

C. F. AND D. E. McAVOY.
 PORTABLE BUILDING OR STRUCTURE.
 APPLICATION FILED NOV. 14, 1917.

1,397,976.

Patented Nov. 22, 1921.

4 SHEETS—SHEET 1.

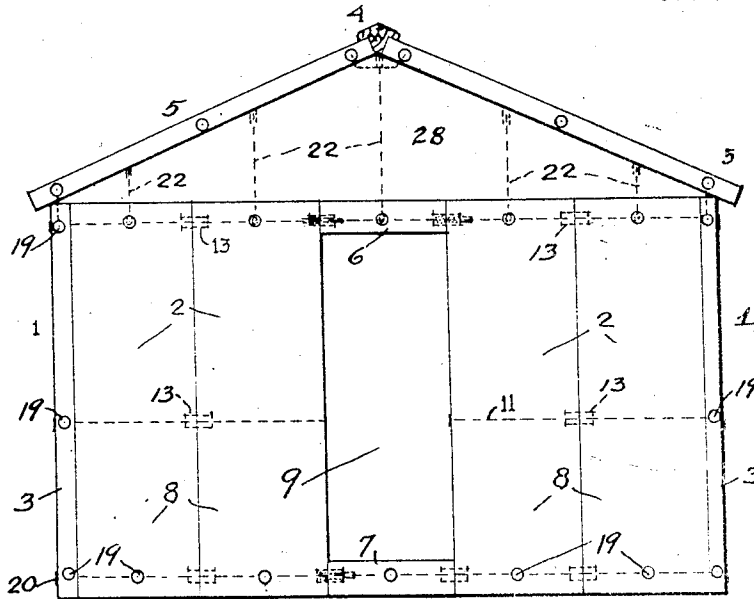


FIG. 1

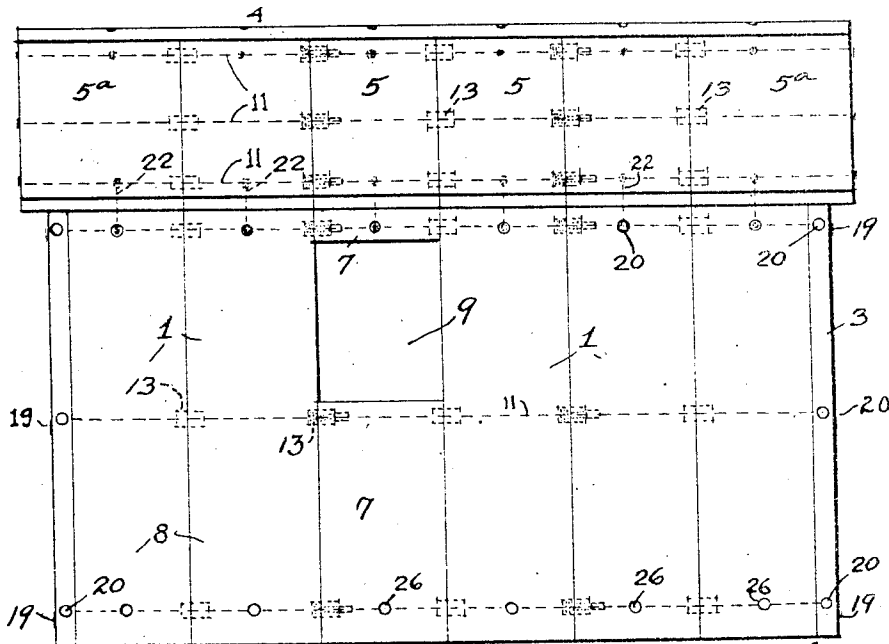


FIG. 2

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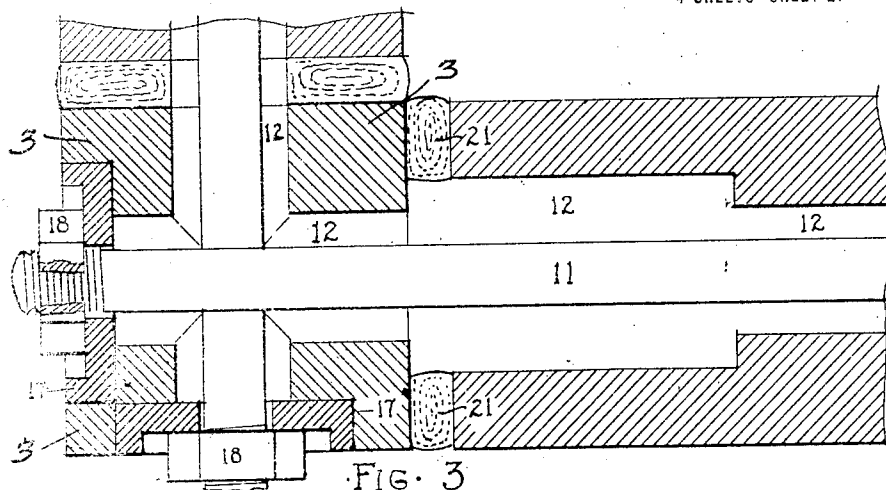


