Dec. 17, 1957 H. C. MARTIN 2,816,346

METHOD OF CONSTRUCTING REINFORCED CONCRETE FLOORS AND BEAMS

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FIG. 2

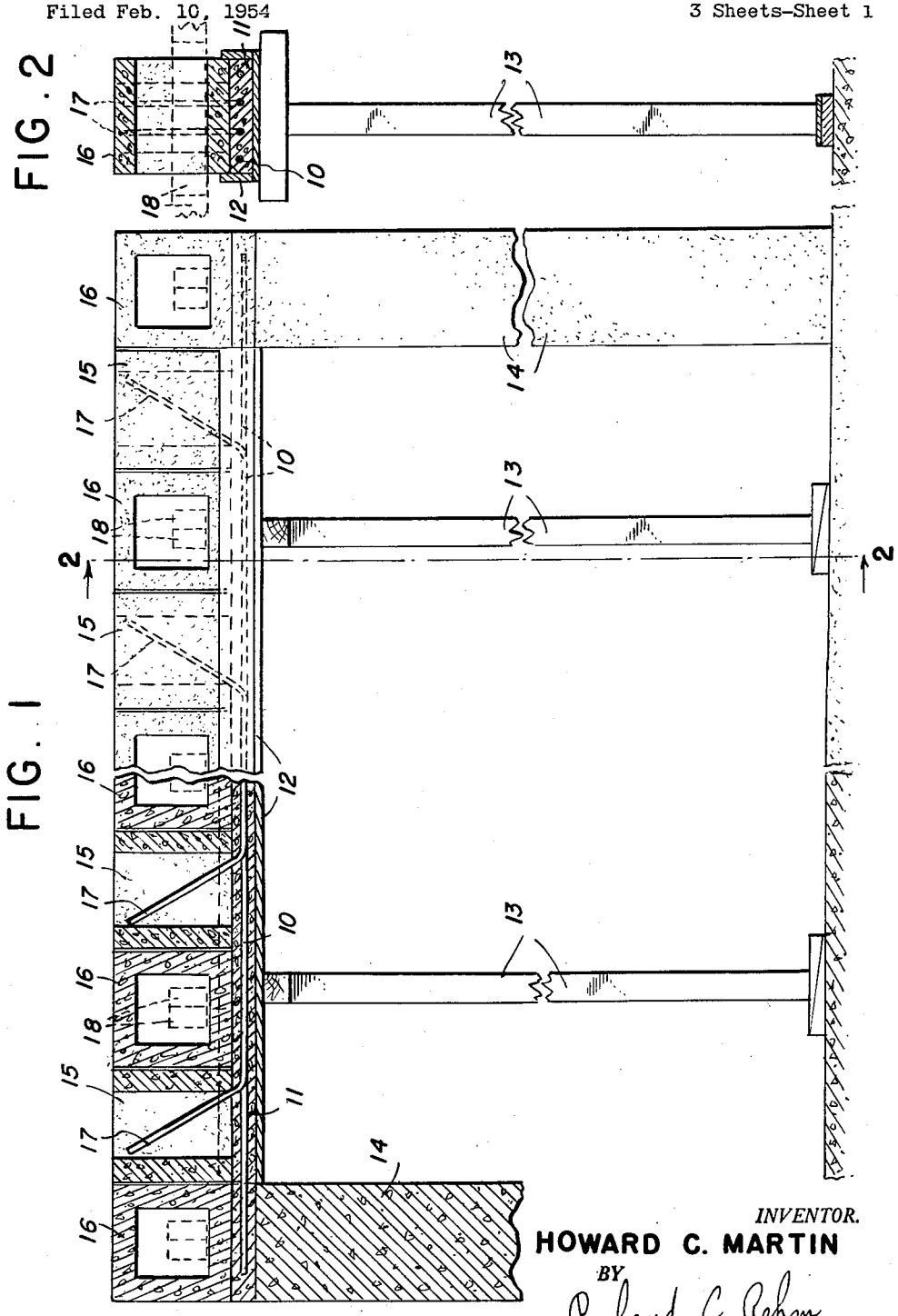


FIG. 1

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FIG. 4

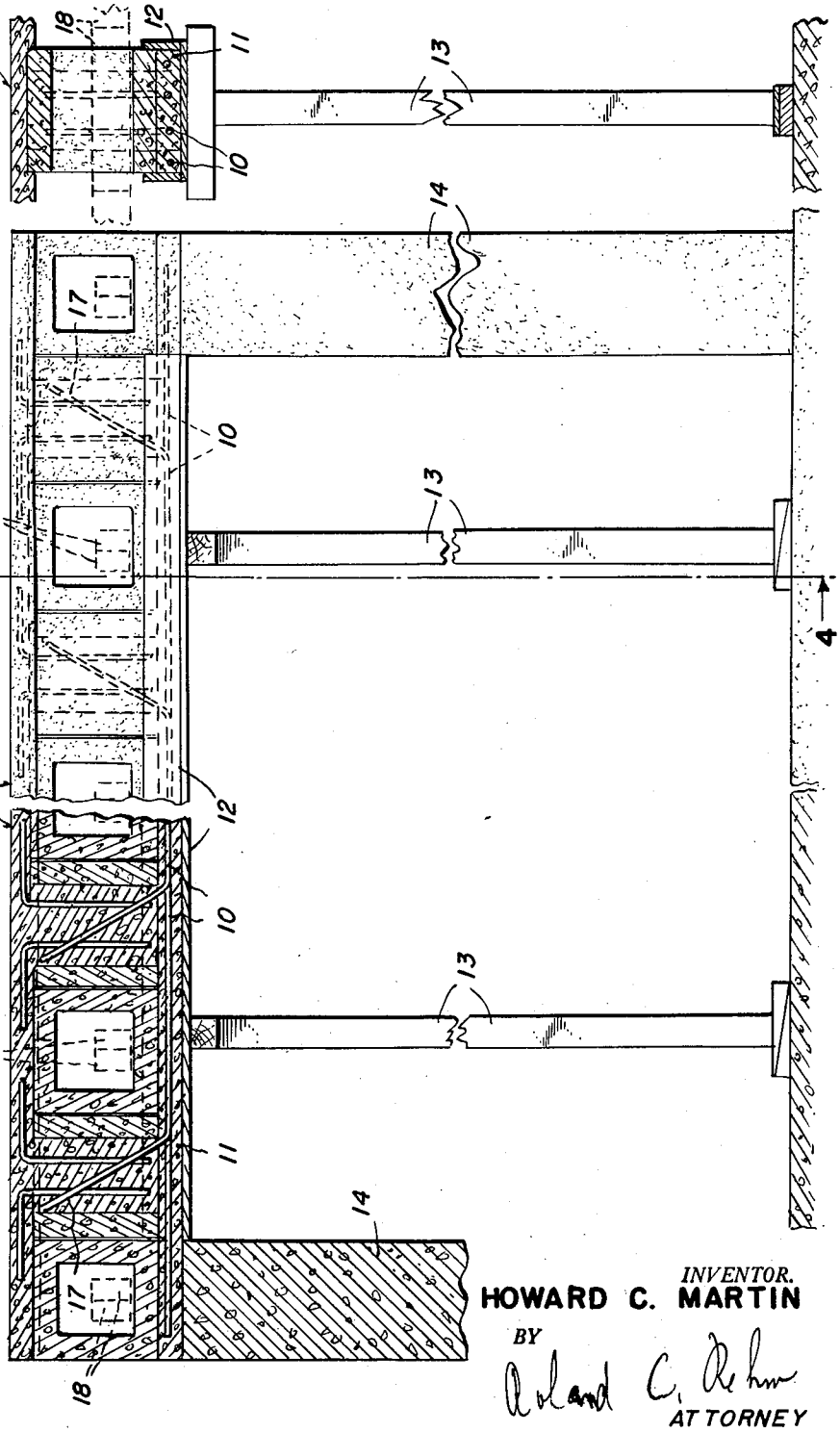


FIG. 3

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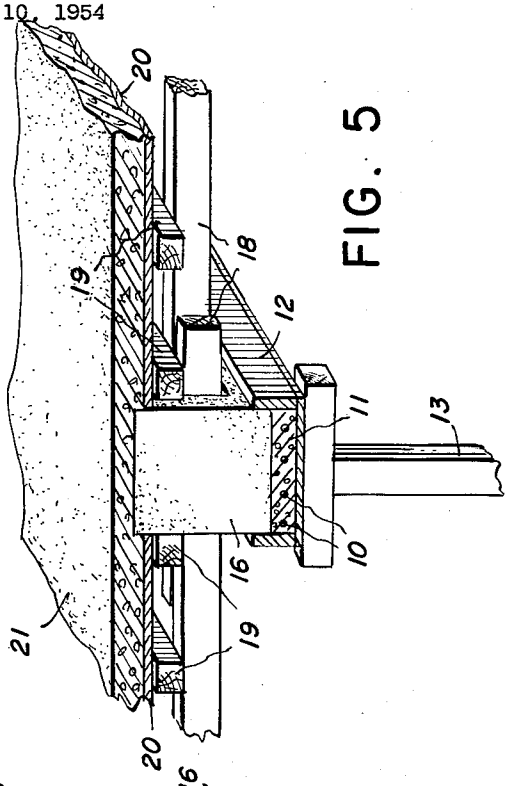


FIG. 5

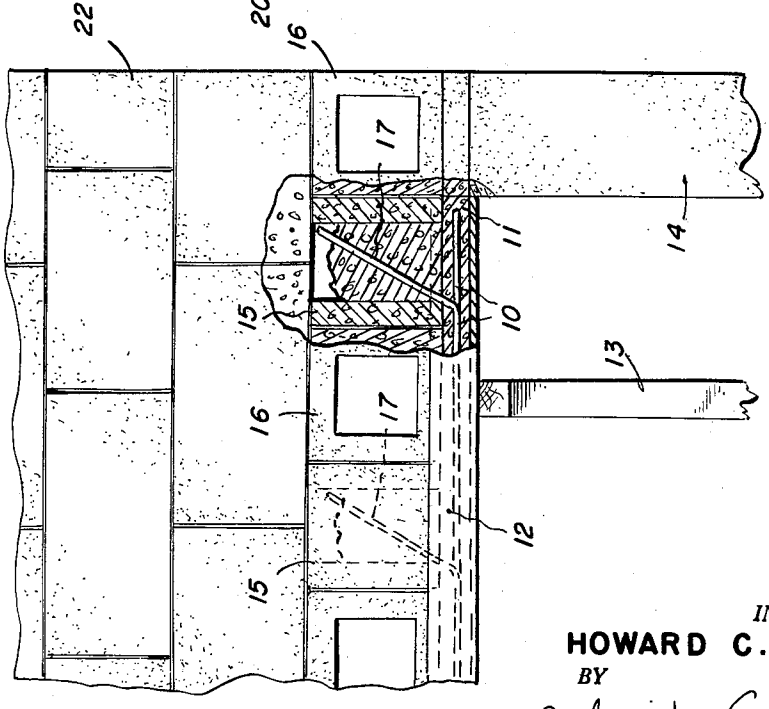


FIG. 6

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METHOD OF CONSTRUCTING REINFORCED CONCRETE FLOORS AND BEAMS

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Application February 10, 1954, Serial No. 409,387

4 Claims. (Cl. 25—154)

This invention relates to reinforced concrete beams and related structures.

