

PATENT SPECIFICATION

DRAWINGS ATTACHED

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COMPLETE SPECIFICATION

Improvements relating to Building Construction

I, EDWARD T. DICKER, a citizen of the United States of America, of 2600 Fairmount Street, Dallas, Texas 75201, United States of America, do hereby declare the invention, for which I pray that a patent may be granted to me, and the method by which it is to be performed, to be particularly described in and by the following statement:—

10 This invention relates to a method of construction for walls, buildings and like structures and to a construction built by the method according to the invention.

15 In a method of construction according to the present invention separate units in the form of porous containers containing a dry concrete mixture are arranged in a course or courses on a cast concrete foundation and wetted so that the mixture in the units sets to form an integrated structure.

20 The term "dry concrete mixture" means in this specification a dry mixture in particulate form, which, when liquid is added, sets rigid. Thus dry mixture of gravel, sand and cement is one example of a dry concrete mixture.

25 Preferably the courses are superimposed. The units may be arranged in close proximity to one another along each course, and may be wetted individually.

30 The structure may include reinforcing members which may be arranged to interconnect adjacent units in the same or adjacent course, the reinforcing members conveniently being in the form of rods. In one method the rods may be driven through superimposed units to extend into the units in an underlying course.

40 The concrete foundation may be laid in a trench to form a concrete beam, in which case the construction units may be arranged in close proximity in superimposed courses on the concrete beam to form an integrated

wall structure, and a roof structure may be mounted on top of the wall structure. When a concrete beam is used reinforcing members (preferably of steel) may be inserted in the concrete beam so as to project upwardly from it and the construction units on the first course impaled upon reinforcing members. Additional reinforcing members may be arranged to connect adjacent units in succeeding courses.

45 When the mixture comprises gravel, sand and cement and the wetting is effected by water, the amount of water added is sufficient only to wet the cement so that there is only a predetermined minimum amount of slump in the unit.

50 A coating of concrete in the wet state may be applied to a course or courses to penetrate the voids and key thereto to form a continuous coating. Alternatively or in addition a coating of finishing material may be applied to the course or courses.

55 The invention may be carried into practice in various ways and one specific embodiment, together with various modifications thereof, will now be described by way of example with reference to the accompanying drawings, in which:—

60 Figure 1 is a perspective view of one of the construction for use in the present invention, with part of the container shown broken away to illustrate the dry concrete mixture.

65 Figure 2 is a perspective view of a building structure in the process of construction using units shown in Figure 1.

70 Figure 3 is a perspective view of a building unit of different dimensions prepared by putting less premixed material into the porous sack;

75 Figure 4 is a fragmentary, side elevational view in section of a wall structure showing the details of construction thereof, including

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a concrete supporting beam and roof structure;

Figure 5 is a fragmentary, end elevational view in section of a wall structure illustrating a finishing material such as sprayed concrete applied to the two sides of the wall;

Figure 6 is a perspective view of a reinforcing and connecting device that can be employed with the construction units;

Figure 7 is a fragmentary, side elevational view in section of a wall structure employing the device shown in Figure 6;

Figure 8 is a fragmentary, side elevational view in section of a wall structure employing horizontal steel reinforcing rods; and

Figure 9 is a perspective view, partly broken away showing a construction unit packaged in a water repellant bag.

A preferred embodiment of a discrete building unit is shown in Figure 1 and comprises a porous sack 10 within which is contained a dry mixture 12 of sand, aggregate and cement as shown exposed in the broken away portion. The contents are premixed in the proper ratios to result in the desired structural strength when activated by water to set up in a hardened form. Although the sack can be tied off at its open end after filling, this usually unnecessary and mere lapping the open end 14 over to form a flap 16 is sufficient. The sack has pores 11, such as burlap, so that application of an amount of water to the surface of the sack is effective to permit the water to penetrate the contents to activate them to form concrete.

