May 4, 1943. M. LAPIDUS 2,317,997

FORM FOR CONCRETE WALLS, FLOORS, OR THE LIKE

Filed Oct. 4, 1938 2 Sheets-Sheet 1

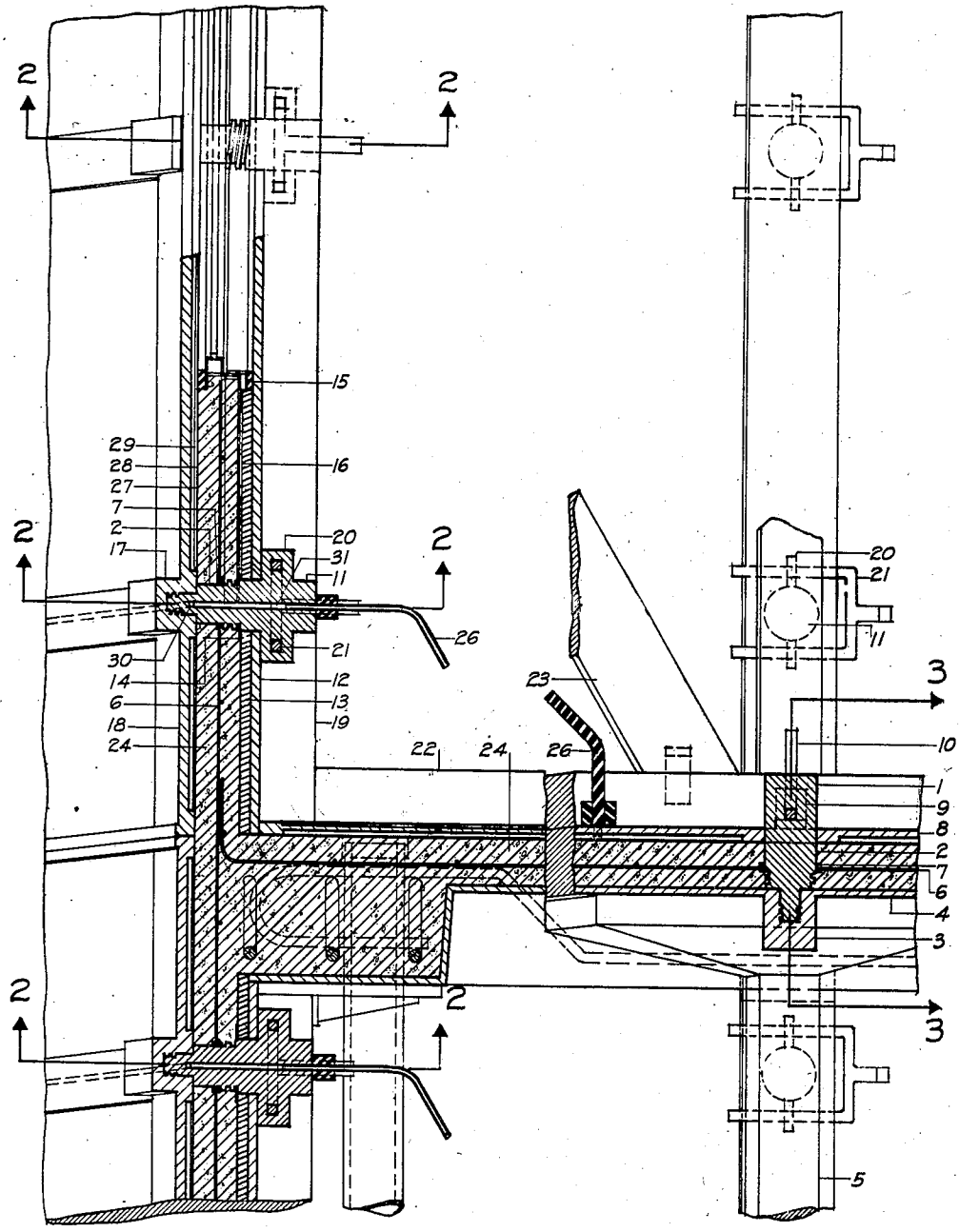



FIG. 1

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FIG. 2

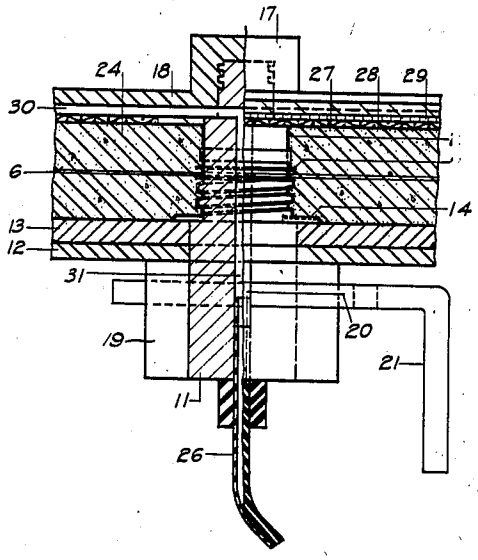



FIG. 4

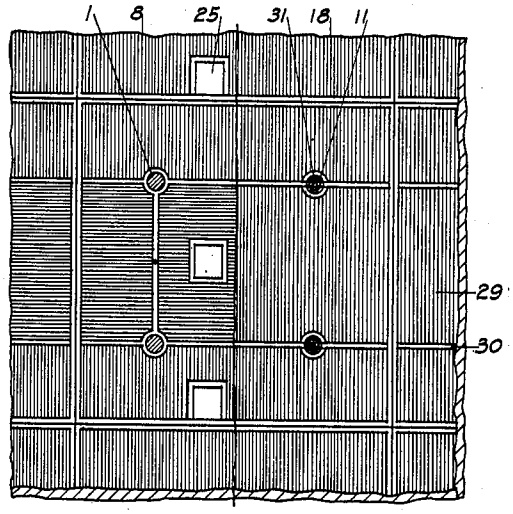
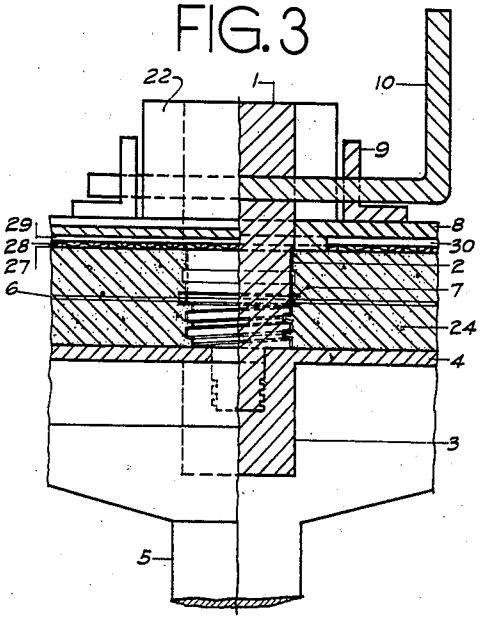



FIG. 3




Morris Lapidus INVENTOR.

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# UNITED STATES PATENT OFFICE

2,317,997

## FORM FOR CONCRETE WALLS, FLOORS, OR THE LIKE

Morris Lapidus, Cleveland, Ohio

Application October 4, 1938, Serial No. 233,249

6 Claims. (Cl. 25—131)

My invention relates to improvements in the method of construction of buildings where concrete is the medium and in part employs or adopts the method of an Apparatus for treating concrete, patented by Karl P. Billner, July 7, 1936, and which patent is known as No. 2,046,867.

The primary object of this invention is to provide an inexpensive and rapid means for constructing a monolithic building.

Another object is to construct such building with re-employable forms which are quickly and easily assembled and disassembled.

A further object is to construct a building of this type with a saving in the amount of concrete used.

Still another object is to employ forms or molds in which the liquid concrete is poured and which also serve as scaffolding for the structure.

