March 26, 1929. J. M. LEIGHTON 1,706,893

CAVITY WALL HOT AND COOL AIR CIRCULATION

Filed May 7, 1927 2 Sheets-Sheet 1

Fig. 1.

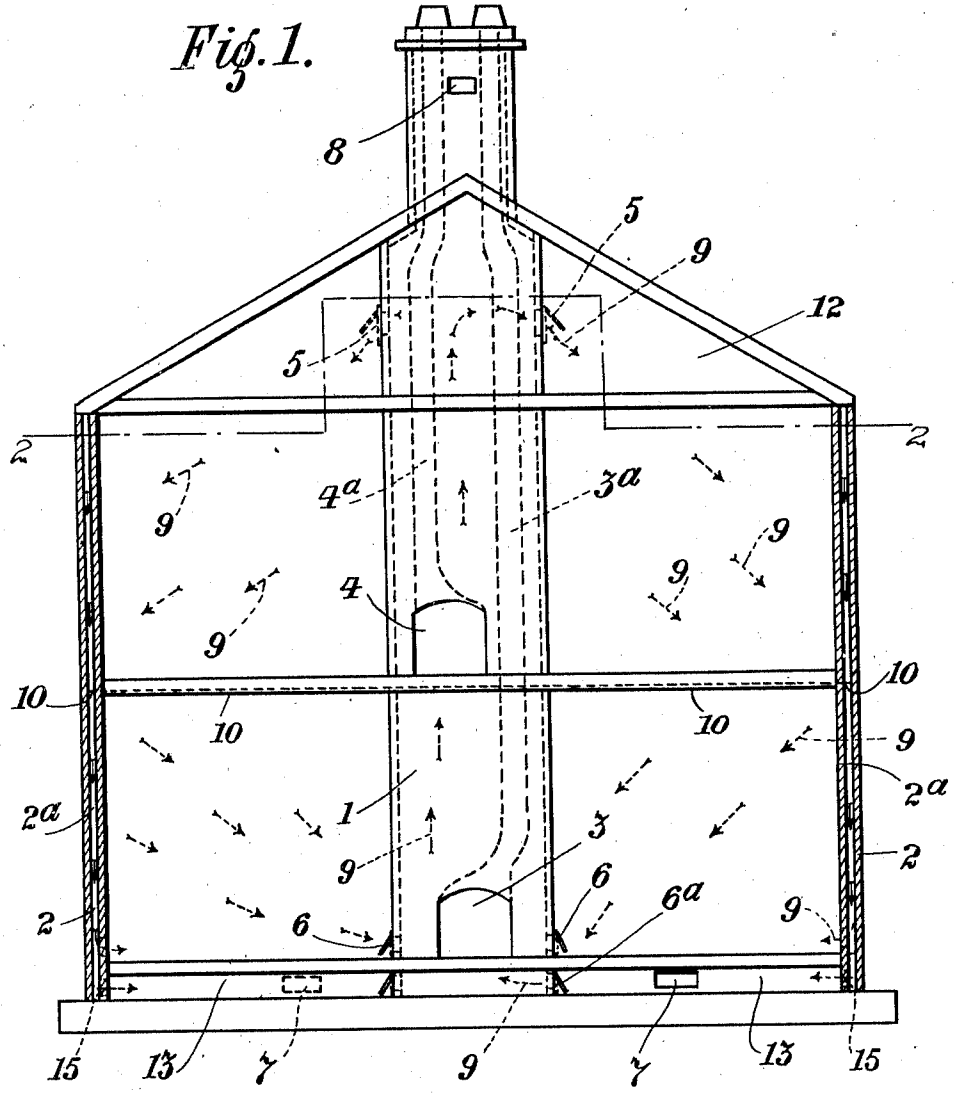


Fig. 2.

