

Aug. 11, 1931.

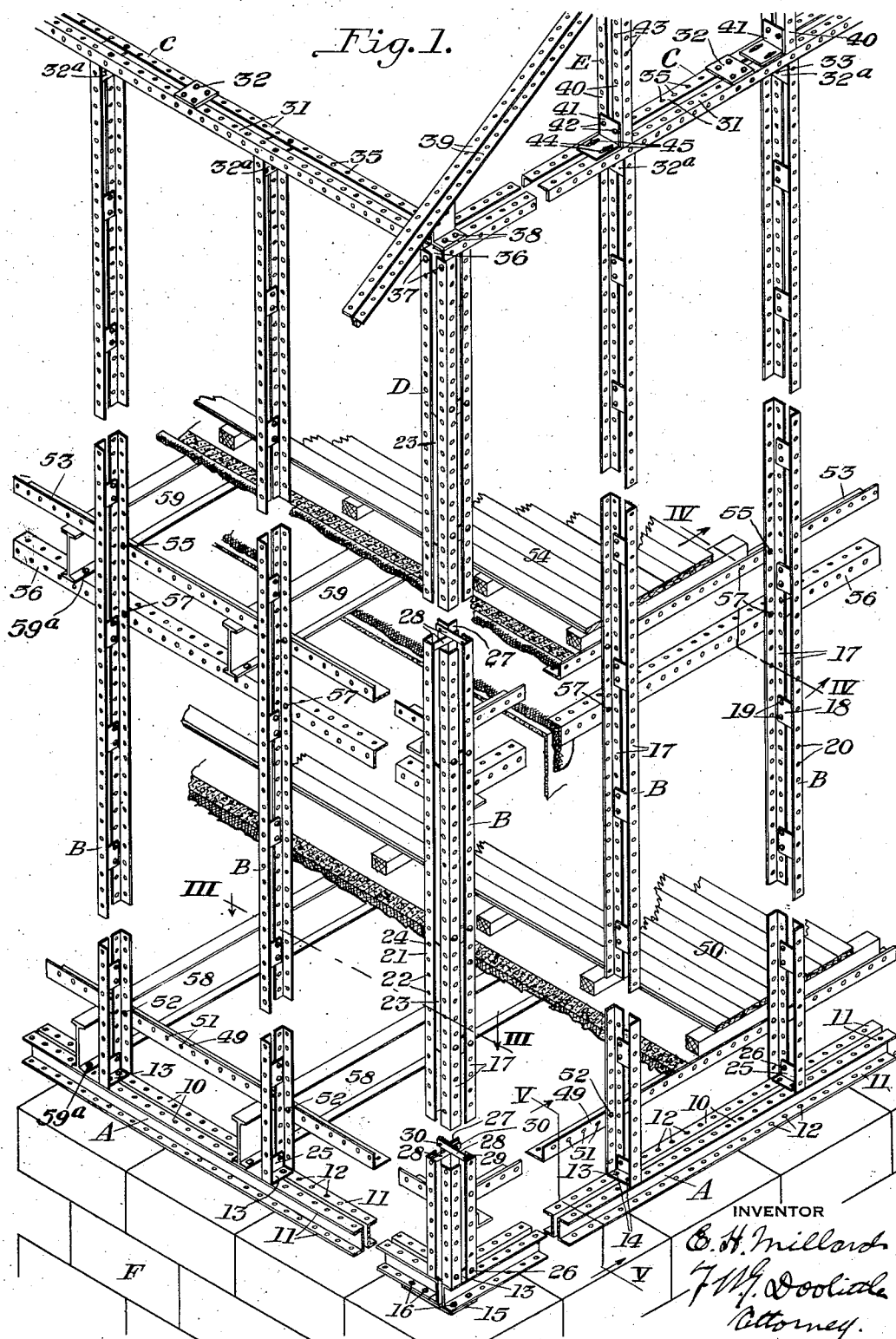
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STEEL FRAME HOUSE CONSTRUCTION

