

[54] **BOTTOM FOR BUILDINGS WITHOUT BASEMENT, AND A METHOD OF MAKING SUCH BOTTOM**

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[58] Field of Search.....94/31; 52/612, 439, 27 A, 292, 52/293, 368, 169, 742, 743

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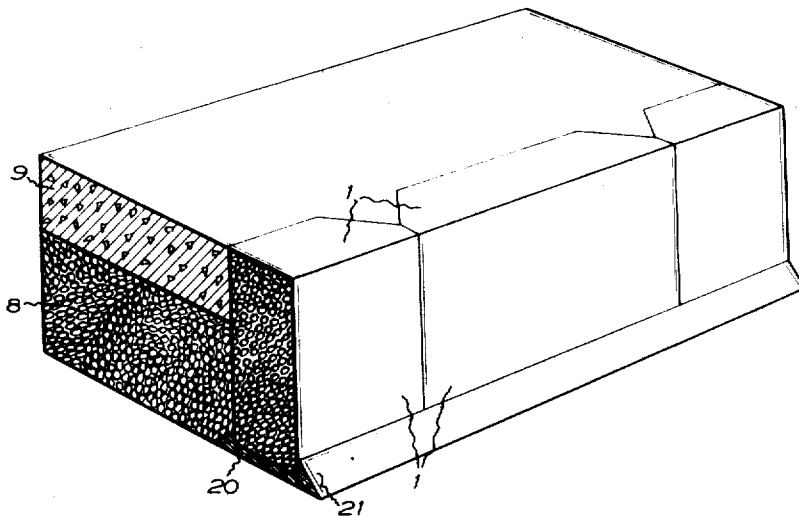
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[57] **ABSTRACT**

A bottom for buildings without basement founded on the soil after removal of only the humus layer and a method of making same. A foundation wall of heat and moisture insulating blocks having the same height as the foundation wall and placed in juxtaposition extends along the outer wall of the building, a heat and moisture insulating layer of pellets of burnt expanded clay is placed directly on the soil inwardly of the foundation wall, and a steel reinforced concrete layer is cast directly on top of the layer of pellets of burnt expanded clay using the foundation wall as form side wall, and is integrally united with the foundation wall.

