No. 654,426. Patented July 24, 1900.

W. DE H. WASHINGTON.

ART OF BUILDING SUBWAYS.

(Application filed Mar. 23, 1899.)

(No Model.) 3 Sheets—Sheet 1.

Fig. 1.

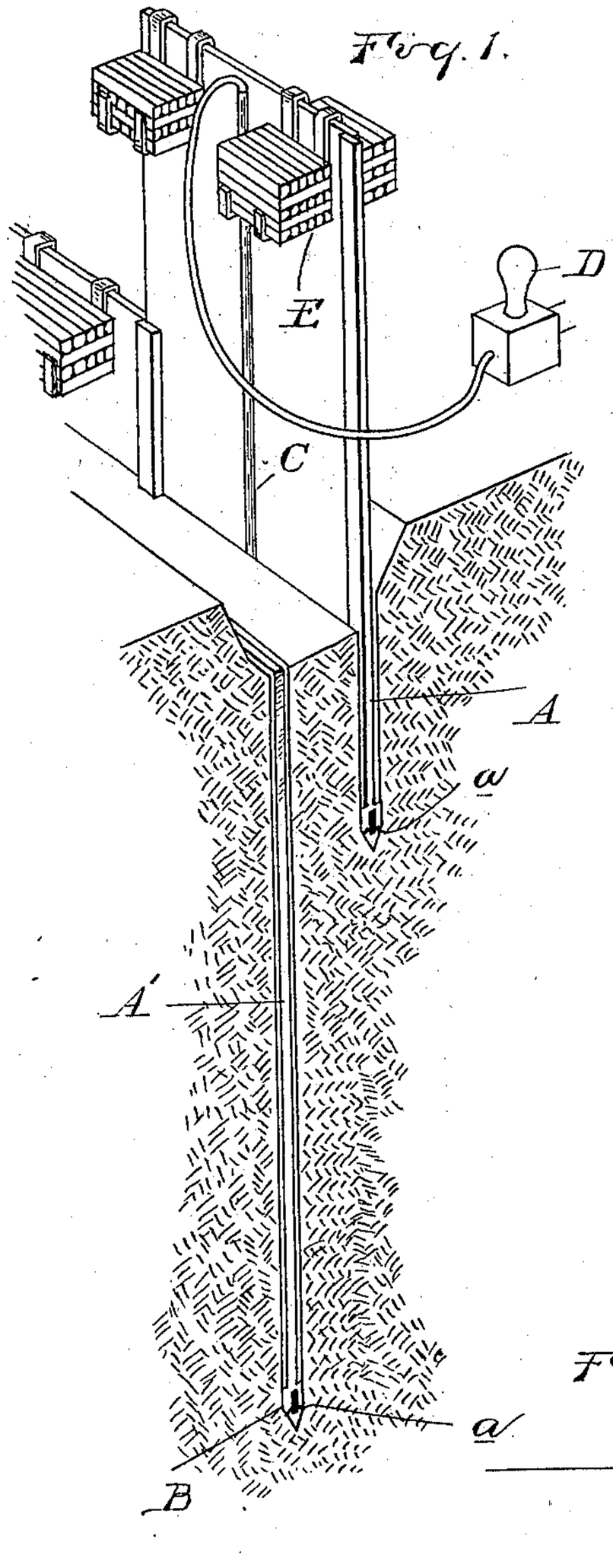

Fig. 2

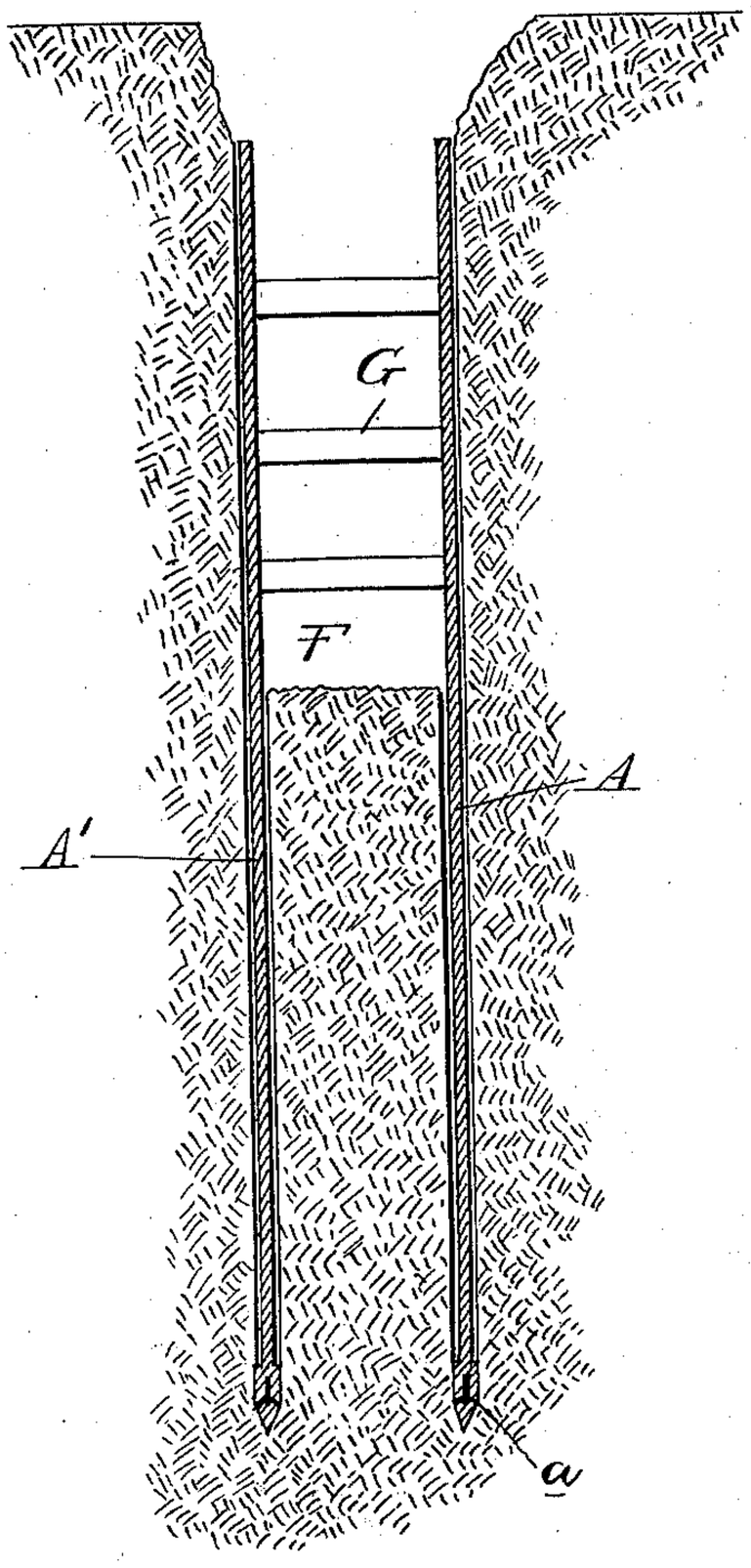

Fig. 7.

