C. J. COLEMAN.

HEAT INSULATING WALL.

APPLICATION FILED JULY 9, 1908.

958,095. Patented May 17, 1910.

Fig. 1

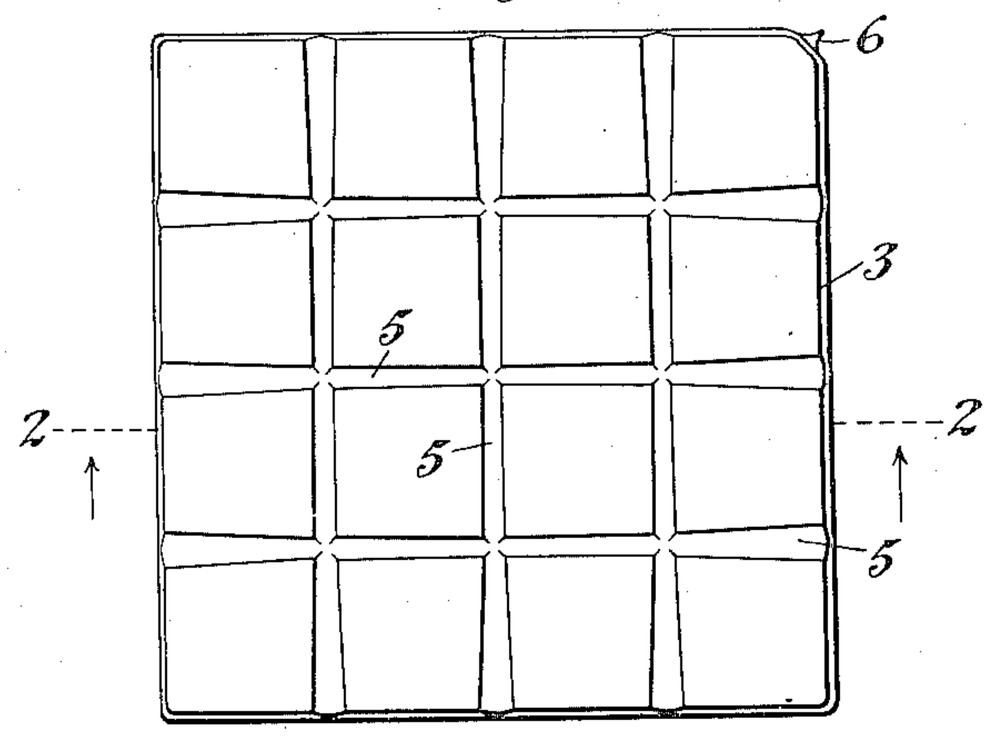


Fig. 2

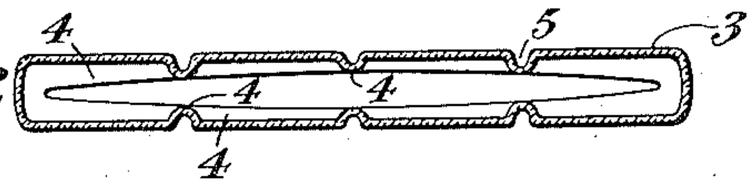