The sack can be of any size and shape to form the desired construction unit. As will be seen hereinafter, the flexible sack and the ability to control the amount of contents in any one sack lend themselves to facilitating construction when the sizes of the units need to be varied. This eliminates the equivalent of breaking concrete blocks and bricks in conventional construction techniques at termination points. The sack can be constituted of many different materials such as burlap, cheesecloth or other suitable fabrics, just to mention a few. Moreover, the sack can also comprise moisture absorbent pulp products, such as paper, in addition to others.

As already stated, the material with which the sack is filled is for most construction purposes, a dry, premixture of sand, aggregate and cement which forms concrete when activated with water. However, there are cases where other construction compositions are desirable or preferred. To mention a few, rock, dirt, mud, clay, straw, sawdust, paper and combinations thereof included with a suitable cement are contemplated, in addition to others that will occur to those skilled in construction materials.

A fragmentary perspective view of a

building constructed according to the invention is shown in Figure 2. A trench 20 is excavated in the earth 22 to correspond to both the outside and inside walls of the structure to be built. Concrete is then poured into the trench to approximately ground level for most purposes to form concrete beam 24. This wall foundation can also be poured, where necessary, to a level above that of ground level by piling up the dirt removed from the trench at the edge of the trench. Pouring concrete in a trench eliminates the necessity for concrete forms for foundations so that skilled labor need not be employed. A concrete slab foundation is also poured between the beams as will be described later with reference to Figure 5.

Detailed steps of the preferred process for laying the various horizontal courses of superimposed construction units will be described in conjunction with Figure 4, although reference to Figure 2 illustrate the appearance of the construction. The construction units 10 are laid on top of the concrete beam 24 in juxtaposed relations, or in end to end relation, until a first horizontal course is laid along the length of one wall, or along the length of all of the walls as the case may be. The construction units are laid on the concrete beam preferably with the folded lap 16 of the open end of the sack contained between the construction unit and the concrete beam. An amount of water is then added or poured onto the top of the first horizontal course of construction units in sufficient quantity to activate the dry premixture material throughout the construction unit. This water can be added by any suitable means or method, such as by pouring the water on top of the construction units from any suitable container. The amount of water that is applied is not in an amount great enough, however, to allow more than a predetermined minimum "slump" in the construction units when wetted, wherein the term "slump" is well understood in the concrete construction business and very generally means that the concrete when activated will slump to some extent and tend to spread out. This predetermined amount of slump is detected visually by the worker and is limited to an extent which can be initially detected visually.

After the first course of construction units have been laid, another course is laid on top thereof in superimposed relation, also in juxtaposed positions, and wherein the units are staggered in relation to the underlying units such as is done when laying brick. This horizontal course is also wetted after laying to activate the dry premixture therein. The result of wetting the construction units, as noted above, activates the cement in the dry premixture to set up as concrete with the sand and aggregate. Since the sacks are

porous, this permits the "latents" of the concrete i.e. the fine particles of the cement suspended in the above when the cement, sand and water are mixed to permeate the sacks so that the superimposed courses will be bound together as will adjacent units in the same course. The first course is also bound to the concrete beam 24. All of this forms an integrated, concrete structure.

10 The successive superimposed courses are laid one on top of the other until a height is reached at which it is desirable, in the preferred embodiment of the method of the invention, to apply a coating of a reinforcing material on either or both the inside and outside surfaces of the wall structure. Such a coating can take the form of concrete applied to the surfaces by any suitable means, such as by spraying. By spraying an initial coating of concrete on the surfaces of the wall structure, the wall structure is reinforced and strengthened to more nearly hold the desired vertical shape, wherein more detail on the coating will be described later.

25 Additional horizontal courses of courses are laid until the height is reached at which windows are to be installed. A suitable window frame 32 is installed directly on top of a horizontal course of the construction units and secured thereto by any suitable bolts inserted in the construction units. It will be understood that the construction units are also built up around the sides of the window frame and wetted to activate them as each course is laid. The bolts holding the window frame are secured within the construction units when the construction units set up to a hardened state and, in addition, the concrete seals to the window frame to further secure it. It will be understood that suitable openings are left for doors, and door frames are installed in a similar fashion. Concrete coatings are applied to the surfaces of the wall structure as the wall height progresses, and when the desired height of the wall is reached, a roof structure is installed as will be described hereinafter in conjunction with Figure 4.

