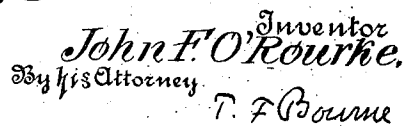
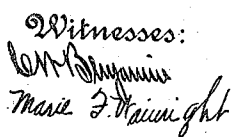


1,038,635.

3 SHEETS—SHEET 2.

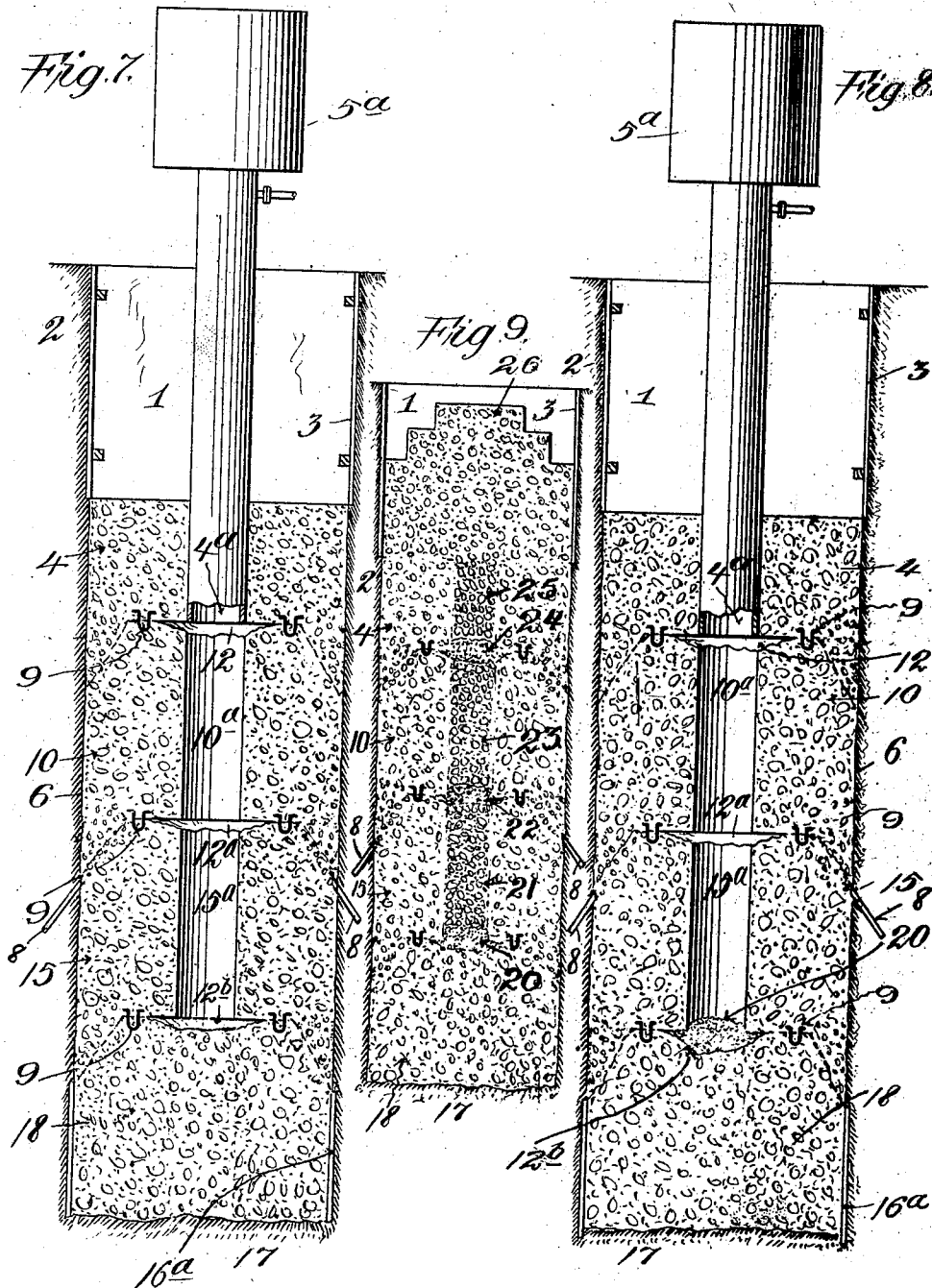


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METHOD OF CONSTRUCTING FOUNDATIONS.
APPLICATION FILED OCT. 24, 1911.

