Dec. 11, 1928. 1,694,514

H. M. NAUGLE ET AL

FLOOR JOIST

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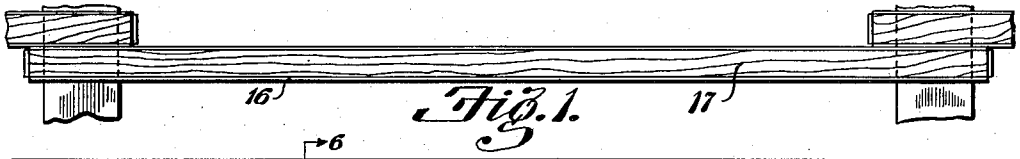


Fig. 1.

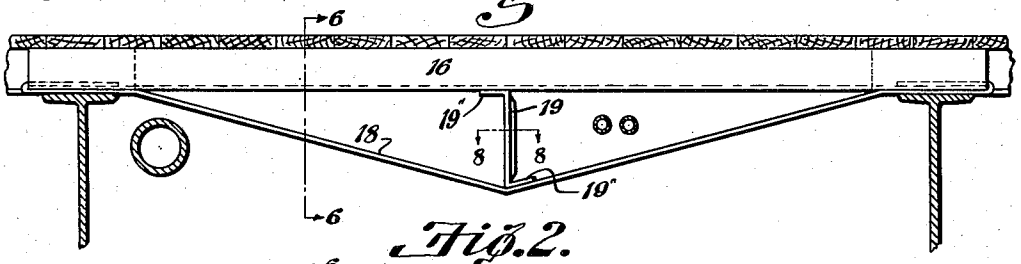


Fig. 2.

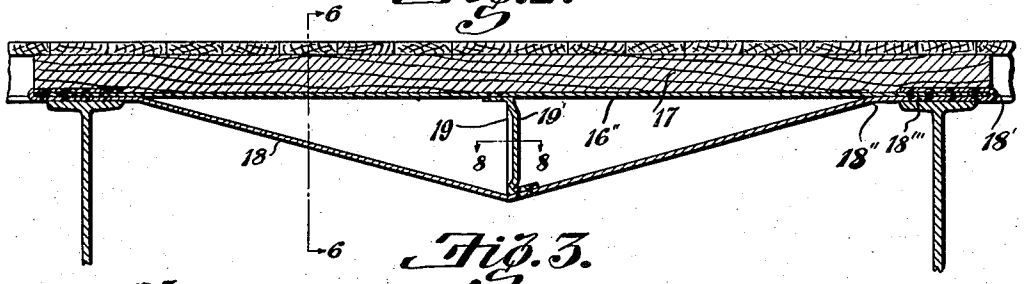


Fig. 3.

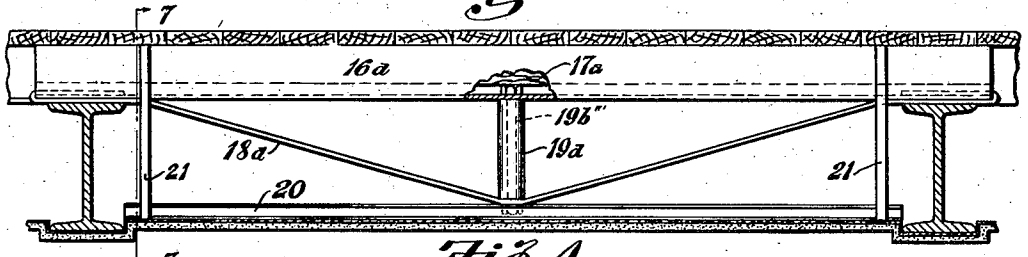


Fig. 4.

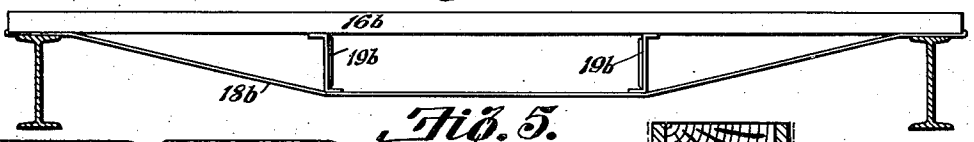


Fig. 5.

