Dec. 15, 1931. F. V. ELLSWORTH 1,837,152

HANGAR

Filed March 2, 1929 * 2 Sheets-Sheet 1

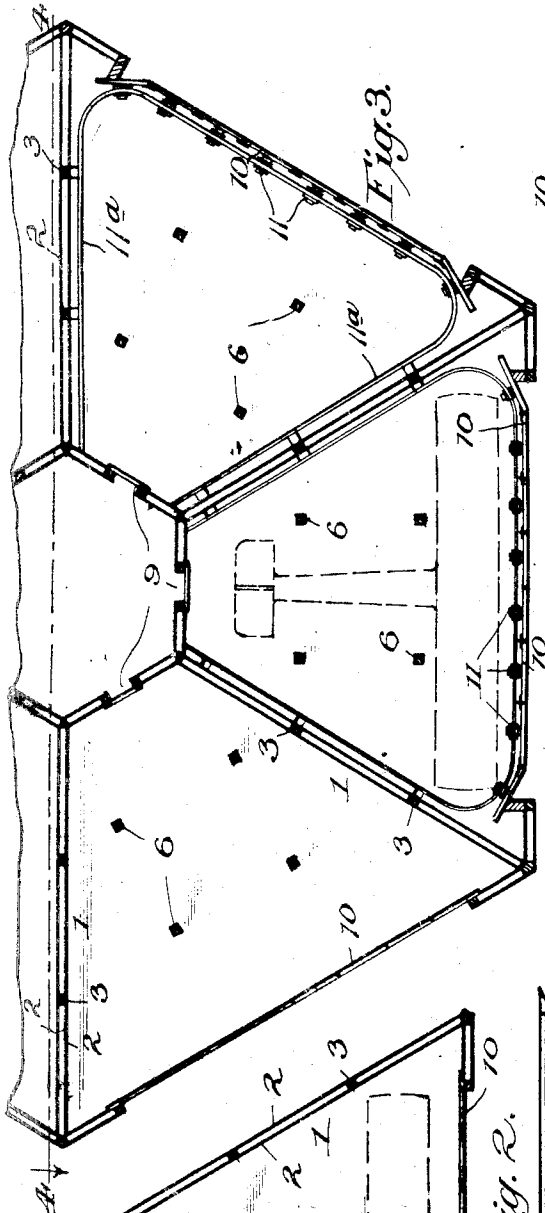


Fig. 3.

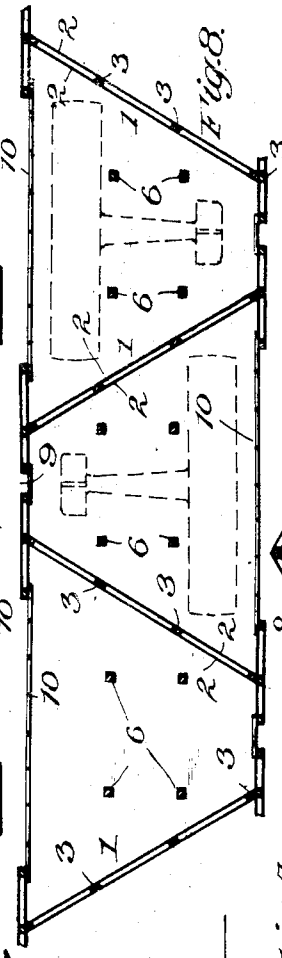


Fig. 8.

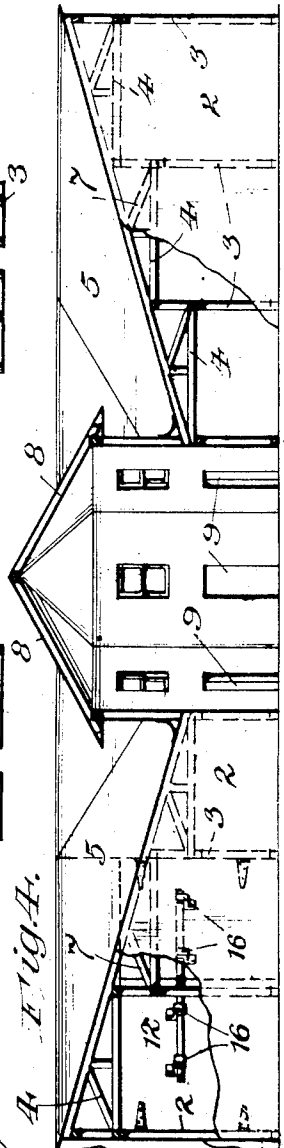


Fig. 4.

