G. O. SCHULZ.

PROCESS OF WALL CONSTRUCTION.

APPLICATION FILED FEB. 13, 1919.

1,307,793.

Patented June 24, 1919.

4 SHEETS—SHEET 1.

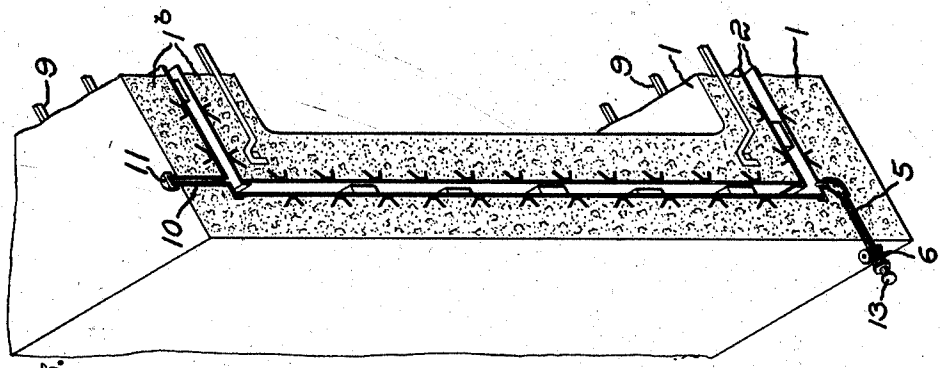


Fig. 3.

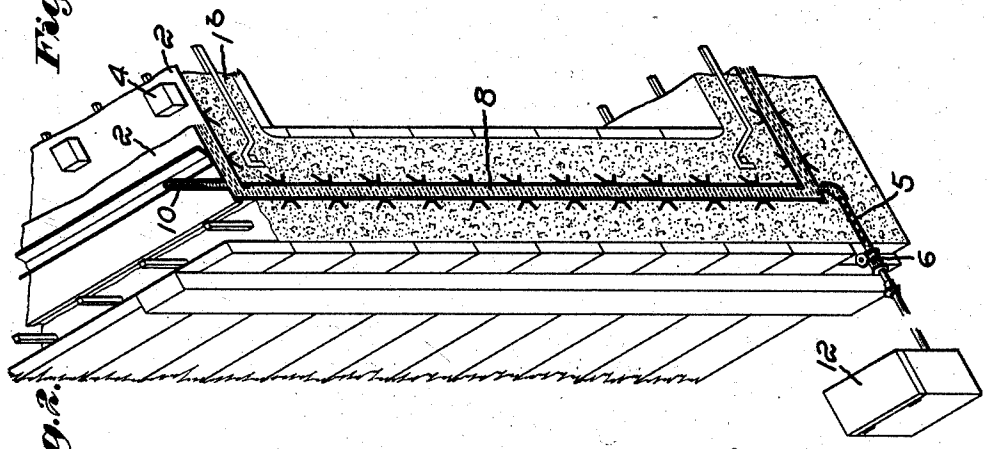


Fig. 2.

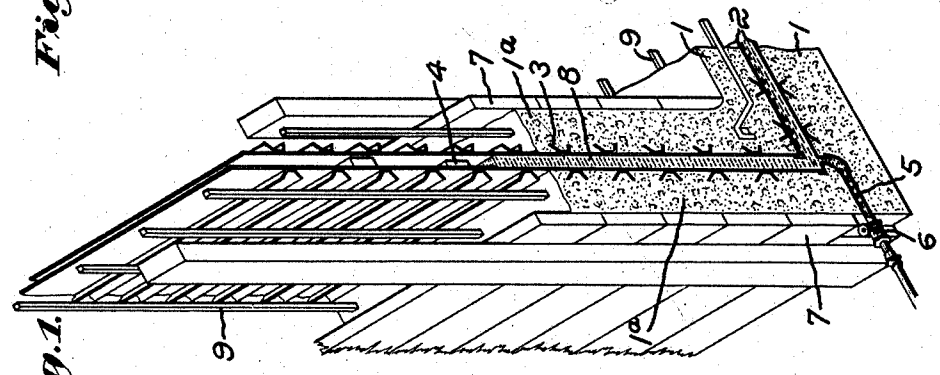


Fig. 1.