8 Claims, 6 Drawing Figures



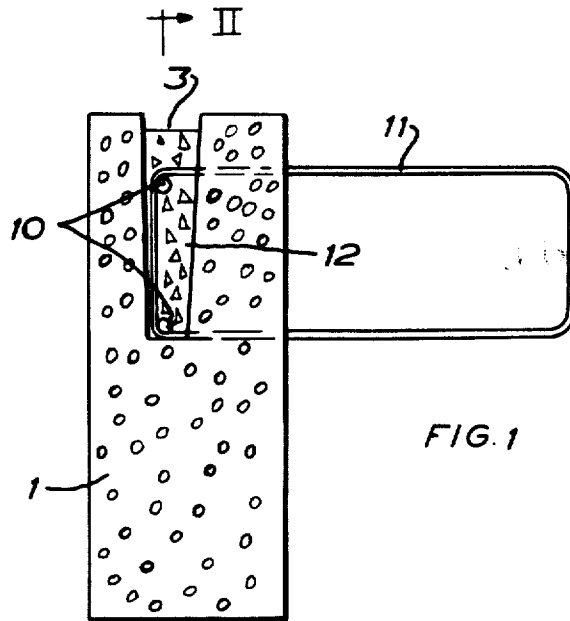


FIG. 1

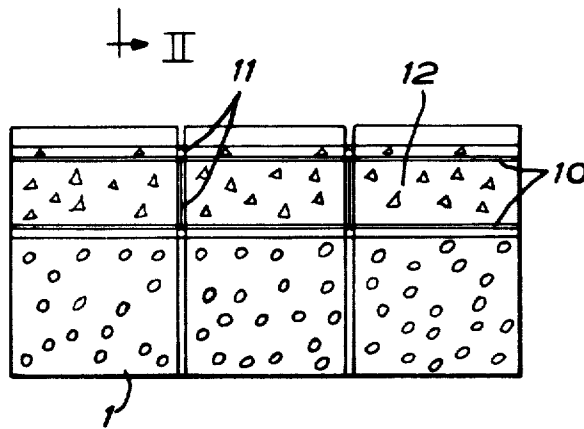
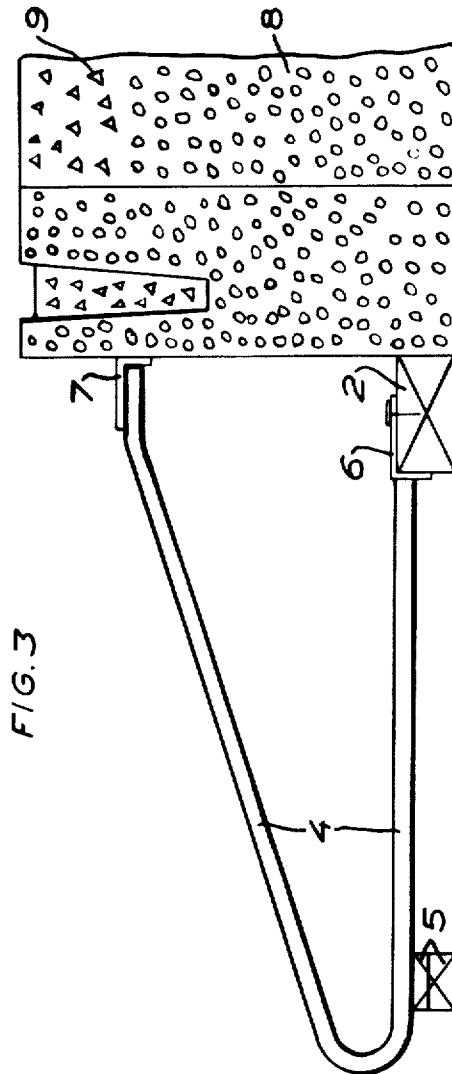


