

May 12, 1942.

H. W. BROWN

2,282,452

METHOD OF CONSTRUCTING THE FOUNDATIONS OF CELLARLESS HOUSES

Filed Oct. 28, 1938

2 Sheets-Sheet 1

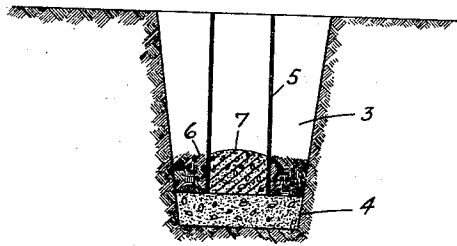


Fig. 1.

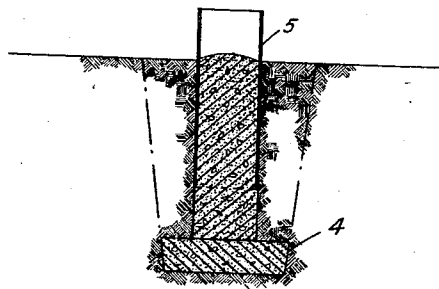


Fig. 2.

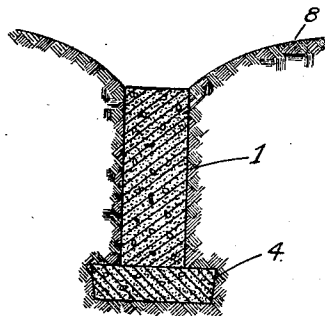


Fig. 3.

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2 Sheets-Sheet 2

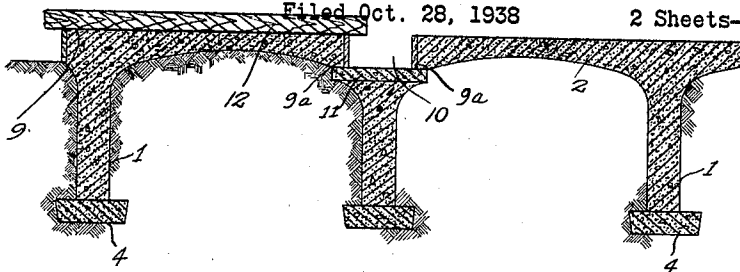


Fig. 4.

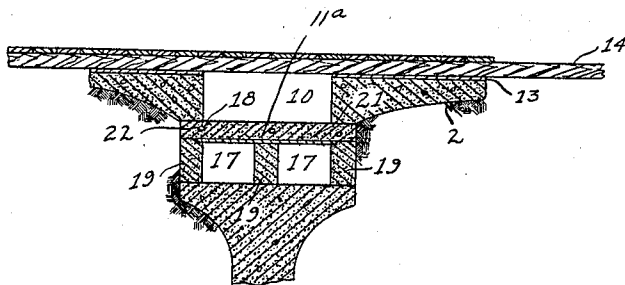


Fig. 5.

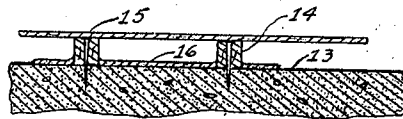
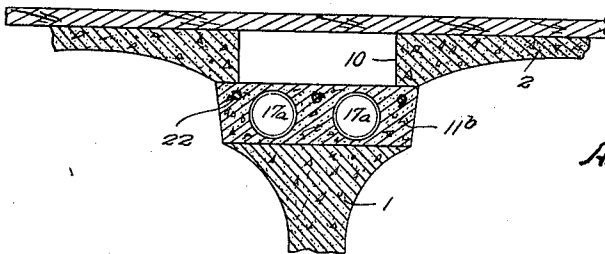


Fig. 6.

Fig. 7.



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2,282,452

METHOD OF CONSTRUCTING THE FOUNDATIONS OF CELLARLESS HOUSES

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Application October 28, 1938, Serial No. 237,451

4 Claims. (Cl. 72-77)

My invention relates to improvements in the method of laying the foundation of a cellarless air-conditioned house and to the provision of ducts therein for air conveyance and heat transfer, all to the end of producing a structure which will be simple and in large part adapted to the use of cheap labor and simple tools in its construction. To these and other ends which will appear, my invention consists in certain improvements in foundation construction which will first be described with reference to the annexed drawings and will then be specifically pointed out in the claims. It is intended that the specific form of the invention here shown and described shall be illustrative only. It may be modified in various ways within the limits set by the appended claims.