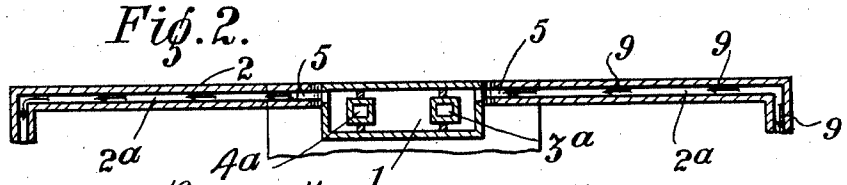
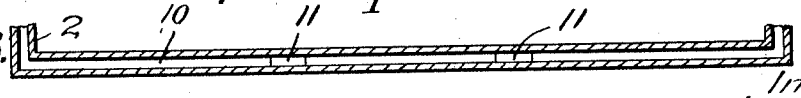


Fig. 3.



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CAVITY WALL HOT AND COOL AIR CIRCULATION

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Fig. 1a.

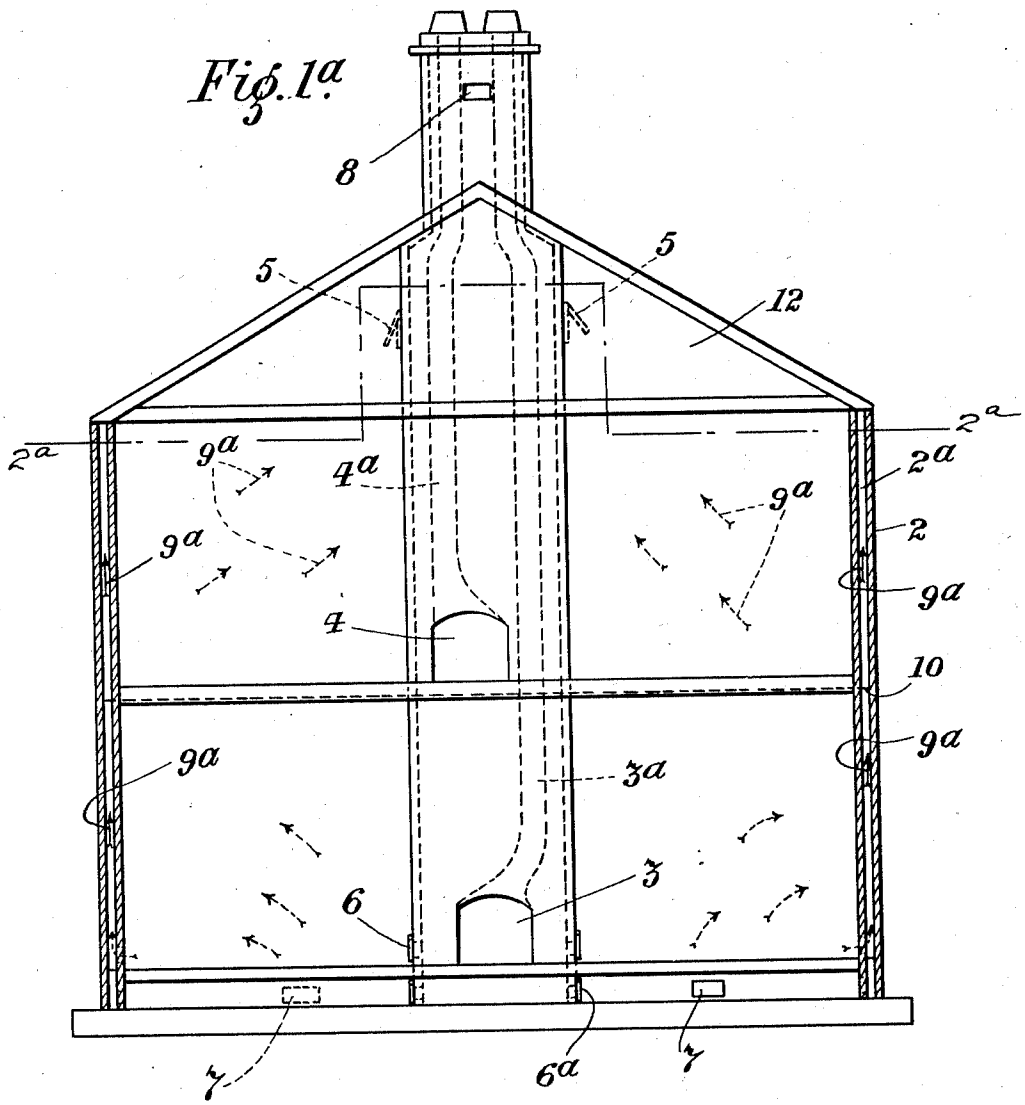
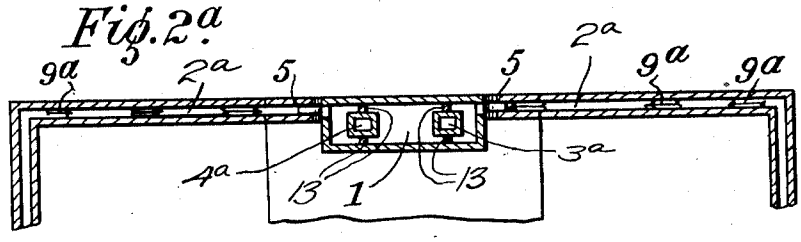


