(No Model.)

C. SOOYSMITH.

METHOD OF TUNNELING AND SINKING SHAFTS.

No. 331,656. Patented Dec. 1, 1885.

Fig. 1.

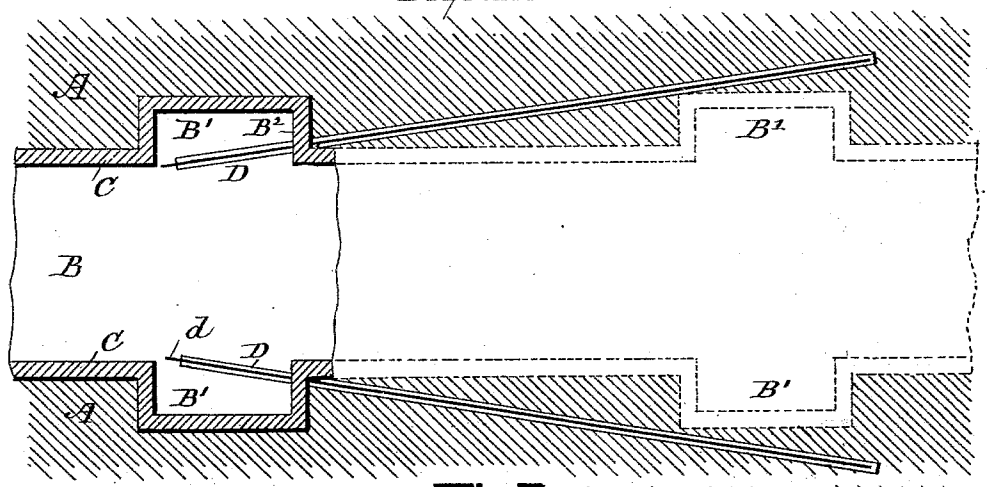


Fig 2

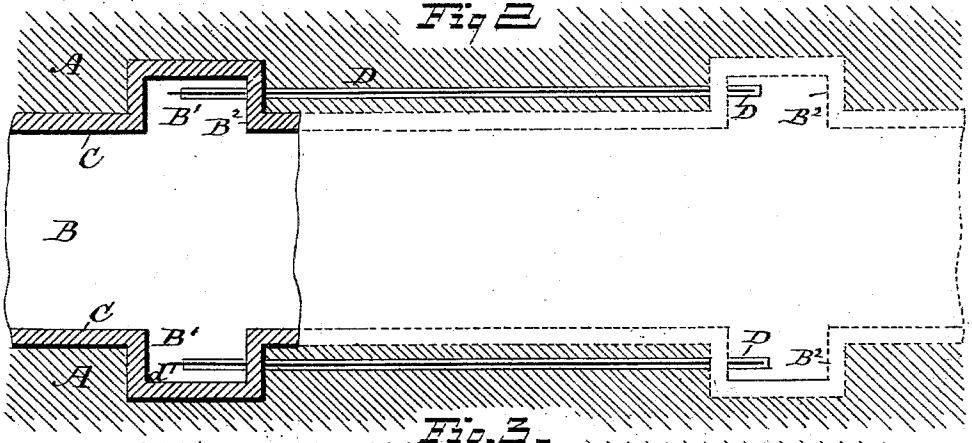
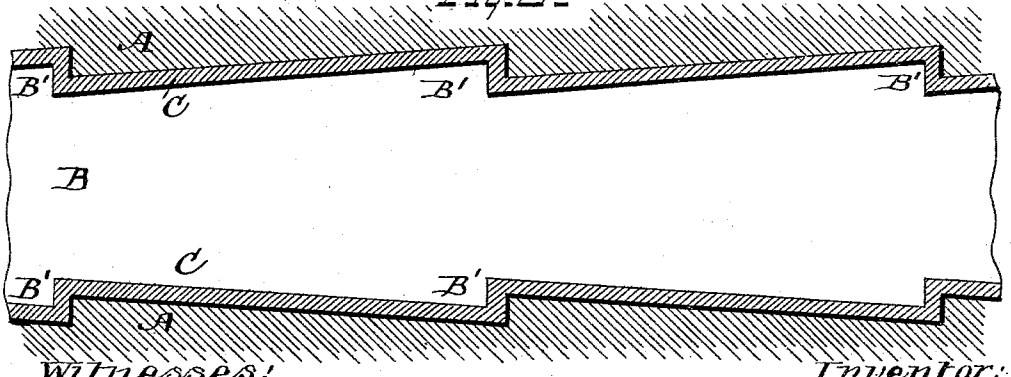


Fig. 3.



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UNITED STATES PATENT OFFICE.

CHARLES SOOYSMITH, OF CHICAGO, ILLINOIS.

METHOD OF TUNNELING AND SINKING SHAFTS.

SPECIFICATION forming part of Letters Patent No. 331,656, dated December 1, 1885.

Application filed January 12, 1885. Serial No. 152,670. (No model.)

