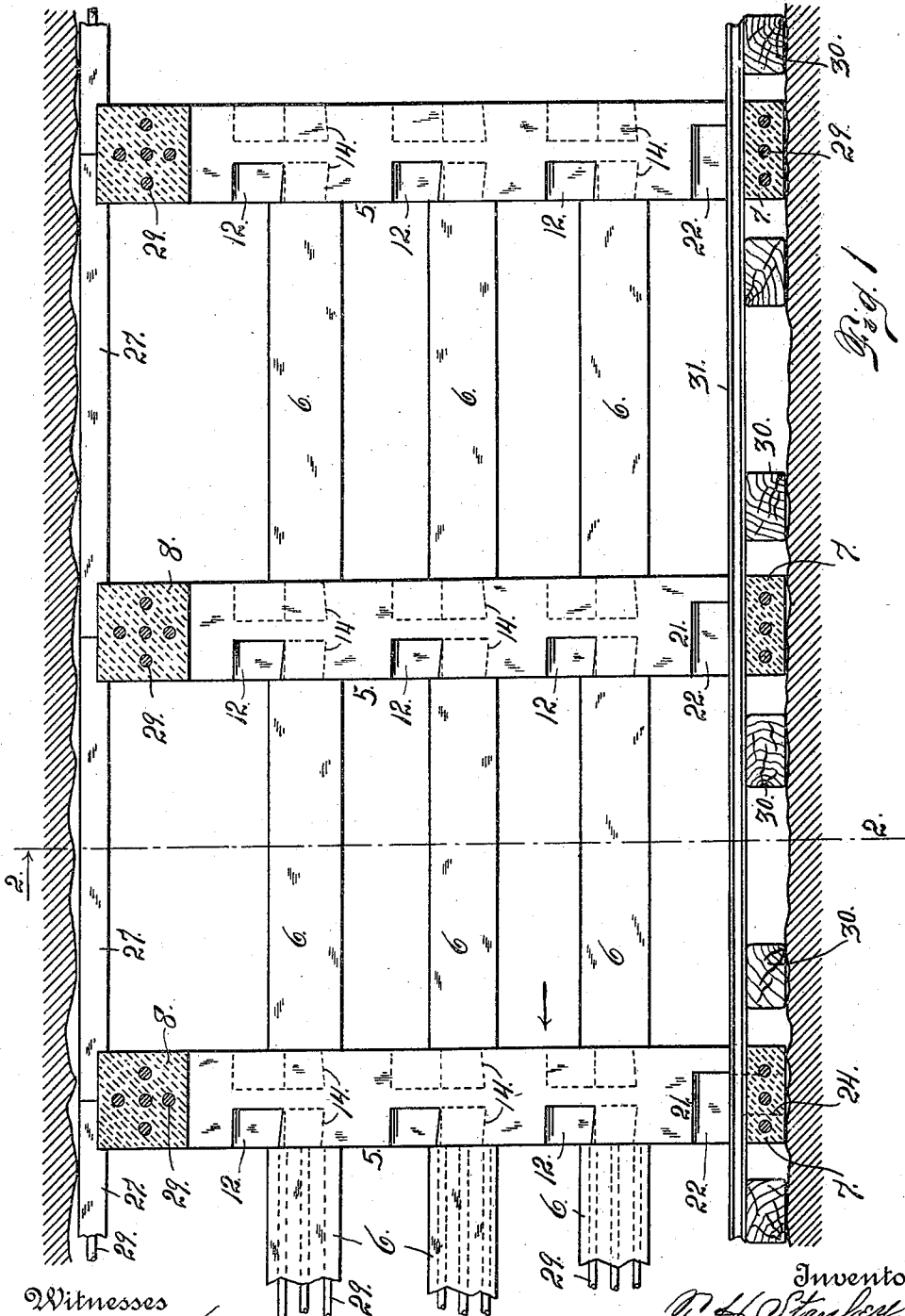


T. H. STANLEY.
 CONCRETE TIMBERING FOR TUNNELS.
 APPLICATION FILED APR. 29, 1909.

975,084.

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3 SHEETS—SHEET 1.



Witnesses

Otto E. Hoddick.

