Nov. 24, 1925. 1,562,706

S. LAKE

CONCRETE BUILDING ELEMENT

Filed Aug. 20, 1924 3 Sheets-Sheet 1

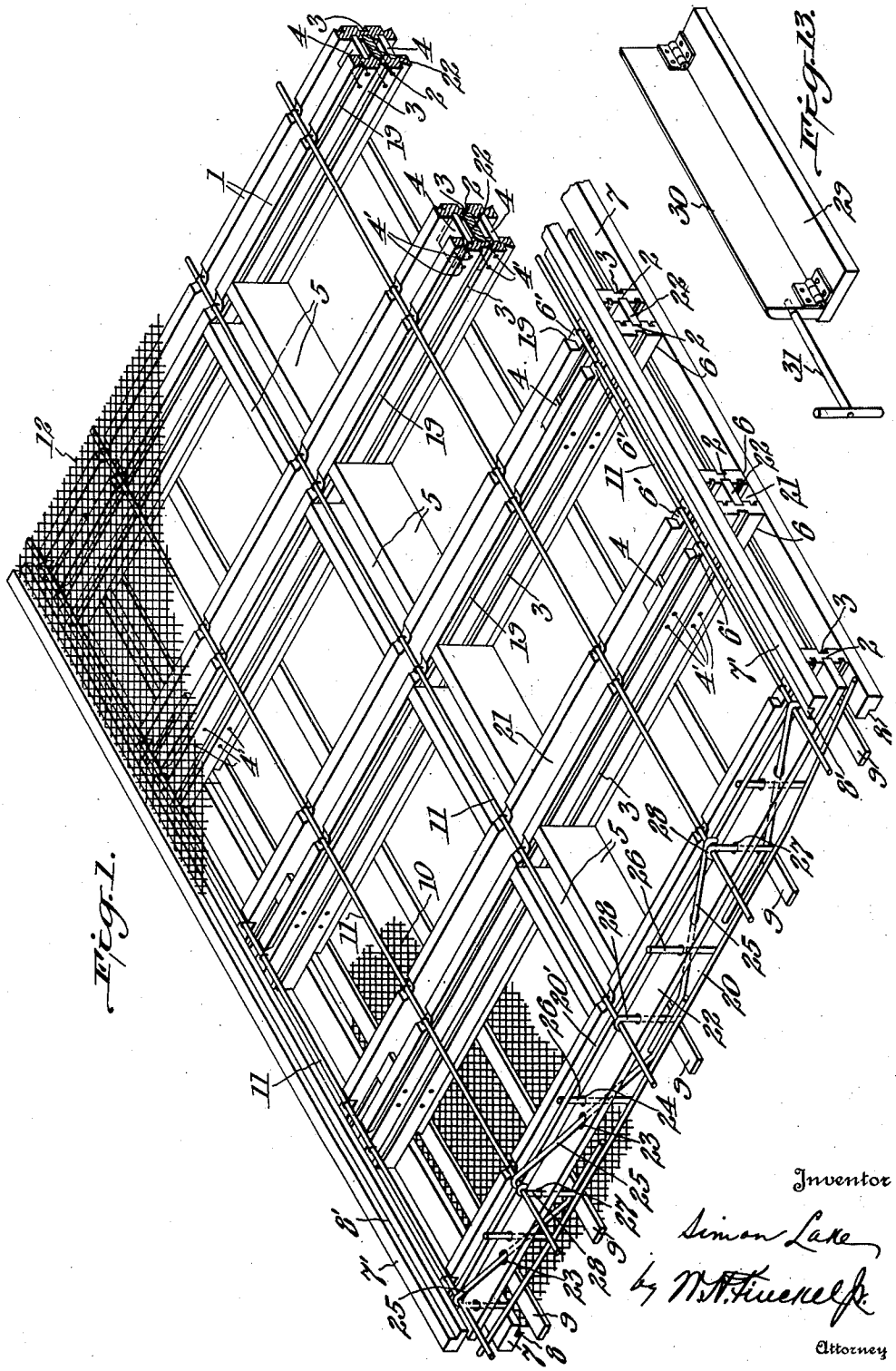

Fig. 1.

Fig. 13.

Inventor

Simon Lake

by W. H. Kinnear Jr.

