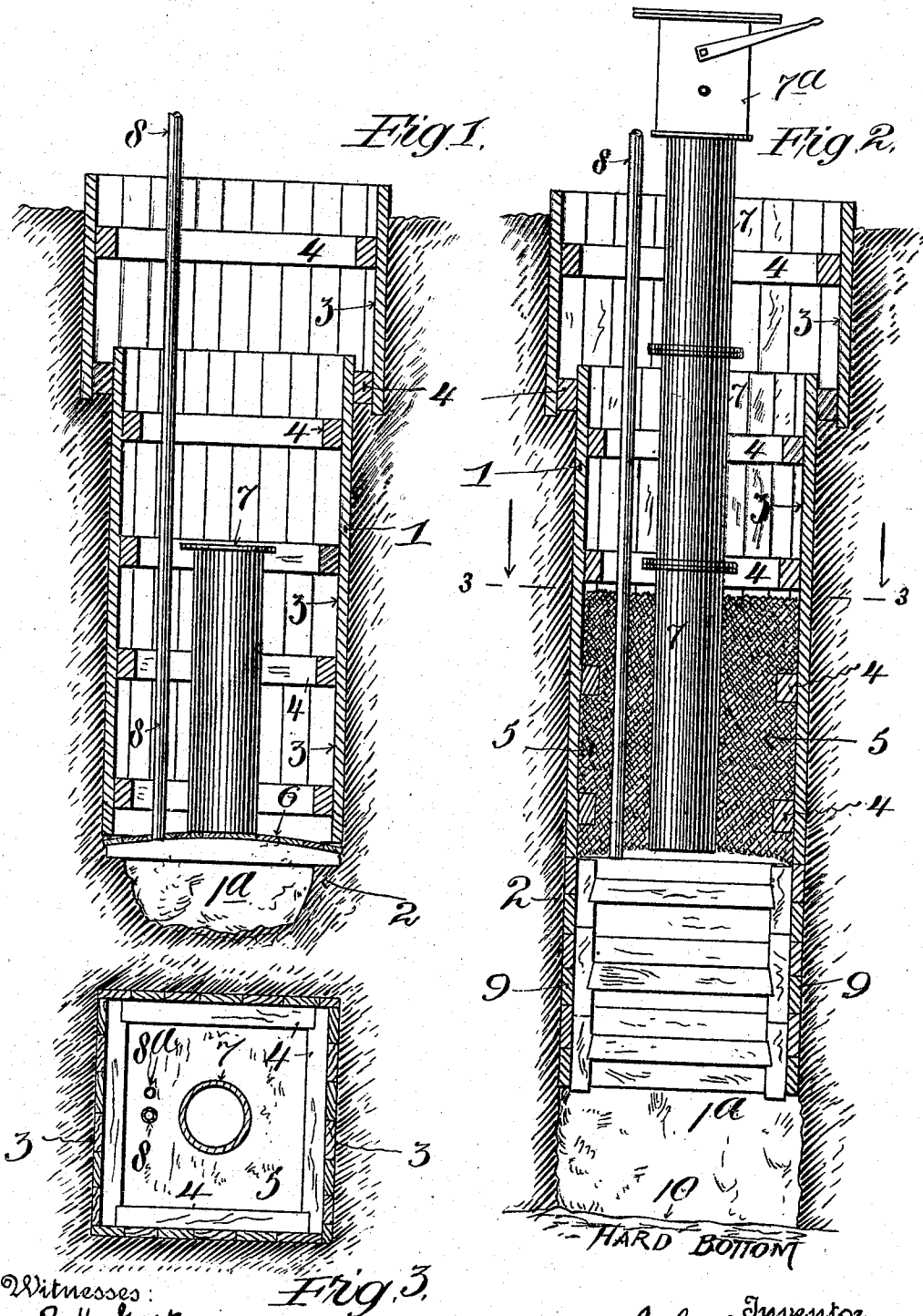


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METHOD OF CONSTRUCTING FOUNDATIONS.
APPLICATION FILED OCT. 10, 1907.

932,717.

Patented Aug. 31, 1909.
2 SHEETS—SHEET 1.



