

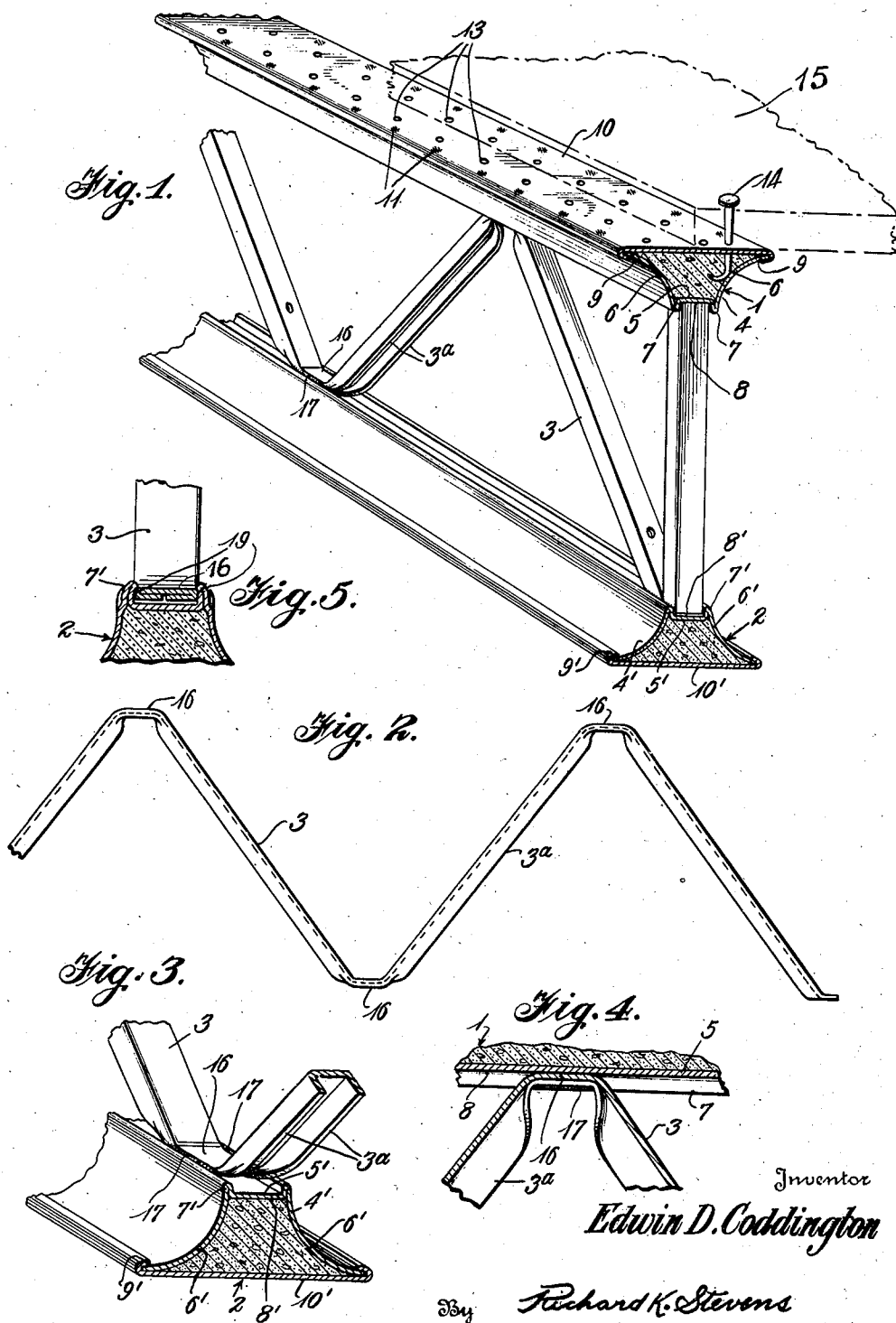
Dec. 1, 1936.

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2,062,399

JOIST

Filed Nov. 1, 1935



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2,062,399

JOIST

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Application November 1, 1935, Serial No. 47,867

9 Claims. (Cl. 72-61)

This invention relates to composite structural members and more particularly to joists suitable for use in building construction.

An important object of my invention is to provide a joist of the truss type formed of sheet metal and a composition filling material constituting a filler or core for the longitudinal chord members. Such type of joist is light, strong and well-balanced and may be manufactured at relatively low cost so as to be successfully marketed in competition with lumber. In addition it possesses advantages over lumber, such as resistance to fire and proof against attack by destructive insects. The joist furthermore is adapted to receive nails in the attachment thereto of the floor boards of buildings, and may be sawed to length somewhat similarly to lumber.