FIG. 3

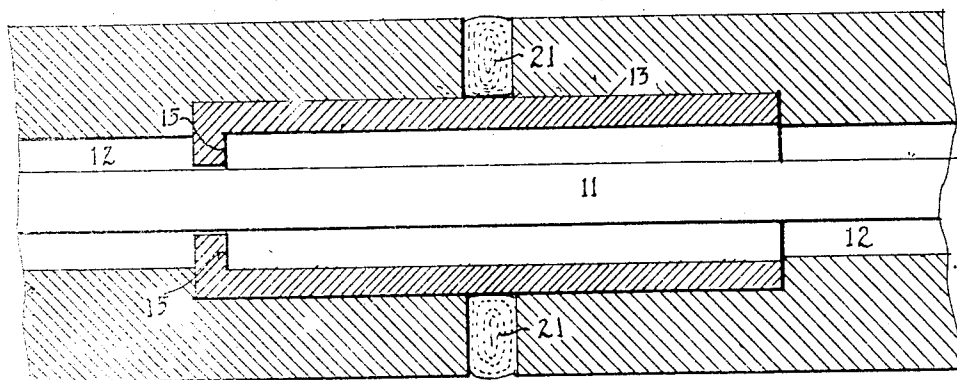


FIG. 4

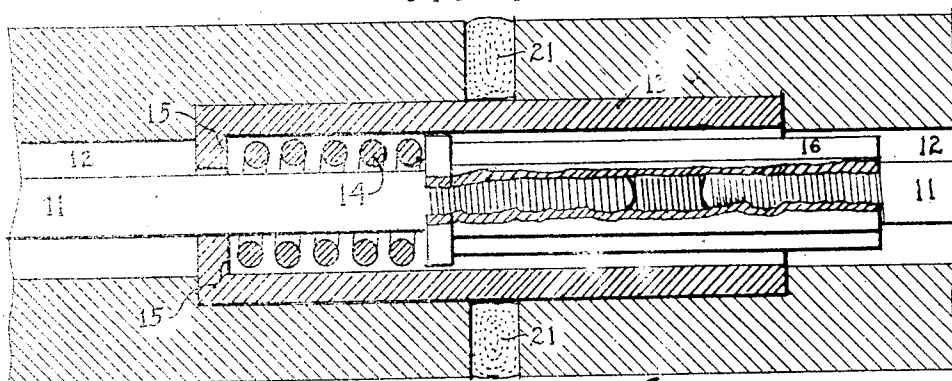


FIG. 5

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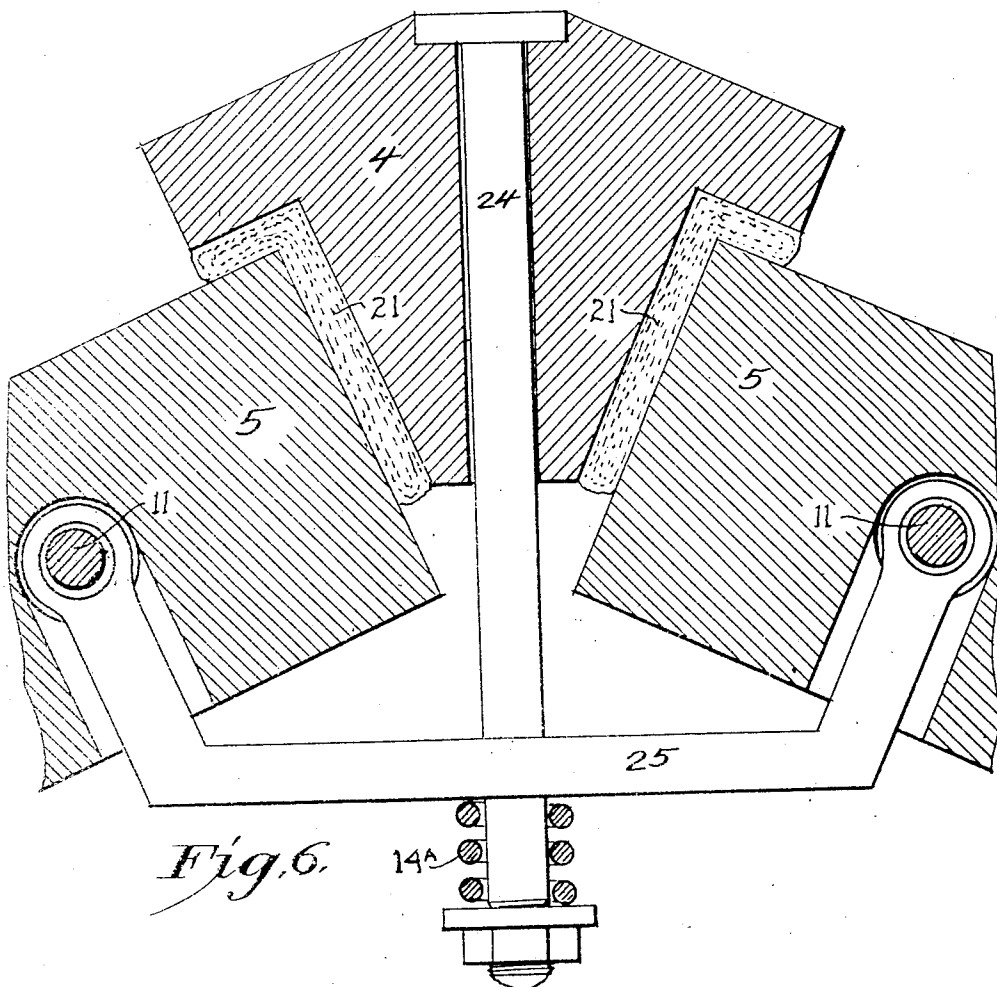


Fig. 6.