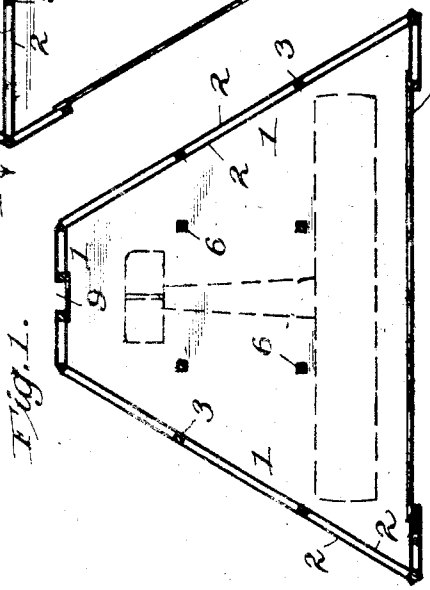


Fig. 1.

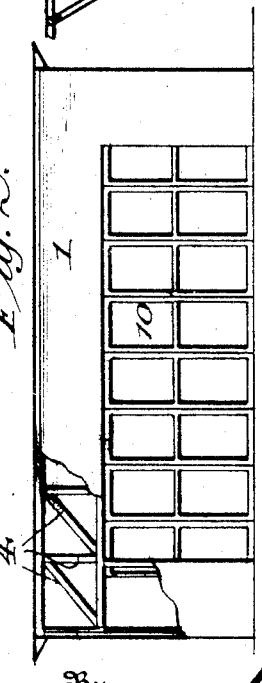


Fig. 2.

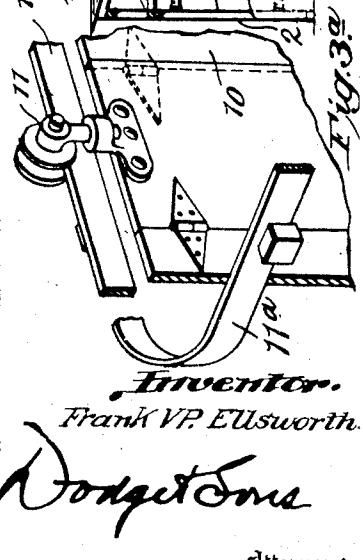


Fig. 3a.

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HANGAR

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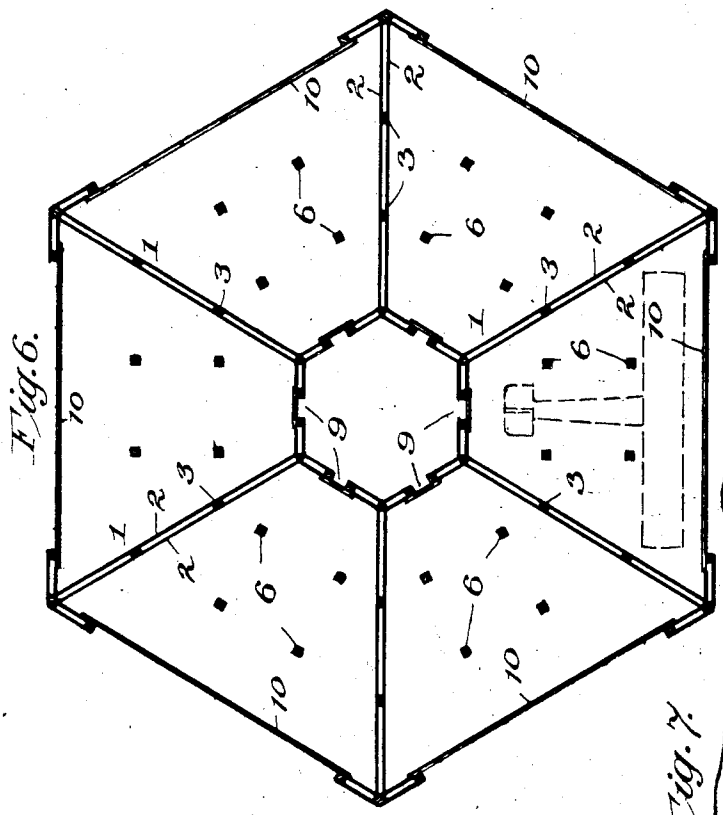


Fig. 6.

