

No. 736,560.

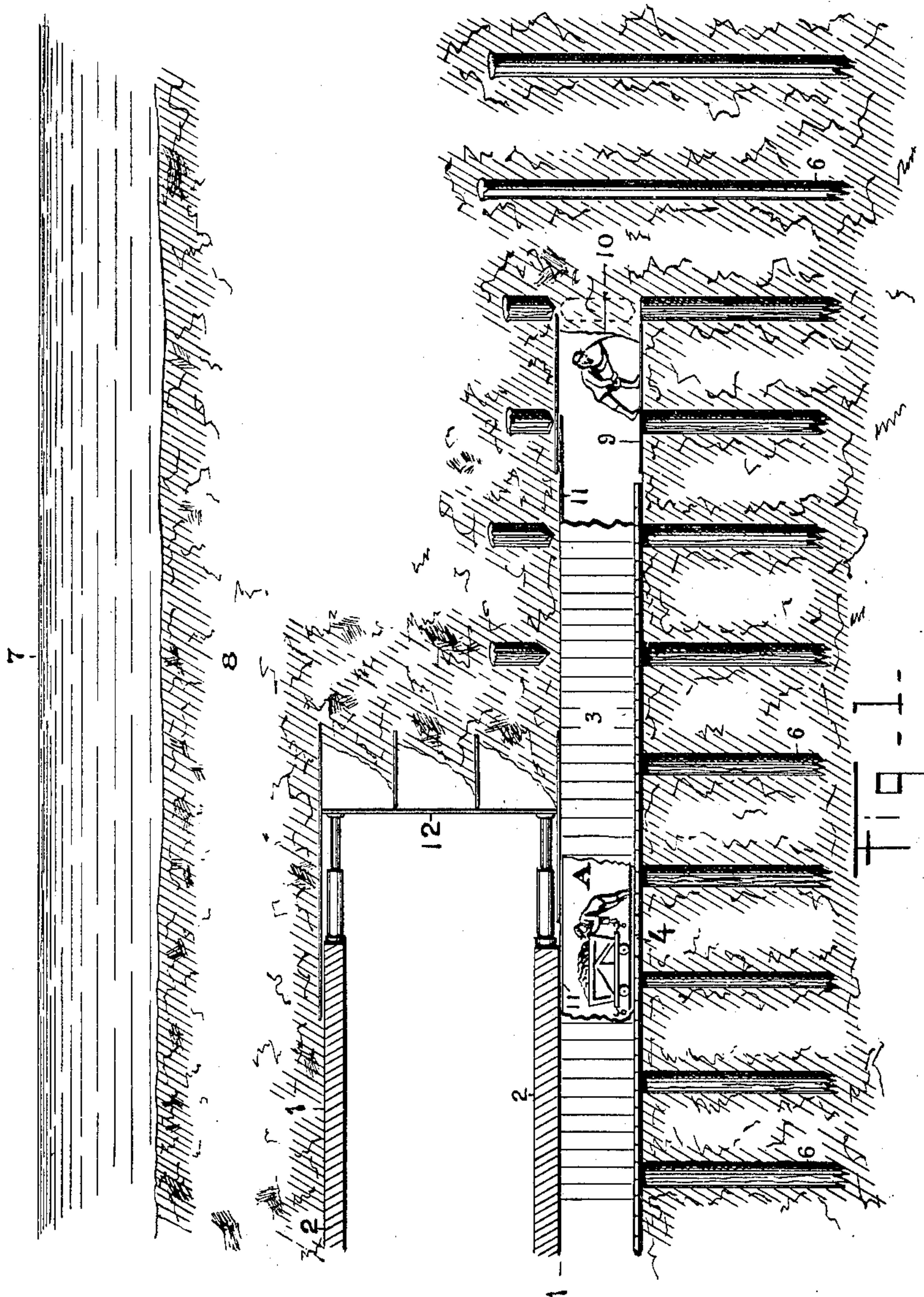
PATENTED AUG. 18, 1903.

C. SOOYSMITH.
METHOD OF CONSTRUCTING FOUNDATIONS AND TUNNELS
OR OTHER STRUCTURES.

APPLICATION FILED MAR. 9, 1903.

NO MODEL.