A preliminary beam is formed by the use of light forms and light shoring sufficient only to form and surround the reinforcing steel with concrete, this comprising only that much of the beam as constitutes the tensile component of the beam.

The compression component of the temporary beam comprises light, hollow blocks laid in close juxtaposition on the concrete. Temporary beams thus formed constitute the supporting structure for carrying the forms for forming the complete beam and the floor slab, if the floor slab be poured concrete.

Further details and the nature of the invention may be readily understood by reference to the following description of one illustrative construction embodying the invention and shown in the accompanying drawings.

In said drawings:

Fig. 1 is an elevation partly in section showing the preliminary beam, the light forms and shoring, and the light weight hollow block comprising the compression component of the beam;

Fig. 2 is a transverse vertical section taken on the plane 2—2 of Fig. 1;

Figs. 3 and 4 are views similar respectively to Figs. 1 and 2 and showing the temporary beam carrying the poured structure, including a poured floor slab, the forms for forming the latter having been removed; Fig. 5 is a view similar to Fig. 4, but in sectional perspective, showing the manner of supporting the forms for the final beam from and by the temporary beam; and

Fig. 6 is a view similar to that of Fig. 3 showing the use of an interior or exterior masonry wall above the beam to carry the compression which ordinarily would be carried by the concrete comprising the upper chord of the beam.