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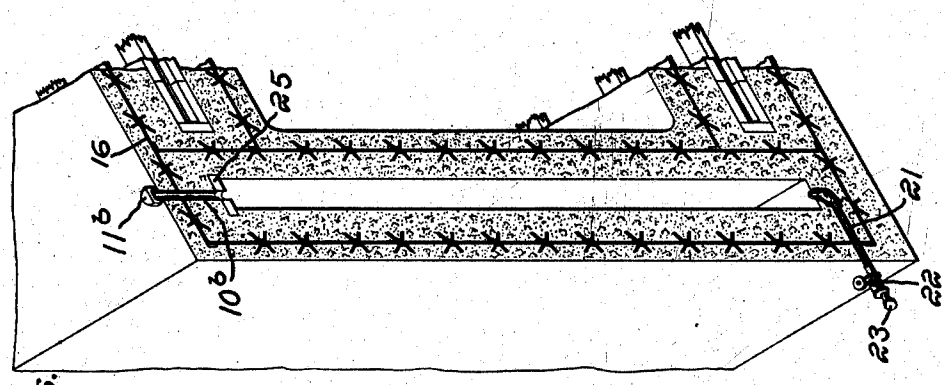


Fig. 6.

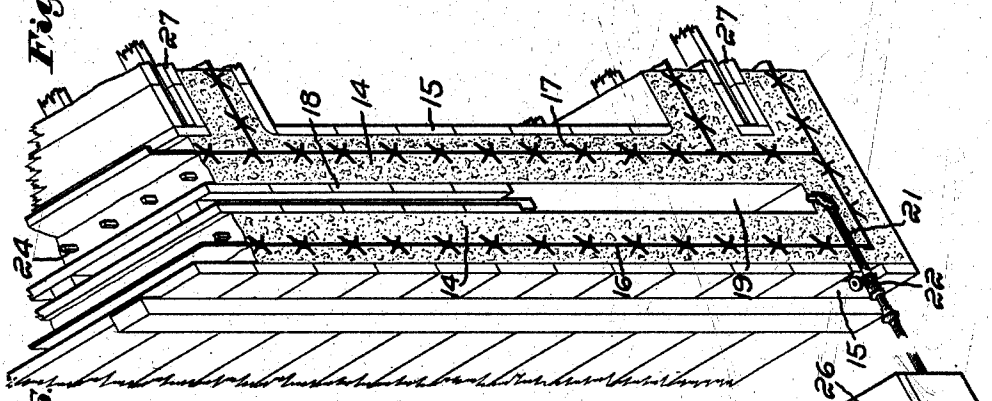


Fig. 5.

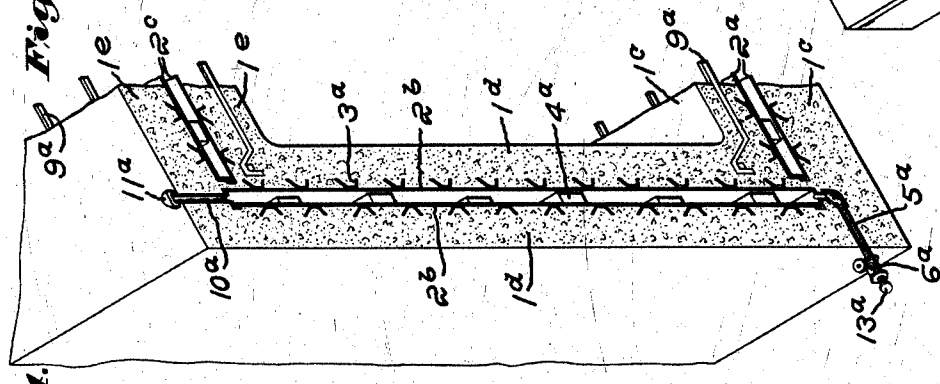


Fig. 4.

