Oct. 4, 1927. 1,644,572

J. V. FERRY ET AL

METHOD OF UNDERPINNING

Filed Aug. 6, 1926

Fig. 1.

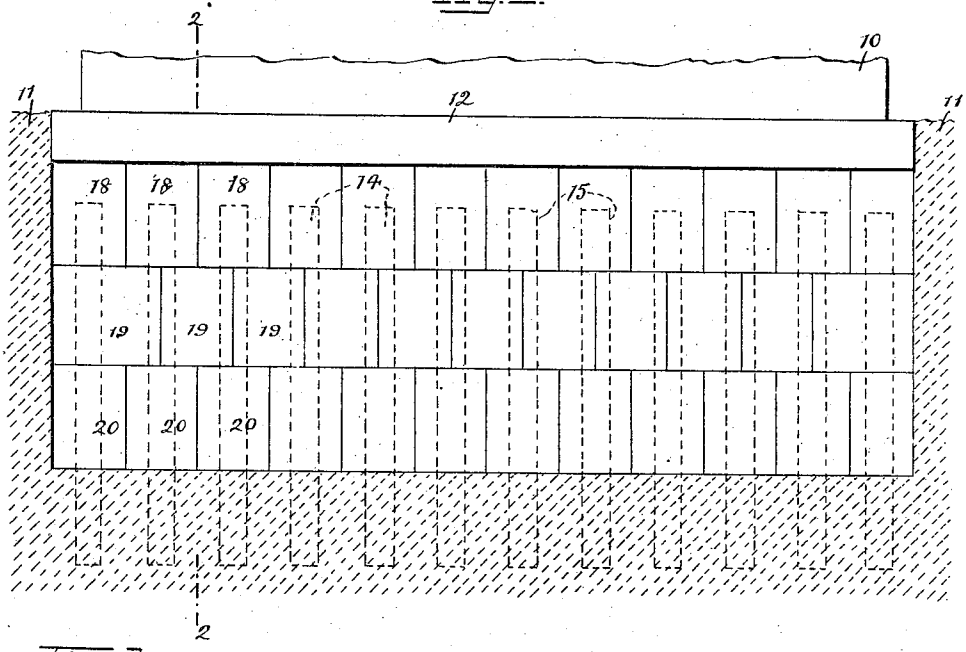


Fig. 2.

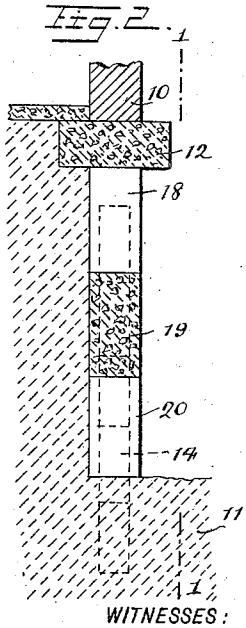


Fig. 3.

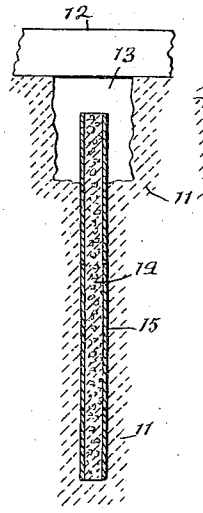


Fig. 4

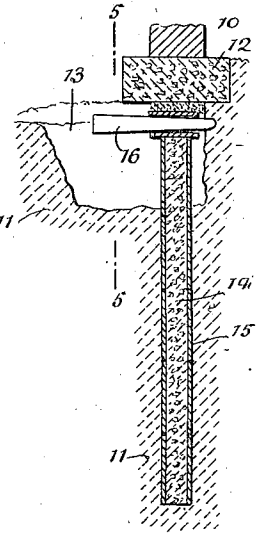
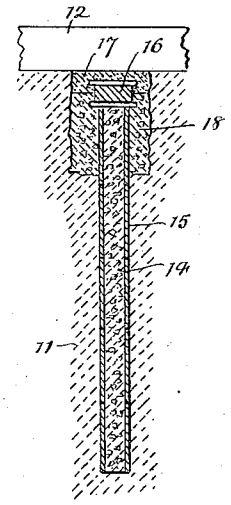


Fig. 5.



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UNITED STATES PATENT OFFICE.

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METHOD OF UNDERPINNING.

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The present invention in its broader aspects is concerned with the provision of a method of underpinning which may have a wide range of utility. More specifically however, the invention while capable of application in any type of soil, such as clay or coarse sand, finds its preferred embodiment in a method of underpinning which is peculiarly suitable for working in fine sand, such as beach sand.

When making excavations adjacent a building which is supported on beach sand, it is necessary to underpin the existing building in order to prevent the sand from running out under it during the excavation with consequent settling of the footing, both at the exterior and interior of the building. The conventional method of installing such underpinning is to excavate small sections of sand from under the outside footing, and then fill the excavations with concrete. After these concrete blocks have set, another section is underpinned in the same manner, and the process proceeds until the entire section of the building to be underpinned is completed. When this type of underpinning is used, it is almost impossible to again excavate under the underpinning blocks, because removal of the sand from under the blocks will cause them to settle or drop.

We have devised a method which renders it possible to carry the underpinning down as far as desired in accordance with the depth of the proposed excavation. In a preferred embodiment of the method, a number of pilings are first installed under the footing, and the weight of the footing sustained by the pilings. Concrete blocks are then cast under the footing around the piling so that they are securely locked to the piling. It is thus possible after the first course of blocks have been laid to excavate under them and install a new course, since the upper course will act as a beam to transmit the weight of the building to the pilings, and there is no danger of the upper blocks dropping out of position, inasmuch as they are firmly cast to, and interlocked with the pilings.

