

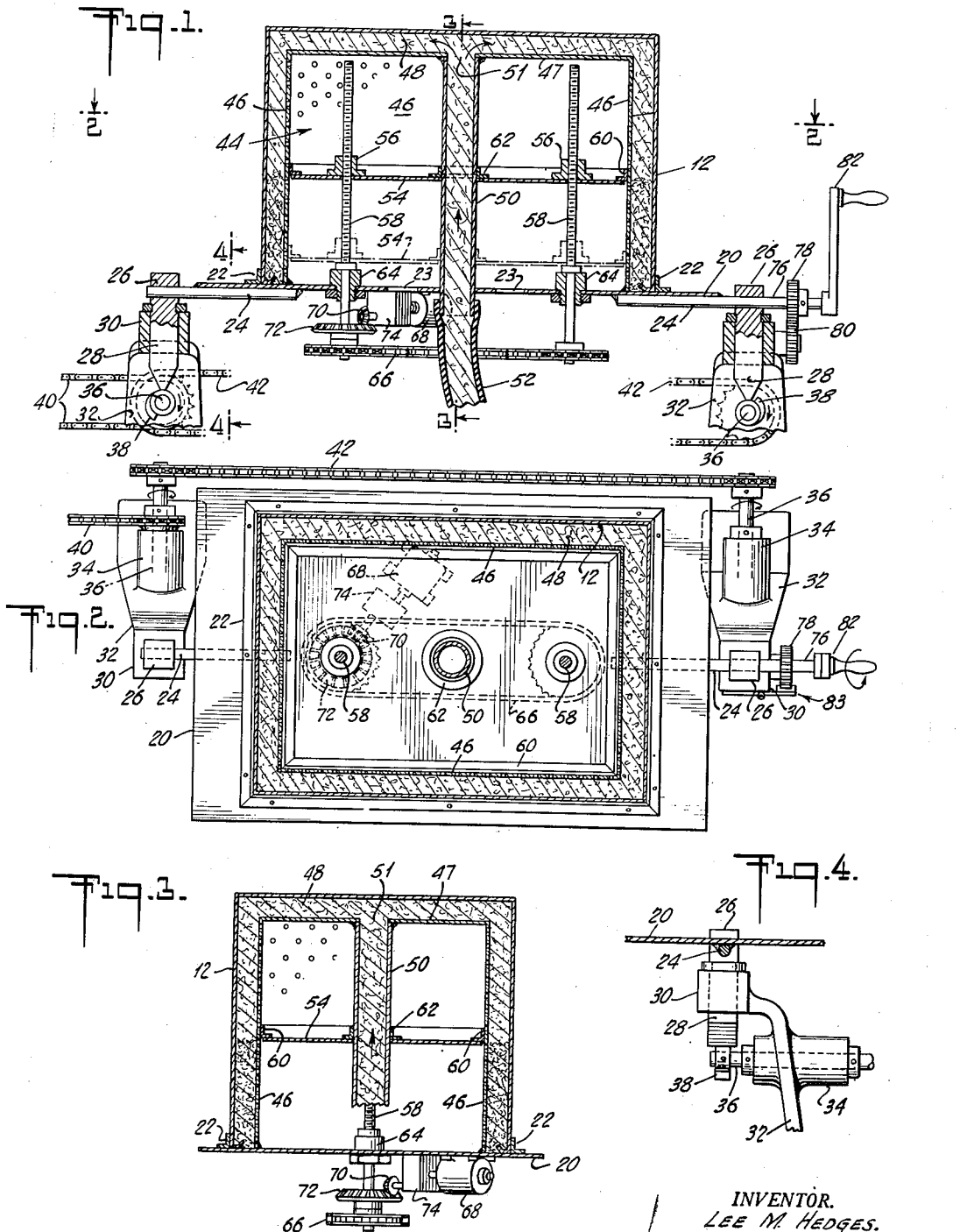
July 3, 1951

L. M. HEDGES
METHOD AND APPARATUS FOR INSULATING
REFRIGERATORS AND THE LIKE

2,559,356

Filed April 28, 1945

3 Sheets-Sheet 1



INVENTOR.
LEE M. HEDGES.

BY

Virgil C. Kline
ATTORNEY

July 3, 1951

L. M. HEDGES
METHOD AND APPARATUS FOR INSULATING
REFRIGERATORS AND THE LIKE

2,559,356

Filed April 28, 1945

3 Sheets-Sheet 2

Fig. 5.