Filed Feb. 4, 1928

3 Sheets-Sheet 1



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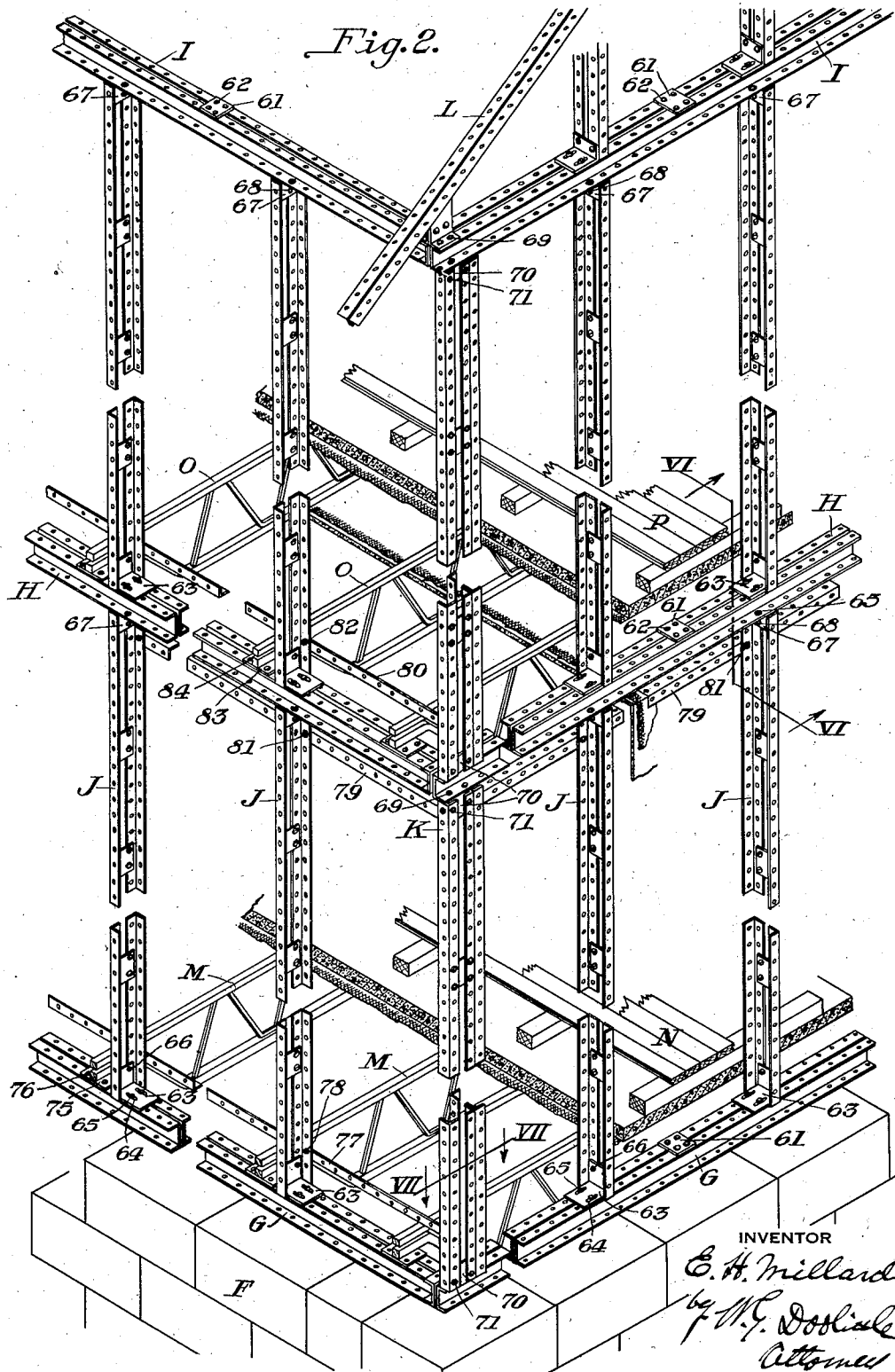
