HEAT-INSULATING WALL.

1,239,770.


To all whom it may concern:

I, CLYDE J. COLEMAN, a citizen of the United States, residing at
5 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 specifica-
tion, reference being had therein to the
10 accompanying drawings, forming part thereof.

My invention relates generally to heat insulating and relates particularly to heat
insulating walls of substantially large di-
mensions, such as of refrigerator cars, cold
storage buildings, household refrigerators
and compartments and the like. The ob-
jects of my invention are to secure highly
effective heat insulation together with a sim-
20 ple 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 gen-
30 eral way to my former inventions, which
are the subject of Letters Patent, No. 946,772, dated January 18, 1910, No. 946,773,
dated January 18, 1910, No. 948,541, dated
February 8, 1910, No. 968,095, dated May 17,
35 1910, and No. 984,541, dated February 21,
1911. My inventions hereinafter will 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
40 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 pos-
sessing the requisite flexibility and includes
vacuum spaces in its construction as a prin-
cipal part of the heat insulation. To these
ends, my invention includes, in combination
vacuum inclosing tubular units of substan-
tially elliptical or double convex cross-
50 section. My invention also includes a heat ins-
ulating wall formed by arranging these vacuum inclosing units or tubes 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 an end view of the sealing
tip end of one of the vacuum inclosing tubes.

Fig. 2 is a side elevation of the same.

Fig. 3 is a transverse section of the same.

Fig. 4 is a longitudinal section of the same
in the direction of its width.

Fig. 5 is a transverse horizontal section
of a heat insulating wall embodying my in-
vention.

Fig. 6 is an elevation on a reduced scale
of the heat insulating wall shown in Fig. 5 with
portions broken away.

Fig. 7 is a side elevation of a slightly
modified vacuum inclosing tube.

Fig. 8 is a transverse section of the same.

In the embodiment of my invention illus-
trated in Figs. 1 to 6, inclusive, of the draw-
ings, vacuum inclosing bodies or vacuum in-
closing tubes are provided. These tubes are
of double convex or substantially elliptical
cross-section, the cross-section of the tubes
being oblong with oppositely outwardly
curved side walls, as may be seen in Figs. 85
1, 3 and 5, and are disposed in substantial
parallelism with the plane of the wall and
are arranged side by side and end to end
adjacent to and substantially in contact one
with another to form a layer extending sub-
stantially parallel with the plane of the wall.
The vacuum inclosing tubes include in their
construction a pressure-resisting shell 1 and
a cushioning strip 2 forming a border along
the edges of the transversely oblong shell 1
and adherently secured thereto. The cushion-
ing strips 2 cushion the vacuum inclosing
bodies or tubes one from another trans-
versely when such bodies or tubes are ar-
 ranged in contact one with another to form a
layer, as above described. The vacuum in-
closing tubes in the layer are cushioned one
from another endwise by interposed gaskets
3 (Fig. 6), the ends of the shells 1 being
substantially flat, as shown in the drawings.

A plurality of layers of vacuum inclosing
units or tubes are provided extending sub-
stantially parallel with the plane of the
wall, and the layers are slightly spaced one
from another, as best seen in Fig. 5, two such
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layers being shown in the heat insulating wall illustrated in the drawings. The elliptical or double convex tubes are arranged so that the tubes or units of one layer break joints with the tubes or units of the other layer (Figs. 5 and 6). Supports 4 and 5 are provided for the layers at the outside thereof and slightly spaced therefrom and fillers of low heat conductive material are provided for the space between the layers and for the spaces between the outer sides of the layers and the supports 4 and 5. The support 4 forms the outer part of the wall and may be the siding of the building or of a car or other enclosure, and the support 5 forms the inner part of the wall and may be the ceiling or inner facing of the wall.

The low heat conductive filling between the layers and for the spaces between the outer sides of the layers and the supports 4 and 5 are shown as sheets 6, which may be composed of any suitable material. Wool felt produces good results, and that is the material used in the construction illustrated in the drawings. The sheets 6 should possess sufficient looseness of structure and should be sufficiently yielding to readily conform to the convexly curved or outwardly rounded surfaces of the vacuum inclosing units or tubes, as shown in Fig. 5.

Such conformation in the sheet between the two layers of vacuum inclosing tubes is facilitated by the fact that these tubes in the different layers are offset from or break joints one with another in the direction of their width, as most clearly shown in Fig. 5; and this offset arrangement also obviously adds to the heat insulating properties of the wall. Merely for convenience in building or laying up the wall structure the vacuum inclosing tubes are shown in the drawings as arranged on end or vertically. The cushioning strips 2 may be composed of thin paper and may be secured to the shell 1 by an adhesive such as sizing. The gaskets or end cushions 3 may be composed of paper or other suitable material. The shell 1 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 transversely oblong tubular shell 1 is provided substantially centrally of one of its ends with a sealing tip 7 which is located in a circular depression formed in one of the flat end walls (Figs. 1 and 4) and projects outwardly from the bottom of the depression and is protected by the rim or border of the depression which forms a protective shoulder around the sealing tip. The sealing tip 7 is thus out of the way and protected from injury and does not interfere with assembling the vacuum inclosing units or tubes in a wall structure.

