March 4, 1924. 1,486,113

W. M. BAXTER ET AL

HEAT INSULATING STRUCTURAL MATERIAL

Filed June 14, 1921 2 Sheets-Sheet 1

Fig. 1.

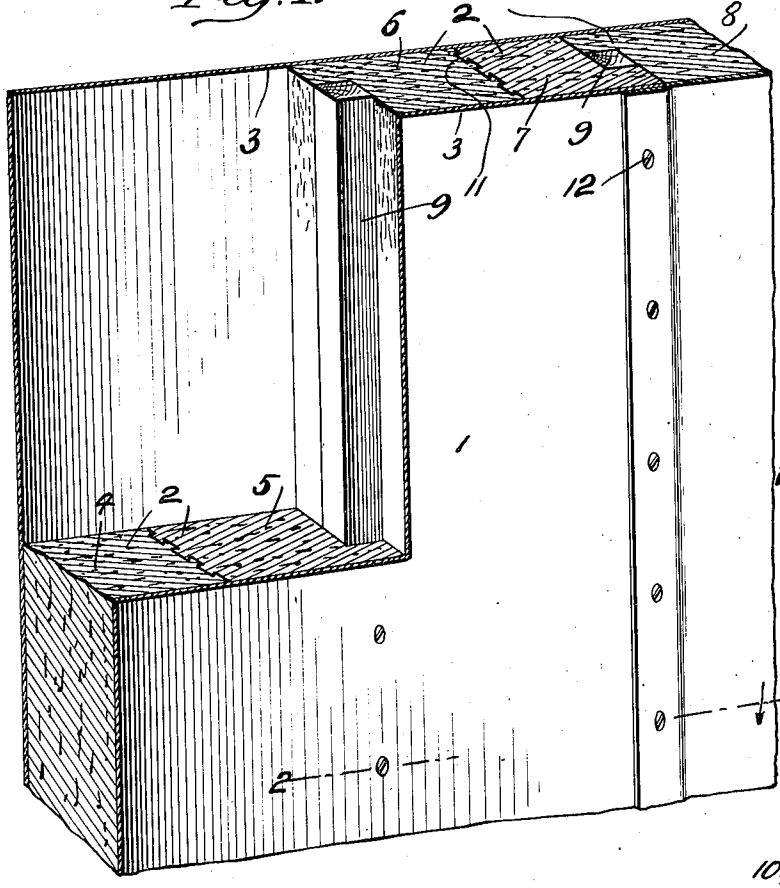


Fig. 3.

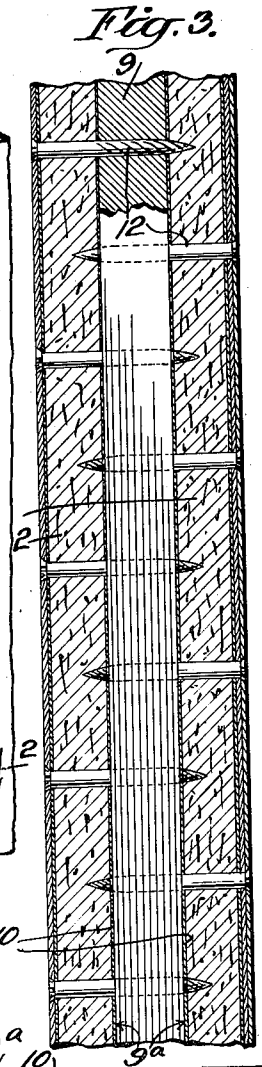
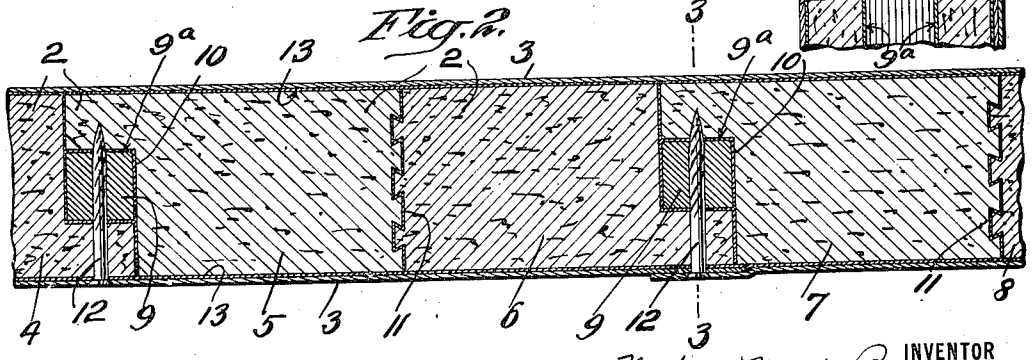