FIG. 2



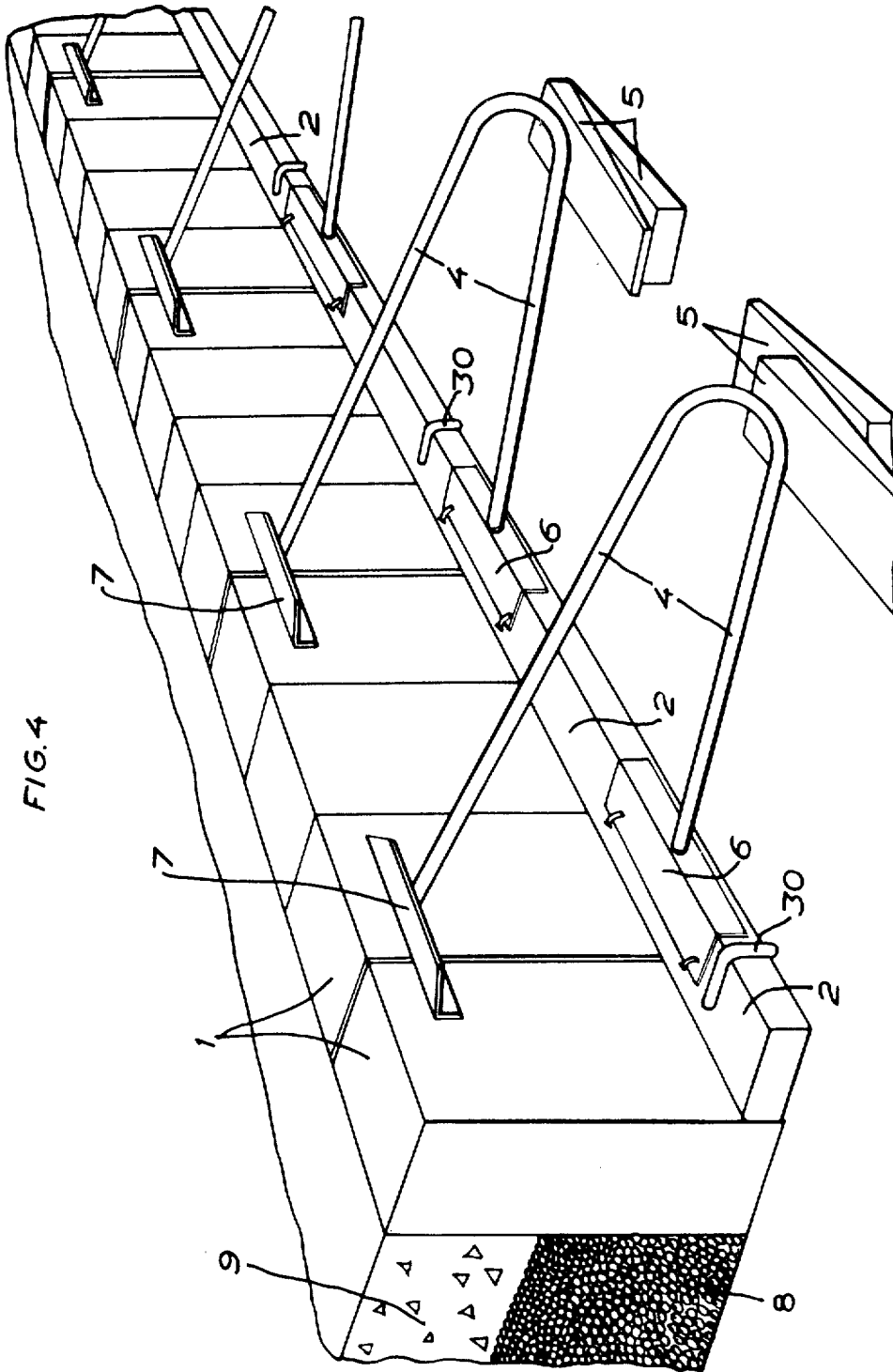
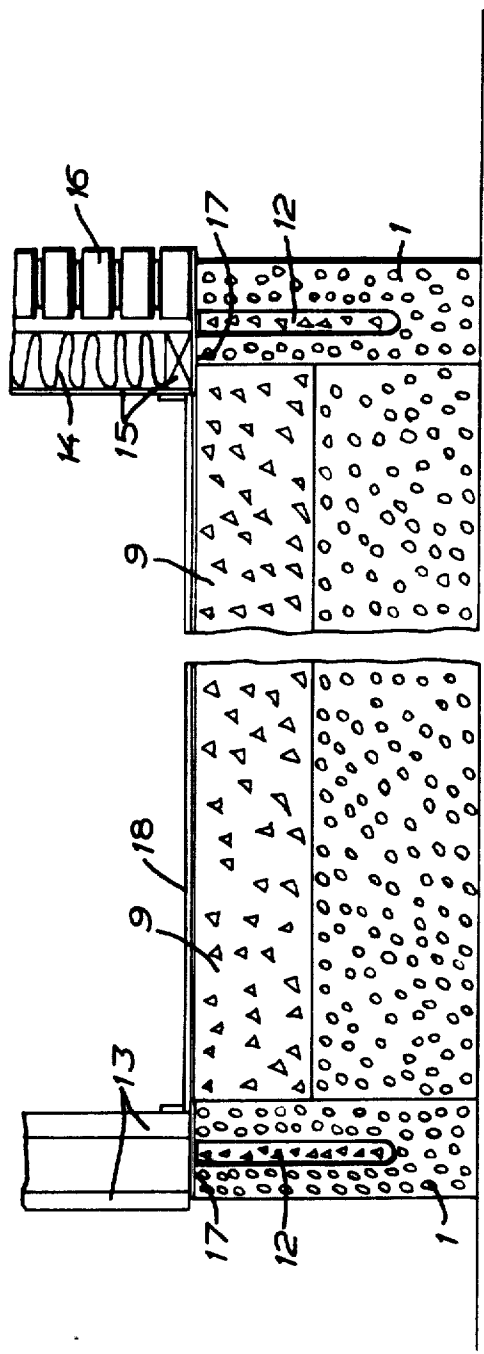
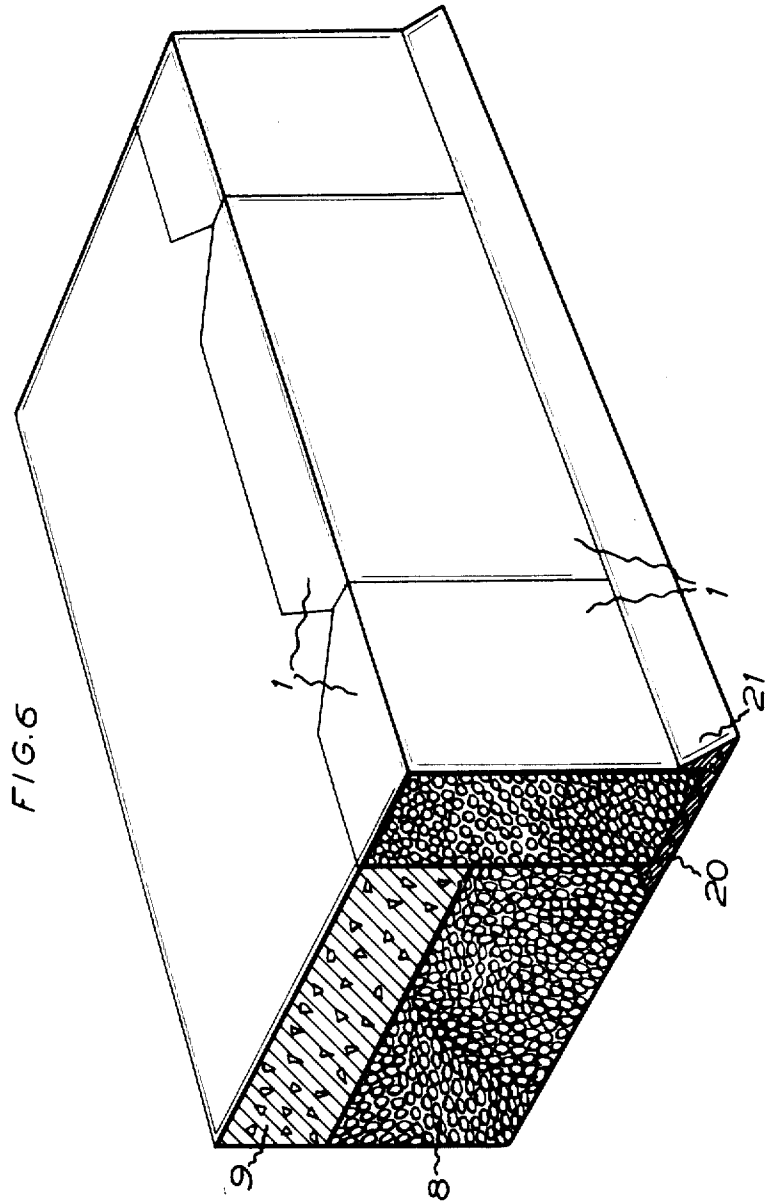


