

A. E. WATERMAN ET AL

KNOCKED DOWN SHELTER BUILDING

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6 Sheets-Sheet 1



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Nov. 28, 1944.

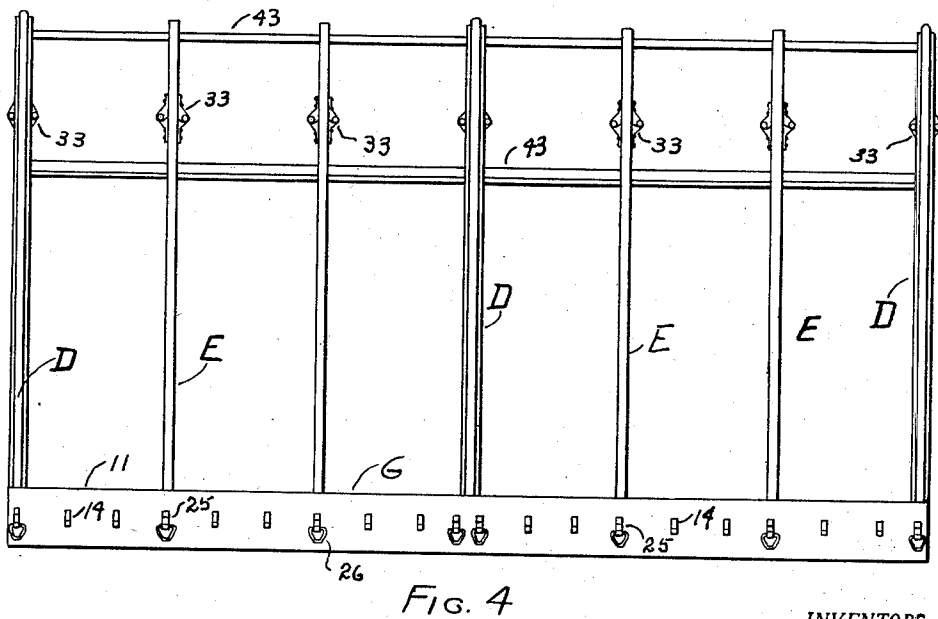
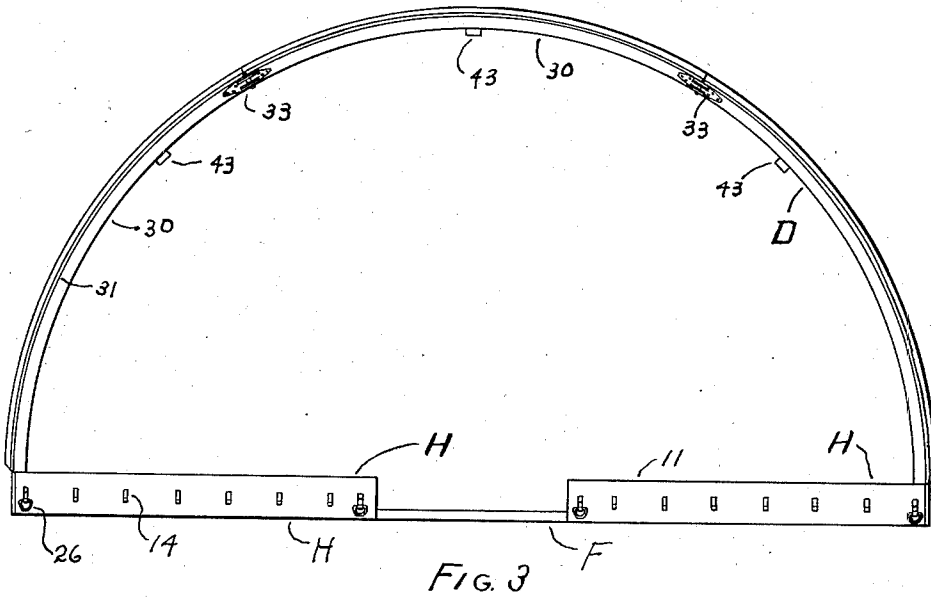
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2,363,916

KNOCKED DOWN SHELTER BUILDING

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6 Sheets-Sheet 2



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KNOCKED DOWN SHELTER BUILDING

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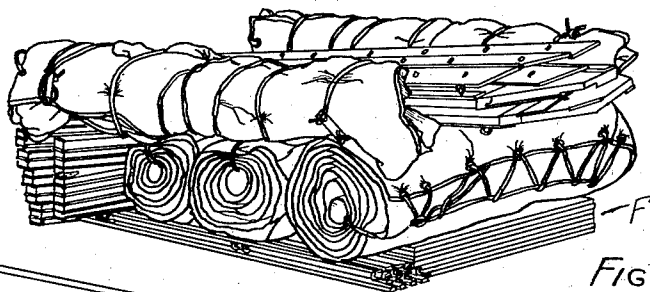


