P. N. NISSEN.

PORTABLE BUILDING.

APPLICATION FILED MAR. 12, 1917.

2 Sheets. Sheet No. 1.

1,377,500.

Patented May 10, 1921.

4 SHEETS—SHEET 1.

Fig. 1.

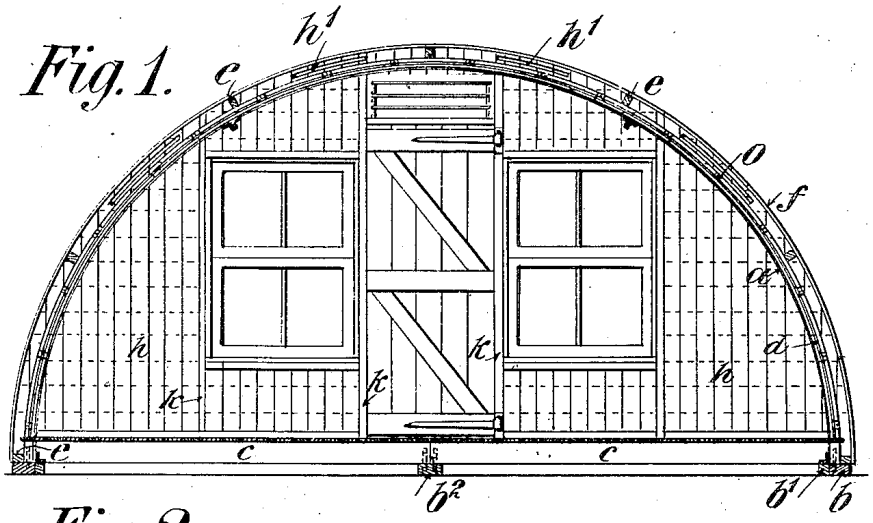
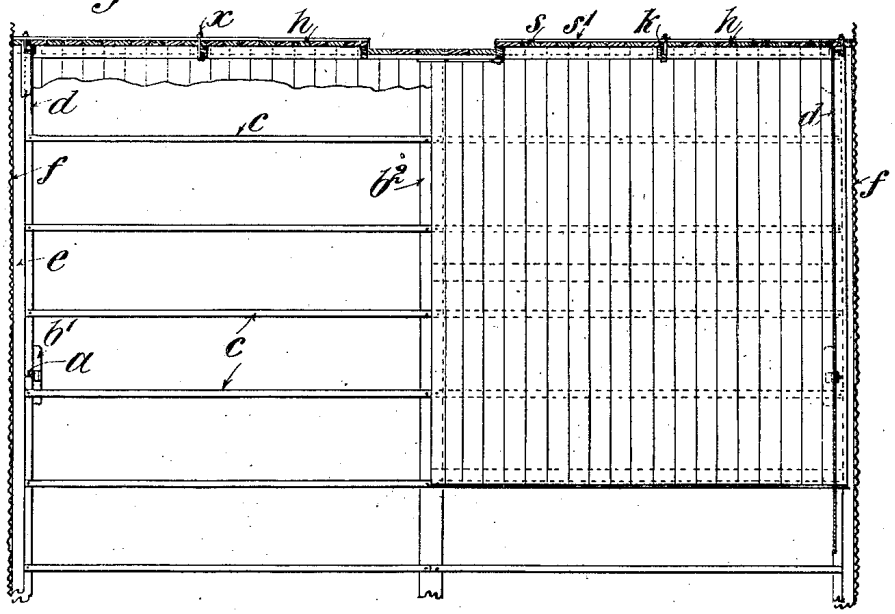


Fig. 2.



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4 SHEETS—SHEET 2.

Fig. 3.

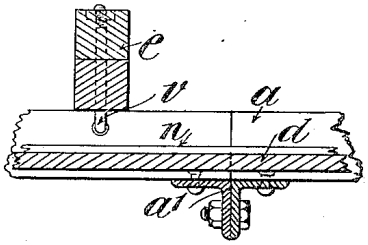

Fig. 4.

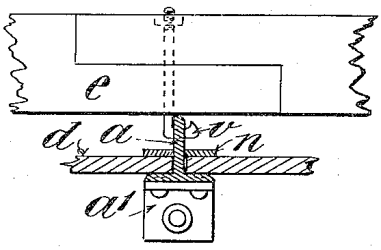

Fig. 5.