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Patented Sept. 17, 1912.

3 SHEETS—SHEET 3.



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UNITED STATES PATENT OFFICE.

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METHOD OF CONSTRUCTING FOUNDATIONS.

1,038,635.

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Patented Sept. 17, 1912.

Application filed October 24, 1911. Serial No. 656,417.

To all whom it may concern:

Be it known that I, JOHN F. O'ROURKE, a citizen of the United States, and resident of New York city, borough of Manhattan, in the county of New York and State of New York, have invented certain new and useful Improvements in Methods of Constructing Foundations, of which the following is a specification.

10 In Letters Patent No. 932,717, issued to me August 31, 1909, I have set forth means for constructing foundations below the earth's surface through earth of soft, spongy or watery character, wherein a plug is fixed
15 in the excavation and below the plug the excavation is continued to hard bottom, and a foundation is built within the excavation from hard bottom upwardly and joins the plug, the walls of the excavation being
20 shored as the work proceeds. This method is satisfactory and efficient for certain kinds of earth, but where the earth is exceedingly soft and watery and the foundation must be carried therethrough to considerable
25 depth my present invention is applicable. To this end I first produce a plug at a suitable depth in the earth, as by the formation of an excavation to a suitable depth, or by
30 sinking an open or pneumatic caisson into the earth to the desired depth, and filling said plug in the bottom of such excavation or caisson, or by sinking a working shaft into the earth to a suitable depth and forming
35 a plug of concrete adjacent the bottom of said shaft by making a chamber into the earth of suitable extent adjacent the bottom of the shaft and filling such chamber with
40 concrete connected with the shaft, or by constructing a pneumatic caisson on the surface of the earth in any usual manner, and
45 sinking the same to such depth as may be desired, with a plug or shaft therein, or the plug and shaft may be inserted in said caisson after the latter is sunk; then below
50 said plug the excavation is continued in the form of a chamber to a suitable depth under air pressure, and upon the bottom of the chamber so formed concrete is filled from the bottom up and joined to the plug above,
55 an opening being provided in such concrete filling, and then below such concrete filling another chamber may be dug, and the chamber filled with concrete and connected with the filling above, and so on downwardly in similar steps, until the required bottom is reached, whereupon concrete is filled upon the bottom of the lowermost chamber and

rises in engagement with the last filling above, thereby producing a solid foundation built in sections. Straps or hangers may be
60 inserted in the ground at the bottom of one or more chambers so as to be embedded in the superposed fillings. Finally the openings in the fillings and plug may be filled with concrete, and spaces or crevices between the fillings and the plug charged with
65 grout, and concrete filled upon the top of the plug to receive a pier, column, wall, or the like.

In the accompanying drawings I have
70 illustrated the various steps for producing a foundation according to my invention, wherein,

Figure 1 is a vertical sectional view illustrating the first portion of the excavation; 75
Fig. 2 is a similar view showing the plug at the bottom of such excavation, and the air shaft applied to the plug; Fig. 2^a illustrates a working shaft sunk into the earth, and a chamber formed in the earth larger than
80 and below the shaft to receive concrete; Fig. 2^b illustrates a pneumatic caisson to be sunk into the ground; Fig. 3 is a view similar to Fig. 2, illustrating a chamber excavated below the plug; Figs. 4 and 5 are views similar
85 to Fig. 3, illustrating further steps in carrying the foundation downwardly; Fig. 6 is a section on the line 6, 6, in Fig. 3; Figs. 7 and 8 illustrate steps taken in the completion of the work, and Fig. 9 illustrates, in section
90 a complete foundation.

Similar numerals of reference indicate corresponding parts in the several views.