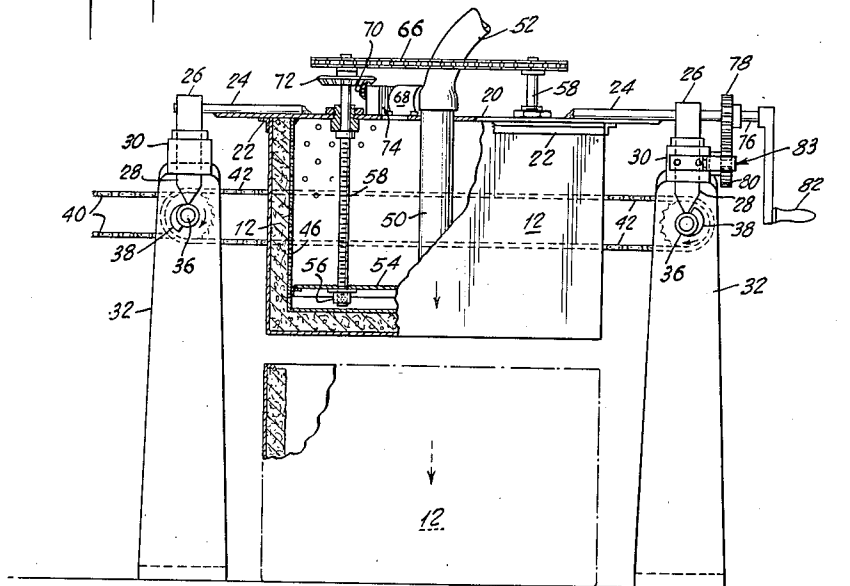


Fig. 6.

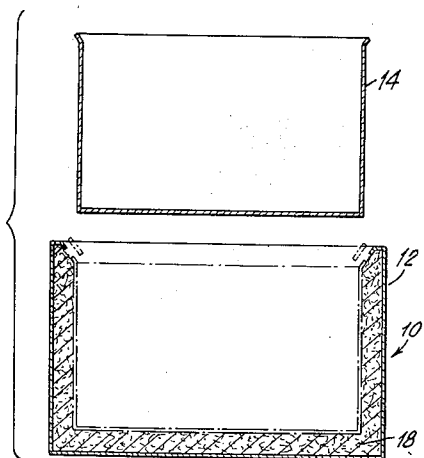
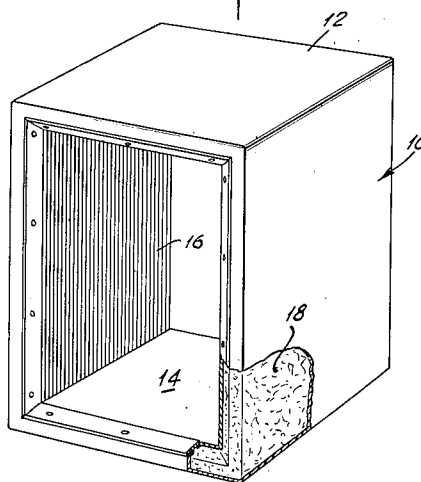


Fig. 7.



INVENTOR.
LEE M. HEDGES.

BY *Virgil C. Kline*
ATTORNEY.