In the drawings

Figs. 1, 2 and 3 show in vertical section one of the foundation piles or piers for a cellarless house at three successive stages of its construction;

Fig. 4 shows in vertical section a portion of a completed foundation;

Fig. 5 shows in vertical section the preferred form of air-return trench having a heat economizer in the form of ducts for waste gases of combustion in the trench in heat-transfer relation to the air-return duct;

Fig. 6 is a fragmentary vertical section of the foundation and floor taken at right angles to Fig. 5; and

Fig. 7 is a sectional view similar to Fig. 5 illustrating a modification.

Referring to Figs. 1 to 4, it will be observed that the foundation comprises several concrete piers or piles 1 of sufficient length vertically to reach below the frost line and to a satisfactory bearing material, supporting and forming a monolithic structure with a concrete slab 2, whose underside is arched to render the transfer of load to the piles more efficient. A pile is made as follows: A hole 3, in the earth, at the corner or at a point along or within the perimeter of the space to be occupied by the building, is excavated to the depth just stated, the bottom of the hole being flattened to give good bearing and stability. Concrete is then poured in the bottom of the hole (Fig. 1) to give a substantial pedestal or anchor 4 say six inches in thickness. The shaft part of the pile is then formed by a method which involves the saving of concrete by limiting the diameter of the column to what is necessary, and it is not usually necessary to entirely fill the excavated hole with concrete in

order to secure a pile of the right strength. A steel cylinder 5 is placed, usually centrally, in the hole, and supported by the concrete pedestal 4. Back filling with the excavated material and tamping it around the cylinder 5 as at 6, then proceeds as the interior of the cylinder is poured with concrete 7 (Fig. 1). As the cylinder is filled it is withdrawn (Fig. 2) so that the back filling remains as a form to hold the concrete shaft in place. Back filling, concrete pouring and withdrawing of the cylinder may be continued until any desired length of pile has been made (Fig. 3).

The concrete piles 1 are spaced to give adequate support for the structure to be erected. Where load concentrations occur, as at chimneys, piles are placed directly thereunder.

The main supporting slab 2 is made by first grading the earth underlying the intended structure to the form of a series of modified groined arches 8 (Fig. 3). If the fill is kept low at the top of the piles and is then sloped to a high point midway between piles, it will provide naturally efficient arch action in the slab when poured thereon (Fig. 4), to transfer the loads of and on the slab to the supporting piles. The slab is poured directly on top of the piles and this arched fill. Because of this arching, tensile stresses in the concrete are largely eliminated, and, consequently, the need for tensile reinforcing is eliminated, or reduced. Furthermore, any settling of fill which may have been used above or around the piles, will not affect the stability of the structure; in fact, the fill could be excavated after the concrete has set, and the structure would be stable, as the earth fill is but a form for the concrete during pouring and setting.

In order to pour the main supporting slab, a form 9 is placed around the perimeter of the space to be occupied by the slab, at the desired level. Most residences require a width of such extent that an intermediate guide between these outside forms is necessary in order to insure a level slab, and it is also desirable, in an air-conditioned house to have a central return duct or trench 10 to conduct the return air to the air-conditioning plant. If this return trench is located in a reasonably central location, it will serve several purposes while construction is proceeding besides its permanent function as an air duct.

First, the forms 9a for its concrete sides will act as guides additional to the forms 9 for the pouring and leveling of the main slab 2. Second, being of some width, it enables the workman

to walk in it while leveling the main slab without walking on other recently poured concrete. The slab 11 (Fig. 4) for the bottom of the air-return trench is poured when completing the pouring of the piles 1, viz. on the day previous to the pouring of the main slab 2 so that the surface of the slab 11 is available for use of the workman working on the main slab. A bar of wood 12 of length enough to span the distance between forms 9 and 9a, is used as a straight-edge, guided by the upper edges of the forms, in leveling the surface of slab 2.

After the concrete in the main slab has set, the forms 9 and 9a are removed and the whole surface of the slab is given a coating of emulsified asphalt 13 to, (1) seal in the water in the concrete to provide good curing conditions, (2) prevent moisture from the concrete slab, or the under lying ground from penetrating upward into the house, (3) assist in holding the sleepers to the concrete by virtue of the adhesive qualities of the asphalt. Sleepers 14 (Fig. 5) are next spiked on the emulsified asphalt on top of the slab 2, as may be required for the walls, partitions, and floor finishing material. If only small stones, not over one half inch in diameter, are used in the concrete of the main slab, and if one waits until the concrete has set to just the proper point, these sleepers may be held in place by driving spikes 15 into the relatively green concrete. The proper time, after pouring the main slab, for spiking sleepers to the green concrete depends upon the proportion of cement to aggregates, the size of the aggregates, and the curing condition. The concrete must be hard enough to hold the spikes firmly in place but not so hard as to render their driving impracticable. Preferably, a second coat of emulsified asphalt 16 is then applied over the former one in the spaces between the sleepers. The combination of the original asphalt coating, the spiking to the green concrete, and the second coating with asphalt over the slab between the sleepers, has proved to be an effective method of waterproofing the slab, sealing and supporting the edges of the sleepers and holding the sleepers in place. It has also been found that sleepers are less affected by roughnesses in the concrete surface, have less tendency to roll, and consequently hold better, if they are of approximately square cross section, i. e., 2" x 2" sleepers work better than 2" x 3" or 2" x 4", and provide equally good nailing for the top or finish floor 36.

