To all whom it may concern:

Be it known that I, AMASA B. CLARK, a citizen of the United States, and a resident of the borough of Manhattan, in the city, county, and State of New York, have invented certain new and useful Improvements in Methods of Constructing Pile Foundations, of which the following is a full, true, and concise specification.

10 The invention relates to sectional piles and methods of sinking the same underneath existing structures for the purpose of shoring or bracing the same as well as to resist the lateral pressure of the material beneath the structure; and the invention consists in successively sinking a number of telescoped pile sections as hereinafter described, at the same time preserving a disposition of sections such that the inner ones will overlap the adjacent ends of the outer ones, and then properly filling in the space between the top of the pile thus formed and the object to be supported by it.

The invention also includes additional features of novelty and importance specially adapted to the invention which will be hereinafter disclosed, as well as the construction and relative arrangement of the mechanism with which the method above referred to is preferably carried out.

In the accompanying drawings forming part hereof, Figures 1, 2 and 3 are representations in diagram of the method in which the pile sections are driven and illustrating the construction thereof, Fig. 4 is a completed pile beneath a structure, Fig. 5 is a cross-section of the same, Fig. 6 is a detail showing reinforcing rods, Fig. 7 is a modification of the spacer means.

It should be noted that the several parts shown in the foregoing figures are illustrated with exaggerated thickness for the sake of clearness.

Referring to Fig. 1, A represents the wall of the structure to be supported, which is supplied with the usual cross or header-beams B. The two telescoped sections C' and D are first placed beneath the wall A and a drive head E surmounted by a pile hammer or jack N, is interposed between them and the beams. The drive head is a hollow cylinder or pipe section with an oblong slot in its side-wall and fitting the pile at its lower end. Its main utility is in providing a convenient means for introducing and operating a jet pipe K within the pile to aid its descent and for venting the material forced out by the jet, but in cases where jetting is not required, the drive head may be omitted if desired, and the driving machine fitted directly to the end of the pile. The pile sections C' and D and which form the point or base of the pile are of different lengths, one of them being preferably about half the length of the other, so that subsequent full length sections superposed thereon will break joints with the sections of the other member of the pile. As shown herein the inner section C' is the shorter and the distance intervening between its upper end and the upper end of the section D is occupied by a temporary section or interior driving section F, which is provided for the purpose of giving the driving machine equal thrust on both the inner and outer sections. But obviously the outer section could be the shorter, if for any reason desired or convenient, and a temporary exterior drive section, such as shown at F' in Fig. 2, could be superposed upon it around the other, with equal effect. These driving sections in practice are merely short lengths of piping cut from the same stock as the main pile sections and similar to them in every respect, save in length. By applying the pressure of the driving mechanism and using a jet pipe K, it is possible to sink the two sections C' and D a suitable distance, whereupon the temporary drive section F is removed and in its place is substituted an inner section C (Fig. 2) about equal in length to the first outer section D. The temporary drive section F' is then placed upon top of the outer section and pressure is applied as before, further sinking the pile. This operation is repeated indefinitely by alternately superposing inner and outer sections as needed and making up for the difference in height by inserting the temporary drive sections F or F' until the pile reaches its depth or bed rock, indicated at R. Where great resistance is encountered by the pile, I have found it convenient, especially toward the end of the sinking process, to bring all the driving pressure first upon the inner and then upon the outer sections or vice versa, and by driving them alternately in this manner I am enabled to sink the whole pile to a greater depth than would otherwise be possible, by forcing both inner and outer sections together. This alternate driving
may be readily accomplished by striking a few blows on the uppermost section, either the inner or the outer section, as the case may be, and then placing the drive head upon the other section and striking a few blows on it, then removing such driving section and again striking more blows on the first section, and so on. In alternating the descents as thus described, the alternate sections of the inner and outer sections, respectively, should be roughly approximate and less than one-half of the vertical distance between joints, so that the overlapping disposition of the inner sections upon the ends of the outer sections will be preserved.

