

Aug. 22, 1961

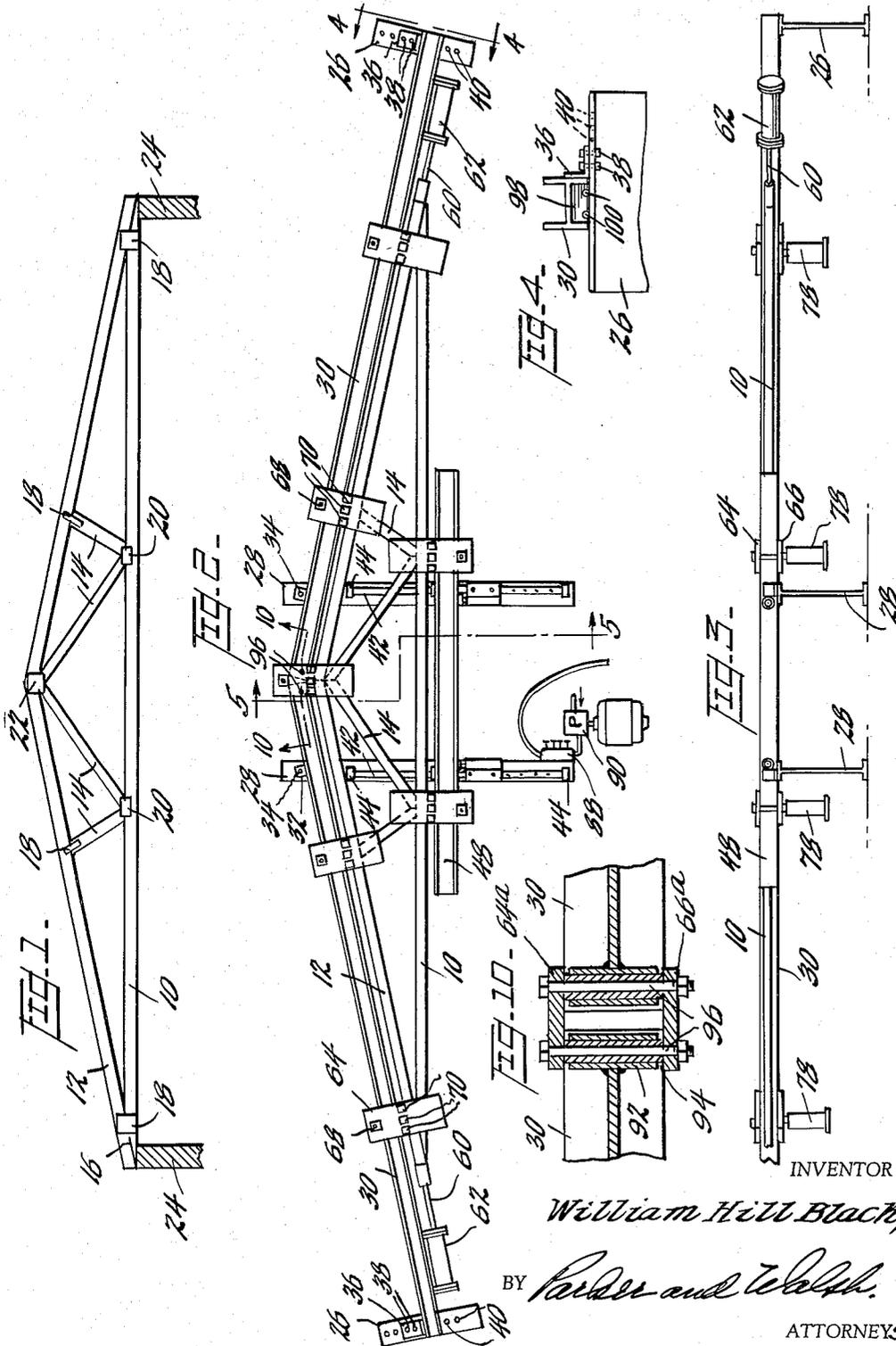
W. H. BLACK

2,996,721

TIMBER TRUSS MACHINE

Filed Aug. 26, 1958

2 Sheets-Sheet 1



INVENTOR
William Hill Black,

BY *Richard and Walsh*

ATTORNEYS

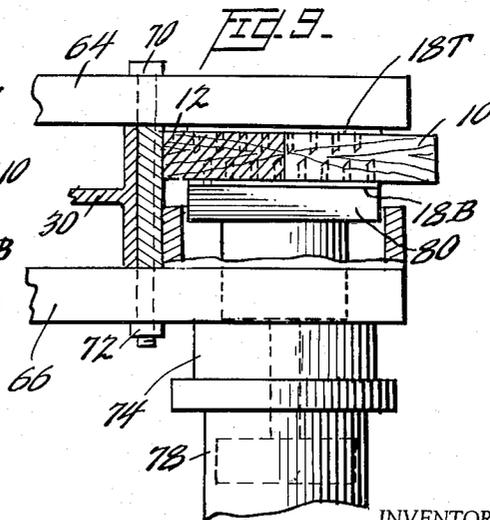
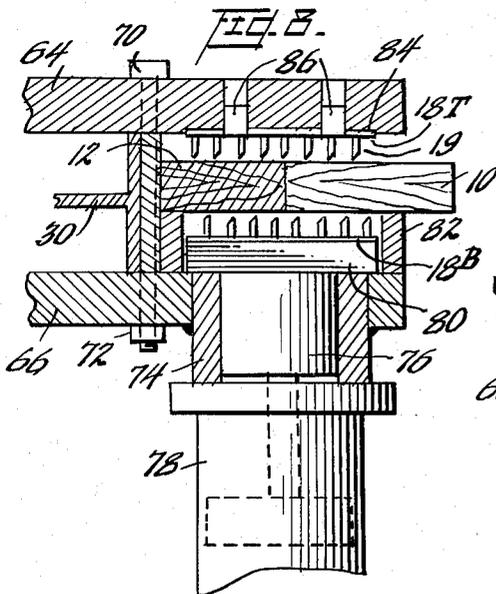
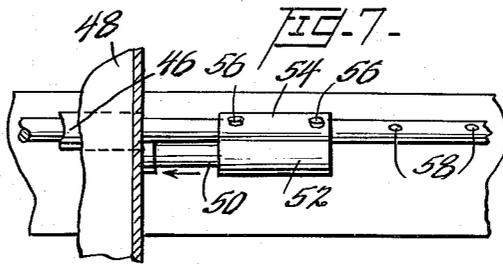
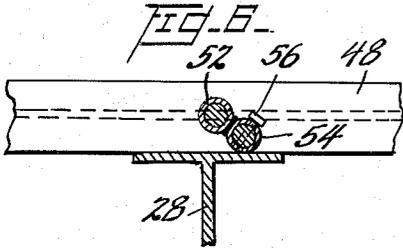
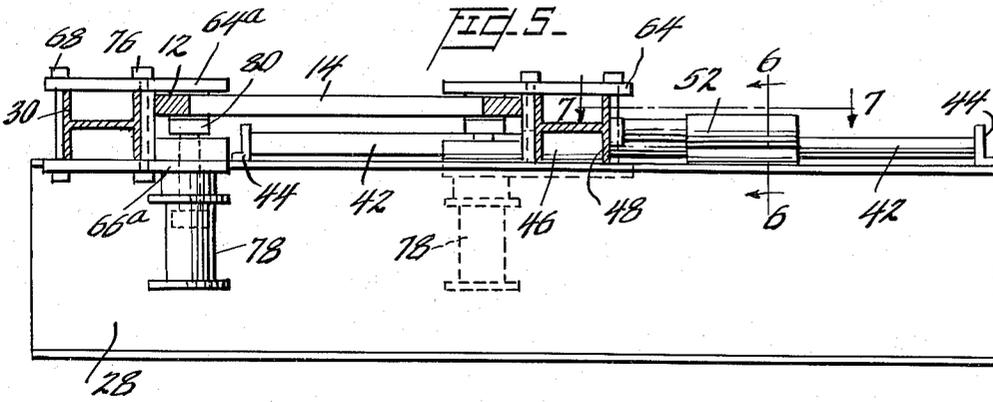
Aug. 22, 1961

W. H. BLACK
TIMBER TRUSS MACHINE

2,996,721

Filed Aug. 26, 1958

2 Sheets-Sheet 2



INVENTOR
William Hill Black,
 BY *Forster and Welsh,*
 ATTORNEYS

1

2,996,721

TIMBER TRUSS MACHINE

William Hill Black, North Miami Beach, Fla., assignor to Gator Lock, Inc., Miami, Fla., a corporation of Florida

Filed Aug. 26, 1958, Ser. No. 757,265
19 Claims. (Cl. 1—149)

This invention relates to a device for combining wood and metallic elements to form structural building components. More particularly, it is especially suited to produce roof trusses of unusually uniform structural characteristics.

