91 at its upper edge adapted to stand beneath the top of the shell, and its lower edge formed into a flange 92 which is itself stamped with an upstruck angle so as to produce a channel 93 capable of resting over the top of the reentrant angle 63 of the V-shaped member when the parts are assembled as seen in Fig. 2. It follows that the feet 11 and 91 of the two parts of the upright member, if made wide enough, will not slip within the wall of the shell; the upper edge of the strut cannot slip because it rests within the angle 73 of the A-shaped member; and the channel 93 at the lower end of the brace cannot slip because it rests over the angle 63 of the V-shaped member. Therefore these two parts are held in strict alignment, and pressure upon the top of the beam is firmly resisted.

Fig. 11 is obviously a combination of the V-shaped and A-shaped members. Fig. 13 shows the V-shaped member combined with the strut, and Fig. 14 the same two elements arranged within a hexagonal shell and combined with the transverse member. Fig. 15 shows the arrangement of the same parts

within a circular shell, the only difference being that the feet as seen at 87 may have to be bent a little so as to fit within the curved wall of the shell, and in this instance the V-shaped member may be provided with feet 67. Figs. 16 and 17 show the A-shaped and V-shaped members combined within a square or rectangular shell, but disposed obliquely therein so that the outer edge of each leaf must here be provided with feet as indicated at 65 and 75; and Fig. 17 shows the addition of the transverse or horizontal member, which is here disposed obliquely across the interior of the square shell and does not need its feet. Fig. 18 is a diagrammatic view illustrating the possibility of utilizing two V-shaped members having different angles, two A-shaped members having different angles, and also the transverse member and the upright member; and from this view it will be clear that quite a number of the various members could be employed, so long as the angles at about the center of the shell interengage each other to prevent slipping. Fig. 19 is but one illustration of the application of my idea to an I-beam whose casing constitutes the shell in the present instance. Herein the V-shaped member 60 stands in the head of the I, the A-shaped member 70 stands in the base thereof, the strut 10 braces the A-shaped member, the brace 90 is within the V-shaped member, but there are two horizontal members 80 and a third part 100 in the upright member, which part in this case can well be made with a plain upper edge entering the upstruck angle 83 of the horizontal member and a channeled lower edge 103 to stand over the angle of the lowermost horizontal member 80. From this illustration it will be quite obvious that the bracing members could be amplified almost indefinitely, as when the beam is of considerable height but not much width. In all instances, however, I prefer to employ the V-shaped member shown in Fig. 6, whether its reentrant angle is supported by an A-shaped member, the upstruck angle at the center of a horizontal member, or the upper edge of a strut, or by any combination of these instrumentalities; and, as above suggested, each and all of the members may be provided with stiffening irregularities as typically shown in Figs. 4 and 5.

The manner of forming and assembling the various elements of this improved building unit constitute no feature of the present invention and need not be elaborated in this specification.

What is claimed as new is:

1. A building unit comprising a rectangular tubular shell, and diagonal and perpendicular bracing members extending throughout the length thereof, each diagonal consisting of two oblique leaves united by an angle

and having their outer edges standing in contiguous corners of the shell, the horizontal member having lateral feet at its outer edges standing within the sides of the shell and its body passing between the angles of said diagonals, and the vertical member consisting of two strips of metal whereof the lowermost has a foot resting on the bottom of the shell and its upper edge stands within the angle of the lower diagonal, and the uppermost has a foot resting under the top of the shell and its lower edge engages the angle of the upper diagonal.

2. A building unit comprising a rectangular tubular shell, and diagonal and perpendicular bracing members extending throughout the length thereof, each of the former consisting of two oblique leaves united by an angle and having their outer edges standing in contiguous corners of the shell, the horizontal member extending from side to side of the shell and passing between the angles of said diagonal members, and the vertical member consisting of a strut rising from the bottom of the shell into the apex of said angles and a brace rising from the latter to the top of the shell.