In order to extract all possible heat from the waste gases flowing from the main heating apparatus, hereinafter described, the air-return trench 10 is preferably further developed to act as an economizer by arranging in the lower part thereof a passage 17, 17, for these waste gases, so that the heat contained in them may be given up to the concrete bottom slab 18 of the air-return trench, and be taken up by the air on its way to the heater. Since these waste gases contain more or less water vapor, depending on the fuel used, provision must be made for the condensation of this vapor; consequently the gas passages in the trench must be formed by using sidewall blocks 19, which are of burned clay products or concrete, and the passages must be pitched to a drain or dry well, not shown, to evacuate condensate, even though much of the condensate remains in the form of mist. In constructing the economizer trench, it is desirable that the sides 19 of the waste gas passages be made of a poor conductor of heat, so that as

much heat as possible will be given up to the slab 11a instead of being somewhat dissipated into the fill under the main slab 2. (This heat would eventually get to the main slab, but only after a considerable amount of the surrounding fill had been heated enough to cause some flow upward to the slab.) Cinder concrete blocks have been used for the side walls 19 with satisfactory results. A sheet of cement asbestos board 21 is placed over the members 19 to act as a form for pouring the concrete slab 11a and also as an extra precaution against leakage of waste gases into the air-return duct 10. Insurance against cracks occurring in slab 11a at the joints of the sheets of cement asbestos board is provided by the continuous steel reinforcing bars 22 embedded in the slab. Since it is often desirable to operate the main heating apparatus when the air heating apparatus may not be in operation, the specific heat of slab 18 should be sufficient to absorb the available heat in the waste gases without causing a serious increase in the temperature of slab 18. Under ordinary conditions in a residence it has been found that three inches thickness for slab 18 accomplishes this result, as well as providing a secure seal against the waste gases passing into the air-return space.

An alternative method of forming an economizer trench is shown in Fig. 7. Here round pipes 17a, 17a of clay or other material are embedded in the slab 11b which forms the bottom of the air duct 10 and which may be reinforced by steel bars 22 and be poured on top of the piles 1 as already described. The pipe is not so advantageous for heat transfer as the large surface of flat slab 18 for the hottest gases to wipe against as in the previous method. Also, the pipes surrounded by concrete do not have the side insulating value of cinder block.

In both illustrative forms of the economizer trench, the waste gas passage is shown with two compartments, as it is frequently desirable to have the gases flow from the heater to one end of the house, and then return to a chimney or exhaust at the other end; the two-part passage allows for flow in opposite directions.

I claim:

1. The improvement in the art of constructing cellarless houses which consists in preparing a foundation by first excavating holes for piles, of a width greater than the diameter of the pile and of a depth to reach below frost, pouring concrete to cover the bottom of the holes and form pedestals for the piles, placing a thin metal tube as a form on the pedestals, pouring concrete in the tube, back filling around the tube and withdrawing the tube as the pouring and back filling continue and pouring a concrete slab upon the piles and the earth between them to form a monolithic foundation, comprising concrete piles supported on the earth below frost line and arches of normal, meaning thereby non-inverted, form supported on the piles.

2. A method such as set forth in claim 1 in which after the piles are poured the work of completing the foundation is proceeded with by preparing the earth surface between the piles to provide a form in the shape of modified groined arches, pouring a concrete slab over and between the piles on the uncompacted fill so that drying and settling of the fill will leave the slab out of contact with it and transfer the slab load to the piles.

3. The method set forth in claim 1, in which

after the concrete has partly hardened and while it remains in a green state, it is covered with emulsified asphalt and sleepers are laid thereon and spiked to the green concrete.

4. The method set forth in claim 1, in which after the concrete has partly hardened and while it remains in a green state it is covered with

emulsified asphalt and sleepers are laid thereon and spiked to the green concrete, and a second coat of emulsified asphalt is applied on top of the first after the sleepers are fastened in place to seal and support the edges of the sleepers.

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