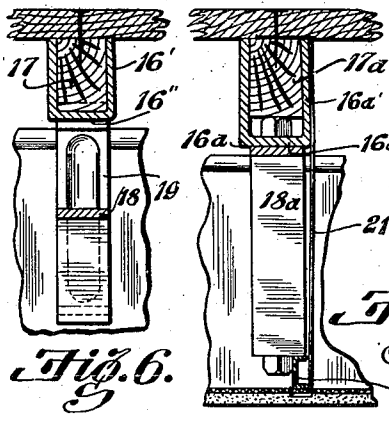


Fig. 6.

Fig. 7.



Fig. 8.

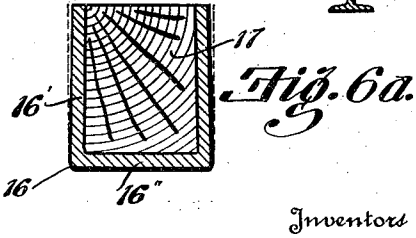


Fig. 6a.

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H. M. NAUGLE ET AL

FLOOR JOIST

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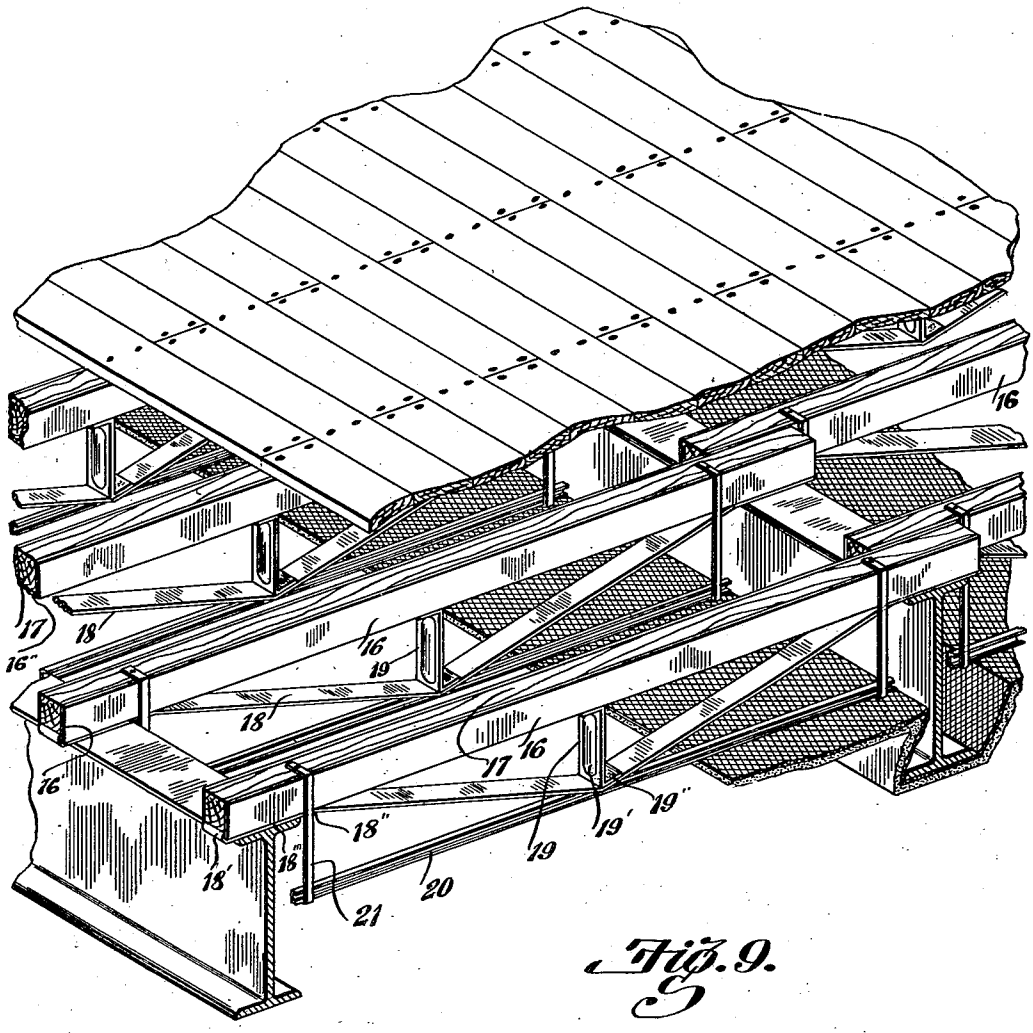


Fig. 9.