FIG. 5





BOTTOM FOR BUILDINGS WITHOUT BASEMENT, AND A METHOD OF MAKING SUCH BOTTOM

The purpose of the present invention is to provide a far-reaching rationalization of the erection of buildings without basements and to conduct this rationalization as far as possible with due consideration of the usual requirements as to the heat and moisture insulation of the bottoms of buildings of this type. In other words, the invention has for one of its objects to provide, notwithstanding the far-reaching rationalization, a fully reliable and sufficiently strong bottom for buildings without basement.

Characteristic of the bottom according to the present invention is that it is founded on soil from which only the humus layer has been removed and which has been levelled and possibly also compacted, and comprises the following parts: a foundation wall of prefabricated heat and moisture insulating blocks following in the plane the extension of the outer walls of the building to be erected and suited to support said outer walls, the heat and moisture insulating blocks being placed in juxtaposition on the soil and having the same height as the foundation wall; a heat and moisture insulating layer of grains of burnt expanded clay laid within the confines of the foundation wall directly on the soil from which only the humus layer has been removed and which has been levelled; and a layer of steel reinforced concrete cast in situ on top of said heat and moisture insulating layer using the foundation as a form side wall, whereby said layer will become integral with said foundation wall and reinforce it, said layer of reinforced steel concrete being suited as a direct support for the flooring of the building. A bottom of the type defined is attained only if all the requirements stipulated are satisfied at the same time.