Reinforced concrete for buildings and particularly small buildings such as residences has heretofore been expensive because of the high forming costs. Unlike industrial buildings, the forms are generally special, being specially made for the job, and cannot be used effectively or efficiently in a second building.

Referring to the illustrative structure, the reinforcing steel **10** which carries the tensile stresses in the completed structure, is used to carry a large part of the load imposed in forming and pouring the complete structure. The reinforcing is first stabilized by enclosing it in concrete **11** whose depth is only a fraction of that of the final beam. Forms **12** for forming this concrete are similarly shallow and are supported by light shoring **13** which would usually be insufficient to carry the load of the entire structure if poured according to conventional practice. If desired the shoring may be adjusted to give the bottom planks of the forms **12** sufficient camber to compensate for the usual deflection of the structure upon removal of the shoring and forms.

The concrete **11** extends to the abutments or columns **14** supporting the beam and serves to anchor or assist

in anchoring the tensile steel in the abutment or other supporting structure. Upon this concrete while it is wet is placed a series of light hollow blocks **15** and **16** with their faces in contact. The blocks are preferably cinder block or block made from some light but strong aggregate such as porous blast furnace slag, porous fired clay etc., that assume and transmit compressive stress in the upper portion of the beam. The block may be the standard 8x8x16 block or half block. The block should preferably be arranged so that some of the core spaces extend vertically as in the case of blocks **15**; and others extend horizontally transversely of the beam, as is the case with blocks **16**. Blocks **15** should particularly be placed to receive reinforcement **17** for shear which extends upwardly from the lower chord of the beam. Such reinforcement for shear generally is located near the supporting columns or abutments where shear stresses are the greatest. The concrete poured in forming the final beam (and floor slab if any) enters the vertical core spaces of the blocks **15** to surround and embed the shear reinforcement **17** and to form an integral connection between the tensile and compressive components of the beam.

The horizontally disposed core spaces of blocks **16** serve to receive and support form material (shown in dotted lines at **18**, Figs. 1 and 3) for carrying the forms **19** and **20** for forming the final beam and poured floor if any. The form supporting material **18** need not be specially cut but may comprise available pieces of wood or the like which are inserted through the core spaces of blocks **16** and project at both sides to support the forms **19** and **20** (see Fig. 5). For example, the form supporting material may comprise wood 2x4's of various lengths placed on edge. They may be overlapped when too long (as shown in Figs. 3, 4 and 5) to avoid cutting, thus preserving them for further use. The horizontal core spaces also may later serve as passages for pipes, wires etc.

Before pouring the concrete for the final beam and floom slab such reinforcement as may be required in the upper chord of the beam and in the floor slab, is placed.

In the event the beam need to be the deeper than the depth of the 8x8x16 inch block, large block may be used or other block may be superposed on one another to the depth required, with the vertical core spaces in register with those of the subjacent block.

When a concrete floor **21** is to be poured simultaneously with the pouring of the completed beam structure the form material **20** for the floor slab is also supported by the transverse members **18** passing through the horizontal cores of the block. Form material **20** may comprise sheeting, corrugated iron or water proofed ply wood and may be re-used later.

In Fig. 6 is illustrated a construction which occurs where masonry walls are located above and in alignment with the beam. In such cases the concrete **21** comprising the floor and upper portion of the beam (as in Fig. 3) is omitted and the compression ordinarily assumed by such concrete is carried by the masonry wall **22**. The wall acts as an arch in carrying the compression. Preferably the vertical core spaces in blocks **15** are partly filled with concrete to anchor the block and those containing the shear reinforcing **17** are completely filled.

For large floor areas, that is where the span is substantial in two directions at right angles to each other, it is preferable to run between the main beams and at right angles thereto, a series of smaller beams supported by the larger beams. The small beams may be advantageously about four feet apart to permit the use of four foot ply wood as forms for the floor slab.

When the concrete has set and cured sufficiently, the

aforesaid form structures may be removed and used elsewhere.