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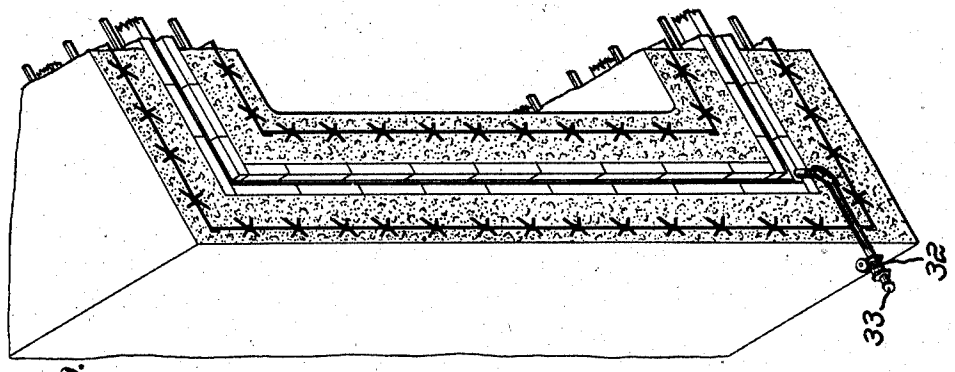


Fig. 9.

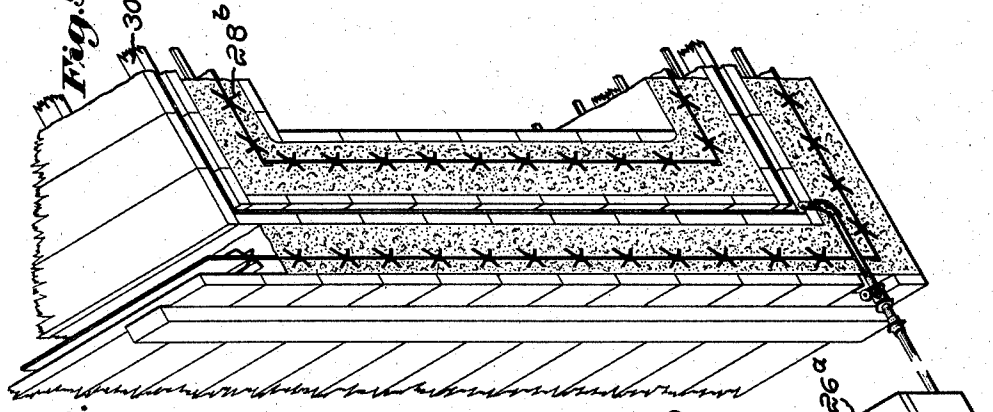


Fig. 8.

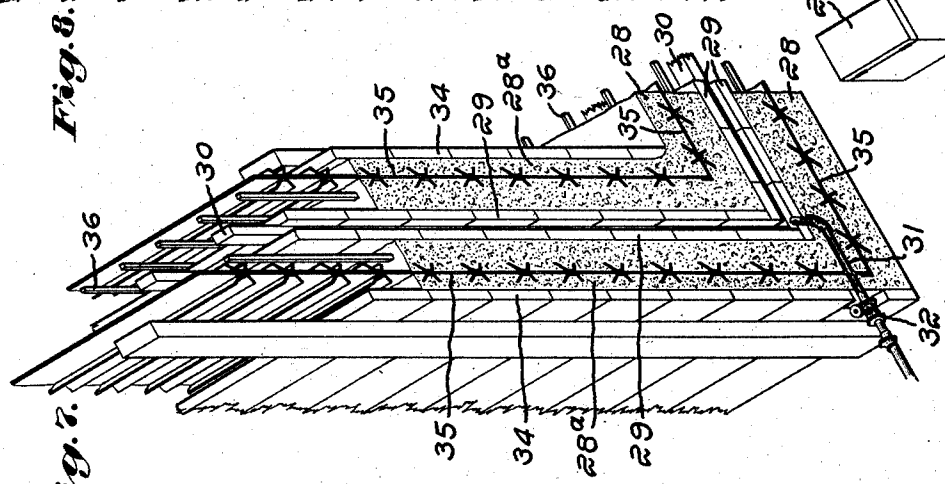


Fig. 7.