J. W. Thornburgh.

Inventor

T. H. Stanley.

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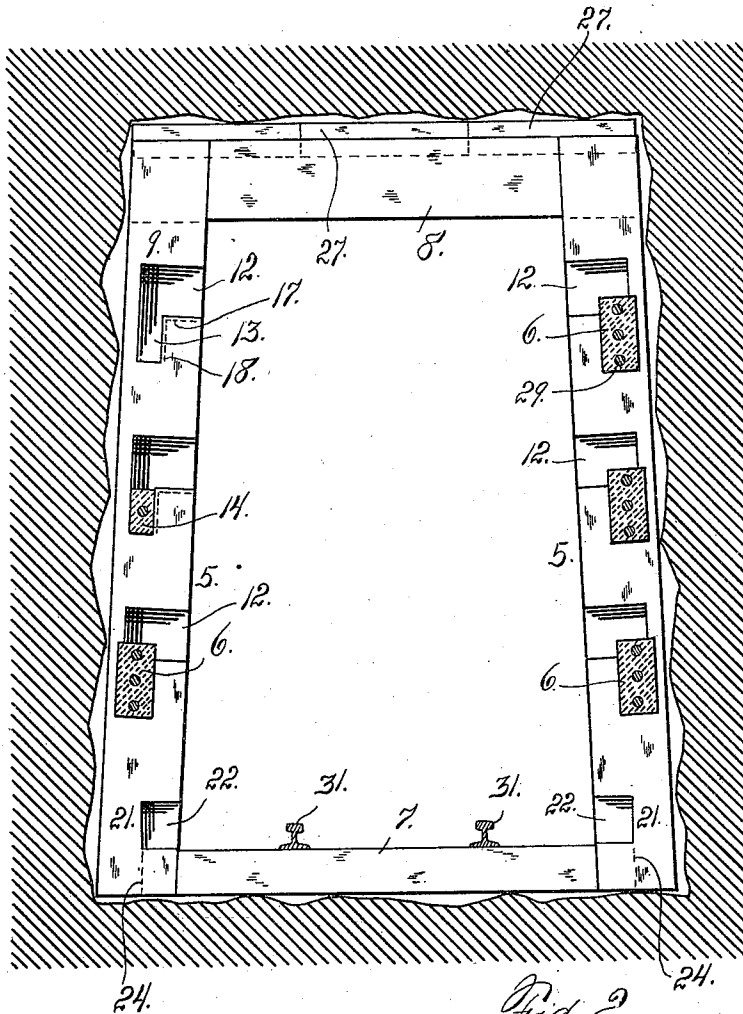


Fig. 2

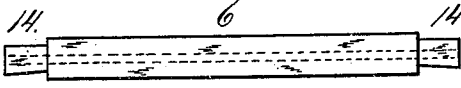


Fig. 3

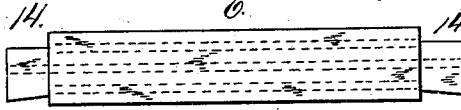


Fig. 4

Witnesses
Otto E. Haddick
J. D. Thornburgh.

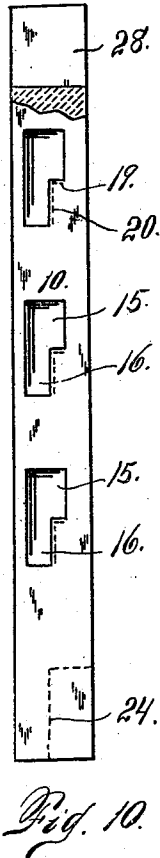
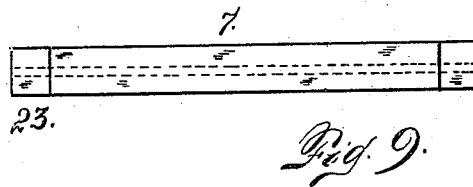
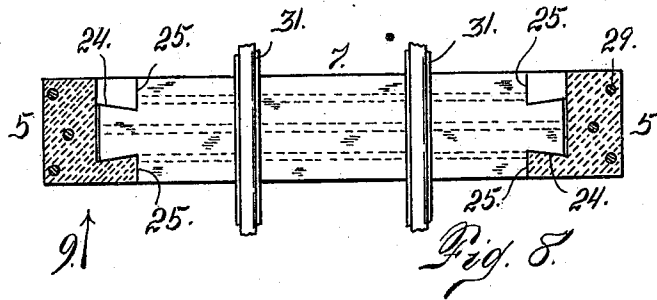
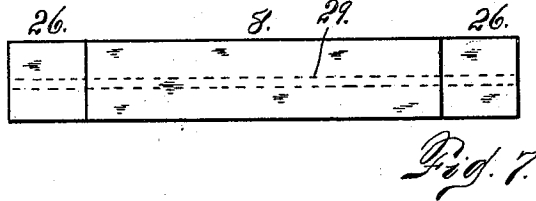
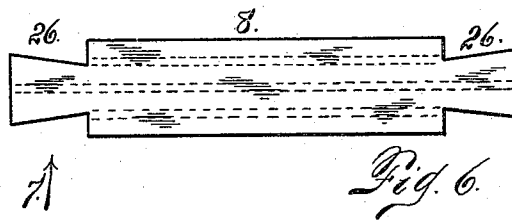
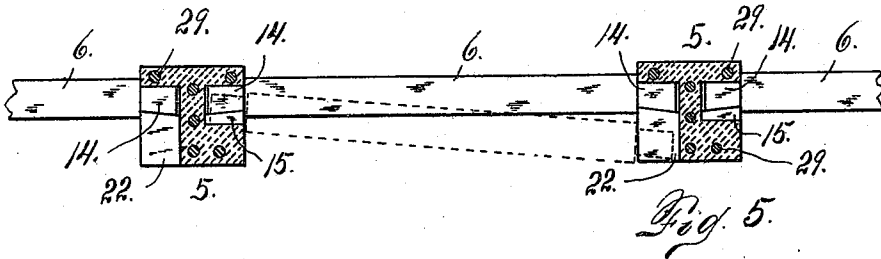
Inventor
T. H. Stanley
By [Signature] Attorney