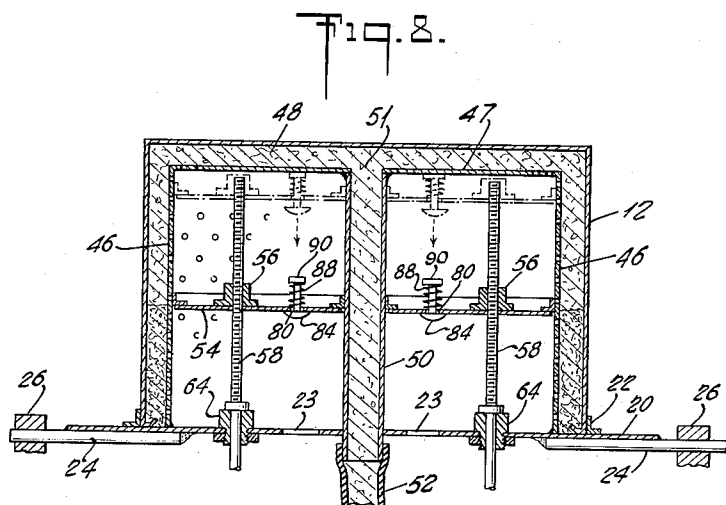
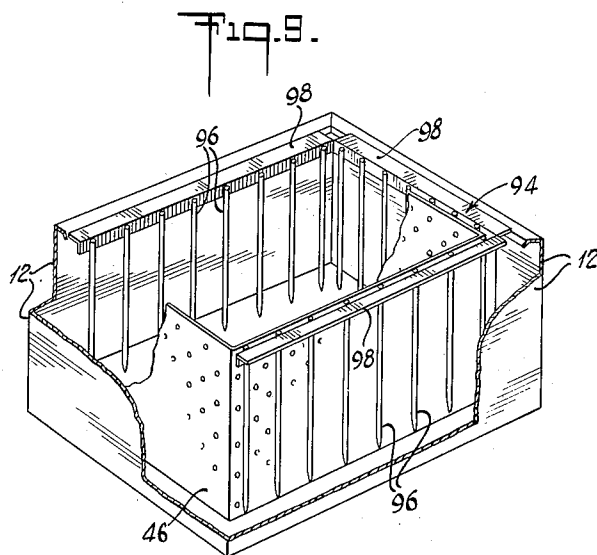
July 3, 1951

L. M. HEDGES
METHOD AND APPARATUS FOR INSULATING
REFRIGERATORS AND THE LIKE

2,559,356

Filed April 28, 1945

3 Sheets-Sheet 3



INVENTOR.
LEE M. HEDGES.

BY *Virgil C. Kline*
ATTORNEY.

UNITED STATES PATENT OFFICE

2,559,356

METHOD AND APPARATUS FOR INSULATING REFRIGERATORS AND THE LIKE

Lee M. Hedges, Somerville, N. J., assignor to
Johns-Manville Corporation, New York, N. Y.,
a corporation of New York

Application April 28, 1945, Serial No. 590,792

9 Claims. (Cl. 20—101)

1

The instant invention relates to the insulating of refrigerator cabinets and other structures having confined wall spaces in which a layer of insulation is retained. The following description is directed specifically to refrigerator cabinets, but it will be understood that this is for purposes of illustration only and that the invention is equally applicable to insulating other similar structures.

Refrigerator cabinets, as conventionally made, comprise an inner shell or liner defining a food compartment, preferably formed as a unitary or one-piece structure, an outer casing or shell, and insulating material filling the spaces between the shells. Suitably the inner and outer shells are secured together at the door opening, which takes up all, or the greater proportion of, one side of the cabinet, by framing members composed of substantially non-conducting material.

The instant invention is particularly directed to, and has for its principal object, the provision of an improved method and apparatus involving the pneumatic conveying or blowing of a bulk insulating material into the spaces between the walls of the inner and outer shells of a cabinet or structure of the type referred to above. Heretofore the insulation has conventionally been provided in the form of slabs or blocks which are placed against the walls of the outer shell, and the inner shell then inserted. More recently it has been proposed to pneumatically install a bulk material, such method having numerous advantages including ease of installation and the elimination of the need of maintaining stocks of different sizes of preformed blocks. Also, the blowing method insures complete filling of the wall spaces, particularly when the latter include obstructions such as frame members or the like, or are of irregular shape. The instant invention is an improvement on such previously proposed blowing methods, the invention providing greater ease of installation and securing a more uniform, firm pack.

Another object of the invention is the provision of a method and apparatus of the type referred to above in which the cabinet outer shell may be rapidly supplied with an insulating lining packed against its walls and, upon completion of this step, a permanent inner liner may be readily installed.

Briefly stated, the instant invention resides in the provision of a method and apparatus whereby a bulk insulating material is deposited in the spaces between a perforated form of the size and shape of the permanent liner and the walls of

2

the permanent outer casing. A movable closure means is provided for preventing escape of air to the atmosphere through the perforated walls of the form, except adjacent the open end of the casing, during the initial deposit of the insulation. The closure means is mounted for retreating movement whereby additional areas of the walls of the form are progressively exposed in timed relationship to the filling of the spaces with the insulating material. In this way the air entering with the insulation is required to carry the latter to the desired place of deposit. Also, the invention provides for the vibrating or rocking of the shell and form during the filling operation to insure uniform packing of the insulating material, and further provides for the inversion of the form to allow the shell to be slipped downwardly off the form without disturbance of the insulating layer.