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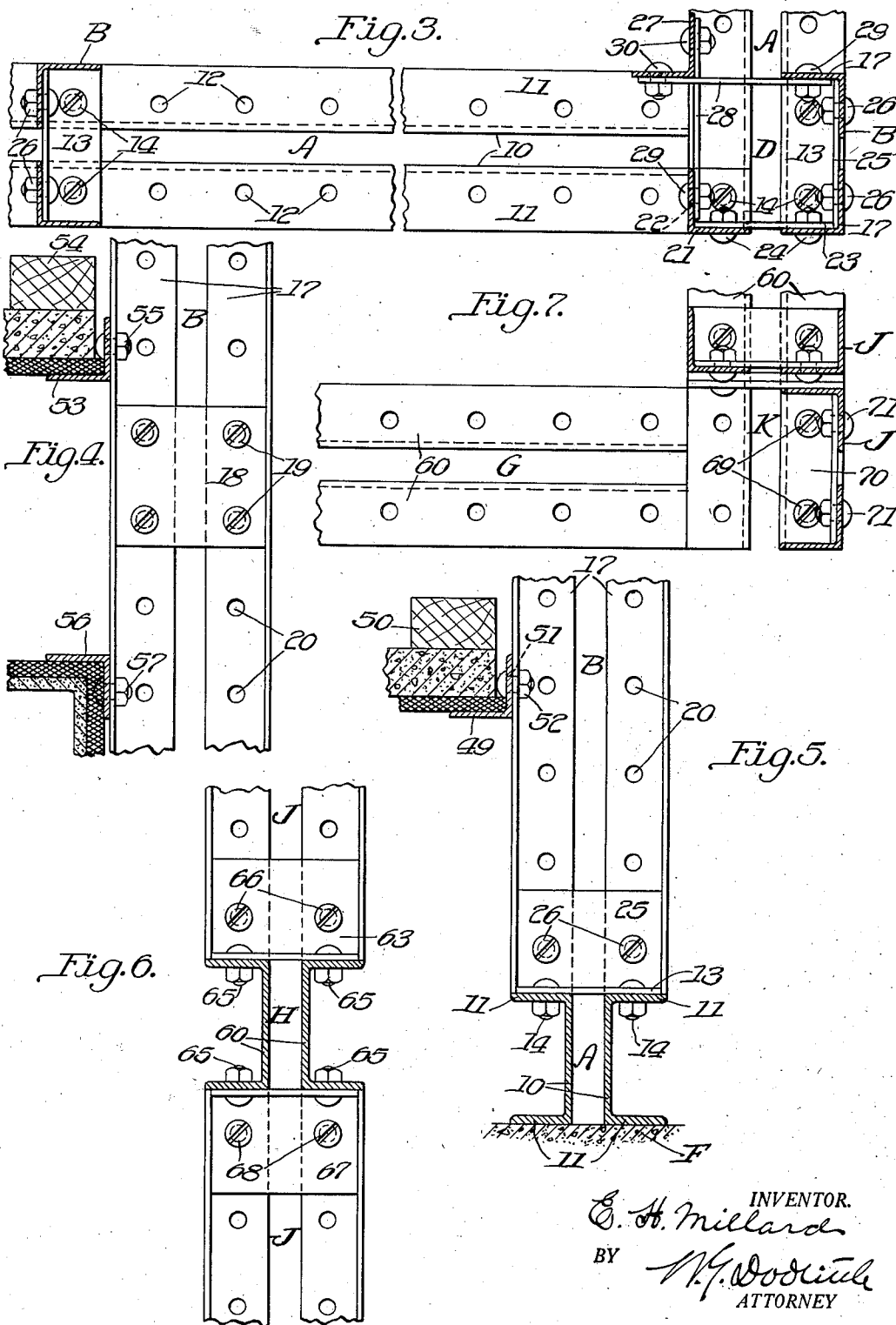
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UNITED STATES PATENT OFFICE

