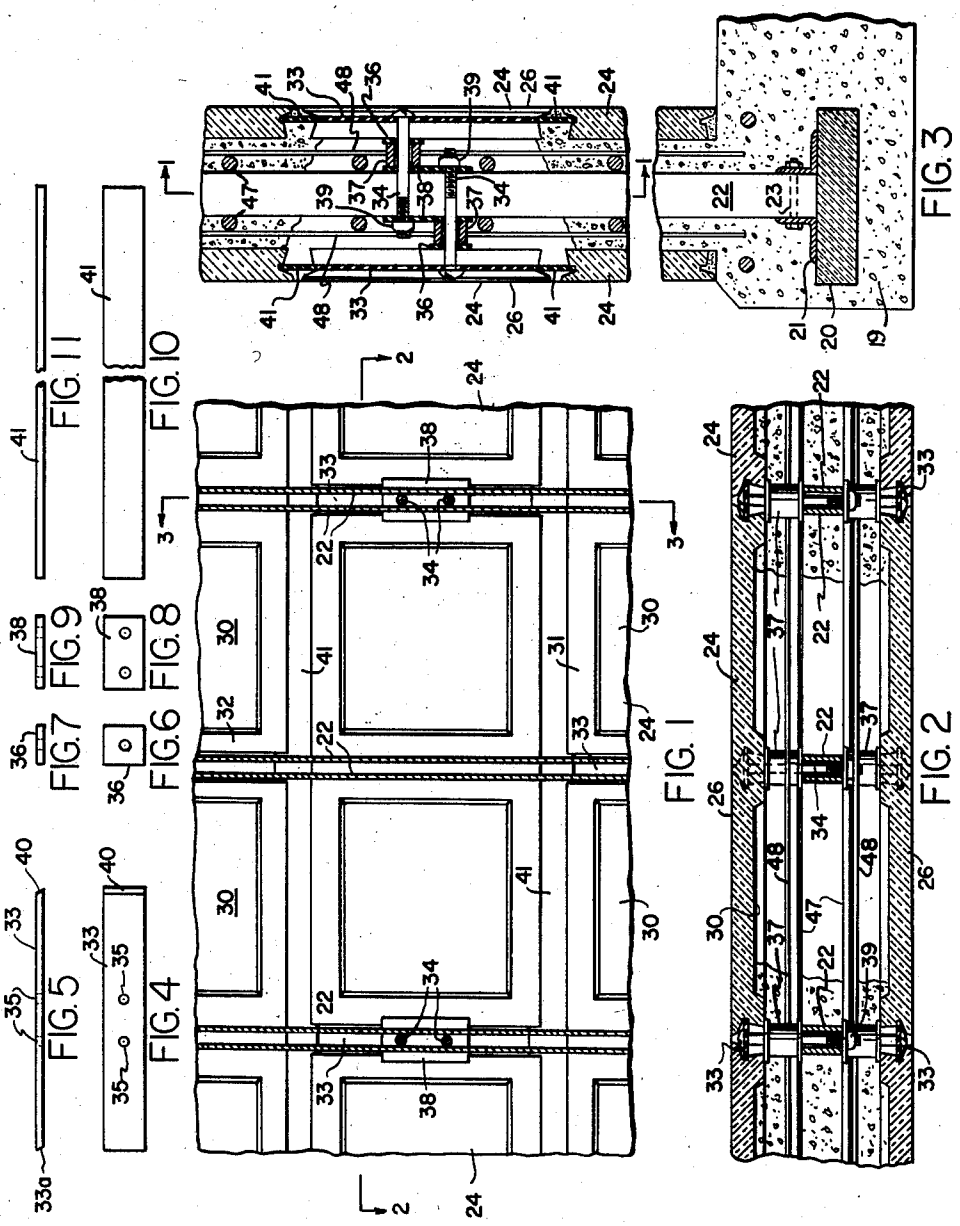
Sept. 16, 1958 J. A. CARLSON 2,851,874

REINFORCED CONCRETE BUILDING CONSTRUCTION

Filed Dec. 29, 1952 2 Sheets-Sheet 1



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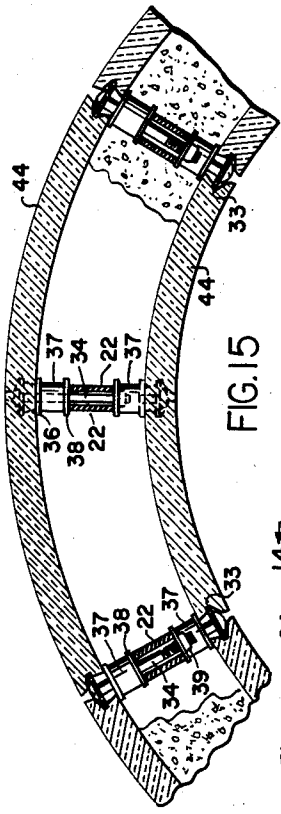


