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C. H. MONTGOMERY

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ROOF CONSTRUCTION

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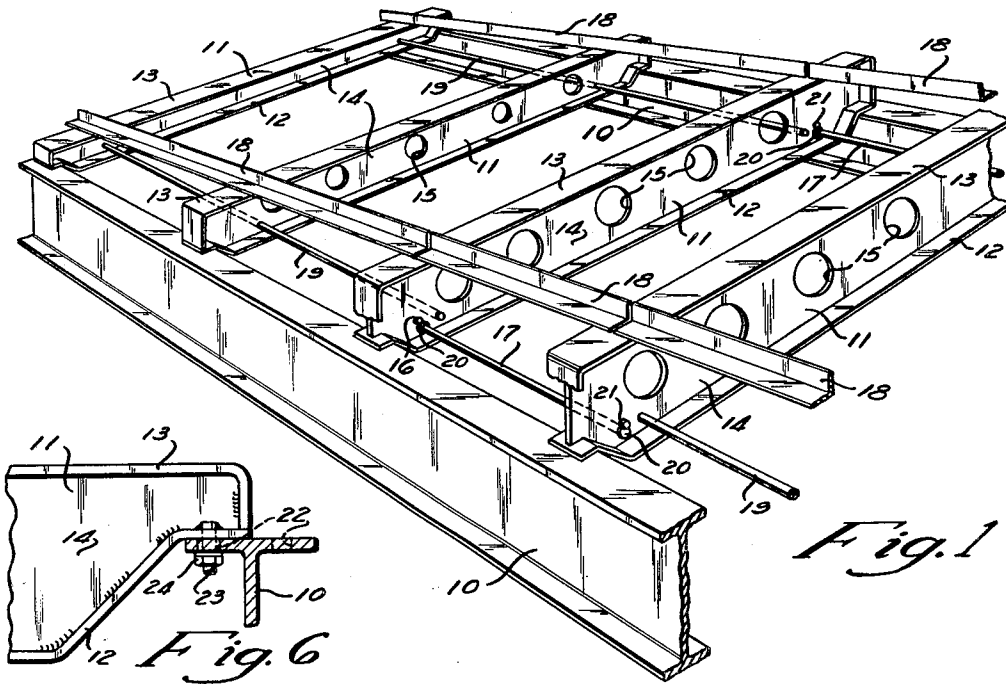


