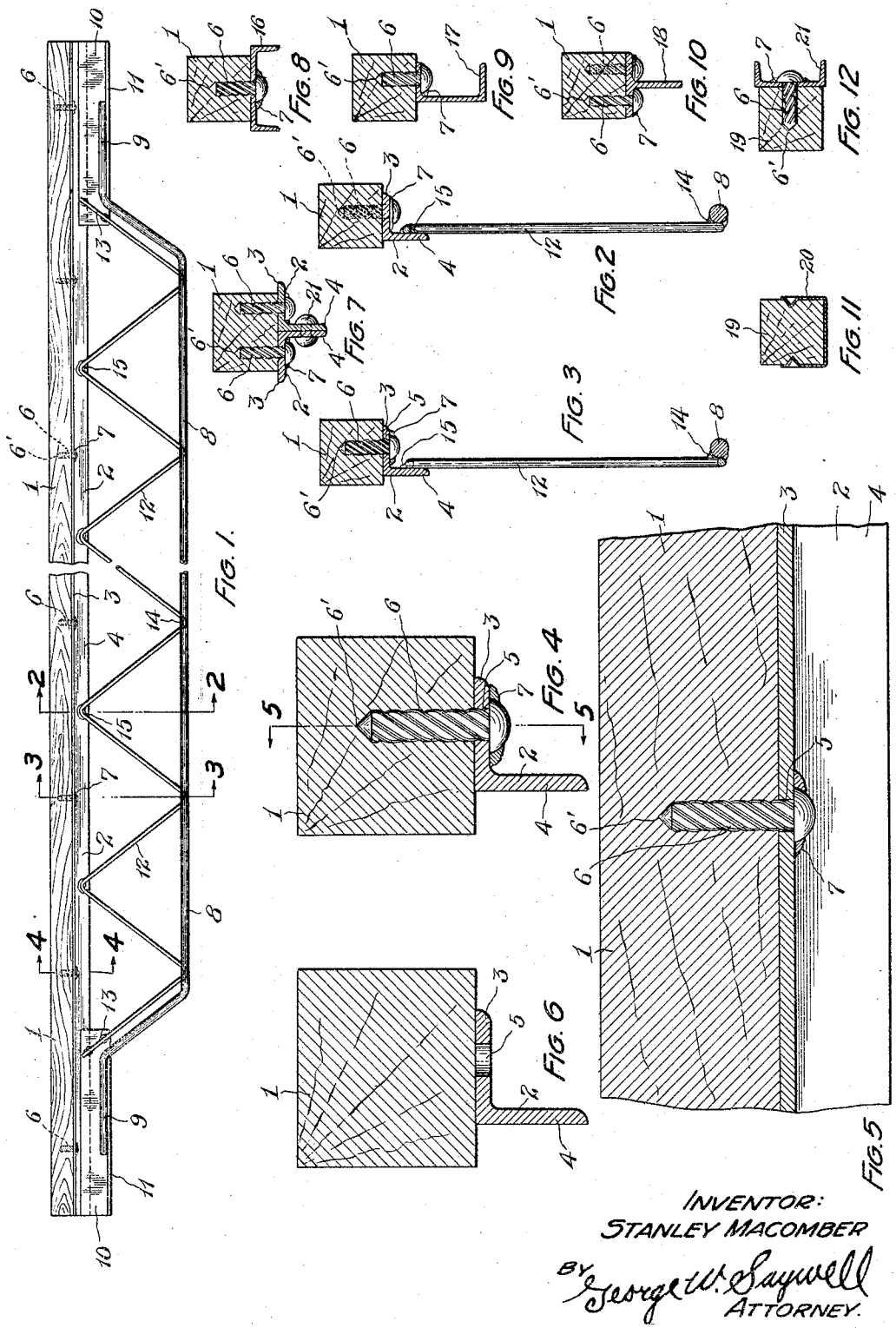
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COMPOSITE WOOD-METAL STRUCTURAL MEMBER

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COMPOSITE WOOD-METAL STRUCTURAL MEMBER

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My invention relates to composite members and particularly to structures of this character intended for use with wood floors. Various types of members are shown in the accompanying drawing and hereinafter fully described, both for use as transverse structural units as well as for columns. One practicable application of my improved composite member is for use as the top chord of a floor joist and in said use the joist containing the composite member is intended as a substitute for wood joists or is used in competition with said wood joists, the wood component of the composite member serving as a nailing strip to which the wood floors are directly secured, in addition to carrying a part of the stresses to which the chord is subjected.

Satisfactory operation of such a composite member is dependent upon such a rigid connecting together of the wood and metal as will make them work together. One satisfactory way of accomplishing this result is illustrated by the composite member shown in the accompanying drawing and hereinafter fully described.

The annexed drawing and the following description set forth in detail certain means embodying my invention, such means constituting, however, but a few of the various forms in which the principle of the invention may be illustrated.