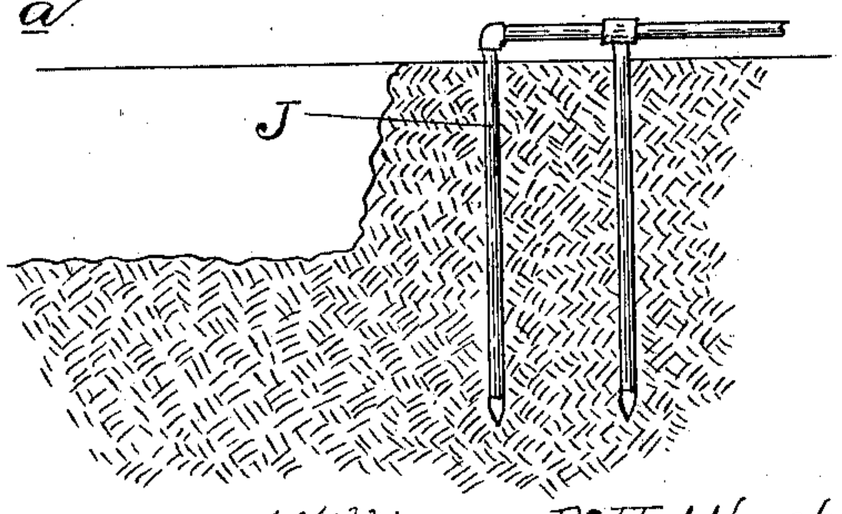

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Fig. 3.

