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METHOD OF STABILIZING FOUNDATIONS

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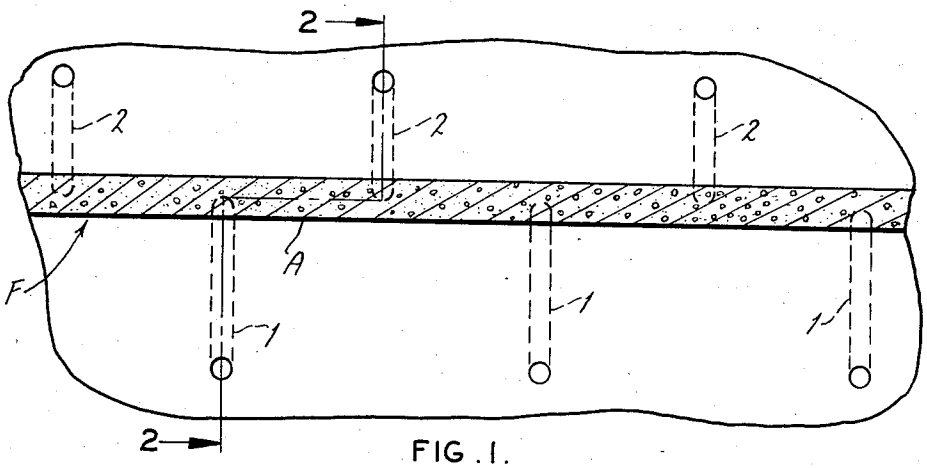


FIG. 1.

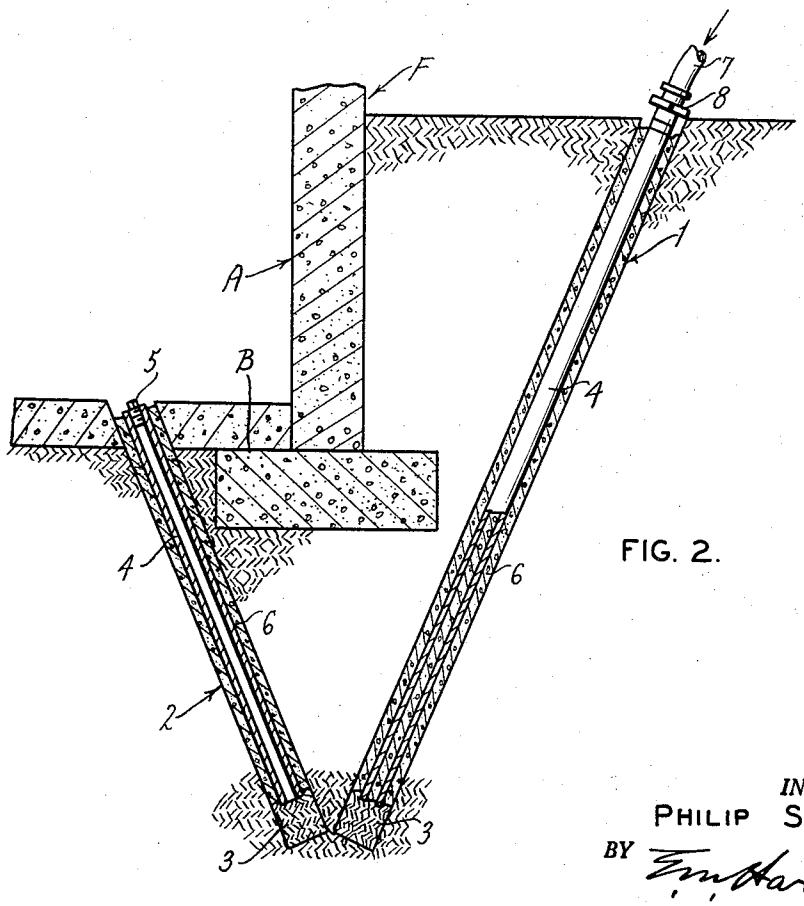


FIG. 2.

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METHOD OF STABILIZING FOUNDATIONS

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2 Claims. (Cl. 61—51)

This invention relates generally to means for and a method of stabilizing foundations of houses and buildings when, because of sub-soil settlement, failure of foundations occur, and more specifically to a method which involves the use of a soupy mixture of fine grades of top soil or sandy loams, to which cement is added, said mixture being pumped into the earth adjacent to the faulty foundation until the earth cannot take any further material, the predominant object of the invention being to provide a novel arrangement of the pipes which conduct the mixture into the earth whereby superior results are obtained in the stabilization of foundations being treated according to this invention.

The results of sub-soil settlement are many, insofar as foundations of houses and buildings are concerned, among same being the sagging of walls and floors and the cracking of walls and foundations, and it is necessary that the condition be corrected without delay if serious difficulties are to be avoided. As stated above the situation has heretofore been corrected by pumping into the earth at points adjacent to the faulty foundation such a stabilizing mixture which will fill all the voids in the subsoil created by shrinkage of said sub-soil and will lift the foundation to its original elevation, this mixture being pumped into the earth under high hydraulic pressure in order that it may accomplish its purpose of stabilizing the foundation. By employing the improved arrangement of the cemented pipes disclosed herein much better results are obtained and the stabilization of the foundation is accomplished in a much more efficient manner than was the case heretofore.

Fig. 1 is a fragmentary horizontal section taken through a foundation and showing the arrangement of the cemented pipes for delivering the stabilizing mixture into the earth.