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FLOOR JOIST

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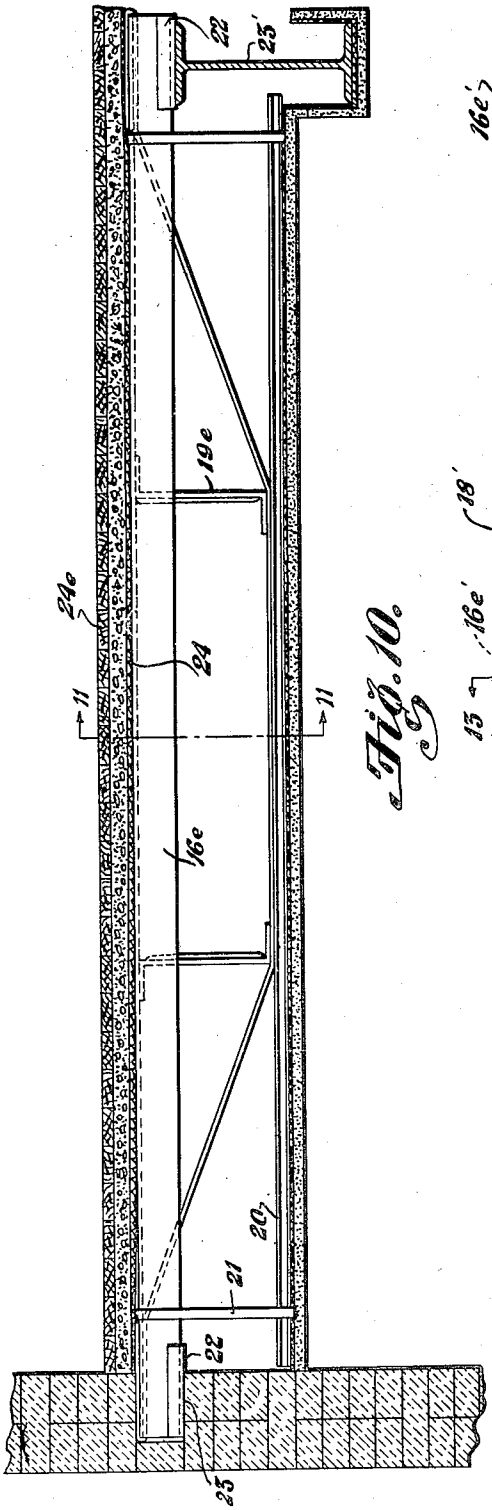


Fig. 10.

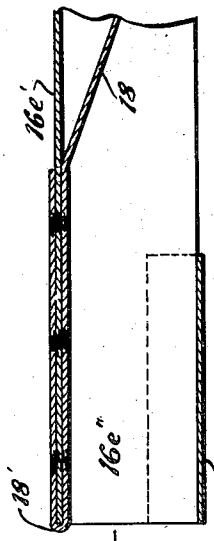


Fig. 13.

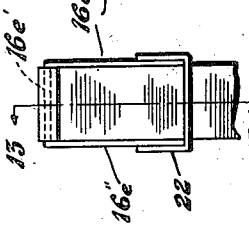


Fig. 12.

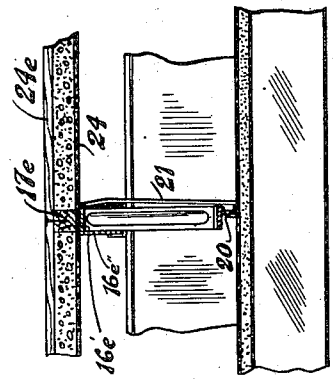


Fig. 11.

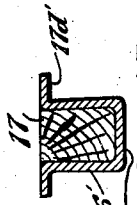


Fig. 15.

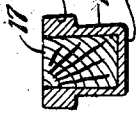


Fig. 14.

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Patented Dec. 11, 1928. 1,694,514

UNITED STATES PATENT OFFICE.

HARRY M. NAUGLE AND ARTHUR J. TOWNSEND, OF CANTON, OHIO, ASSIGNORS, BY MESNE ASSIGNMENTS, TO THE COLUMBIA STEEL COMPANY, OF PITTSBURGH, PENNSYLVANIA, A CORPORATION OF PENNSYLVANIA.