Fig. 2a.



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Patented Mar. 26, 1929. 1,706,893

UNITED STATES PATENT OFFICE.

JOHN MURRAY LEIGHTON, OF BELFAST, NORTHERN IRELAND.

CAVITY-WALL HOT AND COOL-AIR CIRCULATION.

Application filed May 7, 1927, Serial No. 189,696, and in Great Britain May 21, 1926.

This invention relates to the ventilation and heating or cooling of buildings with cavity walls by means of air passed through the cavities of the walls and a separate hollow chimney breast in communication therewith, which chimney breast is associated with means adapted to impart heat to the air when desired.

According to the present invention, the wall cavities and hollow chimney breast as specified are adapted to constitute the whole or part of a closed path around which air can be circulated by convection, and to and from which air can be permitted, when desired, to enter and escape. During cold weather, the heating means associated with the chimney breast is put into action, and the air within the chimney breast thereby receives heat and is circulated by convection round the said closed path, imparting heat, during its circulation, to the cavity walls. During warm weather, the means for permitting the inlet and outlet of fresh air to and from the said closed path are opened, the heating means associated with the chimney breast being, of course, put out of action, and the air within the cavity walls becomes heated and thereby creates a draught which causes the fresh air to be drawn through the wall cavities. Moreover, in cold weather, the means for permitting the inlet and outlet of fresh air as aforesaid may be kept open occasionally for a short period to allow the replacement by fresh air of the air already used for circulation purposes.

Communication between the cavities of the walls and the chimney breast may be effected by openings arranged in such a manner that one opening is at the ground level and another at or near the top of the walls, a third opening or other openings, communicating with the open air, being provided in the chimney breast above the roof, and openings being also provided below the ground floor of the building to permit the access of fresh air to the bottom of the chimney breast or cavities. These openings are provided with flaps or equivalent means whereby they can be closed at will, such flaps or equivalent means being manipulated by wires, chains or the like, connected to handles or other control means at any convenient part of the building.

In order that the invention may be understood reference will be made to the accompanying diagrammatic drawings of a two-story building which, it will be understood, is only shown by way of example.

Fig. 1 is a cross sectional elevation, through the building, showing the fireplaces, chimney breast, and cavity walls.

Fig. 2 is a detail sectional plan taken on the line 2—2 (Fig. 1) of the hollow chimney breast and the two flues therein.

Fig. 3 is a horizontal section of the wall at the end of the building remote from the chimney breast.

Fig. 1ª is another cross sectional elevation through the building, showing the fireplaces, chimney breast and cavity walls.

Fig. 2ª (the section being taken on the line 2ª—2ª, Fig. 1ª) is a view similar to Fig. 2 but illustrating a different air circulation.

