Nov. 28, 1967 N. T. GILROY 3,354,590

BUILDING FRAME STRUCTURE

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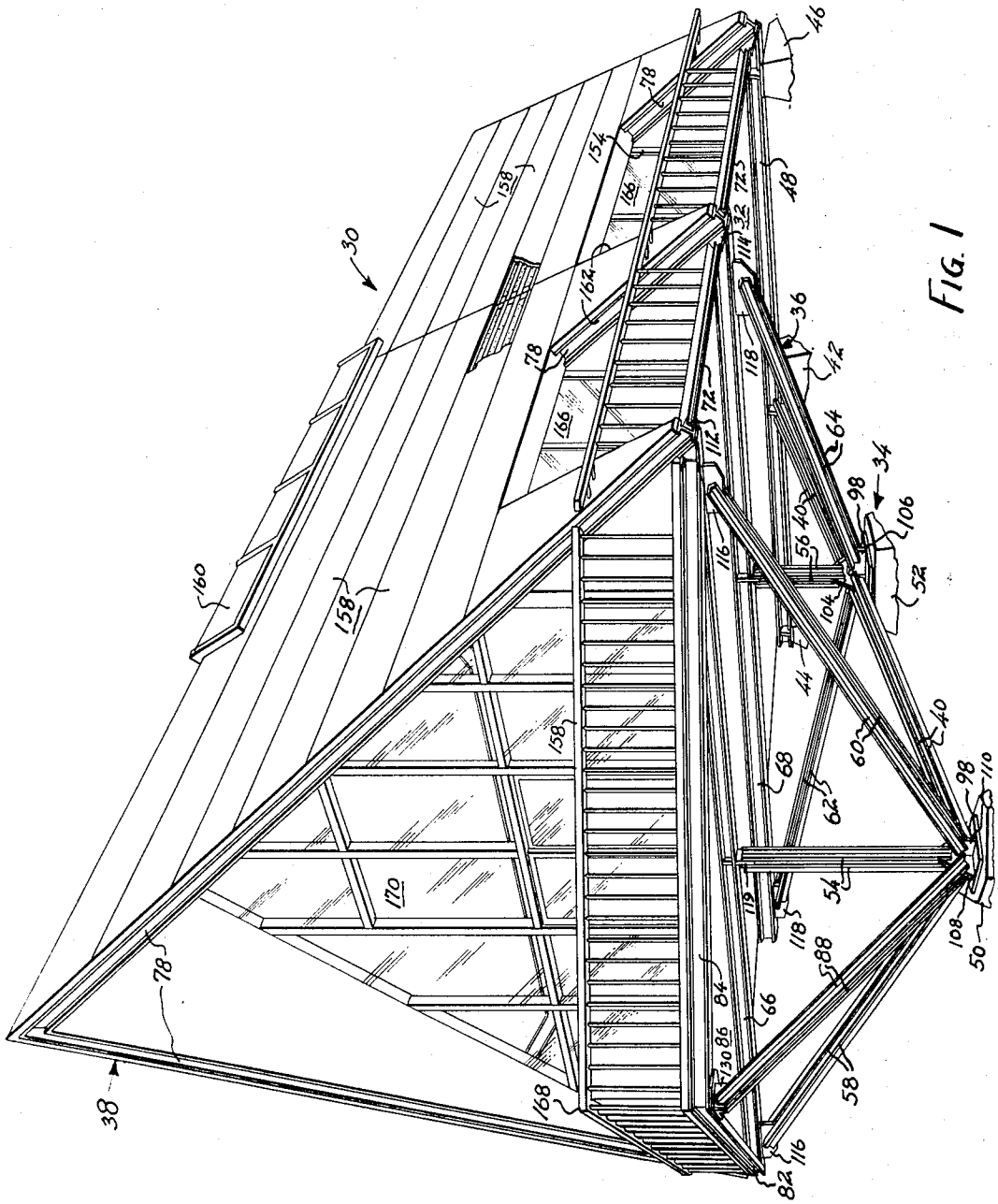


FIG. 1

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BUILDING FRAME STRUCTURE

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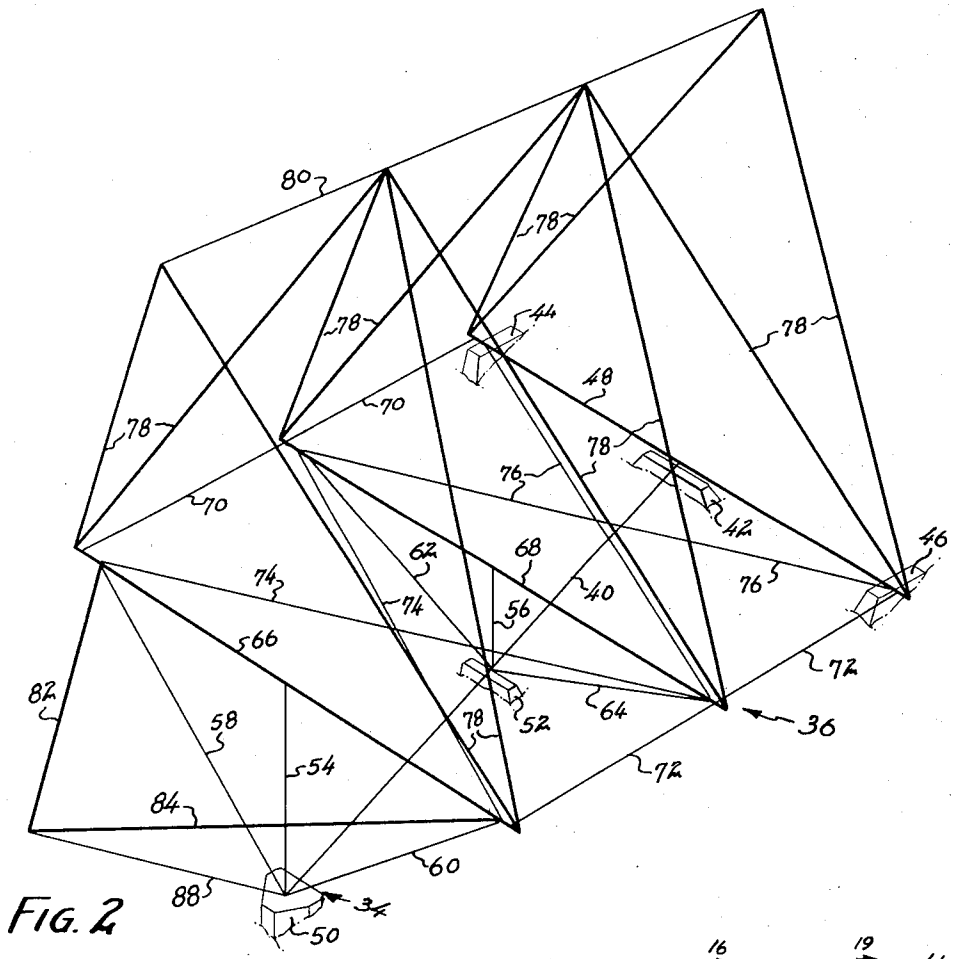