Fig. 3

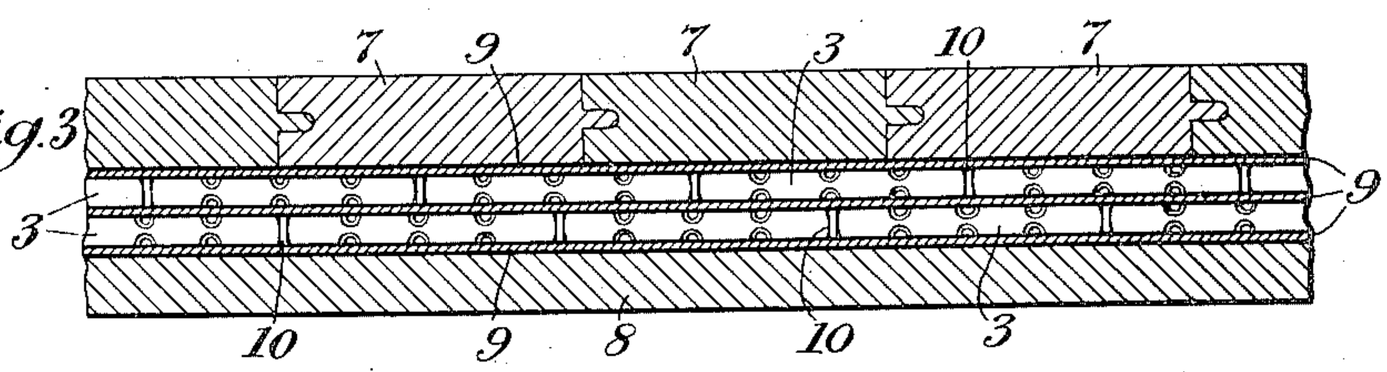
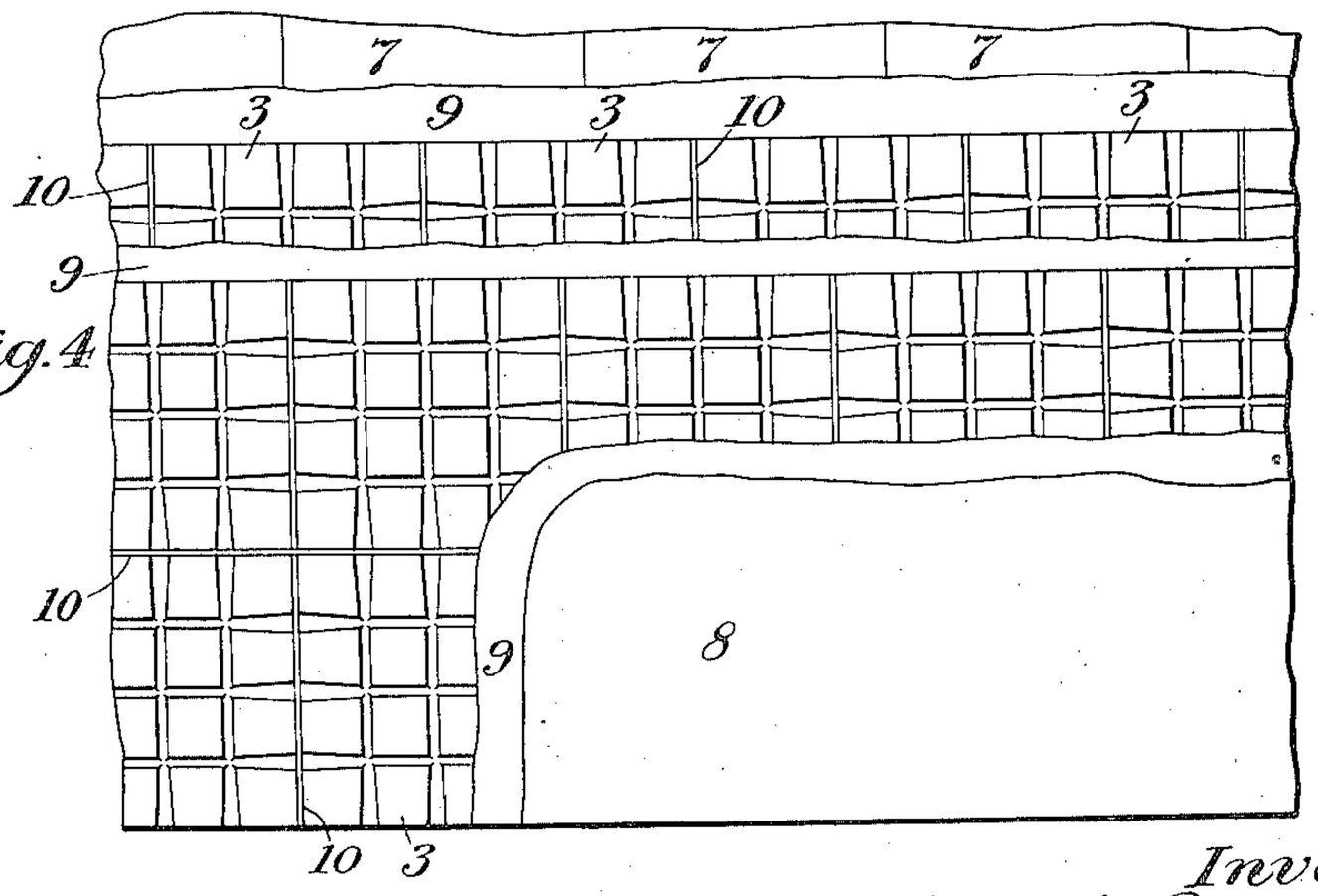


Fig. 4



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UNITED STATES PATENT OFFICE.