The conventional manner of building wooden houses and similar structures makes use of rafters secured to a ridge pole. This practice is highly uneconomical because it requires fabrication at the site of construction which in turn is the source of much lack of uniformity. This necessitates a larger factor of safety in design, adding to the expense of construction. Furthermore, the method of erection requires much climbing about the upper portion of the house being erected, limiting this phase of the work to the stronger and more agile carpenters.

It has been demonstrated through research conducted under the auspices of the Small Homes Council at the University of Illinois, that great savings of material and labor can be accomplished by the use of pre-fabricated roof trusses in place of the former method. However, the successful use of the roof truss is greatly dependent upon accurate fabrication and effective connection of the elements at the points of intersection. If adequate control of these factors is maintained along with proper design and with materials of uniform quality, truss members of predictable, uniform quality will enable savings of worthwhile amounts in the construction of wood frame buildings. Within recent years, it has been proposed to connect the intersecting wood members of these trusses by means of metallic gusset plates, each of said plates having struck out therefrom a large number of pointed teeth for penetration into the wood of the timber members of the truss. These struck out teeth sustain in shear, the compression and tension stresses transmitted by the wood members of the truss. The plate itself lends desired rigidity to the joint, yet, because it is located flat against the surface of the wood, it takes up relatively less space than equivalent methods of joining, a substantial advantage in the transportation of these trusses.

I have devised a machine for shaping the wooden members to the proper form and arrangement and for driving the toothed grip plates into the assembled truss elements positively and in such effective manner that the product is of unusual uniformity and dependability. For a fuller understanding of my invention, reference should be made to the drawings forming a part of this application wherein:

FIGURE 1 is an elevation, showing a typical roof truss in place upon the two opposite walls of a building structure;

FIGURE 2 is a plan view of my invention with a completed roof truss in place in the machine.

FIGURE 3 is an elevation corresponding to FIGURE 2, viewed from the operator's side of the machine;

FIGURE 4 is a partial section taken along the line 4—4 of FIGURE 2;

FIGURE 5 is another section taken along the line 5—5 of FIGURE 2;

FIGURE 6 is an enlarged section taken along the line 6—6 of FIGURE 5;

FIGURE 7 is another detailed section taken along the line 7—7 of FIGURE 5;

2

FIGURE 8 is an enlarged detailed section, the clamping and grip plate driving mechanism shown therein appearing in open position;

FIGURE 9 is a second view corresponding to FIGURE 8 with the clamping mechanism shown in closed position; and

FIGURE 10 is a detail section taken along the line 10—10 of FIGURE 2.

Referring now to the drawing, FIGURE 1, a typical truss may be made up of a bottom chord member 10 and a pair of top chord members 12, together with suitably arranged strut members 14, here shown arranged in inclined fashion. The choice of dimensions and arrangements of these members is a matter for architectural design. By way of example, it may be pointed out that utilizing the standard, so-called 2 x 4 lumber, the pitch of the members 12 may be in the ratio of 2½:12 while the length of member 10 may be as much as 30 feet. As shown, it is customary to bevel the ends of member 10 at 16 to match the inclination of the top chord members 12.

Plates 18 having struck out points 19, may be used to join two connecting wood structural elements or three connecting elements may be joined by plates 20 or four such elements, as at 22. It will be obvious that the size of these various plates may vary according to the type of joint to be made. The shape of the plate, the number, size and arrangement of the points on the plate are again matters of structural design. The completed truss is shown in FIGURE 1 resting upon the two side walls of a suitable building. It is to be understood that, for ordinary truss construction, duplicate plates 18 will be applied to both faces of the wood truss. In appropriate circumstances, it may be desired to apply such a plate to but one side of a structural element.

Referring now to FIGURES 2 and 3, my apparatus for constructing roof trusses of the type described requires first a substantial foundation which may consist of a substantial expanse of concrete pavement. Upon this are placed a pair of outer support members 26 and a pair of inner support members 28. These are best formed of I-beam sections having a web sufficiently deep to bring the upper flanges to a convenient working height for the operator and one or more assistants. Supported on the I-beams 26 and 28 are a pair of H-beams 30 for receiving the top chord members 12 of the truss against their inwardly facing flanges. The inner end of each beam 30 is connected between plates 64a and 66a to form a hinge-like arrangement to permit adjustment of the angle formed between the two beams, thereby enabling the device to be used in the manufacture of any desired pitch truss.

