

Nov. 28, 1939.

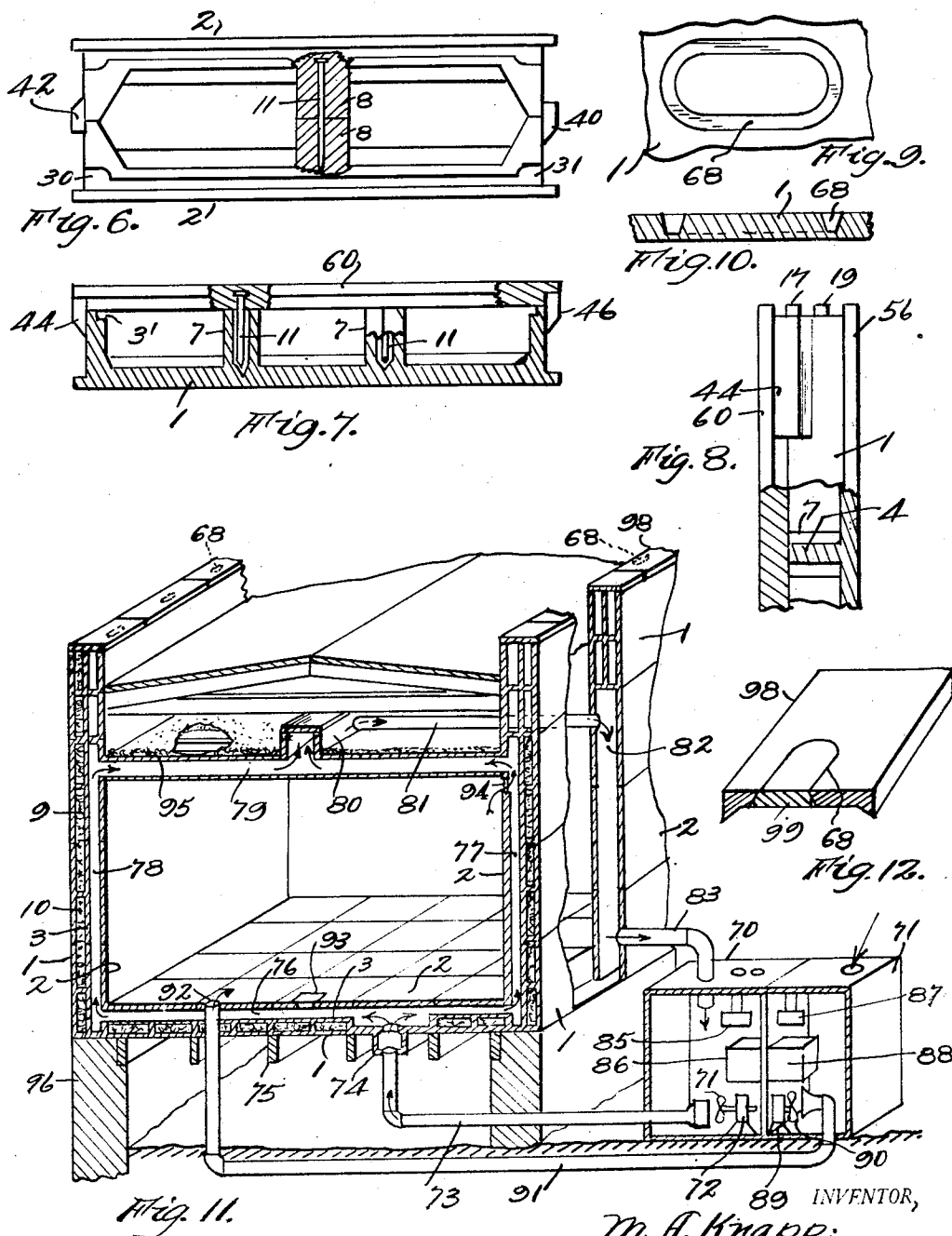
M. A. KNAPP

2,181,814

CONCRETE BUILDING BLOCK

Filed Sept. 20, 1938

2 Sheets-Sheet 2



INVENTOR,
M. A. Knapp;
BY
F. E. Maynard,
ATTORNEY.

UNITED STATES PATENT OFFICE

2,181,814

CONCRETE BUILDING BLOCK

Moses A. Knapp, Los Angeles, Calif.