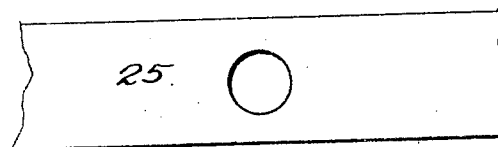


FIG. 6^a

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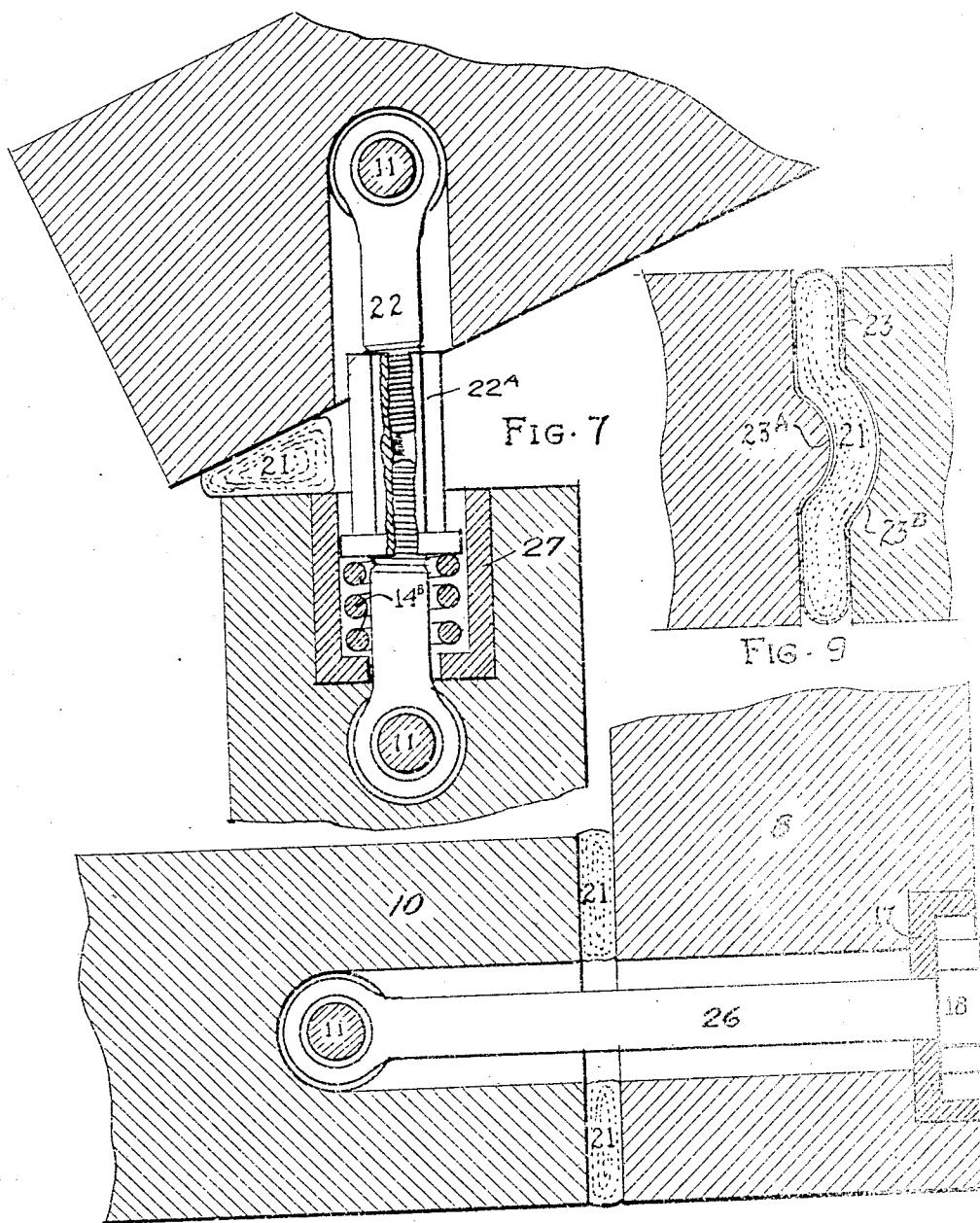


FIG. 8
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UNITED STATES PATENT OFFICE.

CHARLES FREDERICK McAVOY, OF BROOKLYN, AND DANIEL EDWARD McAVOY, OF NEW YORK, N. Y.

PORTABLE BUILDING OR STRUCTURE.

1,397,976.

Specification of Letters Patent.

Patented Nov. 22, 1921.

Application filed November 14, 1917. Serial No. 202,041.

To all whom it may concern:

Be it known that we, CHARLES F. McAVOY, a citizen of the United States, residing in the borough of Brooklyn, county of Kings, city and State of New York, and DANIEL E. McAVOY, a citizen of the United States, residing in the borough of Queens, county of Queens, city and State of New York, have invented a new and useful Portable Building or Structure.

This invention relates to the construction of buildings through the use of a suitable number of identical or closely similar units in the form of hollow framed panels, to be constructed at a factory or factories, shipped to, and assembled wherever desired, and designed to be of a more substantial or lasting character than the ordinary portable or knock-down buildings.

Prominent features of the invention are the utilization of the unit system, which conduces to cheapness through quantity production and permits of the erection of buildings of any desired dimensions and arrangement; the employment of tie-rods passing through successive units of each wall and of the roof; a sectional construction of such tie-rods whereby each unit may be equipped with its individual sections and conveniently stored or shipped so equipped; the provision of tubular dowels projecting into proximate units and serving to effect and maintain proper alinement of the units; the provision of springs or other elastic devices and means for varying their compression, said springs being arranged to apply pressure to the individual units of the structure during and after erection, and to compensate for expansion and contraction of the units; packing strips to be introduced between the various units to insure air and weather-tight joints; and a novel manner of constructing and assembling the roof and floor members.

In practice we contemplate the employment of units made up of rectangular wooden frames of suitable proportions and dimensions, covered on both faces with sheet metal, preferably galvanized sheet iron, the interior open spaces of the frames being filled, if desired, with suitable material of a non-conducting nature to prevent transmission of heat and cold. We may, however, make

the units of any suitable material as, for instance, cement concrete, reinforced in any usual or approved way, metal tubing being employed at those points where the tie-rods are to pass through the units.

The invention further consists in other details which will be pointed out hereinafter.