Attorney

Nov. 24, 1925.

1,562,706

S. LAKE.

CONCRETE BUILDING ELEMENT

Filed Aug. 20, 1924

3 Sheets-Sheet 2

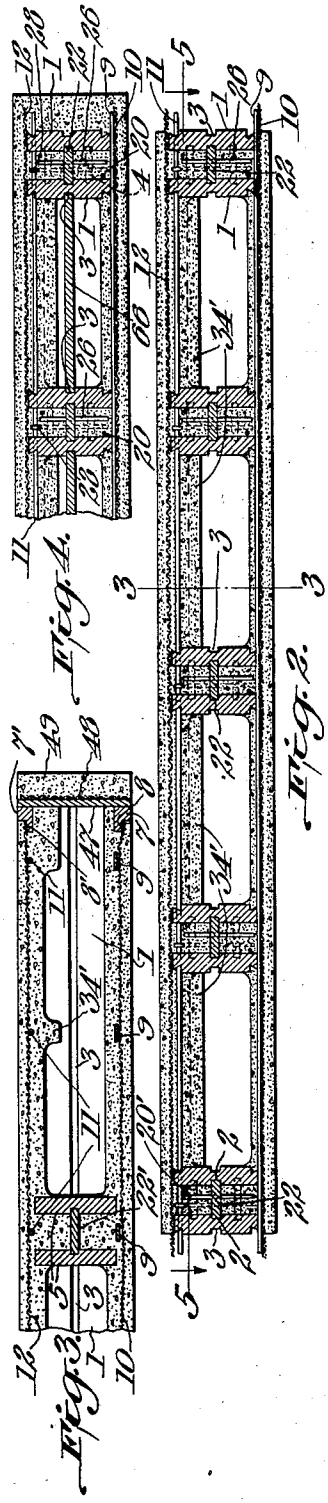

Fig. 4.

Fig. 3.

Fig. 2.

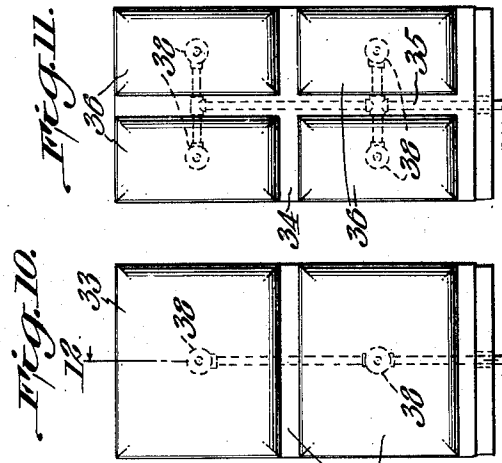

Fig. 11.

Fig. 10.

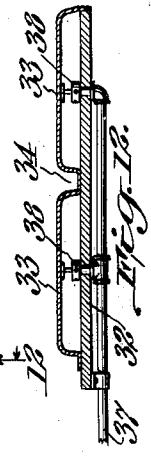

Fig. 12.

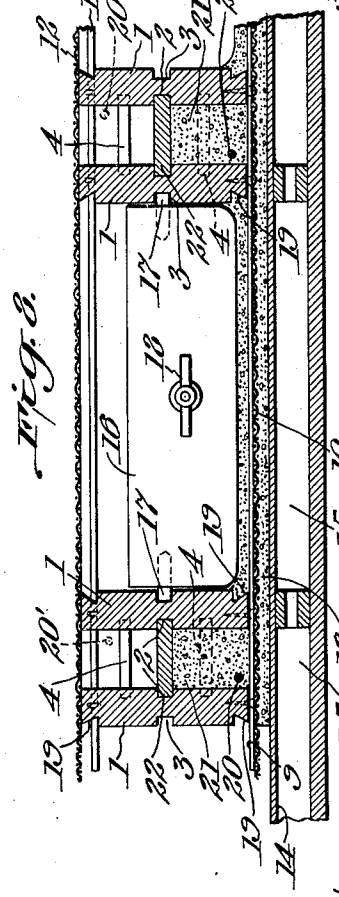

Fig. 8.