Application September 20, 1938, Serial No. 230,807

14 Claims. (Cl. 72-42)

My invention relates to the class of concrete building block and has for its principal object the provision of a hollow concrete block formed of an exterior insulating half block united to an interior half block designed so as to permit the passage through it of air currents for heating or cooling the interior of the building.

To this end my invention consists generally of two separately formed half blocks united by reinforced concrete means interior of the block, having a thin partition between the insulating exterior half block and the interior current carrying half block; together with convenient means of reinforcing the wall by steel rods, means of interlocking the meeting edges of the half blocks and other valuable features all of which are more fully described and explained in connection with the description of the accompanying drawings.

The invention consists of certain advancements in this art as will be set forth in the ensuing disclosure and having, with the above, additional objects and advantages as hereinafter developed and whose construction, combinations and details of means will be made manifest in the description of the herewith illustrative embodiments; it being understood that modifications, variations and adaptations may be resorted to within the spirit, scope and principle of the invention as it is more directly claimed herebelow.

Fig. 1 is an isometric perspective of a complete block of a square form with part of the interior surface cut away.

Fig. 2 is a view from the left side of Fig. 1 of the narrow vertical strip at the abutting edges of the two half blocks.

Fig. 3 is a vertical front-to-back section of Fig. 1 near the right of the figure and looking to the right, with a portion of a similar block setting on top of the first mentioned.

Fig. 4 is a top view of Fig. 1 and of part of an adjoining block, with a sheet metal tie piece on top of them at their meeting plane.

Fig. 5 is a cross section of the reinforced concrete union means connecting the two half blocks of the complete block.

Fig. 5A is a detail of a modified section of joint connection.

Fig. 6 is a top view of a block formed by uniting two interior air-current-carrying half blocks without a partition between them.

Fig. 7 shows a cross section of a special thin block for use in interior walls formed of an exterior half block united by two interior ties as in Fig. 5 to a thin slab in which joining nails are

cemented at two crossings of the interior rib, of the half block.

Fig. 8 is a sectional edge elevation of the block of Fig. 7.

Fig. 9 shows in plan as from an interior view-point an oblong groove in the outer wall of either half block as in Fig. 1, designed to permit the easy removal or punching out of such portion of a block wall.

Fig. 10 is a longitudinal section of Fig. 9.

Fig. 11 is an isometric perspective of a small house with front wall removed, showing the use of the blocks as in Figs. 1 to 5 in insulating the house, allowing warming or cooling air currents to be circulated in the walls, and in insulating such heating or cooling currents while moving through the walls and floors of the house.

Fig. 12 is a perspective of a fragment of a wall capping section.

In Figs. 1 to 4, 1 is the exterior half block, 2 is the interior half block, 3 is an inserted partition largely broken away in Fig. 1. 4 is an interior transverse rib of the exterior half block 1 and 5 is a vertical rib of same. 6 is a vertical rib of the half block 2. 7 shows the enlarged central boss of ribs 4 and 5. 8 is the enlarged central portion of rib 6 in line with boss 7. 9 and 10 are fillings of loose asbestos wool in the insulating compartments of the half block back of partition 3. 11 is a steel rod joining the half blocks 1 and 2 and cemented in the rib bosses 7 and 8.

In Fig. 5A is shown a cross section of the enlarged boss portions 7 of the ribs 4 and 5 meeting the enlarged boss 8 of rib 6. A conical hole 12 is shown in the cement of each enlarged boss and in these meeting holes is shown a rod or nail 11. The half block 2 is commonly formed with the nail embedded in cement filling the space shown as a conical hole 5. A small amount of thin grout is poured into the conical hole in the half block 1 set with its flat side downward after the asbestos wool is placed in the insulating compartments of half block 1 and the partition 3 is in place. The half block 2 is then set upon the other with the nail in the conical hole of half block 1. Some half blocks 2 are formed without the cemented nail to admit of forming complete blocks thereof with doubly wide air passages as in Fig. 6.

In Fig. 4, 15 is the flat recessed top of the half block 1, and 16 is the raised outer edge of the top of the half block 1. 17 is the raised inner edge of the top of the half block 1. 18 and 19 are aligning lugs on the top face 15, which reach the plane of the tops of the edges 16 and 17. 22 is a

thick sheet metal yoke placed about lugs 19 on half block 1 and 18' on the adjoining half block 1'. 20 is a fragment of a long steel reinforcing rod lying along the recessed tops of half blocks 1 and 1'. 21 is a vertical reinforcing rod between the row of half blocks 1 and 1'. 24 is the vertical reinforcing rod between the half blocks 2 and 2'. 25 and 26 are the two end walls of half block 2 the top surfaces of which in Fig. 1 are in the same plane as surfaces 16 and 17 and the top of rib 6.