FLOOR JOIST.

Application filed September 9, 1924. Serial No. 736,679.

The invention relates to a trussed U-bar beam for use as floor joists, roof rafters and the like, and the object of the improvement is to provide a cheap and simple structural member which can be made at a factory and distributed in complete form for use in building construction.

The object of the improvement may be attained by combining an integral metal U-bar beam with flat bar truss and strut members, and with a wooden strip filler in the channel for strengthening the U-bar and receiving floor fastening means.

The invention is illustrated in the accompanying drawings forming part hereof, in which—

Figure 1 is a plan view of a preferred form of the improved joist;

Fig. 2, a side elevation of the same, showing supporting floor beams in section;

Fig. 3, a longitudinal elevation section of the same;

Fig. 4, a side elevation of the improved joist showing a modified form of strut member and ceiling supporting channels suspended from the joist;

Fig. 5, a side elevation of the improved joist showing two strut members;

Fig. 6, a cross section as on line 6—6, Figs. 2 and 3;

Fig. 6ª, an enlarged cross section of the wood filler U-bar as on line 6—6, Fig. 2;

Fig. 7, a cross section on line 7—7, Fig. 4;

Fig. 8, a cross section of a strut strip on line 8—8, Figs. 2 and 3;

Fig. 9, a fragmentary perspective view of a floor containing the improved joists.

Fig. 10, a side elevation of another form of the improved joist, showing the associated parts of a building;

Fig. 11, a cross section on line 11—11, Fig. 10;

Fig. 12, an end view of the same formed joist;

Fig. 13, a fragmentary longitudinal section on line 13—13, Fig. 12;

Fig. 14, a cross section of a wood filled U-bar with edge reinforcing beads; and

Fig. 15, a cross section of a wood filled U-bar with edge reinforcing flanges.

Similar numerals refer to similar parts throughout the drawings.

The integral metal U-bar 16, 16ª or 16ᵇ may be made by rolling of any suitable metal, preferably high carbon steel; and for the purpose of the present invention the bars are formed with a greater depth of flange 16′ than width of wedge 16″ so as to give increased beam strength thereto; the bar may be positioned with its web downward and its flanges upward so as to receive a wooden strip filler 17 within the recess of the bar, as shown in Figs. 1 to 9, inclusive.

As shown in Figs. 2, 6 and 9, the wood strip 17 may fill the entire recess of the U-bar, or as shown in Figs. 4 and 7, the wood strip 17ª may extend downward only part way into the recess to leave a space between the wood filler and the bottom of the U-bar for bolt heads and the like.

When a wood strip is used as a filler, it is placed in the recess of the U-bar and the flanges thereof are rolled together so as to bodily clamp the strip by and between the flanges and to deflect the flanges to converge toward each other from the web bottom of the bar toward the free edges of the flanges.

This construction and arrangement of the composite bar materially increases the strength of the U-bar as a beam, and also as a compression member. When the U-bar is used as a beam, the initial failure under a load is a lateral deflection of the upstanding flanges, and when these flanges are inclined upward and inward from normal according to the present improvement, such a deflection is thereby directed inward; but the abutment formed by the wood filler strip between the flanges, prevents an inward deflection thereof, and thereby realizes the maximum compression strength of the metal in the flanges.

Furthermore, the clamping action of the flanges on the sides of the wood filler holds the strip in endwise alignment, and adds to the U-bar the strength of the wood strip to resist endwise compression. To increase the

adhesion of the wood strip to the metal flanges a thin coating of liquid cement may be interposed between them; and to stiffen the edges of the flanges, a reinforcing bead 17^c, or a reinforcing flange $17^{d'}$ may be provided, as shown in Figs. 14 and 15, respectively.

The truss member 18, 18^a or 18^b is made from a flat bar of steel, of a width to enter between the flanges of the U-bar; and the end portions 18′ of the flat bar may be folded around the ends of the web of the U-bar and extended inward a short distance upon the same, as shown in Fig. 3.

The truss bar is also preferably bent, as at 18″, so that a portion 18‴ of each end of the strip of the flat bar will abut the underside of the end portion of the web of the U-bar; and the end portions of the truss bar which abuts the upper and lower sides of the U-bar may be secured thereto by spot welding or other suitable means.