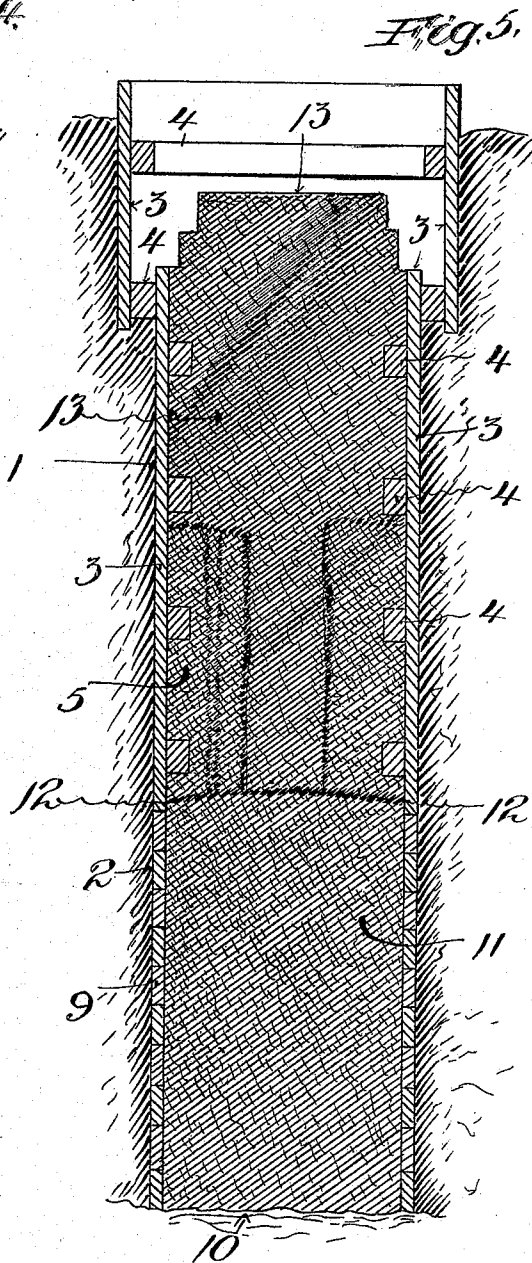
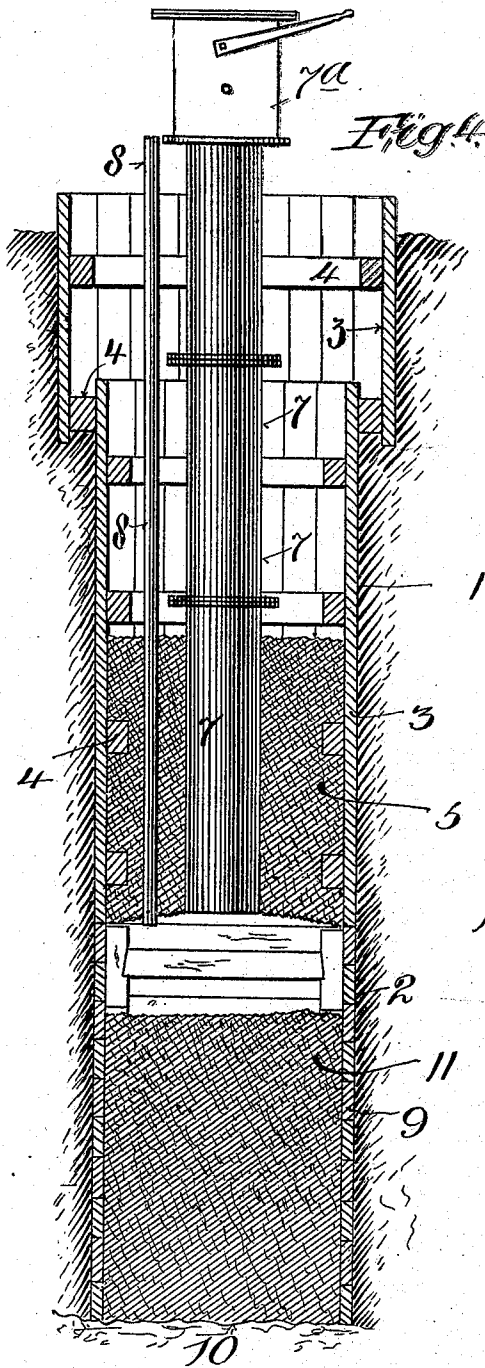
Witnesses:
J. H. Goetz
Marie J. Vainight

Inventor
John F. O'Rourke
By his Attorney P. F. Bourne

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John F. O'Rourke
By his Attorney, J. F. Bourne

UNITED STATES PATENT OFFICE.

JOHN F. O'ROURKE, OF NEW YORK, N. Y.

METHOD OF CONSTRUCTING FOUNDATIONS.

932,717.

Specification of Letters Patent.

Patented Aug. 31, 1909.

Application filed October 10, 1907. Serial No. 396,729.

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.

In constructing foundations below the earth's surface upon which piers, columns, and the like are to be erected for buildings and other structures, it sometimes occurs that the earth into which the excavation is made is of such soft, spongy or watery character, before hard bottom or bed rock is reached, as to fall or flow into the excavation, and the difficulty experienced in such class of work, and to which my invention pertains, is where the spongy, soft or watery earth is met after the excavation has been carried down below the surface for a considerable distance through relatively firm ground, whereby such earth is liable to fall or flow into the excavation as it proceeds and endanger the falling or flowing of the adjacent ground into the excavation, to the great danger of surrounding structures and to the completion of the work.