As shown in FIGURE 10, there is welded to the web of the H-beam 30 the sleeve 92. The ends of the sleeve are kept a fraction of an inch short of the flange width of H-beam 30 to provide clearance between plates 64a and 66a. Within sleeve 92 is a second sleeve 94 at least as long as the flange width of H-beam 30, permitting free pivoting of the end of the H-beam about bolt 96 passing between the two plates 64a and 66a.

Each outer end of H-beam 30 rests upon the upper flange of the I-beam 26 (see FIGURE 4). To facilitate movement of the H-beam 30 along the face of the flange of I-beam 26 a plate 98 is welded at right angles to the length of H-beam 30 and on the underside thereof between the flanges and the web. A pair of rollers 100, mounted on the plate 98, support the end of H-beam 30 on the flange of I-beam 26 as the H-beam 30 is moved to adjust it for making trusses of varied pitch. Angle brackets 36 welded on H-beam 30 have pairs of bolts 38, passing through selected holes 40 in the flange of I-beam 26 for fixing the two beams at the desired

angular relationship. It is obvious that other methods of fixing the beams adjustably may be employed so long as horizontal thrust to the right, as shown in FIGURE 4, is provided for.

At the sharper pitches, no support against horizontal thrust is required for the inner ends of H-beams 30. For the flatter pitches such as $1\frac{1}{2}$ inches in 1 foot, brackets 32 provided with bolts 34 passing through the flanges of I-beams 28 may be used.

The two inner I-beam supports 28 are arranged in parallel relationship. Fixed to the upper flange of the beams 28 are a pair of tubular guide members 42 held at each end by means of angle brackets 44. The guides 42 are arranged sufficiently above the flanges of supports 28 to permit the sleeves 46 to freely pass along the guides 42. The sleeves 46 are relatively short, passing through the two lower flanges of the beam 48 and being welded thereto. The sleeves 46 passing along the guides 42 enable the movement of beam 48 which operates upon lower chord member 10 of the truss to move toward and away from the beams 30. Power for the positive forward movement of the beam 48 toward the beams 30 is provided by ram 50 of the hydraulic cylinder 52. There are two of these, each having attached thereto a sleeve 54, movable along the guide 42 and capable of being held in place thereon by means of pins 56 placed in spaced holes 58 of the guide 42. In this manner, cylinders having relatively short rams may be employed with adequate assurance that there will be adequate closing movement of the beam 48 against the lower chord member 10.

To insure against endwise movement of the top chord members 12, hydraulic cylinders 62 provided with rams 60 compress the two members 12 against each other. Although the details are not shown, the location of these cylinders 62 is made adjustable to accommodate chord members of different sizes.

As shown in FIGURES 8 and 9, the devices used for driving the metallic grip plates into the wood structural elements, are clamp-like being made up of a top plate 64 and a bottom plate 66 held in place on the beam 30 by means of rear bolt 68 and face bolts 70. By loosening the nuts 72 upon the bolts, the devices may be slid along the beam 30 to apply clamping pressure wherever desired. Rollers similar to rollers 100 or other devices may be used to aid the movement of cylinders 72 and the devices.

Welded into the face of the lower clamp plate 66 is a cylindrical guide 74 for the ram 76 of hydraulic cylinder 78. Upon the face of the rams 76 is a rectangular head 80 of approximately the same dimensions as the bottom grip plate 18. The rectangular guide 82 secured to the top of plate 66 cooperates with the head 80 to properly orient the plate 18B with respect to the joint that is to be made. The height of the rectangular guide 82 is chosen to permit the plate 18B to be dropped into the space enclosed by the upper face of the head 80 and the sides of the guide 82, allowing a slight clearance above the points of the teeth 19 of the plate 18B. This condition prevails while the ram is withdrawn into the cylinder 78.

The upper grip plate 18T is held in place by a slight relief 84 in the underside of plate 64, approximately the thickness of plate 18T and by one or more magnets, preferably of the permanent type, 86 embedded in the plate 84.

Operation

It is assumed that, prior to the operation of the device, the necessary wood members will have been pre-cut to the proper length and trimmed with the proper inclination at the ends thereof. Plates of the proper sizes and shapes are also to be provided and drivers, matching in dimensions the plates chosen, will have been put in place.