Fig. 2.



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Fig. 4.

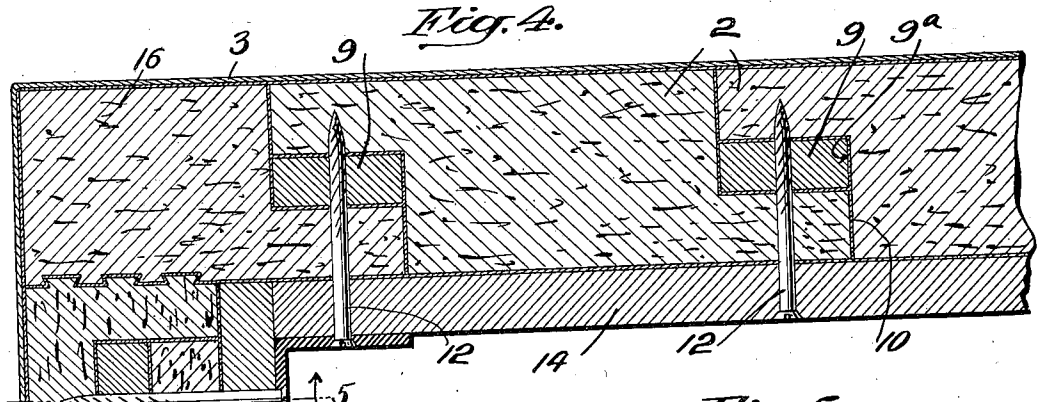


Fig. 5.