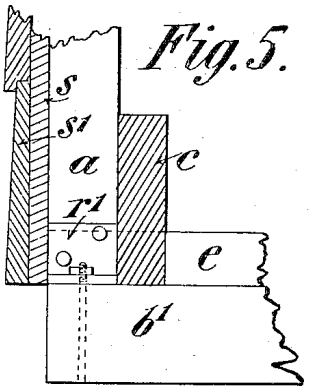

Fig. 6.

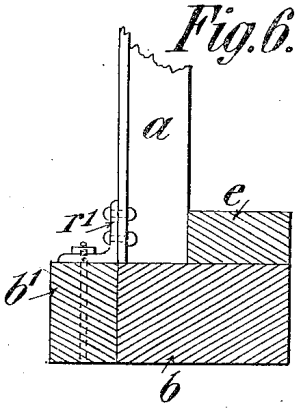

Fig. 8.

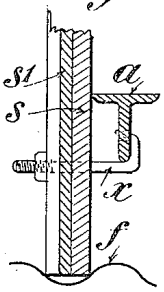

Fig. 7.

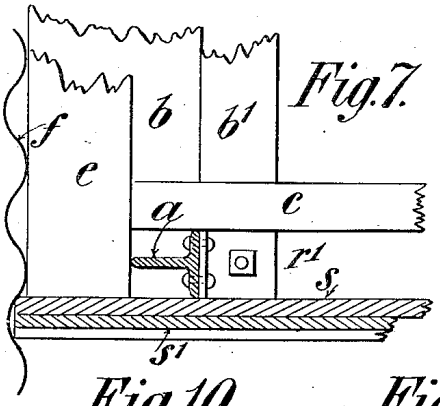

Fig. 9.

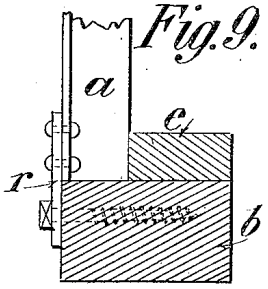

Fig. 10.

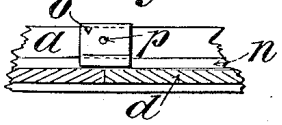

Fig. 11.

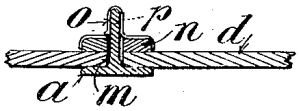

Fig. 12.

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4 SHEETS—SHEET 3.