To all whom it may concern:

Be it known that I, CHARLES SOOYSMITH, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented a certain new and useful Improvement in the Method of Tunneling and Sinking Shafts, of which the following is a specification, reference being had therein to the accompanying drawings.

This invention relates to an improved method of boring and tunneling and the prosecution of other mining and engineering operations; and the invention consists in a novel application of a freezing method, and in a novel method of constructing shafts and tunnels, whereby said freezing method may be employed.

Heretofore pipes adapted for the circulation therein of a freezing agent, medium, or substance have been inserted into the ground and from the surface thereof in such relative positions as to congeal the several strata of earth through which said pipes have been passed, in order to freeze quicksand or other water-carrying strata, that the earth inclosed by said series of pipes may be excavated and the excavation protected by freezing until it could be properly walled up.

My invention consists in the novel manner of placing a series of freezing-pipes so as to practice the freezing method upon successive sections or portions of a shaft or tunnel, and in a method of tunnel and shaft construction which permits of a successive insertion and use of freezing-pipes, all as hereinafter more particularly described, and specifically set forth in the claims.

Referring to the drawings, Figures 1, 2, and 3 are horizontal sections of a tunnel and freezing-pipes arranged therein in accordance with my invention, the outlines of the tunnel being of a form adapted to the practice of my invention.

Like letters indicate like parts in all the figures.

The section-lines A A represent portions of the earth or underground through which is to be extended a tunnel, B, the completed side walls, C, thereof being shown in section. It is to be understood that the earth or underground through which the tunnel is to be constructed is of that nature in which quicksands or water-carrying strata occur, and in which it is necessary to provide means for preventing the caving in of the earth as fast as the adjacent earth is excavated.

In order to provide for the insertion of the freezing-pipes in advance of the completed portions of the lining of the wall of the tunnel, whether of stone-work, timber, or other structure, I form offsets B′ at either side, and, if desired, at the top or bottom of the tunnel, said offsets being at such distance apart as is most convenient in accordance with the length of the freezing-pipes employed—that is to say, the distance from one offset to another is less than the length of the freezing-pipes employed, in order that the earth may be frozen for a distance ahead sufficient for a section of the tunnel and the offset at the end thereof. After the completion of the first series of offsets I insert the freezing-pipes D, which are of the usual construction, and capable of permitting a circulation of a refrigerative agent therethrough, having an internal pipe, *d*, that extends nearly to the end of the pipe D. These pipes are inserted through the front lateral wall, B^2, of the offset, and at such places through said wall and at any direction or angle to said wall which shall insure the passage of the pipes at a greater or less distance from the locality of the proposed lining of the tunnel or excavation, in order that the earth adjacent thereto may be frozen.

In Fig. 1 I illustrate the freezing-pipes as driven at an angle to the proposed wall or lining, and extending beyond the next offset in the series. In Fig. 2 I represent such pipes as are driven in line parallel with the wall of the lining of the tunnel, and extending into the succeeding offset.

The freezing-pipes may be disposed in other relative directions than those shown, if desired, the object being to so dispose of them as to solidify by freezing the adjacent earth.

So far as described it is not absolutely essential that the offsets be completely and permanently walled in or lined, as, the adjacent earth being frozen and kept in that condition until the succeeding section of the tunnel is constructed, it is apparent that the pipes may be either left embedded in the earth or removed and subsequently the wall C continued straight across the offset; but I prefer to wall in the offset, as its rear wall serves as a foun-

dation or resistance for the operation of the hydraulic jack, or any other forcing apparatus which it may be desirous to use in order to drive the pipes into the earth, as shown.

In Fig. 3 I have shown an outline of a tunnel varying from those shown in Figs. 1 and 2, in that the excavation and offset are made by gradually expanding the side walls or lining of the tunnel parallel with the pipes shown in Fig. 1.

I deem it proper to state that although I have described my novel method of applying the freezing process to successive sections with reference to a tunnel, it is readily apparent that it is equally applicable to a shaft either vertical or of any inclination, in which case, by considering the left of each figure of the drawings as the top of said figure, it will be seen that the offsets B′ serve the same as in a tunnel, and also serve the function of a support for any frame-work or structure convenient for the further excavation, and in this regard the rear walls of the offsets serve the same function in the tunnel.

Having described my invention and its operation, what I claim as new, and desire to secure by Letters Patent, is—

1. The method herein set forth of constructing shafts, tunnels, and similar earth-works, which consists in freezing the earth adjacent to the proposed excavation, forming offsets in said excavation, and again inserting pipes in the adjacent earth from said offsets, and freezing as before for further excavation, and so on, substantially as specified.

2. The method herein set forth of excavating earth-works, which consists in freezing the earth adjacent to said excavation, forming offsets in said excavation, and disposing freezing-pipes from said offsets diagonally into the earth adjacent to the proposed extension of the excavation, and freezing and excavating as before, substantially as specified.

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

CHARLES SOOYSMITH.

Witnesses:
E. E. MASSON,
W. B. MASSON.