The novel structure is illustrated in the accompanying drawings, in which:

Figure 1 is an end elevation of a building embodying our invention;

Fig. 2, a side elevation of the same;

Fig. 3 a horizontal sectional view taken through a corner of the structure, and designed to illustrate the meeting of an end and side wall and corner-post;

Fig. 4, a horizontal section through the meeting edges of two units, showing one of the tubular dowels and the tie-rod;

Fig. 5, a similar section illustrating the manner of building up the sectional tie-rod and applying the springs through which pressure is applied to individual units;

Fig. 6, a transverse sectional view through the ridge-piece and the proximate roof units, illustrating the manner of tying these parts together;

Fig. 6^a, a plan view of a section of the yoke by which the proximate edges of the roof are tied together;

Fig. 7, a vertical sectional view showing the manner of tying the roof to the walls;

Fig. 8, a vertical sectional view illustrating the manner of tying the floor to the side walls;

Fig. 9, a transverse sectional view illustrating one form of joint for proximate units, including the special packing strip employed.

Preparatory to the erection of a building in accordance with our invention, a suitable base or foundation of any usual description, as stone, cement, or wooden sills, will be provided; but where conditions are suitable and proper drainage is afforded, it will be sufficient simply to level the surface of the ground and rest the walls directly thereon. This done, the side and end walls 1 and 2 are erected, and for this purpose we employ wall units 8 and 9 of identical outside measurements and of like construction except that only the upper and lower elements 6 and 7 are employed for the units 9. In

other words, openings are left between the upper and lower elements of said units 9, of proper dimensions for doorways and windows, where such are needed. (See Figs. 1 and 2.)

As stated, the units consist preferably of rectangular wooden frames covered on both faces with sheet metal, secured to the frames in any convenient or usual way, the frames being stayed or braced by struts or cross pieces, according to the character or class of building contemplated and the strength required. This of course will vary according to the climatic conditions of different localities, heavier construction being required where the snowfall is considerable than in regions where snow is unknown or rare. No claim is made to any specific construction of the frames, nor do we limit ourselves in this regard.

By making the units of like outside dimensions and adopting proportions and measurements with due regard to the inside dimensions of freight cars, it is possible to utilize to the fullest extent the available space in such cars, and to economize storage space where the units are to be stored in large quantities. This is an item of practical importance. The units being of relatively small dimensions, particularly as to width, permit the utilization of material for which few uses exist, and which may hence be obtained at low cost, thus keeping down the expense of production. We contemplate, however, making the units, in some cases, of solid boards where these are readily obtainable, or of cement concrete where lumber is scarce and materials for such concrete are plentiful.

Each unit is formed or provided with transverse openings 12 extending from edge to edge, through which to pass tie-rods 11 for binding together in common plane the units constituting a wall, roof, or floor. These openings 12 are, under our preferred construction, enlarged at each end to receive tubular dowels 13 of metal, which serve to secure and maintain perfect alinement of the assembled units, and also to receive springs 14 which by proper adjustments of nuts 16 employed to connect the sections of the tie-rods 11, press each unit edge-wise against the one previously erected, or against an interposed packing strip 21 of felt, rubber, or other usual packing material. The use of the springs is advantageous in that each unit in turn is placed under edge-wise pressure or compression, and made to seat closely against the preceding section or the packing strip applied thereto, and a more perfect and uniform application of pressure to the several units is effected than is practicable through the use of continuous or integral tie-rods extending through the entire series of units of a wall, roof, or floor, and admit-

ting of tightening only after the several units thereof have been placed in position. To afford a bearing for the springs 14 within the tubular dowels 13, the latter are provided with inturned shoulders 15 as shown in Figs. 3 and 4; or in other words, they are formed with an end closure having a central perforation or opening of proper diameter to permit the free passage of the tie-rod sections.

In practice we prefer to erect these units one after another on the base or foundation, but where the wall is relatively short the units may be assembled flat upon the ground or other level support, and afterward raised to position on said base or foundation. Where door or window openings are to be provided, units 9 (Figs. 1 and 2) are employed, comprising only the upper and lower elements of units 8, with or without continuous vertical stiles from top to bottom, the lower sections 7 being of greater or less measurement in the direction of the height of the wall, as required.