FIG. 15

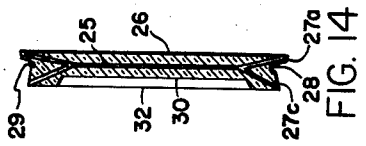


FIG. 14

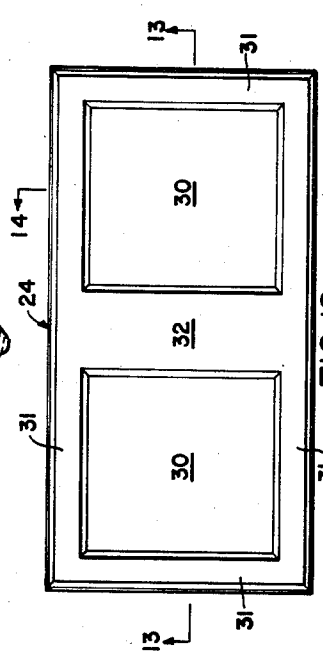


FIG. 12

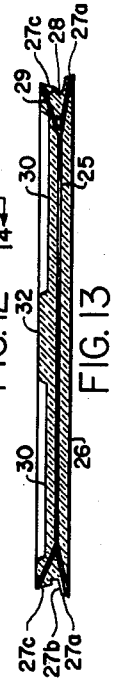


FIG. 13

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REINFORCED CONCRETE BUILDING CONSTRUCTION

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Application December 29, 1952, Serial No. 328,430

3 Claims. (Cl. 72—30)

This invention relates in general to reinforced concrete building construction, and more particularly to a construction wherein concrete is poured into a form secured to opposite sides of a self-supporting steel framework and wherein the form becomes an integral part of the completed construction.

The principal object of this invention is to provide a method of concrete and steel reinforced building construction that in addition to being water-proof and insulated is tornado, earthquake, flood, fire and vermin proof.

Another object of this invention is to provide building construction wherein concrete supporting sub-walls of tiles or blocks are attachable on both sides of a self-supporting steel reinforcing framework and can be readily erected by a workman from within so as to provide a complete form or mold into which concrete may be poured, eliminating the necessity for outside construction scaffolding and the like.

Another object of the invention is the provision of a uniform arrangement of the reinforcing steel whereby the sub-walls of blocks can be readily attached.

These and other objects and features of this invention will become more apparent from the following description taken in conjunction with the accompanying drawings in which:

Fig. 1 is a vertical sectional view on line 1—1 of Fig. 3 showing the inward or rear side of a portion of a wall in which a sub-wall of blocks has been erected prior to the pouring of the concrete portion of the wall.

Fig. 2 is a horizontal sectional view on line 2—2 of Fig. 1 particularly showing the means for securing the spaced block or tile sub-walls to the steel reinforcing.

Fig. 3 is a vertical section on line 3—3 of Fig. 1, and additionally shows footings and the manner in which the steel framework is held in position thereby.

Fig. 4 is a plan view of a vertical block or tile spacing member.

Fig. 5 is an elevational view of Fig. 4 particularly showing the beveled ends of such a spacer member.

Figs. 6 and 7 are plan and elevational views of a square type of washer as seen particularly in Figs. 2 and 3.

Figs. 8 and 9 are plan and elevational views particularly showing a rectangular bracket member as seen in Fig. 1.

Figs. 10 and 11 are plan and elevational views respectively of horizontal stripping or spacing members for the blocks or tiles of the sub-walls.

Fig. 12 is an elevational view of the rear or non-facing side of a block or tile employed in the sub-walls of this invention.

Fig. 13 is a sectional view on line 13—13 of Fig. 12, and Fig. 14 is a sectional view on line 14—14 of Fig. 12.

Fig. 15 is a partial top plan view of a modified construction wherein the exterior and interior blocks or tiles are curved such as might be employed in the construction

of concrete reinforced silos, water tanks, stacks, or the like.