My invention will be more fully understood and further objects and advantages thereof will become apparent when reference is made to the more detailed description thereof which is to follow and to the accompanying drawings in which:

Fig. 1 is a diagrammatic view with parts in elevation and parts in section depicting an apparatus in accordance with the invention and for carrying out the method thereof;

Fig. 2 is a sectional view taken on the line 2—2 of Fig. 1;

Fig. 3 is a sectional view taken on the line 3—3 of Fig. 1;

Fig. 4 is a sectional view taken on the line 4—4 of Fig. 1;

Fig. 5 is a view similar to Fig. 1 illustrating a later stage in the operation of the method;

Fig. 6 is a sectional view through an insulated cabinet illustrating the installation of the permanent liner;

Fig. 7 is a perspective view of a refrigerator cabinet or the like insulated in accordance with the instant invention with a portion of a wall broken away for clearness of illustration;

Fig. 8 is a partial view of the apparatus of Fig. 1, illustrating an additional feature of the invention; and

Fig. 9 is a diagrammatic view, with parts broken away for clearness of illustration, disclosing a further feature of the invention.

Referring now to the drawings, a refrigerator or similar cabinet insulated in accordance with the invention, is indicated at 10 in Fig. 7. The cabinet comprises an outer shell 12 and an inner liner or shell 14 secured together in any suitable

manner about a door opening 16. Between the outer shell 12 and liner 14 an insulating layer 18 is installed, the insulating layer, in accordance with the instant invention, being composed of a suitable bulk material such as nodulated mineral wool or other mineral wool aggregates, loose mineral wool, loose or comminuted balsam wool, glass wool aggregates or the like. All of such and similar thermal insulating materials which are of a character to be readily conveyed in an airstream may be employed and are hereinafter referred to by the generic term "bulk insulating materials." The bulk insulating material may be waterproofed or treated with a binder prior to installation, if desired, to increase the resistance of the insulating layer 18 to moisture-penetration, to bind the fibrous materials into a coherent mass, more resistant to disturbance and settling, or to perform these and additional functions as the case may be.

Referring now particularly to Figs. 1-6 inclusive, the method and the preferred apparatus for performing the method are illustrated. The apparatus includes a bed plate 20 suitably comprising a metal sheet or the like, having means, such as angle members 22, for positioning the outer casing 12 of a refrigerator cabinet. Openings 23 are provided for the movement of air through the bed plate. The bed plate is supported on and welded or otherwise affixed to pintles 24 which, in turn, are rotatably supported in bearings 26 carried by cam followers 28. As shown particularly in Figs. 1, 2 and 4, cam followers 28 are slidably supported in sleeves 30 carried by members 32 forming a portion of the fixed frame of the machine. Also carried by members 32 are bearings 34 accommodating shafts 36. Cams 38, on which rest the lower ends of followers 28, are keyed to shafts 36 to rotate therewith. Shafts 36 are driven from any suitable source of power (not shown) through the medium of sprocket drives 40 and 42 whereby they are preferably rotated at the same speed and in the same direction.

A form 44 having side and end walls 46 and rear wall 47 and of the shape of the inner liner or shell of the refrigerator cabinet is supported on and fixed to bed plate 20 in position to define insulation receiving spaces 48 between it and the side, end and rear walls of the outer shell 12. Walls 46 are air-pervious and may suitably constitute perforated metal sheets, although alternatively, they may be made up of relatively heavy mesh metal screen or the like. The rear wall 47 of the form, in the embodiment shown in Fig. 1 is preferably imperforate.

Located substantially centrally of the bed plate is a filler tube 50 suitably welded or otherwise secured to the rear wall 47 around an opening 51 whereby the tube is in communication with the spaces 48. Filler tube 50 extends through the bed plate and is connected by flexible hose 52 with a blower or the like (not shown) which supplies the bulk insulating material under air pressure from a suitable source. Hose 52 is of sufficient length or is otherwise so arranged as not to interfere with rotation of the bed plate from the position of Fig. 1 to that of Fig. 5 for a purpose later to be described.