2 SHEETS—SHEET 1.



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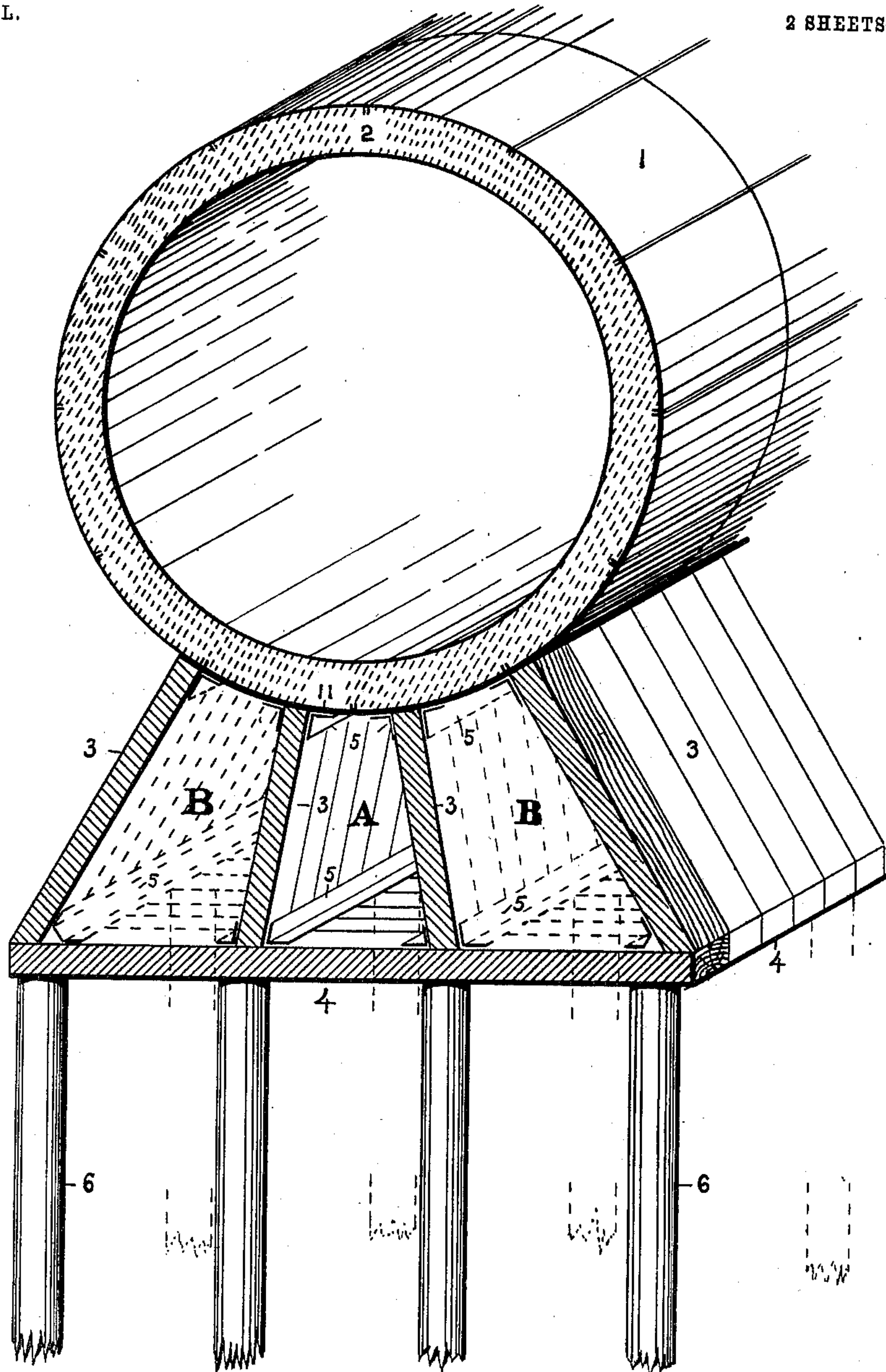


Fig. 2.

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CHARLES SOOYSMITH, OF NEW YORK, N. Y.

METHOD OF CONSTRUCTING FOUNDATIONS AND TUNNELS OR OTHER STRUCTURES.

SPECIFICATION forming part of Letters Patent No. 736,560, dated August 18, 1903.

