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INSULATED MONOLITHIC HOLLOW WALL CONSTRUCTION

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Fig. 1.

Fig. 2.

Fig. 3.

Fig. 4.

Fig. 5.

Fig. 6.

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This invention relates to cement or concrete construction of houses, and has for its objects an improved hollow wall construction which will be easy and inexpensive to construct, and which when completed will be fire-resistant, earthquake-resistant, windproof, insulated against sound, proof against external moisture, insulated against external heat and cold and conductive internally for heating and cooling. Other objects and advantages of the invention will appear in the following description and accompanying drawing.

In the drawing Fig. 1 is a vertical section of the wall of a house constructed in accordance with my invention, also showing a concrete first floor, and partition wall.

Fig. 2 is a horizontal cross section of the outer wall of the house as seen from the line 2—2 of Fig. 1 and showing a corner of the building.

Fig. 3 is a horizontal cross section of the partition wall of Fig. 1 as seen from the line 3—3 thereof.

Fig. 4 is a view similar to Fig. 3 but showing an optional construction of the partition wall.

Fig. 5 is an enlarged cross section of one of the semicircular insulating flues used to form the hollow spaces in the wall.

Fig. 6 is a perspective view of a sheet metal plate carrying a row of spaced tubes which form the flues connecting the hollow wall cavities with the foundation flue.

Briefly described, my improved hollow wall construction comprises a hollow wall, preferably of cement or concrete, and in which the hollow spaces are insulated against sound, heat and water from the outside, yet provided with a relatively thin plaster or cement paneling on the inner sides of the spaces forming the wall of the room so that heat may readily pass through, all so that the rooms may be easily heated or cooled, depending on whether hot or cold air is forced through the hollow flue-like spaces of the walls from a plenum chamber under the lower floor.

In the drawing 1 represents the outer wall foundation, here shown of concrete and provided with a relatively large horizontal duct or flume 2 formed in its upper edge and extending preferably entirely around the foundation. Any number of intermediate or partition foundations, 3, may be cast, and on top of all a concrete floor 4 suitably reinforced as at 5 and of any desired thickness to support the contemplated load, about 5" being sufficient for an ordinary house.

The foundation walls 1 and 3 are high enough or the space between is excavated sufficiently to form a plenum chamber 6, or cellar in which is located suitable air-heating and/or cooling apparatus, not shown.

Horizontal flume 2 is preferably formed in the upper edge of the foundation wall and the wall permitted to set and after setting the form is removed, the open passageway thus formed is covered with a long sheet or sheets of galvanized iron 7 wide enough to straddle the flume, and which sheet of iron carries a row of sheet metal tubes 8 over openings in the plate, secured there to as by ears 9 formed on the lower end of the tubes, so that the tubes project upward to form a series of flues 9 extending through the floor slab when same is cast. Besides these vertical tubes, other tubes 10 are arranged at intervals horizontally at the base of the flume 2 to extend inwardly and open to the plenum chamber, also similar tubes 11 or passageways in the intermediate foundations 3, and tubes 9' through the floor slab under partition walls 12.

The floor slab is suitably anchored to the foundation walls by suitable means, not shown, so as to form an integral unit therewith, and after the floor slab has thoroughly set and is strong enough the outer walls and partitions are erected.

It is, of course, evident that suitable false work must be used to support the floor slab while casting and setting. One of the principal features of my hollow wall construction is the use of light cellular hemicylinders 13 of heat and sound insulating material. These half cylinders which I use are a standard article in trade as used for heat-insulation or packing of large pipes such as furnace hot-air pipes, and are of a size preferably of about an inch or more thick by about seven or eight inches in inside diameter for the walls of an ordinary house. In detailed construction and material they may vary considerably, though preferably are about like the construction shown in Fig. 5 wherein there are several layers of corrugated asbestos paper or board cemented between concentric sheets 18 of the same material, while for the outer diameter I specially provide one or more layers of well tarred or otherwise water-proofed paper, asbestos sheet 19', or even other material such as sheet metal, also cemented in place, so that the half cylinders are proof against passage of moisture from the outside inwardly.

These half cylinders may be cut to any length, but when used for pipe coverings are usually supplied three feet long, and which form convenient length for my purpose.

