No. 626,078. Patented May 30, 1899.

T. H. MURPHY.

TUNNEL LINING.

(Application filed May 19, 1898.)

(No Model.)

Fig. 1

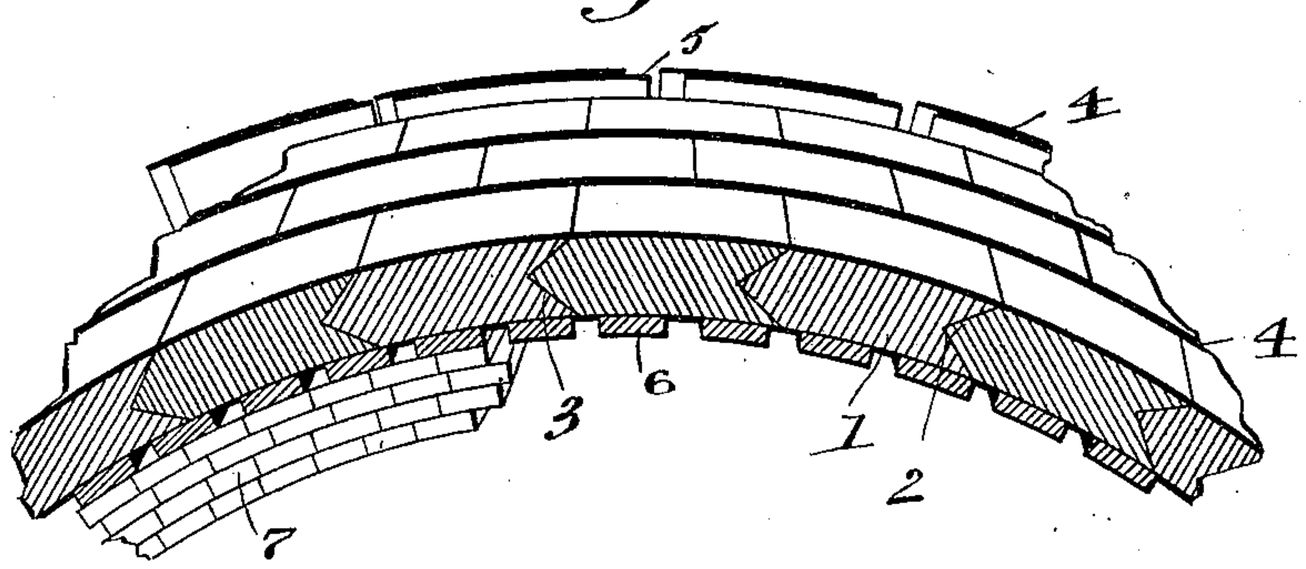


Fig. 2

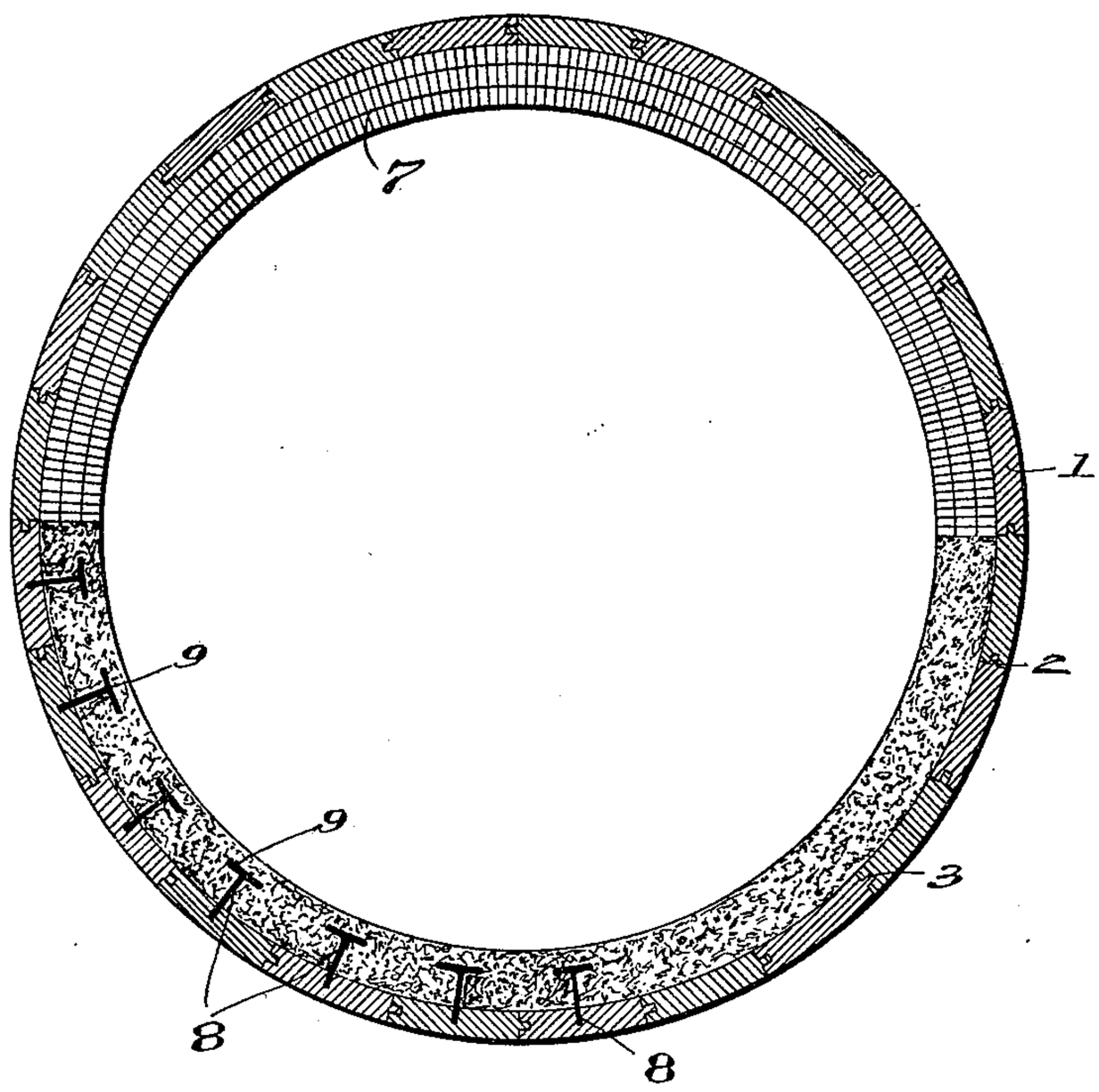
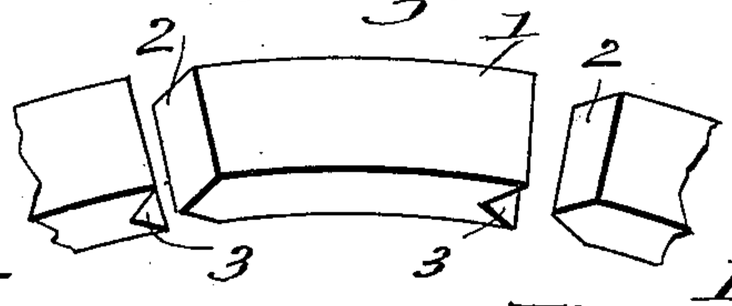


Fig. 3



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Inventor
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By his Atty.
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UNITED STATES PATENT OFFICE.

THOMAS H. MURPHY, OF BOSTON, MASSACHUSETTS.

TUNNEL-LINING.

SPECIFICATION forming part of Letters Patent No. 626,078, dated May 30, 1899.

Application filed May 19, 1898. Serial No. 681,127. (No model.)

To all whom it may concern:

Be it known that I, THOMAS H. MURPHY, a citizen of the United States, and a resident of Boston, (Charlestown,) State of Massachusetts, have invented certain new and useful Improvements in Tunnel-Linings, of which the following is a specification.

My invention relates to improvements in tunnel-linings to be used in the construction of tunnels and subways in connection with the use of a shield which is employed in the process of excavation in a well-known manner.

Heretofore shields have been used most successively in connection with a tunnel-lining comprising cast-iron sections in the form of segment-boxes bolted together in a circle, which receive the direct pressure of the rams which are employed to push the field forward into the heading and cut out the excavation. This lining has been expensive and requires considerable time to erect. Various attempts have been made to use grouting concrete or loose bricks laid together without mortar as an outer lining to receive the thrust of the shield and inclosing an inner lining of brick masonry, as it has been found wholly impracticable to receive the shield pressure upon newly-laid masonry. The grouting concrete when used as an outer lining requires time to set and when pressed upon before setting will check or crack the green or newly-laid masonry and render the lining of the tunnel faulty.