FIG. 2

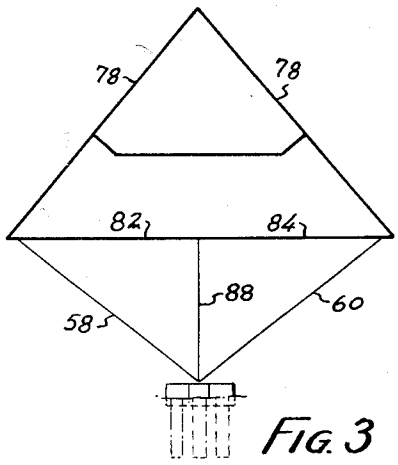


FIG. 3

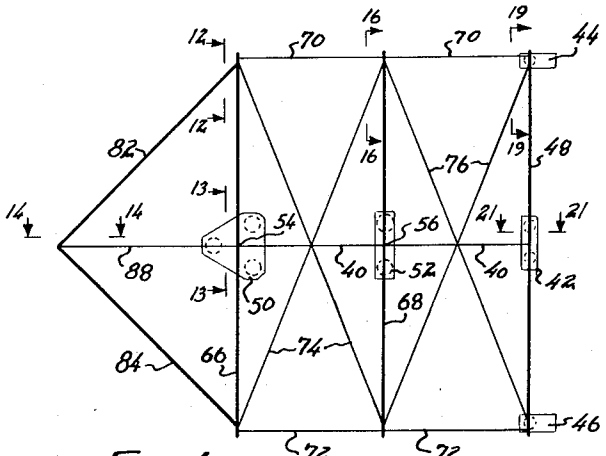


FIG. 4

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BUILDING FRAME STRUCTURE

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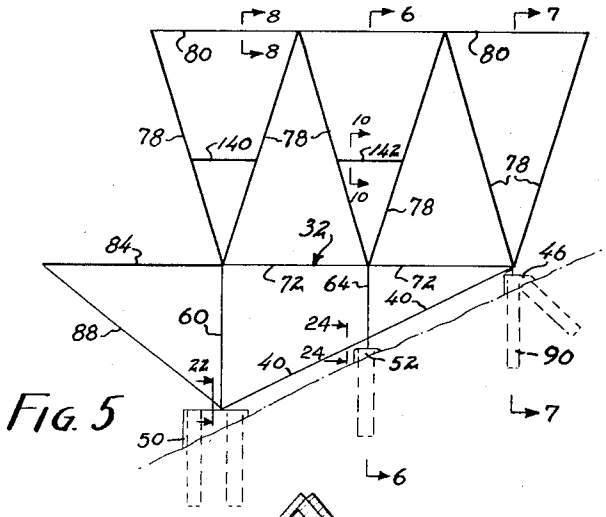