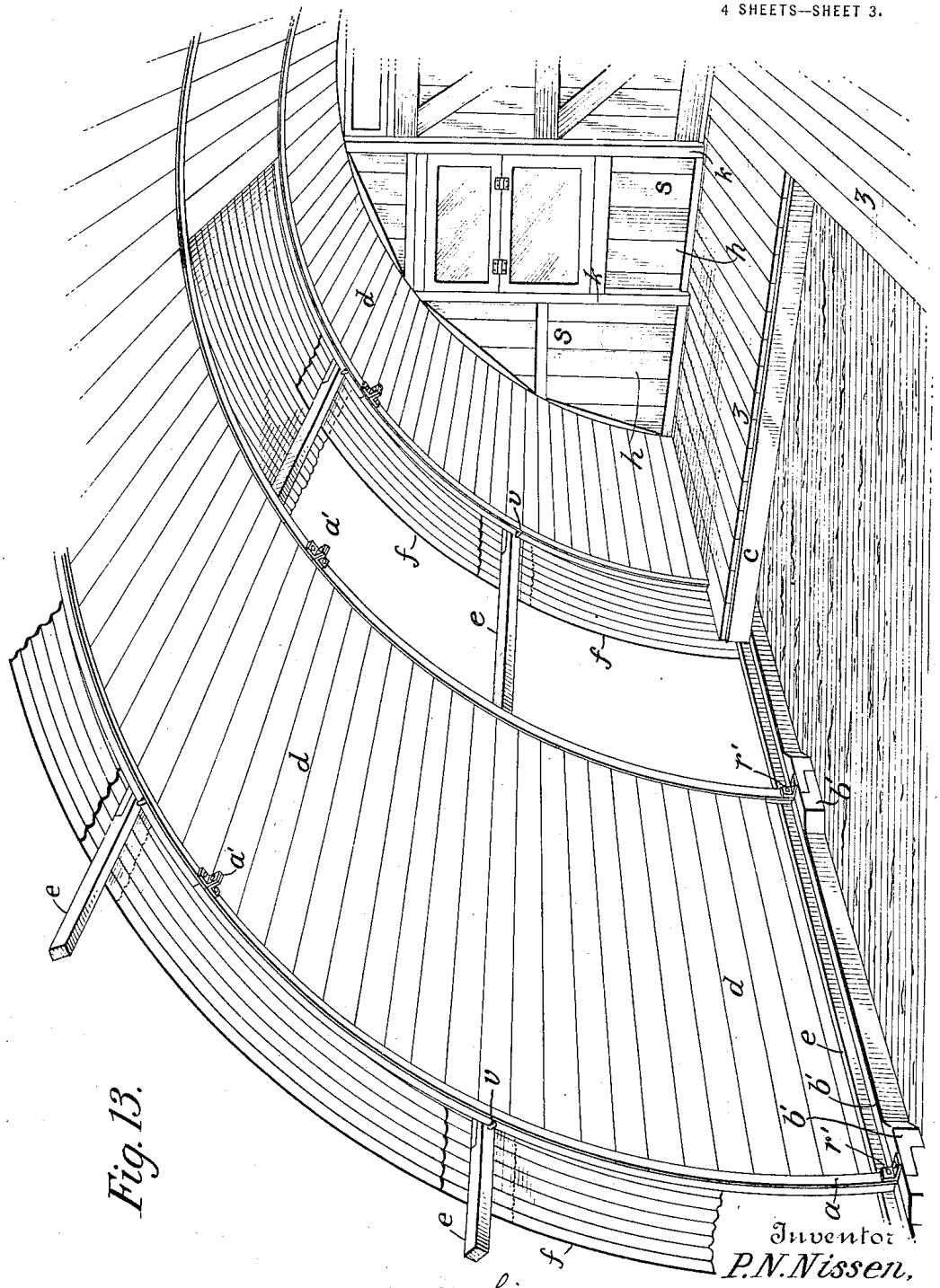

Fig. 13.

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4 SHEETS—SHEET 4.