A still further object is to erect a concrete structure of this type with all the vertical supports and horizontal braces on the inside of the structure and which eliminates outside shoring and scaffolding.

A still further object is to improve the finished surface of the concrete structure.

A still further object is to do all the work from the inside of the building.

A still further object is to permit continuous erection of forms for walls and floors, uninterrupted by the pouring of concrete and application of the suction.

These and other objects and features of the invention will become apparent from a study of the foregoing specification and claims taken together with the accompanying drawings in which like parts are designated by like reference characters and in which:

Fig. 1 is a vertical isometric view partly in section, taken thru an exterior wall, and floor above the ground, showing also a window placed between the forms, and supports for said forms, being on the inside of the building.

Fig. 2 is a horizontal section taken along the lines 2—2 of the Fig. 1.

Fig. 3 is a vertical section taken along the lines 3—3 of the Fig. 1.

Fig. 4 shows Mr. Billner's suction plate, with the cloth or other screen removed, exposing the minor and major channels, and being adapted for use with openings for bolts interconnecting the plates of the forms, and for injection of concrete between the forms. The left half of the figure is the floor suction plate, and the right half of the figure is the wall suction plate.

Referring now to the drawings, floor bolt, 1, with threaded sleeve, 2, thereon, is screwed into fixed nut, 3, on ceiling plate, 4. Vertical support, 5, with hole therein provided as shown, is slipped over fixed nut, 3, and ceiling plate, 4, with floor bolt, 1, attached thereto, and is raised to position.

Reinforcing mesh, 6, is attached to, and held in place by appendage, 7, on threaded sleeve, 2, and floor suction plate, 8, having holes therein, corresponding in size and position to floor bolts, 1, is slipped over one or more floor bolts, 1, depending on the size and number of holes in suction plate, 8. Floor suction plate, 8, has permanently affixed thereto appendages, 9, placed on either side of floor bolt, 1. Rod, 10, passing thru hole in appendages, 9, and hole in floor bolt, 1, holds floor suction plate, 8, at desired distance above ceiling plate, 4.

The floor form having thus been assembled, the wall form is now assembled, as follows.

Wall bolt, 11, is placed in hole provided therefor in inside wall plate, 12. Insulation board, or wall finish board, 13, having holes therein corresponding in size and location to wall bolt, 11, is slipped over the latter. Threaded sleeve, 2, having appendage 14 thereon to hold board, 13, and inside wall plate, 12, in position, as shown, is screwed onto corresponding threads on wall bolt, 11. Reinforcing mesh, 6, is then attached to, and held in place by appendage, 7, on threaded sleeve, 2. Window frame, 15, with leg, 16, attached thereto, is put in position as shown. The frame, 15, of the window has means thereon for diminishing in width when suction is applied, as described later. Wall bolt, 11, is then screwed into fixed nut 17, on wall suction plate, 18, and wall brace, 19, is slipped over wall bolt, 11, and appendages, 20, thereon. U shaped rod, 21, is placed thru holes in wall brace, 19, and appendages, 20, on wall bolt, 11.

The thus assembled wall form is raised to position as shown, standing on previously assembled wall form. Horizontal brace, 22, is slipped over floor bolt, 1, and butts against wall brace, 19. Diagonal brace, 23, is then attached, completing the bracing for the wall form.

Concrete, 24, is then poured thru openings, 25, in floor suction plate, 8, and inside wall plate, 12, and board, 13, until a sufficient area of the thus assembled forms is filled. Suction tubes, 26, are then attached, as shown, to wall bolt, 11, and floor suction plate, 8. U rod, 21, and rod 10, are removed after suction has been started at suction tubes 26. In the case of the wall, the action of the suction causes the excess water in the con-

crete between the forms to pass thru cloth, 27, then wire mesh, 28, to minor channels, 29, and thence to major channel, 30, which leads to passage, 31, in wall bolt, 11, and thence out thru suction tube, 26. The suction creates a vacuum inside the forms, and wall suction plate, 18, and board, 13, move toward each other to fill the vacuum, thus compacting the mass of concrete under terrific pressure. Threaded sleeve, 2, has means thereon to cause it to diminish in width, to comply with this action, and window frame, 15, also has means thereon for diminishing in width, for the same reason.