FIG. 5

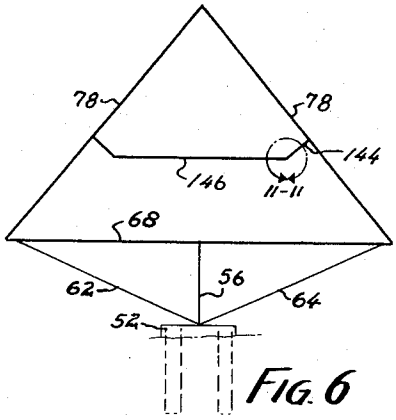


FIG. 6

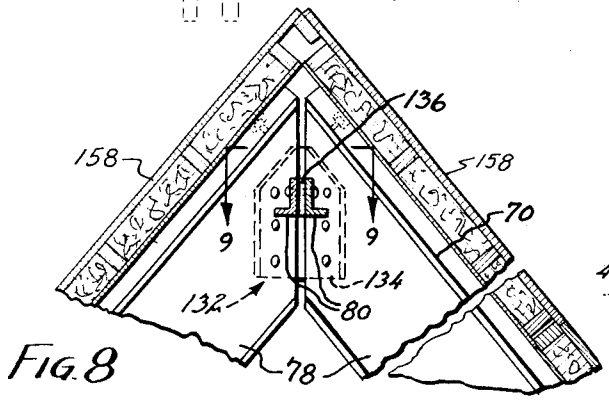


FIG. 8

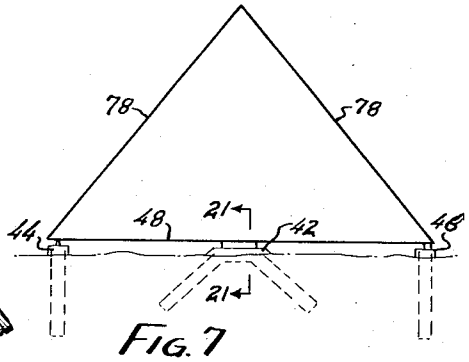


FIG. 7

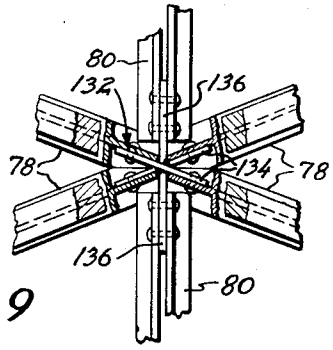


FIG. 9

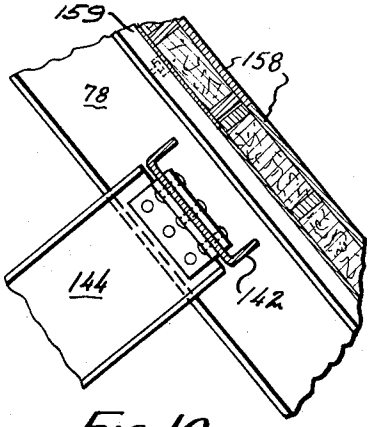


FIG. 10

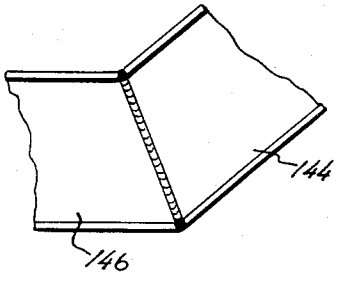


FIG. 11

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BUILDING FRAME STRUCTURE

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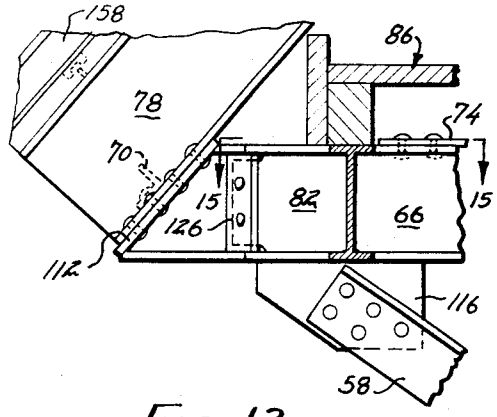


FIG. 12

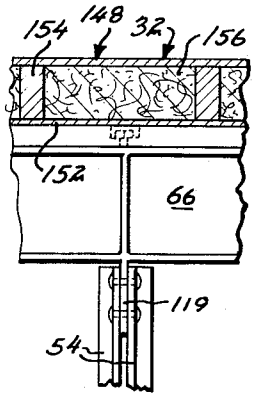


FIG. 13

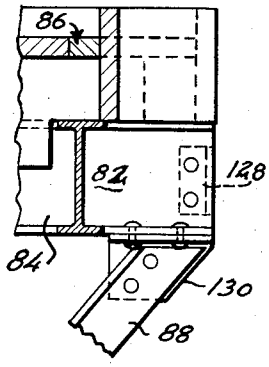


FIG. 14

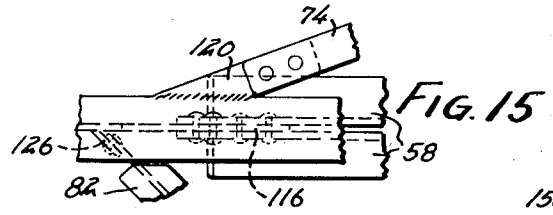


FIG. 15

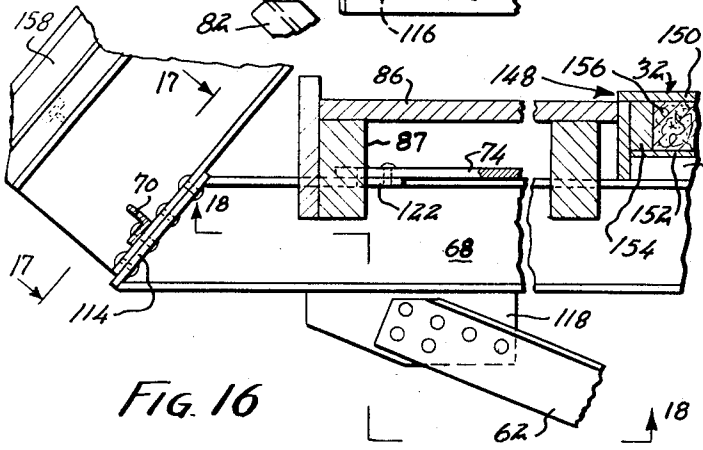


FIG. 16

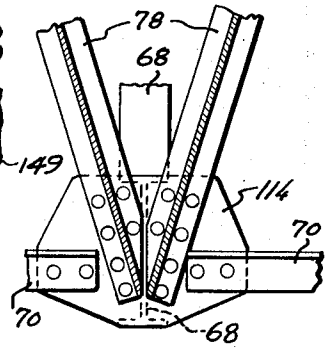


FIG. 17

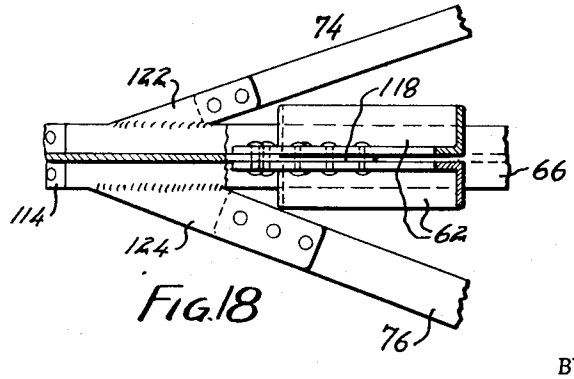


FIG. 18

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BUILDING FRAME STRUCTURE

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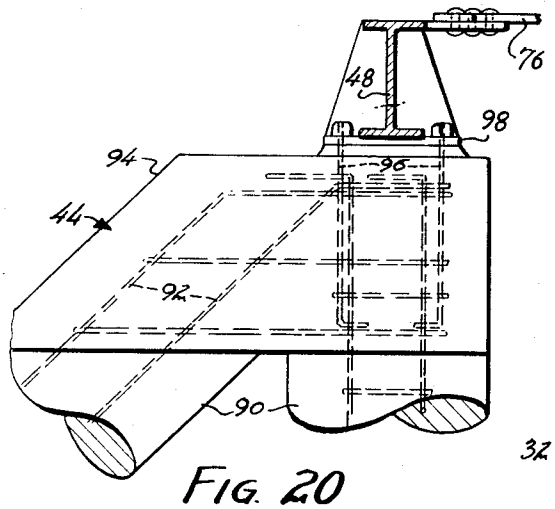