In said annexed drawing:

Figure 1 is a broken side elevation of a complete floor joist in which one type of my improved composite member has been incorporated;

Figures 2 and 3 are transverse vertical sections, upon an enlarged scale, taken in the planes indicated by the lines 2—2 and 3—3, respectively;

Figure 4 is a transverse vertical section, upon a still larger scale, taken in the plane indicated by the line 4—4, Figure 1;

Figure 5 is a fragmentary longitudinal vertical section, taken in the plane indicated by the line 5—5, Figure 4;

Figure 6 is a section similar to Figure 4 but showing the condition of the wood and metal elements forming this type of the composite member before they are rigidly secured together;

Figures 7, 8, 9 and 10 are transverse vertical sections of a floor joist in which other types of my improved composite member have been incorporated; and

Figures 11 and 12 are horizontal sections of columns in which two types of my improved composite member are utilized.

Referring to the annexed drawing in which the same parts are indicated by the same respective numbers in the several views, a wooden element such as a rectangular section 1 is secured to a metal element such as an angle 2 having the horizontal leg 3 and the vertical leg 4, Figures 1 to 6, this wood and steel being relatively so proportioned that each will yield substantially the same amount under a given loading. In other words, if the modulus of elasticity of the wood be presumed to be two million and the modulus of elasticity of the metal angle be presumed to be thirty million, then an area of wood is used which is fifteen times as large as the area of the steel. These members so proportioned are then fastened together in a manner to provide a joint in which the wood and steel will work together and which will not open up under any normal conditions of service, including reasonable excess loading. One way in which I have provided such a joint is by the means now to be described.

A hole 5, Figure 6, is punched or drilled in the leg 3 of the angle 2. A screw 6, Figures 4 and 5 is then driven through the hole 5 and into the wood joist 1, this drive screw 6 having a pointed end 6^1 and being of a diameter somewhat larger than the hole 5 and being of a length so as to enter the wood 1 to a depth of about two-thirds of the thickness of the wood. I have ascertained that the best kind of a screw for this purpose is a rolled thread screw which is driven into the wood rather than screwed in with a screw driver, and which becomes the more tightly fixed the harder it is pounded in, and which in fact worms its way through the wood or turns of its own accord as it is pounded in. Thus, the screw is incorporated within and intermingled with the material of the wood

joist, and not merely contained within a hole having smooth sides and formed by the driving of a smooth faced tooth, tang, or prong into the wood. In order to make of this drive screw 6 what is in effect a solid, stiff steel stud formed upon the angle 2 and sticking up in the wood, I weld the head of the screw to the outside surface of the leg 3 of the angle 2, as illustrated by the welded area 7.

Figure 7 is an illustration of a type of my new composite member in which the wood element 1 is combined with and rigidly secured to two metal angle members 2 which also are rigidly secured together by rivets 21.

In the form of member shown in Figure 8, I have substituted a channel 16 for the angle member 2 and have secured this channel by its web to the wood member 1.

In Figure 9 I also show a channel 17 which is secured to the wood member 1 by one of its flanges.

In Figure 10 is shown the use of a T-member 18 which is secured by both of its flanges to the wood member 1.

Figures 11 and 12 illustrate the use of my composite member as a column, the metal member 20 of Figure 11 being a channel construction which is pressed snugly around the vertical wood member 19 and crimped into the wood member; whereas, in Figure 12 a channel member 21 is rigidly secured to one side of the vertical wood member 19 by means of the stud 6.

Various other forms and shapes come within the spirit of my invention and, of course, the forms illustrated in Figures 11 and 12 for use as columns can also be used for transverse floor joists.

Composite wood-metal members formed in the manner shown and described have been found to work together satisfactorily and not to loosen up under the shrinkage of the wood or during deflection, to give satisfactory deflections, to carry an excess over their normal loading over a comparatively long continuous period of time without further deflection, and to resume their original position when their loads are removed. The value of the steel which is thus saved by the use of the wood strip 1 as a structural part of the member is more than the value of the wood thus used and therefore the member as a whole is manufactured on a more economical basis than a steel member of the same characteristics. When used as a joist, the wood element 1 also serves as a nailing strip to which the wood floor can be directly secured.

A very good exemplification of the application of my improved composite member to a complete structural unit is shown in Figures 1, 2 and 3. The construction is that of a truss joist of a well known general type comprising upper and lower spaced chords connected by a reversely bent web-member, thus forming a central truss, the ends of the chords being brought into proximate close relation and integrated to form extended unit-end supporting and bearing members which can be cut to provide a spanning by the joist of any one of a reasonable range of spans. Specifically this truss joist comprises, in addition to the composite upper chord hereinbefore described, a lower metal chord 8 having its ends 9 brought into close parallel relation with the ends of the upper chord angle 2, these chord ends being rigidly secured together and integrated through the medium of end angles having vertical legs 10 welded to the vertical legs 4 of the upper chord angle 2, and having horizontal leg portions 11 to which the ends 9 of the lower chord 8 are welded. A reversely bent metal web rod 12 is alternately welded, as indicated by the welded areas 14 and 15, to the lower chord 8 and the upper angle 2, throughout the more widely spaced relation of this chord 8 and angle 2, and the upwardly bent end portions 13 of the web-member 12 welded to the vertical legs 10 of the end angle members, all to form the complete unit shown in Figure 1. In this truss joists construction, the metal angle 2 running lengthwise of the joist serves thus as a means for securely attaching the web member 12 to the composite upper chord.

What I claim is:

In a truss structure, an upper chord composed of a wood section and a metal structural member secured together longitudinally by a series of driven screw-threaded fasteners the heads of which are welded to said metal member.

Signed by me this 15th day of November, 1928.

STANLEY MACOMBER.