FIG. 5

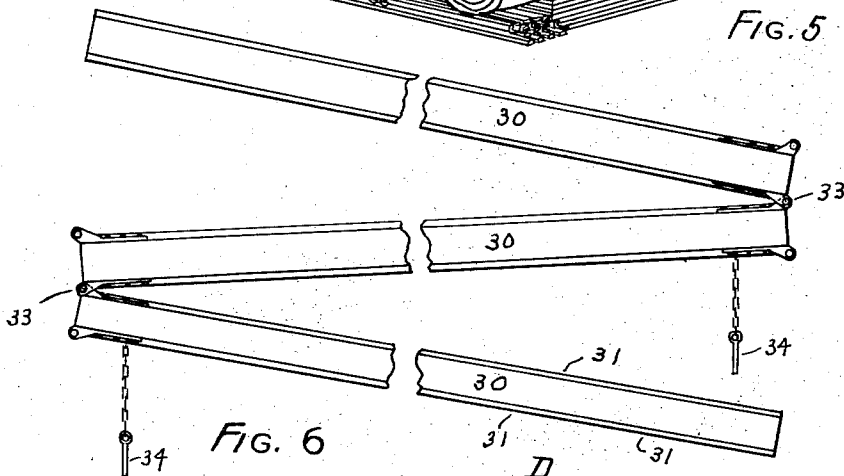


FIG. 6

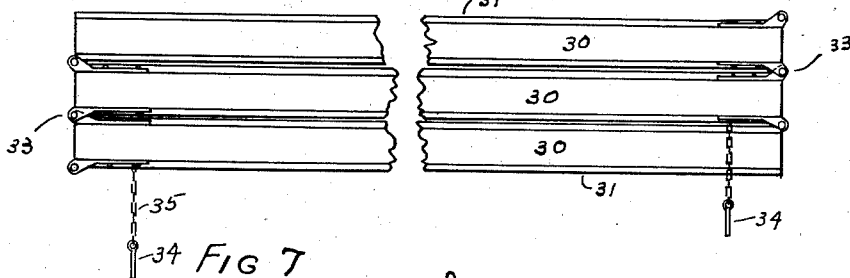


FIG. 7

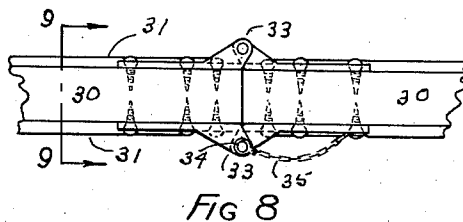


FIG. 8

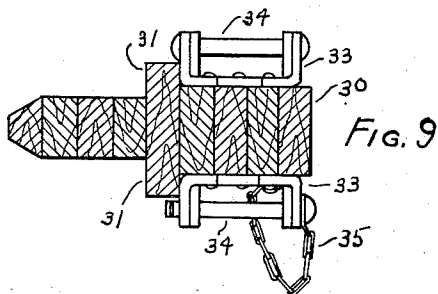


FIG. 9

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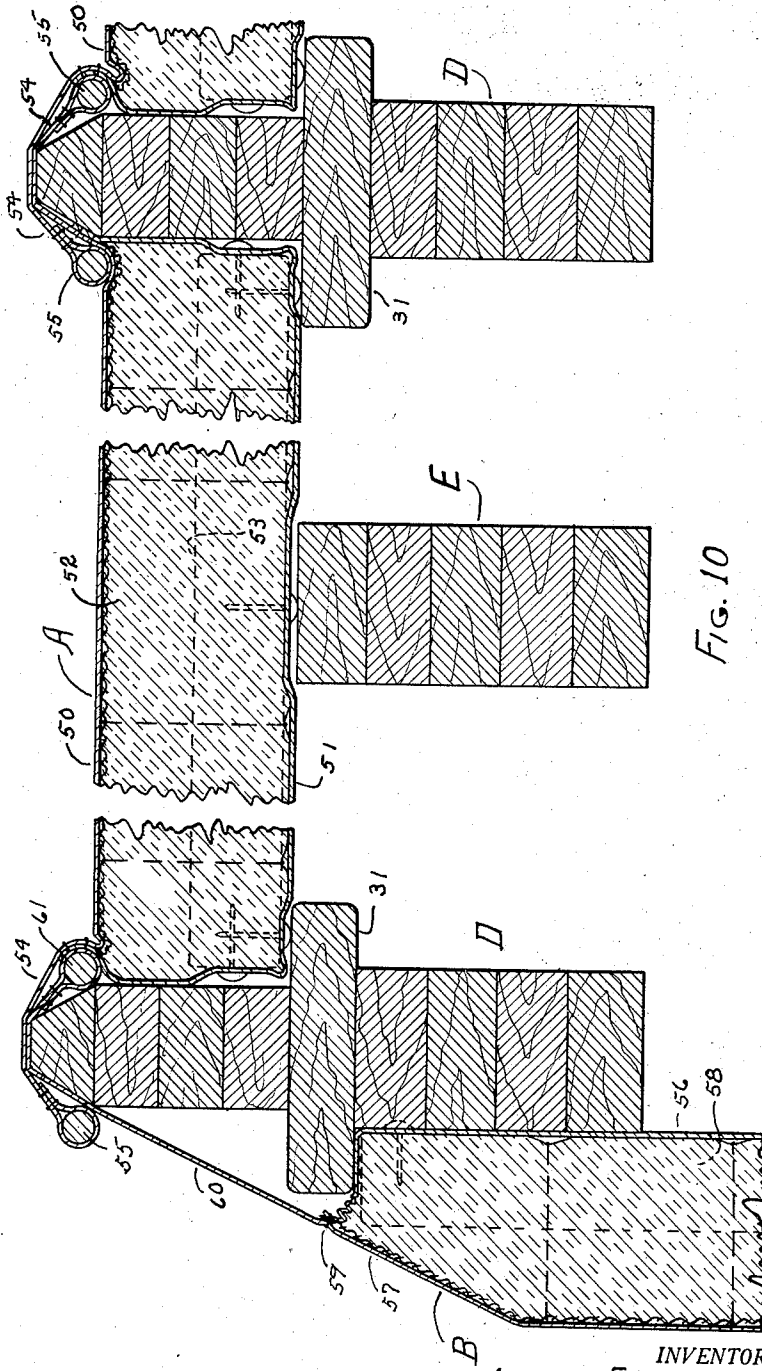
A. E. WATERMAN ET AL