FIG. 20

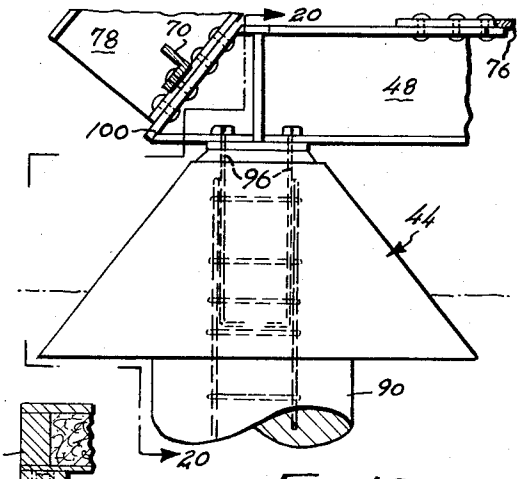


FIG. 19

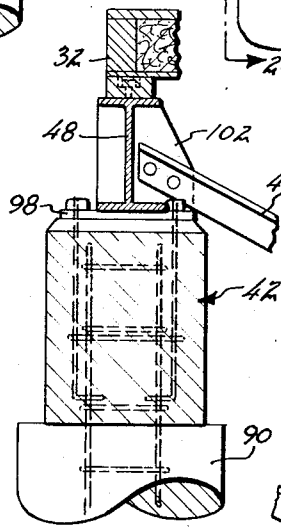


FIG. 21

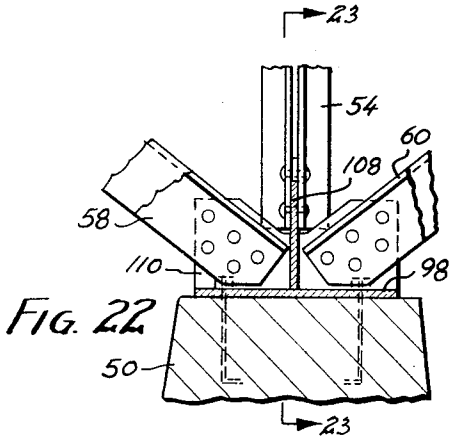


FIG. 22

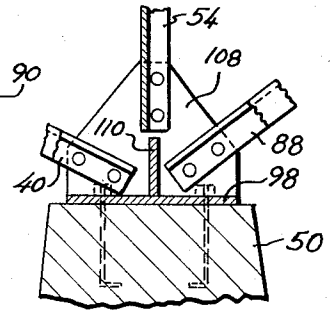


FIG. 23

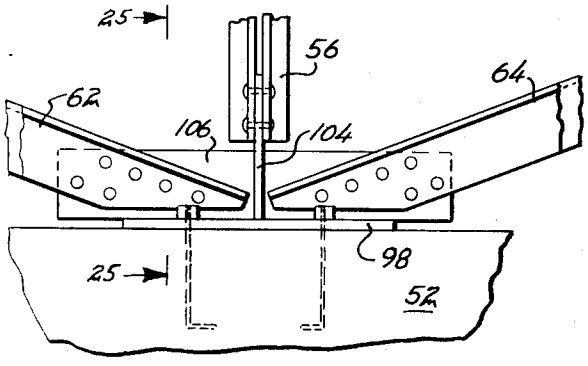


FIG. 24

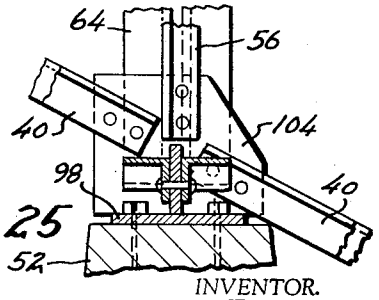


FIG. 25

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United States Patent Office 3,354,590
Patented Nov. 28, 1967

3,354,590

BUILDING FRAME STRUCTURE

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Larkspur, Calif. 94939

Filed May 3, 1965, Ser. No. 452,716
13 Claims. (Cl. 52—73)

ABSTRACT OF THE DISCLOSURE

The disclosure pertains to a building structure particularly adapted for erection on hillside sites and includes the combined foundation and frame system for the building. The frame and foundation members are triangularly arranged to absorb all stresses on the building, and no loads are absorbed by the diaphragm or skin of the building. The foundation members diverge upwardly from ground footings to the main floor and superstructure members converge from the main floor upwardly to a roof ridge.

This invention relates to building structures especially adapted for installation on hillside sites, and more particularly to a combined foundation and frame system for supporting such structures.

The effective utilization of sloped building sites for houses, cabins or other dwellings has long been a challenging problem to architects and builders. Generally, the problem prior to the present invention was that of providing a structure with sufficient strength and support to withstand severe wind and earthquake loads as well as static loads and yet one which is esthetically appropriate, as well as fully compatible with and complementary to the natural beauty of the site. The general object of the present invention is the solution of this problem.

Another object of the present invention is to provide a versatile building structure for hillside sites that can be easily situated in any one of a wide array of alternate positions on the site without entailing a large amount of grading or excavation of the hillside. The natural terrain of a typical hillside lot may slope at various degrees in several different directions and yet for purposes of capturing the optimum view as well as for other reasons, it is essential to orient the building in a certain position on the lot. Heretofore, this often required that extensive excavations be made to accommodate the building foundation. Such procedures are not only costly in time and labor, but usually result in a thorough disruption of the hillside and destruction of its natural beauty.

Long prior to the present invention, attempts were made to avoid extensive excavations by utilizing vertical piers supported by footings and placed at the corners of the building. However, such piers or stilts, like common piling, tend to detract rather than enhance the appearance of any hillside dwelling, and they generally require extensive cross bracing to provide adequate stability and strength. A further disadvantage is that such stilt-like supports do not readily facilitate the orientation of a house on a site having irregularly sloped portions. On such sites, for example, each vertical support member must be supported by a separate foundation member, and its length may vary considerably depending on the lot contour.

The present invention avoids the necessity for making costly excavations or the need for the heavy stilt-type supporting structure for hillside structures. In contrast, it provides a unique supporting framework that allows the

building to be oriented to almost any position on the slope despite the direction of the steepest grade. Moreover, the under portion of the frame is supported on single footings located centrally with respect to the main floor of the structure. No vertical piers are required at the corners of the main floor and thus the slope beneath it can be left substantially unmolested, thereby greatly enhancing the appearance of the structure on its site.

Another object of my invention is to provide a frame structure for hillside houses that is unusually strong, durable and capable of resisting severe earthquake and wind loads, and yet a structure that is unusually light and made up of slender members.

The aforesaid objectives are accomplished in the present invention by a unique frame system which provides both the necessary underfloor support for a hillside house or cabin, as well as the support for its superstructure. The structural elements making up the frame system are straight, slender members which are strong in tension and compression. After the proper footings have been installed on the hillside building site, these frame elements which have been precut to the proper length are then pin or bolt connected at their ends on the site to form the predetermined frame structure. When connected, the frame structure is triangulated in all directions so that a load due to wind or earthquake shock applied to any location on the frame above or below the main floor level will be transmitted to and carried by all of the remaining members of the frame in either tension or compression.