After the walls 1 and 2 are erected on the base or foundation, corner-posts 3 are applied, the extremities of the sectional tie-rods 11 of meeting walls being carried through said posts in the manner best shown in Fig. 3. As will be seen upon referring to this figure, the enlarged end of the openings 12 of the front wall is without dowel or spring, and this will be true of the end units of each wall section. This permits a slight springing or deflection of the tie-rods 11 at that point, sufficient to enable the tie-rods of meeting wall sections to pass each other as they could not otherwise do if each series of openings 12 of the several walls were in common horizontal plane. In the drawings we have indicated three tie-rods for each wall, these being arranged near the upper and lower extremities of the units and at or near the midlength thereof, and such we find a convenient number, but more or fewer may be employed according to the dimensions of the units and the character and purpose of the structure.

The corner-posts 3 are provided on their outer faces with countersunk washers or bearing plates 17, through which the tie-rods 11 pass. Nuts 18 applied to the protruding threaded extremities of the tie-rods and bearing against the plates or washers 17, permit the final compression to be applied to the assembled units of the respective walls, and bind or tie together said walls in a very firm and rigid structure, the joints of which are made perfectly weather-tight through the interposed packing strips 21 which are subjected to the final compression produced by the nuts 16 and 18 and the springs 14. In practice we find it expedient to bind the edges of the packing strips 21 with thin U-shaped strips 23 of sheet metal, 13°

better to protect their edges against the effects of the weather, to prevent disintegration or fraying out, and to give a neat finish to the joints in the completed structure.

5 In some cases we contemplate making the opposed edges of proximate units in the form shown in Fig. 9, that is to say, with a swell 23^a and depression 23^b extending lengthwise through the medial portion of the unit edges, so that the interposed packing 21 shall be bent into the form seen in said figure, and thereby more effectually held against displacement and caused to make a more perfect sealing of the joints. As each unit 10 will have the convex rib and the concave depression on opposite edges, it will be seen that this construction will not in any manner interfere with the use of identical units throughout.

20 The floor is composed of units 10 and is constructed in essentially the same manner as the walls, but may or may not be provided with the packing strips 21 or the springs 14, as found expedient. The tie-rods will, however, be employed to bind together and support the floor units. These will be run transversely of the floor units 10 and carried through the vertical walls of the structure, their ends being anchored in the same manner as in the case of the tie-rods 11, and illustrated in Fig. 3. The anchorages are indicated by the numerals 19 and 20 in Figs. 1 and 2. The washers or bearing plates 17 are, however, in such case, applied to the 35 wall units in the same manner as they are applied to the corner-posts in said figure. Ordinarily the floor units will be arranged with their length in the direction of the length of the building, and the tie-rods will hence run in the direction of the width of the building, or transversely thereof. This of course is not essential, but whichever way they are run the outermost tie-rods 11 of the series are threaded through eye-bolts 26 of sufficient length to project beyond the boundaries of the floor and to extend through the proximate walls of the structure, where they pass through bearing plates or countersunk washers 17, and receive tightening bolts 18: 50 as shown in Fig. 8. By this construction the floor is carried by the tie-rods and the eye-bolts 26. Where the floor is of considerable dimensions it may be found expedient to place piers or supports beneath it at suitable 55 points.

The construction of the roof is illustrated in Figs. 1, 2, 6, 6^a, and 7. The roof comprises a ridge-piece or member 4 and two main sections 5 composed of units in all respects the same as the wall units, and of like size except that the extreme end sections 5^a are or may be of greater width than the other sections, to produce the overhang of the gables. This may, however, be secured through additional and narrower units. The roof sec-

tions bear at their inner edges against the ridge-piece 4, as seen in Figs. 1 and 6. This ridge-piece is of substantially V-form in cross section with overhanging longitudinal upper portions, the sides of the V being inclined to lie parallel with the edges of the two main roof sections, packing strips 21 being interposed between the ridge piece and the roof sections. To tie together the several elements of the roof we provide at suitable intervals long bolts 24, which pass downward through the medial line of the ridge-piece 4, and through a series of yokes 25 having upturned ends which enter recesses in the roof units, and are hung upon tie-rods 11 thereof as shown in Fig. 6. The bolts 24 pass through suitable perforations in the yokes 25, one in each yoke, and are provided at their lower threaded ends each with a nut. If desired a strong coiled spring 14^a may be interposed between each nut and yoke so as to apply a constant but elastic pressure tending to press toward each other the roof sections and the ridge member 4, and to compress between them the packing strips 21. This affords a very firm and rigid connection of the parts and insures weather-tight joints.