The alternate arrangement of layers of double convex or substantially elliptical vacuum inclosing tubes and the low heat conductive filling sheets produces more effective heat insulation than either the one or the other would without the other. The resilient sheets securely retain in place the vacuum inclosing tubes, and as there are no air-containing cavities or openings in the wall there can be no convection air currents. To prevent heat radiation across the vacuum the shells 1 of the vacuum inclosing tubes are provided on the inside with a reflecting surface, such as a silvered surface, and such reflecting surface may be provided on the outside or on both sides of the shells 1 if so desired.

Because of the comparatively small size of the vacuum inclosing units and the manner in which they are combined in the wall structure, it is evident that the heat insulating wall will possess sufficient flexibility to accommodate itself to all ordinary bending and twisting strains to which it would be subjected in usage.

The slightly modified construction of vacuum inclosing unit or vacuum inclosing tube illustrated in Figs. 7 and 8 differs from that above described only in the fact that such modified unit or tubes are proportionately longer. These modified units comprise a double convex vacuum inclosing vitreous shell 8 and cushioning strips 9 aderently secured to the edges thereof.

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

I claim:

1. A heat insulating wall comprising vacuum inclosing bodies of oblong cross-section having closed ends and oppositely outwardly curved side walls and assembled in substantial parallelism with the plane of the wall.

2. A heat insulating wall comprising transversely oblong vacuum inclosing tubes having closed ends and oppositely outwardly curved side walls and assembled adjacent and in substantial parallelism one with another.

3. A heat insulating wall comprising an assemblage of transversely oblong vacuum inclosing bodies having closed ends and oppositely outwardly curved side walls and arranged in the wall in overlapping relation one with another.

4. A heat insulating wall comprising vacuum inclosing bodies of oblong cross-section having closed ends and oppositely outwardly curved side walls assembled with their longer transverse axes in substantial parallelism with the plane of the wall and arranged adjacent one with another to form a plurality of layers spaced apart with the bodies in one layer breaking joints with the
bodies in an adjacent layer and a low heat conductive filler interposed between the layers.

5. A heat insulating wall comprising vacuum inclosing tubes of oblong cross-section having closed ends and oppositely outwardly curved side walls assembled with their longer transverse axes in substantial parallelism with the plane of the wall and arranged adjacent one with another to form a plurality of layers spaced apart and with the tubes in one layer breaking joints with the tubes in an adjacent layer, and a low heat conductive filler interposed between the layers.

6. A heat insulating wall comprising vacuum inclosing bodies of oblong cross-section having closed ends and oppositely outwardly curved side walls assembled with their longer transverse axes in substantial parallelism with the plane of the wall and arranged adjacent one with another to form a plurality of layers spaced apart and with the bodies in one layer breaking joints with the bodies in an adjacent layer, supports outside of the outer layers and spaced therefrom, and low heat conductive filling material interposed between the layers and between the outside layers and the supports.

7. A heat insulating wall comprising vacuum inclosing tubes of oblong cross-section having closed ends and oppositely outwardly curved side walls assembled with their longer transverse axes in substantial parallelism with the plane of the wall and arranged adjacent one with another to form a plurality of layers spaced apart with the tubes in one layer breaking joints with the tubes in an adjacent layer, supports outside of the outer layers and spaced therefrom, and low heat conductive filling material interposed between the layers and between the outside layers and the supports.

8. A heat insulating wall comprising vacuum inclosing tubes of oblong cross-section having closed ends and oppositely outwardly curved side walls assembled with their longer transverse axes in substantial parallelism with the plane of the wall, each of the tubes being provided with cushioning strips adherently secured to its edges, the tubes being arranged adjacent one with another to form a plurality of layers spaced apart with the tubes in one layer breaking joints with the tubes in an adjacent layer, supports outside of the outer layers and spaced therefrom, and low heat conductive filling material interposed between the layers and between the outside layers and the supports.

9. A heat insulating wall comprising vacuum inclosing tubes of oblong cross-section having closed ends and oppositely outwardly curved side walls assembled with their longer transverse axes in substantial parallelism with the plane of the wall, each of the tubes being provided with cushioning strips adherently secured to its edges, the tubes being arranged adjacent one with another to form a plurality of layers spaced apart with the tubes in one layer breaking joints with the tubes in an adjacent layer, supports outside of the outer layers and spaced therefrom, low heat conductive filling material interposed between the layers and between the outside layers and the supports, and cushioning gaskets interposed between adjacent ends of the tubes.

10. A heat insulating wall comprising an assemblage of transversely oblong vacuum inclosing bodies having closed ends and oppositely outwardly curved side walls and arranged in the wall in overlapping relation one with another, and low heat conductive material in which the vacuum inclosing bodies are embedded.

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

CLYDE J. COLEMAN.

Witnesses:
Bernard Cowen,
Wm. Ashley Kelly.