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KNOCKED DOWN SHELTER BUILDING

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6 Sheets-Sheet 4



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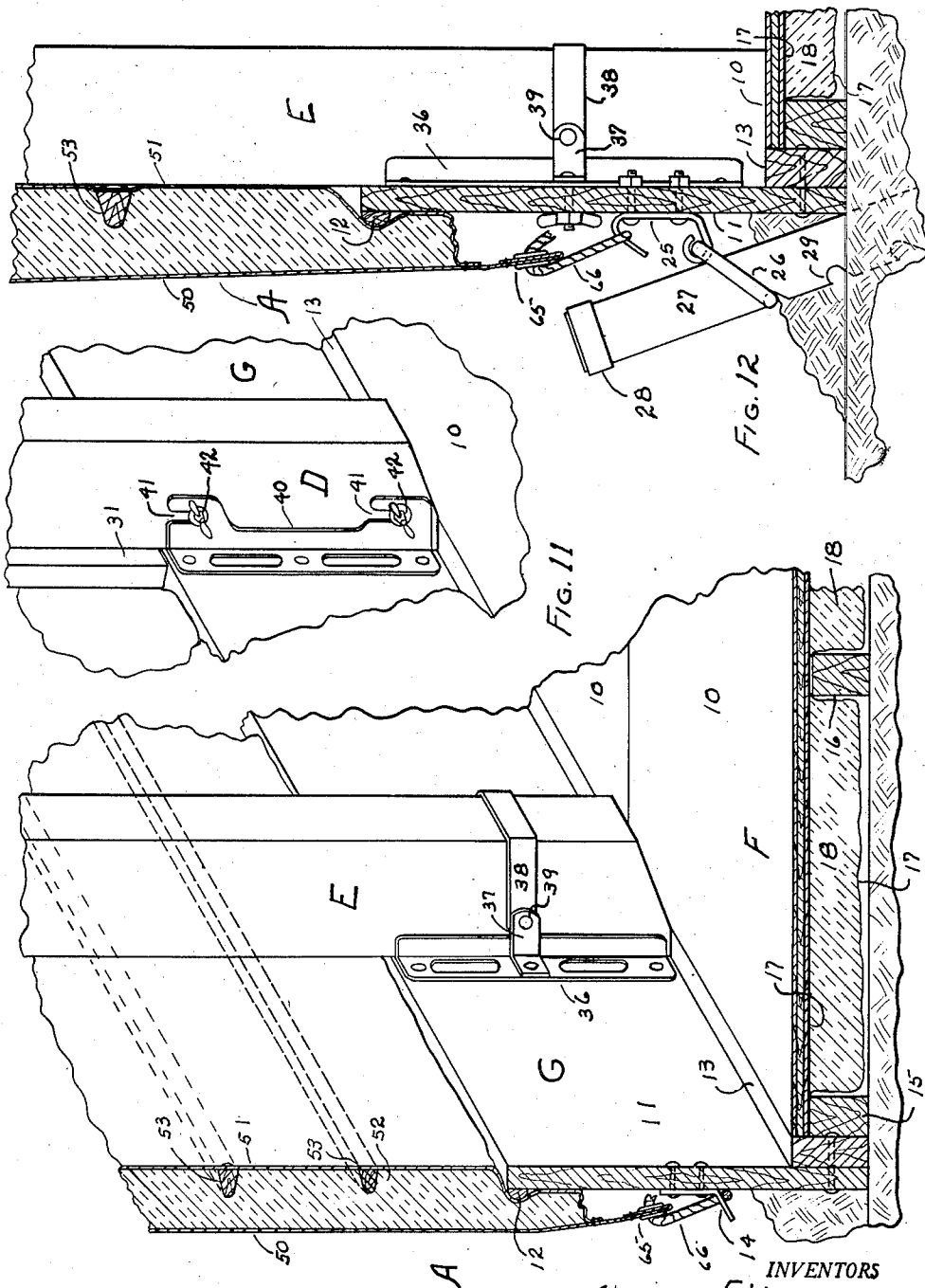
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6 Sheets-Sheet 5