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STEEL FRAME HOUSE CONSTRUCTION

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My invention relates to the construction of metal framework for buildings, and more particularly to a structural steel framework to be utilized in the construction of buildings of various architectural designs, forms, and dimensions, and more especially to a steel framing for dwellings and the like with its load bearing value determined and in which the prime objects are flexibility of assembly, rigidity and ease of jointing, and in which the framing lends itself to a ready application of various building units thereto to form a complete dwelling or the like.

It is well known that it is very desirable for the framework of buildings, especially residential buildings, to be made of steel, but such a construction has heretofore been practically prohibitive on account of the labor and expense involved in the production, fitting and assembly of the parts constituting such steel framework.

The present invention contemplates a steel frame construction comprising essentially but two standard and simple structural elements or units and simple means for connecting said elements.

More specifically, an important aim is to provide a novel form of sill and uprights or studs, each made up of a plurality of standard structural forms or members secured together in the shop or factory in spaced relation, with certain elements of the spacing means serving as mutual securing means and co-acting toward the positioning of other elements or units and the rapid erection of a building.

Additional objects and advantages will become apparent from a consideration of the following description taken in connection with the accompanying drawings illustrating operative embodiments.

In said drawings:

Fig. 1 is a fragmentary perspective view illustrating one form of the invention, i. e. balloon type construction;

Fig. 2 is a fragmentary perspective view illustrating a slightly modified form, known as the girt type construction;

Fig. 3 is a cross sectional view taken on the line 3—3 of Figure 1;

Fig. 4 is a cross sectional view taken on the line 4—4 of Figure 1;

Fig. 5 is a sectional view taken on the line 5—5 of Figure 1;

Fig. 6 is a cross sectional view taken on the line 6—6 of Figure 2, and

Fig. 7 is a cross sectional view taken on the line 7—7 of Figure 2.

Referring specifically to the drawings, and first to the form of Fig. 1, sills are provided at A adapted to be mounted in any suitable manner, as on a foundation F. Each sill consists of two steel channel members 10 of standard design, size and construction, that is, light weight, standard rolled steel sections, such as bar mill sizes, arranged in slightly spaced relation, and, at the factory or shop, secured together in that relation in order to be capable of shipment as a unit to the site where the building is to be erected. Each of the flanges 11 of such beams or channel members 10 is provided with a multiplicity of holes 12, preferably arranged relatively close together, as shown.

It will be seen that by arranging the said members as shown and described, I provide a space between the said members adapted to receive anchor members, electric wiring and/or other connections.

Angle plates or clips 13, as illustrated, have bolts 14 passed through openings therein and selected openings 12. As a result, the clips 13 may constitute a means for securing said channel members together to form the unitary sill or structural element aforesaid. It is, of course, evident that these parts may be united by riveting or otherwise. At the corners, the sills A may rest on a plate 15 and be secured together by bolts 16 passing through openings in said plate 15 and selected openings of the series of openings 12.

Co-acting with the sills A to form the main structural elements or units for use in the erection of the building, are uprights or studs B. Each of the uprights or studs B consists of two steel angle members 17 which may be of any length desired, according to the height of the building, and, for instance, extend from the sill A to the roof plate C, as shown

in Fig. 1. At the factory or shop, said angle members 17 are suitably secured together in slightly spaced relation, in order to be a structural unit capable of assembly as such in the shop or factory, and be shipped to the site of the building for incorporation into its framework. As shown, the connecting and spacing means for the angle members 17 may consist of a suitable number of cleats or plates 18 having a plurality of holes there-through accommodating bolts 19. Each of the angles or flanges of the members 17 has a plurality of bolt holes or openings 20 there-through, preferably corresponding in arrangement and spacing to openings 12, and the bolts 19 may be passed through certain selected holes 20.

From the foregoing construction it will be noted that the angles are assembled in the form of a channel structure, this arrangement of angles provides a space or slot which is utilized for the installation of wind bracing, electric cables and other connections.

The corner posts for the building are usually sturdier or stronger than the intermediate studs or uprights. One of the corner posts is shown at D, and may utilize an upright B and, in addition, employ an angle member 21 having a multiplicity of openings or bolt holes 22 through both legs, spaced similarly to those at 12 and 20. The member 21 is spaced relatively to the members 17 of the adjacent stud B, but is rigidly secured thereto as by means of a suitable number of plates 23 having bolt holes or openings therethrough, corresponding in spacing to those at 22, and occupied by bolts 24 which pass through selected openings 22 and selected openings 20 of the adjacent angle member 17. This corner post D with its component upright or stud B and attached angle member 21 is assembled, in the manner described, in the shop, and in that condition shipped to the site where it is to be erected into a building. It is to be noted that an angle plate or clip 13 is arranged at the base of the corner post D at a right angle to the position of the other clips 13, being secured to one of the channels by bolts passing through adjacent holes 12 in a manner similar to that shown at 14.