50 The flexible sacks in which the dry premixture is contained and the characteristic of the dry premixture to conform to any shape lend themselves to the prepackaging of construction units of any desired shape and size. For example, it is preferable to employ a smaller sized construction unit to fit into spaces adjacent door jams, window frames and other spaces where space does not permit the utilization of one of the more standard size units. A construction unit 40 of reduced size is shown in the perspective view of Figure 3 in which a smaller amount of the dry premixture is placed in a standard size sack and a flap 44 at the open end 42 is folded over. This essentially provides a shorter construction unit. It will also be

stated that the thickness or width of the construction unit can be varied as desired by flattening out the sack accordingly. It will also be apparent that some of the fill within the sack can be removed at will by the construction worker on the site when a variation in the size of the unit is required. This can be performed immediately by the worker on the unit with which he is presently working without stopping his labor and retrieving a unit of different size.

A more detailed illustration of the method of construction is shown in the fragmentary, side elevational view in section of Figure 4, wherein there is shown the concrete beam 24 poured into a trench 20 excavated in the earth 22. In the preferred method of construction, steel reinforcing bars or rods are inserted in the construction units to interconnect adjacent units to form a greatly strengthened and integrated structure when set up. According to this method, steel reinforcing rods 50 are inserted in the concrete beam before the latter sets to provide a structural tie to the first course of construction units. After the concrete beam has set, the first course of construction units are impaled on the steel reinforcing rods, wherein the latter are so spaced that a pair of the reinforcing rods are inserted in the construction unit adjacent the opposing ends thereof. This course of construction units is then wetted to activate the mixture to form a structural tie or bond by means of the concrete setting up around the steel reinforcing rods. The "latents" of the wetted mixture also permeates the sacks to form a bond with the concrete beam. It will be remarked that there is no necessity in waiting until the first course of construction units has set up before the second course, is superimposed thereon. Thus the second course is laid in staggered relation, as shown, on the first course in juxtaposed positions. As they are laid, another pair of steel reinforcing rods 54 and 56 are inserted through each construction unit adjacent the opposite ends thereof and are sufficient length to penetrate the adjacent construction units immediately therebeneath and across which the construction units span. This course is then wetted to activate the mixture, and a third course is laid on top of the second employing reinforcing rods as described. Units of the third course are connected to immediately underlying units of the second course through steel reinforcing rods 58 and 60 penetrating the construction units over which it spans. It will then be seen that each construction unit is tied to four other adjacent construction units through steel reinforcing rods 54, 56, 58 and 60, in addition to which, each unit is also structurally bound to the two opposite adjacent units in the same course by means of the concrete "latents"

permeating the sack and binding to these units. Although it is preferable to wet each course as it is laid, several or all of the courses can be wet simultaneously after being laid in the dry condition by applying water to the surfaces of the wall, such as by spraying.

The superimposed courses of the construction units are laid until the desired height of the wall is attained. At this level, bolts 64 are inserted in predetermined spaced apart units in the top course. These bolts are threaded on their top ends and are left protruding above the top course. A suitable top plate 66 having holes drilled therein corresponding to the bolts 64 is seated over the bolts, and suitable nuts 68 or other suitable fastening means, are employed to secure the top plate to the top course. This provides the means by which the roof structure can be added and secured to the building. The roof structure can be of any suitable or conventional construction, such as that comprising roof joists 70 secured to the top plate by conventional means and which span between the walls of the building. Thereafter, a conventional roof 72 can be applied to the top of the roof joists. Of course, other roof constructions can be employed.