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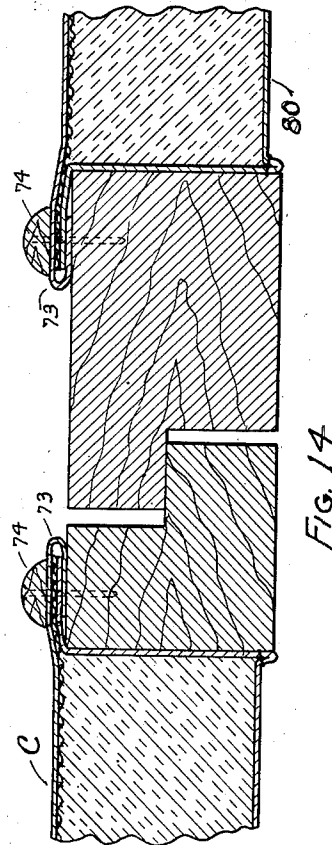
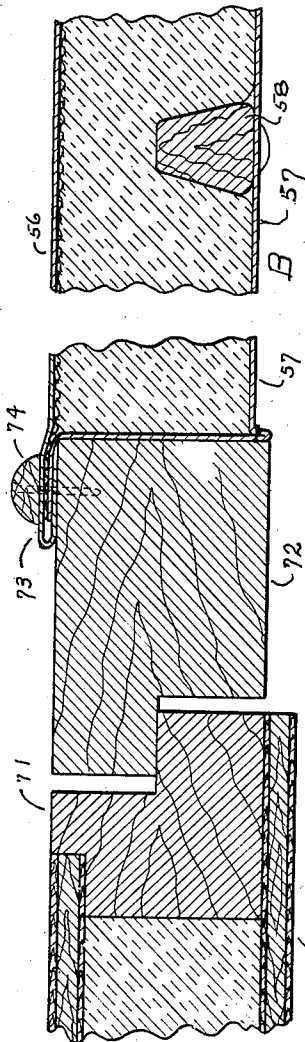
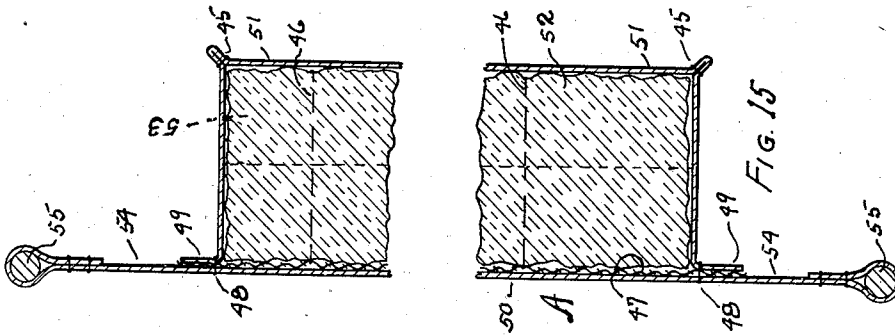
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KNOCKED DOWN SHELTER BUILDING

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6 Sheets-Sheet 6



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UNITED STATES PATENT OFFICE

2,363,916

KNOCKED DOWN SHELTER BUILDING

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13 Claims. (Cl. 135—1)

The present invention relates to buildings which can be knocked down for convenient manufacture and transportation and which are particularly adapted to shelter human beings.