Application filed March 9, 1903. Serial No. 146,825. (No model.)

To all whom it may concern:

Be it known that I, CHARLES SOOYSMITH, a citizen of the United States, and a resident of New York, in the county of New York and State of New York, have invented certain new and useful Improvements in the Methods of Constructing Foundations and Tunnels or other Structures, of which the following is a specification.

10 My invention relates to the method of building subterranean or submarine structures and their foundations and especially the method of constructing tunnels and their foundations in loose or water-bearing material.

15 The objects of my invention are, first, to provide a method of construction and especially of constructing tunnels which shall be quick, economical, and easy; second, to provide a method of constructing foundations simultaneously with the construction of the work itself; third, to provide a method of building foundations for the structure which will prevent delay in erecting the structure superimposed thereon; fourth, to obviate the danger of disalignment of the main tunnel and its shield. I attain these objects by the methods and means illustrated in the accompanying drawings and described hereinafter.

30 In the drawings like letters of reference refer to like parts throughout the respective views.

Figure 1 is a longitudinal elevation, mostly in section, on the middle plane of the tunnel. Fig. 2 is a vertical cross-section of the tunnel.

35 In Fig. 1, 1 is the lining or skin of the tunnel, preferably of metal and made in sections which may be bolted or otherwise attached each to each.

40 2 is the interior lining, of concrete or other material.

3 is the siding or framing of the pilot-tunnel and completed foundation.

45 4 is the bottom timbers of the tunnel or foundation, shown resting upon the piles 6 and to which the timbers 3 are securely fastened, the angle-irons 5, Fig. 2, assisting in this securing.

7 represents the water under which the tunnel is being constructed.

50 8 represents the soft bed of the river or other locality through which the tunnel is being excavated.

9 represents the shield by the advance of which the pilot-tunnel A B, Fig. 2, is constructed. 10 represents the heading of this pilot-tunnel. 55

11 represents the upper lining or plate constituting the ceiling or roof of the pilot-tunnel and in and on which the large tunnel rests and is constructed. 60

12 is the shield of the main tunnel and advanced by the usual hydraulic or pneumatic means.

A B represent divisions or sections of the pilot-tunnel separated each from each by the interior walls of timber 3, the portions B B preferably being intended to be filled in with concrete and the portion A to be left empty, thus providing a passage-way open at all times both for the purpose of construction and subsequent utilization, as may be desired. 70

My method of construction is as follows: I first prefer to drive or place in the line of the proposed tunnel a number of piles 6, preferably driven so that their heads shall lie on the line of the bottom of the completed foundation, although if they do not extend quite so deep as this it is immaterial, since they can be easily cut off on the advance of the pilot-tunnel shield 9. This shield is constructed 80

of such size that a man may work comfortably within it, as illustrated in the drawings. It may or may not be found necessary to use compressed air in the operation of this shield, the cross-section of which is that of the foundation, (shown in Fig. 2 as a substantial trapezoid,) only that the upper side 11 is concaved. 85

As this shield is advanced the pilot-tunnel is excavated and the timbers 4 are laid upon and may be secured to the heads of the piles exposed by the progress of the shield. The timber walls and partitions 3 are then put in place, the latter being set at such angles that the pressure of the surrounding material will be properly resisted and at the same time they will assist to support the main tunnel when completed. The angle-irons 5 assist in securing these timbers. The plate 11 forms the top or roof of this pilot-tunnel and is straight or curved to correspond with the base of the tunnel. I preferably make it curved, as illustrated, in order to serve as a guide or track for the shield 12 and a cradle for the completed tunnel. As the latter progresses the 100

sections B B may be filled in with concrete or other solid material; but the portion A is left open for access to the heading for removal of material or for any other purpose to which it may be then or subsequently devoted. In Fig. 1 at A the side timbers 3 are broken away, showing a tramway in this open passage for the conveyance of material. At 9 and 11 they are also broken away to show the shield and heading. After constructing the pilot-tunnel a sufficient distance in advance the main tunnel is commenced by advancing the shield 12 over and in contact with the plate 11, which forms the top of the foundation formed by the pilot-tunnel, and the sectional and concrete or other lining of the main tunnel is constructed upon this plate 11 in the usual way in rear of the shield 12.

