March 29, 1927.

1,622,559

W. F. ZABRISKIE

METALLIC JOIST

Filed May 25, 1925

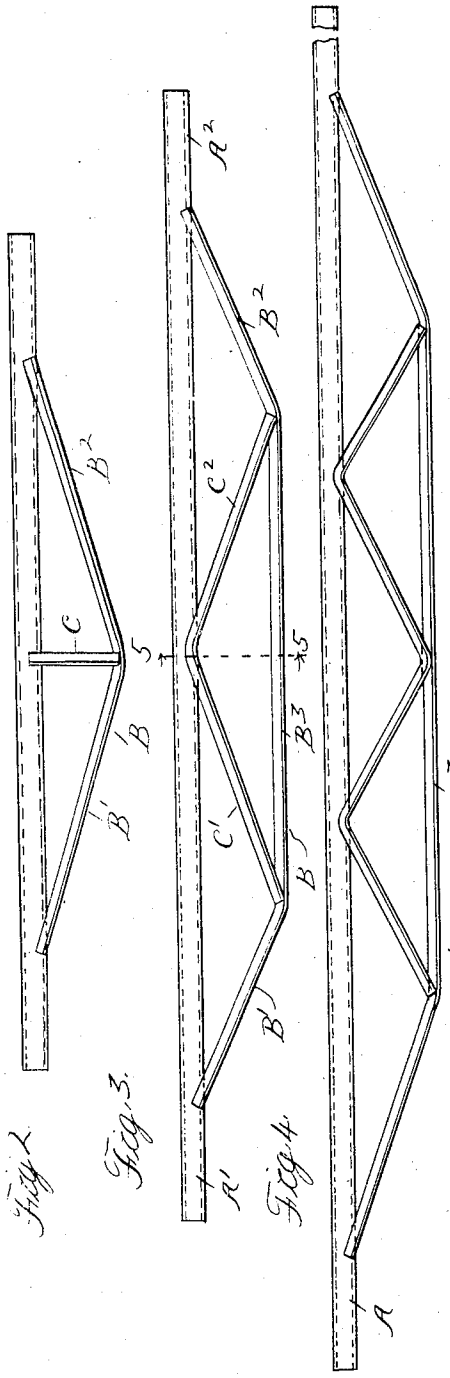


Fig. 1.

Fig. 3.

Fig. 4.

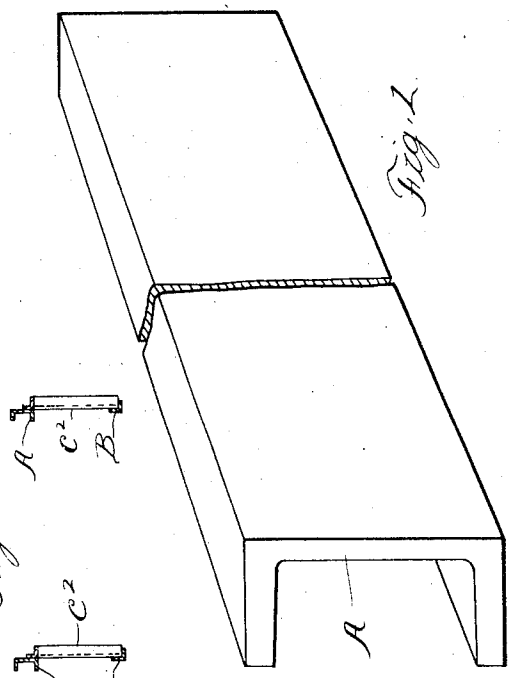


Fig. 5.

Fig. 2.

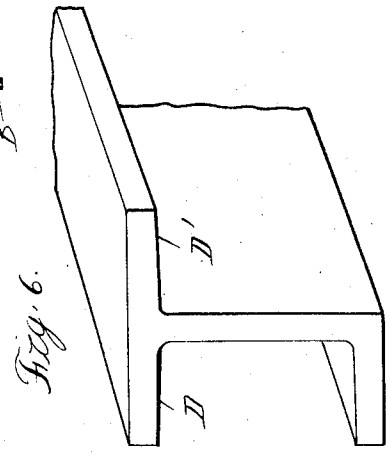


Fig. 6.

