July 10, 1934. F. FÖRSTER ET AL 1,965,636

HEAT INSULATING WALL

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Fig. 1

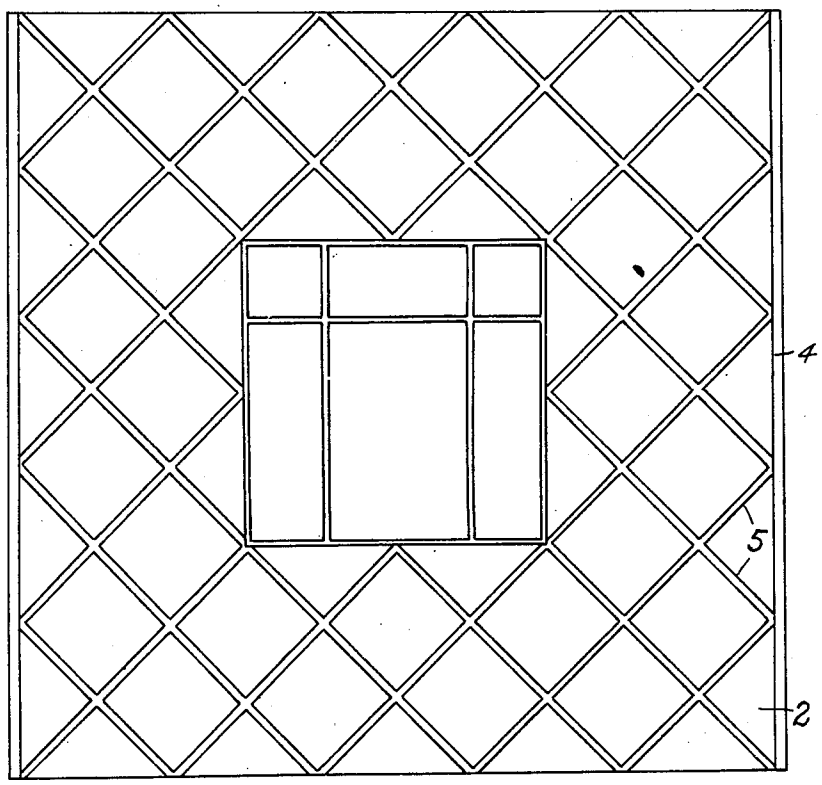
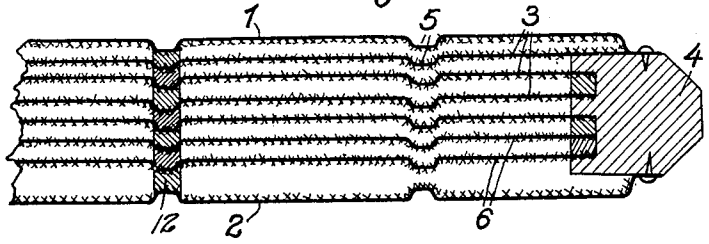


Fig. 2



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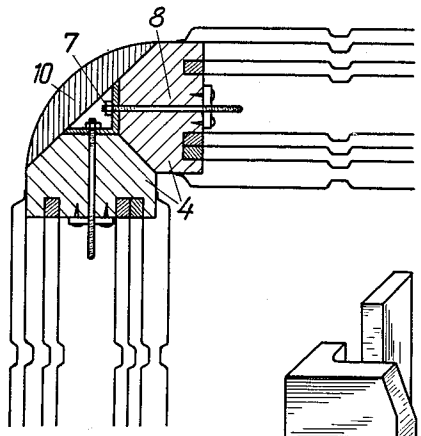