It will be evident that one of the objects of advancing the pilot-tunnel is to insure the correct alinement of the main tunnel, and it is evidently easier to maintain the alinement of the small shield and pilot-tunnel than one of full size, and this alinement having been once attained the large shield and main tunnel may be advanced and constructed upon the foundation thus secured with a minimum of effort and with a maximum of accuracy.

Heretofore in the construction of tunnels upon piles or other foundations there has been a difficulty and delay in properly embedding and superimposing the structure upon these piles and properly cutting the latter off. Moreover, previous methods have not lent themselves easily to the construction of a round tunnel, which latter is for many reasons desirable. It will be evident that the small shield used in the construction of the pilot-tunnel can be much more easily handled than the large one and gotten well in advance of the main tunnel, and the main tunnel may be constructed of any desired shape and size and follow the pilot-shield without interruption caused by the operation of sawing off piles, &c. The unobstructed and open section A may be used as a conduit for walls, cables, pipes, drainage, or other purpose during and after completion of the work. It is also evident that the pilot-tunnel or foundation may be made at one operation or may be made of separate sections and be constructed simultaneously or successively with the construction of the main tunnel thereupon.

In describing herein the use of timber as forming the walls and bottom of this foundation or pilot-tunnel I do not wish to be understood as limiting myself to such material, as timber, metal, or other material may be used in whole or in part, nor do I limit myself to the exact shape as illustrated or any particular size of such foundation or pilot-tunnel. Moreover, while I have indicated that the two outer portions or sections B B of this foundation are filled with concrete and the interior portion A left empty I may reverse or modify this arrangement as I find it desir-

able, and it is evident that the upper portion of the piles which have been cut off by the pilot-shield may be withdrawn or otherwise removed before or during the advance of the main tunnel.

It will be understood that I do not limit myself to the exact arrangement or construction herein shown, as it is evident that I may, for instance, omit entirely the bottom timbers 4, laying my concrete directly upon the heads of the piles. I may not use the shield in the construction of a pilot-tunnel or foundation. I may omit partitions in the construction of the latter, using posts or omitting them entirely. Moreover, the interior chamber A may be filled in with concrete or other substance, and this may be done either immediately or subsequently or not at all, and the main tunnel may not rest directly upon the plate or top 11, but be on slides or rollers, or may be constructed in proximity to this plate, leaving an intervening space filled with mud to be subsequently removed and this space filled with grouting, &c., if desired. It will be clear also that this invention is not limited to the construction of tunnels, but may be used in the formation of foundations or other structures, such as dock-walls or other structures where it may be advisable to construct a foundation under water in this manner and thereafter build thereupon.

What I claim, and desire to protect by Letters Patent, is—

1. The method of constructing foundations which consists in, first, placing a plurality of supports therefor, second, advancing a shield over such supports, third, constructing a foundation in the space so formed and resting upon the supports, substantially as described.

2. The method of construction which consists in, first, placing a plurality of supports, second, excavating over them by means of a shield, third, constructing a foundation in such excavation upon said supports, fourth, erecting a structure upon such foundation, substantially as described.

3. The method of construction which consists in, first, placing a plurality of supports, second, excavating over them by means of a shield, third, constructing a foundation in such excavation upon said supports, fourth, excavating the material over said foundation by means of a shield and erecting a structure in the latter excavation and resting upon said foundation, substantially as described.

4. The method of constructing tunnels which consists in, first, placing a plurality of supports, second, excavating over the heads of said supports and erecting thereon a foundation, third, excavating over said foundation and erecting a structure thereupon, substantially as described.

5. The method of constructing a tunnel which consists in, first, placing a plurality of piles in line of the proposed tunnel, second, constructing a pilot-tunnel resting upon said

5 piles, third, filling in a portion of said pilot-tunnel with solid material, fourth, advancing a shield over the foundation thus formed, fifth, constructing the lining of a main tunnel upon said foundation, substantially as described.

6. The method of constructing tunnels which consists in placing a plurality of supports, progressively constructing a foundation thereon, and progressively erecting a tun-

nel on said foundation, substantially as described.

Signed at New York, in the county of New York and State of New York, this 18th day of February, A. D. 1903.

CHARLES SOOYSMITH.

Witnesses:

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WM. H. GRIFFIN, Jr.