Inventor

William F. Zabriskie

By Whittemore Hulbert Whittemore & Belknap

Attorneys

Patented Mar. 29, 1927. 1,622,559

UNITED STATES PATENT OFFICE.

WILLIAM F. ZABRISKIE, OF DETROIT, MICHIGAN, ASSIGNOR TO GABRIEL STEEL COMPANY, OF DETROIT, MICHIGAN, A CORPORATION OF MICHIGAN.

METALLIC JOIST.

Application filed May 25, 1925. Serial No. 32,834.

The invention relates to metallic joists designed for use as substitutes for the ordinary wooden joists of floor construction.

It is the object of the invention to obtain a standard construction applicable to varying conditions in floor building and one which is simple and inexpensive to manufacture.

It is a further object to obtain a system of joists all the members of which have certain common characteristics permitting of alternative use in the same floor construction.

To this end the invention consists in the construction as hereinafter set forth.

In the drawings;

Figure 1 is a perspective view of a metallic bar or "structural shape" forming the principal element of my improved joist construction.

Figure 2 is an elevation showing a truss construction for use on short spans.

Figures 3 and 4 are similar views of modified constructions for progressively longer spans.

Figure 5 is a cross section on line 5—5 of Figure 3.

Figure 6 is a sectional perspective view of a modified construction of the main member.

In the placing of floors in buildings, the supporting walls, posts and girders are frequently so positioned as to form areas which must be spanned by joists of varying lengths. Thus, to carry a uniform load without objectionable deflection and with a minimum weight of material, such joists should be varied in construction. This might be accomplished by increasing or diminishing the depth of the beam but with such variation there would be difficulty in supporting the joists with their upper edges level. Furthermore, for simplicity and economy in manufacture, it is highly desirable to use a standardized construction as far as possible.

My improved construction is designed to meet the difficulties as above given by utilizing as the main element of the joist a metallic structural shape of uniform depth and of such strength as to be capable in itself to support the desired floor load for short spans. With this main element is combined a reinforcing truss which, however, does not extend the full length of the main element but terminates some distance inward from each end thereof. The reinforcing truss is variously formed according to the length of the span and includes a lower chord member and an intermediate webbing member. This may be formed of simple angle bars suitably bent while the main member which is preferably a channel bar, forms the upper chord of the truss. The members may be arranged with their flat sides adjacent and may be united to each other by electric welding or riveting. A is the main member of the joist formed of a suitable structural shape preferably for light loads, a channel beam having its web arranged vertically. As before stated, this member is of sufficient strength in itself to carry a desired floor load for short spans and for longer spans constitutes the upper chord member. B is the lower chord member preferably formed of an angle bar bent to have the oppositely inclined end portions B′, B² which are secured at their outer ends to the member A a pre-determined distance from the end thereof. This distance is so calculated that the main member in itself will carry the load up to the point of attachment of the truss and without undesirable stresses and deflection even where the support is at the extreme end of the joist. The lower chord member B as shown in Figure 2 is composed solely of the oppositely inclined portions B′ B² and is centrally connected to the main member by a single strut C also preferably formed of an angle bar. In the construction shown in Figure 3 the lower chord member has a centrally horizontal portion B³ and the intermediate webbing is formed of a similar angle bar having the oppositely inclined portions C′ C² centrally connected to the member A and at their opposite ends to the member B.

Figure 4 shows a modification in the webbing and in the length of the portion B³ of the member B to adapt the truss for a different length of span.

With all the various modifications illustrated and suggested, the lower chord member of the truss terminates a pre-determined

distance inside the outer ends of the main member A. This permits of using the same construction of joist for slightly varying spans by variably overlapping the supports with these end portions A' and A^2. It will also be noted that the depth of web of the member A in each of the various modifications shown, is the same so that a level arrangement of the floor supports will result in the levelling of the upper edges of all the joists regardless of the length of spans.