The invention will be more fully described in the following, reference being had to the accompanying drawings in which FIGS. 1-5 illustrate one embodiment of the invention and FIG. 6 illustrates another embodiment of the invention.

In the drawings:

FIG. 1 is a cross section, taken at right angles to the longitudinal direction of the foundation, of one of the heat and moisture insulating blocks utilized for erection of the foundation wall;

FIG. 2 is a section on line II-II in FIG. 1, of some of the blocks placed in juxtaposition for erection of said foundation wall;

FIG. 3 is a vertical cross section of the foundation wall and the adjoining portions of the building bottom as well as the aids exploited in erecting the foundation wall and supporting it during the making of the building bottom;

FIG. 4 is a perspective view of part of the foundation wall and the adjoining portions of the building bottom as well as the aids exploited in erecting the foundation wall and supporting it during the work phases to be carried out after the erection of the foundation for making the building bottom;

FIG. 5 is a fragmentary vertical section of the finished building bottom;

FIG. 6 is a perspective view and section of parts of another embodiment of the building bottom.

The nature of the bottom suggested by the present invention for buildings without basement will appear from the following description of the method of making such bottom. The first phase of the making of the bottom comprises prefabricating the heat and moisture insulating blocks 1 to be used for the erection of the foundation wall. As their designation is intended to express, these blocks shall have a considerably higher combined heat and moisture insulating capacity than building blocks of steel reinforced concrete and also conventional light-weight concrete. Particularly advantageous for the purpose of the invention both from an economical viewpoint and the viewpoint of heat and moisture insulation are blocks of so-called light-weight clinker concrete. By the expression "blocks of light-weight clinker concrete" is to be understood primarily grains or crushed pieces of burnt expanded clay, for instance the material known and commercially available under the trade mark "LECA." Such grains are produced

from selected clay which with the admixture of organic material has been burnt to initial sintering in a rotary kiln and which as a result of the admixture of the organic material effected prior to burning and as a result of the burning being carried out in a rotary kiln displays a blistry structure (mainly closed cells) as distinct from a porous structure (open cells). This material is known to have favorable properties as a heat insulating material, to possess a heat insulation capacity which is relatively insignificantly deteriorated by moisture, and to have a relatively small tendency of absorbing and conducting moisture. Thus, this material is a "capillary breaking" material. Light-weight clinker concrete having light-weight "LECA" clinker as an aggregate is likewise known to possess much of the favorable moisture and heat insulating properties of the "LECA" material.

Upon erection of a building without basement in accordance with the present invention, the excavating work can be restricted, without detriment to a satisfactory heat and moisture insulation of the building in relation to the soil, to the removal of the humus layer (in most cases to a depth of only one or two decimeters) from the soil beneath and in the immediate environment of the building to be erected. An excavation to a greater depth for accommodating the conventional gravel layers that break the capillary force thus is not required, nor is an excavation to a frost-free depth. The soil from which the humus layer has been removed is then levelled by equalization of height differences, and, if necessary, the soil and the filled-out low points can be compacted. The levelling may be carried out by placing a thin cement or concrete layer directly on the soil as in the embodiment shown in FIG. 6.

In the embodiment shown in FIGS. 1-5 wooden laths 2 are placed on the soil from which the humus layer has been removed and which has been levelled, said wooden laths serving as supporting and aligning means at the placing of the heat and moisture insulating light-weight clinker blocks 1 constituting the foundation wall. These supports and the aligning means are laid outside and along the outer contours of the plan of the building to be erected and are suitably secured in position by soil nails (nails having bent upper hook-shaped ends, which are driven into the soil) as will appear from FIG. 4.

In the embodiment shown in FIGS. 1-5 the prefabricated light-weight clinker concrete blocks 1 have an upwardly open U-shaped groove in their top surface. The blocks 1 are placed with this groove facing upwardly along the wooden laths 2 in application against the side of said laths. As a result, an upwardly open channel 3 will be formed, which extends throughout the length of the foundation wall. The juxtaposed blocks 1 are supported on the outer side also by tubular V-shaped elements 4 which have one arm secured to the laths 2 and the other arm applied against the outer sides of the blocks 1 constituting the foundation wall. The tubular V-shaped elements 4 are adjustably blocked up by means of wooden wedges 5, as will appear from FIG. 4. Preferably, the V-shaped elements 4 are provided at their arm ends with angle-iron pieces 6, 7 welded thereto. The pieces 6 have nail holes to permit provisionally nailing them to the lath 2 as will appear from FIG. 4.