A movable closure member 54 is supported for vertical movement within form 44 and extends from wall to wall thereof. The supporting means for member 54 comprises nuts 56 secured to the member around openings for the reception of threaded shafts or screws 58 which are in thread-

ed engagement with the nuts whereby rotation of the screws causes member 54 to move upwardly or downwardly within the form, depending upon the direction of rotation of the screws. Member 54 is provided with flexible slip seals 60 of leather or the like sealing any space between the edges of the member and the walls of the form. A similar seal 62 surrounds filler tube 50. Screws 56 are mounted for rotation within, and are supported at right angles to the bed plate against endwise movement by, thrust bearings 64 carried by bed plate 20. The two screws are operatively connected to be rotated at the same speed and in the same direction by sprocket drive 66 below the bed plate 20 and one of the screws is driven by motor 68 through bevel gears 70 and 72. Suitably a change speed device, shown diagrammatically at 74 and which may be of any suitable type, is interposed between the motor shaft and the shaft supporting gear 70 whereby the speed of rotation of the screws may be controlled. The motor 68 and device 74 are carried by the bed plate as illustrated.

One of the pintles 24 supporting bed plate 20 has an extension 76 projecting through its bearing 26 to which is keyed a gear 78 in meshing engagement with a gear 80 mounted on the fixed frame of the machine. A crank 82 is also keyed to extension 76 whereby, upon rotation of the crank, the bed plate may be rotated from the position shown in Fig. 1 to the inverted position shown in Fig. 5. A pawl or other conventional dogging or braking means as indicated at 83 may be employed to lock gear 78 or 80 against rotation when the cabinet is in the position shown in Fig. 1.

In the operation of the apparatus described above and in carrying out the method of the invention, a cabinet shell 12 is mounted with its open side downwardly on bed plate 20 in the space defined by angle members 22 and with the bed plate in the position shown in Fig. 1. Motor 68 is operated to rotate screws 56 to retract member 54 to its lowermost position, as shown in dotted lines in Fig. 1, to leave only the perforations in the lower marginal areas of the form in communication with the atmosphere through the openings 23 in the bed plate. The insulation installing operation is then started by blowing the bulk insulating material under substantial air pressure through hose 52 and filler tube 50.

If an airstream of such force is employed that the shell 12 tends to rise from the bed plate it may be weighted in any suitable manner or locking means (not shown) may be used to secure it to the bed plate.

Inasmuch as member 54 seals off the interior of the form, the air entering with the insulation can only escape to the atmosphere through the perforations in the lower marginal areas around the door opening of the cabinet. As will be appreciated, the air pressure in the space behind member 54 is substantially immediately equalized with that of the wall spaces. The control of the movement of the airstream causes it to deposit the insulation at the extremities of the spaces adjacent the exposed openings. With the initial deposit of the insulation, motor 68 is operated to cause the screws 56 to rotate in a direction to move plate 54 upwardly and successively expose additional areas of the perforated walls of the form. Movement of the plate 54 is controlled, either manually or by any conventional mechanical or electrical means (not shown), in

timed relationship to the deposit of the insulating material to require the air to pass to and partially through the installed insulation to reach the openings exposed by the plate. When member 54 reaches its uppermost position and the side walls of the cabinet are completely filled, operation of motor 68 is stopped and the plate is held in such position. Flow of the insulating material is continued, however, to fill the rear wall, the air passing through the insulation previously installed in the side walls and escaping through the foraminous walls of the form.

Throughout the filling operation sprocket chain 40 is driven to rotate cams 36 and hence vibrate or rock the bed plate and apparatus carried thereby. This tends to prevent unfilled areas or air spaces and causes the insulating material to pack into a firm layer resistant to later settling even during rough handling of the cabinet.

When all of the spaces are completely filled the flow of insulating material is cut off, rotation of cams 36 is stopped and crank 82 is rotated to invert the bed plate and the apparatus carried thereby from the position shown in Fig. 1 to that shown in Fig. 5. The shell with the insulating lining therearound is then slipped downwardly off the form and the permanent liner 14 inserted as diagrammatically illustrated in Figs. 5 and 6 respectively. The door framing members are then attached and the insulating operation is completed. As soon as the shell is removed the bed plate is returned to the position shown in Fig. 1 by rotation of the crank, and motor 68 is operated to retract member 54 to its lowermost position. The apparatus is then ready for resumption of operation.