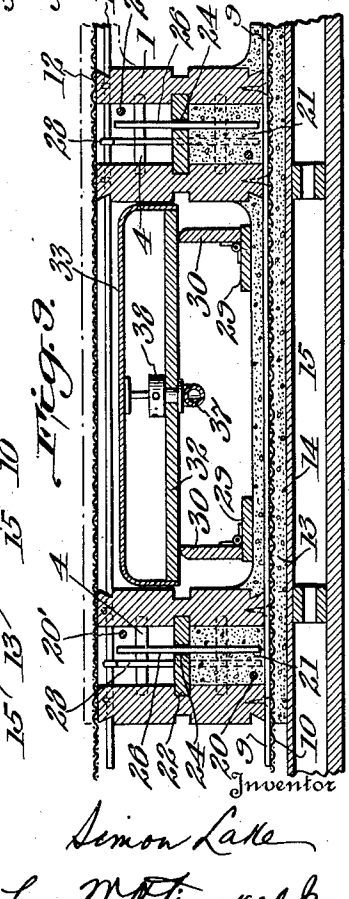

Fig. 9.

Inventor

Simon Lake

by W. T. Finckel Jr.

Attorney

Nov. 24, 1925. 1,562,706

S. LAKE

CONCRETE BUILDING ELEMENT

Filed Aug. 20, 1924 3 Sheets-Sheet 3

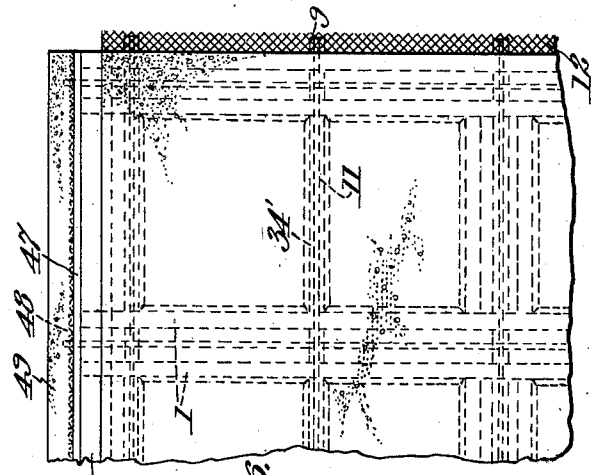

Fig. 6.

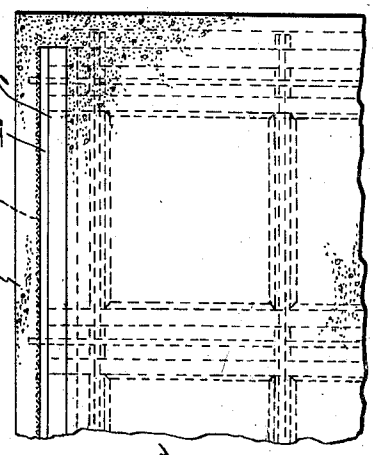

Fig. 7.