When all the blocks 1 necessary for the foundation wall have been put in position a heat and moisture insulating layer 8 of grains or pellets of burnt expanded clay, preferably "LECA" pellets or grains, is spread on the soil within the confines of the foundation wall. These pellets or grains may suitably have a grain size of 8-16 mm. The grains of burnt expanded clay can be loosely spread within the foundation wall, but it is also possible to have the heat and moisture insulating layer 8 in the form of a bonded layer of grains of burnt expanded clay. In the last-mentioned case the grains of burnt expanded clay shall only be coated with a binder, for instance a cement slurry or possibly a bituminous binder, so that the communicating passageways between the individual grains are not clogged by the binder. The heat and moisture insulating layer 8 may suitably be slightly compacted on spreading.

A layer 9 of steel reinforced concrete suited as a direct support for a flooring is then cast in situ on top of the heat and moisture insulating layer 8, the foundation wall formed by the blocks 1 being exploited as form side walls. The concrete layer 9 will thus become integral with and thereby strengthen the foundation wall. At the casting a particularly careful vibration should suitably be effected in the area closest to the foundation wall.

In the embodiment shown in FIGS. 1-5, prior to casting the concrete layer 9, reinforcing rods 10 serving as longitudinal reinforcement have been disposed in the upwardly open channel 3 in the foundation wall. Also, reinforcing rods 11, preferably in the form of frames embracing the longitudinal reinforcement 10, have been arranged so as to extend through the joints between the blocks 1 into the space accommodating the concrete layer 9. As a result, said reinforcing rods 11 will be embedded in the concrete layer 9 at the casting thereof. Prior to, simultaneously as or after the casting of the concrete layer 9, concrete 12 is poured into the channel 3 for embedding the reinforcing rods 10, 11 in the foundation wall. This will firmly anchor the foundation wall to the concrete layer 9 by means of the reinforcing rods 11 arranged in the joints between the blocks 1. After the concrete layer has set or hardened the aids utilized for externally supporting the foundation wall are removed. They can then be utilized for the erection of another building.

As will appear from FIG. 5, the foundation wall formed by the blocks 1 can be utilized as a support for the outer walls of the building, after the concrete has set. Thus there is shown in the left-hand portion of FIG. 5 an outer wall of prefabricated concrete elements 13 erected on the foundation wall with the interposition of insulating board 17, while the right-hand portion of FIG. 5 shows an outer wall consisting of an internal lath work 15 containing a heat insulation 14, and an external coat 16 of facade bricks. This outer wall is also placed on the foundation wall with the interposition of a moisture insulation. A building bottom constructed in accordance with the invention is suitable not only for one-storied buildings but also for multistoried buildings.

The heat and moisture insulating layer 8 and the concrete layer 9 cast in situ on the layer 8 have a sufficient supporting ability to permit supporting the partitions of the building which are usually constructed as light-weight walls. FIG. 5 also shows the exploitation of the concrete layer 9 as a direct support for a flooring 18 of parquet, linoleum, asbestos polyvinyl chloride boards or the like.

In the embodiment of the invention described in the foregoing with reference to FIGS. 1-5 the V-shaped elements and wooden laths have been used for fixation and supporting the prefabricated heat and moisture insulating blocks constituting the foundation wall, during the casting in situ of the layer of steel reinforced concrete. In the embodiment of the invention illustrated in FIGS. 1-5 a longitudinal reinforcement has also been arranged in the blocks constituting the foundation wall, and this longitudinal reinforcement has been connected with the layer of steel reinforced concrete with the aid of frame means.

However, the construction of the bottom of the building without basement can also be further rationalized in that the longitudinal reinforcement and the frame means as well as the supporting structures can be dispensed with if the bottom is designed and made in accordance with what is described below in connection with the embodiment of the invention illustrated in FIG. 6.

