Sept. 29, 1936. R. K. PALMER 2,055,701

STEEL JOIST FOR CONCRETE FLOORS

Filed May 24, 1934

Fig. 1.

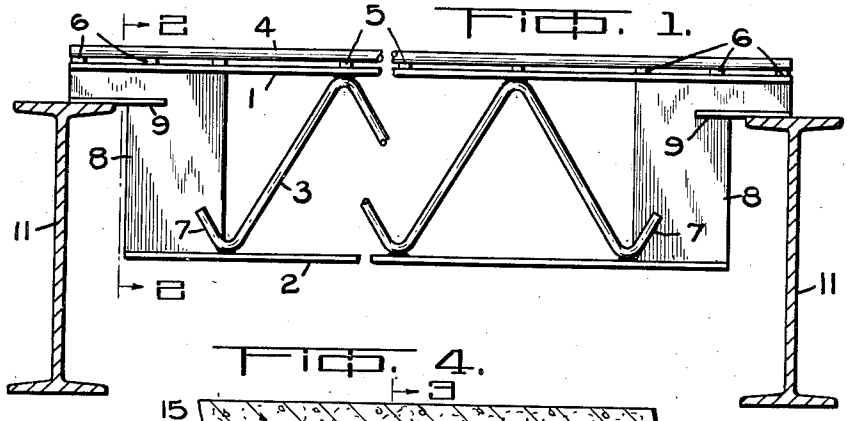


Fig. 4.

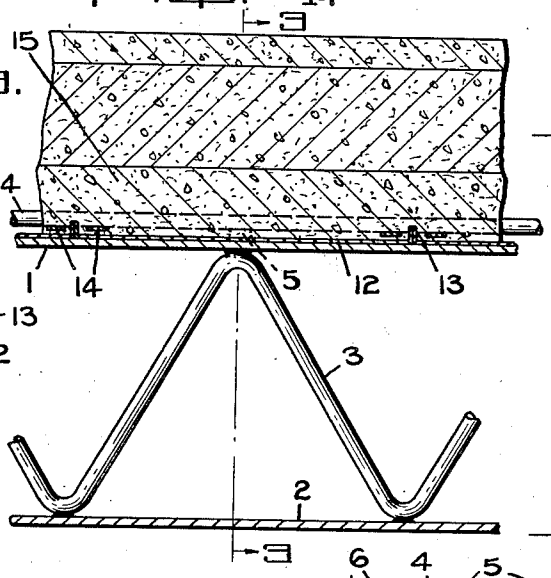


Fig. 3.

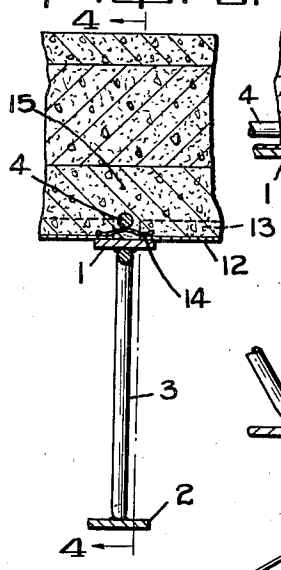


Fig. 2.

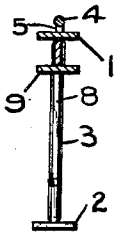


Fig. 7.

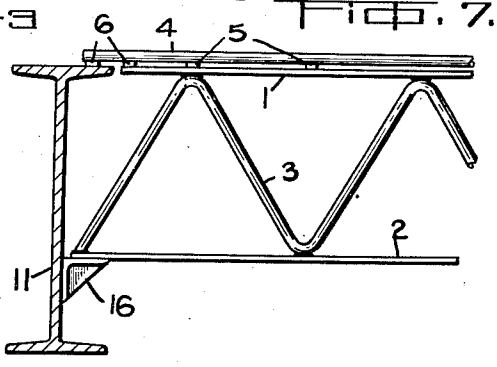


Fig. 6.