A suitable procedure in preparing the site for the construction arrangement and method of this invention may be as follows: The base outline of the building may be surveyed and staked out and a suitable footing trench dug about the periphery thereof after the site has been cleared and leveled. The entire area may then be covered over with a thin layer of concrete, in the order of about one inch in thickness.

Several blocks, of about two inches in narrow dimension, such as ordinary building bricks **20** may be set flat upon the thin layer of concrete in the bottom of the footing trench. Across bricks **20** running longitudinally of the footing trenches pairs of angle irons **21** are positioned so that the entire outline of the proposed building is encompassed. Angle irons **21** are pre-drilled with registering holes at exact intervals, and in the embodiment illustrated, these holes are exactly one foot apart from center to center. Basic upright steel studding **22** also previously cut to proper length and prefabricated into spaced pairs are then erected straddling the evenly spaced holes in angle pieces **21** and clamped between the angle pieces **21** by means of bolts **23** thru said bores and between the pairs of spaced upright steel studs **22**. The studding pairs **22** are always separated sufficiently to permit a bolt to freely pass between the members of each pair, and the pairs are erected 12 inches apart for 24 inch blocks, 18 inches apart for **36** inch blocks and so on. A similar arrangement (not shown) of angle steels **21** and bolts **23** across the tops of the studding is employed in like manner. In this manner the entire steel framework for a building is erected. The framework at corners or other juncture points may be welded or otherwise suitably fastened together. At door and window areas the studding **22** is either omitted or shorter pieces of studding are employed so that the door and window areas remain unobstructed.

After the entire steel framework comprising top and bottom angle steels **21** and studding pairs **22** are all in place, including similar partition wall framework joined therewith the entire surface of the previously poured thin layer of cement is waterproofed by covering over with a coating of hot tar or other suitable waterproofing material. After the waterproofing material has been applied, the entire floor slab and footings **19** may be together poured with concrete thereby securely tieing the angle irons **21** and the lower ends of the upright studding **22** into the footings of the exterior walls, and the studding **22** constituting partition wall reinforcing into the footings and floor slab beneath all partition walls so that the entire floor slab and footings are one integrated solid concrete mass with all of the reinforcing framework of the building firmly held in place therein. The concrete floor slab will of course be reinforced with steel rod or mesh according to standard specifications depending upon the use for which the building is being constructed. Obviously, the floor can be poured either in one flat relatively thick slab or it can be constructed with conventional integral suitably reinforced cross-beams and a lesser thickness of poured concrete and cement topping for the floor proper.

The process of construction according to this invention next includes the setting up of a first spaced pair of lower-most rows of specially shaped blocks **24** forming concrete retaining sub-walls about the outer and inner peripheries of the footings.

The blocks **24** are particularly illustrated in Figs. 12, 13, and 14, and may consist of various types of material such as cement, terra cotta, clay tile, or other similar and suitable materials. These blocks **24** are pre-cast in

the particular shape shown and may contain suitable reinforcing wire therewithin. The shape of these blocks is such that both outer and inner surfaces may be either smooth or ribbed but as illustrated in the drawings, the blocks shown are such that one face **26** is flat and smooth and generally rectangular so that when incorporated in a finished wall, its outer appearance will be that of large rectangular blocks. Regardless of the inner and outer surface shapes, the edges of the blocks **24** are cast with at least two and preferably three bevels **27** and a somewhat central groove **28** having at least one surface **29** which is parallel to flat face **26**. In the embodiment illustrated, the rear or inner side of the block **24** (see particularly Fig. 12) is provided with two depressed areas **30** of a size and shape such that the block is provided with a peripheral raised portion **31** and a central rib or raised portion **32** of twice the width of the peripheral raised portions **31**, the purpose for which will appear later. The blocks illustrated are twelve inches by twenty four inches and about two inches thick at the raised portions **31** and **32**. In general whether or not blocks **24** are provided with raised portions such as **31** and **32**, the blocks preferably are about two inches thick.