When, due to the character of the insulating material or for other reasons, difficulty is encountered in removing the shell from the form and inserting the permanent liner without unduly disturbing the insulating layer, an insulation retaining device illustrated at 94 in Fig. 9 may be employed. This device, which operates on the principle of a shoe horn, comprises a series of parallel rods or pins 96 of relatively small diameter, say, about $\frac{1}{8}$ " diameter, spaced about $\frac{3}{4}$ " apart and secured at their ends to preferably separate angle members or bars 98. The length of the pins 96 is equal, or substantially equal, to the depth of form 44. In the use of device 94, members 98 with their attached pins 96 are placed against the walls of the form 44 with the bars 98 adjacent the door opening. The outer shell 12 is then mounted as before. After the filling operation is completed and the bed plate is inverted, the shell with its insulating lining is slipped off the form carrying the device 94 with it, the rods 96 sliding on the walls of the form and preventing the insulating layer from being torn or distorted. The permanent inner liner is inserted by sliding it into place against the rods and device 94 is then readily removed by an outward pull on members 98. It will be understood that the operation of this device is shown only diagrammatically in Fig. 9 where the shell and form are shown inverted from their normal position during the filling operation and other parts of the apparatus are omitted for ease of illustration.

Referring now to Fig. 8, a modification or further additional feature of the method and apparatus is disclosed. In this embodiment the upper or rear wall of the form also includes perforated areas, and means are provided in

member 54 to permit the escape of air there-through when the member is in its uppermost position. If desired the entire upper or rear wall of the form may be perforated, similarly as the side walls, but it is found preferable to limit the perforations to the peripheral areas as shown in Fig. 8. The air escape means in member 54 comprises valves 84 of any suitable type to be opened to allow movement of air through the member when the member 54 is in its uppermost position. For example, as shown, valves 84 may be of the type of poppet valves including valve heads 86 underlying openings in the plate and normally maintained in a closed position by compression springs 88 surrounding valve stems 90 projecting through the openings. In operation, when member 54 approaches its uppermost position, the ends of stems 90 contact the upper wall of the form and, upon continued upward movement of members 54 the valves are opened whereby at least a substantial proportion of the conveying air may escape through the perforations in the upper wall of the form during the installation of the final insulating layer.

The invention as described successfully overcomes the difficulties heretofore encountered in prior pneumatic methods of installing insulation in closed spaces. Particularly, the apparatus and method provide for the rapid, uniform and efficient insulating of domestic refrigerator cabinets and similar structures with bulk granular or fibrous insulating material. Inasmuch as the air entering with the insulating material can escape only at, or beyond the point of deposit of the latter, and the cabinet is constantly vibrated or jogged during the filling step, uniform and firm packing of the insulating material is insured. At the same time excessive pressures are not built up in the wall spaces inasmuch as the air does not have to travel any great distance through the installed insulation. The construction of the apparatus to permit rotation of the form and shell from the position shown in Fig. 1 to that of Fig. 5 promotes ease of operation in the filling steps and also greatly reduces the likelihood of disturbing or distorting the insulating layer during the removal of the shell from the form, particularly when employed in conjunction with device 94. As previously referred to, the apparatus and method are adapted to be employed with any suitable bulk-type insulating material which may contain any binders, waterproofing agents and the like, as desired.

Having thus described my invention in rather full detail it will be understood that these details need not be strictly adhered to but that various changes and modifications may suggest themselves to one skilled in the art, all falling within the scope of the invention as defined by the subjoined claims.

What I claim is:

1. An apparatus for installing an insulating lining in an open sided casing comprising a bed plate, means thereon to position the casing with its open side downwardly, a foraminous form extending from said bed plate and having side and rear walls to define insulation receiving spaces with the side and rear walls of said casing, an insulation filler tube connected to the rear wall of said form and in communication with said spaces, a closure member extending from wall to wall of said form with said filler member passing through an opening therein, and means projecting through said closure member for moving

the same from a position adjacent the front of said form to a position adjacent the rear thereof.

2. An apparatus for installing an insulating lining in an open sided casing comprising a bed plate, means to position a casing thereon with its open side downwardly, pintles extending from opposite sides of said bed plate, bearings for said pintles, a foraminous form extending from said bed plate and having side and rear walls to define insulation receiving spaces with the side and rear walls of said casing, means to pneumatically convey bulk insulating material into said spaces, and means acting on said bearings for vibrating the bed plate.