For long spans it may be desirable to arch the temporary beams so that a portion of the stress (ordinarily in the form of tensile strength and carried by the reinforcing) may be carried in compression.

Obviously the invention is not limited to the details of the illustrative construction since these may be variously modified. The arrangement, number and size of the beams depends, for example, on the design of the building structure. Even though beam depths and widths vary they may be readily constructed with standard block and without recourse to specially made block. Reinforcing may be varied in amount and location depending on design and without departing from the invention. For example, with continuous beams (which extend over several columns or supports and wherein the upper portion of the beam is in tension in the region of the support) the reinforcing is placed according to standard practice employed in conventional beams, and again without departing from the invention. Moreover, it is not indispensable that all features of the invention be used conjointly since various features may be used to advantage in different combinations and sub-combinations.

Having described my invention, I claim:

1. The method of forming in situ a reenforced concrete beam extending from one beam support to the next which comprises erecting light shoring and forms between said beam supports to form and carry the lower chord of the beam, said shoring and forms being insufficient to form and carry the completed beam, placing reenforcing tensile members in said forms extending from one beam support to the next, pouring concrete in said forms to surround said reenforcing thereby to form said lower chord, then placing a series of light weight blocks having open cores therein in juxtaposition on and extending the length of said lower chord, said blocks being constructed and arranged to transmit compression in the upper portion of said beam, certain of the blocks being placed with their open cores extending transversely of said beam, placing form supporting members in said transverse open cores, placing and supporting forms to complete said beam on said supporting members, then pouring concrete to complete said beam in the latter forms, and then removing said forms and supporting members.

2. The method of making a reenforced concrete beam or the like in situ extending from one beam support to the next which comprises erecting a light form for forming the lower chord of the beam, shoring the said form with light shoring insufficient to support the weight of the completed beam, placing reenforcing steel tensile members in said form extending from one beam support to the next and also steel which projects upwardly for reenforcing against shear, pouring concrete in said form to surround said tensile members to form a temporary beam of less depth than the final beam, placing on said temporary concrete beam and extending longitudinally thereof blocks having open core spaces therein, said blocks being juxtaposed to transmit compressive stress in the completed beam, certain of said blocks being placed with cores extending vertically to receive the upwardly extending shear reenforcing, others of said blocks being placed with cores extending transversely of

the beam, then inserting form supporting members in said transverse cores, placing and supporting members in said transverse cores, placing and supporting forms for completing the beam on said members, then pouring concrete in the latter forms to fill said vertical cores and surround the shear reenforcing therein and to complete the beam, and then removing said forms after the concrete has set.

3. The method of forming a reenforced concrete beam extending from one beam support to the next which comprises constructing a light form for forming the lower chord of the beam of less depth than the final beam, placing reenforcing steel tensile members in said form, pouring concrete in said form to surround said tensile members, shoring the said lower chord with light shoring insufficient to support a complete beam, placing on said concrete longitudinally of said beam blocks having open core spaces therein, said blocks being juxtaposed to transmit compression in the beam, placing certain of said blocks with the cores extending vertically, placing upwardly extending shear reenforcing in said vertically extending cores, placing other of said blocks with the cores extending transversely of the beam, and then inserting supporting members into said transversely extending cores, placing on said members forms to complete the beam and flooring supported by the beam, then pouring concrete in the latter forms and filling said vertical cores to surround the shear reenforcing therein to complete the beam, and then after the concrete has set removing said forms and supporting members.

4. The method of forming a reenforced concrete beam extending from one beam support to the next which comprises constructing a light form for forming the lower chord of the beam, placing reenforcing steel tensile members in said form and also the steel which projects upwardly for reenforcing against shear, pouring concrete in said form to surround said tensile members, shoring the said lower chord with light shoring insufficient to support a complete beam, placing on said concrete longitudinally of said beam light weight blocks having open core spaces therein, said blocks being juxtaposed to transmit compression in the completed beam, placing certain blocks with the cores extending vertically to receive the upwardly extending shear reenforcing, placing other blocks with cores extending transversely of the beam, then inserting form supporting members into said transverse cores and placing and supporting thereon the forms for completing the beam, then pouring concrete in the latter forms to fill said vertical cores and surround the shear reenforcing therein, and then removing said forms and supporting members.

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