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3 SHEETS—SHEET 3.



Witnesses

Otto C. Hoddick.

J. D. Thornburgh.

Inventor

T. H. Stanley.

Attorney

UNITED STATES PATENT OFFICE.

THOMAS H. STANLEY, OF DENVER, COLORADO.

CONCRETE TIMBERING FOR TUNNELS.

975,084.

Specification of Letters Patent.

Patented Nov. 8, 1910.

Application filed April 29, 1909. Serial No. 493,034.

To all whom it may concern:

Be it known that I, THOMAS H. STANLEY, a citizen of the United States, residing in the city and county of Denver and State of Colorado, have invented certain new and useful Improvements in Concrete Timbering for Tunnels; and I do declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to the letters and figures of reference marked thereon, which form a part of this specification.

My invention relates to improvements in concrete timbering for mine or other tunnels, my object being to provide a tunnel structure which shall be absolutely secure, readily constructed and practically indestructible when installed.

This timbering consists of uprights, top and bottom members suitably interlocked with the uprights and side members whose extremities are fashioned or tenoned to interlock with the uprights, the latter being provided with mortises or sockets to receive the tenoned ends of the side members.

Having briefly outlined my improved construction, I will proceed to describe the same in detail, reference being made to the accompanying drawing in which is illustrated an embodiment thereof.

In this drawing, Figure 1 is a central longitudinal section taken through a tunnel, timbered in accordance with my invention. Fig. 2 is a vertical cross section of the same taken on the line 2—2, Fig. 1. Fig. 3 is an edge view of one of the side timbering members. Fig. 4 is a side view of the same. Fig. 5 is a section taken through two of the uprights on the same side of the tunnel, illustrating the manner of applying the side members to the uprights. Fig. 6 is a top plan view of one of the top members of the tunnel structure. Fig. 7 is a side or edge view of the same. Fig. 8 is a section taken through two uprights on opposite sides of the tunnel, and cutting the mortises engaged by the tenoned extremities of the bottom members. Fig. 9 is a side or edge view of one of the bottom members. Fig. 10 is a detail view of one of the uprights or posts looking at the side opposite that shown in Fig. 2.

The same reference characters indicate the same parts in all the views.

Let the numeral 5 designate the uprights or posts of the timbering structure; 6 the side members of the same, 7 the bottom members and 8 the top members thereof.

Each upright is provided intermediate its extremities with two sets of mortises, those on one side being designated 9 and those on the opposite side 10. The mortises 9 have an opening 12 extending from the inner surface of the post outwardly, the inner portions being in communication with a downwardly extending mortise part 13. Both the parts 12 and 13 of each mortise 9, are also open on one side of the post or upright to permit the insertion of the tenoned extremity 14 of a side member 6. On the opposite side of each post from the mortises 9 are located the mortises 10 which have no opening extending to the inner surface of the post. These mortises 10, however, are open on the side of the post for the introduction of the tenoned extremities 14 of the members 6, and the upper portions 15 of these mortises 10 are somewhat wider than the lower portions 16 thereof.

The parts 12 and 13 of the mortises 9 are of dove-tail shape as indicated by the dotted lines 17 and 18 (see Fig. 2). This is also true of the parts 15 and 16 of the mortises 10 as indicated by the dotted lines 19 and 20. (See Fig. 10). This peculiar shape of both sets of mortises is required by the dove-tail shape of the tenons 14 of the side members.

The lower extremity of each post 5 is provided with a mortise 21 having a part 22 open on one side of the post to receive a dove-tailed tenon 23 of a bottom member 7. The inner portion of the mortise part 22 communicates with a downwardly extending mortise part 24 into which the tenon 23 drops after its introduction into the mortise part 22 (see Fig. 8). The mortises 21 are of dove-tail shape to receive the tenons 23. It is evident that when the tenons 23 have dropped into the lower parts 24 of the mortises 21, the bottom members can be removed or disengaged from the posts by first lifting them and then moving them in the opposite direction from their movement when inserting them in the posts or standards. These bottom members by virtue of their tenoned

extremities, are provided with shoulders 25 formed by the casting of the tenons upon the said members. These shoulders, of course, engage the inner surfaces of the standards on opposite sides of the mortise parts 24 when the bottom members are in place.