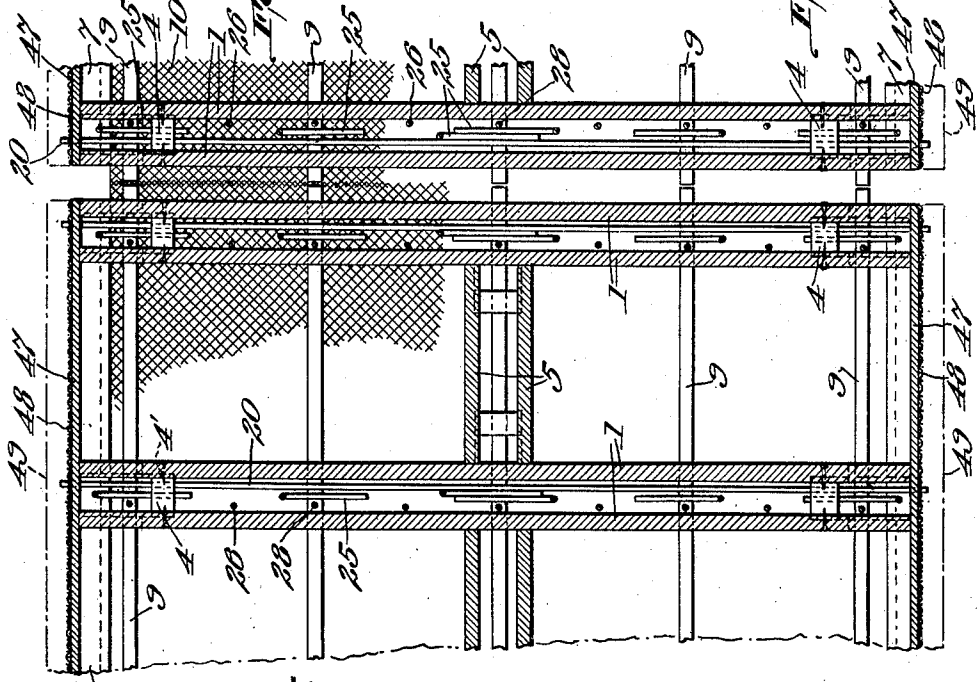

Fig. 5.

Inventor

Simon Lake

by W. T. Finney Jr

Attorney

Patented Nov. 24, 1925. 1,562,706

UNITED STATES PATENT OFFICE.

SIMON LAKE, OF MILFORD, CONNECTICUT.

CONCRETE BUILDING ELEMENT.

Application filed August 20, 1924. Serial No. 733,208.

To all whom it may concern:

Be it known that I, SIMON LAKE, a citizen of the United States, residing at Milford, in the county of New Haven and State of Connecticut, have invented a certain new and useful Improvement in Concrete Building Elements, of which the following is a full, clear, and exact description.

This invention relates to a concrete building element suitable for use in the construction of walls, floors and roofs of buildings, and so designed and fabricated as to meet all of the requirements of strength, permanence and adaptability incident to its several uses.

One object of the invention is to provide a concrete building element which will lend itself readily to quantity production and shipment, and which may be used as a substitute for other building elements or materials.

Another object is to provide a building element of such a nature that it makes possible the construction of buildings in a much shorter time than has heretofore been possible, thus materially reducing the cost of construction.

A further object is to provide a building element of such formation that a building constructed of same will be insulated against heat and cold, will be moisture and vermin proof, fire safe and sanitary.

The invention consists in a concrete building element composed, in effect, of two slabs forming the faces of the element, and these slabs joined together and held in spaced relation to each other by longitudinal and transverse webs or spacing means, the webs and the slabs provided with reinforcing and strengthening members tied together to form a reinforcing framework bonded in the concrete of the element, as I will proceed now to explain and finally claim.

In the accompanying drawings illustrating the invention, in the several figures of which like parts are similarly designated, Figure 1 is a fragmentary perspective view illustrating the various members of the reinforcing framework. Fig. 2 is a longitudinal section of a finished element. Fig. 3 is a fragmentary transverse section taken on the line 3—3 of Fig. 2. Fig. 4 is a fragmentary section similar to that of Fig. 2, but showing a modification. Fig. 5 is a section through the reinforcing framework taken on the line 5—5 of Fig. 2. Fig. 6 is a fragmentary plan view of an element such as is shown in Fig. 2. Fig. 7 is a fragmentary plan view of an element such as is shown in Fig. 4. Figs. 8 and 9 are fragmentary sections illustrating the method and apparatus for forming the elements. Figs. 10 and 11 are top plan views of cores, such as shown in Fig. 9, for use in the manufacture of the elements. Fig. 12 is a section taken on the line 12—12 of Fig. 10. Fig. 13 is a perspective view of a device, such as shown in Fig. 9, for supporting the cores during the operation of forming the elements.

My building elements may be made in a variety of shapes and sizes, and they may be provided with openings for doors and windows by the incorporation in them of suitable door and window frames, but for purposes of illustration I have shown an element of rectangular form, without openings.

