Dec. 3, 1935. G. P. RICE 2,022,784

CONCRETE FLOOR CONSTRUCTION

Filed Aug. 4, 1933 2 Sheets-Sheet 1

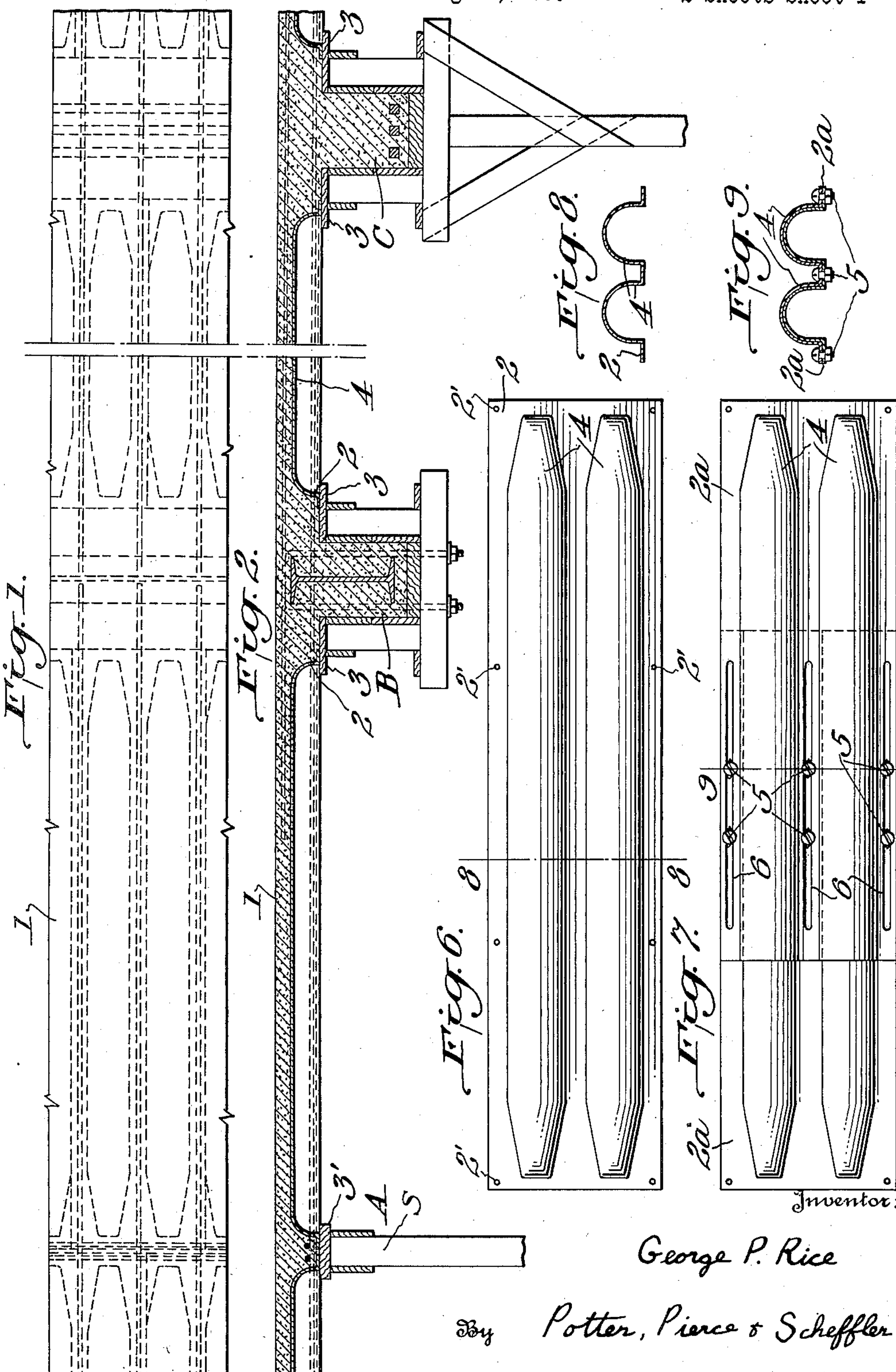

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Fig. 3.

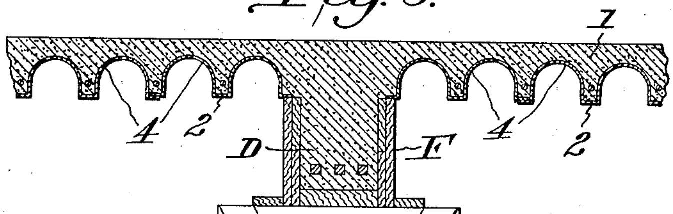
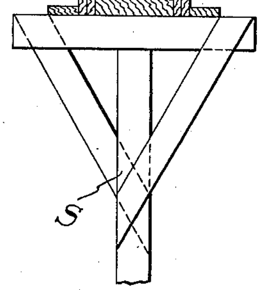



Fig. 10.