27 is the outer top edge of half block 2 which is also in the same plane as edges 16 and 17. 28 is a deep, long recess in the top plane surface of half block 2 in which groove is placed steel reinforcing rods 29. 30 and 31 are recesses in the tops of walls 25 and 26 of the half block 2. 33 and 34, Figs. 1 and 3 are flat cylindrical lugs on the bottom of the complete block to interlock in a lower block near its corners.

Lugs 33 fit between lugs 18 and 19 and the edge 16 of half block 1, and lugs 34 fit in the recesses 30 and 31 when the complete block is set on top of another similar block. The lugs are symmetrically placed so as to fit just inside the top edges 16 and 27 and fit just inside the curving edges of recesses 30 and 31. They therefore cause the bottom of one block to fit exactly upon the top of another similar to it.

In Figs. 1, 2, and 4, 40, 41, 42, and 43 are overlapping edge parts of half block 1 extending over the edges of half block 2. 44, 45, 46 and 47 are similar overlapping edges of half block 2 extending over the edges of half block 1. These overlapping edges are ended by planes perpendicular to the planes of the ends of the block on which they are formed and these plane edges meet closely without undue play. These overlapping edge parts are disposed symmetrically with respect to the line of the central nail 11 as in Fig. 1, but not symmetrically with respect to the central vertical ribs consequently a half block as 2 Fig. 1 may be placed together with a similar half block as in Fig. 6.

In Figs. 1 and 4 the edges 55, 56, 57 and 58 of the broad flat sides of the half blocks 1 and 2 are shown as extending about one half inch horizontally beyond the body of the completed block both to right and to left. In Fig. 4 the edges 55 and 56 are shown as meeting edges on the adjoining block leaving vertical spaces 48 and 49 in which are reinforcing rods as 21 and 24. These edges extend beyond the plane of the end surfaces between them to the same amount as do the overlapping lips 40 to 47.

In Fig. 6 are shown two half blocks 2 fastened together to make a complete block having a double width vertical air passage. These half blocks are used where large air currents are passed or where large plumbing pipes are put in the walls. Two half blocks 1 may also be joined together to make a double insulating block.

In Fig. 7 is shown a complete block adapted to form thin inside walls. It is formed by fastening a thin slab 60 to an exterior half block 1. In this figure two binding hubs or posts with included nails are shown, the nails having been first cemented into the slabs.

In Figs. 9 and 10 is shown a generally elliptical groove 65 formed outwardly on the inside surface of a wall of a half block 1 or 2. Such grooves are shown in full or dotted lines in Fig. 1 at 66. When desired the thin cement at the bottom of the groove can easily be broken out and a hole made through the wall of the block.

In Fig. 11 the walls and floor of the house are formed of the completed building blocks as in Fig. 1 except in certain places where blocks as in Fig. 6 are used to accommodate large air currents. Outside the house is an air conditioning apparatus in box 70. In the box is a fan 71 operated by a motor 72 which forces warmed or cooled air through insulated pipe 73 into conduit 74 under a floor made of blocks as in Fig. 1 laid across floor joists as 75. The blocks are laid with the connecting passageways as in half blocks 2 uppermost and in Fig. 11 such connecting passageways run across the lines of the joists. From the conduit 74 air holes pass through the walls of the lower half block and through the partition 3 into the air passages of the half blocks 2 immediately above conduit 74. This air travels both ways from the conduit through the air passages 76 of the half blocks 2 and through holes broken, as at grooves 68 Fig. 9, in lower tier of blocks of the vertical walls as shown by the arrow in the figure. It then passes upward in the air passages 77 and 78 to the height of the ceiling of the room. This ceiling is nailed to the ceiling joists running across the figure which joists are covered by an attic floor. From the vertical air passages in the walls of the house the air passes inwardly into the spaces 79 between the ceiling joists above the ceiling and the attic floor through holes in the interior walls of the wall blocks. From said spaces through the attic floor are passageways through which the air passes into a conduit 80 from which a pipe 81 conducts it to a double width vertical passageway 82 in the side wall of the room, formed by a column of blocks as in Fig. 6.