The upright flange or wall 25 of the clips 13 serve as means for positioning the uprights B, since they are received in the channels of such uprights, and they also serve as securing means for such uprights, since bolts 26 may be passed through holes in the walls 25 and adjacent holes or bolt openings 20.

The over-all width of the sills A and studs B is preferably the same and in conformity with this preference, the clips 13 are of a length to terminate short of the sides of the sills and be accommodated within the channels of the uprights or studs B.

Attention is called to the fact that, in lieu of the bolts as at 14, 19 and 24, spot welding or other fastening means may be employed. Spot welding or other fastening means may also be employed in lieu of the bolts at 26; also, if desired, at the site of erection of the building.

If desired, the corner posts D may utilize a fourth angle member, such as that shown at 27, arranged similarly to the corner angle 17 of the post D to serve as a guide and attaching means or structure making up the inner sheathing or wall of the building. Such angle 27 may be secured in place in any desired manner, as by means of short cleats or tie plates 28, which may be arranged at an angle to each other, as shown. Such cleats 28, by means of bolts 29, may be secured to adjacent angle members 17 and 21, and by means of bolts 30 may be secured to the angles of the member 27. If desired, spot welding or other fastening means may be substituted for the bolts 29 and 30. It will be realized that the member 27 and the tie plates 28 are secured to the post at the shop, and form part of the unit thereof.

At the base of the roof, the framework utilizes plates C. The plates C consist of angle members in spaced relation and similar to angle members 17, however, being designated 31. Such plates, at the shop, are connected together in unitary relation, for shipment in that condition to the place of erection of the building, by means of tie plates 32. Clips 32a are bolted as at 33 to the uprights B, occupying adjacent bolt holes 20, and they are secured in a similar manner to the angle members 31. The openings in angle members 31 are designated 35 and correspond in spacing to the openings at 12, 20 and 22.

At the top of the corner post D, special bracket structures 36 are bolted thereto, as at 37, and as at 38 are bolted to the angle members 31. Such brackets in turn support and have rafters 39 suitably bolted or otherwise secured thereto. The roof of the building is not specifically shown, since it forms no part of the present invention. However, extensions of the studs or uprights B, adapted to support the rafters 39, are shown at E and consist of angle members 40 secured together in spaced relation unitarily at the shop by means of angle clips 41 and bolts 42 passing therethrough and through selected openings 43 in the angle members 40. The clips 41 through their horizontal flanges have elongated slots 44, through which bolts 45 pass in order to secure the clips 41 and units E in place. Roof trusses may be suitably supported on the plates C, in any desired manner and number, according to the size and structure of the building.

Adjacent the sills A, angle supports 49 are used to form shelves which are adapted

to accommodate fastening and support of a floor 50, which would be the first floor of the building shown. Each of the flanges of the members 49 is provided with a multiplicity of bolt holes or openings, as at 51, and bolts 52 pass through certain of them and adjacent bolt holes in the uprights B and D.

Similarly, angle members 53 are used to form a shelf for the attachment and support of the second floor, fragmentarily shown at 54. Angle members 53 correspond in structure to those at 49, and bolts 55 are passed through selected openings thereof and adjacent bolt holes in the uprights B and D.

Ceiling angle members 56 are provided to accommodate the lathing and plaster for the ceiling of the first floor rooms. These members 56 are similar in structure to those at 49 and 53, but arranged in reverse relation, and have bolts, as at 57, passed through selected openings thereof and adjacent openings of the different uprights.

Supporting beams 58 and 59 for the floors 50 and 54, respectively, may rest on the sills A and angle members 56, respectively, and be secured thereto by bolts 59a passed therethrough and adjacent openings in the sills and angle members 56.