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HEAT-INSULATING WALL.

958,095. Specification of Letters Patent. Patented May 17, 1910.

Application filed July 9, 1908. Serial No. 442,752.

To all whom it may concern:

Be it known that I, CLYDE J. COLEMAN, a citizen of the United States, residing in the borough of Manhattan, city of New York, in the county of New York and State of New York, have invented a certain new and useful Improvement in Heat-Insulating Walls, of which the following is a specification, reference being had therein to the accompanying drawings, forming part thereof.

My invention relates generally to heat insulation and relates particularly to heat insulating walls of substantially large dimensions such as of refrigerator cars, cold storage buildings, household refrigerators and compartments and the like.

The objects of my invention are to secure highly effective heat insulation together with a simple and inexpensive construction and also to secure flexibility of the heat insulating walls.

My invention also has other objects and advantages which will appear from the following description.

My present invention is related in a general way to my former inventions, which are the subject of my applications for Letters Patent Serial Number 397,071, filed October 12, 1907, for heat insulation, Serial Numbers 422,815, 422,816 and 422,817, filed March 23, 1908, and Serial Number 442,751 filed contemporaneously herewith, for heat insulating walls. My inventions aforesaid all employ vacuum inclosing bodies or a plurality of units which inclose a vacuum as a part of the heat insulating construction. The high efficiency of a vacuum as a heat insulator has been long known, but prior to my said inventions no practical embodiment of the same had been made in heat insulating walls of any considerable size and adapted to the uses above noted.

My present invention is directed to producing a highly effective heat insulating wall of any desired size and possessing the requisite flexibility, and includes vacuum spaces in its construction as a principal part of the heat insulation. To these ends, my invention includes vacuum inclosing units having flat or plane sides provided at intervals with strengthening ribs running in two directions and crossing one another and forming braces or bridges to prevent the flat sides of the vacuum inclosing units from collapsing or being crushed in by the pressure of the atmosphere on the outside thereof. This construction enables the vacuum inclosing units to be made in the form of hollow plates or small hollow slabs which are convenient to assemble in a heat insulating wall. My invention also includes a heat insulating wall formed by arranging these vacuum inclosing units or vacuum inclosing plates in layers in substantial parallelism with the plane of the wall and interposing low heat conductive material between the layers.

My invention also includes several details of construction and other advantageous features which will hereinafter appear.

I shall now describe my invention with reference to the accompanying drawings and shall thereafter point out my invention in claims.

Figure 1 is a side elevation of one of the vacuum inclosing slabs or plates. Fig. 2 is a transverse section of the same in a plane indicated by line of section 2—2, looking upward. Fig. 3 is a transverse horizontal section of a heat insulating wall embodying my invention. Fig. 4 is an elevation of the same with portions broken away.

In the embodiment of my invention illustrated in the drawings, the vacuum inclosing units are in the form of hollow plates or small hollow slabs 3. These plates or slabs 3 are of substantially rectangular outline, being shown as square (Figs. 1 and 4), and because of this shape and their thinness may be conveniently and compactly assembled in a wall structure such as shown in Figs. 3 and 4. The walls of these vacuum inclosing units 3 must be pressure-resisting, to withstand the pressure of the atmosphere on the outside thereof. If no means were provided to strengthen the flat or plane side walls of these units or slabs 3, such walls would collapse or be crushed in by the pressure of the atmosphere. For resisting or withstanding this pressure, internal arched ribs 4 are provided forming bridges or braces for the plane or flat sides of the vacuum inclosing unit 3. The ribs 4 are formed by indenting or pressing inward portions of the plane side walls, V-shaped grooves 5 being thereby formed on the outside surfaces of such walls, as clearly shown in the drawings. The grooves 5 become gradually deeper toward their ends, thereby giving a corresponding arched form to the ribs 4, as shown in Fig.

