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CONSTRUCTION OF ROOFS, FLOORS, CEILINGS, AND THE LIKE

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2 Sheets-Sheet 1

Fig. 1.

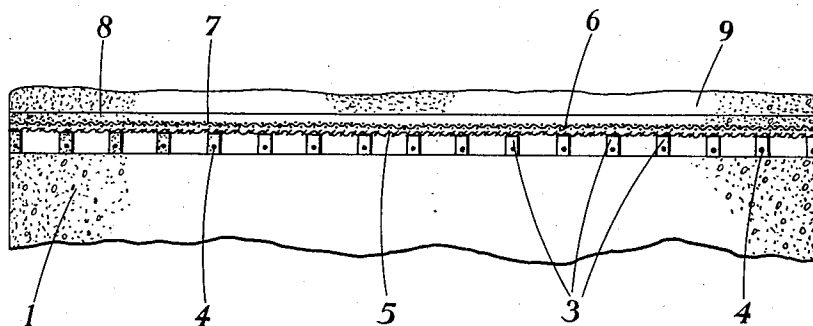
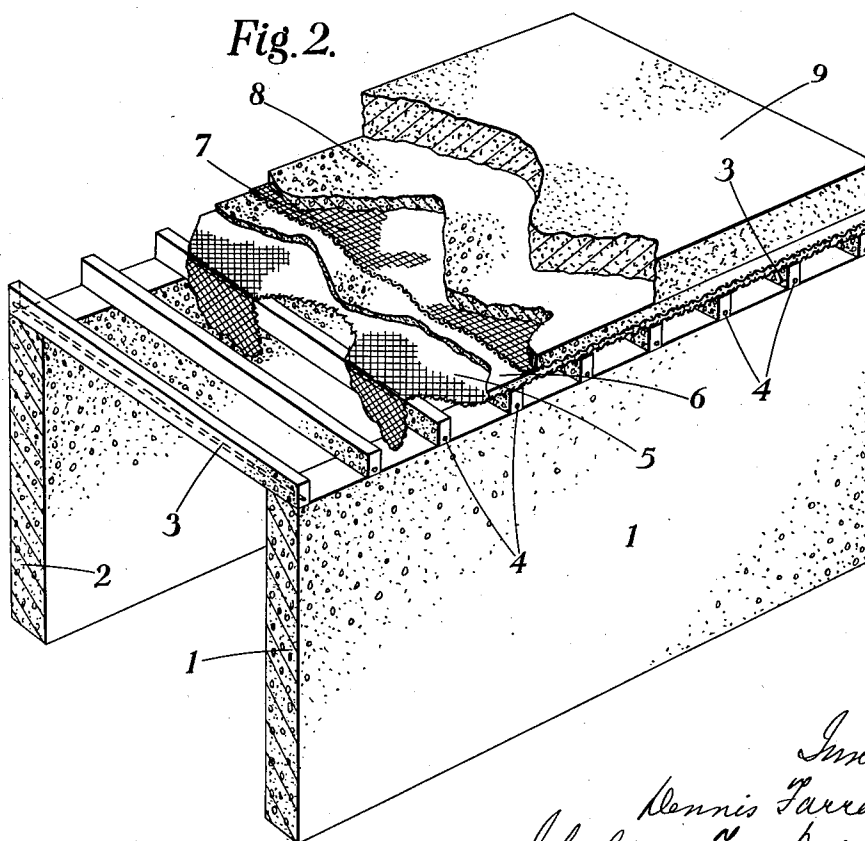


Fig. 2.



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CONSTRUCTION OF ROOFS, FLOORS, CEILINGS, AND THE LIKE

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3 Claims. (Cl. 72-71)

This invention relates to the construction of roofs, floors, ceilings and the like, and is particularly concerned with a method of construction which is characterized by its simplicity and is economical both as regards the quantity and type of materials used, and in that it does not entail the use of highly skilled labour. The invention is particularly useful for the construction of roofs for huts, garages, outhouses and the like, although its application is by no means limited thereto.

The roof, floor or the like in accordance with the invention consists essentially of a reinforced concrete or like slab supported on beams or joists, the advantages of which over thatched, corrugated iron and other cheap forms of roofs are obvious. The disadvantage of concrete, plaster and the like, however, is that if it is cast in situ, centering or shuttering is required which adds considerably to the cost. If the slab is to be supported on beams, these could, of course, be placed so close together that no extra support for the slab is needed between them but this, obviously, again leads to expense. The difficulty is got over in accordance with the invention by using a particularly cheap form of shuttering or centering, namely, a layer of material such as hessian which is stretched over and is supported by beams or joists which are not themselves capable of providing the support required by the slab during its setting.