The object of my invention is to permit safe and economical digging of an excavation into or through such relatively soft or spongy or water bearing earth down to hard bottom or bed rock, and the forming of a foundation upon such bottom or bed rock within such soft or spongy earth, in such manner that the latter may be held back while the excavation and building of the foundation proceed.

In carrying out my invention I first make a suitable excavation in the ground to or into soft, spongy or watery earth which may be of such character as to fall or flow into the excavation and prevent the further safe digging of the excavation after certain depths are reached, (the walls of such excavation being protected, when required, with sheet piling or otherwise as far down as desired). I then fit into such excavation, at a suitable point adjacent to or above the bottom of the excavation as so far made, a plug or filling of foundation material such as concrete or the like, causing the same to closely adhere to the walls of the excavation and to a section of an air shaft and pipes that open below through the plug, or

upper part of foundation, and I then force compressed air into the excavation below such plug or part of foundation, and continue the excavation down through the soft or spongy earth below the plug, carrying the material out through the air shaft, which plug retains such compressed air in the chamber or excavation below, whereby the wet, soft or spongy earth at the sides of the excavation may be held back until hard bottom or bed rock is reached, and if necessary breast braces or sheathing are placed along the walls of the soft or spongy earth in such chamber. After the excavation is carried down to the required depth through such earth said excavation below said plug is filled with foundation material, such as concrete, up to the bottom of the plug, or approximately to the bottom of the plug, and joined to the plug by a binder such as grout under pressure, the compressed air causing the grout to flow into the spaces and crevices between the plug and foundation material below. The air shaft may then be removed from the plug, and concrete is filled, if desired, in the bore left in the plug or in the air shaft, if the latter is not removed, and in the pipes and upon the plug to the desired height, whereby a solid foundation through the excavation to hard bottom or bed rock is produced, and upon which piers, columns and the like may be erected in any desired manner, either hollow or solid. Thus, I am enabled to carry on the work under the plug by plenum pneumatic pressure, and the plug that is used in carrying on the work becomes part of the completed foundation.

In the accompanying drawings I have illustrated various steps utilized in carrying out my invention, wherein,

Figure 1 is a vertical sectional view illustrating the procedure preparatory to placing the concrete plug in the excavation; Fig. 2 is a similar view illustrating the excavation with the concrete plug, air shaft and pipe in place preparatory to continuing the work below the same; Fig. 3 is a cross section on the line 3, 3, in Fig. 2; Fig. 4 is a vertical section showing the further step of building the foundation beneath the concrete plug, and Fig. 5 is a similar view illustrating the complete foundation ready to receive a pier, column, or the like to be erected thereon, when the foundation is filled solid.

In carrying out the invention a suitable

excavation, illustrated at 1, is dug in the ground to or into soft, spongy or watery earth, at 2, which would be liable to fall or flow into the excavation if the latter be carried below to the required depth, and which is also liable to permit the adjacent ground to fall or flow into the excavation, and meanwhile the walls of the excavation may be protected, as with sheet piling 3 and ranges or braces 4, or otherwise, in well known or suitable manner. A plug 5 is then formed within the excavation adjacent to and above the soft, spongy or watery earth 2, so as to adhere firmly to the walls of the excavation, or to the piling 3, which plug may be formed by first building an arch or temporary support or the like 6 adjacent the soft, spongy or watery earth 2 and filling foundation material, such as concrete, preferably of a somewhat thin consistency, into the excavation upon the arch or temporary support to a desired depth. To permit further work to be carried on below plug 5 I place a section 7 of an air shaft within the excavation with its lower end resting upon or passing through the arch, and pipes 8, 8^a, rest upon or pass through the arch or temporary support, said shaft section and pipes preferably being placed in position before the foundation material or concrete plug 5 is filled in (see Fig. 1), whereby the plug will adhere closely to said shaft section and pipes. After the plug has hardened the arch or temporary support is removed, and the required upper shaft sections are applied with the usual air lock 7^a. The part of the excavation, as at 1^a, below said plug and air shaft forms an air chamber in which further digging of the excavation may proceed, while access to such chamber and carrying out of the excavated material from below the plug, may be had through air shaft 7 and its lock 7^a in well known manner, the plug 5 forming a seal for the top of said air chamber.