More especially the invention has for an object the provision of a joist comprising a pair of parallel longitudinally-extending chords each composed of a sheet metal casing enclosing a nailable cementitious core, these chords being supported in spaced relation by a web composed of a continuous channel member passing diagonally back-and-forth between the chords. A characteristic feature of the invention resides in forming the return bends of the web with short straight sections, or "flats", at their points of junction with the chords. In the preferred form of my invention the sides of the channel are folded inwardly against its bottom with their edges lying in substantial contact with each other and thereby providing an additional thickness of metal at the flats. These flats may be disposed within recesses extending externally along the opposed faces of the chords and bonded, as by welding, to the side walls thereof so as to form a rigid unitary structure.

Other objects and advantages will become apparent from the following detailed description of a preferred form of joist embodying the features of my invention, reference being had to the annexed sheet of drawings in which:

Figure 1 is a perspective view of one end of a joist exemplifying the invention;

Figure 2 is a side view of the web alone;

Figure 3 is a detail view showing the manner in which the web is attached to one chord of the joists;

Figure 4 is a detail view illustrating the manner in which the web is attached to the companion chord; and

Figure 5 is a detail sectional view disclosing an alternative mode of attaching the web to a chord.

The joist shown in Fig. 1 comprises an upper chord 1, a lower chord 2 and an intermediate web 3 extending back and forth between the

two chords and supporting them in parallel spaced relation.

The upper chord 1 comprises a sheet metal trough-shaped member 4 having a bottom 5 and outwardly-flaring sides 6. The sides are extended beyond the bottom 5 and folded back upon themselves to form the side walls 7 of a recess 8 extending longitudinally and externally of the bottom of the chord. The sides 6 terminate in horizontal flanges 9, and a cover plate 10 of sheet metal extends between the flanges and closes the top of the trough, the lateral edges of the cover plate being bent around the flanges and secured thereto by crimps, indicated at 11, or alternately, by puncturing or welding. The cover plate thus forms with the trough a tubular casing of generally trapezoidal cross-section.

The interior of the trough is filled with a cementitious core 12, which for example may be composed of a mixture of gypsum, Portland cement and sawdust represented in the approximate proportions, by weight, 55:20:9, respectively. This material may be packed into the casing in a dry state, and moisture then being introduced therinto through perforations 13 in the cover plate. Upon drying, the material sets into a hard mass into which nails may be driven without causing it to crack or crumble, and which offers great frictional resistance to their withdrawal. This mode of fabricating composite structural members is more fully described in my copending application Serial No. 39,022, filed September 3, 1935.

The cover plate 10 is of relatively light sheet metal so as to permit the use of nails 14 in the attachment of floor slabs or boards 15 (indicated by dotted lines in Fig. 1) to the joist. To prevent the nails from passing out of the joist when driven into the edge of a chord, the trough 4 is made of heavy sheet metal which causes the ends of the nails to be deflected by its inclined sides and clenched within the core.

The lower chord 2 is of identical construction to the upper chord 1 and for convenience corresponding parts thereof are designated by the primes of the same reference numerals.

The upper and lower chords are associated in reverse relation with their bottoms opposed to each other and joined by the web 3. As illustrated in Fig. 2 the web is constituted of a continuous channel member bent back and forth and having its apices flattened as at 16 so as to flatly contact the chords. These flats are further characterized by the deformation of the sides 3a of the channel inwardly against its bottom with their edges in substantially meeting engagement and together providing an additional thickness of metal overlying the bottom of the channel.

The width of the channel is such that its flattened areas 16 are snugly received within and substantially contact the bottom of the recesses 8 and 8' extending along the chords 1 and 2. As shown in Fig. 3, the folded over sides 3a of the channel underlie its bottom where the channel joins the lower chord 2; while, as illustrated in Fig. 4, these sides overlie the channel bottom where the channel joins the upper chord 1. In both cases, however, the side edges of the flats are bonded to the side walls of the recesses as by welding 17.

The joist may be closed at its ends by struts 18 which extend perpendicularly between the chords 1 and 2 and foot within the recesses 8 and 8'. These struts may comprise straight sections of a channel member similar to that which constitutes the web 3. One end of each strut overlies the flattened terminal of the channel 3, and both struts are welded to the side walls of the recesses so as to form a rigid connection with the joist.