2, and this deepening of the grooves 5 at their ends incidentally results in such grooves being wider at the top at their ends, as most clearly seen in Figs. 1 and 4. The indented grooves 5, forming corresponding ribs 4, are provided in both of the flat or plane sides of the vacuum inclosing unit 3. In each of such flat sides the grooves 5 cross one another at substantially right angles, the crossing ribs 4 combining the one with another at the points of crossing. Three of the grooves 5 are shown as running in each direction, or six in all, for one side wall of the unit 3. The grooves 5 and consequently the corresponding ribs 4 for the opposite side walls of the vacuum inclosing unit are located directly opposite one another, as most clearly shown in Fig. 2, and corresponding ribs 4 of the two side walls coalesce or unite the one with the other near their ends and adjacent to the edges of the unit or slab 3 (Fig. 2), thus increasing the strength of the edges or border walls of the unit 3 and also increasing the strength of the ribs 4. Excepting at their ends, as above noted, the ribs 4 of the opposite side walls are out of contact and arched outwardly one from another.

The shell of the unit 3 is composed of pressure-resisting low heat conductive material, and as this shell is sealed by fusing it is formed of vitreous material, such as glass, as indicated in the drawings. The flat rectangular unit 3 is provided with a sealing tip 6 (Fig. 1) located on one of its corners which is depressed sufficiently so that the sealing tip 6 does not project beyond the edges of the unit 3, that is, the sealing tip 6 is within the lines forming the rectangular outline or border lines of the unit 3. Thus the sealing tip 6 does not interfere with compactly assembling the vacuum inclosing units in a wall structure.

A plurality of the flat rectangular vacuum inclosing units 3 may be conveniently laid up or assembled to form a heat insulating wall as shown in Figs. 3 and 4. The units 3 are built up or laid up in a plurality of layers, shown as two, the members or units of which overlap or break joints one with another transversely of the wall as shown in the drawings. Supports 7 and 8 are provided for the layers at the outside thereof. The support 7 may be the wood outer siding and the support 8 may be the ceiling or inner facing of the heat insulating wall of a car or of a building or other inclosure. Sheets 9 of low heat conductive material are interposed between the layers and also between the outer sides of the layers and the supports 7 and 8, and cushioning and sealing strips or gaskets 10 of low heat conductive material are interposed between the units 3 in the layers. The sheets 9 and the strips 10 may be composed of any suitable material, for example, paper, and that is the material used in the construction illustrated in the drawings. The sheets 10 securely hold the flat vacuum inclosing units 3 in place, and the alternate arrangement of vacuum inclosing plates or units 3 and sheets 9 produces a compact heat insulating wall without open air spaces, thus preventing convection air currents in the wall. To prevent heat radiation across the vacua, the vacuum inclosing units 3 are provided on the inside with a reflecting surface, such as a silvered surface, but such reflecting surface could be provided on the outside or on both sides of the vacuum inclosing units if desired.

The vacuum inclosing units 3 are of comparatively small size and may be about four inches square and of about the proportionate thickness indicated in the drawings. The small dimensions of the vacuum inclosing units obviously substantially assists the ribbed or braced side walls of the shells in withstanding the outer pressure. Also because of the small size of the heat insulating units 3 and the cushioned manner in which they are assembled in the wall structure, the heat insulating wall will possess considerable flexibility and will therefore be able to accommodate itself without injury to all bending and twisting or other strains to which it may be subjected in use.

It is obvious that various modifications may be made in the construction shown and above particularly described within the principle and scope of the invention.

I claim:

1. A unit for heat insulating construction comprising a vacuum inclosing shell having flat side walls provided at intervals with internal longitudinally arched strengthening ribs.

2. A unit for heat insulating construction comprising a vacuum inclosing shell having flat side walls provided at intervals with internal longitudinally arched strengthening ribs running in two directions and crossing one another.

3. A unit for heat insulating construction comprising a vacuum inclosing shell having flat side walls provided at intervals with indented grooves forming internal strengthening ribs, such grooves becoming gradually deeper toward their ends and the internal ribs being correspondingly arched to increase their strength.

4. A unit for heat insulating construction comprising a vacuum inclosing shell having flat side walls provided at intervals with indented grooves running in two directions and forming internal strengthening ribs crossing one another, such grooves becoming gradually deeper toward their ends and the internal ribs being correspondingly arched to increase their strength.

5. A unit for heat insulating construction comprising a thin and flat vacuum inclosing shell having plane opposite side walls provided at intervals with indented grooves forming internal strengthening ribs, such grooves becoming gradually deeper toward their ends and the internal ribs being correspondingly arched, the ribs of the opposite sides coalescing one with another near their ends and adjacent to the edges of the unit.