Air under pressure in chamber 1^a is maintained through pipe 8 to hold back the soft, spongy or watery earth at the walls thereof, but if this air pressure is not found sufficient for the purpose breast-braces or sheathing, illustrated at 9, may be placed along the walls of chamber 1^a as required. When the excavation below plug 5 has been carried down to the required depth, as to hard bottom or bed rock 10, and the latter has been smoothed or finished as required, foundation material, such as concrete 11 for the foundation, is built upwardly upon said bottom or rock until it meets and adjoins plug 5, or nearly so, this work also being carried on under pressure. A suitable binder, such as grout or thin cement, is then poured into the air shaft to fill the spaces and crevices, at 12, between the bottom of plug 5 and the top of the portion 11 of the foundation, to unite such parts in a solid

mass, under pressure, and the air pressure may be increased if desired, to force the grout or cement thoroughly into said spaces and crevices. The air shaft may then be removed and concrete or foundation material is then filled into the bore in plug 5, to rest upon foundation 11, or one or more sections of the air shaft may be left in position, such as the section in the plug, and filled with the foundation material. The foundation material or concrete is also filled in excavation 1 upon and above plug 5, as at 13, to any desired height, as shown in Fig. 5, upon which piers, columns and the like may be erected for buildings and other structures. The foundation 11 built up from below to engage plug 5 and the foundation portion 13 filled into and upon said plug, all united in a solid mass as described, produce a foundation resting upon hard bottom or bed rock which will be safe and durable for the purpose intended.

By my method I am enabled to utilize plenum pneumatic pressure for working below the plug whereby I gain the advantages of such pressure for holding back the earth and setting the foundation. Furthermore, by means of my invention the construction of foundations through soft, spongy or watery earth may be readily and expeditiously carried on by reason of the fact that the plug formed within the excavation retains the compressed air in the chamber below the plug, and also by reason of the further advantage that said plug forms part of the completed foundation, because the lower foundation portion 11 built up to said plug from below the plug forms a continuation thereof, and the plug remains in the excavation.

Having now described my invention what I claim is:

1. The method of constructing foundations consisting in producing an excavation, introducing a permanently fixed plug in said excavation, building a foundation in the excavation beneath the plug, and joining such foundation to the plug.

2. The method of constructing foundations consisting in producing an excavation, introducing a permanently fixed plug in said excavation, building a foundation in the excavation beneath the plug, and forcing a binder under pressure into the spaces between the plug and the foundation below it.

3. The method of constructing foundations consisting in producing an excavation, forming a permanently fixed plug in the excavation, building a foundation under pressure beneath the plug, and forcing a binder under pressure into the spaces between the plug and the foundation.

4. The method of constructing foundations consisting in producing an excavation, introducing a permanently fixed plug in said

excavation, building a foundation in the excavation beneath the plug, joining such foundation to the plug, and superimposing foundation material upon said plug.

5 5. The method of constructing foundations consisting in producing an excavation, forming a permanently fixed plug in the excavation, maintaining pressure in the excavation below the plug and continuing the excavation downwardly, building a foundation under pressure in the excavation upwardly approximately to the plug, joining the foundation under pressure to the bottom of the plug, and superimposing foundation material upon the plug.

10 6. The method of constructing foundations consisting in producing an excavation, introducing a permanently fixed hollow plug in said excavation, continuing the excavation below said plug, building a foundation upon the bottom of the excavation and joining it to the bottom of the plug, and then filling the opening in such plug.

15 7. The method of constructing foundations consisting in introducing a permanently fixed portion of a foundation within an excavation, maintaining air under pressure in the excavation beneath said foundation portion, and continuing the foundation in the excavation under such air pressure.

20 8. The method of constructing foundations consisting in producing an excavation, introducing a permanently fixed portion of a foundation therein securely fitted substantially air-tight to the walls of the excavation, and building an additional foundation portion in the excavation beneath and joined to the first named foundation portion under compressed air pressure retained in the excavation by the first named foundation portion.

25 9. The method of constructing foundations consisting in producing an excavation,

inserting an air shaft therein, introducing a permanently fixed plug in said excavation in contact with the walls of the excavation and the air shaft, continuing the excavation below said plug and building up a foundation from the bottom of the excavation under air pressure in the excavation, joining said foundation to the plug, and filling the opening in the plug with foundation material.

30 10. The method of constructing foundations consisting in producing an excavation, shoring the walls thereof, placing an air shaft and air pipe in said excavation, filling the excavation with a plug above the lower end of the air shaft and pipe and in close contact therewith and with said shoring, continuing the excavation below the air shaft, building up a foundation to the plug under air pressure in the excavation, filling the openings in the plug with foundation material, and filling foundation material upon said plug in the upper part of the excavation.

35 11. A foundation comprising a permanently fixed plug introduced above the bottom of an excavation, foundation material formed upon the bottom of the excavation below the plug and joined thereto, and foundation material located upon and supported by said plug.

40 12. A foundation having a permanently fixed portion secured to the walls of an excavation above its bottom and an additional portion below and joined to the bottom of the first named foundation portion.

Signed at New York city, in the county of New York, and State of New York, this 3rd day of October, A. D. 1907.

JOHN F. O'ROURKE.

Witnesses:

T. F. BOURNE,
MARIE F. WAINRIGHT.