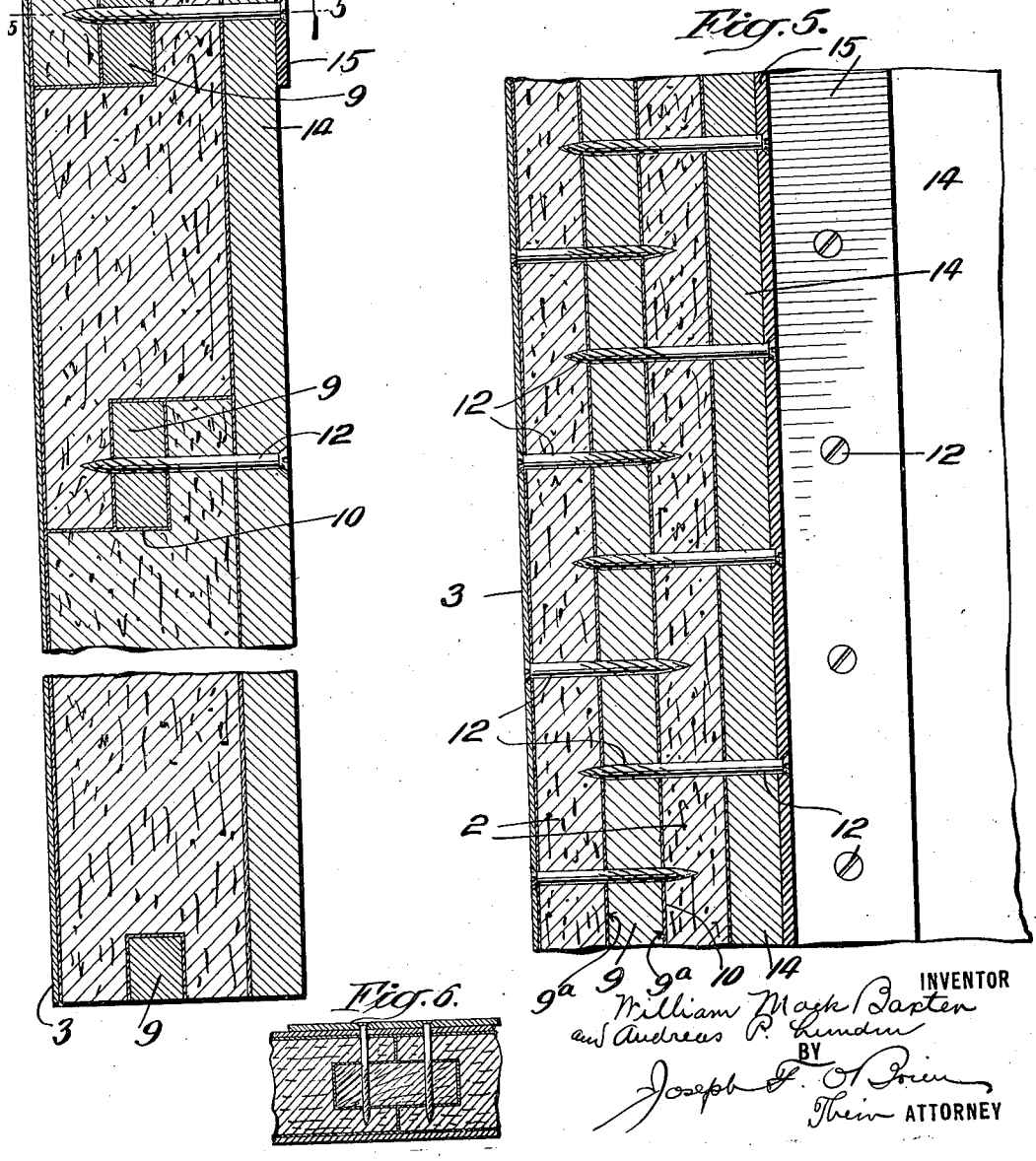


Fig. 6.

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Patented Mar. 4, 1924. 1,486,113

UNITED STATES PATENT OFFICE.

WILLIAM MACK BAXTER, OF CHICAGO, ILLINOIS, AND ANDREAS P. LUNDIN, OF BAYSIDE, NEW YORK, ASSIGNORS TO AMERICAN BALSA COMPANY, INC., A CORPORATION OF NEW YORK.

HEAT-INSULATING STRUCTURAL MATERIAL.

Application filed June 14, 1921. Serial No. 477,428.

To all whom it may concern:

Be it known that we, WILLIAM MACK BAXTER and ANDREAS P. LUNDIN, citizens of the United States, and residents, respectively, of Chicago, county of Cook, and State of Illinois, and Bayside, borough of Queens, county of Queens, and State of New York, have invented certain new and useful Improvements in Heat-Insulating Structural Materials, of which the following is a specification.

This invention relates to improvements in heat-insulating structural material.

One of the objects of this invention is to combine into a composite, heat-insulating structural material a body or core of balsa wood or similar light, soft, porous and readily fracturable wood of low specific gravity, which is preferably treated with paraffin to preserve and make the same waterproof and has heat-insulating qualities of a high degree, with a sheathing of a hard and tough structural material such as plates of steel or other metal, or boards of hard and tough wood, so that the composite material will possess heat-insulating properties of a high degree combined with great structural strength, lightness in weight and durability. Such composite material may be used in the building up of panels suitable for use as the walls of refrigerator railway cars, refrigerating plants, refrigerating shipping boxes and other similar refrigerating structures designed to prevent the transmission of heat to or from goods transported or stored therein.

Another object of this invention is to provide the soft and readily fracturable core of such a composite material with embedded frame posts or grounds of a hard tough wood or like material and to securely fasten such posts or grounds to said core, whereby fastening devices may be driven into such embedded posts or grounds to fasten or assist in fastening a sheathing of such hard and tough structural material to the said core.

