N. F. AMBURSEN.

CONCRETE FLOOR.

APPLICATION FILED APR. 27, 1918.

1,334,729. Patented Mar. 23, 1920.

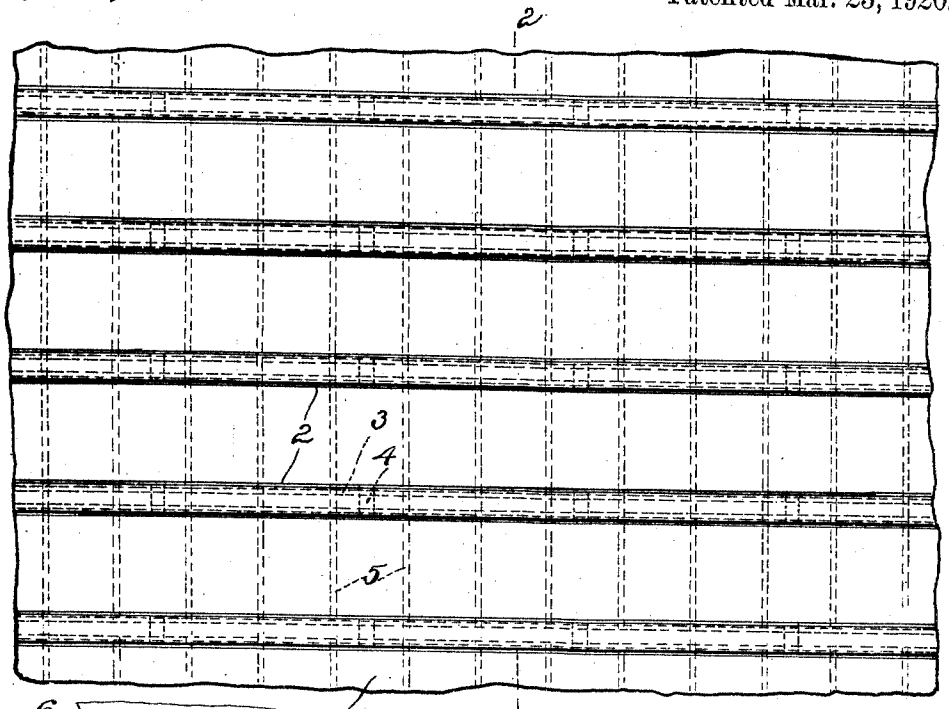


Fig. 1.

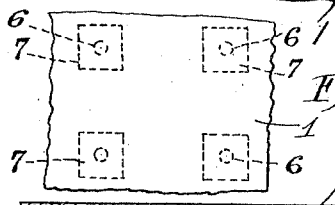


Fig. 5.

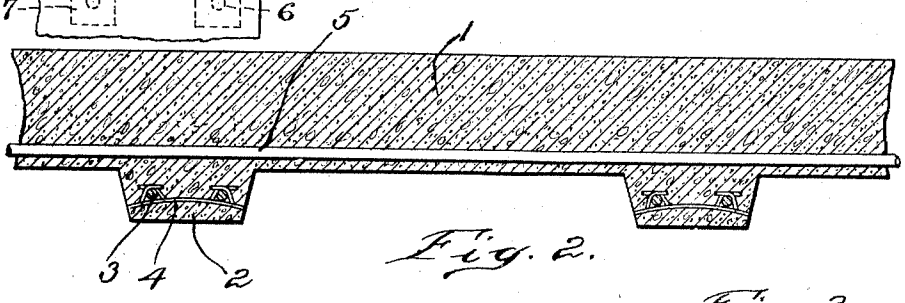
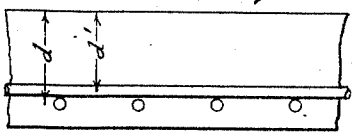


Fig. 2.

Fig. 3.