Fig. 2 is a fragmentary cross-section taken on staggered line 2—2 of Fig. 1.

In installing the cemented pipes in accordance with this invention, measurements are taken for the purpose of determining the angle on which the outside openings 1 should be drilled and these openings 1 are drilled approximately five feet apart, the tops of the openings being located approximately three feet outwardly from the wall A of the foundation F, and the bottoms of said openings 1 being located approximately beneath the foundation footing B, as is shown in Fig. 2. In like manner the inside openings 2 are drilled at the inside of the foundation wall A, these inside openings being drilled at approximately the same angle as that on which the outside openings 1 are drilled with the tops of said inside openings located inwardly some distance from the foundation wall and the bottoms of said inside openings being located approximately beneath the foundation footing B. The outside openings 1 and inside openings 2 are staggered with respect to each other as is shown in Fig. 1, and these groups of openings are arranged in V-shaped formation (see Fig. 2), the openings of the two groups of

openings being drilled until a sub-grade area of stability is reached that has not shifted. When this point in the drilling of the openings is reached the drilling is stopped and loose soil 3 is pitched down each opening, this soil serving to pad the bottom of each of the openings and it also has a tendency to give more of a spreading action to the stabilizing mixture pumped into the openings.

When this point in the preparation has been reached a pipe 4 is introduced into each of the openings 1 and 2, said pipes being pressed slightly into the pad 3 at the bottom of the opening, and a suitable cap 5 is then applied, screw-threadedly or otherwise, to the upper end of each pipe 4. At this point a mixed grout, consisting of sand and cement, is poured around the pipe in each opening completely filling the space in each opening between the wall of the opening and the outer face of the wall of the pipe, as is indicated at 6 in Fig. 2. In this manner the space referred to in each opening is filled to the upper end of the pipe within said opening. The cement in the grout 6 will set in approximately seventy-two hours, thus making is impossible for the pipes to shift within their openings in any direction.

The actual task of pumping the grout through the pipes consists in first mixing the ingredients of the stabilizing mixture in a suitable piece of apparatus, a mortar mixer, for instance, to a soupy mix and then pouring this soupy mix into a mud-jack machine, this mud-jack machine, which is not shown in the drawing, having connected thereto a high pressure hose 7. The high pressure hose is in turn connected to a valve 8 and said valve is connected to the upper portion of the pipe 4 through which the stabilizing mixture is to be pumped. The stabilizing mixture is pumped past the open valve 8, down through the pipe, and said stabilizing mixture is forced through the sub-soil, filling voids therein and compacting all of the sub-grades so as to eliminate any further sub-soil settlement. The stabilizing mixture is pumped through a pipe until the earth cannot receive any further material, at which time the valve 8 is closed and the hose 7 is uncoupled from the pipe being used and is coupled to another pipe, the process being repeated around the entire foundation, or just in areas that have settled, and after the pouring job has been completed, cracks in the foundations and walls are repaired. Because of the high hydraulic pressure under which the stabilizing mixture is pumped into the openings 1 and 2 the foundation being treated is restored to its original elevation, thereby also restoring the walls and floors of the house or building which are supported by said foundation.

The reaction from these hydraulic pressures exerted on the bottoms of the openings 1, 2 would drive the pipes 4 out of the earth were it not for the cementitious grout 6 which sets and bonds within the openings. For adequate bonding, the openings 1, 2 are shown in the drawing, Figure 2, as having an inner diameter approximately twice the outer diameter of the pipes 4.

It is evident from Figure 2 that if the pipes 4 were put in place within the openings 1, 2 and the grout 6 poured around them, without the use of the pads of soil 3, the grout 6 would fill the bottoms of the openings 1, 2, sealing them and making them impervious so that they could not serve as areas from which the stabilizing mixture would spread. Further, the grout 6 would tend to cement up the bottom ends of the pipes 4.

Use of loose material such as the soil pads 3, into which the bottom ends of the pipes 4 are pressed before the grout 6 is poured, preserves the bottoms of the openings in pervious condition and effectively prevents the poured grout from entering the ends of the pipes 4. Thereafter when the soupy stabilizing mixture is introduced within the pipes 4 and pressure is applied, the soil

pads yield and permit the spread of the stabilizing mixture outward from the areas of the pipe bottoms which have thus been preserved uncemented.

I claim:

1. The method of stabilizing the earth beneath a structure, comprising the steps of drilling from the surface to below the level of such structure, a hole having a diameter substantially greater than the outer diameter of a pipe to be inserted therein, then filling loose soil into the bottom of such hole, then inserting within the hole a pipe for pumping an earth-stabilizing mixture therethrough and pressing its lower end into the loose soil, then filling the space within the hole around the pipe and above the loose soil, with a cementitious grout, whereby to fix such pipe securely within the earth, and then pumping an earth-stabilizing mixture under pressure through the pipe into said loose soil in the bottom of the hole and thence outward into the earth.

2. For use in stabilizing the earth beneath a structure, the method of securing a pipe within the earth for conveying an earth-stabilizing mixture downward under pressure to below the level of such structure, comprising the steps of drilling a hole downward to below the level of

such structure, filling the bottom of the hole with loose soil, inserting within the hole a pipe whose outer diameter is less than the diameter of the hole and pressing its lower end into said loose soil, then cementing the space within the hole around the pipe and above the loose soil with a cementitious material and permitting such cementitious material to harden, and then pumping a fluid, earth-containing stabilizing mixture under pressure through the pipe and spreading such mixture outward from the hole bottom into the earth.

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