Fig. 3

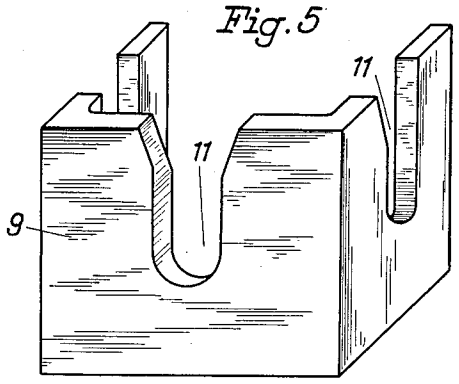

Fig. 5

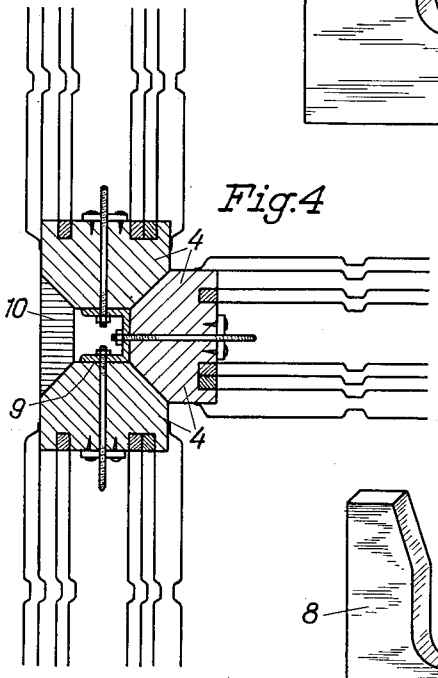

Fig. 4

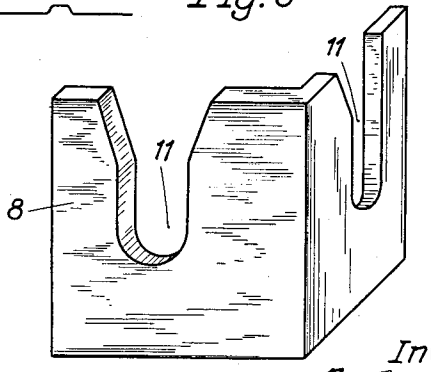

Fig. 6

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UNITED STATES PATENT OFFICE

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HEAT-INSULATING WALL

Friedrich Förster and Robert Krafft,
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Application September 8, 1930, Serial No. 480,289

5 Claims. (Cl. 189—34)

Our invention relates to heat-insulating walls of metal and more particularly to walls having two metal plates defining a hollow space between them.

It is an object of our invention to improve a wall of this type. To this end we subdivide the hollow space into several separate layers by parallel partitions of a material which is impervious to air.

Heat insulating metal walls for houses, heat-insulation of storage rooms, refrigerating plants, and the like, have already been proposed. Such walls have two parallel metal plates with a space between them which may be filled with air or a heat-insulating material, for instance, peat. The insulating capacity of such walls is not high as the air is free to circulate in the space between the two metal plates more or less freely and so a certain temperature equalization between the inner and outer plates will soon occur.

Our invention relates to a plate of this general type but in which the hollow space, and the air it contains, are subdivided by parallel partitions of a material which is impervious to air, preferably metal, the partitions being parallel to the plates defining the space.

It has already been proposed to provide several layers of air in succession in walls of concrete, bricks, or similar materials but the heat transfer through such walls was not much below that of a solid brick wall while our wall has a surprisingly good insulating capacity. For instance, a wall according to our invention which is $3\frac{1}{8}$ in. thick, is equal as to insulation to a brick wall about 7 ft. 3 in. thick. The temperature in a room enclosed by our walls is practically independent of the ambiant temperature, provided that the indispensable openings are well packed.

The explanation of this unexpected improvement in heat-insulating properties is that the impervious partitions absolutely prevent flow of air from one layer to the other while in the old walls, with their partitions of more or less foraminous material, there is always an exchange of warmer and cooler air between the layers, and the heat insulation is interfered with to a considerable extent. Heretofore it was even believed that such air exchange was necessary in order to ventilate the rooms.

We have demonstrated that this is not so, and by our invention we obtain heat-insulating capacities in metal walls which are about 20 times those of an equally thick brick wall with cavities but the weight of which is only a small percentage of the weight of the brick wall.

Our plates may be further improved by lining the partitions with a layer of a poor heat conductor, preferably of fibrous material. The layers have two functions: They prevent contact of the partitions in case of bending and thereby prevent the formation of "bridges" along which the heat is conducted, as there will never be any direct contact of the partitions. The other function of the layers is that the air is prevented from flowing in vertical direction since the rough and preferably fibrous material of the layers exerts friction on the air and prevents flow. Therefore we have only stagnant layers of air within the wall which are excellent heat insulators.