The invention is best described by setting forth the method of its production, and this method may be stated as follows:—

I take a plurality of transverse members or boards 1 provided on their inner faces with grooves 2 extending throughout their length and upon their outer faces with similar grooves 3. These members 1 are arranged in pairs and are suitably spaced apart by spacers 4 arranged adjacent to their ends, which spacers in addition to maintaining the members 1 in proper spaced relation serve as a means for connecting them by nails, screws or the like 4′, which are driven through the members 1 and into the spacers 4. The pairs of members 1 thus connected are then arranged at suitable spaced distances from each other and in number as required by the length of the building element to be formed and are maintained in such spaced relation by means of separator members 5 arranged between them and substantially midway of their length, as shown. As will be seen, particularly by reference to Fig. 1, the members 1 are slabbed off at their ends as at 6 and on these slabbed off portions are nailed or otherwise secured the edge pieces 7 provided with rabbets 8. After these edge pieces have been secured in place, flat reinforcing bars or tension members 9 are secured by nailing or otherwise upon the edges of the members 1 in suitable spaced relation longitudinally of the framework. After these bars 9 have

been secured in place, wire mesh 10 is laid over the whole exposed surface of the framework with its longitudinal edges resting in the rabbets 8 of the edge pieces 7, and is nailed or stapled to these edge pieces and to the members 1. The whole framework is then bodily turned over and edge pieces 7', similar to the edge pieces 7 and provided with rabbets 8', are secured upon the slabbed off portions 6' of the members 1. Then longitudinal reinforcing rods or compression members 11 are stapled or otherwise suitably secured to the members 1, and wire mesh 12 is positioned over the whole exposed surface of the framework, with its longitudinal edges engaging with the rabbets 8' of the edge pieces 7', and is secured to the framework in the same manner as is the wire mesh 10. This structure comprises the foundation or main supporting and strengthening framework for the building element.

Referring now to Figs. 8 and 9, a layer of concrete or cement plaster 13 of suitable thickness and consistency is spread upon a pallet 14 preferably of hollow construction providing a space 15 in to which steam or other heating fluid may be introduced, for a purpose later explained, and then the whole framework just described, with the side carrying the bars 9 downward, is placed upon this layer of concrete 13 and is worked into same until the wire mesh 10 and members 9 are embedded therein. Then a hoe-like levelling tool 16, provided on its edges with pins 17 and with a handle 18, is run into the spaces between the pairs of members 1, with its pins 17 finding bearings and guides in the grooves 3 of the members 1 and the concrete in these spaces is screeded off to a uniform thickness and surface conformation. As will be seen, the members 1 are provided with undercut grooves 19 on their upper and lower edges which, due to their dove-tail shape, form a retaining connection or bond with the concrete, thus anchoring the concrete to them in addition to its bond with the bars 9 and wire mesh 10.

After the molding operation has been carried this far, transverse reinforcing rods 20 are inserted in the spaces 21, the spaces are filled with concrete to approximately the level of the grooves 2, and insulating members or strips 22 are then slid into the grooves 2 from the ends of the members 1. These insulating members are provided with appropriately positioned openings 23 and 24, and through these openings and into the plastic concrete are forced reinforcing rods 25 and 26 respectively, and through similar openings 27 are inserted reinforcing and tying members 28 which bond with the concrete below the insulating members 22 and are hooked over the longitudinal rods 11. After these various elements have been positioned as described, the filling of the spaces between the members 1 above the insulating members 22 with concrete may be completed if desired, and the transverse reinforcing rods 20' may be inserted, or these latter operations may be deferred until the top portion or slab of the element is formed.

The above operations having been completed, and the concrete 13 forming the lower slab of the element having acquired sufficient set to sustain an appreciable load, but being still plastic and capable of uniting with additional concrete, the top portion or slab of the element may be formed as next described.

Boards or the like 29 having hinged to them cam members 30 provided with handles 31, as shown in detail in Fig. 13, are laid upon the lower slab of the element, as shown in Fig. 9, but with the cam members 30 turned down so as to lie flat upon the boards 29. Then the cores illustrated in Figs. 9, 10, 11 and 12 are slid into the spaces between adjacent pairs of members 1, and the handles 31 are turned to raise the cam members 30 to thereby elevate the cores to casting position, as shown in Fig. 9. With the cores in this position, concrete is spread over the whole upper surface of the frame of the element, and is worked through the wire mesh 12, sufficient concrete being supplied to form a substantial coating above the mesh 12, as shown in Fig. 2, and is screeded off to the desired uniform thickness, the cores arranged as described forming a bed to receive the concrete thus applied.

It is during this operation that the filling of the spaces 21 between the members 1 may be completed and the rods 20' inserted, as hereinbefore indicated, and I prefer to follow this procedure.

This last operation completes the casting or molding of the element.