A great variety of materials can be used for providing this support. Hessian has already been mentioned. Other textiles such as jute, cotton, wool and so on can be used. Further, the material need not be a fabric. Paper, for example, could be used or even a layer or carpet of leaves or grasses which may be readily available locally.

In the preferred method of construction, the supporting beams or joists are first placed in position. The spacing of these is such that they will not provide adequate support for the concrete which is to form the roof or floor slab. A layer of hessian is then stretched over these beams so as to constitute a centering for the slab. A thin layer of cement or plaster, say $\frac{1}{4}$ " thick, is then laid on the hessian and a layer or sheet of wire netting is embedded in it. Finally, a layer of concrete, say $\frac{3}{4}$ " thick, is laid on top of the wire netting. A reinforced concrete slab about 1" thick is thus produced which is adequately supported during setting by the hessian. The latter may, if desired, be then removed.

If the plastic material of which the slab is formed is rather wet, there may be a danger of percolation through the hessian shuttering. This

may be guarded against by proofing the hessian for example by plastering its under side with plaster, mortar, mud or any other readily available substance.

The beams used for supporting the shuttering or centering may be of any convenient construction and material. They may, for example, be steel joists or wooden beams, but are preferably constructed of reinforced concrete. They then have the advantage that they can easily be manufactured on the actual site, which minimizes the expense of construction, transport and erection.

If the ground near the site is of suitable material, the beams can be formed in moulds made in the ground itself. Troughs may be formed in the earth of the size of the finished beam, by pressing a master beam into the earth and consolidating the earth around it by tamping. The master beam can then be removed and concrete poured into the trough thus formed.

Alternatively, a mud mould can be formed in a clay bed of suitable consistency by rolling into the soft clay or mud a series of wooden former battens, which taper somewhat from the upper surface to the lower one, and are provided with suitable means for facilitating their extraction from the moulds. In this method, a clay puddle may be made in a shallow bed formed in the earth and a number of the wooden former beams may be sunk into the puddle and then rolled down flush with the surface of the puddle by means of an ordinary roller. By providing suitable hooks, T slots or the like in the upper surface of the wooden former beams, these may be withdrawn from the clay puddle.

A further convenient method of casting the beams is to build up a mould having a level piece of ground as its base and having its sides formed of rows of bricks or two wooden, iron, steel or concrete beams of the same size. The ends can be closed by means of a brick or a piece of wood. It is advisable to grease the surfaces of the bricks, beams and so on which are to come into contact with the beam to be cast so as to facilitate the removal from the mould. A mixture of water and oil or soap can be used for this purpose. The earth base of the mould can be covered with paper or flat level wood if considered necessary.

In order that the invention may be properly understood and be more readily carried into effect, an example of construction in accordance therewith will now be described with reference to the accompanying drawings which show constructions suitable for the roofs of huts and in which:—

Figure 1 shows the roof in sectional end elevation.

Figure 2 is a pictorial illustration of the roof shown in Figure 1.

5 Figure 3 is a sectional elevation of a roof in accordance with the invention showing particularly the reinforcement of the beams and the roof slab.

Figures 4 and 5 illustrate a method of casting 10 beams for use in accordance with the invention.

Figure 6 shows a former or master beam for forming moulds in which the beams can be cast.

Figure 7 illustrates the use of formers as shown in Figure 6.

15 Figure 8 illustrates a detail, and

Figure 9 illustrates a method of connecting together lengths of fabric for use in a roof in accordance with the invention.

In the arrangement shown in Figures 1 and 2, 20 a number of beams 3 of rectangular cross section which are about 2" deep, 1" wide and about 12 ft. long are supported on the walls 1 and 2. These beams are of concrete reinforced each with a single rod of $\frac{3}{8}$ " to $\frac{3}{4}$ " diameter. The 25 beams are spaced at 6" centres and on the top of the beams is laid a layer 5 of hessian which extends over the whole area spanned by the beams 3, and constitutes a carpet on which a reinforced concrete roof slab is to be constructed. On the 30 top of the layer of hessian 5 is spread a fairly thin layer 6 of cement-concrete. While this layer is still plastic, a layer 7 of wire netting is laid on it, and over this netting is applied a further layer 8 of cement-concrete, which passes through the 35 meshes of the wire netting 7 and consolidates with the lower layer 6 of cement-concrete, to constitute a reinforced roof slab extending over the whole width and length of the space to be spanned. When the top surface of the upper 40 layer 8 of cement-concrete has dried and hardened, a layer 9 of heat insulating material such as earth can be laid on it, a parapet or raised edging 8a (Figure 3) being provided around the edges of the slab for retaining this material in position. 45 A roof constructed in this way constitutes a good heat insulated screen, is strong and is impervious to water.