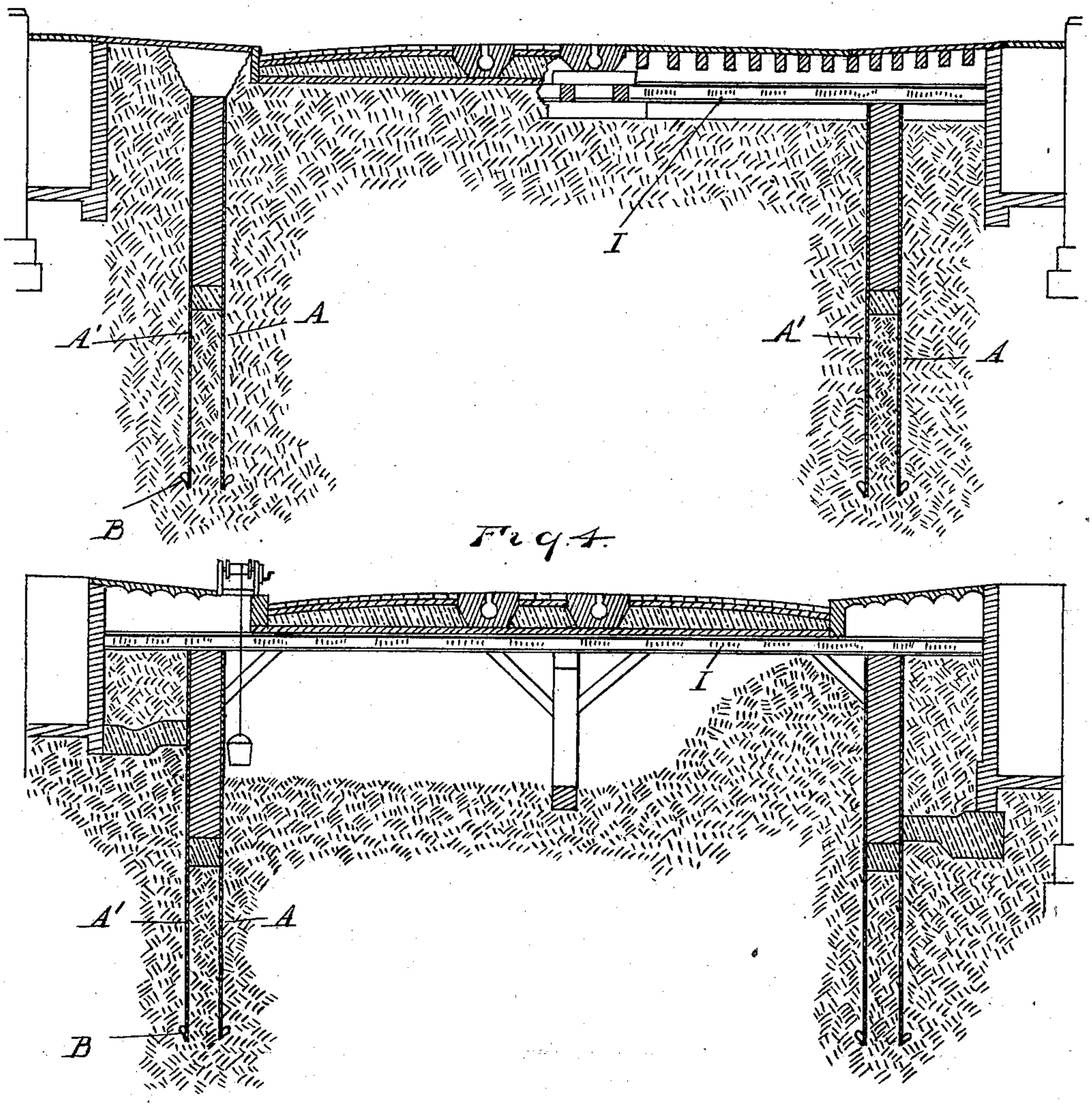

Fig. 4.

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Fig. 5.