Referring now particularly to Figs. 1, 2, and 3, the lowermost spaced rows of blocks **24** are set up on the respective inner and outer footing peripheries as follows: between the first two blocks of either the inner or outer row of blocks **24** set up, a vertical spacer strip **33** (Figs. 4 and 5) is placed in the vertical or shorter side grooves **28** in blocks **24**. The vertical spacer strips **33** are in length equal to the height of blocks **24**. Bolts **34** previously placed thru alternate ones of two adjacent holes **35** centrally located in the vertical strips **33** each extend inwardly therefrom thru a washer **36** (Figs. 6 and 7), spacing ferrules **37** and one pair of two alternate registering pairs of holes in a pair of rectangular washers or bracket members **38** (Figs. 8 and 9) positioned on either side of the stud pairs in a manner so that the bolts **34** extend between the stud pairs and are secured thereto by nuts **39** drawn up against the rectangular bracket members **38**. In this manner the bolts extend between the stud pairs **22** in a vertically spaced overlapping arrangement and when the nuts **39** are drawn up against the outer sides of their respective rectangular brackets **38**, the vertical spacing elements **33** positioned within the grooves **28** of the adjacent blocks holds them firmly in place secured to and suitably spaced from the upright studding **22**. This is particularly true as the operation is repeated with another block stood laterally adjacently in place in the lower row of each of the inner and outer sub-walls being formed thereby and secured in similar fashion to the second next studding pair **22** in similar fashion by bolts **34** thru vertical spacing elements **33**, washers **36**, spacing ferrules **37** and brackets **38** by nuts **39**. This arrangement provides a tying means which secures the blocks of the spaced sub-walls in a permanent fashion to the reinforcing steel studding **22** and further provides ample strength to the block sub-walls to withstand the weight and pressure of the wet concrete subsequently poured therebetween.

It will be noted that blocks **24** in the embodiment of the invention illustrated are in length equal to twice the distance between stud pairs **22**. This arrangement is provided so that when the blocks are staggered in vertically succeeding rows, each lateral block edge will be aligned with a pair of spaced studs to which it is secured. It is also to be noted that the short edges **40** of vertical spacing strips **33** are beveled and parallel, the purpose for which will also be explained later.

When the first or lowermost rows of blocks **24** have been secured in place in the manner explained, horizontal spacing strips **41** are placed in the upper horizontal grooves **28** of the adjacently aligned blocks of both the inner and outer rows. The strips **41** may be of considerable length but preferably are not provided with bores such as those in the vertical spacing strips **33** as the securing arrangement thru the vertical spacing strips only, for all normal applications will suffice. However, in certain unusual circumstances spaced bores may be provided in the horizontal strips **41** for registry with each or alternate stud pairs **22** for the reception of additional securing means **34—39**.

Both the vertical spacing strips **33** and the horizontal spacing strips **41** are made of the same material and are of uniform width. The washers **36** which are preferably square are likewise of this same material. Their purpose is best served by a material which is sufficiently strong to withstand the forces exerted thereon by the somewhat flat heads of bolts **34** and yet sufficiently resilient so that the blocks will not be damaged should jarring occur in setting them in place. A suitable material for said strips has been found in Masonite; however, other suitable plastic or synthetic resin based plastic fibre materials or semi-soft metals obviously can be employed.

The beveling of the ends **40** of the vertical strips **33** in a parallel manner as heretofore referred to is preferable and provided so that the upper bevel will meet or wedge behind the horizontal spacing member **41** which it abuts and the lower edge will wedge over the horizontal spacing member **41** which it abuts, except below the bottom row of blocks and above the top row of blocks where there is no necessity for a horizontal spacing member. The purpose for this bevelling is so that any moisture or water will be shed outwardly, particularly regarding the outer sub-wall and prior to tuck pointing.

After the horizontal spacing members **41** have been set in place, the next inner and outer rows of blocks are positioned thereover but staggered with relation to the first rows. Vertical spacing members **33** with bolts **35** therein are slid in place therebetween and as with the blocks below are secured to the studding pairs intermediate those to which the lower row is secured in the same manner previously described. In this manner either the entire wall structure, circumscribing and partition, may be erected with spaced sub-walls of blocks in staggered relation and then filled in with poured concrete or the walls may be erected and poured in increments. At window and door openings and corners the same procedure is followed except that special angular blocks (not shown) are employed. Such angular blocks will all have grooves and beveled edges similar to wall blocks **24** but of course must be provided with one leg full length and the other half length for corners so that the staggered block arrangement may be maintained; and for door or window openings, the inwardly directed portions will vary in depth depending upon the thickness of wall being constructed. In the event that metal sash is to be employed in such door or window openings, the angular sash blocks may be suitably provided with grooves into which the metal sash can be inserted and bonded.

After the sub-walls are erected either completely or in increments, but prior to pouring, suitable reinforcing rods **47** may be wired in place transversely to studding pairs **22** and lighter rods **48** may also be added forming additional network reinforcing. Rods such as **47** may also be placed in the footing trenches prior to pouring.