As a result of the structure described, it will be seen that the sills A and plates C and the studs or uprights B, and corner posts D, form units made up of standard steel elements, which are assembled or made into unitary form at the shop and in such unitary form shipped to the destination or place of erection of the building, where the same are supplemented by other standard steel forms adapted to be attached thereto, and with them form a fabricated or skeleton framework for the building.

The girt type structure is shown in Fig. 2, this construction accomplishes the results and possesses the same advantages as the form of Fig. 1. In this form, sills G are used, which are identical in construction to those shown at A in the preceding figure. Girts H, similar to sills G, are used for the second floor line, while plates I, of similar construction, are used at the base of the roof.

The channel members 60 of the sills G, girts H and plates I are secured together as units at the shop, as by means of tie-plates 61 bolted, as at 62, thereto and also by angle clips 63 similar to those at 13, except the base flanges may have elongated slots 64 accommodating the securing bolts 65 which are used to secure such angle clips to the sill members.

Uprights or studs J, similar to those at B, are used between the sills G and girts H, and girts H and plates I, and such members and uprights are secured together by bolts 66 passing through the clips 63 and openings of the adjacent uprights and by means of angle

under clips 67, similar to those at 32a, and secured in place by the aforesaid bolts 65 and bolts 68 which secure them to the angle members of the uprights J. The corner post in this form of the invention is designated K and utilizes two of the units J. This corner post K, as illustrated, is in two sections, one for each story of the building, and the uprights J forming part thereof are secured to the adjacent sills, girts and plates by bolts 69, angle clips 70, and bolts 71.

A portion of the roof supporting structure which corresponds identically with that used in the form of Fig. 1, is shown and designated by the character L.

For the first floor, bar joists M are employed and are mounted on plates 75 which may be secured in place by bolts 76 passing therethrough and selected openings in the sills G. The lower floor supported by such joists M is fragmentarily shown at N. Angle members 77, similar to those at 49, are provided for the same purpose and are bolted as at 78 to the uprights J. Angle members 79 and 80 correspond to and are used for the same purposes as the angle members 56 and 53 respectively of the other form of the invention and are bolted in place as at 81 and 82. Plates or cleats 83, similar to those at 75, are bolted in place at 84 and may secure the elements of the units H together, in addition to supporting bar joists O for the second floor, which is fragmentarily shown at P.

Like in the other form of the invention, the same is made up of various units adapted for complete assembly at the shop and shipment in unitary condition to the site of erection of the building, and the structure otherwise attains the objects and possesses the advantages of the first form.

It is preferred to space the openings or bolt holes of the various rows of the angle members and flanges throughout the structure in either form of the invention the same distance apart, so that when assembled said openings will be equally distant from one another both in horizontal and vertical planes, and it is to be understood that where bolts are referred to, spot welding or other securing means may be substituted.

Various changes may be resorted to, provided they fall within the spirit and scope of the invention.

I claim:

1. In a steel framing primarily for small buildings such as dwellings and the like wherein rigidity and ease of jointing are the primary objects, a steel framework element consisting of two channel members having their webs opposed and in relatively close relation, the flanges of said members having a multiplicity of bolt holes, an angle clip, means securing said clip to the channel members and passing through certain of said holes, one of the angles of the clip serving

as a means for attachment of a framework element thereto.

2. In a steel framing primarily for small buildings such as dwellings and the like wherein rigidity and ease of jointing are the primary objects, a steel framework having a structural unit composed of a plurality of structural elements secured together in spaced relation, a clip securing said members together, said clip having an angle portion spaced from the planes of the sides of the unit, a second unit having a channel adapted to receive said angle portion, means securing the second unit to said angle portion, said second unit being of substantially the same width as the first unit, and said second unit consisting of angle members secured together in spaced relation.

3. A steel post comprising a connected pair of divided channel-like elements each consisting of two perforated spaced apart angle members arranged relatively close together, and spaced apart cleats disposed within said channel-like elements and securing together the angle members thereof, one of said framework elements being disposed at an angle to the other element.