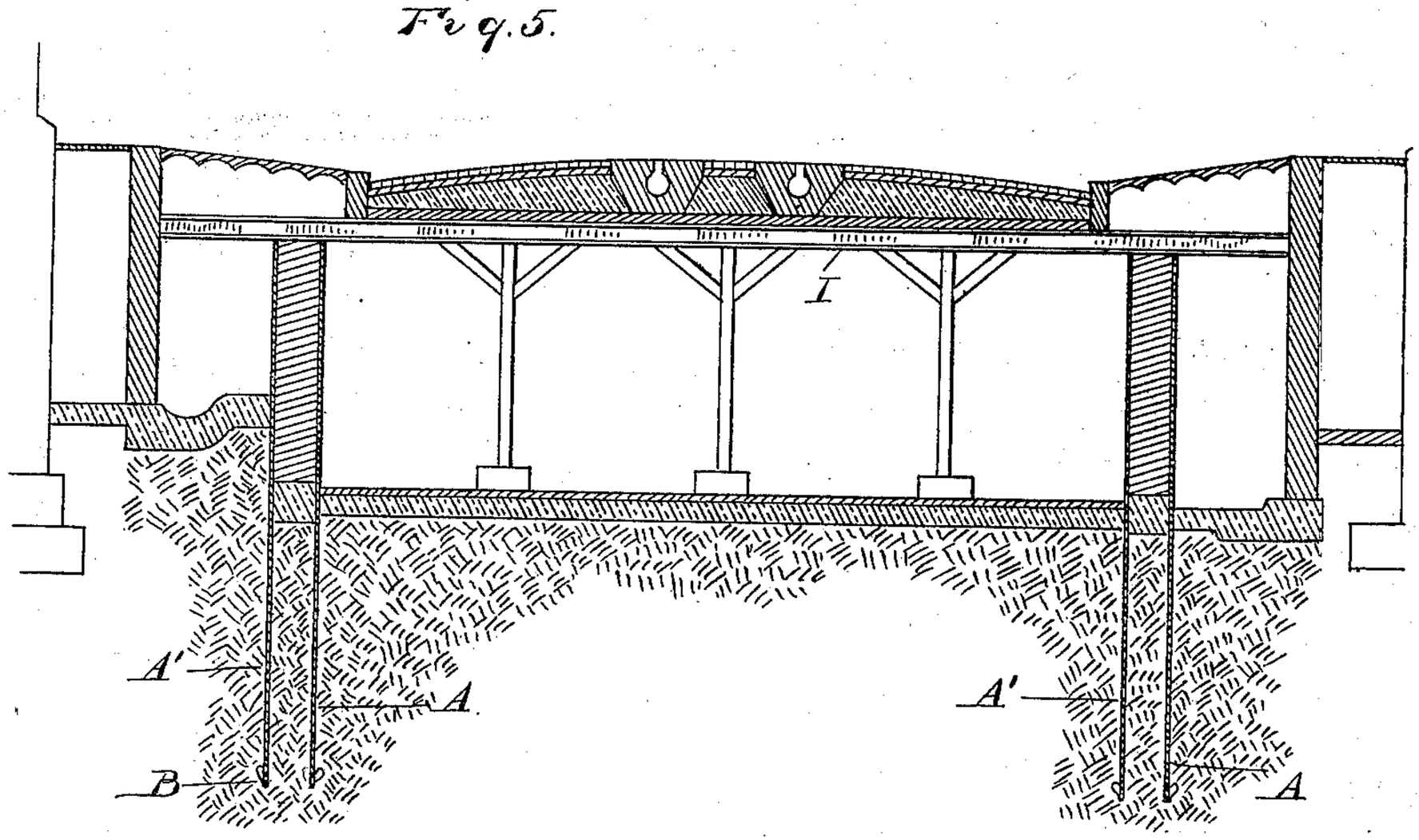
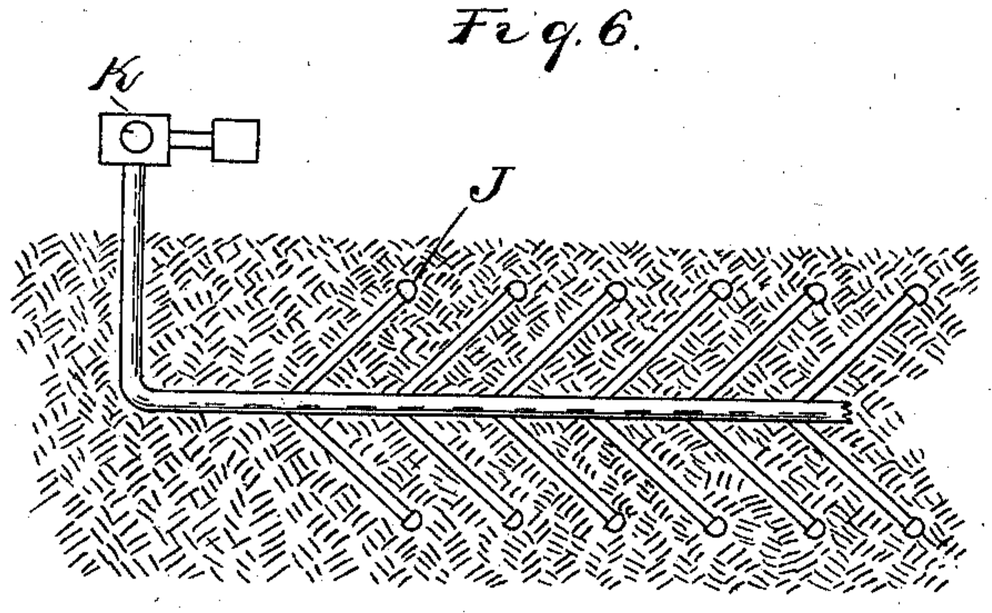