Fig. 11.

Fig. 4.

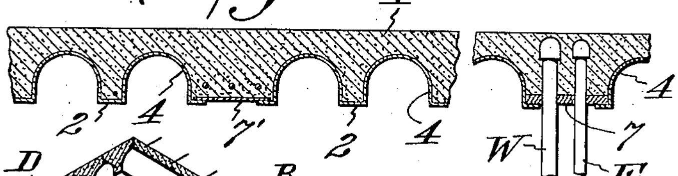
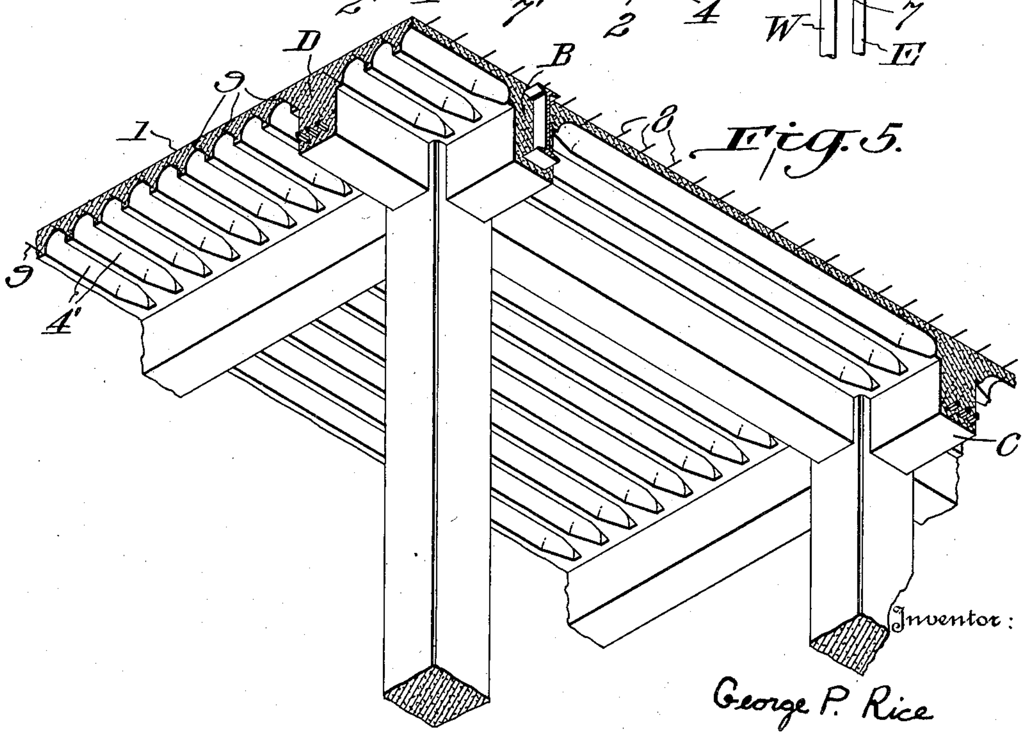


Fig. 5.



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UNITED STATES PATENT OFFICE

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CONCRETE FLOOR CONSTRUCTION

George Peter Rice, New Orleans, La.

Application August 4, 1933, Serial No. 683,680

3 Claims. (Cl. 25—131.5)

This invention relates to a new and improved system of concrete floor construction.

An object of the invention is to provide an improved reinforced concrete floor construction combining the greatest possible strength with a minimum weight.

A further object is to provide a self-supporting sheet metal form for concrete floor construction which will eliminate concrete having no functional necessity. A further object is to provide a simple, inexpensive form for concrete floor construction, which can be readily adapted to structures of varying dimensions and which can be erected and dismantled with a minimum of labor and expense.

Other objects and advantages of the invention will appear from the following description:

Steel and concrete are the most utilized and important materials of engineering construction. The physical properties and low cost of these materials, together with the flexibility with which they lend themselves to combination, arrangement, and their ease of handling are attributive to this result. The steel or concrete frame buildings with concrete floor construction are of typical application. In fact, these two types are the rule of present day building construction.

Buildings constructed of these materials usually employ a system of columns, girders and beams for the support of the loads accruing from the weight of the construction and the loads and stresses to which the building is subjected in use. This arrangement of skeleton framing is most practical and efficient, but it is evident that the combined cost of the various framing elements and foundation is primarily influenced by the amount of load to be supported.