An object of our invention is to provide a building which may be insulated so as to be suitable for shelter in very cold or very warm climates and to provide, if desired, a suitably insulated floor for this purpose.

Another object of our invention is to provide a building of the class which is light and can be knocked down so as to occupy minimum space for convenient transportation either by truck, railroad, vessel or transport plane.

A still further object of our invention is to provide a building which can be quickly erected and knocked down by a limited number of unskilled persons so it is particularly adapted for the use of the armed forces.

An object of our invention is to provide a building of the class which is suitable for emergency Red Cross use or for living quarters.

Generally stated, the objects of our invention are to provide a building which can be manufactured at low cost in mass production, is simple and pleasing in appearance.

Another object of our invention is to provide a structure which can be efficiently and cheaply anchored to the ground.

To these and other useful ends, our invention consists of parts, combinations of parts, or their equivalents, as hereinafter set forth and claimed and shown in the accompanying drawings in which:

Fig. 1 is a perspective three quarter front view of one form of our invention.

Fig. 2 is a rear end view of the building shown in Figure 1.

Fig. 3 illustrates a front elevational view of the frame of the building.

Fig. 4 is a side view of the frame shown in Figure 3.

Fig. 5 is a perspective view showing how our complete building, when knocked down, can be packed in a limited space.

Fig. 6 illustrates a complete frame rib and how it is formed in a number of pieces so it may be folded.

Fig. 7 illustrates a complete frame rib folded together for transportation.

Fig. 8 illustrates a fraction of the ends of the frame rib and illustrating how they are hinged together.

Fig. 9 is a section of a main frame rib taken on line 9—9 of Figure 8.

Fig. 10 is an enlarged fractional section of our improved building taken on line 10—10 of Figure 2.

Fig. 11 is an enlarged fractional perspective view of our improved building.

Fig. 12 is an enlarged fractional sectional view.

Fig. 13 is an enlarged fractional sectional detail of the front door and door jamb taken on line 13—13 of Figure 1.

Fig. 14 is an enlarged fractional view taken on line 14—14 of Figure 2.

Fig. 15 is an enlarged fractional section of the cover blanket.

As thus illustrated, the coverings of our improved building are designated in their entirety by reference characters A. The front wall of the building is designated in its entirety by reference character B. The rear wall of the building is designated in its entirety by reference character C. The main ribs in their entirety are designated by reference character D and the supplemental ribs are designated in their entirety by reference character E. The floor sections in their entirety are designated by reference character F. The side base panels or sills are designated in their entirety by reference characters G and the end base sills are designated in their entirety by reference character H.

Members F comprise plywood sections 10. Generally it requires four or eight of these members for a building, two occupying the space between side sills so they may be easily packed with the other parts of the building. For the building illustrated in Figures 1 and 2, eight of these members are required. In this building, it will be noted that three main ribs D and two supplemental ribs E are required. In the frame shown in Figure 4, three main and four supplemental ribs are required.

Sills or floor boards G comprise preferably plywood panels 11 having preferably at the outer top edge a half round stiffening strip 12 and secured to its bottom inside edge a stiffening strip 13 which may be either plywood or integral strips of wood.

Members 11 and 13 are secured together by bolts. Sills H are similar to sills G except as to length and having the same part numbers 11 and 13. On the outside of each sill G and H we mount a number of spaced hooks 14, the purpose of which will hereinafter appear. Members 10 are mounted on frames comprising sills 15 which extend around the edge of these members and preferably other sills 16 which extend across the center of member F longitudinally with the building.

When sills 15 and 16 are attached to members 10, waterproof fabric pieces 17 are secured at their edges between the sills and members 10. These fabric pieces are shaped so as to be separated as shown and the space is filled by means of suitable insulating material 18.

When the building is erected, a suitable place is leveled and members F are positioned thereon so members G and H may be positioned against the floor assembly as illustrated in Figures 11 and 12.

Members G and H are provided with spaced hook brackets 25 each having a ring 26 which is adapted to fit loosely over stakes 27 which are pointed at their bottom ends and reinforced at their tops by means of ferrule 28. Posts 27 are each provided with a number of cut-away slots 29, the stake, when being driven, extending loosely through rings 26.

At the proper time, ring 26 is permitted to drop into one of slots 29 in the stake and the stake further driven into the ground so as to hold members G and H firmly on the ground and against members F. Clearly members G and H will be caused to hug the ground and tightly contact the outside edges of members F.

Members D comprise preferably three laminated members 30 (see Figures 3, 4, 6 and 9) having strips 31 on opposite sides thereof. Members 30 are secured together by means of pairs of hinges 33, as illustrated in Figures 3, 6 and 7.