The angular relationship of beams 30 is adjusted as described in connection with the description of FIGURE 4. The location of cylinders 52 is determined so that there will be approximately eighteen inches of opening when the rams are withdrawn into the cylinders. Similarly, the rams 60 are withdrawn into their respective cylinders and the cylinders located to give about six inches free space between the rams and the ends of chord members 12. The various drivers are bolted into proper position.

With the respective rams 76 withdrawn, the various bottom grip plates are dropped into their proper openings followed by the placing of the wood members in loose position, the bottom chord member 10 being placed last. The wood members can then be loosely fitted together to their approximate ultimate position. Next, the top grip plates are tucked under the top clamping plates 68 until they fit properly in the relieved spaces.

At a centralized station 88, are all of the controls for the various hydraulic cylinders, the hydraulic connecting lines being omitted for clarity. A pump 90 and other conventional hydraulic system facilities are also provided. The rams 50 and 60 are first actuated, locking the wood members of the truss into their proper dimensional relationship. Then the rams 76 are actuated in unison. The teeth 19 of the plates 18T and B are simultaneously driven into opposite sides of the wood members 10, 12 and 14 until the inner sides of the grip plates are flush with the surface of the wood.

The completed truss member is removed from the apparatus by first backing off the rams 76, followed by withdrawing the rams 50 and 60. The truss is pulled horizontally toward the beam 48 and then the lower chord member 10 is raised vertically, tipping the truss so that it may be lifted out. The apparatus is immediately ready for fabrication of another truss element.

The apparatus of this invention is capable of ready adjustment to manufacture trusses of a wide range of dimensions and proportions. Besides the obvious economy resulting from mechanical production of the trusses, this device also materially improves the truss product by making each one of uniform quality, thereby aiding in the design and construction of houses equipped with such trusses.

Depending upon the design of the specific grip plate employed, stitching nails may be used in association with said plates. However, the apparatus of this invention is especially advantageous in that it enables the use of grip plates without stitching nails by holding the individual wood members in place firmly without the need for application of the stitching nails initially.

It will also be obvious that, if it is desired to apply a grip plate to but a single side of one or more of the joints, the apparatus of the invention may be utilized effectively, simply by failure to place a grip plate in the position where its use is to be omitted.

I claim:

1. In an apparatus for fabricating building members from at least two structural elements, said apparatus comprising a horizontally-disposed, longitudinally extending support member, carrying thereon a stop face to aid in the positioning of said elements; a fastener driving device, adjustably carried by said support member, said device having a pair of opposite jaws facing each other and extending outwardly from the support member, adjacent said stop face; means for relatively moving said jaws toward and away from each other, and means for releasably securing said device to said support member, at points spaced along its length, to facilitate adjustment of said apparatus.

2. The apparatus of claim 1 wherein the support member is provided with upper and lower parallel faces, said releasable securing means comprises a pair of parallel plates extending rearwardly to embrace the parallel faces

5

of the support member, and said releasable securing means acts through said parallel plates.

3. The apparatus of claim 2 wherein one of said rearwardly extending parallel plates is extended forwardly to form one jaw of said fastener driving device.

4. The apparatus of claim 3 including means on the inwardly extending jaw for supporting a drivable fastening device in position to be driven during movement of said jaws toward each other.

5. The apparatus of claim 1 wherein said means for relatively moving said jaws is a piston, reciprocating along an axis at right angles to the closed position of said jaws, and carrying one of said jaws.

6. The apparatus of claim 5 wherein said piston carried jaw includes means for supporting a drivable fastening device in position to be driven during movement of said jaws toward each other.

7. The apparatus of claim 6 including a spacing member supported adjacent the piston-carried jaw, arranged to support a structural member above said piston-carried jaw, when in retracted position.

8. A device for fabricating structural building members from wood framing members and toothed metallic grip plates comprising: a plurality of horizontally spaced-apart fixed support members; an elongated stop member carried by at least two of said supports and having a stop face conformed to receive without flexure, an elongated framing member; an elongated compression member mounted facing said stop member on at least two of said supports for movement toward and away from said stop member for compressing framing members between itself and said stop member, the face of said compression member facing said stop member being conformed to receive without flexure, an elongated framing member; means for actuating the compressor member; a plurality of clamp members; means for selectively securing said clamp members along said stop and compression members at the intersection of two framing members to be joined, the clamping faces of said clamp members being arranged in substantially horizontal planes and between the framing member engaging faces of said stop and compression members; means upon at least one clamping face of said clamp member for holding a grip plate against sidewise movement upon said clamping face and means for simultaneously actuating a plurality of said clamp members to clamp multiple pairs of intersecting framing members to thereby drive the teeth of the grip plates into the framing members.