Fig. 1

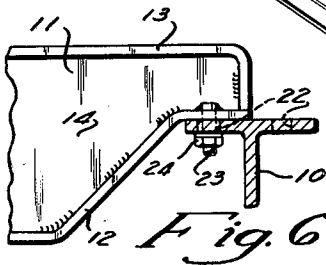


Fig. 6

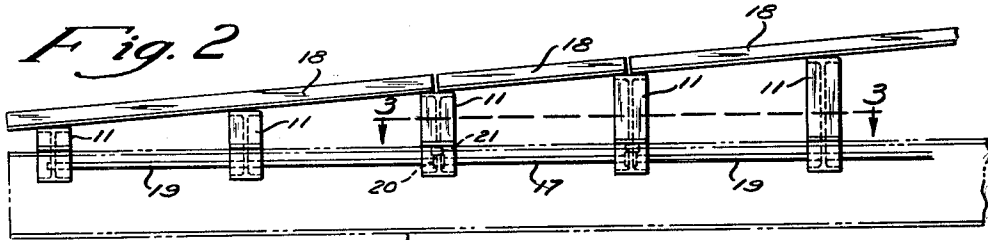


Fig. 2

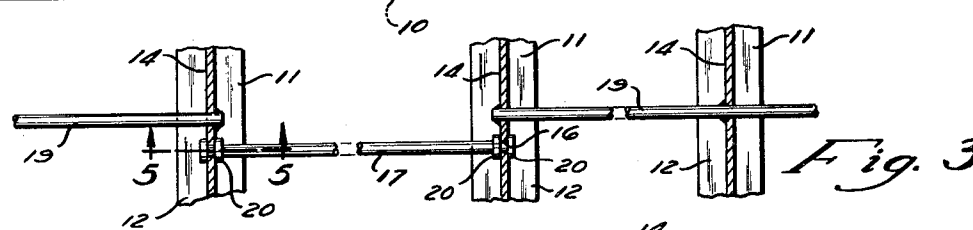


Fig. 3

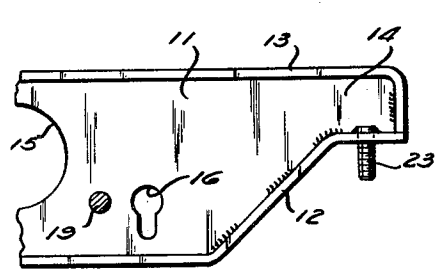


Fig. 4

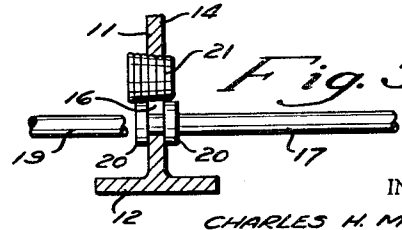


Fig. 5

INVENTOR.
CHARLES H. MONTGOMERY
BY
RICHEY, WATTS, EDGERTON,
MCNEENY & FARRINGTON
Attorneys

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ROOF CONSTRUCTION

Charles H. Montgomery, 3975 Jennings Road,
Cleveland 9, Ohio

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This invention relates to improvements in structural steel beams and to the method of assembly thereof in order to minimize the cost of erection in situs.

One of the objects of the invention is to provide shop sub-assemblies from a plurality of beams and to form certain of the beams with key slots therein to accommodate the ready assembly of the sub-assemblies at the building site during erection of a building.

Another object of the invention is to form a steel beam or roof joist from an I beam by cutting away a portion of the ends of the web thereof, then folding and welding the lower flange of the I beam upwardly against the remaining end portion of the web and bending the upper flanges downwardly over the end of the web to produce reinforced end sections or footings. The cut-away portion of the web may vary in height to produce a fall or predetermined inclination of the roof.

Another object of the invention is to provide openings in the web of the beam for the reception of tie bars for uniting the sub-assembled panels in place at the site of the building.

A further object of the invention is to provide tie bars with spaced lugs welded, in the shop, on the ends thereof so that the bars may be slipped into the opening found in the beams and locked therein to hold the beams together after the sub-assembled panels are elevated in place.

Further objects of the invention reside in the provision of conical plugs to wedge the tie rods in fixed relation in the openings in the beams during field erection of a roof or floor.

Other objects and advantages more or less ancillary to the foregoing, and the manner in which all the various objects are realized, will appear in the following description, which considered in connection with the accompanying drawings, sets forth the preferred embodiment of the invention.

Referring to the drawings:

FIG. 1 is a view in perspective of a plurality of roof beams having joists of the improved form mounted thereon, and tie bars therefor, some of which are welded in place in the shop, while others are joined to the beams in the field assembly of the building. The drawing further shows the variable height of the footings, and the predetermined number of beams in a shop assembled panel;

FIG. 2 is a side elevational view of a fragmentary portion of a roof frame embodying the improved beams and the organization of the parts thereof;

FIG. 3 is a sectional view through a roof joist, the section being taken on a plane indicated by the line 3—3 in FIG. 2;

FIG. 4 is a side elevational view of a fragmentary end portion of one of the joists;

FIG. 5 is a vertical sectional view through one of the joists showing the tie rods and wedge in place, the section being taken on a plane indicated by the line 5—5 in FIG. 3; and

FIG. 6 is a detail view, partially in section, of an end portion of one of the beams embodying the invention.

Referring first to FIG. 1, the assembly comprises a pair of I beams 10 or other structural steel members constituting the plates on the top of a wall of masonry or other side walls or partitions having the improved roof joists 11 mounted thereon. The joists are formed from I beams having the end portions of the web thereof cut-

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away from the flanges 12 and 13, the flanges 12 being folded over the web 14 and welded thereto. The flanges 13 are bent downwardly and folded over the end of the web 14 to strengthen the footing for the beam or joist.

It will be noted that the central portion of the joist depends below the footing, and that the altitude of the ends of the cut-away portions of the web vary in height, thus providing an inclined roof of a predetermined pitch.

The joists are formed with openings 15 in the webs 14 thereof to reduce the weight of the roof structure, and are further provided with key hole slots 16 in certain of the beams to facilitate the ready assembly of tie rods 17 during the erection of the parts in situs. As illustrated, a predetermined number of joists are sub-assembled in a shop, the number of joists, tie rods and purlins 18 therefore, depending upon the width of the span and weight of the sub-assembly. As shown, the first panel includes three joists 11, a pair of tie rods 19 and a pair of angle irons constituting the purlins 18. The parts of the sub-assembly are welded together in the shop and the panel is then transferred to the building site where it is elevated in place and anchored to form one of the roof sections. The second panel is of similar form and includes other joist members 11 and other assemblies similar to the first panel.