One hinge of each pair of hinges is provided with a removable pin 34 which is preferably secured to the hinge by means of a chain 35 so pins 34 may be removed and the three members of the ribs folded as illustrated in Figures 6 and 7. When members 30 are unfolded and pins 34 placed into position, the ribs will be rigid as if made integral.

Members E are similarly secured together by means of a number of pairs of hinges, members E however, being considerable narrower than members D, as illustrated in Figure 10.

After ribs D and E are made rigid, as already described, their ends are preferably secured to members G, as illustrated in Figure 12, members E being preferably detachably secured to member G as illustrated in Figure 11, wherein two spaced brackets 36 (one not shown) are secured to members G so they contact members E. Members 36 are provided with L-extensions 37 and U-strips 38 which are hinged to members 37 as at 39. Clearly when the building is knocked down, members 38 may be folded so as to save space.

Members D may be secured to members G, as illustrated in Figure 11 wherein brackets 40 (one not shown) are secured to members G so they fit snugly on opposite sides of members D and having slots 41 for the reception of bolts 42; thus when member D is in position, these bolts may be made taut and the assembly made rigid.

After members D and E are secured to members G, three or more spacing strips 43 are detachably secured to these members in any convenient manner whereby the ribs are suitably spaced for their length and the assembly made rigid for mounting members A thereon.

As illustrated in Figures 3, 4 and 12, the frame of our building will be suitably held to the ground and made rigid. After the frame has been assembled as described, members A are mounted thereon. These members comprise preferably an outer water proof fabric member 50 and an inner water proof fabric member 51. These members are formed as shown in Figure 15 for the recep-

tion of insulating material 52, the portion inclosing the insulating material being adapted to lie between two members D having spaced wood strips 53 which are preferably tacked to fabric 51, as illustrated, the ends adapted to lie on members 31 as illustrated in Figure 10.

The edges of members 51 extend outwardly as at 49 and are stitched to member 50 as at 48. Insulating material 52 is stitch mounted to a fabric piece 47 as at 46 and corners are formed in member 51 by stitching as at 45. Members 50 extend past member 49 so as to form flaps 54 which are folded at their edges in any suitable manner around ropes 55. Members A on their longitudinal centers lie on the outer surface of members E; thus to prevent the coverings from sagging.

Member B is formed somewhat similar to members A having an inner fabric member 56 and an outer fabric member 57, having stiffening ribs 58 which are preferably spaced horizontally, the upper end lying on the outer surface of end member D and the lower end (not shown) lying against the upper edge of member H. Members 56 and 57 are stitched together as at 59, forming flaps 60, the outer edge having a rope 61. The shape of member B is such whereby the flap will lie over member D when the rope is pulled taut, as illustrated in Figure 10.

Member C is similar to member B. The bottom edges of members A, B and C are folded and have spaced grommets 65 (see Figures 1, 2, 11 and 12) through which ropes 66 extend and are laced under hooks 14 and 25 and made taut as illustrated in Figures 1 and 2, the ends being preferably anchored to stakes 27.

It will be seen that members A, B and C will be stretched tightly, their flaps 54 and 60 lying over the outer edges of member D (see Figure 10) and tightly against members 12 so as to make an air tight inclosure. Ropes 55 and 61 are, at their ends, preferably also anchored to stakes 27.

We provide preferably a door 70 in member B, the frame 71 of the door being suitably shaped so as to lie against an offset in the door jamb 72. The edges of member B are folded as at 73 and being covered preferably by means of half round strips 74 which are nailed to member 72, as illustrated. Door 70 is preferably supplied with a window 75 and a ventilating grille 76 is positioned in the top of member B as illustrated in Figure 1.

We provide preferably a somewhat wider door 80 for member C having a window 81. This door is preferably hinged to the door jamb as at 82. Member 80 is preferably formed similar to member C wherein the structure extends to and over the top of the building as illustrated in Figure 10.

Stiffening ribs 58 terminate below the horizontal plane of the axis of hinges 82 so the structure of the door will bend in conformity to these hinges. It is desired to use the door when open as a shelter or canopy and the door is made wide so automobiles and the like may be driven into the shelter. The sides of the door are provided with door jambs similar to jambs 72 shown in Figure 13.

As illustrated in Figure 10, members D and E are preferably laminated and clearly when the building is completely assembled, because of the flaps on members A, B and C and ropes 55 and 61 the building will be practically air tight.

Strips 12 (see Figure 11) are provided as stiffeners for members G and H and also a curved surface around which members A, B and C may

be stretched tightly. After the building has been assembled, it is the custom to dig a small trench a distance from the four sides of the building, piling the dirt against members G and H to seal the building to the earth and provide means whereby water will not accumulate under the floor of the building.