It is, therefore, another object of my invention to provide building structure having an entire frame and undersupport structure comprised of structural steel members which can be cut to a predetermined length at a factory and assembled on the building site.

Another object of the present invention is to provide a house or cabin structure particularly adapted for installation on sloped building sites whose frame and undersupport structure is comprised of precut structural frame members which can all be pin connected when the house is assembled on the building site.

Still another object of my invention is to provide a house or cabin for a sloped building site having an unusually attractive A-frame configuration.

A further object of the present invention is to provide a building structure for sloping lots having generally an A-frame shape wherein the diaphragm covering the frame to form the roof or walls and the floor does not take any load except the weight load distributed over it, the frame members themselves taking all major loads on the structure such as earthquake or wind loads. This is an important feature of my building because it makes it possible to utilize many additional exterior and interior architectural design features. For example, any portion of the sloped roof area can be cut out completely or glazed in a desired pattern for windows or skylights. Vertical side walls can be utilized to increase the effective living space within the building.

Other objects, advantages and features of my invention will become readily apparent from the following detailed description presented in accordance with 35 U.S.C. 112.

In the drawings:

FIG. 1 is a view in perspective of a building embodying the principles of the present invention;

FIG. 2 is a schematic view in perspective showing the arrangement of the frame members for the building shown in FIG. 1;

FIG. 3 is a schematic view in front elevation of the building frame structure shown in FIG. 2;

FIG. 4 is a schematic plan view showing the floor frame structure of the building in FIG. 2;

FIG. 5 is a schematic view in side elevation showing the frame structure of the building in FIG. 2;

FIG. 6 is a schematic view in elevation taken along the line **6—6** of FIG. 5;

FIG. 7 is a schematic view in elevation taken along the line **7—7** of FIG. 5;

FIGS. 8–25 are fragmentary views showing structural details of the building of FIG. 1 and taken at the locations shown in FIGS. 4–7, as indicated:

FIG. 8 is an enlarged fragmentary view taken along the line **8—8** of FIG. 5;

FIG. 9 is an enlarged view in section taken along the line **9—9** of FIG. 8;

FIG. 10 is an enlarged fragmentary view taken along the line **10—10** of FIG. 5;

FIG. 11 is an enlarged view taken along the line **11—11** of FIG. 6;

FIG. 12 is an enlarged view taken along the line **12—12** of FIG. 4;

FIG. 13 is a view in section taken along the line **13—13** of FIG. 4;

FIG. 14 is a view in section taken along line **14—14** of FIG. 4;

FIG. 15 is a view in section taken along the line **15—15** of FIG. 12;

FIG. 16 is a view in section taken along the line **16—16** of FIG. 4;

FIG. 17 is a view in section taken along the line **17—17** of FIG. 16;

FIG. 18 is a view in section taken along the line **18—18** of FIG. 16;

FIG. 19 is a detailed view of a footing for the building frame taken along the line **19—19** of FIG. 4;

FIG. 20 is a view in section taken along the line **20—20** of FIG. 19;

FIG. 21 is a detailed view in section of another footing for the building frame taken along the line **21—21** of FIG. 4;

FIG. 22 is a detailed view in section showing another footing installation for my building frame taken along the line **22—22** in FIG. 5;

FIG. 23 is a view in section taken along the line **23—23** of FIG. 22;

FIG. 24 is a detailed view of an intermediate downhill footing taken along the line **24—24** of FIG. 5;

FIG. 25 is a view in section taken along the line **25—25** of FIG. 24.

In the drawings, FIG. 1 shows a building **30** embodying the principles of the present invention as it appears when erected on a typical hillside site for which it is most ideally suited. Broadly speaking, it comprises a horizontally oriented main floor **32** having one end located closely to a horizontal ground line along the slope and extending outwardly therefrom. A foundation system **34** embedded in the ground at predetermined locations beneath the main floor **32** is connected to the floor by a supporting lower frame structure **36**. The latter is interconnected and cooperates in a unique manner with an upper frame structure **38** extending above the main floor and supporting the superstructure of the house. As will be seen from the following description, the upper and lower frames combine as an integrated system to provide many distinctive features and advantages.

The configuration and arrangement of structural elements in the entire frame system is such that relatively light and slender frame members such as conventional structural steel members can readily be used in forming it. These members may be precut at a factory to predetermined lengths and then assembled later at the building site.

As shown schematically in FIGS. 2 through 7, the lower frame structure **36** supporting the main floor **32** comprises a slope beam **40** which is located just above the ground and is connected at one end to a footing **42** at the uphill end of the foundation system **34**. The footing **42** is centrally located between and aligned with two other similar footings **44** and **46** that together support a cross beam **48** forming one end of the main floor structure. If desired, the footings **42, 44** and **46** could be combined as a single foundation member such as a continuous wall. From the footing **42** the slope beam **40** extends down the slope of the site and is connected at its lower end to another foundation pier or footing **50**. In the embodiment of the invention shown, an intermediate footing **52** is provided between the footings **42** and **50** on the slope grade, the beam **40** being conveniently formed in two aligned sections connected to the intermediate footing **52**. The slope beam **40** lies directly below the longitudinal center line of the floor **32** and extending upward vertically from the footings **50** and **52** are vertical support members **54** and **56**, respectively. In the same vertical plane as the support **54**, which is transverse to the slope beam **40**, and extending outwardy and upwardly from it are a pair of side support members **58** and **60** of equal length. A similar pair of shorter side support members **62** and **64** extend upwardly and outwardly at equal angles from the foundation pier or footing **52** and from opposite sides of the vertical support member **56**.

The upper ends of the members **54, 58** and **60** are connected to a transverse floor frame member **66**, and the members **56, 62** and **64** are connected to a similar floor frame member **68**. These floor frame members **66** and **68** are parallel to each other and also to the cross beam **48**. Connected at right angles between the floor members **48, 66** and **68** at their opposite ends are longitudinally extending floor frame members **70** and **72**. Extending diagonally between the floor members **66** and **68** are a pair of diagonal bracing members **74**, and a similar pair of bracing members **76** extend diagonally between the floor members **68** and **48**.