In order to quickly dry out the concrete to hasten its acquiring such a set as will permit the handling of the element without danger of fracture, I prefer to artificially heat the entire concrete body, and this I do by the introduction of steam into the space 15 of the pallet 14 and into the interior of the cores.

By reference to Figs. 10 and 12, it will be seen that the cores are of waffle-like formation as regards their surface contour and comprise base members 32 to which are attached stamped or otherwise suitably formed members 33 providing between them a depression 34 which when in casting position, lies beneath one of the rods 11, and when the concrete is poured upon the core, forms a rib 34', Figs. 2, 3 and 4, running longitudinally of the under face of the upper slab of the element and containing the rod 11, and broken only by the members 1 of the reinforcing framework.

Fig. 11 shows a modified form of core in which in addition to the depression 34 there is a transverse depression 35 which with the depression 34 divides the surface of the core into four raised portions 36 and provides in addition to the longitudinal rib 34′ an intermediate transverse rib upon the under side of the upper slab of the element.

After the concrete has attained its initial set, the cores may be withdrawn by turning the handles 31 to move the cam members 30 to their lowered position, thus lowering the cores so that they may be disengaged from the ribs formed by them and may be thereafter withdrawn.

Steam for heating the cores may be introduced into them through pipes 37 having connected with them a plurality of nozzles 38, one in each of the divisions of the cores.

Houses constructed of my building elements may be of such size that a single element will suffice for each wall thereof and for the floors and roofs, or it may be necessary to use a number of the elements to construct a wall, floor or roof.

When a single element only is needed for a wall, floor or roof, the edges of the element may be finished as shown in Fig. 7 by casting concrete upon its ends and edges, such concrete bonding with the reinforcing elements which extend beyond the edges of the reinforcing framework.

Where a plurality of elements must be used, elements such as shown in Fig. 6 may be used, wherein the reinforcing elements extend beyond the edges. In uniting adjacent elements of this last mentioned type as indicated in Fig. 5, the abutting ends of the bars 9 and rods 11 are welded or otherwise united, and the wire mesh of adjacent elements is laced or otherwise joined, or merely overlapped, and then the space between the elements and including these interlocked and welded reinforcing elements is filled with a strong grout which is screeded off into uniformity with the surfaces of the adjacent elements, to form in effect a continuous unbroken face.

The above refers principally to the joining of the ends of the building elements, but it will be apparent that it may be necessary in structures of considerable size, or containing a number of stories, to superpose one element edgewise upon another. When my elements are to be used in this relationship, it may be found expedient to leave their edges unfinished, so that an air space will extend from the center of one element to the center of the next adjacent element, but if this is not desired, the ends of the cored openings, and the spaces 21 between the members 1 may be closed by boards or insulating material 47 upon which wire mesh 48 may be nailed, and concrete applied thereto to complete the edges of the member as shown in Figs. 3, 6 and 7 at 49, and as indicated in Fig. 5, by the broken lines.

By my construction, it will be seen that I provide a concrete building element having a reinforcing framework adapted to absorb longitudinal and transverse strains, and having reinforcing elements combined with the reinforcing framework and bonded with the concrete for distributing pressures exerted upon the building element from above and below whether localized or evenly distributed.

Moreover, I produce a building element comprising in effect two slabs of concrete spaced apart to form dead air spaces capable of insulating a structure composed of said elements against heat, cold and moisture, and with strengthening webs or spacing means of concrete connecting these two slabs at intervals by cooperation with the reinforcing framework of the elements, but insulated from each other by means of the insulating members 22, between the members 1, and similar insulating members 22′, Fig. 3, between the separator members 5.

I produce, by my invention, a building element of very light weight relative to its size, of great strength, and of low cost per foot as compared with materials now in use. As an indication of the strength of elements of my design, it has been found practicable to construct such elements 12 ft. 6 in. wide by 28 ft. 5 in. long by 3½ in. thick, with a 2½ in. air space, thus making the upper and lower slabs only ½ in. thick. Such a slab when only thirteen days old was found on official test to be capable of supporting a load of eighty pounds per square foot without damage of any sort.

Referring to Fig. 4, it will be seen that, if desired, the value of the dead air space as an insulator against transmission through the element of heat, cold, moisture and sound may be enhanced by the addition of an insulating partition member 66 which may be slid into the grooves 3 and positioned thereby in spaced relation to the upper and lower slabs of the element, thus forming two dead air spaces insulated from each other by the member 66.