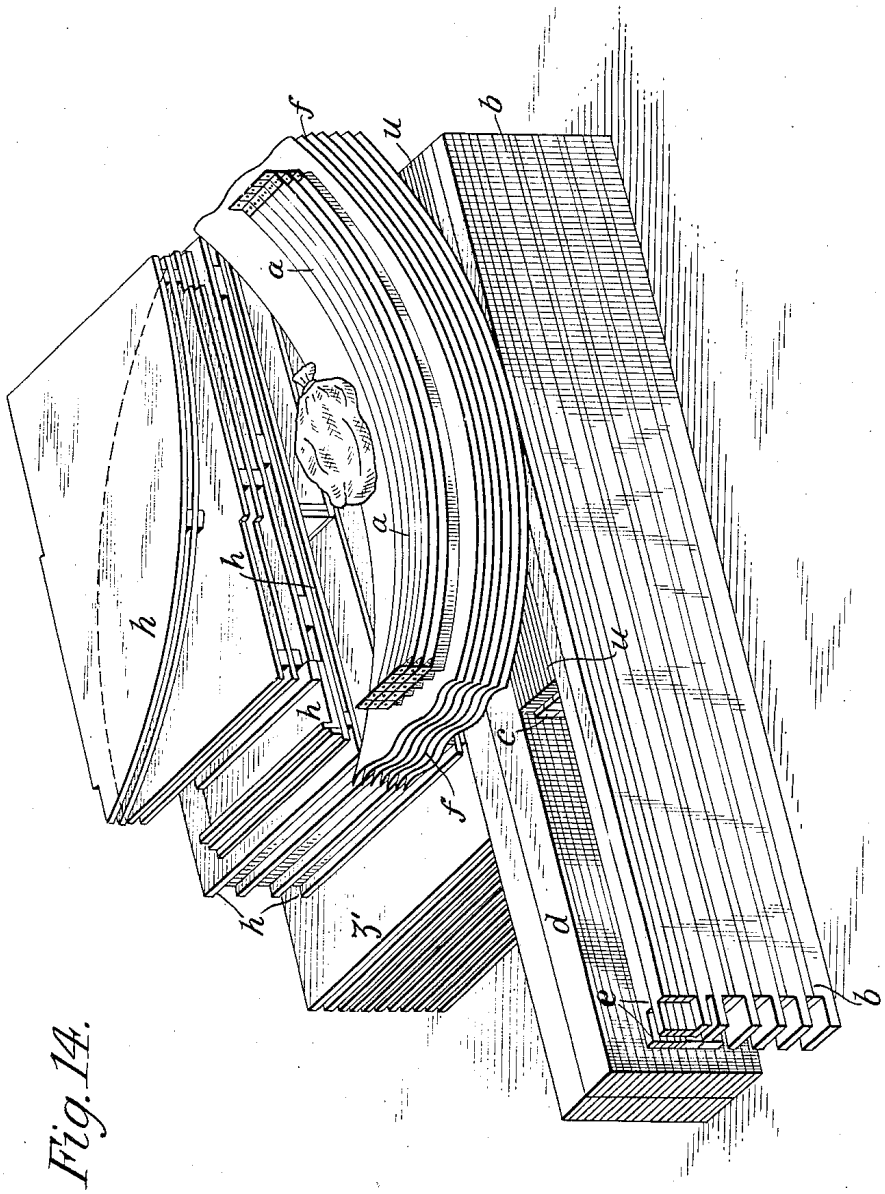

Fig. 14.

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PETER NORMAN NISSEN, OF LONDON, ENGLAND.

PORTABLE BUILDING.

1,377,500. Specification of Letters Patent. Patented May 10, 1921.

Application filed March 12, 1917. Serial No. 154,188.

To all whom it may concern:

Be it known that I, PETER NORMAN NISSEN, a subject of the King of Great Britain and Ireland, residing at 1 Finsbury Circus, London, England, and now major 29th company, Royal Engineers of the British Expeditionary Force in France, have invented certain new and useful Improvements in and Relating to Portable Buildings, of which the following is a specification.

The object I have in view is the production of a portable building in which the whole interior space from end to end, side to side, and floor to roof, is free and unobstructed, the parts of which may be standardized and fabricated and when unassembled occupy the least possible space, and which may be repeatedly, quickly and readily set up and taken down.

These objects are preferably attained in a building embodying my invention, in which the frame consists of semi-circular or bow shaped ribs, each comprising three or more similar parts detachably secured together, which ribs are tied together and secured against longitudinal movement by purlins each comprising a plurality of parts and longitudinally arranged and detachably secured to the ribs and upon which purlins is laid and detachably secured an external roofing, which with the purlins assist in lending the necessary rigidity and stability to the structure.

In the accompanying drawing which illustrates this invention:—

Figure 1 is a view in cross section of the improved building,

Fig. 2 is a broken view in plan—partly in section thereof,

Figs. 3 and 4 are broken views in section showing the joint in the purlins and ribs,

Figs. 5, 6 and 7 are broken views in longitudinal section, in transverse section, and in horizontal section respectively showing the connection of the feet of the ribs with the bearers.

Fig. 8 is a broken view in section showing one of the hook bolts for securing the end panels in relation to the end rib,

Fig. 9 is a broken view in section showing an alternative method of fixing the ribs to the bearers,

Figs. 10 and 11 are broken views showing how the recesses are formed in connection with the ribs,

Fig. 12 is a view in section showing an alternative method of forming the recesses.

Fig. 13 is an interior view partly broken, showing the construction and relation of parts and illustrating how the combination of elements contributes to the production of a building in which the entire interior space is free and unobstructed, and Fig. 14 is a view of the various parts of the improved building stacked and packed ready for transportation.

Throughout the views similar parts are marked with like letters of reference.

In the preferred embodiment of my invention, a series of bow or semi-circular supporting members or ribs *a* are mounted on bearers *b*, which are made in suitable lengths halved together at their junctions. These members or ribs carry on their inner sides the lining *d* of the building and on their outer sides the purlins *e* which carry the outer wall or roof *f*. The ends of the building consist of a series of panels *h* fitting in vertical struts *k*, said panels containing the necessary windows, doors, and ventilators.