The superstructure or upper frame portion of the house **30** is comprised of a series of rafter beam members **78** that slope upwards from opposite sides of the main floor **32**. Pairs of adjacent rafter beams are secured closely together at the ends of the transverse floor frame members **48, 66** and **68** and they diverge as they extend upwardly at an angle. At their upper ends the rafter beams **78** of adjacent pairs come together and are connected by a composite central ridge beam **80**. As shown in FIG. 2, the sloping rafter beams **78** extending upward from both sides of the main floor essentially form a pair of triangulated trusses which lean together and are connected at their upper ends to the common ridge beam **80**.

At the front of the frame structure **36** forming the main floor **32** which is well above the foundation footing **50**, I provide a pair of horizontal deck frame members **82** and **84** which are each connected near one end to the transverse beam **66**. These latter members extend outwardly to converge, connect together and form a support for an extended deck portion **86** of the main floor (see FIG. 1). At the point where the members **82** and **84** converge and are connected together, another supporting beam **88** is provided which lies in the same vertical plane as the upright members **54** and **56** and extends downwardly at an angle to the deck and is fastened to the front foundation pier **50**.

It will be noted from the foregoing description taken with FIG. 2 that the entire frame structure is a series of frame members connected to form a multi-triangular frame system wherein loads applied to any part of the superstructure are transmitted to and distributed throughout the entire frame to the foundation. The location of the foundation comprised of the footings **42, 44** and **46** along a first line beneath one end of the building and the footings **50, 52** along a line perpendicular to the first line and

directly below the center line of the building, is another factor that contributes to the even load distribution throughout the frame. This feature of load or stress distribution, which can be established by conventional engineering stress analysis procedures, contributes greatly to the strength and efficiency of my building structure. It eliminates the need for a diaphragm covering the frame to carry any load except the weight bearing on it. It also enables the frame members to be assembled and connected on the building site by simple bolt or pin connections or by welding, if desired. Moreover, it makes possible the use of relatively light frame members which can be relatively inexpensive and easy to handle.

When the house or cabin **30** is assembled on the building site, the foundation system **34** is first installed and the precut frame members forming the load bearing members frame system described above are then connected together. The following portions of the specification set forth in greater detail the various components of a preferred foundation system **34**, as well as a description of typical connecting joints for the members of the frame system.

In supporting a structure on a sloped building site, it is essential that the foundation be extremely stable and well anchored. The actual strength requirements for footings comprising a foundation may vary considerably according to a lot topography, soil conditions, and also the safety factor desired over extreme loads such as wind gusts and earthquake shocks which the building may be subjected to. In the foundation system shown in FIGS. 5 through 7, each footing or pier may be supported by one or more subterranean pilings **90** which extend into the ground to the necessary depth (e.g., 5 to 15 feet). Such pilings may be oriented vertically or at a predetermined angle to the lot grade in order to provide suitable strength and shock resistance characteristics in different directions. These pilings, as shown typically in FIGS. 19 and 20, may be conveniently formed by first drilling a proper sized hole and then filling it with concrete which is preferably reinforced by internal steel rods **92** and the like. When more than one piling is used such as for the footing **44**, their upper ends are joined together by a block or slab **94**. On the rear footings **42**, **44** and **46**, a pair of subterranean reinforced concrete pilings **90** are preferably used to provide extra strength and stability to resist any overturning forces that would be transmitted by the frame to the foundation because of a severe loading applied to the forward end of the building. Here, one of the pilings is installed vertically and the other extends into the ground at an angle substantially perpendicular to the lot fall line.

For other footings, one or more of the concrete pilings **90** may be oriented in the ground at angles in different directions. For example, as shown in FIG. 7, the pilings for the central footing **42** are angled in opposite directions from the longitudinal center line of the house **30**. The block or slab **94** at the upper ends of the concrete pilings is secured to them by means of the internal reinforcing members such as the steel rods **92** which extend between the pilings and the slab. Extending above the upper level of the block or slab on each footing are embedded bolt members **96** to which is preferably secured a steel mounting plate **98** for receiving the frame members supported by the footing. In this respect, all of the footings are formed in a similar manner.

While the foundation means shown are fully adequate to support the building **30**, other foundation means such as bell-based concrete footings or steel piling could also be utilized within the scope of the invention.

Turning now to the details of the frame member connections, and with reference to FIGS. 19, 20 and 21, the cross beam **48** is supported on the plates **98** fixed to each of the footings **42**, **44** and **46** by the bolt members **96**. The ends of the cross beam are beveled at an angle equal to that to be formed by the upwardly extending rafter beam members **78**. An adapter plate **100** attached to each end of the cros beam serves as a means for mounting the end of a sloped rafter beam **78** to it.

Above the central footing **42** a vertical support flange **102** is attached as by welding between the flanges of the cross I beam **48** and provides a means for securing the upper end of the slope beam **40** to the cross beam (see FIG. 21). Thus, the slope beam **40** is preferably formed from two right angle beam members which are bolted to opposite sides of the flange **102**. At their lower ends the slope beam members **40** are bolted to an upright flange **104** mounted on the base plate **98** of the intermediate footing **52**, as shown in FIGS. 24 and 25. Also bolted to the support plate are a pair of right angle structural beam members forming the upright vertical support member **56**. Extending transversely through a slot in the support plate **104** is another support member **106** which rests on the base plate **98** of the intermediate footing **52**. To this latter support plate **106** are attached pairs of angular beam members **62** and **64** which comprise the angular supports that extend upward to opposite sides of the main floor.

In FIG. 22 are shown the details of the lowermost footing **50** and the various frame members attached to and supported by it. Here an upright support plate **108** rests on the edge of the base plate **98** of the footing **50** and to it are bolted the lower ends of the lower grade beam section **40**. Running transversely through a slot in the support plate **108** and at a right angle to it is another support plate **110** to which are bolted the lower ends of the upwardly extending angular support beam members **58** and **60**. The latter are also preferably comprised of angle shaped structural beam members.

The roof beams **78** fixed to the ends of the cross beams **66** and **68** are attached thereto in essentially the same manner as those attached to the ends of the cross beam **48**. As shown in FIGS. 12 and 16, end adapter plates **112** and **114** are first secured to the beveled opposite ends of the beam members **66** and **68**, respectively. The rafter beams are then bolted to these plates in the manner shown in FIG. 17, the corners of the rafter beams being preferably cut away so that they can converge together neatly in a minimum of area on the plate **114**. The plates **100**, **112** and **114** also provide a means for interconnecting a series of structural beam sections that form the longitudinal floor frame members **70** and **72** extending along opposite sides of the main floor **32**.