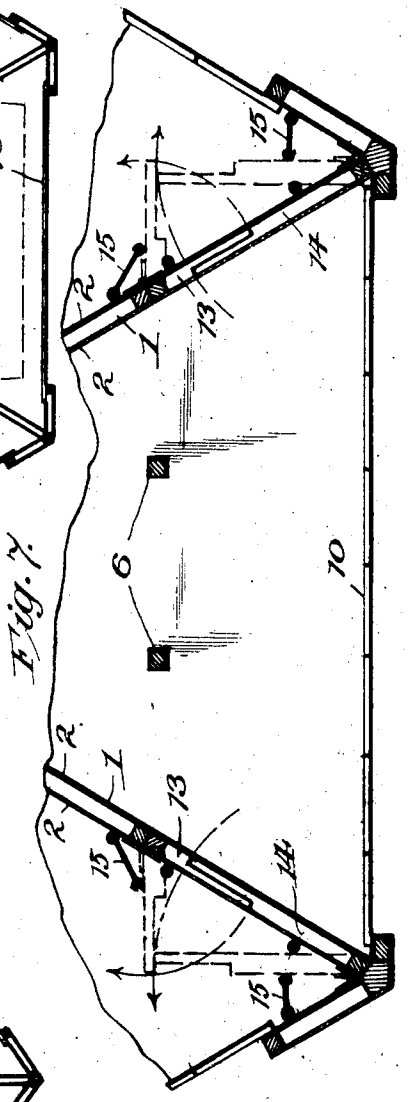


Fig. 7.

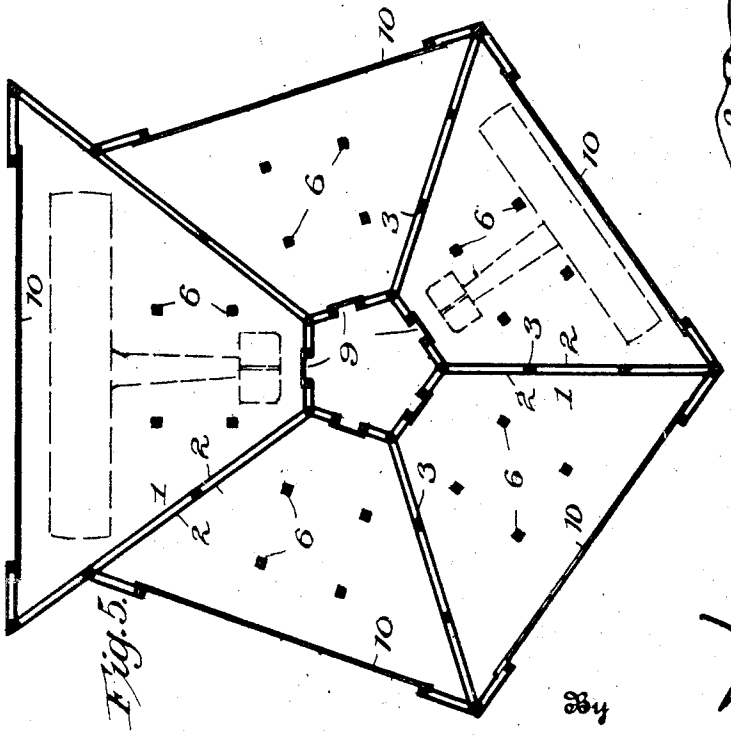


Fig. 5.

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Patented Dec. 15, 1931

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UNITED STATES PATENT OFFICE

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HANGAR

Application filed March 2, 1929. Serial No. 343,932.

