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RIGID LATTICE GIRDER FOR FLOORS

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Fig. 1.

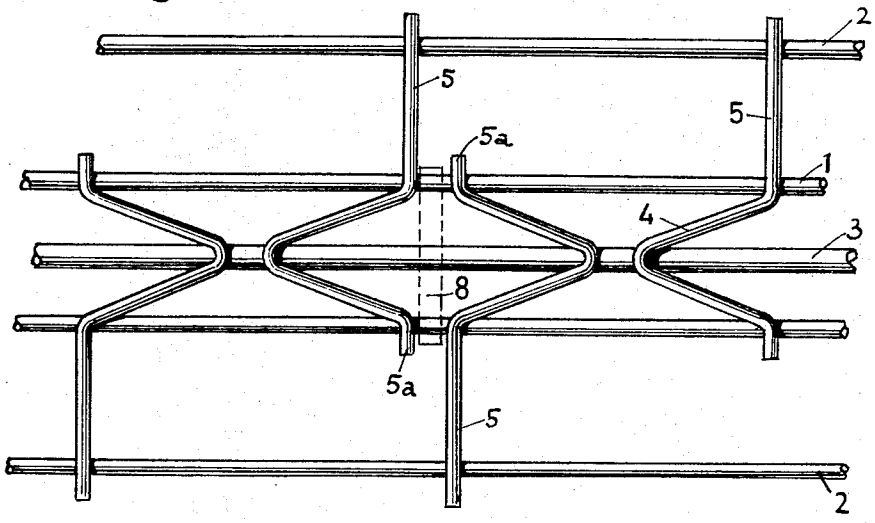


Fig. 2.

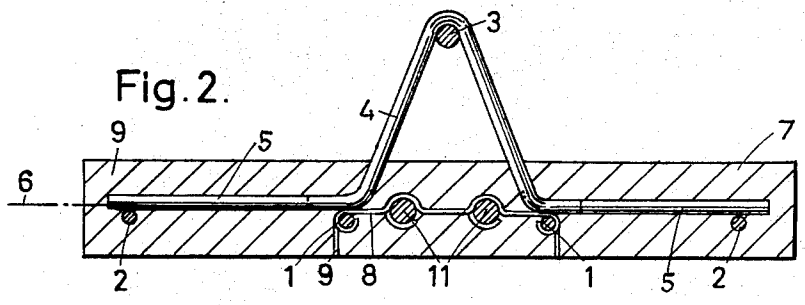
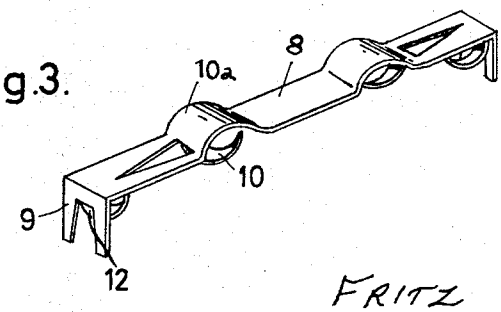


Fig. 3.



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RIGID LATTICE GIRDER FOR FLOORS

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The present invention relates to rigid lattice girders for floors, and more particularly to lattice girders whose lower chord means is embedded in a concrete slab which may serve as a form for pouring concrete to produce a reinforced concrete floor.

It is known to build concrete floors or ceilings by pouring concrete onto a flat form about metallic lattice girders serving as reinforcement, the concrete form consisting of a plurality of adjacently arranged elongated plates which are coplanar, extend in the same direction as the reinforcing girders and are connected thereto before the forms are placed into coplanar position for pouring the concrete. After the concrete has been poured and has set, the form plates become part of the floor structure, i.e. they function as a lost form. The prefabricated form units, including the reinforcing girders, are placed in position at the building site and require little additional support when the concrete is poured to produce the floor. Therefore, it is possible to proceed with all necessary work in the space underneath the floor form even while the concrete is being poured and the floor is thus completed, no supports being in the way of the workmen beneath the floor.