Fig. 6.



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UNITED STATES PATENT OFFICE.

WILLIAM DE H. WASHINGTON, OF NEW YORK, N. Y.

ART OF BUILDING SUBWAYS.

SPECIFICATION forming part of Letters Patent No. 654,426, dated July 24, 1900.

Application filed March 23, 1899. Serial No. 710,202. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM DE H. WASHINGTON, a citizen of the United States, residing at New York, in the county of New York and State of New York, have invented certain new and useful Improvements in the Art of Building Subways, &c., of which the following is a specification, reference being had therein to the accompanying drawings.

The invention consists in an improvement in the art of building subways or other similar excavations or subterraneous work.

The invention as herein outlined particularly relates to building a subway under a street upon which there is traffic; and it consists in the method of performing the work and in the means employed, so that the work may go on with the least possible interruption to the traffic, as will be more fully hereinafter described.

In the drawings, Figure 1 is a sectional perspective view showing the manner of sinking the sheet-piling preparatory to laying the side walls. Fig. 2 is a section showing the piling sunk and the trench formed ready for the wall. Fig. 3 is a section through the roadway, showing on the left hand the side wall sunk and on the right hand the temporary roadway in position. Fig. 4 is a section showing the permanent roof in position and excavation under way. Fig. 5 is a section showing the subway complete, and Fig. 6 is a diagram plan illustrating means for draining the work during trenching or tunneling. Fig. 7 is a diagram section illustrating the arrangement of the drainage-wells.