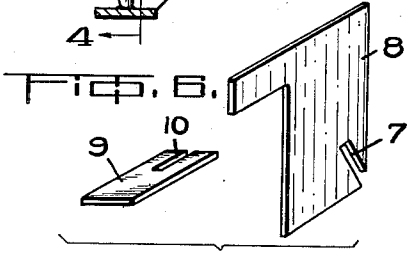


Fig. 5.



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STEEL JOIST FOR CONCRETE FLOORS

Robert Kendrick Palmer, Hamilton, Ontario, Canada

Application May 24, 1934, Serial No. 727,216

8 Claims. (Cl. 189—37)

My invention relates to improvements in steel joists for concrete floors of the kind which are poured upon forms which are supported by the joists, such forms being of the type which may be temporary or which may be left permanently in place, such as sheet steel pans as hereinafter described, and the object of the invention is to devise an improved joist in which a member secured to the upper flange thereof will be embedded in the concrete floor formed thus increasing the rigidity of the joist both longitudinally and laterally, and hence enabling it to carry a greater vertical load with a given weight of steel.

A further object is to provide novel and improved means for supporting the joist ends on the main floor supporting girders or beams.

A still further object is to construct joists in which the forms for supporting the concrete in pouring the floor will be directly supported upon the upper flanges of the joists instead of having to employ independent supporting beams therefor.

Yet another object is to provide joists in which portions thereof will extend above the pans as laid thus allowing the latter to be securely keyed to the joists to obtain flatness, security and uniformity during the pouring and in the final floor thus doing away with loose wiring or clipping through holes in the sheets or the driving of wooden plugs to hold the joists to the concrete.

With the above and other objects in view which will hereinafter appear as the description proceeds, my invention consists, in its preferred embodiment, of the construction and arrangement hereinafter more particularly described and illustrated in the accompanying drawing in which:—

Fig. 1 represents, in side elevation broken away intermediately, a joist constructed according to my invention showing the same in position between two main floor girders which, in this case, are of I-beam form.

Fig. 2 is a vertical cross-sectional view through the line 2—2 (Fig. 1).

Fig. 3 is an enlarged vertical section through the line 3—3 (Fig. 4).

Fig. 4 is an enlarged vertical longitudinal section taken through the line 4—4 (Fig. 3).

Fig. 5 is an enlarged perspective detail of one of the spring clips which I employ for holding the adjacent ends of adjacent pans in place on my joists.

Fig. 6 is a perspective detail of the two parts of the ends of my joist constituting a step for supporting the joist ends on the main girders, such parts being shown separated and,

Fig. 7 is an elevational view of one end of my joist showing a modified construction of joist end for supporting such joist on the main floor girders.

Like characters of reference indicate corresponding parts in the different views.

My joist which, as illustrated, is of the diagonal open web type comprises an upper flange 1, a lower flange 2 and a zig-zag bar web 3 welded to the upper and lower flanges 1 and 2 at its apices. A longitudinal bar 4 is positioned in spaced relation above the flange 1 of the joist and is secured thereto by means of welding joints 5, such welding joints being spaced apart and preferably positioned immediately above the upper apices of the web as well as intermediately thereof. The ends of the bar 4 are secured to the flange 1 by welding, as for instance, by the additional welding joints 6.

The ends of the bar of the web 3 are, in the construction illustrated in Figs. 1 to 6, received into the inclined slots 7 of the vertical inverted L-shape plates 8 provided between the ends of the flanges 1 and 2, said bar ends being welded to such plates which are themselves welded to the flanges 1 and 2. Horizontal flange plates 9 having longitudinal slots 10 extending from one end straddle the vertical portions of the L-shape plates 8 and are welded thereto as well as to their horizontal portions, thus constituting steps which support the joists ends on the main floor supporting girders 11.

The pans 12, which preferably have side flanges 13 and are preferably corrugated lengthwise, extend between the joists and their ends rest directly upon the flanges 1 of such joists. They are held in place by the bowed spring clips 14, which are inserted between the bars 4 and the flanges 1 with their main portions in engagement with the former and their ends resting on the surfaces of adjacent pans as is illustrated in Fig. 3.