3. An apparatus for installing an insulating lining in an open sided casing comprising a bed plate, means to position a casing thereon with its open side downwardly, pintles extending from opposite sides of said bed plate, bearings for said pintles, means for rotating said pintles within said bearings to move said bed plate from an upright to an inverted position, a foraminous form extending from said bed plate and having side and rear walls to define insulation receiving spaces with the side and rear walls of said casing, means to pneumatically convey bulk insulating material into said spaces, and means acting on said bearings for vibrating the bed plate.

4. An apparatus for installing an insulating lining in an open sided casing comprising a bed plate, means to position the casing thereon with its open side downwardly, a foraminous form extending from said bed plate and having side and rear walls to define insulation receiving spaces with the side and rear walls of said casing, means to pneumatically convey bulk insulating material into said spaces, a closure member extending across said form from wall to wall thereof, means to progressively move said closure member from a position adjacent the front of said form to a position adjacent the rear thereof, and valve means carried by said closure member operable to open the space between the member and rear wall of the form to the atmosphere when said closure member approaches said rear wall.

5. A method of applying an insulating liner to a relatively air-impervious casing, said method comprising supporting an air-pervious form in spaced relationship to said casing to define an insulation receiving space therewith, placing an insulation retaining device against the walls of said form, conveying a bulk insulating material into said space to fill the same, removing the casing and insulating lining from the form with said insulation retaining device carried therewith, inserting a permanent inner liner against said insulation retaining device and then removing the latter.

6. A method of installing an insulating lining in a layer around the walls of a relatively air-impervious casing having an open side, said method comprising supporting the casing with its open side downwardly around an air-pervious form to define an insulation receiving space between the walls of said form and said casing, placing an insulation retaining device against the walls of said form, conveying an insulating material in an airstream into said space, sealing the interior of said form from the atmosphere to cause air first to escape through said air-pervious form at points most remote from the place of introduc-

tion of the insulating material, exposing successive areas of said form to the atmosphere in timed relationship to the deposit of the insulating material by said airstream to build up an insulating lining in said casing, inverting said form and casing, removing the casing and insulating lining from the form with said insulation retaining device carried therewith, inserting a permanent inner liner against said insulation retaining device and then removing the latter.

7. An apparatus for installing an insulating lining in an open sided casing comprising a bed plate, means to position the casing thereon with its open side adjacent the bed plate, an air-pervious form to extend within said casing and having side and rear walls to define insulation receiving spaces with the side and rear walls of the casing, means to pneumatically convey bulk insulating material into said spaces, a closure member extending across said form and closing off the interior thereof to prevent the escape of air therefrom and from the spaces except forwardly of the closure member, and means to progressively move said closure member rearwardly from a position adjacent the open side of the casing to a position adjacent the rear wall of the form.

8. An apparatus for installing an insulating lining in an open sided casing comprising an air-pervious form, means to support a casing in spaced relationship to said form to define an insulation receiving space, means to convey bulk insulating material into said space, a closure member extending across said form and closing off the interior thereof to prevent the escape of air therefrom and from the space except forwardly of the closure member, and means to progressively move said closure member from a position adjacent the open side of the casing to a position adjacent the rear wall of the form.

9. An apparatus for installing an insulating lining in an open sided casing comprising a bed plate, means to position a casing thereon with its open side downwardly, an air-pervious form extending from said bed plate and having side and rear walls to define insulation receiving spaces with the side and rear walls of said casing, a closure member extending across said form and closing off the interior thereof to prevent the escape of air therefrom and from the spaces except below the closure member, means to progressively move said closure member from a position adjacent the open side of the casing to a position adjacent the rear of the form, and means to invert said bed plate whereby said casing with an insulating lining installed therein may be easily removed from said form.

LEE M. HEDGES.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
870,215	Bates	Nov. 5, 1907
2,128,336	Tortensson	Aug. 30, 1938
2,318,744	Brown	May 11, 1943
2,390,438	Hobson et al.	Dec. 4, 1945
2,429,059	Horstkotte	Oct. 14, 1947
2,439,603	Heritage	Apr. 13, 1948
2,439,605	Pauley	Apr. 13, 1948