In forming the outer walls with these half
cylinders. I first erect a suitable false wall of well braced boards on the floor slab as dotted at 16 about a half inch outside the desired line of the inner surface of the wall, and to this I 5 lightly attach a wire mesh fabric 17 and coat the outer side with a layer 18 of cement plaster, applied in any desired manner. Before this is hard I stand up on end a row of the half-cylinders 13 with their open sides against the plastered wall layer 18. These half-cylinders are preferably spaced about an inch or so from one another as indicated in Fig. 2 (the fuses 9° below being previously spaced so as to bring one within the hollow space formed by each half-cylinder).

After the row of insulating half-cylinders is in place I hook into the wire mesh 17 within the still soft layer 18 some short wires 19 and engage their outer ends with a vertical sheet of wire fabric 20, and thereafter place an outer form of boards (not shown) along the line 21 to form the outer surface of the structural wall portion 22 which is thereafter cast from above.

The wire fabric 20 may be a continuation of a similar sheet cast into the foundation walls and floor slab as indicated in Fig. 1, if desired. Also any number or arrangement of reinforcing bars may be additionally used as at 23, or used to the exclusion of the wire mesh 20. The wall is thus built up as desired and when set and the forms are removed a finishing coat of plaster 24 is given to the inside, and a heavier one, 25, of stucco, preferably of water-proof cement, is applied to the outside.

Where metal window frames are used, they may be suitably supported and cast in place, but where wooden frames are to be used I cast a cement frame 26 in place by the use of suitable forms, and which cement frame is recessed at the under side of the top lintel with a downwardly extending outer lip 27 so that the wooden frame 28 may be cast under it and forced back into place when the cement frame is hard. The cement frame may be reinforced as indicated 30 and is formed with a shoulder 28 extending in back of the wooden frame at all sides. When forcing in the wooden frame a suitable plastic water-sealing compound, or mastic, is smeared in the joint first. Door frames are similarly handled. The outer stucco coat 25 is returned over the cement frame to lock the wooden frame in place as indicated in the drawing.

On the extreme top edge of the wall I preferably cast a beam 29 suitably reinforced as by rods 30 so as to provide for lateral stiffness to the wall, and when wooden roofs are used I preferably channel this beam by inserting a wooden plate 31 to which the rafters 32 may be secured as the insulating layer 13 may be varied somewhat in shape, though I prefer the half-cylinder as it yields a concrete wall composed of a plurality of arched sections as shown in Fig. 2 which contributes to great strength and rigidity with minimum use of concrete materials. Also, while I prefer that the shells be of built-up cellular construction, it is evident that if otherwise of good heat and sound-insulating properties, they might serve the purpose. Also, the concrete or cement may be placed by means of a cement gun instead of pouring, if desired. Other details 70 may similarly be varied within the spirit of the invention and scope of my appended claims.

I claim:—

1. Hollow concrete building wall construction in which the wall is provided with a plurality of
relatively small adjacently disposed, vertically arranged flue-like hollow spaces within it, said spaces each defined by a heat-insulating shell covering the side of the space directed toward the outer side of the wall, and a relatively thin heat-conductive slab covering the space on the inner or room side of the wall.

2. Hollow concrete building wall construction in which the wall is provided with a plurality of relatively small adjacently disposed, vertically arranged flue-like hollow spaces within it, said spaces each defined by a heat-insulating shell covering the side of the space directed toward the outer side of the wall, and a relatively thin heat-conductive slab covering the space on the inner or room side of the wall, said flue-like hollow spaces being vented at their upper ends, and means connecting the hollow flue-like spaces at their lower ends for the introduction of tempered gases.

3. A building wall formed of cementitious material provided with a plurality of relatively small adjacently disposed vertically arranged flue-like hollow spaces within it, some of said spaces defined each by a heat-insulating shell covering the side of the space directed toward one side of the wall and a heat-conductive slab covering the space directed toward the opposite side of the wall, and others of said spaces being reversed as regards their insulated and conductive sides.

4. A concrete building wall provided with a plurality of relatively small adjacently disposed, vertically arranged flue-like hollow spaces within it, said spaces each defined by a trough-like shell with its open side covered by a relatively thin heat-conducting wall slab forming the inner wall of a room.

5. A concrete building wall provided with a plurality of relatively small adjacently disposed, vertically arranged flue-like hollow spaces within it, said spaces each defined by a substantially hemi-cylindrical, heat-insulated trough-like shell waterproofed on its convex surface, and with its open side covered by a relatively thin heat-conducting wall slab forming the inner wall of a room.

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