Objects of the invention are to provide a method of underpinning which may be expeditiously carried out, and which will afford a completed structure well suited to fulfill its purpose; particularly to prevent sand from running out under the building and causing settling of the interior footing.

With the above noted and other objects in view, the invention consists in certain novel features of construction and combinations and arrangements of parts, as will be more fully hereinafter set forth and pointed out in the claims. The invention may be more fully understood from the following description in connection with the accompanying drawings, wherein—

Fig. 1 is a view in side elevation, mainly below the surface of the ground showing a complete underpinning after it has been installed in accordance with our method.

Fig. 2 is a vertical sectional view on the line 2—2 of Fig. 1.

Fig. 3 is a longitudinal sectional detail illustrating the first step of the method which consists in installing a piling below the underpinning.

Fig. 4 is a view at right angles to Fig. 3, showing a wedge entered between the piling and underpinning to transmit the weight of the underpinning to the piling.

Fig. 5 is a view similar to Fig. 3, but showing the first concrete block and the grout in place.

In the drawings we have used the reference character 10 to indicate a building resting upon soil such as beach sand. One of the outer footings of the building has been indicated at 12, and the present method is concerned with the provision of means for underpinning the footing in such a manner that excavation work may be carried on immediately adjacent the building without

danger of causing either the outer footing or any of the interior footings to settle.

The first step of the method consists of digging a small hole indicated at 13 in Figs. 3 and 4 adjacent the footings, and carrying this excavation inwardly until a small portion of the footing is undermined. The next step consists in installing a concrete piling 14 through the working excavation 13. This step of installing the piling presents a problem in itself. It is almost impossible to jack pipe in fine sand, and if jetting is resorted to, to assist the sinking of a steel cylinder, there is great danger of undermining or settling the building. We preferably install our piling therefore, by the simple expedient of using a post hole digger operated from a flexible cable to drill a vertical shaft downwardly from the bottom of the excavation 13. A steel shell, such as 15 is then preferably, but not necessarily inserted in the shaft, this shell of course being of sectional shape, and being entered one section after another until it is built up nearly to the footing.

The shell 15 may be of any desired cross sectional shape, and serves a two-fold purpose. In the first place it acts as a reinforcing agent to assure that no sand will be mixed with the concrete when the concrete is poured into the top of the shell. In the second place it acts as a substantial reinforcement for the concrete piling. It is to be understood of course that the shell is used only where the load to be carried is great, or where the soil is of such a nature as to demand its use. If desired, mushroom pilings of the character disclosed in our prior Patent No. 1,593,445, of July 20, 1926, might be used.

After the shaft or the casing, as the case may be, has been filled with concrete, and has set sufficiently, the load of the footing is transferred to the piling by the use of wedges or jacks. We have shown a wedge 16 in position, this wedge being driven in to refusal.

The next step is to fill the excavation 13 or a concrete mould which may be placed in the excavation with concrete up to within a few inches of the bottom of the footing. After the concrete has set sufficiently, the remaining space between the top of the concrete block and the bottom of the footing is packed with a stiff grout 17 of cement mortar or other suitable material.

The concrete which is placed in the excavation 13 completely surrounds the piling 14 and interlocks therewith. The same method is carried out in installing the remainder of the pilings 14, preferably alternate pilings being first installed, and then the interspaces between the alternate cement blocks 18 being provided with pilings and filled in.

After the first course, consisting of the blocks 18 has been completed, there will be a substantially beamlike structure consisting of interlocking concrete blocks and pilings, and we may readily excavate under this course of blocks for installing a second course of blocks 19. A third course of blocks 20 may also be installed if desired, it being understood that the underpinning may be carried down to any desired depth. It will be noted that the pilings if used alone, would not effectively prevent the sand from running out under the building between them when an adjacent excavation was made. The concrete wall however, which is formed by the courses of blocks 18, 19 and 20 effectively dams the sand under the building, and prevents the possibility of any settling of interior footings.

The particular number or arrangement of the pilings, blocks, and courses of blocks, is subject to a wide range of variation, and depends entirely upon the particular job in hand. The pilings may be arranged in rows or pairs or staggered as desired. The blocks are preferably corbelled, or staggered relatively to superadjacent and subjacent blocks, and the ends of the courses may be corbelled if desired.

In the event that the underpinning is to be done in water-bearing sand, we may use any of the well known methods of lowering the water level in the sand. Preferably we use a well point system for reducing the water level if the water bearing sand is fine, and use sump bits for lowering the water level if the sand is coarse.

Obviously, a great many minor changes might be made in the exact steps of the method or in the particular construction of the completed underpinning without departing from the spirit and scope of the appended claims.

We claim:

1. A method of underpinning buildings which includes the steps of placing a series of concrete pilings beneath the footing of the building to be underpinned, transforming the weight of the building to the pilings, casting concrete blocks to the upper ends of the pilings and to each other to produce a beam-like series of interlocked concrete blocks, then excavating under the blocks and casting a subadjacent series of blocks to the pilings.

2. A method of underpinning a building which includes the steps of forming an excavation which partially undermines the footing of the building, sinking a piling through said excavation, transferring the weight of the building to the piling and casting a concrete block around the upper end of the piling, subsequently similarly sinking additional pilings and casting additional blocks until a complete course of blocks has

been formed under the footing, then excavating under the first course of blocks and introducing a second subadjacent course.

3. A method of underpinning buildings which includes the steps of supporting the footing of a building on a series of pilings and building a cement wall downwardly from the tops of the pilings by blocks cast to and interlocked with the pilings.

4. A method of underpinning buildings in beach sand which includes the steps of sinking a series of concrete pilings beneath the building footing and building an underpinning wall downwardly from the tops of the pilings to prevent sand from running out from under the building between the pilings when an adjacent excavation is formed.

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