This invention relates to hangars for aeroplanes, and has for its objects a construction which, through adoption of the unit system, enables one to erect quickly a convenient housing adapted to contain a single aeroplane or several such planes; to economize ground space and material; to quickly add to or take from the housing rooms, spaces or compartments provided; to arrange the several units in varying ways to suit different spaces; and to readily disassemble, transport, and reassemble the units constituting a hangar of one or of several sections.

A leading feature of the invention resides in giving to each section a generally triangular form, so that by arranging a proper number of sections side by side about a common center, a building or structure of geometrical form and good appearance is produced, preferably of pentagonal, hexagonal or octagonal outline, comprising a series of spaces or compartments with wide outer ends and narrow inner ends, corresponding somewhat closely to the outline and dimensions of aeroplanes of usual proportions. By truncating the narrow end of each section to produce a short plane, and grouping a suitable number of sections about a common center, a central space is left in the building suitable for a storage room or workshop, in close proximity to and easy reach of the several compartments, communication between which and said central space may be had by providing each such inner end wall with a doorway and door.

Each unit comprises an outer or front wall, one side wall, and a roof section of shape and dimensions to cover one stall or compartment of the completed hangar. As the side wall of each such unit serves as a partition between that unit and the adjoining unit, a hangar formed by a series of such units grouped about a central point and arranged in the requisite number to form the complete geometric figure for which the units are designed, renders unnecessary an individual second side wall for any one of the units. If, however, a single unit be employed, or a plurality of units, one or more of which faces in an opposite direction from another or others, an additional side wall or partition will be required for the open side of the last of the series of units.

Any suitable materials may be employed, metal being preferred because of its non-inflammability, its ready and accurate standardization, and ease of assemblage and disassemblage.

The accompanying drawings illustrate the embodiment of my invention in structures of varying form, all constructed of similar units. In these drawings:

Fig. 1 is a horizontal sectional view of a single unit section having its two side walls in 60° relation, so that six such units shall produce a building of hexagonal outline;

Fig. 2 is a front elevation of such unit section, partially broken away to show a simple type of trussing for the front or outer wall of the unit;

Fig. 3 is a horizontal sectional view of a hexagonal hangar, approximately half of which is broken away to economize space on the sheet;

Fig. 3ª is a fragmentary view illustrating the construction of the folding doors and the mode of suspension thereof;

Fig. 4 is a vertical sectional view, taken on the line 4—4 of Fig. 3;

Fig. 5 is a horizontal sectional view of a hangar composed of five unit sections, each having side walls diverging in 72° relation, so that five unit sections constitute a pentagonal structure, one section being shown extended to accommodate an aeroplane of larger size than could be housed in the other compartments;

Fig. 6 is a horizontal sectional view of a hexagonal hangar, the walls of the several sections being in 60° relation one to another.

Fig. 7 is a fragmentary horizontal sectional view, illustrating a mode of providing additional wing space to accommodate a plane of wing spread greater than normally provided for;

Fig. 8 is a diagrammatic plan view showing how the same unit section can be assembled in a straight line or series, alternate sections facing in opposite directions.

The drawings are essentially diagram-

matic, since usual methods of construction, variable according to the materials used, will be employed.

In practice, and particularly where a structure capable of ready erection, dismantling, and transportation is desired, it is deemed expedient to make each triangular unit with double or hollow walls, 1, formed of sheets 2 of metal, spaced apart sufficiently to enclose uprights 3, of wood or metal, and overhead trussing or bracing 4 carried by said supports and serving in turn to support the roof 5. The roof proper may be formed of sheet metal, tinned or otherwise coated to prevent rusting, or any other usual type of flexible roofing material capable of being rolled into small, compact compass, may advantageously be employed. Further to support the roof, particularly for use in sections subject to heavy snowfall, additional uprights 6 and overhead trusses 7 may be provided at points intermediate the converging side walls of, or the partitions between, sections, where two or more stalls or compartments are erected side by side. In such situation one wall or partition serves for two adjoining sections or compartments.

In Figs. 1, 3, 5, 6, 7 and 8 where aeroplanes are indicated by dotted lines, it will be seen that adequate space can be provided for planes of usual dimensions on very small ground area, the upright supports within each space or compartment being spaced sufficiently apart to permit the read end or empennage to pass readily between them without liability of contact or injury.