The lower or eave portions of the roof extend outward more or less beyond the side walls, and rest upon packing strips 21 lying upon the upper edge or surface of said walls, as seen in Fig. 7. Sectional eye-bolts or turnbuckles 22, each comprising two members respectively threaded right and left and coupled by long nuts or sleeves 22^a, extend into recesses in the roof and wall sections, and are threaded upon the tie-rods 11 of said sections. By turning the sleeve or nut the sectional eye-bolt or turnbuckle can be tightened or loosened as required. As also represented in Fig. 7, the nut or sleeve 22^a of each turnbuckle or sectional eye-bolt 22 has a radial flange at its lower end to bear upon and compress a strong spring 14^b contained in a metal cup or socket 27 seated in the upper end of the wall section. This construction causes the springs to offer a yielding support for the roof tending to relieve the tie-rods 11 of the wall from undue load, and leaving its sections free to be turned in assembling the walls, or permit the entire tie-rod to move in applying the final compression to the wall elements. It likewise tends to prevent undue compression of the packing 21 between the roof sections and the walls.

In Fig. 1 sectional eye-bolts 22 are indicated as extending from several tie-rods 11 of the roof sections to tie-rods of the end walls, and such may be the actual construction if desired. However, this will not ordinarily be necessary, particularly as gable units 28 are employed to fill the space between the end walls formed of the units 8

and 9, and the roof, said gables affording firm support for said roof additional to that given by the side walls.

In Figs. 1 and 2 we have indicated tie-rods and anchorages extending transversely of the structure near the upper line of the main walls. These may be employed if desired better to guard against spreading of the walls under pressure of the roof. If used they may support a ceiling of the same construction as the floor, but this will be used or not as preferred in any particular instance.

By the adoption of the unit system both the original construction of the units and the building up of structures from said units are greatly simplified, and the cost of construction reduced as compared with other systems not worked out with like regard to quantity production. The structures built up of units such as described are rigid, strong, and durable, and by reason of the hollow construction, the walls, roof and floor, whether filled with insulating material or simply holding air confined within them, transmit heat and cold only very slowly; hence the structures are well adapted for use both in warm and in cold climates. The closeness of the joints precludes entrance of air through them, and with proper care to the fitting of the window sash and the doors, the buildings are found to answer admirably even in severe weather in northern latitudes.

Cross walls or partitions may be introduced wherever desired, and L's or lateral extensions may be constructed, giving to the building such space and arrangement of rooms as desired.

Most of the features of this application have been transferred to and claimed in our application Serial No. 270,340, filed January 9, 1919, and the claims herein are hence confined to certain features not disclosed in said application.

Having thus described our invention what we claim is:

1. In a portable or knock-down building, a wall composed of a plurality of units arranged in edgewise relation; a tubular

dowel extending across the meeting line of each pair of adjacent units, each dowel seated in shouldered recesses in said units and having at one end an internal flange or shoulder; a spring located within each dowel and resting at one end upon the flange or shoulder thereof; sectional tie-rods extending through proximate wall units; and connecting sleeves or nuts uniting said tie-rod sections, each sleeve or nut bearing at one end against its associated spring, whereby edgewise pressure is applied independently to each wall unit in succession.

2. A building having a wall composed of a series of like units arranged in common plane with their longitudinal edges opposed; tubular dowels extending across the joints between the several units and serving to hold the same in alinement, said dowels being provided at one end with an internal flange or shoulder; springs within the tubular dowels and bearing at one end against the intumed flange or shoulder; sectional tie-rods passing through the units, dowels and springs from end to end of the wall; threaded sleeves or nuts connecting the sections of the tie-rods, each bearing at one end against one of the springs; and nuts applied to the ends of the tie-rods and serving to tie together the several units of the wall, and to apply a final compression thereto additional to that afforded by the springs and coupling sleeves or nuts.

3. In combination with wall and roof units of a portable or knock-down building, and with horizontal tie-rods extending through said wall and roof units; an internally flanged metal cup or socket seated in the upper end of a wall unit; a spring placed within said socket and resting at one end upon the internal flange; sectional eye-bolts threaded upon the longitudinal tie-rods, one of said sections passing through the spring; and an internally threaded sleeve or nut connecting the proximate ends of the aligned eye-bolt sections and resting upon said spring.

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