The object of my invention is to provide a combined outer tunnel-lining and shield abutment-ring within which the masonry of the tunnel-lining may be built, or a concrete lining may be secured and completely protected both against the pressure and destructive actions of extraneous or unexcavated material until the inner lining containing lime or cement has been thoroughly dry and set.

My invention consists in an outer tunnel-lining made of wooden blocks or sections locked together and placed one upon the other and secured together, the circumferential joints being preferably laid with sheets of suitable waterproof material, as burlap soaked in tar, which will, when tightly compressed by the rams, provide a non-yielding abutment to receive the pressure of the shield and also a water-tight outer lining for the masonry.

My invention further consists in securing inwardly-projecting bolts to the wooden lining, having bond-plates upon their inner end to hold the concrete or other inner lining more securely to the outer lining, as will hereinafter appear with reference to the accompanying drawings, wherein—

Figure 1 is a perspective view of a series of blocks, lining, and connecting-pieces laid together to form my improved outer lining; Fig. 2, a transverse section upon a reduced scale of a tunnel formed in accordance with my invention, and Fig. 3 a perspective detail of a segmental lining-strip and fragments of two adjacent strips.

The tunnel-lining, as shown in Fig. 1, comprises an outer lining of wooden blocks matched and interlocked at their ends and placed in rings or in a continuous ring circumferentially within the bore of the tunnel, the wooden blocks 1, as shown, having a V-shaped protrusion 2 at one end and a corresponding V-shaped indenture 3 at the other end to match and interlock with each other, and thus provide a self-supporting cylindrical shell, against which the outer unexcavated loose and liquid material of the tunnel-bore may be supported. The circumferential seams between the layers of wooden blocks may be protected and be made waterproof by a layer of waterproof material 4, as burlap, formed in segmental sections, with rabbeted ends 5, soaked in tar and placed between each layer of blocks and compressed together with the blocks by means of the rams in a solid cylindrical mass, the burlap layer breaking joint with the blocks and the blocks and burlap sections being built up continuously, one following the other, the pistons of the rams being released and adjusted successively and continually, thus enabling the shield to be pushed forward without intermission.

The continuous method of laying the outer lining and moving the shield forward uninterruptedly is of great advantage both for expediting the work and for keeping the constant pressure upon the outer lining to render it perfectly water-tight before the inside lining is laid. The rings of blocks being thus tightly compressed by the rams may be tied together by lagging 6, placed longitudinally within the outer lining and spiked to the

blocks either as a sheathing or at suitable distances apart. The entire shell forming the inner lining is thus made compact, watertight, and of pieces of any required size or sizes to thus use up waste material, the whole lining being securely bound together to provide a strong continuous self-supporting shell should the shield be removed or the pressure taken from all the rams.

The inner lining 7 may be laid within a lining such as described in a secure and workmanlike manner, suitable bolts 8 being passed through and held between the wooden blocks and secured thereto in a suitable manner, the inner end of said bolts projecting within the outer lining and provided with bound or bond plates 9, thus providing an anchorage for an inner lining of concrete or grouting, which may be readily shaped to any desired design of cross-section, either to suit the purposes of the tunnel or to provide subconduits for drainage, gas, water, and electric conductors in a simple, inexpensive, and expeditious manner.

I claim as my invention and desire to secure by Letters Patent—

1. A tunnel-lining comprising an outer circle of segmental wooden blocks placed end for end and one upon the other and secured together in rings to receive the rams of a tunneling-shield and connected together in a suitable manner longitudinally to provide a self-sustaining outer shell to closely follow the shield and an inner lining of suitable material as masonry or concrete to be protected by said outer lining until set substantially, as described.

2. A tunnel-lining comprising a cylindrical shell of wooden sections forming continuous rings intermediate sheets of waterproof material, and longitudinal lagging-strips secured to and across the wooden ring-sections to connect them together substantially as described.

3. In a tunnel-lining an outer shell comprising a series of wooden sections interposed sheets of waterproof material, bond-plate bolts secured to and projecting outwardly from said outer shell and an inner lining secured by said bolts substantially as described.

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

THOMAS H. MURPHY.

Witnesses:
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