In the erection of the building, the second, third and other panels of the roof are spaced apart a distance equal to the spacing of the joist in the panels, and purlins 18 of a length equal to the length of the joist spacer are then mounted thereon in the field to span the gap. The panels are further united by the tie rods 17 which are formed with spaced cylindrical lugs 20 welded in the shop to the ends thereof. The lugs are inserted through the key hole slots 16 and the rod is seated in the lower end of the key hole slot. Next, a conical wedge 21 is driven into the larger opening in the key hole slot to facilitate affixation of the tie rods. The sheathing for the face of the roof may be formed from a plurality of channel sheet metal stampings or planking disposed in parallel relation with the purlins 18 and secured thereto and to the roof joist.

The I beam 10 or similar structural member forming the side wall plate is preferably formed with apertures 22 in the upper faces thereof for the reception of studs 23 welded to the lower face of the portion of the flanges 12 that are folded over the web of the I beams adjacent the fabricated ends thereof. The studs are threaded and inserted in the apertures 22 during erection of the structure, and nuts 24 are tightened thereon to lock the joist in place.

It will be recognized that the improved joist and sub-assembly of a requisite number thereof provides a substantial economy through the shop assembly thereof, and, moreover, reduces the hazard of erection since the sub-assembled panels reduce the field labor at the building site and necessitates installation only of the tie bars in the panels in the manner heretofore described.

It will be understood that the joist disclosed herein is unique, has pronounced utility and is not obvious from the prior art. The removal of a part of the web adjacent to one or both flanges near one or both ends thereof and the bending of the ribs to contact the web and the uniting of the flanges to the web affords several advantages. The part of the web may be removed by shearing the web along one flange and also toward the other web and the end of the joist. The rib so separated from the web is bent into contact with the sheared edge of the web and is welded thereto. Joists of a uniform size may be rolled and then roof beams which extend various distances above the end supporting members can be made by the simple expedient of varying the width or height of the web material removed from the ends of the joist. Thus, joists for sloping roofs are made from identical I-beams. Another advantage is that the joists are not weakened by such re-

removal of part of the web material. The flanges are not cut or broken and the initial strength of the flanges is retained. The initial strength of the web is not reduced to an important extent. This application is a continuation-in-part of my co-pending application Serial No. 739,046, filed June 2, 1958, now abandoned.

Although the foregoing description is necessarily of a detailed character, in order that the invention may be completely set forth, it is to be understood that the specific terminology is not intended to be restrictive or confining, and that various rearrangements of parts and modifications of detail may be resorted to without departing from the scope or spirit of the invention as herein claimed.

What is claimed is:

1. A sub-assembly of a predetermined number of I-beam steel joists each having a web and upper and lower flanges, tie rods and purlins constituting a unitary roof panel, the flanges of each joist being longer than the web thereof with end portions of the upper flange extending down along, and being welded to, the ends of the web and with end portions of the lower flange extending upwardly and then substantially parallel to the top flange along, and being welded to, the lower edge of the web near its ends, the said tie rods extending through, and being connected to, the webs of the said joists, and means for connecting two of such panels together, said means comprising slots in the webs of adjacent panels and second tie rods extending through said slots and having spaced collars on each end thereof straddling the web.

2. The combination of elements set forth in claim 1 in which the said slots are key-hole slots to receive the spaced collars on the second tie rods, and wedges engage the collars to retain them in position straddling the web.

3. A panel for roof construction comprising a sub-assembly of a predetermined number of I-beam steel joists, tie rods and purlins, said I-beam joists each having a web and upper and lower flanges, the flanges of each joist being longer than the web thereof with end portions of the upper flange extending down along, and being welded to, the ends of the web and with the lower flange having end portions extending upwardly and then substantially parallel to the top flange along, and being welded to,

the lower edge of the web near its ends, said tie rods extending through said webs and being connected thereto and the purlins being connected to the upper flanges of the joists, and means for connecting two of said panels together.

4. A panel for roof construction comprising a sub-assembly of a predetermined number of I-beam steel joists, tie rods and purlins,

(a) each of said I-beam joists having a web and upper and lower flanges, the upper flange being integral with the web for its full length and extending downwardly along and being welded to the ends of the web, the mid-portions of the lower flange and web being integral, the portions of the web at the opposite extremities of its said mid-portion having edges extending divergently from the lower flange and then outwardly to the ends of the web, the lower flange conforming in shape to the said lower edges of the web and being welded thereto,

(b) said tie rods extending through said webs and being connected thereto, the purlins being connected to the upper flanges of the joists, and means for connecting two of said panels together.

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