While this is most advantageous, such form units require a separate form plate which becomes a lost form and serves no static function in the structure, i.e. has no load-bearing function in the building of the reinforced concrete floor.

It is the primary object of the present invention to overcome this latter disadvantage and to produce a lattice girder most economically and with a view to saving labor and materials.

To accomplish this object, this invention proposes to use a precast concrete slab about the lower chord means of a reinforcing lattice girder as a form for pouring concrete floors about the girder. For this purpose, the girder has strut means consisting of a plurality of yokes extending transversely of the girder chord means and being diagonally inclined in relation thereto, as is known, but to provide each yoke with an asymmetrical transverse extension adjacent the lower chord means. According to the invention, alternating yokes are so arranged in the direction of elongation of the concrete slab that the yoke extensions are on alternating sides of the upper chord in a transverse direction.

These laterally extending yoke extensions provide sufficient reinforcement for lateral portions of the concrete slab and make it possible to widen these elongated slabs so that the slabs themselves may serve as the forms and replace the previously used separate plate forms. Thus, elongated slabs having reinforcing girders embedded therein may be placed side by side to provide a floor or ceiling form for the concrete pouring. This not only saves the extra form plates but also makes it possible to use the precast concrete slab form as part of the supporting structure since such reinforced slabs are load-supporting. The asymmetrical and alternating arrangement of the laterally extending slab reinforcing yoke extensions use only as much structural steel as is actually needed for static purposes.

The above and other objects, features and advantages of the present invention will become more apparent in the following detailed description of one specific embodiment thereof, taken in conjunction with the acompanying drawing wherein

FIG. 1 is a top view of the lattice girder of the present invention showing its essential elements without the concrete slab;

FIG. 2 is a transverse section of the lattice girder of FIG. 1, with the concrete slab; and

FIG. 3 is a perspective view of a connecting member useful in the girder of this invention.

Referring now to the drawing wherein like reference numerals refer to like parts in all figures, the lattice girder is shown to comprise an elongated concrete slab **7** and a lower chord means embedded in the concrete slab and extending in the direction of elongation of the slab. The illustrated lower chord means consists of two like pairs of lower chords, each pair consisting of an inner chord **1** and an outer chord **2**. An upper chord **3** is spaced from the lower chord means and is generally parallel thereto. The upper chord is arranged centrally of the lower chord means, i.e. centrally of the inner chords **1, 1**, in the direction of elongation of the slab **7**. The lower chord means and the upper chord are connected by strut means, preferably by spot welding the metal elements **1, 2, 3, 4** together at their points of contact, as is well known in this art. The strut means consists of a plurality of yokes **4**. Each yoke extends transversely of the girder chord means and is diagonally inclined in relation thereto.

In accordance with the present invention, each yoke has an asymmetrical transverse extension **5** adjacent the lower chord means and alternating ones of the yokes are so arranged in the direction of elongation of the slab that the asymmetrical yoke extensions are on alternating sides of the upper chord in a transverse direction.

In the illustrated embodiment, each yoke includes a generally V-shaped portion having an apex connected, i.e. by spot welding, to the upper chord **3** and two transverse extensions **5**, **5***a* connected to the lower chord means, the asymmetrical extensions **5** being substantially longer than the extensions **5***a*. The shorter extensions **5***a* are adjacent the inner chord **1** of one pair of the lower chords and the asymmetrical longer extensions **5** are adjacent the inner and outer chords of the other pair of lower chords. The V-shaped yoke portions of adjacent yokes are oppositely inclined whereby pairs of yokes with the V-shaped portions thereof inclined towards each other are arranged in the direction of elongation of the concrete slab **7**. The alternating arrangement of the yokes always places a short extension **5***a* and a long extension **5** adjacent one another.