Referring to the drawings:—

The diagrammatic elevation shown in Fig. 1 illustrates a two-storey building with a hollow chimney breast 1 arranged to heat the air in the cavities 2ª of the walls 2 in cold weather.

In order to heat the walls of the building from the hollow chimney breast 1, the flues 3ª and 4ª from the fireplaces 3 and 4 are laid up the inside of the hollow chimney breast as shown clearly at Fig. 2 and the air heated in the chimney breast is passed therefrom into the wall cavities by openings 5 controlled by hinged flaps (see Fig. 1), it being clear from the drawings that the wall cavities 2ª extend right up to the roof of the building not only at the sides but also at the ends, and consequently the openings 5 lead from the interior of the chimney breast 1 directly into the adjacent wall cavity 2ª (see sectional plan, Fig. 2). The air passes into the hollow chimney breast by the openings 6 at the bottom of the chimney breast 1, meanwhile openings 7 and 8 are closed, these openings being used in cooling the cavities in the walls as hereinafter described. The circulation of the heated air from the chimney breast 1 is as indicated by the arrows 9: the air flows first vertically through the hollow chimney breast, and then through the openings 5 into the cavities 2ª of the walls 2, the heated air from each of the openings 5 passing half way round the building above the first floor level and being retained therein by a baffle 10 which is continuous round the building except at openings 11, made in the portion of the baffle 10 in the cavity of the end wall 2 remote from the chimney breast (see Fig. 3), through which openings the

heated air passes down to the ground floor and, after circulating round the ground floor walls, is finally drawn again into the chimney breast through the openings 6. This circulation is continuous and results in the building being uniformly heated.

On the other hand, in hot weather when the heating means in the chimney breast 1 is out of operation, the above described circulation is automatically reversed. Thus, referring to either Fig. 1 or Fig. 1ª, it will be seen that, with the structure shown, when the wall cavities 2ª become heated by the sun, air contained therein will tend to rise whilst the column of air in the chimney breast 1, being cooler than the thin layer of air in the wall cavities, will be drawn downwards and pass through the openings 6 up into the wall cavities. The air, on reaching the top of the said cavities will pass through the openings 5 and again be drawn downwards through the chimney breast 1.

In Fig. 1ª, I have illustrated an air circulation whereby the building can be cooled. In this further circulation, the openings 6 are closed and the openings 7, 8 and 5 are opened. The opening 8 permits of heated air passing out to atmosphere and the opening 7 permits inlet of air from the atmosphere to the cavities 2ª in the walls. The circulation of the air shown by arrows 9ª will then be from the inlet 7 round the ground floor cavities to the openings 11, then round the upper floor cavities to the openings 5 and into the hollow chimney breast 1, and thence through the opening 8 to the atmosphere. This will cause a continuous circulation of fresh air through the wall cavities and will draw off heat due to direct rays of the sun striking the walls, thereby keeping the inner walls of the building at a moderate temperature.

In an electrically heated house a radiator placed within an air flue equivalent to the air space in the hollow chimney breast may be used to set up the convection currents in the air in the wall cavities.

The circulation of the air in the chimney breast and cavities is automatic, provided the valves be suitably regulated, the heated air whether in the chimney breast or wall cavities tending to rise and draw in cool air.

Where the general construction lends itself to the purpose, the air, in passing from the chimney breast 1 to the wall cavities 2ª or from the cavities 2ª to the chimney breast 1, may flow through the space 12 between the roof and ceilings of the upper floor. Likewise, if it is suitable, an air space 13 may be provided underneath the ground floors, the said space communicating with the cavities 2ª by means of openings 15 and with the chimney breast 1 by means of flap-controlled openings 6ª. The said openings 6ª are provided in addition to the flap-controlled openings 6, but, by means of the controlling flaps thereof, the openings 6 can be closed when the openings 6ª are opened and likewise when the openings 6 are opened the openings 6ª can be closed.