The suction is applied for about twenty minutes as directed by Mr. Karl P. Billner, inventor of the vacuum process, and the forms then removed. Excess water in the concrete between the floor forms is extracted in the same manner, except that suction tube, 26, is attached directly to the major channel, 30. When the ceiling plate, 4, is removed, vertical support, 5, having a head covering the entire area of ceiling plate, 4, is immediately replaced. Ceiling plates and supports therefor will be small enough in area so that this can be done successfully.

The processes of erecting the forms, pouring the concrete inside the forms, applying the vacuum process or suction, and disassembling the forms, are all independent of each other. Forms are set up continuously. After a few forms have been erected, concrete is poured between them, and the pouring thenceforth continues without interruption. Suction is also applied continuously, as long as forms are erected and concrete poured. The forms are removed in about twenty minutes as claimed by Mr. Billner, and then reemployed elsewhere on the building where they will fit.

The continuous and uninterrupted erection of forms, pouring of concrete, applying of suction, and disassembling of forms, coupled with the added strength and waterproofness given to the concrete by the vacuum process, as claimed by Mr. Billner, will result in the erection, in a minimum of time, of a building having the highest qualities of concrete. The above described method of construction is applicable to any type of building, and I claim will result in a time of erection of 1/5, and a cost of 1/3 of that required for concrete construction in the ordinary manner.

Concrete is injected between the forms thru a hose, and supports for said forms are all on the inside of the building. All work is done from the inside of the building, eliminating the need for scaffolding on the exterior. The forms themselves are the scaffolding, since the workmen can walk on the floor suction plate. No matter how tall the structure will be, the men will always be working in a one story building. The chance for accident is thus cut to a minimum.

If desired, a special mix of concrete used for the surface, can be injected on one side of the reinforcing mesh of the wall, when a fine meshed screen is attached to said reinforcing mesh. Ordinary concrete is poured in behind it, and when the suction is applied and the forms move toward each other compacting the mass, as explained by Mr. Billner, the concrete on both sides of the mesh and screen become one.

Attempts have been made in the past few years to sufficiently lower the cost of building so that adequate housing could be obtained for those who were hitherto unable to purchase living accommodations of a standard which could be termed minimum or decent. In imitation of the process of constructing automobiles, so-called "pre-fabrication" of buildings was begun, which process consisted of the manufacture of the various parts of a building in large units, the shipping of these parts to the site and their assembly.

Pre-fabrication could not provide the necessary adequate housing at a cost low enough to include those of our people above mentioned, and therefore has failed of its objective. This failure is now generally recognized and admitted throughout the country.

All buildings are in reality pre-fabricated, with the exception of those made of concrete monolithically on the site. In the case of the latter all parts excluding the concrete structure itself and including the reenforcing in the concrete is pre-fabricated. In the case of the former, all parts, including the structure itself is pre-fabricated.

Therefore nothing new had been attempted by the so-called pre-fabricators. The manufacture of the various parts of a building in great quantities has not sufficiently lowered the cost of these buildings. Furthermore, pre-fabricated buildings have little structural strength and can therefore be employed only for small structures requiring small floor loads. The cutting down of the thickness of walls, size or floor beams etc. will make these buildings less permanent than those traditionally built of brick, stone and wood, and most certainly less durable than concrete which has greater permanency than any other building material.

Furthermore, the assembling of these pre-fabricated units on the site was not sufficiently rapid to make up for the additional expense incurred in the manufacture of these units which required special machinery and in their delivery to the site which required additional care. The traditional methods of building required less expense in the pre-fabrication of the various parts than the pre-fabricated method, but the assembling of the parts on the site required more time.

Traditional methods of building monolithically with concrete afford no saving in the time of erection and also incur additional cost in the use of forms which are not re-employable.