Another object of this invention is to enable the building in a practical and commercial manner of panels formed of this composite material of any desired size and configuration, which panels may be built into refrigerator railway cars, refrigerating plants, refrigerating shipping boxes or other similar structures.

Such a panel of composite material constructed in accordance with this invention acts in effect as an I-beam of a T-beam, and from an engineering standpoint must be figured in the same manner as such beams according to the disposition of the surface plates of steel or other tough structural material on only one surface or on opposite surfaces. Thus assuming that a balsa wood body or core is so disposed between opposite plates of steel which are fastened thereto in accordance with my invention, an I-beam is, in effect, produced wherein the outer plates of steel will act similarly to the flanges of an I-beam while the balsa wood body or core will act similarly to the web of such a beam; that is to say the strength of the complete structure is caused to be transferred toward the said outer steel plates or flanges and the body or core of balsa wood which forms the major part of the composite panel or material transmits stresses toward the outer portions of the said material, and it combines in one integral structure the desirable characteristics of high heat insulation, great structural strength, extreme lightness in weight, resistance to strains of compression, crushing, shearing and torsion, as well as surface hardness. A panel constructed of such material will furthermore cause any local strains applied to the hard surface or surfaces to be distributed over a considerable area adjacent to the place of application of the stress or pressure causing such local strain.

Still another object of this invention is to provide a practical and commercial method of building up the core panels from boards of balsa wood and arranging for seats between adjacent core boards for the embedded frame posts or grounds.

Still another object of this invention is to further increase the solidity of the composite panel by gluing together the adjacent surfaces of the built up core and sheathing.

With these and other objects in view, the invention comprises the combination of members and arrangement of parts so combined as to co-act and cooperate with each other in the performance of the functions

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and the accomplishments of the results herein contemplated, and comprises in one of its adaptations the species or preferred form illustrated in the accompanying drawings, in which:—

Fig. 1 is a perspective view of a portion of a panel of the composite material of this invention, a part of the sheathing at one side and the core of the panel being broken away;

Fig. 2 is a section on the line 2—2 of Fig. 1;

Fig. 3 is a section on the line 3—3 of Fig. 2;

Fig. 4 is a sectional view similar to Fig. 2 showing a modified form of the invention applied to a corner;

Fig. 5 is a section on the line 5—5 of Fig. 4 looking in the direction of the arrow; and

Fig. 6 is a fragmentary section similar to Fig. 2 showing another form of joint between the core and embedded frame posts.

Referring now to these drawings and particularly to Figs. 1 to 3 thereof, 1 indicates a portion of a composite panel embodying my invention which is composed of a core 2 of balsa wood or similar soft, light and porous wood which has been treated to preserve and make the same waterproof and an outer sheathing 3 which, as illustrated in said figures, is composed of relatively thin steel plates which are securely and tightly fastened to the said core 2 so as to form a complete and solid composite material.

The core 2 is preferably built up of a series of balsa wood boards fastened together at their adjacent edges to produce a built-up core panel of any desirable dimensions to which the sheathing may subsequently be so securely and tightly fastened as aforesaid, and as illustrated in Figs. 1, 2 and 3 the said core is composed of boards 4—5—6—7 and 8 respectively. The cellular structure of balsa wood has not sufficient body or coherence to grip and hold or retain metallic fastening devices and the treatment with paraffin will cause such fastening devices to be lubricated and will thus make the same further ineffective. To overcome this difficulty and still retain the heat-insulating properties of the balsa wood, each core panel is provided in suitable spaced relationship from each other with a plurality or series of embedded frame posts or grounds 9 composed of a suitable tough wood, the structure of which will possess the necessary coherence to retain metallic fastening devices. Such frame posts 9, as illustrated, are preferably square or rectangular in cross-section and are embedded and fastened in the soft core-panel between the opposite faces thereof.