In constructing a subway on a street in which there is traffic I propose first to complete the side walls without disturbing the street beyond that part necessary for building such walls, and to do this without the danger of caving in, which exists in the digging of deep and narrow trenches and without the necessity of digging out the entire street.

I proceed first to drive sheet-piling A A′ in parallel courses separated a width equal to the width of the side walls of the complete structure. This sheet-piling I prefer to drive by hydraulic means, as follows: I build up the sheet-piling in sections, as shown in Fig. 1, and apply to each section at the foot a hollow pointed shoe B, having discharge-jets, such as *a*, therefrom, and I connect into this shoe one or more pipes C, which connect with a source of water-supply, such as the pump D. I then dig a shallow trench of sufficient depth to stand the piling upright, as shown in Fig. 1 at the right hand. The water is then forced through the pipe or pipes C, through the shoe B, and being discharged therefrom will dig out the earth below the piling and allow the same to sink. This sinking may be aided by pressure or by weight, such as E, applied while the water is being discharged.

In the drawings I have shown the sheet-piling A′ driven to the depth desired, while the sheet-piling A is just in the act of being sunk. I drive this sheet-piling a considerable distance below the point at which the foundation is to stand, so that it acts to prevent the inflow of water from the side and also acts to support the base of the sheet-piling when the trench is formed between the two sections, as shown in Fig. 2. This figure shows the two sections of sheet-piling in position with the trench F of the desired depth for a foundation, and suitable braces, such as G, for the upper part of the piling. The manner of sinking this sheet-piling I do not herein claim, as I make that the subject-matter of a concurrently-pending application, Serial No. 660,990. When the sheet-piling is driven upon one or both sides of the street and the trench F is formed, I then build in this trench the foundation of brick or stone work, as shown at the left hand in Fig. 3. It is obvious that in laying these side walls in this manner the traffic in the street need not be seriously or at all impeded. I next remove the roadway to a slight depth and replace it with a temporary roadway H, and as this may be done in sections, one side of the street or one short section of the street at a time, and as traffic can go on over the temporary roadway as soon as it is laid, it is evident that but a short interruption will be necessary. In laying this temporary roadway I may lay in position at the same time the cross-girders I, which are to form the roof-girders of the subway. I may lay those girders under the temporary roadway and complete the rough skeleton structure thereunder.

This being done, the pavement may be replaced and the excavation go on beneath either the permanent or temporary roadway, as desired, as shown in Fig. 4, where I have shown a section of the street with walls on opposite sides, the permanent roof in position, and the permanent roadway replaced, the excavation being in progress. The excavation may be continued now without danger to the side walls, as they are tied together at the top by the roof, and the only necessary indication of the activity beneath will be at that point where the material is drawn up from the excavation below.

Fig. 5 shows the subway complete. In building such subways it happens at times that the excavation would go into places where there is considerable water, or it may even go into places beneath the water-level, so that the work would be much impeded by the water if means were not provided for drawing it away. To drain the excavation, (in advance of the excavation in this or similar work,) I may either attach suction-pipes to the pipes C, which connect to the shoes B in advance of or adjacent to the excavation, or I may and preferably do sink a series of drive-wells of any known or usual construction, as indicated at I in Fig. 6, and connect these drive-wells with the suction apparatus, such as the pump indicated in diagram at K, drawing the water from a point below the excavation and maintaining it below that point at all times and in advance of the work. In Fig. 7 I have indicated in a simple diagram section a pair of these wells and the connecting-pipes, showing them arranged slightly in advance of the excavation. I believe this is an entirely new departure in excavation—that is, to sink wells adjacent to the trench, subway, or other excavation, so as not to interfere in any way therewith and by suitable pumps or suction devices maintain the water-level in the strata in which the excavation is being done below the level at which the work is being carried on.

What I claim as my invention is—

In a subway, the side walls, sheathing on both sides thereof and extending a considerable distance below the bottom thereof, to form in effect a dam below the walls.

In testimony whereof I affix my signature in presence of two witnesses.

WILLIAM DE H. WASHINGTON.

Witnesses:
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JULIAN E. INGLE, Jr.