Attention is called to the fact that in Fig. 2, in one instance, the side member 6 is so cut as to show only the cross section of the tenon, while in the other instances, the section is taken through the body of the side members. It may also be stated that in the case of the uppermost mortise 9 at the left of Fig. 2, the mortise is shown without a tenon therein, for the purpose of more clearly indicating its shape.

The upper extremities of the posts or standards are mortised from the top downwardly to receive the dove-tailed tenons 26 of the top members 8. These top members when in place, securely bind the standards together at the top and prevent them from spreading by virtue of the dove-tail shape of the tenons. On top of the members 8, is placed a covering of slabs 27 which may be made to completely close the tunnel at the top to prevent any loose or granular material from entering the tunnel in case the formation should be of such a nature as to require this covering. Side slabs may also be employed, if desired, to completely close the side walls of the timbering structure.

The posts or standards, as well as the top, bottom and side members, of the timbering structure, are all composed of metal reinforced concrete, rods 29 being employed for reinforcing the various members. These rods are, of course, cast in the members by properly placing them in the mold before introducing the plastic material.

As it is generally necessary to place tracks for cars in the bottom of the tunnel, suitable ties 30 may be interposed between the concrete timbers 7, for the purpose of securing the track rails 31 in place.

After the tunnel uprights are in place, the other members may be quickly and easily applied. The bottom members 7 are applied to the posts by inserting their tenons 23 first in the parts 22 of the mortises 21, after which the tenons drop downwardly into the parts 24 of the said mortises. The top members are applied by simply placing them in position so that their tenons 26 may drop downwardly into the mortises in the upper extremities of the posts 5.

In applying the side members, the latter are held in the position shown in Fig. 5 after which one of the tenons is inserted in the upper part 15 of one of the mortises 10, while the opposite tenon 14 is caused to enter the part 12 of one of the mortises 9 of another post, after which the tenons are al-

lowed to drop downwardly respectively entering the parts 13 and 30 of the mortises 9 and 10. In order to remove these side members, the operation just described is reversed. It will thus be seen that the operation of installing the structure may be readily accomplished, the timbering members having been constructed to interlock in the manner heretofore explained.

Having thus described my invention, what I claim is:

1. A concrete timbering structure for mines or other tunnels, comprising uprights having mortises formed in their sides, the said mortises being formed near the outer sides of the uprights, one set of mortises of each upright having laterally extending openings from their upper portions to the inner surfaces of the uprights, while the lower parts of the mortises are closed on their inner surface, near the outer edge of the uprights, the mortises on the opposite sides of the uprights being closed on the inner surface of the uprights, but having openings from the upper portion of the mortises, the said openings extending laterally toward the inner side of the uprights, and the said mortises adapted to receive tenons of side members, the mortises of the uprights being correspondingly shaped for engagement with the side members.

2. A concrete timbering structure, comprising uprights held in position by transverse bottom and top members, side bars mortised in suitable mortises formed on opposite sides of the uprights, the extremities of said side bars being tenoned, the outside of the tenons having a straight outer edge to lie flat against the outer side of the mortises in the upright members, and the inner sides of said tenons having an inclined surface toward the body portion of the side members, the mortises of the uprights being correspondingly shaped for engagement with the said side members.

3. A tunneling structure composed of uprights suitably separated, each upright having mortises on opposite sides, the said mortises being formed near the outer sides of the uprights, one set of mortises of each upright having laterally extending openings to the inner surface of the uprights, while the lower parts of the mortises are closed on the inner surface near the outer edge of the uprights, the mortises on the opposite sides of the uprights being closed on the inner surface of the uprights, but having openings from the upper portion of the mortises, the said openings extending laterally toward the inner side of the uprights, the outer sides of the mortises on the opposite sides of the post having a flat surface and the inner side of the said mortises having their sides inclined toward the center of the post, and side tim-

bering members whose sides are tenoned to enter the mortises of the uprights, the said tenons having a straight outer edge adapted to lie flat against the corresponding flat surface of the outer side of the mortises, the opposite side of the tenon having an inclined surface toward the body portion of the side member and adapted to fit snugly against

the inclined surface of the inner side of the said mortises, substantially as described. 10

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

THOMAS H. STANLEY.

Witnesses:

A. J. O'BRIEN,

A. EBERT O'BRIEN.