In Figure 5 we illustrate a bundle made up from all of the parts of a complete building. It will be seen that the blankets may be rolled into compact bundles. Members E, D, G, H and F may be stacked as illustrated or several bundles made of a shelter.

It will be understood that any desired shape and size of door may be provided in members B and C. When door 70 is used, frame 71 co-operates with the plywood members to stiffen the structure so the door may be hinge supported. When door 80 is used in member C, the side frame members of the door shown in Figure 4 terminate slightly below the horizontal plane of the axis of hinges 82, the door thus formed having a door frame which rests on the door jamb as illustrated.

It will be seen that as long as the stakes are in position and ropes 55, 61 and 66 are firmly anchored to the ground, the building will remain practically air tight and will withstand severe storms without danger of becoming dislodged or damaged.

From the foregoing, it will be seen that our improved shelter may be quickly erected by a limited number of unskilled men without the use of tools of any kind except for driving the stakes in the ground and the building may be knocked down quickly without the use of special tools. It will also be noted that while the building is suitably insulated and strong, it is not heavy and is particularly suited for army use in any territory and under any weather conditions.

Having thus shown and described our invention, we claim:

1. A knock down building of the class described, comprising side sills, generally curved spaced ribs adapted to be detachably secured at their ends to the inside of said side sills, a flexible covering adapted to be stretched over said ribs, its ends extending slightly past the upper edges of said side sills and in contact therewith, spaced hooks secured to the outer surface of said side sills a short distance below the ends of said covering, detachable means for securing the ends of said covering to said hooks.

2. A device as recited in claim 1 including; said ribs comprising a number of curved pieces permanently fastened together by hinges on opposite sides of adjacent ends, the bolts on opposite sides for succeeding pairs of hinges being removable whereby the pieces may be folded together accordion like for transportation.

3. A knock down building of the class described, comprising end and side sills, generally curved spaced ribs adapted to be detachably secured at their ends to said side sills, spaced rings flexibly secured to the outside of said sills, stakes having notches adapted to be driven into the ground in contact with the outside lower edge of the sills with the rings loosely embracing the stakes and whereby the rings may be engaged by one of said notches to hold the sills to the ground, a flexible covering adapted to be stretched over said ribs, its ends extending slightly past the upper edges of said side sills, spaced hooks secured to the outer surface of said side sills a short distance below the ends of said covering, detachable means

for securing the ends of said covering to said hooks, a floor adapted to fill the space between said sills and being held in intimate contact therewith by said stakes.

4. A device as recited in claim 3 including; end coverings, the outer edges having flaps which are adapted to lie over said ribs and having ropes at their edges whereby the overlying portion may be drawn tightly and the ends of the ropes anchored to said side sills, spaced hooks on said end sills, the bottom of said end coverings having spaced grommets and a rope which extends through the grommets and engaging said hooks whereby the end coverings may be stretched tightly over the ends of the building.

5. A knock down building of the class described, comprising end and side sills, generally curved spaced primary and supplemental ribs adapted to be detachably secured at their ends to said sills, spaced rings flexibly secured to the outside of said sills, flexible coverings adapted to be stretched over said ribs, their ends extending slightly past the upper edges of said side sills, spaced hooks secured to the outer surface of said sills, spaced grommets on the ends of said coverings and ropes adapted to extend through said grommets and engage said hooks lace-like, said supplemental ribs positioned between said primary ribs and adapted to form a rest for said coverings, flexible end coverings having a curved shape at their outer edges with flaps adapted to lie over the adjacent edges of said first coverings, said flaps having ropes at their free edges whereby the coverings may be caused to tightly embrace the first coverings, spaced grommets on the bottom edges of said end coverings, ropes extending through said grommets and engaging said hooks lace-like whereby the end coverings may be stretched tightly over the end of the building.

6. A knock down building of the class described, comprising end and side sills, generally curved spaced ribs adapted to be detachably secured at their ends to said side sills, spaced rings flexibly secured to the outside of said sills, stakes having notches adapted to be driven into the ground in contact with the outside lower edges of the sills with the rings loosely embracing the stakes and whereby the rings may be engaged by one of said notches to hold the sills to the ground, flexible coverings adapted to be stretched over said ribs, their ends extending slightly past the upper edges of said side sills, spaced hooks secured to the outer surface of said side sills a short distance below the ends of said coverings, spaced grommets on the ends of said coverings and ropes adapted to extend through said grommets and engage said hooks lace-like, said ribs comprising a number of curved pieces hinged together on opposite sides of adjacent ends, the bolts of one hinge of each pair of hinges being removable whereby the pieces may be folded together accordion like for transportation, flanges on the sides of said ribs positioned a distance from the outer edge thereof, said coverings comprising two canvas water proof sheets having insulating material therebetween forming a blanket and having a width equal to the spacing of the ribs and a length adapted to overlie the top edges of said sills, spaced strips within said blanket, their ends adapted to lie on said flanges, supplemental ribs positioned between said first ribs adapted to act as intermediate supports for said blanket.