As hereinbefore indicated, when the element is used in substantially horizontal position for the construction of floors or roofs, its reinforcing members are capable of sustaining loads either localized or evenly distributed, and whether applied from above or below, and when used in vertical position, as in a wall, will sustain loads applied from either side.

Moreover, it will be seen that, due to the arrangement of the members comprising the reinforcing framework proper, and of the reinforcing rods, bars, wire mesh and other elements applied thereto and embedded in the concrete of the slabs and webs, loads, no

matter how or where applied upon the element, will be distributed and absorbed throughout the whole element.

Various changes are contemplated as within the spirit of the invention and the scope of the following claims.

What I claim is:—

1. A concrete building element, comprising a pair of substantially similar slabs, longitudinal and transverse webs connecting said slabs and maintaining them in predetermined spaced relation, a reinforcing framework embedded in said slabs and defining said webs, reinforcing members in said webs and engaging the reinforcement of said slabs and insulating means embodied in said webs and positioned by said framework for preventing transmission of heat, cold and moisture from one of said slabs to the other.

2. A concrete building element, comprising a pair of similar slabs, a reinforcing framework comprising longitudinal and transverse members spaced apart in pairs to receive concrete forming ribs connecting said slabs, said framework embedded in said slabs, and reinforcing members embedded in said webs and interengaging with the reinforcement of said slabs.

3. A concrete building element, comprising a pair of similar slabs, webs extending longitudinally and transversely thereof and serving to connect them in spaced relation, insulating means incorporated in said webs and serving to prevent transmission of heat, cold and moisture from one slab to the other, and reinforcing elements embedded in said webs and passing through said insulating means for tying the slabs together.

4. A concrete building element, comprising a pair of substantially similar slabs, reinforcing elements incorporated in each of said slabs, webs arranged between and integral with said slabs and serving to maintain same in spaced relation, and reinforcing elements embedded in said webs and interlocking with the reinforcing elements of said slabs.

5. A concrete building element, comprising a pair of substantially similar slabs, a non-metallic framework embedded in said slabs and having web-forming members, webs of concrete defined by said members and connecting said slabs in spaced relation, insulating means incorporated in said webs and adapted to prevent transmission of heat, cold and moisture from one slab to the other through said webs, metallic reinforcing elements incorporated in each of said slabs, and metallic reinforcing members embedded in said webs and extending through said insulating means and bonded in said slabs for connecting the slabs together through said webs.

6. A concrete building element, comprising a pair of substantially similar slabs spaced apart to form dead air chambers, transverse webs connecting said slabs at suitable intervals throughout their length, a longitudinal median web extending throughout the length of the element and united with said slabs, reinforcing elements embedded in said slabs, reinforcing elements embedded in said webs and interlocked with the reinforcing elements of said slabs, and a plurality of strengthening ribs formed upon the inner face of one of said slabs.

7. A concrete building element, comprising a pair of similar slabs, reinforcing elements incorporated in said slabs, means for spacing said slabs a predetermined distance apart to form dead air chambers, and reinforcing elements incorporated in said spacing means and interlocking with the reinforcing elements of said slabs for tying the slabs together through said spacing means.

8. A concrete building element, comprising a pair of similar slabs, reinforcing elements incorporated in said slabs, means for spacing said slabs a predetermined distance apart to form dead air chambers, and reinforcing elements incorporated in said spacing means and interlocking with the reinforcing elements of said slabs for tying the slabs together through said spacing means, the reinforcing elements of said slabs extending beyond the edges of said element and serving as means for interlocking engagement with the reinforcing elements of similar slabs arranged in structural association therewith.

9. A concrete building element, comprising a pair of similar slabs, reinforcing elements embedded in said slabs, spacing and strengthening webs connecting said slabs together at intervals and provided with reinforcing elements interengaging with the reinforcing elements of the slabs, and strengthening ribs formed upon the inner face of one of said slabs and in line with the reinforcing elements thereof, whereby a reinforcing element of the slab lies in juxtaposition to each of said ribs.

In testimony whereof I have hereunto set my hand this 19th day of August A. D. 1924.

SIMON LAKE.