9. Apparatus as in claim 8 wherein the upper clamping face of the clamp member is vertically fixed and provided with means for temporarily holding a grip plate in position and the lower clamping plate is vertically movable, having a face conformed to the grip plate to be held and provided with a collar to prevent sidewise displacement of the grip plate.

10. Apparatus as in claim 8 wherein the clamp members are closed by hydraulic pistons for simultaneous operation.

11. A device for fabricating structural building members from wood framing members and toothed metallic grip plates comprising: a plurality of horizontally spaced-apart fixed support members; a pair of elongated stop members carried by at least two of said supports, each having a stop face conformed to receive without flexure, an elongated framing member, said stop members being pivotally joined for angular movement in a horizontal plane; an elongated compression member mounted facing said stop members on at least two of said supports for movement toward and away from said stop members for compressing framing members between itself and said stop members, the face of said compression member facing said stop members being conformed to receive without

6

flexure, an elongated framing member; means for actuating the compressor member; a plurality of clamp members; means for selectively securing said clamp members along said stop and compression members at the intersection of two framing members to be joined, the clamping faces of said clamp members being arranged in substantially horizontal planes and between the framing member engaging faces of said stop and compression members and upon their facing faces; means upon at least one clamping face of each clamp member for holding a grip plate against sidewise movement upon said clamping face and means for simultaneously actuating a plurality of said clamp members to clamp multiple pairs of intersecting framing members to thereby drive the teeth of the grip plates into the framing members.

12. The apparatus of claim 11 including inter-fitting means on said stop members and their supports for holding the stop members in one selected position of a plurality of angular positions.

13. The apparatus of claim 11 including means interposed between said stop members and their supports for facilitating movement of the stop members on the supports.

14. The apparatus of claim 11 including means upon the stop members for preventing endwise movement of the framing member along the face thereof.

15. The apparatus of claim 14 wherein the movement preventing means may be used to positively exert compression from the outer portions of said stop members inwardly towards the point of connection of said stop members.

16. The apparatus of claim 15 wherein each of the movement preventing means is operated hydraulically to obtain simultaneous compression action.

17. The apparatus of claim 14 wherein the movement preventing means are adjustably fixed along the length of the stop members.

18. A device for fabricating structural building members from wood framing members and toothed metallic grip plates comprising: a plurality of horizontally spaced-apart fixed support members; an elongated stop member carried by at least two of said supports and having a stop face conformed to receive without flexure, an elongated framing member; an elongated compression member mounted facing said stop member on at least two of said supports for movement toward and away from said stop member for compressing framing members between itself and said stop member, the face of said compression member facing said stop member being conformed to receive without flexure, an elongated framing member; means for actuating the compressor member; said mounting and actuating means including a pair of parallel rails carried by the support members, corresponding rail engaging members on said compression member to guide said member in rectilinear movement along said rails and a pair of hydraulic cylinders mounted on the support members, parallel to said rails, having their respective rams positioned to act on the compression member and means for actuating said rams simultaneously to advance along the rails said compression member in even rectilinear manner, a plurality of clamp members; means for selectively securing said clamp members along said stop and compression members at the intersection of two framing members to be joined, the clamping faces of said clamp members being arranged in substantially horizontal planes and between the framing member engaging faces of said stop and compression members and upon their facing faces; means upon at least one clamping face of each clamp member for holding a grip plate against sidewise movement upon said clamping face and means for simultaneously actuating a plurality of said clamp

members to clamp multiple pairs of intersecting framing members to thereby drive the teeth of the grip plates into the framing members.

19. The apparatus of claim 18 wherein the cylinders for actuating the compression member are mounted on the parallel rails, the mounting means being selectively locatable along said rails.

References Cited in the file of this patent

UNITED STATES PATENTS

1,647,365	Kalgren -----	Nov. 1, 1927
2,357,480	McMahan -----	Sept. 5, 1944
2,544,499	Hovey -----	Mar. 6, 1951
2,803,012	Eddleblute -----	Aug. 20, 1957