As illustrated in Fig. 1, a suitable excavation 1 is dug into the ground or into soft, 95
spongy or watery earth 2 to a suitable depth, the walls of which excavation may be protected by sheet steel or other piling 1^a if desired in any well known manner, into which excavation a plug or pneumatic
100 caisson of concrete or other suitable foundation material 4 is filled in the manner illustrated in Fig. 2. Or I may sink an open or pneumatic caisson 3 into the earth to the
105 desired depth, as illustrated in Fig. 2, and the plug 4 will be filled into the bottom of the same. Or I may sink a working shaft 5 to a suitable depth into the earth and form a suitable chamber *a* in the earth beneath
110 said shaft, the same being protected if required by shoring, poling boards or the like 6, and filling the plug 4 into said chamber to be connected with shaft 5; or I may construct or apply a pneumatic caisson 3^a upon

the surface of the earth in any usual manner, and sink the same to such depth as may be desired with the plug 4 and shaft 5 therein, or the plug and shaft may be inserted in said caisson after the latter is sunk. Straps or hangers 9 may be inserted in the bottom of the excavation with their upper ends exposed in the latter as in Fig. 1, or at the bottom of chamber *a* as in Fig. 2^a, or in the earth at the bottom of chamber 4^b after the pneumatic caisson 3^a, of Fig. 2^a, has been sunk. At the margin of the bottom of the excavation or chamber so formed a trench 7 may be dug. Plug 4 is formed in trench 7 and embeds the upper ends of straps or hangers 9. A working shaft or section of such shaft 5 may be embedded at its lower end in such plug, and when the work is to be carried on under pneumatic pressure said shaft may be provided with a suitable or usual air lock 5^a, suitable air pipes being provided for supplying compressed air to the air shaft and to the work to proceed below plug 4. Thereafter, below plug 4 a chamber 6 (Fig. 3) is dug to a suitable depth, air pressure in the chamber serving to hold back the soft, spongy or watery earth and water, or shoring may be applied at the walls of the chamber if required, and at the margin of the bottom of such chamber is dug a trench 7^a, and a suitable number of straps or hangers 9 may be inserted in the earth at the bottom of chamber 6, as before explained. Poling boards 8 may be applied at the trenches if required. The chamber 6 is next filled from the bottom upwardly with concrete 10, which enters trench 7^a, and binds the upper ends of said straps or hangers 9, a vertical opening 10^a being provided in the concrete filling 10 and in communication with the opening 4^a in plug 4 (Fig. 4). The filling 10 is carried up substantially into contact with the bottom of plug 4 and in engagement with the straps or hangers depending therefrom, although crevices or spaces 12 may necessarily be formed between the top of filling 10 and the bottom of plug 4, to be filled with grout or the like as hereinafter explained. The poling boards 8 may be removed or cut away within the chamber as indicated in Fig. 7. Another chamber 11 of suitable depth, is excavated below plug 10 (Fig. 4), and at the margin of the bottom of chamber 11 is dug a trench 7^b, and a suitable number of straps or hangers 9 may be inserted in the earth at the bottom of chamber 11 in manner before described, so that the upper ends of the straps or hangers will be exposed within the chamber. The walls and bottom of chamber 11 may be protected by shoring or poling boards or flooring if desired. Chamber 11 is next filled from the bottom upwardly with concrete 15, and binds the upper ends of said straps

or hangers 9 at the bottom of the chamber, an opening 15^a being provided in the concrete filling 15 and in communication with the opening 10^a in filling 10. The filling 15 is carried into contact with filling 10 and with the portions of straps or hangers 9 depending from filling 10, and any crevices or spaces 12^a will be filled up by running grout into the same, as hereinafter explained, and filling 15, by hardening upon the depending portions of straps or hangers 9 is partially suspended thereby from filling 10. A chamber 16 may then be excavated below filling 15 (Fig. 5), and the walls of the chamber may, if desired, be protected by boards or the like 16^a, and when hard bottom 17 is reached concrete 18 will be filled in chamber 16 from such bottom upwardly (Fig. 7) into engagement with filling 15 and hangers 9 depending therefrom, but if hard bottom be not struck when the chamber 16 is dug to the desired depth, then the chamber will be filled with concrete as before described, and so on, chamber after chamber being made and filled, and the several fillings united together until a required or hard bottom is reached, when the lowermost filling will rest thereon as described. The concrete in the trenches 7, 7^a, 7^b aids in retaining compressed air in the chambers below as the work therein progresses. After the fillings have all hardened grout 20 will be poured through the central openings to fill the crevice or space 12^b and bind fillings 15 and 10; concrete 23 will next be filled in opening 10^a, and grout 24 will be filled upon concrete 23 to fill space 12 and bind filling 10 to plug 4, see Fig. 9. Air shaft 5 having now been removed, concrete 25 will be filled into opening 4^a, of plug 4, and upon the latter concrete or foundation material 26 may be placed, upon which a pier, column or the like may be set or embedded.