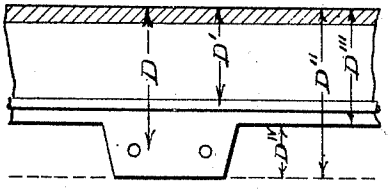


Fig. 4.

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CONCRETE FLOOR.

1,334,729. Specification of Letters Patent. Patented Mar. 23, 1920.

Application filed April 27, 1918. Serial No. 231,175.

To all whom it may concern:

Be it known that I, NILS FREDERICK AMBURSEN, a citizen of the United States, and a resident of Newton, in the county of Middlesex and State of Massachusetts, have invented a new and useful Improvement in Concrete Floors, of which the following is a specification.

My invention relates to monolithic concrete floors or roofs molded in position by means of suitable forms such for example as those described in my application, Serial No. 229,168, filed April 17, 1918, on which Letters Patent No. 1,292,986 were issued February 4, 1919.

The primary object of my invention is to provide a monolithic flat-slab concrete floor or roof which for a given load shall require the minimum amount of material.

An illustrative embodiment of my invention is shown in the accompanying drawings in which—

Figure 1 is an inverted plan view of a portion of a floor or roof embodying my invention, such portion being located between the supporting columns and the drop panels carried thereby, if the latter are employed; Fig. 2 is a transverse section taken on the line 2—2 of Fig. 1; Figs. 3 and 4 are diagrams hereinafter referred to in explaining the theory upon which my invention is based; and Fig. 5 is a diagrammatic plan view of the usual flat-slab floor of the prior art of which Fig. 3 is a diagrammatic section.

My improved monolithic flat-slab floor, in the particular example selected for more fully disclosing the principle of my invention, comprises the usual flat-slab floor 1 having on its lower surface a plurality of shallow, laterally-spaced ribs 2, the width of each of which is at least twice its depth, there being a number of such ribs, all running in the same direction between a pair of the usual supporting columns (not shown) and the said ribs extending longitudinally of the floor when the latter is oblong. Embedded within each rib are reinforcing members 3 which may be metallic rods, said members being supported in the mold before the concrete is poured by the spacing member 4 which of course remains in the molded structure after the forms have been taken down. Another system of reinforcing members 5 is embedded in the floor proper and extends transversely of the same.

The two systems of reinforcing members are angularly related and preferably are arranged at right angles to each other. The members 3 of the longitudinal reinforcing system are located partly or wholly below the plane of the lower surface of the floor proper and as shown in Fig. 2 they are preferably wholly below said plane. In Fig. 5 which represents in diagram a bay or panel of the usual flat-slab floor of the prior art, the floor slab 1 is supported directly on the columns 6 without the intervention of beams or girders and 7 indicates the usual drop panels now generally employed for reducing the negative bending moments and increasing the shearing resistance over the tops of the columns. Such a floor, as is well understood by those skilled in this art, is a beamless and girderless monolithic concrete floor consisting of concrete slabs supported directly on columns. The present invention is an improvement on such flat-slab floor of the prior art.

The area of the steel constituting the reinforcing system of a floor varies inversely as the distances between the centers of the respective members thereof and the top of the floor, or, more strictly speaking, the neutral axis of the floor, such neutral axis being about one-third of the depth of the slab below the surface of the floor. It will therefore be apparent that a saving in the amount of material required for a given floor may be effected by increasing said distances, provided however that the amount of concrete is not thereby augmented so greatly as to offset such saving.

In Fig. 3 I have shown the usual flat slab floor in which one system of reinforcing members rests directly upon the other, d, d' representing the distances between the centers of the respective reinforcing members and the top of the floor. If these distances are increased by making the floor thicker, the gain secured by reducing the area of the steel is more than offset by the extra amount of concrete required. However as shown by Fig. 4, I am enabled to materially increase these distances by means of the ribs 2 which require in their construction only a comparatively small additional amount of concrete.