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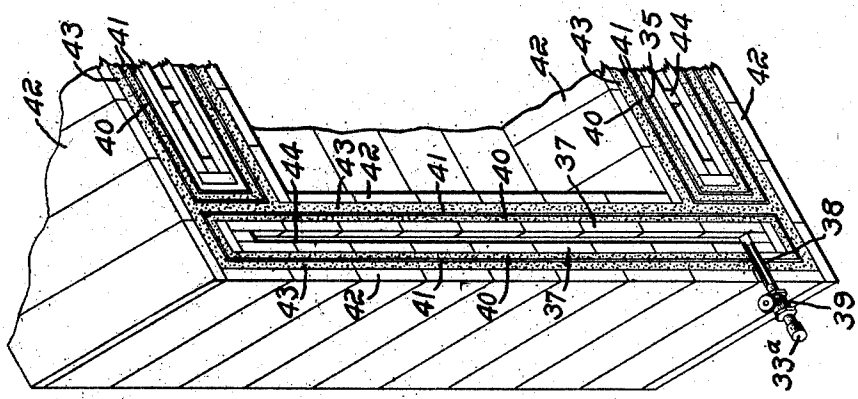


Fig. 12.

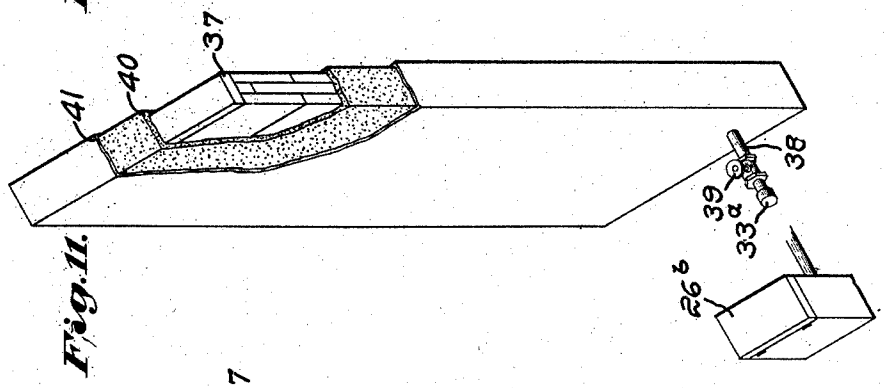


Fig. 11.

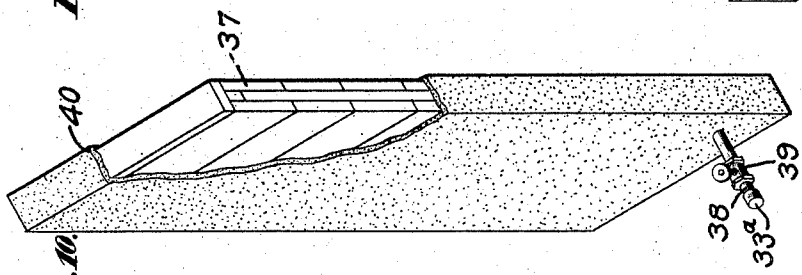


Fig. 10.

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UNITED STATES PATENT OFFICE.

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PROCESS OF WALL CONSTRUCTION.

1,307,793. Specification of Letters Patent. Patented June 24, 1919.

Application filed February 13, 1919. Serial No. 276,811.

To all whom it may concern:

Be it known that I, GUSTAV O. SCHULZ, a citizen of the United States, and a resident of Revere, in the county of Suffolk and State of Massachusetts, have invented an Improvement in Processes of Wall Construction, of which the following description, in connection with the accompanying drawings, is a specification, like characters on the drawing representing like parts.

This invention relates to the process of wall construction for various purposes and more particularly to wall construction for containers which, in the disclosed embodiment of means for practising the invention are typified by wall sections of vessels adapted to receive a refrigerant and articles to be subjected to refrigerating action.

In order that the principle of the invention may be readily understood, I have disclosed in the accompanying drawings several adaptations of or means for practising my invention, and to the use of which the same is in no wise limited.

In said drawings,—

Figures 1 to 9 inclusive and Fig. 12, are perspective views showing concrete or cementitious walls in various stages of construction, in accordance with my process; and

Figs. 10 and 11 are perspective views showing hollow cores in different stages of construction.

I will describe certain embodiments of means for practising my process but which may be otherwise carried on.

In Fig. 1, I have shown a bottom and an upright section of a refrigerator in the process of construction. The concrete members 1 are of the bottom section and the concrete members 1^a are of the upright section of the refrigerator. It is preferable first to pour the concrete for the lower member 1 of the bottom section and on this to erect a hollow core comprising the members 2, which are preferably, but not necessarily, metal and have embodied therein, if desired, metallic ties 3 which may be of any suitable form, character and number.