7. A knock down building of the class described, comprising end and side sills, generally curved

spaced ribs adapted to be detachably secured at their ends to the inside of the side sills, spaced rings flexibly secured to the outside of said sills, stakes having notches adapted to be driven into the ground in contact with the outside lower edge of the sills with the rings loosely embracing the stakes and whereby the rings may be engaged by one of said notches to hold the sills to the ground, flexible coverings adapted to be stretched over said ribs, their ends extending slightly past the upper edges of said side sills, spaced hooks secured to the outer surface of said sills a short distance below the ends of said coverings, spaced grommets in the ends of said coverings and ropes adapted to extend through said grommets and engage said hooks lace-like, said flexible coverings comprising two water proof fabric sheets having insulating material therebetween forming a blanket having a width equal to the spacing of said ribs and a length adapted to overlap the top edges of said side sills, flaps on the sides of said blankets having ropes at their free edges whereby the flaps may overlie the ribs and be made taut by anchoring the ends of the ropes to the sills.

8. A device as recited in claim 7 including; end coverings comprising two water proof fabric sheets and insulating material therebetween, the outer edges of the canvas being brought together forming flaps adapted to overlie the adjacent rib, the flaps having ropes on their free edges whereby they may be drawn tightly over the ribs and the ends of the ropes anchored to said sills, the bottom edges of said end coverings having spaced grommets with ropes extending therethrough and engaging said hooks.

9. A device as recited in claim 7 including; end coverings comprising two water proof canvas sheets and insulating material therebetween, the outer edges of the canvas being brought together forming flaps adapted to overlie the adjacent rib, the flaps having ropes on their free edges whereby they may be drawn tightly and the ends of the ropes anchored to said sills, the bottom edges of said end coverings having spaced grommets with ropes extending therethrough and engaging said hooks, a floor for said building being divided into sections and adapted to occupy the space within said sills and be held in contact therewith by the stakes.

10. A knock down building of the class described, comprising side and end sills, a number of spaced generally curved primary ribs adapted to be detachably secured at their ends to side sills, a number of supplemental ribs positioned between said primary ribs being generally curved and having their ends detachably secured to the side sills, said primary ribs having side flanges spaced a distance from their outer edges, flexible blankets comprising two water proof fabric sheets

with insulating material therebetween and having spaced strips therein, the ends of which are adapted to lie on said side flanges, flaps on the sides of said blankets adapted to overlie the adjacent primary rib and having ropes at their outer edges adapted to stretch and hold the flaps over said ribs with their ends anchored to said side sills, the ends of said blankets extending slightly past the upper edges of the side sills and being detachably anchored to the sills, said blankets adapted to lie on said supplemental ribs, end blankets comprising two spaced sheets having insulating material therebetween, the upper edges having flaps adapted to overlie the end ribs and having ropes in their outer edges adapted to firmly hold the flaps into position when anchored at their ends to said sills, spaced stiffening ribs positioned in said end blankets adapted to lie against the end ribs and end sills, the bottoms of said end blankets being detachably anchored to the adjacent end sill.

11. A device as recited in claim 10 including; spaced stakes adapted to be driven into the ground in contact with the outside bottom edge of said sills and having means for anchoring the sills thereto, a floor adapted to occupy the space between said sills and to be firmly contacted by the sills because of the pressure of said stakes.

12. A knock down building of the class described, comprising side sills, generally curved spaced ribs adapted to be detachably secured at their ends to said side sills, flexible coverings adapted to be stretched over said ribs, their ends extending past the upper edges of said side sills and in contact therewith, spaced hooks secured to the outer surface of said side sills a short distance below the ends of said coverings, detachable means for securing the ends of said coverings to said hooks, supplemental ribs positioned between said first ribs adapted to form a rest for the center of said coverings, said flexible coverings having therein spaced transverse stiffening strips, flaps on the sides of said flexible coverings adapted to lie over the first ribs with the sides of the flexible coverings abutting the sides of the first ribs, said supplemental ribs being generally lower than the first ribs whereby the flexible covering will lie normally on said supplemental ribs.

13. A device as recited in claim 10 including; said ribs comprising a number of curved pieces permanently fastened by hinges on opposite sides of adjacent ends, the bolts on opposite sides for succeeding pairs of hinges being removable whereby the pieces may be folded together accordion-like for transportation.

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