In my method of building, windows and doors are made permanently air-tight, and the building of a roof presents the same problem as does a floor which requires a pitched surface. The method of assembling and disassembling the forms is rapid and these forms can be re-employed many times, either on the same building or on subsequent buildings. The use of the vacuum process produces a strange concrete which is also less liable to the formation of cracks, and therefore floors and walls can be made with a resulting saving in materials. By use of a concrete gun which is inserted in holes in the forms large units of the latter can be assembled and concrete poured to fill up all the spaces between them although they may be as little as two inches apart. The use of a tap plate for the floor saves times in leveling off the poured concrete and also insures a level or pitched floor or roof exactly as desired. The same is true of the walls. The structure of the building can be erected in about the same time as that required for a so-called pre-fabricated structure. But my method of building will result in a building of greater permanency and strength than any other building hitherto built not employing the vacuum process and can therefore be employed for buildings requiring great structural strength also. My method therefore

can be employed for all buildings. My method of pouring a special surface or wall or floor will insure a beautiful building, and the elimination of bracing or shoring on the outside of the building and the erection, support and bracing of the forms from the inside, also thereby employing the latter as scaffolding and consequent elimination of same on the outside of the building will not only save money but will increase the safety of workmen on the building since they will always be working on the inside and also in a one story structure no matter how tall the building. The use of the vacuum process insures the hardening of the concrete in a very short time and the consequent removal and re-employment of the forms elsewhere on the building or on a subsequent building. The strength of the concrete is so great that it is being employed for bomb-proof shelters. Special wall, floor and ceiling finishes, if desired, are merely plugged into preformed plugs which are employed to fill the space vacated by the bolts which hold the forms together.

My method of building entirely eliminates the expense of pre-fabricating the structure of a building since it can be erected on the site in about the same time as that of a pre-fabricated building. Furthermore, it has permanency and strength which the latter does not possess and can therefore be used for any type of building.

In short, my method of building has the maximum of desirable qualities in the fact that the resulting building will be monolithic, have structural strength, beauty of surface, permanency, and application to any type of building. It also has the minimum of undesirable qualities, referring to the expense of materials, time of erection and danger to the workmen.

Employing my method, therefore, a building far better than any hitherto produced can be built at an expense which is less than any method hitherto employed. It is therefore, in my opinion, the greatest step forward in the art of building and will solve not only the problem of housing those hitherto financially unable to purchase adequate housing, but will also provide quickly and at less expense adequate, beautiful and permanent buildings for every other purpose.

My method can also be employed for the building of footpaths, roads, retaining-walls, furniture etc.

I claim:

1. A form for concrete walls and the like comprising a fixed plate, a plate movable theretoward, tubular bolting means connecting said plates and threaded into said movable plate, and channels on the inner face of said movable plate communicating with the interior of said tubular bolting means.

2. A form for concrete floors comprising a fixed lower plate, an upper plate movable theretoward, tubular bolting means releasably connecting said plates, and channels on the inner face of one of said plates communicating with the interior of said tubular bolting means.

3. A form for concrete floors comprising a fixed lower plate, an upper plate movable theretoward having channels on the inner face, for removing excess water from the concrete by means of suction, bolting means releasably connecting said plates passing through holes in said upper plate.

4. A form for concrete walls, floors, and the like, comprising relatively spaced opposed plates, releasable bolting means interconnecting said plates, said bolting means having a passage extending therethru, at least one of said plates having channels formed on its inner face communicating with said passage, and suction means communicating with said passage.

5. A form for concrete walls, floors, and the like, comprising oppositely spaced plates, at least one of said plates having channels formed on the inner face thereof, means releasably interconnecting said plates and adapting them for movement toward each other, said means including a bolt projecting from one of the plates thru a hole in said channeled plate, and suction means communicating with said channels.

6. A form for concrete walls, floors, and the like, comprising oppositely spaced plates, means releasably interconnecting said plates and adapting them for movement toward each other, at least one of said plates having channels on the inner face thereof and an opening thru which concrete is introduced into the form, and suction means communicating with said channels.

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