Inclosed in the core and in any desirable way attached to the members 2 are supporting blocks 4, which provide means to overcome the atmospheric pressure that is exerted upon the concrete members embedding the core. Attached to and becoming an integral part of the core is a tubular projection or pipe 5, extending from the core and from within the concrete members 1 and 1^a. The pipe 5 is preferably provided with a valve 6, the purpose of which is to control the passage way through the pipe 5, and consequently to the space between the members 2 of the core.

In order to facilitate the casting of the concrete members 1 and 1^a, I preferably erect forms 7, which may be of any desired type. Having positioned the hollow core 2, and having erected the forms 7, the core 2 is preferably partially filled with water as indicated at 8 through the pipe 5, which is connected to some water supply, the flow of the water being controlled by the valve 6. As the concrete is cast or molded about the core, the water indicated at 8 is permitted gradually to rise in the core so that the pressure exerted by the water on the walls 2 of the core is approximately equal to the pressure of the surrounding concrete. The concrete members 1 and 1^a are preferably reinforced by metallic rods 9, which are embedded in the concrete as shown and may be of any suitable form, character and number.

The forms 7 are gradually built up and the concrete members 1^a of the upright section of the refrigerator are cast between them until the desired position for the lower member 1^b of the top section of the refrigerator shown in Fig. 2 has been reached. The forms 7 are then extended and the upper concrete member 1^b is cast as shown. Upon this member 1^b and preferably while the concrete is soft, the members 2 of the core are positioned including the supporting blocks 4.

It is of great importance in good construction that the walls of the core be impervious to air. Therefore, in constructing the members 2, all of the joints should be air tight.

Having completed the construction of the walls of the core, the water indicated at 8 is permitted to rise until it has completely filled the core and partially filled a tubular projection or pipe 10, as shown in Fig. 2. The upper concrete member 1^b of the top section of the refrigerator is then cast, which is shown in a completed section in Fig. 3. The water indicated at 8 is then permitted to rise until it completely fills the pipe 10. The pipe 10 is then hermetically sealed with a cap 11 shown in Fig. 3, and the water is exhausted through the pipe 5 preferably by a pump 12, thus establishing a vacuum between the members 2 of the core.

When all of the water has been exhausted, the valve 6 is closed, thus hermetically sealing the pipe 5. Having established a vacuum between the members 2 of the core, I preferably guard against any leakage that may occur in the valve 6 by hermetically sealing the end of the pipe 5 by a cap 13, Fig. 3.

The water can be exhausted in any convenient way, and a vacuum established between the members 2 of the hollow core in any desired manner.

In Figs. 4, 5 and 6, I have shown sections of refrigerators having embedded in their lower upright and top members separate receptacles for vacuum spaces.

In Fig. 4, the hollow core comprising the members 2^a is embedded in the concrete members 1^c of the lower section of the refrigerator; the hollow core having the members 2^b is embedded in the concrete members 1^d of the upright section of the refrigerator, and the hollow core comprising the members 2^c is embedded in the concrete members 1^e of the top section of the refrigerator. Each of the cores has a tubular projection or pipe 5^a with a valve 6^a and cap 13^a and preferably a tubular projection or pipe 10^a with a cap 11^a extending from within the concrete members embedding the cores as shown.

The cores are preferably wholly or partially filled with a liquid such as water while being embedded in the concrete, which is then exhausted, a vacuum established in its stead and the cores hermetically sealed, as previously described in connection with the construction shown in Figs. 1, 2 and 3.

By embedding the cores in concrete before establishing a vacuum within them the cores can be constructed out of a light and cheap material which need not have the strength to resist atmospheric pressure, because the surrounding concrete can be made of sufficient strength to overcome such pressure. Consequently, by eliminating the costly construction of a glass or heavy iron core which would withstand atmospheric pressure, the construction of a vacuum insulated wall is made practicable for the first time in the art.

In Fig. 5, the concrete members 14 are cast between the forms 15 embedding an air barrier 16, which may be of any suitable material such as metal or paper, and if desired may have ties 17 of any suitable form, character and number. The concrete members 14 are cast about a movable core 18, which is moved upward as the concrete is being cast, thus establishing a hollow receptacle 19. A pipe 21 is embedded in one of the concrete members 14 and extends from the receptacle 19 through the air barrier 16 to the exterior of the wall as shown. The pipe 21 is provided with a valve 22 and a cap 23 to control the passageway through it and consequently to the receptacle 19. In order to reinforce the concrete members 14, reinforcing rods 24 are embedded in the concrete as it is cast.