As shown, a frame post 9 is inserted or fitted in a rectangular seat 9^a provided between the adjacent boards 4 and 5 and another post is spaced therefrom and fitted in a seat between the adjacent boards 6 and 7, the abutting edges of adjacent boards being so cut as to form a seat for such posts. Thus in Figs. 1 to 5 the edge of one abutting board is cut in substantially L-shaped conformation to provide a joint flush with one edge of the post and the edge of the abutting board is similarly cut to provide a joint which is flush with the opposite edge of the post, while in Fig. 6 opposing grooves are formed in the opposite abutting edges of the balsa wood boards and a post is seated within these grooves. The faces of said posts or grounds are securely fastened to the abutting edges of the said boards and the abutting edges of said boards are securely fastened together by a film of glue 10. In this way, the said posts will be firmly and securely fastened and retained in their seats without rupturing the cellular structure of the soft, pithy material of the core. Where it is desired to fasten other adjacent edges of the core boards without the insertion of such grounds, such adjacent edges are preferably provided with oppositely-disposed interengaging dove-tailed grooves 11 and we also securely glue such edges together.

After the formation of a core panel as above described, an outer sheathing 3 is applied to said panel core by inserting or driving through the said sheathing 3 and into the core panel and through the said embedded frame posts or grounds, suitable metallic fastening devices such as screws 12. As illustrated in Figs. 1, 2 and 3 the sheathing 3 is composed of steel plates which are fastened on opposite sides of the core by rows of screws 12 registering with and entering a post. The steel plates may have an overlapping joint which is in alignment with the post so as to permit a single row of screws to fasten the edges of both plates to the core. To provide the most effective heat-insulation, the metallic sheathing on one side and the fastening devices therefor should be insulated or separated by the wooden core from the metallic sheathing and fastening devices for the other side.

In Figs. 1 to 5 the sheathing plates are fastened to each post or ground by a single row of fastening devices or screws 12 which pass through the balsa wood core and into the post at one side of the joint or abutting edges of the said balsa boards, while in Fig. 6 two rows of screws are employed at opposite sides of the joint between the balsa boards.

In order to further increase the solidity of the composite panel, the abutting surfaces of the sheathing plates 3 and the core panel are fastened together by films of glue 13.

From the above it will be seen that a solid, strong, heat-insulating structural ma-

terial is produced which will have heat-insulating qualities of high degree and will have hard and tough surfaces and sufficient structural strength and durability to enable the same to be employed in structures such as refrigerator railway cars, refrigerating shipping boxes, refrigerating plants and other similar refrigerating structures.

In Figs. 4 and 5 we have shown a modified form of our invention and our preferred method of forming a corner. In these figures 2 again indicates a core panel of balsa wood in which is embedded a series of posts 9 inserted in seats 9^a between the abutting boards of balsa wood composing the panel, the panel being preferably formed as hereinabove described, except that a corner board of balsa wood 16 is employed which is fastened to abutting boards in the manner hereinabove described. To the outer side of the panel is applied a metallic sheathing 3 which is fastened by rows of screws in the same way as hereinabove described, while to the inner side of the panel is applied a sheathing 14 of tough wood which is likewise applied by rows of screws extending through the boards of such tough wood and into the said posts. When an inner sheathing of this character is employed the corner is preferably reinforced by means of an angle iron 15 and posts are positioned in the balsa wood in alignment with the opposite flanges of the angle iron so as to permit a fastening thereof with the wood sheathing and the cores on opposite sides of the corner.

Having described our invention we claim:—

1. A composite heat-insulating structural material composed of a body of wood having substantially the qualities of balsa wood, a ground of a tougher and harder material associated with said body of soft wood, a sheathing of a rigid and tough structural material, and means for fastening said sheathing and soft-wood body together by connection to said ground.

2. A composite heat-insulating structural material composed of a body of wood having substantially the qualities of balsa wood, a ground of a harder and tougher material associated with said body of soft wood, a sheathing composed of plates of metal and means for securely fastening said metal plates to said soft wood body by connection to said ground.