Fixed to the underside of the beam **66** near its opposite ends is a pair of support plates **116**, and near the ends of the beam **68** is fixed a similar pair of plates **118**. To the plates **116** are bolted the upper ends of the angular beams **58** and **60** and to the plates **118** are bolted the upper ends of the angular beams **62** and **64**, as seen in FIGS. 12 and 16, respectively. A similar bracket plate **119** welded to and extending downwardly from the midpoint of the cross beam **66** provides a support to which the upright frame members **54** are bolted (FIG. 13).

In FIG. 15, the cross beam **66** is shown from a top view which also illustrates how the diagonal floor beams **74** are attached thereto. Here, I prefer to weld short triangular members **120** to the upper flange of the cross beam so that the flat diagonal frame members **74** can readily be bolted to it. A pair of similar triangular members **122** and **124** are welded to opposite sides of the cross beam **68** to provide for the attachment of the diagonal frame members **74** and **76** thereto (see FIG. 18). Near opposite ends of web portion of the front cross beam **68**, as also shown in FIG. 15, are provided a pair of angular mounting flanges **126** to which are bolted the web portions of the horizontal deck beams **82** and **84**. At the outer end of the deck where the beams **82** and **84** converge, they are held together by a clip **128** (FIG. 14). A bracket **130** secured to the lower flanges of the beams **82** and **84** serves as a means for retaining the angular support beam **88** which extends upward from the foundation member **50**.

The means for connecting rafter beams **78** to the ridge roof beam **80** is shown in FIGS. 8 and 9. Where the beams

converge at one location on the ridge beam they are all bolted to a bracket **132** comprised of a pair of crossed plate members **134** and a third central plate member **136** extending from opposite sides of the vertical intersections of the crossed plate members. The angle between the crossed plate members on one side of the central plate is equal to the angle of convergence of the rafter beams which are attached thereto by bolts. Bolted to each central plate **136** is a section of the ridge beam **80** which is preferably formed by pairs of angle shaped frame members.

In the embodiment of the building **30** shown in the drawing, an upstairs or second floor is suspended above the main floor by means of structural frame members supported by the rafter beams **78**. As shown in FIGS. 5 and 10 a pair of channel members **140** and **142** are fixed by some suitable means between pairs of upwardly diverging rafter beams **78** at one end of the frame structure. Bolted at their ends to these channel members are four downwardly extending support frame members **144**, and welded to the ends of the latter are a pair of spaced apart horizontal beams **146**. The support frame members and the horizontal beams are preferably "I beams" which are strong enough to support a substantial living area located above but not necessarily extending the full length of the main floor. The aforesaid "upstairs" arrangement illustrates the fact that, in my invention, the lower and upper frames **36** and **38** are integrated self-supporting systems that require no internal load-bearing members on the main floor for support. Thus, non-load-bearing partitions for subdividing the living area into rooms can be utilized within the house at any location to form the desired floor plan.

The main and upper floors and the deck portions may be made from suitable wood or metal materials that can be secured to the frame members by spaced apart fasteners such as lag screws or bolts. As shown in FIG. 16, the main floor **32** is preferably made up of prefabricated stressed skin panels **148** comprising upper and lower sheets **150** and **152** of plywood separated by internal joists **154**, the space between the sheets being preferably filled with insulation material **156**. Other forms of stressed skin panels such as steel panels could also be used. These panels are secured to wood members **149** previously bolted to the cross frame members **66**, **68** and **48**. The surrounding deck **86** may be wood planking secured to wood stringers **87** extending between the cross frame members.

Since all of the stresses applied to the building are taken as either tension or compression loads by the load-bearing frame members, it is not necessary that any load be absorbed by the skin or diaphragm covering the rafter beams **78** of the house. Thus, as shown in FIG. 8, the upper frame diaphragm may also be formed by stressed skin panels **158**, similar to the floor panels **148**. These roof panels can be easily attached to wood members **159** previously secured to the rafter beam members **78** by bolts or screws.

As stated previously, an important overall feature of the present invention lies in the fact that my unique frame, by virtue of its triangulated arrangement of members, takes all of the loads on the building so that the diaphragm covering the roof beams **78** takes no stress and merely fulfills a fill-in function. Thus, no internal columns or braces for the roof beams are required within the building **30**, and along the sloping sides of the house any arrangement of openings or glazing can be provided. This is contrary to the conventional A-frame structures heretofore devised wherein the roof diaphragm is a load-bearing component and must extend down to the floor level along both sides of the house. In the embodiment of my invention shown in FIG. 1, for example, a skylight **160** is provided along the roof ridge, and the roof diaphragm terminates near its lower side above the main floor level between pairs of rafter beam members **78** and thereby forms side openings **162**. Upright wall members **164** on opposite sides of the house extending between the main floor and the roof above, may then be provided with windows or doors **166**, which are aligned with the openings **162**. The space beneath the roof and between the edge of the main floor and the adjacent wall then provides the deck or walkway **86** connecting with the front deck and providing access around the outside of the indoor living space.

Various other features of both an esthetic and functional character can be applied to the building **30**. For example, a wood railing **168** of any suitable design is preferably provided around both the deck and the sides of the main floor. At the end of the house overlooking the deck, I prefer to provide a glazed facade **170** comprised of a large number of windows formed by a wooden frame pattern or an aluminum curtain wall.

To those skilled in the art to which this invention relates, many changes in construction and widely differing embodiments and applications of the invention will suggest themselves without departing from the spirit and scope of the invention. The disclosures and the description herein are purely illustrative and are not intended to be in any sense limiting.

I claim:

1. An integrated frame structure for a building particularly adapted for erection in a sloped lot comprising:
- a horizontal main floor having a first end edge substantially parallel to the ground surface and a second end edge extending outwardly above a downhill portion of the lot;
- a first foundation means located along a line parallel to said first end edge;
- a second foundation means located directly beneath a longitudinal center line of said main floor at its outwardly extending second end edge and along a line normal to said first foundation means;
- upwardly divergent lower frame means connecting said foundation means to said main floor at points equidistant from its said longitudinal center line;
- upper frame means connected to and sloping towards each other from near the opposite sides of said main floor;
- and means connecting said upper frame means together, said latter means having a longitudinal center line in the same vertical plane as said center line of said main floor and said foundation means.