When the desired height of the receptacle 19 has been reached, a form 25 (Fig. 6) is placed in position and the concrete members 14 are extended until the position of the top member of the air barrier 16 has been reached. The air barrier 16 is then extended, thus completely enveloping the receptacle 19. The concrete members 14 are then extended completing the top section of the refrigerator and thus embedding the air barrier 16, as shown in Fig. 6. After the receptacle 19 has been established and the surrounding concrete has become sufficiently hard, a vacuum is created in the receptacle 19 by a pump 26 through the pipe 21. The receptacle 19 is then hermetically sealed, preferably by the valve 22 and the cap 23, and thus completed as shown in Fig. 6.

I have shown in connection with the receptacle 19 a pipe 10^b having a cap 11^b. If desired a vacuum may be established in the receptacle 19 by connecting the pipe 21 to some water supply and completely filling the receptacle 19 and the pipe 10^b, then positioning the cap 11^b and exhausting the water through the pipe 21, and hermetically sealing the pipe 21 by closing the valve 22 and positioning the cap 23.

It is important that great care be exercised in the hermetical construction of the air barrier 16 especially in the passing of the pipe 21 through the barrier 16. The pipe 21 is preferably joined to the barrier 16, so as to become an integral part of the air barrier, thus hermetically sealing the receptacle 19, in conjunction with the passageway 21.

The cores 27 may be of any desired type and are shown in connection with the receptacle 19 for a more lucid illustration of the latter.

In Fig. 7, I have shown a bottom and an upright section of a refrigerator in the process of construction. The concrete members 28 are of the bottom section, and the concrete members 28^a are of the upright section of the refrigerator. It is preferable first to pour the concrete for the lower member 28 of the bottom section and on this erect a hollow core comprising the members 29, which are preferably wood and if desired have between them supporting strips 30.

Extending from the space between the members 29 of the core and through the concrete members 28 and 28^a is a pipe 31, which is preferably provided with a valve 32 and a cap 33 shown in Fig. 9. The purpose of the valve 32 and the cap 33 is to control the passage way through pipe 31, and consequently to the space between the members 29 of the core. In order to facilitate the casting of the concrete members 28 and 28^a, I preferably erect forms 34 which may be of any desired type. Having positioned the

hollow core 29 and having erected the forms 34, the concrete members 28 and 28[a] are cast, embedding at any desirable depth from the surfaces of the concrete members 28 and 28[a] a hermetical barrier comprising the members 35. In order to reinforce the concrete members embedding the hollow core 29, reinforcing rods 36 are embedded, if desired, in the concrete which may be of any desired form, character and number.

The forms 34 are extended and the concrete members 28[a] of the upright section are cast between them until the desired position for the lower member 28[b] of the top section of the refrigerator shown in Fig. 8 has been reached. The forms 34 are then extended and the upper concrete member 28[b] is cast, embedding the lower member of the hermetical barrier 35 as shown. Upon this member 28[b] and preferably while the concrete is soft, the members 29 of the core are extended including the supporting strips 30. Having completed the walls of the core, the upper concrete member 28[b] and the upper member of the hermetical barrier 35 of the top section of the refrigerator are extended as shown in completed section in Fig. 9. Having completed the embedding of the hollow core in concrete, a vacuum is established between the members 29 of the core through the pipe 31, preferably by a pump 26[a] and hermetically sealed, preferably by the valve 32 and cap 33, Fig. 9.

In Fig. 10, I have shown a hollow core covered with a cementitious material, preferably a composition of coal tar and pitch. Extending from the core 37 is a pipe 38, which is provided with a valve 39 and a cap 33[a]. The pipe 38 provides a passage way to the hollow space between the walls of the core as shown in Fig. 12. The hollow core 37 is covered with the cementitious material 40, a vacuum is established within the core through the pipe 38, by a pump 26[b], and the core is hermetically sealed by closing the valve 39 and positioning the cap 33[a]. By covering the core 37 with a cementitious material before establishing a vacuum within it, the core can be constructed out of cheap material such as wood and need not necessarily be made air tight as the cementitious material 40, when acted upon by atmospheric pressure, will readily seal any leakage that may occur by reason of a cheaper construction than glass or iron which are commonly used to construct vacuum receptacles.