Some of the more important features of the preferred construction method being described will be noted. The characteristic of the flexible sack and its contents to conform to the surface on which it is laid to form an integral part of a course, both in the dry state and especially in the wetted condition, is of considerable importance. By so conforming, no stress points or lines are introduced in the structure between adjacent units when the structure sets up in a hardened form as is so often the case of conventional masonry units which are inflexible. No mortar is used that is invariably of a different material than that of the masonry units with which it is employed, which eliminates weaknesses due to mismatching materials. Since no mortar is used, water cannot be absorbed therefrom by the construction units which is a typical cause of weak joints. In the present method, concrete is bound to concrete in an integrated structure but without the necessity of using concrete forms. The steel reinforcing rods serve to secure adjacent construction units together to greatly increase the strength of the structure. In the preferred practice of the invention, the sacks are porous enough to permit the penetration by water and by the "latents" or wetted "fines" of the mixture, but not so porous to allow the wetted mixture as concrete to penetrate to any great extent. Therefore, the reinforcing rods, or other suitable means, are employed as a structural means to which the concrete is secured and by which adjacent units are secured together.

A fragmentary, end elevational view in section of a wall structure is shown in Figure 5 which illustrates the additional reinforcing and finishing material added to the surfaces of the wall structure and the details of a 70 slab foundation. This figure shows the concrete beam 24 poured to ground level and usually includes therein suitable steel reinforcing means (not shown). Since the first course of the wall structure is laid after 75 the concrete beam is set up, a "cold" joint 74 is formed between this course and the beam. The steel reinforcing rods 50 serve to secure the wall structure to the beam with sufficient structural strength. A concrete slab 80 is poured between beams by preferably providing a dirt fill 78 of greater elevation between the beams and pouring the concrete over the fill to the desired thickness. This is done after at least a sufficient number of 85 wall courses have been laid to provide a form 82 against which the slab can be poured. It will be seen that the concrete beam 24 is preferably wider than the construction units to provide a base or surface 75 the 90 width of which the outside surfacing material fills and a base surface 76 on which the slab foundation is partially supported. The slab can also be poured after completion of the courses. It will be seen that another 95 cold joint is formed between the concrete beam 24 and the slab surface 76 which is desirable, since shifting of the slab foundation does not tend to crack or weaken the wall structures, or at least minimizes this 100 effect.

Additional reinforcing and surfacing material will be unnecessary in some instances, although it is preferred in the construction of homes and other similar buildings to serve the multiple purposes of an additional reinforcing means, a surface finishing means, and a layer beneath which there can be contained pipes and electrical conduits to provide utilities to the building. As already noted in conjunction with Figure 2, additional reinforcing of the wall structure is achieved by applying an initial coating of concrete sprayed onto the surfaces of the wall structure at various successive heights 115 during construction. This initial coating is denoted by numeral 30 in Figure 5. It will be understood that this coating also serves to fill any holes, cracks or crevices that exist between concrete units to seal the wall. 120 Another important aspect is to be noted here. Since there will be some voids between the construction units 10, the concrete sprayed onto the surfaces will fill these voids so as to "key" into the walls as structural members themselves to strengthen the wall structure. Since the sacks are also porous and expose the concrete therein, the surfacing material preferably concrete, is bonded directly thereto and keys to the sacks them- 130

selves. The rough surface of the sacks facilitates this bonding process. In addition, the rough surface onto which the concrete is sprayed or applied and the fact that this material keys into this surface means that very little, or negligible, shear or lateral stress is present in the surface material that would tend to cause it to become loose or crack off.

10 When the wall structure is completed to the desired height with the construction units, an additional coating of concrete can be sprayed onto the surfaces to finish the wall. A coating 88 may be sprayed onto the initial

15 coating 30 on the outside wall and left in a rough, textured condition. On the inside surface of the wall, it is usually necessary to install pipes and electrical conduits against the inner surface which can be held

20 in place temporarily by wire ties 92 or other suitable means. Then, a finishing surface 94 is sprayed onto the inner surface of the wall and can be left in the rough, textured condition or leveled to a smooth surface as

25 shown in Figure 5. Any suitable means may be employed to smooth the surface, such as by screeding the surface with a level board. Colouring may be added to the concrete before spraying the wall surface, or the surfaces may be painted as a last step.