The floor arch construction is usually productive of a considerable portion of this load. It obviously follows that any considerable diminishing in the weight of this building element would reflect appreciable economy, provided the arch itself were likewise practical and efficient.

The corrugated slab construction of the present invention has been developed for the use of steel and concrete, and the utilization of these materials with maximum efficiency contributes to its light weight. The method of construction affords exceptional opportunity for the saving of materials, time and expense; not only in itself, but with corresponding reflection upon the other elements of the building. The system is adaptable to both steel and reinforced concrete framework and its span limitations are well within those usually encountered.

Its design is similar to that of the ordinary reinforced concrete floor slab, except that the concrete at the underside of the slab, otherwise ineffective, is eliminated. Increased depth, permitting longer spans, greater load carrying capacity and greater rigidity, is accordingly attainable at a fractional weight of the usual reinforced concrete floor slab.

The exact contour of these grooves is unimportant, except to the extent that the permissible concrete stresses be not exceeded, and that it be adaptable to the method of forming and other practical considerations.

Forming of the slab is accomplished by the use of permanent or removable corrugated sheet metal units, shaped to establish contour. These units are not only self-supporting but are capable of carrying construction loads, without intermediate supports between their ends.

Briefly stated, the invention comprises a slab floor construction in which the underside of the floor slab is grooved or corrugated parallel to the main reinforcement of the slab, the grooves being tapered off at the ends as they approach the transverse load carrying elements of the construction. The invention also comprises novel forming units adapted to produce such corrugated floor slabs and the novel system of construction including said forming units.

For the purpose of illustration, the invention will be more fully described with reference to the accompanying drawings in which:

Figs. 1 and 2 are a plan and a sectional elevation, respectively, of a section of floor construction embodying the invention;

Fig. 3 is a sectional elevation transverse to the main reinforcing elements of the floor construction;

Fig. 4 is a transverse sectional elevation through a longitudinal rib of extended width;

Fig. 5 is a perspective view of the underside of a section of floor constructed in accordance with the invention;

Fig. 6 is a plan view of a forming unit of the invention;

Fig. 7 is a plan view of a modified forming unit of adjustable length;

Fig. 8 is a section on line 8—8 of Fig. 6;

Fig. 9 is a section on line 9—9 of Fig. 7; and

Figs. 10 and 11 are sectional views of forming units showing alternative contours.

In Figs. 1, 2 and 3 a section of flooring is shown during construction after the concrete has been poured and before the flooring units and temporary supports have been removed. The floor slab 1 is supported during pouring and setting by the supporting and forming units 2. These units are entirely self-supporting throughout their span, being supported at their ends by appropriate members 3 which form part of the usual types of framing customarily employed at the edges of a floor slab and by intermediate members 3' when the span is of such length that two sets of forming units are to be employed between adjacent beams.

The typical forming units of the invention as shown more particularly in Figs. 6 and 8 are elongated sheet metal plates of rectangular form having grooves or corrugations 4 stamped or otherwise formed therein. Each unit constitutes, in effect, a girder or arched truss and the sheet metal is of such gauge that the unit is not only self-supporting but is of sufficient strength to carry all loads placed thereon during the construction of the floor. The sides and ends of the corrugations preferably terminate short of the edges of the plates to leave a continuous lower edge which lies in a plane for engagement with wooden forming, the edge portion being provided with holes 2' at the corners and, preferably, at the one-third points along the lateral edges. Nails driven through the holes serve to anchor the units to the supporting members 3, 3' and to forming, not shown, at the lateral edges of the floor panel. The corrugations preferably taper off toward each end of the form thereby increasing the rib cross-sectional area accommodating the diagonal tensile and bending compressive stresses at the ends of the floor spans. By appropriate correlation of the taper at the ends of the forms to the depth and length of the corrugations, the resulting widening of the concrete ribs adjacent their supported ends develops the full strength of the slab and increases its live load carrying capacity considerably above that of the usual solid concrete slab of the same total thickness.

Figs. 7 and 9 show a forming unit of adjustable length comprising a pair of members 2a longitudinally slidable on each other. The unit may be firmly fixed at the desired length, for example, by means of bolts 5 positioned in slots 6.

The number, size and contour of the corrugations 4 may be varied to a wide extent within the scope of the invention. Various alternative contours of the corrugations are shown by way of example in Figs. 8, 10 and 11. The design of the units, is of course, subject to the two restrictions that the units are to be capable of carrying the constructional loads without the aid of intermediate shores and that the resulting floor slab is to be of such cross-section as to effect a substantial elimination of such concrete as would not be usefully employed in carrying the live and dead loads.