3. A building unit comprising a polygonal tubular shell, a V-shaped bracing member therein having its edges in upper corners of the shell and a reentrant angle in its vertex, a lateral member connecting the sides of the shell and having an upstruck angle at its center entering said reentrant angle, an A-shaped member whose edges rest in lower corners of the shell and whose angle rests under that of the lateral member, an upright strut supporting the angle of the A-shaped member from the bottom of the shell, and an upright brace whose upper edge rests under the top of the shell and whose lower edge has a channeled flange resting over said reentrant angle.

4. A building unit comprising a polygonal tubular shell, a V-shaped bracing member therein having its edges in upper corners of the shell and a reentrant angle in its vertex, an A-shaped member whose edges rest in lower corners of the shell and whose angles stand under said reentrant angle, an upright strut supporting the angle of the A-shaped member from the bottom of the shell, and an upright brace whose upper edge rests under the top of the shell and whose lower edge has a channeled flange resting over said reentrant angle.

5. A building unit comprising a tubular shell, a V-shaped bracing member therein having a reentrant angle in its vertex, a lateral member having an upstruck angle at its center entering said reentrant angle, an A-shaped member whose angle rests under that of the lateral member, an upright strut supporting said angles, and an upright brace

between the top of the shell and said reentrant angle.

6. A building unit comprising a tubular shell, V-shaped and A-shaped sheet metal bracing members therein, a horizontal sheet metal member passing between the angles of said members, and a strut supporting the apex of the A-shaped member.

7. A building unit comprising a tubular shell, a V-shaped bracing member therein having a reentrant angle in its vertex, a lateral member having an upstruck angle at its center entering said reentrant angle, and an A-shaped member whose angle rests under that of the lateral member.

8. A building unit comprising a rectangular tubular shell, a V-shaped bracing member disposed with its edges in the upper corners and its vertex at the center thereof, said vertex being provided with a reentrant angle, and an A-shaped member disposed with its edges in the lower corners of the shell and its vertex in said angle.

9. A building unit comprising a tubular metallic shell, a V-shaped bracing member disposed with its edges in contact with the wall of the shell and its vertex at the center thereof, said vertex being provided with a reentrant angle, and a second bracing member leading from a point within said angle straight to the wall of the shell.

10. A building unit comprising a rectangular tubular shell, a V-shaped bracing member disposed therein with its edges in the upper corners and its vertex at the center thereof, said vertex being provided with a reentrant angle, and a second bracing member supporting said angle.

11. A building unit comprising a tubular metallic shell, a V-shaped bracing member disposed with its edges in contact with the wall of the shell and its vertex provided with a reentrant angle, and other bracing members leading from a point within said angle to different points within the wall of the shell.

12. A building unit comprising a tubular shell of sheet metal having a seam along one side and its ends closed, and a plurality of sheet metal bracing members therein consisting of leaves radiating from near its center to its wall, certain of said leaves being united in pairs by angles at said center interengaging each other and supporting the inner edges of the other leaves, and one of the leaves so united having its outer edge coincident with said seam.

13. A rivetless building unit comprising a rectangular tubular shell of sheet metal having a seam along one corner and its ends closed, and a plurality of bracing members therein consisting of leaves radiating from near its center to its sides and corners, certain of said leaves being united in pairs by

angles at said center interengaging each other and supporting the inner edges of the other leaves, and one of the leaves so united having its outer edge extending into the corner designated by said seam.

14. A building unit comprising a polygonal shell, and a plurality of bracing members therein consisting of leaves radiating from a common point, those extending into the angles of the shell having plain outer edges and the others having feet at their outer edges turned at angles to their bodies and resting against the inner face of the shell.

15. A building unit comprising a rectangular shell, and perpendicular and diagonal bracing means therein consisting of leaves radiating from a common point, the

diagonals having plain outer edges and the other leaves having right angular feet at their outer edges resting against the inner face of the shell.

16. A building unit comprising a sheet metal shell, and a series of bracing members extending throughout the length thereof and composed of metal leaves radiating from a common point to the shell and having stiffening irregularities formed in their bodies.

In testimony whereof I have hereunto set my hand in presence of two subscribing witnesses.

FRANK J. SCHISLER.

Witnesses:

CHAS. W. QUANDT,
L. J. LARSON.