For excessive floor loads it may be desirable to modify the construction of the main member A from a simple channel shape to that of an I beam with one of the lower flanges removed. Such a construction is shown in Figure 6 and because of the symmetrical arrangement of the upper flanges D, D' will add a considerable element of strength while the elimination of one of the lower flanges facilitates the attachment of the reinforcing members.

One important advantage of my construction is the simplicity of the truss and particularly the webbing between the upper and lower chord members thereof. This is possible by reason of the fact that the upper chord member performs not only the function of transmitting compression stresses but also possesses considerable strength to withstand transverse stresses. It is therefore possible to use for the webbing a simple bent bar with only a few points of attachment between the same and the upper and lower chord members, whereas with an upper chord designed merely for compression stresses it would be necessary to attach the webbing at more points and closer to each other. In other words, the inherent rigidity in the upper chord member to resist transverse deflection simplifies and cheapens the construction of the remainder of the beam.

Figures 2, 3, and 4 show a series of floor joists which are progressively increased in length by substantially uniform increments. This is rendered possible by maintaining the same length in the end portions of the joists beyond the point of attachment of the lower chord member and varying the number of bends in the truss. However, as shown in Figures 3 and 4 the spacing of the points of attachment between the web members and chord members is shorter in the longer members so as to take care of the increasing total load of the joist as the length is increased. By constructing series of joists in this manner the cost of manufacture is greatly reduced for the number of joists is reduced to the minimum and the structure is substantially the same in all lengths of spans excepting for a varying number of bends in the web member.

What I claim as my invention is:

1. A metallic floor joist comprising a top chord formed of a structural shape possessing greater strength than required for compression only and adapted to resist bending in a vertical plane, a bottom chord having its ends attached to said top chord at points sufficiently spaced from the ends thereof to provide substantial bearing supports for limited variations in span, and diagonal web members spaced in their points of attachment to said upper chord members by at least one and one-half times the total depth of the truss.

2. A metallic floor joist comprising a top chord formed of a structural shape possessing greater strength than required for compression only and so formed as to provide its maximum resistance to bending in a vertical plane, a bottom chord having its ends attached to said top chord at points sufficiently spaced from the ends thereof to provide substantial bearing supports for limited variations in span, and diagonal web members spaced in their points of attachment to said upper chord members by at least one and one-half times the total depth of the truss.

3. A metallic floor joist comprising a top chord formed of a structural shape having a vertical web and top and bottom horizontal flanges to provide resistance to bending in a vertical plane and also possessing greater strength than required for compression only, a bottom chord having its ends attached to said top chord at points sufficiently spaced from the ends thereof to provide substantial bearing supports for limited variations in span, and diagonal web members spaced in their points of attachment to said upper chord member by at least one and one-half times the total depth of the truss.

4. A metallic floor joist comprising a top chord formed of a structural shape having a vertical web and top and bottom horizontal flanges to provide resistance to bending in a vertical plane and also possessing greater strength than required for compression only, a bottom chord of angle cross-section having its ends attached to said top chord at points sufficiently spaced from the ends thereof to provide substantial bearing supports for limited variations in span, the vertical legs of said lower chord member overlapping the web of the upper chord member at points of attachment, and diagonal web members spaced in their points of attachment to said upper chord member by at least one and one-half times the total depth of the truss.

5. A metallic floor joist comprising a top chord formed of a structural shape having a vertical web and top and bottom horizontal flanges to provide resistance to bending in a vertical plane and also possessing greater strength than required for compres-

sion only, a bottom chord of angle cross-section having its ends attached to said top chord at points sufficiently spaced from the ends thereof to provide substantial bearing supports for limited variations in span, the vertical legs of said lower chord member overlapping the web of the upper chord member at points of attachment, and diagonal web members also formed of angle bars having their vertical legs overlapping the vertical webs of the top and bottom chord members at points of attachment, said points in the upper chord member being spaced by a distance at least one and one-half times the total depth of the truss.

In testimony whereof I affix my signature.

WILLIAM F. ZABRISKIE.