The forming units 2 may, if desired, be left in place on the underside of the floor slab, but they are preferably removed after the concrete is properly hardened.

As shown at A, in Fig. 2, shoring S is employed to support the intermediate wooden member 3' when the floor span is of such width that a plurality of sets of forms are required to span the space between adjacent beams.

As indicated at B, Fig 2, the supporting members 3 may form part of a type of framing commonly employed with structural steel beams or, as shown at C, the members 3 may be part of the framing appropriate for the formation of a reinforced concrete beam which may be, and preferably is, integral with the floor slab

The general adaptability of the forming units to meet special conditions is illustrated in Figs. 3 and 4. When, as indicated in Fig. 3, it is desirable or necessary to form a longitudinal beam D in the floor slab, the series of forms 2 is interrupted by the forming members F which are carried by shores S, the lateral edges of the forming units being nailed to the forming F through the intermediate holes 2'. As shown in Fig. 4, longitudinal webs of increased width may be formed by inserting filler strips between the flanges of two of the forming units. When water pipes W and/or electrical conduits E are to be introduced into the forming, the filler strip 7 is preferably of wood to facilitate the placing of the pipes and the later removal of the forming, but metal strips 7' are preferably employed when the increased width of web is desired solely for increased strength.

Fig. 5 shows clearly the finished floor slab with the corrugations 4' on the underside thereof. The load-distributing reinforcing rods 8 extend transversely of the corrugations 4' but the longitudinal rods 9 are positioned near the bottoms of the concrete ribs between adjacent corrugations 4'. The floor is therefore a monolithic construction made up of a series of floor slabs of the one-way reinforced beam type. The reinforced ribs constitute the tension members of the beams, and the concrete and steel located between the center lines of an adjacent pair of corrugations form the compression chord for the tension rib between those corrugations. The flooring is less expensive to construct than the usual flat slab of uniform thickness type since shoring is not required, and it is much stronger than a flat slab of the same weight as the beam construction displaces concrete from regions where it was not fully loaded into the deep ribs, thus increasing the efficiency of the steel reinforcement 9.

The important advantages of the corrugated slab floor construction of the invention include: reduced cost of skeleton frame and foundation due to its light weight; the ease and exactness of placing forms by virtue of their design and simplicity; elimination of disadvantageous and costly slab shores; the positive placing of slab steel reinforcement with greater facility and assurance against displacement; savings in both steel and concrete in the slab itself; involves no material requiring skilled labor for its setting; not limited to the customary short span of ordinary solid concrete slabs; eliminates objectionable and costly intermediate beam framing; is adaptable to both structural steel and reinforced concrete skeleton framing; is fire resistive; and time of construction is greatly reduced.

I claim:

1. A temporary form system for concrete floors comprising a plurality of juxtaposed metal sheets extending between adjacent load carrying members and supported solely at the ends of said sheets, said sheets having lateral flanges between which are embossed a plurality of longitudinal channels tapering to the plane of the sheet adjacent the ends thereof, and a filler strip between the opposed flanges of two adjacent sheets to space the same apart, thereby to form between said adjacent sheets a concrete rib of greater width than those formed between the channels of a sheet

2. A mold form for use with similar forms for supporting the construction load in the formation of a concrete floor slab comprising an elongated rectangular sheet metal member having a continuous edge flange lying in a plane, said sheet

within the confines of said edge flange being upwardly embossed to provide a spaced pair of longitudinally extending ribs, said ribs being tapered at their ends to the plane of said edge flange, whereby when said form is assembled with similar forms and supported at its ends for the construction of a floor slab, the space between adjacent ribs will define a mold for a one way concrete beam having flaring ends merging with flaring ends of adjacent similarly formed beams.

3. A mold form for use with similar forms for supporting the construction load in the formation of a concrete floor slab comprising a pair of longitudinally overlapping elongated rectangular sheet metal members each having a continuous edge flange lying in a plane and extending along the two sides and one end thereof, said sheets being upwardly embossed within the confines of said edge flanges to provide a spaced pair of longitudinally extending ribs, said ribs being of uniform diameter at their overlapping ends and tapered to the plane of said edge flange at their other ends, and means for adjustably securing said sheets together in said overlapping relation, whereby when said form is assembled with similar forms and supported at its ends for the construction of a floor slab, the space between adjacent ribs will define a mold for a one way concrete beam having flaring ends merging with flaring ends of adjacent similarly formed beams.

GEORGE PETER RICE.