In the larger passageway formed by these blocks the air passes downward to an insulated pipe 83 which conducts the air to box 70.

In the air conditioning box 70 is an electric heater 85 and an electric refrigerator 86. In the box 71 are also similar heater 87 and a refrigerator 88. A motor 89 turns a fan 90 which blows air into a buried pipe 91 which conducts air through the floor into the room at valve 92. Air from the heated, or cooled, air current from box 70 can also be admitted into the room through the valve 93, and both such currents can be allowed to enter the upward current in passageway 77 and 78 in the sidewall or allowed to escape otherwise.

In its passage through the hollow walls and floor the moving current of heating or cooling air is insulated by the spaces in the exterior half blocks which are filled with loosely laid asbestos wool 9 to prevent convection currents. This greatly increases their insulating efficiency. The thin partitions 3 are preferably made of non-inflammable wall board 1/4 inch thick and fit closely into recesses 3' in the exterior half blocks.

In the centers of the partitions in Fig. 5, at the point where the binding nail 11 passes through them, is a half inch diameter hole. This is filled with grout when the two half blocks are put together. This grout makes a cement joint between the half blocks which gives compressive strength to this connection. The nail gives tensile strength, and thus the two half blocks are so bound together that any pressure upon the flat surface of one is resisted by both blocks.

On top of the attic floor is shown a layer of asbestos wool 95 which is preferably blown into the attic and allowed to settle upon the said floor. This insulates the air current passing through the passageways 79 in the ceiling.

In building the side walls as shown in Fig. 11 the lower tier of blocks is first cemented to the foundation wall 96. The lower two or three tiers are set in place with their reinforcing rods as shown and water is poured into spaces 48 and 49, Fig. 4. When this leaks out thin grout is poured into said spaces. It flows from the vertical passageways through grooves 28 about the rods 29 and over the tops of the exterior half blocks about the reinforcing rods 20.

In finishing the floor, reinforcing rods may be laid in the passageways 49 and grout may be forced into these passageways either horizontally by pressure through holes in the walls or through a few holes chipped into the passageways at the meeting corners of the blocks.

The heating current shown as passing through the room in Fig. 11 and thence through the valved opening at 94 into the air passage 77 in the wall does not so pass at all times. When the said valve is closed the current through the walls and floor (and perhaps through the ceiling) to the heater is a closed current. The partition 3 is of incombustible material as are also the ceiling, ceiling joists and attic floor, consequently a high temperature may be used in the heating current and products of combustion may pass in this current if desired.

In the lower row of blocks setting on and cemented to the foundation as in Fig. 11, openings in the lower portions of the inside surface walls of the wall blocks, made as indicated in Figs. 9 and 10, are formed to communicate the passages through the interior half of the walls to those in the upper half of the floor blocks. Other passages through the walls of the blocks may be made to allow for plumbing.

The reinforced concrete connection 8 between the two pre-fabricated halves of the block acts not only to bind the two parts of the block together but this strong bond together with the vertical ribs and the adjacent parts of the outer block walls form a very strong I-beam structure to resist pressure against the centers of the blocks in the wall. There is a concrete connection as well as a metal one between the interior and exterior halves of the block.

The division of the hollow of the exterior half of the blocks into several compartments covered by the partition 3 forms air spaces such as are commonly called insulation in walls. In these spaces I have shown asbestos wool which is a definite heat insulator and prevents convection currents in said spaces. In my claims the word "insulation" refers to both of said forms of protection against heat loss or against undue entrance of heat.

It should be noted that when these blocks are used in a wall, thin concrete grout is to be poured into the vertical passageways 48-49 between ends of blocks to unite them together and at the same time to strongly unit two opposite parts of the blocks together. This grout flows horizontally from such vertical passages into the horizontal passages between the tops and bottoms of the blocks and around the steel reinforcing rods shown in the drawings. The flat bottoms of the blocks fit tightly upon the raised parts of the tops of the next lower blocks and prevent the grout from flowing into the open air passageways in the interior half of the blocks. When the blocks are built against a corner post of a building or against the side of another block the horizontally extending edges of the blocks leave

space for grout to flow to unite the blocks to such post or other block.

The floor blocks are cemented together by grout forced between the blocks and in the passageways between the blocks, preferably through holes chipped into the floor at the meeting corners of the blocks.