3. A composite heat-insulating structural material composed of a built-up body of wood having substantially the qualities of balsa wood which has been treated to preserve the same; a plurality of frame posts of a harder and tougher material embedded in said body; a sheathing composed of plates of metal and fastening means for fastening said metal sheathing to said body by connection to the embedded frame posts.

4. A composite heat-insulating structural material composed of a built up body of balsa wood, a plurality of frame posts of a harder and tougher material embedded in and fastened to said body, a sheathing of a tough structural material, and fastening devices for fastening said sheathing to said body by connection to the embedded frame posts.

5. A composite heat-insulating structural material composed of a body of balsa wood which has been treated with a preservative material, a plurality of frame posts of a harder and tougher material embedded in said body, and a sheathing of a hard tough structural material, and fastening devices for fastening said sheathing to said body, which fastening devices extend through such sheathing and into said embedded frame posts.

6. A heat-insulating material comprising a body principally composed of a wood having substantially the qualities of balsa wood which has been treated with paraffin to preserve and water-proof the same and built up of a plurality of boards of said material, the abutting edges of some of which boards have been cut to provide frame-post seats, frame-posts of a tough material seated in said seats, a sheathing of structural material and fastening devices for fastening said sheathing to said body by connection to said posts.

7. A heat-insulating material comprising a body principally composed of balsa wood which has been treated with paraffin to preserve the same and built up a plurality of boards of said material, the abutting edges of some of which boards have been cut to provide frame-post seats, frame-posts of a tough material seated in and fastened to the walls of said seats, a sheathing of structural material and fastening devices for fastening said sheathing to said body by connection to said posts.

8. A heat-insulating material comprising a body principally composed of a wood having substantially the qualities of balsa wood which has been treated with paraffin to preserve the same and built up of a plurality of boards of said material, the abutting edges of some of which boards have been cut to provide frame-post seats, frame-posts of a tough material seated in said seats, a sheathing of metal plates and fastening devices for fastening said sheathing to said body by connection to said posts.

9. A structural element having heat insulating capacity combined with structural strength, which consists of a core of balsa wood, an outer sheathing of metal, bodies of fastener-retentive material embedded in said core, and fasteners extending from the outer sheating and into said bodies for uniting the parts of the structure together.

10. A structural element having heat-in-

sulating capacity combined with structurel strength, consisting of a core of balsa wood, an outer sheathing of metal, bodies of fastener-retentive material embedded in seats formed in the core, with portions of the core interposed between said bodies and the metal sheathing, and fasteners extending from the metal sheathing and the core into said bodies.

11. A structural element having heat insulating capacity combined with structural strength, consisting of a core of balsa wood, outer sheathings of metal on each side thereof, bodies of fastener-retentive material embedded in the core, and fasteners extending from each of said metal sheathings into said bodies.

12. A structural element having heat insulating capacity combined with structural strength, consisting of a core of balsa wood, outer sheathings of metal on each side of the core, bodies of fastener-retentive material embedded in seats formed in said core, with portions of the core interposed between said bodies and the metal sheathings, and fasteners passing from said sheathing respectively, through said core, into said bodies.

13. A structural element having heat insulating capacity combined with structural strength, consisting of a core of balsa wood, sheathings of metal on each side thereof, posts of tough wood placed in seats in said core, with portions of the core between the posts and each of said sheathings, and fasteners passing through each of said sheathings into each of said posts.

14. A structural element having heat-insulating capacity combined with structural strength, embodying, in combination, a plurality of posts formed of relatively tough material, a sheathing of metal plates spaced therefrom, a core of wood having substantially the characteristics of balsa wood interposed between such posts and metal plates and means for fastening said metal plates and posts to confine the core.

In witness whereof, we have signed our names to the foregoing specification in the presence of two subscribing witnesses.

WILLIAM MACK BAXTER.
ANDREAS P. LUNDIN.

Witnesses:
WALTER J. HENRY,
R. W. RITTER.

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