Aeroplanes of different type or design vary somewhat in lateral measurement or wingspread as related to fore-and-aft measurement, and this fact may well be taken into consideration in designing, or selecting a design for, a hangar for any given situation. If the plane be relatively long in a fore-and-aft direction as compared with wingspread, the sections may be of 45° side wall relation; if of relatively great wingspread as related to fore-and-aft measurement, a wall relation of 90° may be adopted, the former giving, in a full geometric arrangement, an octagonal structure, and the latter, a square structure. For the general run of planes, however, the pentagonal and hexagonal structures with units having respectively 72° and 60° wall relation, will perhaps be found most suitable.

Whatever geometric figure the unit sections may produce when assembled in full number, they will, if truncated at the end nearest the common center about which they are grouped, enclose a central space of the same outline as the outer boundary, and of a size depending upon the extent to which the units are truncated. This space may advantageously be utilized by extending the inner end walls of the units to suitable height and supporting a roof 8 thereon as shown in Fig. 4, said space being fitted up as a watchman's room, a work shop, a storage room, or the like. Where the units are sufficient in number to produce a symmetrical or complete geometric structure, it will be found convenient to use the ground floor for a repair shop, with suitable equipment in the way of lathe, benches and tools, and an upper story for a watchman's quarters.

It will be obvious that with doorways, 9, one for each plane-space or compartment, in the inner end walls of the several sections, access can be had to any and all sections with minimum travel of workmen and movement of material. With glazed doors, or with a window in each such inner wall, a watchman or attendant in the central room can see what is stored, and what is occurring, in each space or compartment without going outside of such room, or exposing himself to the outside temperature or to inclement weather. A fire in any section can be seen, and will generally be observed in its incipiency, and can be quickly reached and extinguished by the attendant in the central room or chamber, without opening communication between any two of the spaces or compartments, and only one plane will be subject to injury by fire, water, or both. If glazed openings be provided above the outer doors, fire within may be discovered from outside the structure, and an alarm can be sent in promptly and before serious damage occurs.

It will be seen from the foregoing description that the present invention affords a maximum storage capacity for a minimum ground space, at a small cost, and permits of rapid erection, removal, and transportation.

If desired the central structure can be made wholly separate from the main hangar, but as the utilization of a single wall for the inner structure and for the proximate ends of the spaces or compartments, simplifies and cheapens construction, and gives the maximum available space, the single wall construction is preferred.

The outer doors, 10, which must be such as to permit practically the entire width of the outer or front end of each space or compartment to be opened, may be of any common or well-known type. In Fig. 1 the doors are shown as made up of comparatively narrow panels hinged one to another at their vertical side edges, so that they may be swung outward or inward; folded back and forth, one upon another; or carried by overhead hangars provided with pulleys 11 to run upon rails or bars 11^a secured in any usual or convenient way to the walls or roof of the structure as indicated in Fig. 3.

In Fig. 4, two wide doors are indicated, meeting at the midwidth of the door opening, and provided with the common locking bar 12 pivoted at or near its midlength to

one leaf of the door, and entering and engaging suitable irons 13 on the doors or door jambs.

If desired a sheet metal curtain or door may be caused to wind upon a roll above the doorway, as is now often done in warehouses, the sheet metal being horizontally corrugated to facilitate its winding and to give due stiffness against facewise pressure. As all these types of closure are common and well known, and not patentable, it is deemed unnecessary to illustrate them in detail, or further describe them.

It may and doubtless will happen more or less frequently, that a plane of greater wingspread than usual will need to be housed, and to meet such a contingency I have provided a detail which is illustrated in Fig. 7. In this figure, which is a horizontal sectional view showing the forward or outer end of one space or compartment, the side walls 1 are vertically divided to produce two overlapping portions 13 and 14 which may be swung outward to the positions shown by dotted lines in said figure. The division will be at such point as to afford space for the full fore-and-aft measurement of the plane or planes, and the outer faces of sections 13 and 14 will be provided with a hook and eye 15 or other simple fastening, to retain them in their temporary adjustment.