In Fig. 12 there is shown a fragment of a wall capping section 98. In this capping the weakened portion 68 has been broken away to remove a part of the section for access to a vertical passageway as 74, Fig. 11. The aperture is shown as refilled by a flat wedge plug 99.

What is claimed is:

1. A hollow concrete building block adapted to be used in multiple in forming the wall of a building, and consisting of two pre-fabricated concrete parts; said block parts having two opposite broad surfaces, one on each of said parts to form portions of the outer and inner surfaces respectively of said wall, and means uniting said parts rigidly and inseparably before installation in said walls.

2. A hollow concrete building block adapted to be used in multiple in the forming of the wall of a building, and comprising two pre-fabricated concrete parts united rigidly and inseparably by cementitious concrete means; said block having two opposite broad surfaces one on each of said parts to form portions of the outer and inner surfaces respectively of said wall.

3. A hollow concrete building block adapted to be used in multiple in the forming of the wall of a building, and comprising two pre-fabricated concrete parts united rigidly and inseparably by metal reinforced cement means before wall installation; said block having two opposite broad surfaces one on each of said parts to form portions of the outer and inner surfaces respectively of said wall.

4. A hollow concrete building block adapted to be used in multiple in forming the wall of a building, and consisting of two pre-fabricated concrete parts united inseparably before installation by metal reinforced concrete means crossing the hollow interior of said block, said block having two opposite broad surfaces, one on each of said parts, to form portions of the outer and inner surfaces respectively of said wall, and interlocking means on the meeting portions of said parts in assembled relation.

5. A hollow concrete building block adapted to be used in multiple in forming the wall of a building, and consisting of two separately pre-fabricated concrete parts inseparably united as a unit to be set into said wall; said block unit having two opposite broad surfaces, one on each of said parts and a thin partition crossing the space between said parts other than that occupied by the uniting means.

6. In a block construction as in claim 5 the block including an open-end passageway through that half of the block adapted to form part of the interior surface of the exterior wall of a building, said passageway being adapted to communicate freely with registered passageways in similar blocks in a relative tier or row.

7. In a block construction as in claim 5, the block having a passageway for free air flow in a tier, a heat insulation held in the part of said hollow block next to the wall web of said block adapted to be placed in the outer portion of the exterior wall of a building, said heat insulation being exterior of said passageway, and adapted to insulate the air in said passageway.

8. In a construction as in claim 5, the block having an air circulation passage, a heat insulating material held in said block exterior of said passageway and between said passageway and the surface of said block adapted to form the outer surface of the exterior wall of a building.
9. A floor of a building composed of blocks constructed as in claim 5, and in which the blocks have air passages; said blocks being arranged so as to allow air circulation through the air passages of said blocks in the upper part of said floor.
10. A floor construction including blocks as in claim 5, and which have horizontal air passages; and means for communication of said passageways in the floor with vertical air passageways in adjacent walls of said building.
11. A thin walled, hollow building block, having a deep groove in the inside of said thin outer wall and around a break out part of said wall and adapted to allow of the easy breaking out of the concrete at the bottom of said groove and removal of said part of the thin wall for access to the built wall space.
12. A building block comprising matched, pre-molded sections one of which forms an inner wall face surface and the other forms an exterior wall face surface, and means transversely joining the sections in assembled relation to form a building unit bodily insertible in a wall floor or other structure the backs of said sections being recessed, means transversely connecting the sec-

tions to form a unitary block for subsequent installation, and means for effectively dividing the recess of one block from that of the other, and the recess of one section being open from side to side of the block so as to form a flow passage.

13. A building block comprising matched, pre-molded sections one of which forms an inner wall face surface and the other forms an exterior wall face surface, and means transversely joining the sections in assembled relation to form a building unit bodily insertible in a wall floor or other structure the backs of said sections being recessed, means transversely connecting the sections to form a unitary block for subsequent installation, and means for effectively dividing the recess of one block from that of the other, and the recess of one section being open from side to side of the block so as to form a flow passage, and the recess of the other section being closed on all sides to prevent flow of air in said section.

14. A building block comprising matched, pre-molded sections one of which forms an exterior wall face surface, and means transversely joining the sections in assembled relation to form a building unit bodily insertible in a wall, floor or other structure, one section having a recess from side to side for air flow and provided with rearwardly projected rib means, and the other section having a back recess divided into compartments by crossed ribs.

MOSES A. KNAPP.