As indicated by the cross-sectioned portion of Fig. 4, the thickness of the ribbed floor in the case of a square floor may be reduced for a given load, the material thereby saved being much greater than that required for constructing ribs. One set of reinforcing members is embedded in the ribs and as the distance D from the center thereof to the top of the floor is greater than the distance *d* of Fig. 3, the area of the steel constituting this system may be reduced. The other system may be lowered so that the distance D′ from the center thereof to the top of the floor is equal to *d* of Fig. 3 and the area of the steel constituting the same also reduced.

I have found that for a given load, a floor constructed in accordance with my invention requires less material than a flat slab floor of the type shown in Fig. 3. In the case of an oblong floor the saving of material is quite marked for the following reason: The thickness D″ of the floor is necessarily designed with reference to the longer span. Had the floor been designed with reference to the shorter span, its thickness would have been D‴, but the longer span and the greater thickness necessarily governs. By my invention I am enabled to limit the dimension D″ to the ribs only while retaining for the slab the dimension D‴ which is the correct thickness for the shorter span. I have therefore saved a body of concrete equivalent to the thickness D^{iv} between the ribs, and, inasmuch as the dead weight is thereby reduced, it necessarily follows that the area of steel will be correspondingly diminished.

Another advantage secured by the construction above described is that the reinforcing rods are not in contact and therefore may be entirely surrounded by concrete, thereby eliminating a defect inherent in flat slab floors of the prior art in which the bond between the concrete and a pair of crossed rods is faulty.

Having thus described an illustrative embodiment of my invention without however limiting the same thereto what I claim and desire to secure by Letters Patent is:

1. A beamless and girderless monolithic concrete floor consisting of concrete slabs supported directly on columns, said slabs having a plurality of shallow laterally-spaced ribs on the lower surface thereof, there being a number of such ribs, all running in the same direction, between a pair of supporting columns but not intersecting the latter nor terminating therein, and two systems of angularly-related reinforcing members, one system lying above the plane of the lower surface of the floor and being embedded in said slabs and the other system lying below said plane and being embedded in said ribs.

2. An oblong beamless and girderless monolithic concrete floor consisting of concrete slabs supported directly on columns, said slabs having a plurality of shallow laterally-spaced longitudinally-extending ribs on the lower surface thereof, there being a number of such ribs, all running in the same direction, between a pair of supporting columns but not intersecting the latter nor terminating therein, the thickness of the ribbed portion of the floor depending upon the length of the longer span of said floor and the thickness of the slab portion depending upon the length of the shorter span thereof and two systems of angularly-related reinforcing members, one system lying above the plane of the lower surface of the floor and being embedded in said slabs and the other system lying below said plane and being embedded in said ribs.

3. A beamless and girderless monolithic concrete floor consisting of concrete slabs supported directly on columns, said slabs having a plurality of laterally-spaced ribs on the lower surface thereof, the width of each rib being at least twice its depth, there being a number of such ribs, all running in the same direction, between a pair of supporting columns but not intersecting the latter nor terminating therein, and two systems of angularly related reinforcing members, one system lying above the plane of the lower surface of the floor and being embedded in said slabs and the other system lying below said plane and being embedded in said ribs.

4. An oblong beamless and girderless monolithic concrete floor consisting of concrete slabs supported directly on columns, said slabs having a plurality of laterally-spaced longitudinally-extending ribs on the lower surface thereof, the width of each rib being at least twice its depth, there being a number of such ribs, all running in the same direction between a pair of supporting columns but not intersecting the latter nor terminating therein, the thickness of the ribbed portion of the floor depending upon the length of the longer span of said floor and the thickness of the slab portion depending upon the length of the shorter span thereof, and two systems of angularly-related reinforcing members, one system lying above the plane of the lower surface of the floor and being embedded in said slabs and the other system lying below said plane and being embedded in said ribs.

In testimony whereof, I have hereunto subscribed my name this 24th day of April, 1918.

NILS FREDERICK AMBURSEN.