Similarly, a plane of more than usual length may need to be housed, and to this end one or more of the unit sections or compartments may have its side walls extended outward further than others, as shown in Fig. 5.

By suitably proportioning the various parts of the wall, roof, and door structures to unit dimensions, it is entirely practicable to produce standardized parts, admitting of very compact and convenient storing of the several units, transporting them with minimum requirements of carrying space, permitting their ready handling, erection and disassembling, and ensuring speedy provision of adequate and safe housing of planes in a practically fireproof structure, at very low cost as compared with any permanent structure. Where, however, a more permanent structure is desired and the greater cost is of minor importance, the same general features of design as are here set forth may be retained, and the like advantages secured. Brick or stone, cement, and like materials may in such cases be used to advantage; but the cheaper and lighter construction is of marked advantage for less permanent structures. This is particularly true where bodies of troops carry air planes, and have need of readily portable housing facilities, capable of rapid erection and dismantling.

Practical construction and use of a structure in accordance with the general plan here set forth has proven its worth, and marked convenience.

Where the structure employs sections grouped about a common point or central space, ample downspouts or pipes will be located at the lowest point or points of the roof, to carry off promptly the water due to rain or melting snow, this being important because of large aggregate area of the roof of a structure of such form or outline.

I am aware that it has long since been proposed to construct buildings, including hangars, of geometrical outline, as pentagonal, hexagonal, octagonal, etc., and I make no broad claim thereto. In no prior instance so far as I know, has it been proposed to construct a hangar of like portable unit sections, capable of ready assemblage and disassemblage, nor am I aware that provision has heretofore been made for convenient temporary enlargement of space to accommodate a plane of more than usual wing spread. I believe also that I am the first to construct a hangar having a plurality of stalls or compartments, one or more of which is or are of greater radial measurement than others, to accommodate a plane or planes of more than customary length. These features are of considerable importance, particularly where both large and small planes, and planes of different but definitely known types are to be housed, as in the cases of naval and military equipment.

I claim:—

1. A hangar unit section of generally triangular outline, having its side walls near the front or outer end divided, hinged, and arranged to overlap when in normal plane, but when swung outward, serving to widen the space between said side walls to accommodate a plane of greater wing spread than it could otherwise receive.

2. A demountable hangar unit of generally triangular outline, comprising an outer end wall, a single side wall, and a roof section, whereby said unit is adapted, when combined with a like unit or units, to produce a plurality of sections having a common center from which their respective single side walls radiate, and whereby each side wall is made to serve as a partition between two proximate units.

3. A hangar comprising a series of separable unit sections, the side walls of one or more of said sections being provided with portions capable of being thrown out of plane with the main bodies of such walls, to provide room for planes of wing spread in excess of the normal space between such partitions.

4. A hangar for aeroplanes, comprising a series of like demountable unit sections, each of a generally triangular outline and comprising a front wall, one side wall and a roof section, arranged side by side about a

common center, whereby a structure of geometric form is produced containing a number of stalls or compartments, each adapted to contain a single aeroplane, with a minimum use of ground space.

5. A unit section for demountable aeroplane-hangars, comprising an outer or front wall, a side wall, and a symmetrical roof section of substantially triangular form, the longitudinal edges of which roof section meet the front or outer edge thereof at like acute angles; and a removable second side wall to complete the unit section when a single section is employed, or when fewer sections than necessary to produce a hangar of complete polygonal form are used.

6. A portable hangar composed of a plurality of like demountable units, each having an outer or front wall, one side wall and a roof section, the front wall being provided with an opening extending approximately the entire width of said wall, said units being grouped side by side about a common center and detachably joined together to produce one self-sustained demountable structure.

7. A hangar composed of a series of similar demountable unit sections, each of generally triangular form and each comprising an outer or front wall, one side wall and a roof section, said units being grouped about a common center and each truncated at the end nearest such center to afford a central space or chamber, the inner end walls of the respective sections being provided with doorways opening into said central space and the outer end walls being provided with doorways approximately co-extensive with the width of the outer walls.

In testimony whereof I have signed my name to this specification.

FRANK VP. ELLSWORTH.