6. A unit for heat insulating construction comprising a thin and flat vacuum inclosing shell having plane opposite side walls provided at intervals with indented grooves running in two directions and forming internal strengthening ribs crossing one another, such grooves becoming gradually deeper toward their ends and the internal ribs being correspondingly arched, the ribs of the opposite sides coalescing one with another near their ends and adjacent to the edges of the unit.

7. A unit for heat insulating construction comprising a thin and flat vacuum inclosing body of rectangular outline and having plane opposite side walls provided with indented grooves crossing one another at substantially right angles and forming crossed internal strengthening ribs for each side wall.

8. A unit for heat insulating construction comprising a thin and flat vacuum inclosing body of rectangular outline and having plane opposite side walls provided with indented grooves crossing one another at substantially right angles and forming crossed internal strengthening ribs for each side wall, such ribs of the opposite walls coalescing adjacent to their ends and being out of contact and arched outwardly one from another toward their middle portions.

9. A heat insulating wall comprising thin and flat vacuum inclosing bodies having plane opposite side walls of substantially rectangular outline assembled in substantial parallelism with the plane of the wall and edge to edge adjacent one to another to form a layer substantially parallel with the plane of the wall, each of such flat vacuum inclosing bodies being provided in its opposite side walls with indented grooves crossing one another at substantially right angles and forming crossed internal strengthening ribs for each side wall to prevent collapse of the walls of the vacuum inclosing bodies from outside pressure.

10. A heat insulating wall comprising thin and flat vacuum inclosing bodies having plane opposite side walls of substantially rectangular outline assembled in substantial parallelism with the plane of the wall and edge to edge adjacent one to another to form a plurality of layers substantially parallel with the plane of the wall, each of such flat vacuum inclosing bodies being provided in its opposite side walls with indented grooves crossing one another at substantially right angles and forming crossed internal strengthening ribs for each side wall, and a low heat conductive sheet interposed between the layers.

11. A heat insulating wall comprising thin and flat vacuum inclosing bodies having plane opposite side walls of substantially rectangular outline assembled in substantial parallelism with the plane of the wall and edge to edge adjacent one to another to form a plurality of layers substantially parallel with the plane of the wall, each of such flat vacuum inclosing bodies being provided in its opposite side walls with indented grooves crossing one another at substantially right angles and forming crossed internal strengthening ribs for each side wall, the bodies in one layer breaking joints with the bodies in an adjacent layer, and a low heat conductive sheet interposed between the layers.

12. A heat insulating wall comprising thin and flat vacuum inclosing bodies having plane opposite side walls of substantially rectangular outline assembled in substantial parallelism with the plane of the wall and edge to edge adjacent one to another to form a plurality of layers substantially parallel with the plane of the wall, each of such flat vacuum inclosing bodies being provided in its opposite side walls with indented grooves crossing one another at substantially right angles and forming crossed internal strengthening ribs for each side wall, the bodies in one layer breaking joints with the bodies in an adjacent layer.

13. A heat insulating wall comprising thin and flat vacuum inclosing bodies having plane opposite side walls of substantially rectangular outline assembled in substantial parallelism with the plane of the wall and edge to edge adjacent one to another to form a plurality of layers substantially parallel with the plane of the wall, each of such flat vacuum inclosing bodies being provided in its opposite side walls with indented grooves crossing one another at substantially right angles and forming crossed internal strengthening ribs for each side wall, a low heat conductive sheet interposed between the layers, and low heat conductive strips interposed between the bodies in the layers.

14. A heat insulating wall comprising thin and flat vacuum inclosing bodies having plane opposite side walls of substantially rectangular outline assembled in substantial parallelism with the plane of the wall and edge to edge adjacent one to another to form a plurality of layers substantially parallel with the plane of the wall, each of such flat vacuum inclosing bodies being provided in its opposite side walls

with indented grooves crossing one another at substantially right angles and forming crossed internal strengthening ribs for each side wall, the bodies in one layer breaking joints with the bodies in an adjacent layer, supports outside of the outer layers, low heat conductive sheets interposed between the layers and also between the outer layers and the supports, and low heat conductive strips interposed between the bodies in the layers.

In testimony whereof I have affixed my signature in presence of two witnesses.

CLYDE J. COLEMAN.

Witnesses:
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