The walls according to our invention are light and strong and may be standardized and manufactured as they can be made exclusively of wood and metal. The finished walls are transported to the building station where, on account of their lightness, they are united to form buildings in a very short time and with little labour.

In the accompanying drawings a wall embodying our invention and some details are illustrated by way of example.

In the drawings

Fig. 1 is an elevation of a complete wall,

Fig. 2 is a section through the wall and part of its frame, drawn to a larger scale,

Figs. 3 and 4 are sections of wall frames showing their corner connections,

Fig. 5 is a perspective illustration of a channel section, and

Fig. 6 is a perspective illustration of an angle section for connecting the corners of the frames.

Referring now to the drawings, and first to Figs. 1 and 2, the wall includes a wooden frame 4 with two metal plates 1 and 2 at opposite sides, and parallel partitions 3 which are preferably of metal and are also secured to the frame 4. The plates which are separated by wooden spaces 12 are provided with grooves or crozes 5 for heat expansion and are lined with layers of heat-insulating, fibrous material, for instance, thin layers 6 of hair felt, which prevent the flow of the air between the partitions.

Referring now to Fig. 3, the corner connection is made so as not to form a metallic heat-conducting "bridge". The adjacent sides of the frame bars 4 are beveled in Fig. 3 and connected by an angle section 7 which is inserted in the angle formed by the adjacent sides of the bars and secured to the bars by screws 8.

Referring to Fig. 4, this shows a corner constructed of three bars, the adjacent sides of the bars being made as in Fig. 3 and connected by a channel section 9. The corners in both figures are lined with fillets 10 of wood which are laid with metal plates.

Referring to Fig. 5 the channel section 9 is slotted at 11 for the reception of the bolts 8. The angle section, Fig. 6, is slotted in a similar manner.

The sections are distributed over the height of a room between the longitudinal and transverse bars of the frames. Preferably the lowermost section is inserted in the foundation for anchoring the walls.

We claim:

1. A heat-insulating unit comprising a frame having poor heat-conducting properties, bendable metal plates on opposite sides of said frame, said plates and the frame enclosing a dead air space, at least one metal partition secured to the frame between the metal side plates and dividing the dead air space enclosed by the side plates and frame into a plurality of dead air spaces, said frame insulating the metal side plates from one another and from the metal partition, the interior of at least one of the metal walls defining each dead air space being covered with a heat-insulating material, whereby if any of said metal walls are deformed so as to contact with another metal wall, said heat-insulating material will retard the free conduction of heat between the walls, said heat-insulating material having a rough surface which will retard the flow of air therealong.

2. A heat-insulating unit comprising a frame having poor heat-conducting properties, metal plates on opposite sides of said frame, said plates and the frame enclosing a dead air space, and at least one partition of material impervious to air secured to the frame between the metal side plates and dividing the dead air space enclosed by the side plates and the frame into a plurality of dead air spaces, the interior of at least one of the walls defining each space being covered with a heat-insulating material having a rough surface which will retard the flow of air therealong.

3. A heat-insulating unit comprising a frame having poor heat-conducting properties, and metal plates on opposite sides of said frame, said plates and frame enclosing a dead air space, the inner surface of at least one of the metal side plates being covered with a heat-insulating material having a rough surface which will retard the flow of air therealong.

4. A wall having heat-insulating units each comprising a frame having poor heat-conducting properties, and metal plates on opposite sides of said frame, the plates and the frame of each unit enclosing a dead air space, the edges of the frame member being beveled, said units being connected to one another with their beveled edges abutting, the outer edges adjacent the bevel of adjoining units forming an interior angle, iron sections located in said interior angle and having a flange lying against the outer edge of the adjoining units, and fastening means securing each flange to the frame member against which it lies.

5. A wall having heat-insulating units each comprising a frame having poor heat-conducting properties, and metal plates on opposite sides of said frame, the plates and the frame of each unit enclosing a dead air space, said units being connected to one another so that the sides of the frames of adjoining units form interior angles, iron sections located in said interior angles and having a flange lying against an edge of each section, and fastening means securing each flange to the frame member against which it lies, the inner edge of each fastening means terminating between the spaced side plates, whereby said fastening means do not conduct heat through the units.

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