4. A metallic post comprising a connected pair of divided channel-like elements each consisting of two perforated spaced apart angle members arranged relatively close together, and spaced apart cleats disposed within said channel-like elements and securing together the angles thereof, one of said framework elements being disposed at substantially a right angle to the other element with two of the flanges of one element in alignment with a flange of the other element.

5. A metallic framework element consisting of two perforated relatively rigid angle members of substantially similar cross-sectional size, one flange of each of said members being in substantially the same plane to form a channel, said flanges being relatively close together, spaced apart cleats located in the channel securing the channel members together, an angle member secured to one of the first mentioned angle members, a fourth angle member, and spaced apart cleats securing the fourth angle member to the third angle member in relatively close spaced apart relation.

6. A metallic post comprising three, perforated, relatively rigid angle members, arranged with their walls embracing three walls of an imaginary rectangle, a fourth perforated relatively rigid angle member reverse to the first mentioned angle members so that its flanges will be spaced from and parallel to the corresponding flanges of the intermediate angle member of said first mentioned angle members, and securing means attached to the outer faces of the flanges of the fourth angle member and to the inner surfaces of angles of the remainder of the first mentioned angle members.

7. In a metallic framework for buildings, a metallic sill consisting of laterally spaced structural members having flanges in substantially the same plane forming a substantially continuous upper surface, metallic studs of channel form supported on said surface transversely of the flanges consisting of angle members, flat clips in the channels of the studs securing the angle members together, angle clips at the ends of the studs substantially located in the channels serving also to secure the perforated angle members together and the same to the sill, beams supported from said surface, and a supporting member for interior structure arranged substantially parallel to the sill secured to perforations of the studs and supported by the beams.

8. In a metallic framework for buildings, a metallic sill composed of laterally spaced perforated structural members, metallic studs composed of laterally spaced perforated angle members supported on said sill, beams supported at one end on said sill, and a metallic supporting member substantially parallel to the sill secured to the studs at perforations on the inner side thereof and supported on said beams.

9. In a metallic framework for buildings, a metallic sill composed of structural members relatively close together having a vertical space therebetween, studs supported on the sill and composed of metallic structural members relatively close together and having vertical spaces therebetween, metallic structural members parallel to the sill connecting the studs at the top, perforated metallic structural means parallel to the sill between the same and the third mentioned structural members secured to the inner side of the studs having an inwardly extending flange adapted to support a floor, and rafters supported by the third mentioned structural members.

10. A metallic framework for buildings comprising a metallic sill, studs rising therefrom consisting of perforated metallic angle members in spaced relation forming a channel, a metallic supporting member, elements engaging perforations of the angle members to secure the supporting member thereto, plates in the channels of the studs secured to the aligned flanges thereof and connecting the angle members together, said plates being substantially flat whereby they avoid interference with the securing of said supporting member by said elements in the proper perforations.

11. In a metallic framework for buildings, perforated metallic sills composed of a plurality of laterally spaced structural members, said sills meeting at an angle to each other with an end of one of them abutting a side of the other, a perforated metallic corner post comprising a plurality of later-

ally spaced structural members and resting partly on each sill, metallic means engaging perforations of and securing the sills and corner post together and the members of the latter together.

12. In a metallic framework for buildings according to claim 11 wherein channel shaped metallic studs are spaced from the post and supported on the sills, said studs consisting of perforated angle members, and metallic roof supporting structure supported on and fastened to the post and studs.

13. In a metallic framework for buildings, a sill of metal, metallic studs rising therefrom consisting of laterally spaced apart angle members having multitudinous perforations, structural members parallel to the sill and in spaced apart relation having multitudinous perforations, said members being secured to the inner side of the studs and having flanges extending in the same direction inwardly whereby one member may coact with the erection of a ceiling and the other with the support of a floor.

14. In a metallic framework for buildings, a metallic sill consisting of laterally spaced structural members having flanges in substantially the same plane forming a substantially continuous upper surface, metallic studs of channel form supported on said surface transversely of the flanges consisting of angle members, flat clips in the channels of the studs securing the angle members together, angle clips at the ends of the studs substantially located in the channels serving also to secure the perforated angle members together and the same to the sill, and beams supported from said surface.

In testimony whereof I affix my signature.

EMMOR H. MILLARD.