As will appear from FIG. 6 the bottom comprises prefabricated heat and moisture insulating blocks 1 which preferably consist of light-weight clinker concrete blocks. Within the blocks 1 there have been arranged a heat and moisture insulating layer 8 of grains or pellets of burnt expanded clay which is placed on the soil from which only the humus layer has been removed and which has been levelled and possibly also compacted, and on top of said layer 8 a layer 9 of steel reinforced concrete cast in situ with the use of the

blocks 1 as a form side wall, whereby said layer 9 becomes integral with the foundation wall thus reinforcing it. The embodiment shown in FIG. 6 differs from that shown in FIGS. 1-5 in that at least the final levelling of the soil from which the humus layer has been removed is realized within the area of the extension of the foundation wall by placing on the soil a thin cement or concrete layer 20 as a planar support for the prefabricated heat and moisture insulating blocks 1. To fully exploit said cement or concrete levelling layer 20 the prefabricated blocks 1 should preferably be placed on the levelling layer 20 while this layer is still moist and capable of bonding with the heat and moisture insulating blocks to be united with them after setting and hardening.

A still better support for and anchoring of the prefabricated blocks constituting the foundation wall is realized by providing, as shown in FIG. 6, along the foundation wall and extending over but part of the height thereof a projecting longitudinal anchoring means or moulding 21 which is made integral with and of the same material as the levelling layer 20. Said moulding 21 should be cast at least on the outer side of the foundation wall, but it is preferred to provide such a moulding on each side of the foundation wall, as is shown in the drawing. In certain cases and particularly when the foundation wall has to carry great loads it is advantageous from the viewpoint of strength to embed one or more longitudinal reinforcing rods in said moulding 21. This reinforcement can also serve to take up temperature strains from the outer wall. After the cement levelling layer 20 and the moulding or mouldings 21 have set the distribution of the heat and moisture insulating layer 8 consisting of grains or pellets of burnt expanded clay is commenced, whereupon the layer 9 of steel reinforced concrete is cast with the use of the foundation wall as a form side wall. At the casting of said layer 9 one should in order to realize as good a bond as possible between the prefabricated blocks 1 and the layer 9, thoroughly vibrate the concrete at least in the area adjacent the foundation wall so that the concrete penetrates into the prefabricated blocks thereby providing not only a chemical bond but also a mechanical bond between said blocks and the layer 9 of steel concrete. To increase the contact surface between the layer 9 and the prefabricated blocks 1 the latter should preferably be designed in the manner shown in FIG. 6, that is the facing end surfaces of the prefabricated heat and moisture insulating blocks should be bevelled at the edge facing inwardly towards the layer 9 of steel concrete. If the mouldings 21 have been reinforced the reinforcement therein contributes to transferring loads to the concrete bottom.

The mouldings 21 should preferably extend 40-100 mm outwardly from the foundation wall and in an upward direction along it, 70 mm being preferred for both of these two dimensions.

When the bottom of a building without basement is constructed in accordance with what is shown in FIG. 6 there arises so strong a bond between the layer 9 of steel concrete and the prefabricated blocks 1 that the foundation wall can be regarded as an integral part of the layer of steel concrete, whereby the building will settle almost to the same extent within all portions thereof when the ground consolidates. By reason of said strong bond between the blocks 1 and the layer 9 of steel concrete the heat insulating foundation wall can very well be loaded with 3 metric tons/running meter since the tensile strength as a rule is 6-9 metric tons/running meter. A load of 3 metric tons/running meter approximately corresponds to that provided by a non-supporting wall of a six-storied building.