30 A reinforcing device to connect adjacent construction units in a structural manner is shown in Figure 6, and as applied in Figure 7. This device comprises an elongated steel

35 member 100 pointed on each end and having a cleft in each end medially of the sides thereof, so that the two sides of each end can be bent oppositely at 90° to the main body. Thus a pair of opposing barbs or

40 pointed members 102 and 104 are formed at one end, and similarly, a pair of opposing barbs 106 and 108 are formed at the other end. As the courses of units are laid as shown in Figure 7, one of the reinforcing

45 devices is inserted into the ends of adjacent units spanning the two units and on each top end of each unit, all as shown. The central portions of the units of the next course are impaled on the protruding barbs

50 so that the units are staggered, and additional reinforcing devices are inserted in the tops of these units as just described. Therefore, each unit is reinforced by four barbs and tied to four adjacent units as before when

55 the mixture sets in a hardened state. Additional reinforcing can be provided by pushing elongated steel reinforcing rods horizontally throughout the entire length of a course as shown in Figure 8. Here, vertical

60 reinforcing members are likewise employed, and in addition, an elongated steel reinforcing rod 112 is inserted through each unit in an entire course along one direction to form continuous reinforcement. These rods can

65 be employed at each course or, as shown,

be employed at predetermined spaced apart courses as denoted by reinforcing rod 114 to further strengthen the structure.

It will now be apparent that the construction units described herein constitute a major improvement in construction and structural methods, and that skilled labor need not be employed in the utilization thereof. Accordingly, these units are adapted for sale to the general public and others. A packaged construction unit is shown in Figure 9 which allows the unit to be shipped, displayed and transported without loss of the material contained within the porous sack and which prevents moisture in the ambient atmosphere from activating the contents. The basic construction unit is packaged in a water repellant bag similar or the same as that employed in packaging cement, and sealed by any suitable means at the open end 122 thereof, such as by stitching. Thus a prepackaged construction unit is provided which requires no molds or forms for the utilisation thereof.

In a modification it may be desirable in the construction of some structures to space apart adjacent construction units contained within one or more courses to provide a partially open construction.

WHAT I CLAIM IS:—

1. A method of construction in which separate units in the form of porous containers containing a dry concrete mixture, as herein defined, are arranged in a course or courses on a cast concrete foundation and wetted so that the mixture in the units sets to form an integrated structure.

2. A method as claimed in Claim 1 in which the courses are superimposed.

3. A method as claimed in Claim 1 or Claim 2 in which the units are arranged in close proximity to one another along each course.

4. A method as claimed in Claim 1 or Claim 2 or Claim 3 in which each of the units is wetted individually.

5. A method as claimed in any one of the preceding claims in which the structure include reinforcing members.

6. A method as claimed in any one of the preceding claims in which the reinforcing members are arranged to interconnect adjacent units in the same or adjacent courses.

7. A method as claimed in Claim 6 in which the reinforcing members are in the form of rods.

8. A method as claimed in Claim 7 in which the rods are driven through superimposed units to extend into the units in an underlying course.

9. A method as claimed in any one of the preceding claims in which the concrete slab foundation is laid in a trench and the construction units are arranged in close

selves. The rough surface of the sacks facilitates this bonding process. In addition, the rough surface onto which the concrete is sprayed or applied and the fact that this material keys into this surface means that very little, or negligible, shear or lateral stress is present in the surface material that would tend to cause it to become loose or crack off.

- 10 When the wall structure is completed to the desired height with the construction units, an additional coating of concrete can be sprayed onto the surfaces to finish the wall.
- 15 A coating 88 may be sprayed onto the initial coating 30 on the outside wall and left in a rough, textured condition. On the inside surface of the wall, it is usually necessary to install pipes and electrical conduits against the inner surface which can be held
- 20 in place temporarily by wire ties 92 or other suitable means. Then, a finishing surface 94 is sprayed onto the inner surface of the wall and can be left in the rough, textured condition or leveled to a smooth surface as shown in Figure 5. Any suitable means may be employed to smooth the surface, such as by screeding the surface with a level board.
- 25 Colouring may be added to the concrete before spraying the wall surface, or the surfaces may be painted as a last step.