In order that no leakage whatever may occur, I preferably cover the core 37 with one or more layers of an air barrier 41, Fig. 11, preferably such as tar paper.

If desired, the establishing of a vacuum within the core 37 can be deferred until the core has been enveloped by the air barrier 41.

As shown in Fig. 12, the core 37 is preferably positioned between outer and inner forms 42, and is embedded in a cementitious material 43. If desired the core 37 may have supporting strips 44, as shown, which may be of any suitable form, character or number.

In the bottom and top sections of the refrigerator, Fig. 12, I have represented the hollow core 37 enveloped by two air barriers 41 which inclose between them another layer of cementitious material 40. If desired, the core 37 may be enveloped by any desired number of air barriers 41, this being consistent with good construction.

Having established the core in the cementitious material 43 and between the forms 42 and thus created a desired heat barrier, I remove the cap 33[a], connect the pipe 38 with the vacuum pump 26[b], open the valve 39 and intensify or reëstablish a vacuum in the core 37. The object of intensifying or reëstablishing the vacuum in the core 37 is that during the process of embedding the core in the cementitious material, air may have forced itself through into the core before the cementitious material had sealed all of the leaks that occurred, and consequently in order to remove such air, it is necessary to intensify the already established vacuum or to reëstablish it.

Having thus described several illustrative embodiments of means whereby my process may be practised, I desire it to be understood that although specific terms are employed, they are used in a generic and descriptive sense and not for purposes of limitation, the scope of the invention being set forth in the following claims.

Claims:

1. That process of wall or like construction comprising the following steps; first, establishing a hollow core in concrete or cementitious material, second, creating a vacuum within said core, and, third, hermetically sealing the said core.

2. That process of wall or like construction comprising the following steps; first, establishing a hollow core in concrete or cementitious material, and, second, creating a vacuum within said core.

3. That process of wall or like construction comprising the following steps; first, establishing a partial vacuum-inclosing body in concrete or cementitious material, second, intensifying or reëstablishing said vacuum, and, third, hermetically sealing said body.

4. That process of wall or like construction comprising the following steps; first, establishing a partial vacuum within concrete or cementitious material, and, second, intensifying or reëstablishing said vacuum.

5. That process of wall or like construction comprising the following steps; first, establishing a hollow core wholly or par-

tially filled with liquid, in concrete or cementitious material, second, exhausting the liquid from said core, and, third, hermetically sealing the core.

6. That process of wall or like construction comprising the following steps; first, establishing a hollow core wholly or partially filled with liquid, in concrete or cementitious material, second, exhausting the liquid from said core, third, creating a vacuum within said core, and, fourth, hermetically sealing said core.

7. That process of wall or like construction comprising the following steps; first, constructing a hollow core and simultaneously therewith casting or molding concrete or cementitious material to said core, second, establishing a vacuum within said core, and, third, hermetically sealing said core.

8. That process of wall or like construction comprising the following steps; first, casting concrete or cementitious material about a hollow core, and simultaneously therewith establishing a hermetical barrier about said core, creating a vacuum within said core; and, third, hermetically sealing said core.

9. That process of wall or like construction comprising the following steps: first, creating a receptacle in concrete or cementitious material and simultaneously therewith establishing a hermetical barrier about said receptacle, second, creating a vacuum within said receptacle, and third, hermetically sealing said receptacle.

10. That process of wall or like construction comprising the following steps; enveloping a hollow relatively rigid core, both by a hermetical barrier and by concrete or cementitious material, and at a time subsequent to the application of said hermetical barrier establishing a vacuum within the core and hermetically sealing the core.

11. That process of wall or like construction comprising the following steps; enveloping by a hermetical barrier and by concrete or cementitious material a hollow core adapted to brace said barrier against atmospheric pressure consequent upon the establishment of a vacuum within said core; and at a time subsequent to the application of said hermetical barrier establishing a vacuum within said core and hermetically sealing said core.

In testimony whereof, I have signed my name to this specification.

GUSTAV O. SCHULZ.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."