The ribs *a* are each made up of three or more lengths which are secured to one another by means of angle-iron brackets a^1 and bolts and nuts. These ribs are of a suitable section to provide or assist in providing a recess *m* on each side thereof. In Figs. 10 and 11 of the accompanying drawings these ribs are shown of T-section iron, and the recesses *m* are formed by and between the horizontal parts of said ribs and slats *n* which are arranged in parallel relation to said horizontal parts on each side of the vertical part of the rib and fixed in relation thereto by any suitable means but preferably by clips *o* which are so shaped as to straddle both the vertical part of the rib and also the slat on each side thereof and which are fixed by means of split pins or the like passing through holes *p* in the clips and said vertical part of the rib. By this construction straight slats can be used which can be bent to conform to the bow shape of the building and the recesses have considerable depth for a purpose that will presently be made clear.

To the foot ends of the ribs *a* are riveted either angle iron brackets r^1 as shown in Figs. 5, 6 and 7 or plates *r* as shown in Fig. 9. The former is the preferred construc-

tion as by making these brackets (r^1) similar to the brackets a^1 all the elements of the ribs are alike and therefore become interchangeable. In the former construction the brackets r^1 are attached to cleats b^1 fixed to the sides of the bearers b, and in the latter construction the plates r are attached to the inner sides of the bearers b by coach screws, the ends of the ribs a in each case taking a bearing on the upper sides of the bearers b.

The joints of the purlins e, where such are necessary, are made to coincide with the ribs as shown in Figs. 3, 4 and 13, and said purlins—at the joints or otherwise—are fixed to said ribs by means of hook bolts such as v which engage holes in the ribs and after passing through the purlins are drawn up by means of nuts. For convenience in construction the hook bolts on adjacent ribs are arranged on opposite sides of their respective ribs.

The boards or the like forming the lining d, which are preferably tongued and grooved, are cut in suitable lengths to fit in between any two adjacent ribs and are held in place simply by engagement with the recesses m in connection with said ribs. These boards or sheets may be of wood or any other suitable material or composition and of any desired thickness as being subject to no nailing there is no destructive action in erection or dismantling. Owing to the depths of the recesses into which the boards fit, longitudinal shrinkage within limits is of no matter, while transverse shrinkage can be taken up by packing the boards or sheets tighter and if necessary inserting another length of the necessary width.

As a modification, the section of the ribs a may be such as will provide the necessary side recesses m. Such a section is shown in Fig. 12. The corrugated iron sheets forming the outer wall or roof f are secured to the purlins e by means of clawed hook bolts similar to those shown in Figs. 3, 4 and 8.

The panels h forming the ends of the building are constructed in any suitable manner, that illustrated being a convenient one. This consists in filling in the panels with vertically arranged boards s on the inside and with transversely or horizontally arranged boards s^1 on the outside. Alternatively the vertical joints of the boards s may be covered by vertically arranged fillets. The panels are bolted to the end ribs a, to the vertical struts k, and to the end floor joists c by hook bolts x. By providing ventilators h^1 in the panels between the inner and outer walls free circulation of air can be obtained throughout the longitudinally arranged air spaces.

The floor joists c are preferably made in two lengths and rest at their outer ends on the bearers b supporting the ribs a and on their inner ends on a central bearer b^2, said joists being kept in their correct position on the bearers b and b^2 by means of dowel pins carried by said bearers and engaging holes in the joists. The flooring z, which is grooved and tongued, is preferably made up in suitably sized panels z^1.

Fig. 14, in which the bag contains the hardware used, and h represents the various end panels, illustrates the manner in which the separate parts of the various structural elements of my portable building may be arranged and stacked for shipment and the small space which they occupy.

It will be observed that in the portable building described above, which is the preferred embodiment of my invention, the various structural elements are standardized and fabricated in two or more separate parts, and these parts, as well as the various structural elements, are detachably secured to each other, and the devices illustrated for securing the various parts together are so constructed and arranged that they may be readily and quickly put together, taken down and thus used over and over again.

Many advantages inhere in my portable building, some of which I will briefly summarize.

By reason of my construction the whole interior space of the building from end to end, side to side, and floor to roof, is free and unobstructed, thus providing a maximum of space for utilization.

It will be clear that the various structural elements may be standardized and fabricated at the plant and shipped to the point at which the building is to be erected. By reason of the standardization of the parts, the careful and reliable manufacture and the simplicity of assembling, a minimum of unskilled labor is required for rapid erection.

The structure is quickly and readily knocked down, without damage to the structural elements or any loss of material, such as roofing, etc., rendering additional parts or material unnecessary, and hence eliminating additional tonnage and cost for erection.