The concrete floor 15 is now poured as illustrated in Figs. 3 and 4, the concrete filling the spaces between the bars 4 and the upper flanges 1 of the joists upon which the pans are supported. Thus the bars 4 are completely embedded in the concrete floor and such embedded bars serve to increase the rigidity and strength of the joists against buckling under the weight of the floor.

Where it is desired to lower the floor level with respect to the main supporting girders, I may construct the joists with ends as illustrated in Fig. 7. In this case the top flange 1 is cut to a length to allow a working clearance between its

end and the edge of the top flange of the main floor girder 11 and the bar 4 extends over said latter flange sufficient distance to allow the welding of the bar to the girder for stiffness and security. The bottom flange 2 is cut to a length to rest on a bracket or shelf 16 welded or otherwise secured to the web of the main girder 11, the diagonal end of the web 3 being welded to the top of the bottom flange 2 of the joist.

My construction of joist as set forth stiffens the joist vertically by increasing its depth by the amount that the member is embedded in the concrete floor and this increases its moment of inertia. It stiffens the joist laterally due to its being partially embedded in the concrete, being, therefore, held absolutely in line and in no way subject to side bending.

The carrying load of the joist is increased because its top or compression member is embedded in the concrete and after the concrete floor has set the latter and the compression member become one composite whole making what is essentially a much enlarged top chord without appreciable additional cost for steel or labour.

There is a saving in material because the joist may be constructed to secure a balance in strength as between the top and bottom chords after the concrete is poured although the top and bottom chords may be out of balance until the concrete floor is completed, such concrete floor, which would otherwise be idle, is used to carry a portion of the top chord stress.

What I claim as my invention is:

1. In a joist for concrete floors, the combination with the joist proper including an upper lateral flange or load carrying compression member upon which the concrete floor is adapted to be supported, said concrete floor being disposed entirely above said flange, of a bar substantially coextensive with the upper flange disposed longitudinally thereabove, and adapted to be embedded in the concrete floor, and means for securing the bar to the upper flange in spaced relation therewith.

2. In a joist for concrete floors, the combination with the joist proper including an upper lateral flange or load carrying compression member upon which the concrete floor is adapted to be supported, said concrete floor being disposed entirely above said flange, of a bar disposed longitudinally above the upper flange and adapted to be embedded in the concrete floor, and a plurality of spaced apart welding joints between the bar and the upper flange for permanently securing the former to the latter in vertical spaced apart relation.

3. In a joist for concrete floors as claimed in claim 1, a horizontal flange plate secured to each joist end.

4. In a joist for concrete floors, in combination, a built-up joist proper comprising upper and lower flanges and a connecting diagonal bar web therebetween, the upper flange constituting a load carrying compression member disposed entirely below the concrete floor and supporting the same, a bar substantially coextensive with the upper flange disposed longitudinally thereabove and adapted to be embedded in the concrete floor and means for securing the bar to the upper flange in spaced relation above the same.

5. In a joist for concrete floors as claimed in claim 4 wherein said securing means comprises a plurality of spaced apart welding joints, certain of said welding joints being disposed immediately above the upper apices of the diagonal bar web, and other of said welding joints being disposed intermediately of the aforesaid welding joints.

6. In a joist for concrete floors as claimed in claim 4, vertical inverted L-shaped plates secured between the upper and lower flanges in the vicinity of their ends, and transverse flange plates secured to said vertical plates, the ends of said diagonal bar web being secured in inclined slots in the vertical plates.

7. The combination with a plurality of substantially parallel joists, each comprising a joist proper including an upper laterally extending flange constituting a load carrying compression member disposed entirely below the concrete floor and supporting the same, a bar disposed longitudinally above each flange and adapted to be embedded in the concrete floor, and means for securing each bar to each upper flange in spaced relation thereabove, of pans extending between each pair of joists and having their ends resting on the upper flanges of such joists, and means insertable between the bars and the pan ends for holding such pan ends in engagement with said upper flanges.

8. In a construction as claimed in claim 7, wherein the means insertable between the bars and the upper flanges of the joist comprises bowed spring clips.

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