The action of the column of heated air within the chimney breast 1 may also be utilized to assist in ventilating the rooms of the building by means of suitable non-return ventilators (not shown) arranged to pass the vitiated air from the rooms into the air space in the chimney breast 1 from which it will be discharged through the opening 8 above the roof.

The air spaces within the chimney breast 1 may, as shown at Fig. 2ª, be divided into two or more compartments by vertical webs 13, and one compartment may be used for ventilation, another for warming or cooling the air space in the walls, roofs and under floors, and a third or others for delivering warmed air into the rooms. Any of these actions may be set into operation by the opening or closing of the appropriate flaps or shutters in the compartments.

I claim:—

1. In buildings, the combination of hollow walls having cavities which extend from top to bottom of the walls, heating means, a hollow chimney breast surrounding said means and extending from top to bottom of the building, means whereby the upper part of said chimney breast communicates with the top of said cavities, means whereby said cavities communicate at the bottom thereof with the bottom of said chimney breast, means whereby the chimney breast and wall cavities at the bottom thereof can be placed in communication with the atmosphere, and means whereby communication can be established between the atmosphere and the top of the chimney breast.

2. In buildings, the combination of hollow walls having cavities which extend from top to bottom of the walls, heating means, a hollow chimney breast surrounding said means and extending from top to bottom of the building, means whereby the upper part of said chimney breast communicates with the top of said cavities, a chamber constituted below the ground floor of the building, means whereby said chamber communicates with the bottom of the wall cavities and chimney breast, means whereby the wall cavities communicate with rooms in said building, and means whereby said rooms can be placed in communication with said chimney breast.

3. In buildings, the combination of hollow walls having cavities which extend from top to bottom of the walls, heating means, a hollow chimney breast surrounding said means and extending from top to bottom of the building, means whereby the upper part of said chimney breast communicates with the top of said cavities, a chamber constituted

below the ground floor of the building, means whereby said chamber communicates with the bottom of the wall cavities and chimney breast, means whereby the wall cavities communicate with rooms in said building, means whereby said rooms can be placed in communication with said chimney breast, means whereby the said chamber can be placed in communication with the atmosphere, and means whereby communication can be established between the atmosphere and the top of the chimney breast.

4. In buildings, the combination of hollow walls having cavities which extend from top to bottom of the walls, fireplaces, flues communicating with said fireplaces, a hollow chimney breast surrounding said flues and extending from top to bottom of the building, webs dividing the space between said flues and chimney breast into compartments continuous in the vertical direction, means whereby the upper part of said chimney breast communicates with the top of said cavities, a chamber constituted below the ground floor of the building, and means whereby said chamber communicates with the bottom of the wall cavities and chimney breast.

5. In buildings, the combination of hollow walls having cavities which extend from top to bottom of the wall, heating means, a hollow chimney breast surrounding said means and extending from top to bottom of the building, flap valves whereby the upper part of said chimney breast communicates with the top of said cavities, a chamber constituted below the ground floor of the building and communicating with the bottom of the wall cavities, flap valves whereby said chamber can communicate with the bottom of the chimney breast, flap valves whereby said chamber can be placed in communication with the atmosphere, and flap valves whereby communication can be established between the atmosphere and the top of the chimney breast.

6. In buildings, the combination of hollow walls having cavities which extend from top to bottom of the walls, heating means, a hollow chimney breast surrounding said means and extending from top to bottom of the building, baffles arranged in said wall cavities, flap valves whereby the upper part of said chimney breast communicates with the top of said cavities, a chamber constituted below the ground floor of the building and communicating with the bottom of the wall cavities, flap valves whereby said chamber can communicate with the bottom of the chimney breast, means whereby the wall cavities communicate with rooms in said building, flap valves whereby said rooms can be placed in communication with said chimney breast, flap valves whereby said chamber can be placed in communication with the atmosphere, and flap valves whereby communication can be established between the atmosphere and the top of the chimney breast.

In testimony whereof I affix my signature.

JOHN MURRAY LEIGHTON.