The strut member 19 or 19^b may be made from a flat bar of steel of substantially the same width as the truss bar; and as shown in Figs. 2, 3, 5 and 6, the strut bar may be provided with a longitudinal corrugation 19′ for increasing its endwise compression strength.

Each strut bar may be provided with L-flanges 19″ on its ends for abutting the underside of the U-bar and the upper side of the flat truss bar, to which the flanges may be secured by spot welding or the like.

The modified strut member 19^a shown in Fig. 4, may comprise a tubular stem clamped between the U-bar and the truss bar, by a tie bolt $19^{b'''}$, and as shown in Fig. 5 two spaced truss members 19^b may be interposed between a long span U-bar 16^b and a corresponding truss bar 18^b.

The abutment of a portion of the ends of the flat truss bars against the underside of the web of the U-bar provides a long flat bearing, and the length of this bearing permits a reasonable range of variation in the distance between the floor beams, without changing the length of the joist; so that the improved joists can be kept in stock in standard lengths in the same or similar manner that wooden joists are usually cut and carried in stock lengths.

The substantial width of the U-bar, as compared with the depth thereof, gives a bearing of sufficient width upon the floor beam to render unnecessary the use of bridging means. Ceiling channel bars 20 may be suspended from the improved joist U-bars by means of depending metal strips 21 having their ends bent over and nailed to the wood filler strip in the U-bar, and having the lower ends engaged with the channel bar, or with the metal lath thereon, as shown in Figs. 4 and 7.

In the form of joist shown in Figs. 10 to 13 inclusive, the U-bar 16^e positioned with its web $16^{e'}$ upward and its flanges $16^{e''}$ downward, for which arrangement the ends of the strut bars 19^e abut the under side of the web between the flanges of the U-bar, and short lengths of channel bars 22 may engage the flanges at the ends of the U-bar, to form bearings for seating upon a wall support 23 or a beam support 23′.

Expanded metal sheets 24 may be laid upon the web of the U-bars in this form of joists and a cement slab formed thereon, with wooden strips 17^e laid upon the joists to which a wooden floor 24^e may be nailed.

It will be understood that floor joists and other like structural members are required to carry the load of the floor throughout the length of the joist, and that the strains imposed upon the trussed U-bar of the present improvement includes not only the compression strains imposed by the truss bar, but also the load strains upon the bar as a beam, between the points of support at the end and strut bar bearings.

And it is evident that in either arrangement of the U-bar with its flanges turned upward or downward, the greater depth of the flanges as compared with the less width of the web, gives the necessary beam strength for the use of the U-bar as a constituent member of the improved joist.

We claim:

1. A floor joist including an integral metal U-bar beam with flanges extending upward from the web, and a wood strip bodily clamped by and between the flanges of the U-bar.

2. A floor joist including an integral metal U-bar beam with flanges extending upward from the web, and a wood strip bodily clamped by and between the flanges of the U-bar, the flanges being inclined inward from the web bottom to the free edges of the flanges.

3. A floor joist including an integral metal U-bar beam with flanges extending upward from the web, a wood strip bodily clamped by and between the flanges of the U-bar, the flanges being inclined inward from the web bottom to the free edges of the flanges and reinforcing means with edges of the flanges.

4. A floor joist including an integral U-bar beam with flanges extending upward from the web, reinforcing means on the edges of the flanges, and structural means resisting downward deflection of the U-bar.

5. A floor joist including an integral metal U-bar beam with flanges extending upward from the web, a wood strip inserted and bodily clamped by and between the flanges of the U-bar, a metal truss bar having its ends secured to the ends of the U-bar, and one or more strut bars between the U-bar and the truss bar.

6. A floor joist including an integral U-bar

beam with flanges extending upward from the web, a flat truss bar having its ends folded over and upon the end portions of the U-bar, one or more strut bars between the U-bar and the truss bar, and means as spot welding for fastening the abutting parts together.

7. A floor joist including an integral U-bar beam with flanges extending upward from the web, a wood strip inserted and bodily clamped by and between the flanges of the U-bar, and structural means resisting downward deflection of the U-bar.

In testimony that we claim the above, we have hereunto subscribed our names.

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ARTHUR J. TOWNSEND.