As shown in FIG. 2, the lower chord means **1, 2** and the yoke extensions **5**, **5***a* extend at least approximately in the horizontal center plane **6** of concrete slab **7** to provide the most effective reinforcement therefor. The alternating arrangement of the extensions **5**, in conjunction with the outer chords **2**, provide sufficient reinforcement for the portions of concrete slabs **7** extending laterally beyond the inner chords **1** of the lattice girder to ensure rigidity of the slab under the load conditions imposed thereon under normal operations contemplated therefor while using up no more reinforcing steel than is absolutely required. Therefore, while such a girder meets all structural requirements, it is very economical in the use of steel.

In the preferred embodiment herein illustrated, a transverse connecting member **8** is mounted on the lower chord means between adjacent yokes, i.e. between the transverse extensions **5**, **5***a* of the yokes. As shown, the connecting member **8** has perpendicularly bent end portions **9** func-

tioning as spacers between adjacent yoke extensions **5** and **5***a*, and embedded in the concrete before the same is set about the lower chord means. A central part **12** of the end portions **9** is cut out and bent inwardly to form an arcuate element encircling the chords **1**, **1** and holding these chords in position so that they are clamped together by the connecting member **8**. Additionally, the member **8** has two arcuate portions **10***a* cooperating with similarly arcuate cut-out elements **10**, each of the connecting member portions **10**, **10***a* cooperating to encircle elongated reinforcing rods **11** extending in the direction of elongation of the slab and serving as auxiliary reinforcements therefor.

While the invention has been described in connection with a now preferred embodiment, it will be clearly understood that many variations and modifications may be devised by those skilled in the art without departing from the spirit and scope of this invention as defined in the appended claims.

What we claim is:

1. A rigid lattice girder for floors, comprising an elongated concrete slab, a lower girder chord means embedded in the concrete slab and extending in the direction of elongation of the slab, an upper girder chord spaced from the lower chord means and generally parallel thereto, the upper chord being arranged centrally of the lower chord means in the direction of elongation of the slab and strut means connecting the lower chord means and the upper chord, the strut means consisting of a plurality of yokes extending transversely of the girder chord means and being diagonally inclined in relation thereto, each yoke having an asymmetrical transverse extension adjacent the lower chord means, and alternating ones of said yokes being so arranged in the direction of elongation of the slab that the yoke extensions are on alternating sides of the upper chord in a transverse direction.

2. The rigid lattice girder of claim **1**, wherein the lower girder chord means consists of two like pairs of lower chords, each pair of lower chords consisting of an inner and an outer chord, and the upper chord being arranged centrally of the inner chords of said pairs of lower chords.

3. The rigid lattice girder of claim **1**, wherein each yoke includes a generally V-shaped portion having an apex connected to the upper chord and two transverse extensions connected to the lower chord means, the asymmetrical one of said extensions being substantially longer than the other extension, the V-shaped yoke portions of adjacent ones of said yokes being oppositely diagonally inclined whereby pairs of said yokes with the V-shaped portions thereof inclined towards each other are arranged in the direction of elongation of said slab.

4. The rigid lattice girder of claim **1**, wherein the lower girder chord means consists of two like pairs of lower chords, each pair of lower chords consisting of an inner and an outer chord, the upper chord being arranged centrally of the inner chords of said pairs of lower chords, and wherein each yoke includes a generally V-shaped portion having an apex connected to the upper chord and two transverse extensions, a shorter one of said extensions being adjacent the inner chord of one of said pairs of lower chords and the asymmetrical one of said extensions being adjacent the inner and outer chords of the other one of said pairs of lower chords.

5. The rigid lattice girder of claim **1**, further comprising a transverse connecting member mounted on the lower chord means between adjacent ones of said yokes, said connecting member maintaining the spacing of the adjacent yokes and including means for securing longitudinally extending reinforcing elements for the concrete slab.

References Cited by the Examiner

UNITED STATES PATENTS

992,994	5/1911	Smith	52—690
1,365,126	1/1921	Simpson	52—685
1,620,501	3/1927	Vogel	52—686

FOREIGN PATENTS

1,219,125	12/1959	France.
831,764	2/1952	Germany.
786,204	11/1957	Great Britain.

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