In the preferred form of my building, I utilize steel or iron for the roofing, which renders the structure fireproof and reduces the risk of fire spreading.

As the various structural elements are fabricated into a plurality of similar parts, it is possible to transport the elements necessary for a complete building in the smallest possible space, thus permitting minimum tonnage, either of ships, freight cars, trucks or other transportation vehicles.

As all the parts are standardized and constructed in a determined length of section, say a five-foot section, buildings can be erected of any length in multiples of five

feet, and hence are adapted for hospitals, garages, temporary dressing stations, stables, storehouses, mess halls, repair shops, and generally cover all the requirements and conditions whether for portable or permanent buildings.

Although I have shown in the preferred embodiment of my invention the various structural elements in a plurality of separate and similar parts, both the separate parts and the elements being detachably secured together, yet I do not desire to be limited to that form of construction, for I believe I am entitled to claim broadly a portable building in which the frame consists of semi-circular ribs tied together by purlins, longitudinally arranged on and secured to the ribs, with a roofing laid upon and secured to the purlins, thus affording a building sufficiently rigid and staunch and having entirely free and unobstructed interior space from side to side, end to end, and floor to roof.

Also, in the preferred embodiment of my invention I have shown particular devices for detachably securing the various structural elements and parts thereof to each other, but I do not wish to be limited to the precise devices shown, as it is obvious that many others may be used.

What I declare as my invention, and desire to secure by Letters Patent, is:—

1. In a portable building in which the whole interior space from end to end, side to side, and floor to roof is free and unobstructed, a frame comprising in combination supporting bearers, each comprising a plurality of similar parts, said bearers extending longitudinally of the building, semi-circular ribs resting upon and detachably secured to said bearers, and purlins, each comprising a plurality of parts longitudinally arranged on and detachably secured to said ribs, the parts of said bearers and purlins being of substantially the same length, whereby the building may be constructed of a length equal to any desired multiple of the length of said parts.

2. A portable building comprising in combination semi-circular ribs spaced at substantially equal distances apart, purlins longitudinally arranged on and secured to the ribs, an exterior roofing resting upon and detachably secured to the purlins, and a lining arranged between and detachably secured to the ribs, said lining comprising a plurality of narrow pieces of material of a uniform length equal to the distance between two of said ribs, whereby the building may be constructed of a length equal to any desired multiple of the distance between two of said ribs.

3. In a portable building in which the whole interior space from end to end, side to side, and floor to roof is free and unobstructed, a frame comprising in combination semi-circular ribs spaced at substantially equal distances apart, each comprising a plurality of similar parts, purlins each comprising a plurality of similar parts substantially equal in length to the distance between two of said ribs, said purlins being arranged longitudinally upon said ribs and detachably secured thereto, and an exterior roofing made up of separate parts and resting upon and detachably secured to the purlins.

4. A portable building comprising in combination supporting bearers, each comprising a plurality of similar parts, semi-circular ribs spaced at substantially equal distances apart and each comprising a plurality of similar parts, the ends of which rest upon and are detachably secured to the bearers, purlins each comprising a plurality of parts longitudinally arranged on and detachably secured to the ribs, an exterior roofing made up of separate parts and resting upon and detachably secured to the purlins and a lining made up of separate parts and arranged between and detachably secured to the ribs, the parts of said bearers, purlins and lining being all substantially equal in length to the distance between two of said ribs and being so arranged that the building may be constructed of a length equal to any desired multiple of the distance between two of said ribs.

5. A portable building comprising in combination, semi-circular ribs each comprising a plurality of similar parts, purlins each comprising a plurality of similar parts longitudinally arranged on the ribs, the said parts being joined together and secured to the ribs at the point of intersection of the purlins with the ribs.

6. In a portable building in which the whole interior space from end to end, side to side, and floor to roof is free and unobstructed, a frame comprising in combination semi-circular ribs of T-section arranged so that the vertical part of each rib is on the exterior thereof, and having slots formed adjacent the interior thereof for the reception of an inner lining, purlins longitudinally arranged and detachably secured to said ribs, an exterior roofing resting upon and detachably secured to the purlins and a lining comprising a plurality of relatively narrow pieces of material longitudinally arranged and held in position within the slots in said ribs.

In testimony whereof I have signed my name.

PETER NORMAN NISSEN.