When the entire block sub-walls have been so erected and secured to the steel studding, or whatever portion thereof it may be desired to erect and pour at any one time, the entire internal surface particularly of the outer block sub-wall, as well as the top portion of the footings are waterproofed preferably with a coating of hot tar or other suitable waterproofing material. When the waterproofing material has sufficiently hardened, the concrete is poured between the block sub-walls. The spaced block sub-walls therefore act as inner and outer forms eliminating the necessity and expense entailed therein and when the concrete is poured therebetween, it fills the depres-

sions **30** in the inner sides of the blocks **24** and the dovetails between the inward bevels **27***c* which are inwardly convergent so that the blocks **24** forming the subwalls become securely interlocked with and in fact integrated with the concrete and the reinforcing steel studding therewithin. That is to say, the beveled edges **27***c* of the blocks **24** when in place provide on all sides (top, bottom and sides) a dovetail integral concrete joint around each block which after the poured concrete has set most effectively interlocks and integrates the blocks **24** with the poured concrete proper.

The outwardly convergent recesses between the blocks formed by bevels **27***a* and **27***b* may be mortared in or tuck pointed either as the sub-walls are being erected or after the walls are completed. The shape of bevels **27***a* insures a dovetail locking seal for the mortar or material therewithin.

Insulation material may be incorporated into the poured concrete between the block sub-walls in the form of sheets or may be subsequently secured to the inside facing surface of the inner block sub-wall with conventional internal wall finishing materials such as lath, plaster and the like added thereafter.

In Fig. 15, there is shown another embodiment of this construction wherein the inner and outer sub-wall blocks **44** are made to a suitable radius and secured to circumferentially spaced steel studding pairs **22** by bolts, washers, spacing ferrules and nuts, **34**, **36—39**, through the vertical spacing members **33** in the same manner as described with reference to a flat wall. The inside of the outer curved block sub-wall is then suitably water-proofed and thereafter the concrete is poured therebetween. Such construction is readily adaptable to the building of silos, water tanks, smoke stacks, and other such structures requiring a round or curved exterior.

Having described what is at present the preferred embodiment of this invention, it will be understood that such modifications and changes as will suggest themselves to those skilled in the art and come within the true spirit of this invention are intended as coming within its scope as best defined in the appended claims. I claim and desire to have protected by issuance of Letters Patent of the United States:

1. In reinforced concrete building construction, the combination of a self-supporting framework of reinforcing steel mounted in poured concrete footings about the building periphery, said framework comprising spaced pairs of upright steel studding members, the studding members of each pair being slightly spaced apart in the longitudinal direction along the building periphery, at least one sub-wall of spaced cementitious blocks, each block of which is provided with a peripheral groove having a bevel on each side of said groove, spacing members of uniform width and being provided with bores disposed in said grooves between blocks, bolts extending through said bores and between the members of said pairs of the studding members and secured thereto by nuts, corresponding bevels of adjacent blocks forming dovetail shaped spaces diverging inwardly toward the spacing members, pointing material received in the dovetail shaped spaces on one side of the spacing members, and poured concrete enveloping said framework and bolts, integrated with said sub-wall of blocks and filling the other dovetail shaped spaces on the other side of said spacing members.

2. Building construction as claimed in claim 1, including ferrules disposed about said bolts for spacing said sub-wall blocks from the studding members, and bracket members of sufficient size to bridge the spaces between the members of said pairs of studding members and between said sub-wall blocks, said bracket members being provided with a central bore and disposed about said bolts between the ferrules and the sub-wall blocks, between the ferrules and the pairs of studding members and between the nuts and the pairs of studding members.

3. In reinforced concrete building construction, the combination of a self-supporting framework of reinforcing steel mounted in poured concrete footings about the building periphery, said framework comprising spaced pairs of upright steel studding members, the studding members of each pair being slightly spaced apart in the longitudinal direction along the building periphery at least one sub-wall of spaced cementitious blocks, each block of which is provided with a peripheral groove having a bevel on each side of said groove, spacing members of uniform width disposed in said grooves between blocks, means connected to said spacing members extending between the members of said pairs of the studding members and secured thereto, corresponding bevels of adjacent blocks forming dovetail shaped spaces diverging inwardly toward the spacing members, pointing material received in the dovetail shaped spaces on one side of the spacing members, and poured concrete enveloping said framework and said means, integrated with said sub-wall of blocks and filling the other dovetail shaped spaces on the other side of said spacing members.

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