The pile sections C or C' and D are most economically pieces of ordinary commercial pipe and are so chosen, as to diametrical size, that an annular space or crevice will be left between the exterior surface of the inner sections and the interior surface of the outer sections and in order to preserve the integrity of the same even after the outer sections may have become completely rusted away. In cases where the pile is required to withstand the lateral pressure of the soil beneath the wall A, as would occur when excavations are made adjacent to it, reinforcement may be provided by trussing the pile by introducing a number of rods M therein in the far side from the source of pressure (see Figs. 4, 5 and 6). These serve to convert the pile into a form of truss of which the rods become the bottom chords or tension members, and by inserting rods in any relation the thrust sustaining strength of the sectional pile is augmented. The rods may be sufficiently slender to be capable of being passed into the pile in single lengths equal to the length of the pile, but stouter rods may be employed in sections coupled together by sleeve nuts as shown at M' in Fig. 6.

By the use of the foregoing methods and means, it is possible to sink a supporting column beneath a building wall without cutting a slot therein any wider than is required simply to insert and superpose the successive sections, which point is of material advantage as compared with older methods which require the screwing of the pile sections together or the couplings thereof; the adjacent ends of the respective sections are preserved in actual aligned contact throughout the circumference thereof and the frictional resistance of outside couplings against the soil is avoided; and, moreover, the time required to sink the pile is materially reduced, inasmuch as the labor of making coupled connections of the several sections as they descend is obviated, as well as the necessity of coupling and uncoupling the drive head to the top section at the beginning and close of each driving step. Various other obvious advantages are also involved in the use of the above described apparatus which are not necessary here to be mentioned.

Referring again to Figs. 1-3, it will be observed that the bottom ends of the lowest inner and outer sections are beveled to...
form chisel edges. While this formation is not essential, it is frequently of advantage, especially in driving the pile into soil containing rock. By driving the inner and outer sections alternately, as above described, a channeling effect will be produced on the rock which will either cause a perforation or disintegration thereof or at least provide a proper seat for the sections.

Having described my invention, what I claim and desire to secure by United States Letters Patent is:

1. A method of constructing foundations which comprises superposing inner and outer telescopic pile sections respectively end to end with the meeting ends of one series of sections in broken joint relation to the meeting ends of the other series and sinking the inner and outer sections distances such as to preserve said relation, the inner and outer series of sections being built up as the sinking proceeds, and thereafter inserting a thrust-sustaining member between the uppermost sections and the structure to be supported.

2. A method of constructing foundations which consists in alternately superposing inner and outer telescopic pile sections respectively end to end and with the joints between inner and outer sections respectively at relatively different heights, inserting a temporary driving section, after each such superposition, upon the lower of the two uppermost pile sections to compensate for the difference in height and applying the driving force jointly to the uppermost pile section and the driving section, and thereafter inserting thrust-sustaining means between the uppermost of said sections and the structure to be supported, substantially as described.

3. A method of constructing double casing pile foundations for an existing structure which consists in making an opening in the wall, inserting two telescoping sections of the pile, one of which projects above the other, superimposing upon the lower section a temporary driving section of a length equal to the difference in height between the two sections, then driving the two sections simultaneously into the earth, removing the temporary driving section and placing a full length section upon the lower permanent section, then placing a short driving section upon the other pile section whereby both the inner and outer casings may be driven simultaneously, repeating the above operations of driving and alternately adding a short driving section and a full length casing section to the inner and outer casings, and thereafter interposing a connecting load-supporting member between the sunken sections and the structure.

4. A method of constructing double casing pile foundations for an existing structure which consists in making an opening in the wall, inserting two telescoping sections of the pile, one of which projects above the other, superimposing upon the lower section a temporary driving section of a length equal to the difference in height between the two sections, then driving the two sections simultaneously into the earth, removing the temporary driving section and placing a full length section upon the lower permanent section, then placing a short driving section upon the other pile section whereby both the inner and outer casings may be driven simultaneously, repeating the above operations of driving and alternately adding a short and full length sections to the inner and outer casings, then filling the spaces between the inner and outer pile sections with concrete, and thereafter interposing a connecting load-supporting member between the sunken sections and the structure.

In testimony whereof, I have signed my name to the specification in the presence of two subscribing witnesses.

AMASA B. CLARK.

Witnesses:
G. A. TAYLOR,
H. G. KIMBALL.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D.C."