2. An integrated frame structure for a building particularly adapted for erection on a sloped lot comprising:
- a horizontal main floor having one end near the surface of the lot and an opposite end extending above a downhill portion of the lot;
- a first foundation means for supporting said first end and aligned along a line directly beneath said first end;
- a second foundation means located directly beneath a longitudinal center line of said main floor;
- slope beam means following substantially the ground slope beneath said main floor and interconnecting said first and second foundation means;
- a lower frame means connecting said second foundation means to the sides of said main floor;
- and upper frame means connecting the sides of said main floor and converging to connect together along a line in the same plane as said center line and said second foundation means.

3. An integrated frame structure for a building adapted for installation on a sloped lot comprising:
- a first series of horizontal frame members forming the main floor frame of the building including first and second cross frame members interconnected by intermediate frame members, said first said cross frame member located at the end of the main floor nearest the ground level and supported on foundation means located beneath its opposite ends;
- a second series of sub-floor frame members beneath said main floor members including a slope beam extend-

ing downwardly from said first cross frame member on a line that lies in a vertical plane containing a main floor center line that is centrally disposed between said intermediate frame members, said slope beam terminating at and being connected to a second foundation means, a first pair of angular support beams extending upwardly and outwardly from the end of said slope beam and from said second foundation means, each being connected with a second cross frame member near its opposite ends;

a third series of rafter frame members extending above said main floor and forming the superstructure frame for the building, said rafter frame members being arranged in pairs, each said pair of rafter members being connected to one end of a said cross frame member and diverging upwardly while slanting at an angle towards a similar pair of diverging rafter members extending upwardly and at an angle from the opposite end of the same cross frame member;

and means for connecting together the rafter beams from opposite ends of said cross beams along a line that lies in the same vertical plane as said main floor center line and said slope beam.

4. The frame structure described in claim 3 including a pair of horizontal deck frame members in the same plane as said main floor members for forming a deck extension thereof, said deck members each being fixed at one end near an end of said second cross frame member and connected together at their opposite ends at a junction aligned with the center line of the main floor; and an angular supporting frame member extending from the junction of said deck frame members to said second foundation means.

5. The frame structure described in claim 3 including an intermediate cross frame member spaced between and parallel to said first and second cross frame members; a second pair of angular support beams extending upwardly and outwardly from an intermediate foundation means and connected near the opposite ends of said intermediate cross frame member.

6. The frame structure described in claim 5 including diagonal frame members extending from near the ends of each said cross frame member to near the end of its adjacent cross frame member.

7. An integrated frame structure for a building adapted for installation on a sloped lot comprising:

a main floor frame of the building including a plurality of parallel, spaced apart cross frame members with a first said cross frame member being located at the end of the main floor nearest the ground level and a second cross frame member at its opposite end;

a first foundation means for supporting said first cross frame member and located at spaced apart intervals along a line beneath its opposite ends;

a second series of sub-floor frame members for supporting said main floor frame including a slope beam extending downwardly from said first cross frame member on a line that lies in a vertical plane containing a center line of the main floor;

a second foundation means located at and connected to the termination of said slope beam;

a pair of angular support beams extending upwardly and outwardly from the end of said grade beam and from said second foundation means, each being connected with said second cross frame member near its opposite ends, and a central support column extending vertically from said second foundation means and connected with said second cross member at its mid-point;

a third series of rafter frame members extending above said main floor and forming the superstructure frame for the building, said rafter frame members being arranged in pairs, each said pair of rafter members being connected to one end of a said cross frame and diverging upwardly while slanting at an angle towards

a similar pair of diverting rafter members extending upwardly and at an angle from the opposite end of the same said cross beam;

and means for connecting together the rafter members from the opposite ends of said cross beams along a line lying in the same vertical plane as said main floor center line and said slope beam.

8. A building adapted for installation on a sloped lot having an integrated frame structure and comprising:

a horizontal main floor frame including a plurality of spaced apart cross frame members interconnected by intermediate frame members, an inner cross frame member being located at the end of the main floor nearest the ground level; and an outer cross frame member being located at the other end of said floor frame above a downhill portion of the lot;

first foundation means located beneath and supporting said inner cross frame member at spaced apart intervals between its ends;

a series of sub-floor frame members beneath said horizontal main floor including a slope beam extending downwardly from said inner cross frame member on a line that lies in a vertical plane containing a center line of said main floor frame;

second foundation means aligned with said center line and located directly beneath said outer cross frame member, said slope beam terminating at and being connected to said second foundation means;

a first pair of angular support beams extending upwardly and outwardly from the end of said slope beam and from said second foundation means, each being connected with said second cross frame member near its opposite ends;

a third series of rafter frame members extending above said main floor and forming the superstructure frame for the building, said rafter frame members being arranged in pairs, each said pair of rafter members being connected to one end of a said cross frame member and diverging upwardly while slanting at an angle towards a similar pair of diverging rafter frame members extending upwardly and at an angle from the opposite end of the same cross beam;

and means for connecting together said rafter frame members from opposite ends of said cross frame members along a line lying in the same vertical plane as said main floor center line and said slope beam.

9. The building as described in claim 8 including a series of stressed skin wooden panels attached to said rafter frame members and forming the covering of said building, said panels providing the fill-in cover forming the roof of said building but not required to absorb a diaphragm load thereon.

10. The building as described in claim 8 including horizontal beam members attached to said adjacent rafter frame members on opposite sides of said building and supporting an upstairs floor above the main floor thereof.

11. The building as described in claim 9 wherein said panels are comprised of spaced apart sheets of plywood attached to intermediate wood frame members.

12. The building as described in claim 9 wherein said panels cover only a predetermined area bordered by said rafter frame members and are arranged to form openings between adjacent rafter frame members along the sides of said building; and vertical wall sections spaced inwardly from the lower ends of said rafter frame members having doors aligned with said openings.

13. The frame structure described in claim 9 including a pair of horizontal deck frame members in the same plane as said main floor members, for forming a deck extension thereof, each said deck frame member being fixed at one end near an end of said outer cross frame member and connected to the other deck member at its opposite end at a junction aligned with the center line of the main floor; and an angular supporting frame mem-

ber extending from the junction of said deck frame members to said second foundation means.

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