By means of my invention, it will be understood that the work may be carried on to any required depth, until the required bottom is reached, because the chambers below the fillings may be made each to any required depth according to the nature of the earth being excavated and the air pressure that may be maintained in the excavation at all times. The several chambers may be excavated merely to such depth as is practical to hold back their walls under air pressure with or without requiring shoring, because as fast as each chamber is filled with concrete the latter replaces the excavated material, thus preventing the earth around the filling from caving into the chamber beneath. The building of foundations in accordance with my invention may thus be carried on expeditiously, economically, and

with safety to the workmen, since at no time need there be any chamber of extended depth, causing exposure of a large area of earth wall, and foundations or walls may be installed under existing structures where the usual method would be impracticable.

Having now described my invention what I claim is:—

1. The method of constructing foundations consisting in installing a pneumatic caisson in an excavation in the earth, continuing the excavation in the form of a chamber below such caisson, filling such chamber with foundation material, continuing the excavation in the form of a chamber below such filling, and filling such chamber with foundation material.

2. The method of constructing foundations consisting in inserting a pneumatic caisson containing a working shaft in an excavation in the earth and maintaining said caisson in such position, producing a chamber in the earth beneath such caisson through said working shaft, and filling said chamber with foundation material into contact with the filling above and forming a working shaft in the second named filling.

3. The method of constructing foundations consisting in inserting a pneumatic caisson containing a working shaft in an excavation in the earth and maintaining said caisson in such position, producing a chamber in the earth beneath such caisson through said working shaft, filling said chamber with foundation material into contact with the filling above and forming a working shaft in the second named filling, excavating another chamber below the second named filling, and filling the last named chamber with foundation material.

4. The method of constructing foundations consisting in inserting a pneumatic caisson containing a working shaft in an excavation in the earth and maintaining said caisson in such position, producing a chamber in the earth beneath such caisson through said working shaft, filling such chamber with foundation material into contact with the filling above and forming a working shaft in the second named filling, excavating another chamber below the second named filling, filling the last named chamber with foundation material, binding the meeting faces of said fillings, and charging said working shafts with foundation material.

5. The method of constructing foundations consisting in producing in an excavation a permanently fixed caisson having an opening therethrough, continuing the excavation in the form of a chamber below the caisson, filling such chamber with foundation material and forming in such material an opening through the same communicat-

ing with the opening in the caisson, continuing the excavation in the form of a chamber below such filling, and filling such chamber with foundation material.

6. The method of constructing foundations consisting in producing in an excavation a permanently fixed caisson having an opening therethrough, continuing the excavation in the form of a chamber below the caisson, filling such chamber with foundation material and forming in such material an opening through the same communicating with the opening in the caisson, continuing the excavation in the form of a chamber below such filling, filling such chamber with foundation material, and filling said openings with foundation material.

7. The method of constructing foundations consisting in installing a pneumatic caisson in an excavation in the earth, continuing the excavation in the form of a chamber below the caisson, inserting a strap or hanger in the bottom of the chamber with the upper end of the strap or hanger projecting into the chamber, filling such chamber with foundation material and embedding the upper end of the strap or hanger in such filling, continuing the excavation in the form of a chamber below the filling, and filling such chamber with foundation material up to and in contact with the last named filling.

8. The method of constructing foundations consisting in making an excavation for a working shaft, locating the shaft in said excavation, producing a chamber below said shaft, filling said chamber with foundation material and providing an opening therein communicating with the working shaft, producing a chamber below said material, and filling said chamber with foundation material.

9. The method of constructing foundations consisting in making an excavation for a working shaft, locating the shaft in said excavation, producing a chamber below said shaft, filling said chamber with foundation material and providing an opening therein communicating with the working shaft, producing a chamber below said material, filling said chamber with foundation material and producing an opening therein communicating with the opening in the filling above, producing a chamber below the second named filling, and filling the third named chamber with foundation material.

Signed at New York city, in the county of New York, and State of New York, this 21st day of October A. D. 1911.

JOHN F. O'ROURKE.

Witnesses:

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T. F. BOURNE.