It may be mentioned as an example of how far it has been possible to conduct the rationalization according to the present invention that a bottom for a building without basement having the outer dimensions of 10 x 60 meters can be finished in 8-10 days when the bottom is made in accordance with FIG. 6, whereas about 3 weeks are required for finishing a continuous slab footing constructed in the conventional manner. On making a bottom designed in accordance with FIG. 6 and having the above-mentioned dimensions the time

consumed for the various working phases is as follows: removal of humus layer and rough levelling, 2 days; fine levelling by means of a cement or concrete layer, placing prefabricated light-weight clinker concrete blocks and casting the mouldings of cement or concrete layer, 2 days; laying the heat and moisture insulating layer of grains or pellets of burnt expanded clay within the confines of the foundation wall (material consumption about 60 cu.m. of grains of burnt expanded clay), 1 day; placing a reinforcement (grid reinforcement) for the layer of steel concrete cast in situ, about 1 to 1 1/2 days; casting the layer of steel reinforced concrete and grinding thereof for permitting laying the flooring directly on the concrete layer, 2 days. On making a bottom designed in accordance with FIG. 6 for a detached house of 135 sq.m. it is actually possible to finish the bottom in about 8 work hours, a pause being made overnight after the prefabricated blocks have been placed and the mouldings have been cast to permit setting of the cement or concrete levelling layer so that the prefabricated heat and moisture insulating blocks are anchored therein before the remaining work phases are carried out.

We claim:

1. In a building without basement founded on soil from which only the humus layer has been removed and which has been levelled, a bottom comprising prefabricated heat and moisture insulating light weight clinker concrete blocks, said blocks having the same height as said bottom and placed in juxtaposition on the soil so as to follow in the plane the extension of the outer walls of the building; a heat and moisture insulating layer of pellets of burnt expanded clay, said insulating layer being placed within the confines of the row of said blocks on the soil from which only the humus layer has been removed; and a layer of steel reinforced concrete formed by being cast directly on top of said heat and moisture insulating layer using said blocks as a form side wall and being integral with said blocks.
2. In the building according to claim 1 including levelling means for levelling the soil beneath said blocks, consisting of a thin layer of concrete.
3. In a building according to claim 2 including longitudinal anchoring means along at least the inner side of said blocks; said longitudinal anchoring means being formed integral with said levelling means and extending a short distance in an upward direction on said blocks.
4. In a building according to claim 1 wherein said heat and moisture insulating blocks at their facing end surfaces are bevelled at their vertical edges facing said steel reinforced concrete layer.
5. In a building without basement founded on soil from which the humus layer has been removed and which has been leveled, a bottom comprising prefabricated heat and moisture

insulating light weight clinker concrete blocks, said blocks having the same height as said bottom and placed in juxtaposition on the soil so as to follow in the plane the extension of the outer walls of said building; a heat and moisture insulating layer of pellets of burnt expanded clay, said insulating layer being placed within the confines of the row of said blocks; levelling means for levelling the soil beneath said blocks, said levelling means comprising a thin layer of concrete; longitudinal anchoring means along at least the inner side of said blocks, said anchoring means being formed integral with said levelling means and extending a short distance in an upward direction on said blocks, and a layer of steel reinforced concrete formed by casting said concrete directly on top of said heat and moisture insulating layer using said blocks as side walls and being integral with said blocks.

6. In a method for constructing buildings without basements the improvement which comprises forming a foundation by the steps comprising:

- A. removing only the humus layer from the ground;
 - B. levelling said ground;
 - C. placing on said ground in juxtaposition prefabricated heat and moisture insulating light-weight clinker concrete blocks;
 - D. forming a peripheral row of said blocks following in the plane the extension of the outer walls of the building to be erected;
 - E. placing longitudinal anchoring means along at least the inner side of the row of said blocks with said anchoring means also extending upwardly on said blocks;
 - F. placing a heat and moisture insulating layer of pellets of burnt expanded clay on the ground within said row of blocks;
 - G. casting in situ a layer of steel reinforced concrete directly on top of said heat and moisture insulating layer whereby said row of blocks forms a side wall;
 - H. integrally uniting said concrete layer with said blocks, and then
 - I. erecting said building whereby the outer wall of said building is supported by said row of blocks.
7. The method according to claim 6 wherein said longitudinal anchoring means is placed along at least the inner side of the row of said blocks and is formed integral with, and of the same material as said levelling means, and extending said longitudinal anchoring means also a short distance in an upward direction on said blocks.
8. The method according to claim 6 wherein said step of integrally uniting said steel reinforced concrete layer with said blocks comprises bevelling said heat and moisture insulating blocks at their facing end surfaces at the vertical edge facing said steel reinforced concrete layer.

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