In the arrangement shown in Figure 3, the beams 3 are about 3" deep, 2" thick and 12 ft. 50 long and are spaced parallel to one another at 12" centres. With this somewhat wider spacing of the beams, it is desirable to first plaster the length of hessian between the beams with a proofing comprising mud, plaster or any pasty material which can be spread with a trowel and which 55 will set reasonably hard, and allow this to set hard before applying the concrete thereon. This layer of proofing prevents the concrete from percolating through the hessian. It is not applied on the upper surfaces of the beams 3 and in order to keep these latter clean, strips of paper may be placed on them which are removed before the concrete slab is cast. This slab unites or bonds 60 with the concrete of the beams 3 and, in effect, provides a considerably stronger roof.

In order to unite lengths of the hessian together to form a sheet which will extend over the whole area of the roof, a wire loop stitch may be employed as shown in Figure 9. This stitch may 70 also be employed for connecting together lengths of the wire netting which forms the reinforcement for the roof slab.

The beams 3 can quite conveniently be made on the building site without necessitating the 75 use of much plant. A useful method is to pre-

pare a bed in the earth as shown at 10 in Figure 7 and to fill this bed with a clay puddle 11. A number of wooden former battens 12 shown separately in Figures 6 and 8 are laid in this puddle. These battens are somewhat wider at the top 5 than at the bottom, for example they may be 2" wide at the top and $1\frac{3}{4}$ " at the bottom and some 3" in depth. They are rolled into the clay puddle by means of a roller 13 until their upper surfaces are level with the surface of the clay and 10 they are left in the puddle until the latter sets hard so that when removed, a mould of the required shape is formed. Alternatively, the formers are removed after their impressions have been left in the puddle and before the clay sets hard. 15 In this way a given number of moulds can be made with a smaller number of formers. The formers are withdrawn by means of an extracting tool 14 (Figure 8) which is provided at its lower end with two outwardly projecting lugs and may 20 be introduced into a T slot 15 provided in the former 12. When the formers have been removed from the moulds and the moulds have set hard, the reinforcement is placed in position, and the concrete is then poured in and allowed to set 25 before removal.

In the construction of beam shown in Figure 3, the longitudinal reinforcement consists of two longitudinally disposed rods 4a and 4b of $\frac{3}{8}$ " 30 diameter, which are disposed in the upper and lower parts of the beam respectively. These reinforcing rods 4a and 4b are connected together by means of ties 16 and 16a which act as stirrups, and have their upper portions 17 bent outwardly to rest upon the ground surface as shown in Figure 35 5. After the beam is set, these outwardly projected portions are straightened so as to project vertically upwards as shown at 17a in Figure 3, and when the wire netting 7 is laid before the casting of the slab 8, the alternate projecting 40 portions 17a are bent horizontally to either side of the beam as shown at 17b and 17c and are then connected to the wire netting in a suitable manner, for example by wire.

In order to distribute the load 3 on the wall 1 45 at the ends of the beams, concrete wall-plates may be used. With such wall-plates, not only is the top of the wall bound together, but the load may be so distributed that it comes upon vertical supports spaced at intervals in the wall if so desired, 50 and, in any case, distributes the stresses in a better manner than would otherwise be the case.

The layer of wire netting used to reinforce the cement mortar of the slab serves to support the weight of the slab and relieves the centering, i. e. 55 the hessian, from the full weight of the unset plastic material. The centering may be left permanently in position but is not relied upon to contribute to the support of the finished structure and can, if desired, be removed after the slab has 60 set. It thus differs from the usual types of centering which are subsequently removed, and also differs from types of constructions in which the fibrous material is used as a permanent reinforcement. 65

The reinforcement of the slab in the examples described above is stated to be wire-netting. This can be of the ordinary form used for cheap fencing or it can be of a more expensive form such as 70 expanded metal.

It is clear that the construction of the roof, floor or the like which has been described is simple and economical in construction and in erection. It is particularly suitable for use in outly- 75

ing districts where plant is not readily available and where skilled labour is scarce.

We claim:—

5 1. A method of constructing a roof, floor or the like comprising laying a carpet of fibrous material over a plurality of beams, proofing said fibrous material and casting thereon a reinforced concrete slab.

10 2. A method of constructing a roof, floor or the like according to claim 1, in which the proofing is effected by means of a layer of plaster.

3. A method of constructing a roof, floor or the like comprising laying a carpet of fibrous material over a plurality of beams, applying a thin layer of proofing material to said fibrous material, embedding wire meshing in said proofing material and forming a layer of concrete on said wire meshing. 5

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