- 30 A reinforcing device to connect adjacent construction units in a structural manner is shown in Figure 6, and as applied in Figure
- 35 7. This device comprises an elongated steel member 100 pointed on each end and having a cleft in each end medially of the sides thereof, so that the two sides of each end can be bent oppositely at 90° to the main body. Thus a pair of opposing barbs or
- 40 pointed members 102 and 104 are formed at one end, and similarly, a pair of opposing barbs 106 and 108 are formed at the other end. As the courses of units are laid as shown in Figure 7, one of the reinforcing
- 45 devices is inserted into the ends of adjacent units spanning the two units and on each top end of each unit, all as shown. The central portions of the units of the next course are impaled on the protruding barbs
- 50 so that the units are staggered, and additional reinforcing devices are inserted in the tops of these units as just described. Therefore, each unit is reinforced by four barbs and tied to four adjacent units as before when
- 55 the mixture sets in a hardened state.

- 60 Additional reinforcing can be provided by pushing elongated steel reinforcing rods horizontally throughout the entire length of a course as shown in Figure 8. Here, vertical reinforcing members are likewise employed, and in addition, an elongated steel reinforcing rod 112 is inserted through each unit in an entire course along one direction to form continuous reinforcement. These rods can
- 65 be employed at each course or, as shown,

be employed at predetermined spaced apart courses as denoted by reinforcing rod 114 to further strengthen the structure.

It will now be apparent that the construction units described herein constitute a major improvement in construction and structural methods, and that skilled labor need not be employed in the utilization thereof. Accordingly, these units are adapted for sale to the general public and others. A packaged construction unit is shown in Figure 9 which allows the unit to be shipped, displayed and transported without loss of the material contained within the porous sack and which prevents moisture in the ambient atmosphere from activating the contents. The basic construction unit is packaged in a water repellant bag 120 similar or the same as that employed in packaging cement, and sealed by any suitable means at the open end 122 thereof, such as by stitching. Thus a prepackaged construction unit is provided which requires no molds or forms for the utilisation thereof.

In a modification it may be desirable in the construction of some structures to space apart adjacent construction units contained within one or more courses to provide a partially open construction.

WHAT I CLAIM IS:—

1. A method of construction in which separate units in the form of porous containers containing a dry concrete mixture, as herein defined, are arranged in a course or courses on a cast concrete foundation and wetted so that the mixture in the units sets to form an integrated structure.
2. A method as claimed in Claim 1 in which the courses are superimposed.
3. A method as claimed in Claim 1 or Claim 2 in which the units are arranged in close proximity to one another along each course.
4. A method as claimed in Claim 1 or Claim 2 or Claim 3 in which each of the units is wetted individually.
5. A method as claimed in any one of the preceding claims in which the structure include reinforcing members.
6. A method as claimed in any one of the preceding claims in which the reinforcing members are arranged to interconnect adjacent units in the same or adjacent courses.
7. A method as claimed in Claim 6 in which the reinforcing members are in the form of rods.
8. A method as claimed in Claim 7 in which the rods are driven through superimposed units to extend into the units in an underlying course.
9. A method as claimed in any one of the preceding claims in which the concrete slab foundation is laid in a trench and the construction units are arranged in close



proximity in superimposed courses on the concrete slab to form an integrated wall structure.

10. A method as claimed in Claim 9 in which a roof structure is mounted on the top of the wall structure.

11. A method as claimed in Claim 9 or Claim 10 in which reinforcing members are inserted in the concrete beam to project upwardly from it and the construction units on the first course are impaled upon the reinforcing members.

12. A method as claimed in Claim 11 in which additional reinforcing members are arranged to connect adjacent units in succeeding courses.

13. A method as claimed in any one of the preceding claims in which the concrete slab foundation is poured against the wall.

14. A method as claimed in any one of the preceding claims in which the mixture comprises gravel sand and cement and the

wetting is effected by water, the amount of water being sufficient only to wet the cement so that there is only a predetermined minimum amount of slump in the unit.

15. A method as claimed in any one of the preceding claims in which a coating of concrete in the wet state is applied to a course or courses to penetrate the voids and key thereto to form a continuous coating.

16. A method as claimed in any of the preceding claims in which a coating of finishing material is applied to the surface of the course or courses.

17. A method of construction substantially as described herein with reference to the accompanying drawings.

18. A structure made by a method as claimed in any of the preceding claims.

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