Instead of joining the web 3 to the chords in the manner just described, this may be accomplished by the process known as "smash welding" as exemplified in Fig. 5. As illustrated in this figure, the side walls 7 of the recess 8' extending along the chord 2 are swaged into tight engagement with the edges of the flats 16 contemporaneously with the welding of these parts as designated at 19. This operation also acts to bend over the tops of the side walls 7 against the flats 16 to securely anchor the web in place. It will be obvious that this type of bond can be employed at the junction of the web with either the upper or the lower chord. Various other changes in structure and design in the form of joist described above may be made without departing from the spirit of my invention.

I claim:

1. A joist comprising a pair of chords, a web supporting the chords in parallel spaced relation, said chords each being composed of a sheet metal casing enclosing a nailable core and said web comprising a continuous channel bent so as to extend back and forth between the chords and the sides of said channel being folded inwardly upon itself to provide a double thickness of metal at the points of junction of said channel with the chords.

2. A joist comprising a pair of chords, a web supporting the chords in parallel spaced relation, said chords each being composed of a sheet metal casing enclosing a nailable core, and said web comprising a continuous channel bent so as to extend back and forth between the chords, said channel being flattened at its points of junction with the chords and having its sides folded inwardly upon said flattened portions.

3. A joist comprising a pair of chords each being composed of a sheet metal casing enclosing a nailable cementitious core, a web supporting the chords in parallel spaced relation and comprising a continuous channel bent so as to extend back and forth between the chords, a recess extending longitudinally of each chord and said channel having its sides folded inwardly upon itself to provide a double thickness of metal at its reverse bends and disposed within the recesses.

4. A joist comprising a pair of chords each being composed of a sheet metal casing enclosing a nailable cementitious core, a web supporting the chords in parallel spaced relation and comprising a continuous channel bent so as to extend back and forth between the chords, said channel being flattened at its reverse bends, and a recess

extending longitudinally of each chord, said channel having its sides folded inwardly upon itself to provide a double thickness of metal and disposed within the recesses at its points of junction with the chords.

5. A joist comprising a pair of chords each being composed of a sheet metal casing enclosing a nailable cementitious core, a web supporting the chords in parallel spaced relation and comprising a continuous channel bent so as to extend back and forth between the chords, said channel being flattened at its points of junction with the chords and having its sides folded inwardly upon said flattened portion to provide a double thickness of metal, and upright struts extending between the chords and closing the two ends of the joist.

6. A joist comprising a pair of chords each being composed of a sheet metal casing enclosing a nailable cementitious core, a web supporting the chords in parallel spaced relation and comprising a continuous channel bent so as to extend back and forth between the chords, each of said chords having a longitudinal recess extending along its bottom and said channel being flattened at its return bends and having its flanges folded inwardly and bonded to the side walls of the recesses, and upright channel sections extending between the chords and closing the ends of the joist.

7. A joist comprising a pair of chords each being composed of a sheet metal casing of generally trapezoidal cross-section enclosing a nailable cementitious core, a web supporting the chords in parallel spaced relation and comprising a continuous channel bent so as to extend back and forth between the chords, each chord having a recess extending along its external bottom face and said channel being flattened and having its sides folded inwardly at its reverse bends to provide a double thickness of metal and bonded to the side walls of the recesses.

8. A joist comprising a pair of chords each being composed of a sheet metal casing of generally trapezoidal cross-section enclosing a nailable cementitious core, a web supporting the chords in parallel spaced relation and comprising a continuous channel bent so as to extend back and forth between the chords, each chord having a recess extending along its external bottom face and said channel being flattened and having its sides folded inwardly at its reverse bends to provide a double thickness of metal and bonded to the side walls of the recess, and upright channel sections extending between the chords and closing the ends of the joist, said channel sections having their ends projecting within the recesses and bonded to the side walls of the recesses.

9. A joist comprising a pair of chords, a web supporting the chords in parallel spaced relation, said web being constituted of a continuous channel bent so as to extend back and forth between the chords and having its sides folded inwardly at its points of junction with the chords, and each of said chords comprising a trough-shaped member having outwardly flaring walls of relatively thick sheet metal enclosing a nailable core, and a cover plate of relatively thin sheet metal rigidly connected thereto, whereby nails may be driven through the cover plate and clenched against the outwardly flaring walls of the trough-shaped member.

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