

July 14, 1931.

R. V. PROCTOR

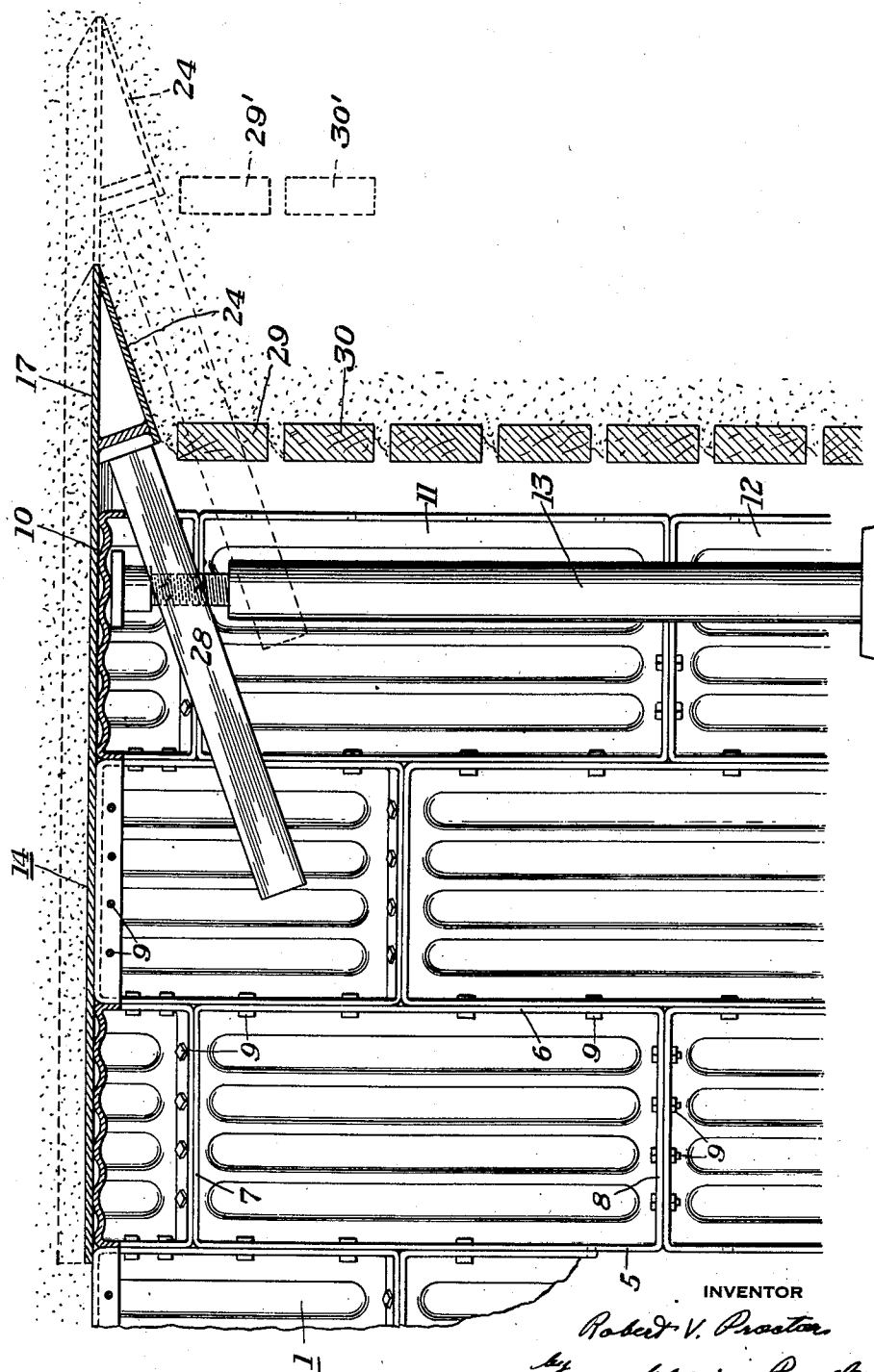
1,814,852

TUNNEL APPARATUS

Filed May 4, 1928

3 Sheets-Sheet 1

Fig. 1.



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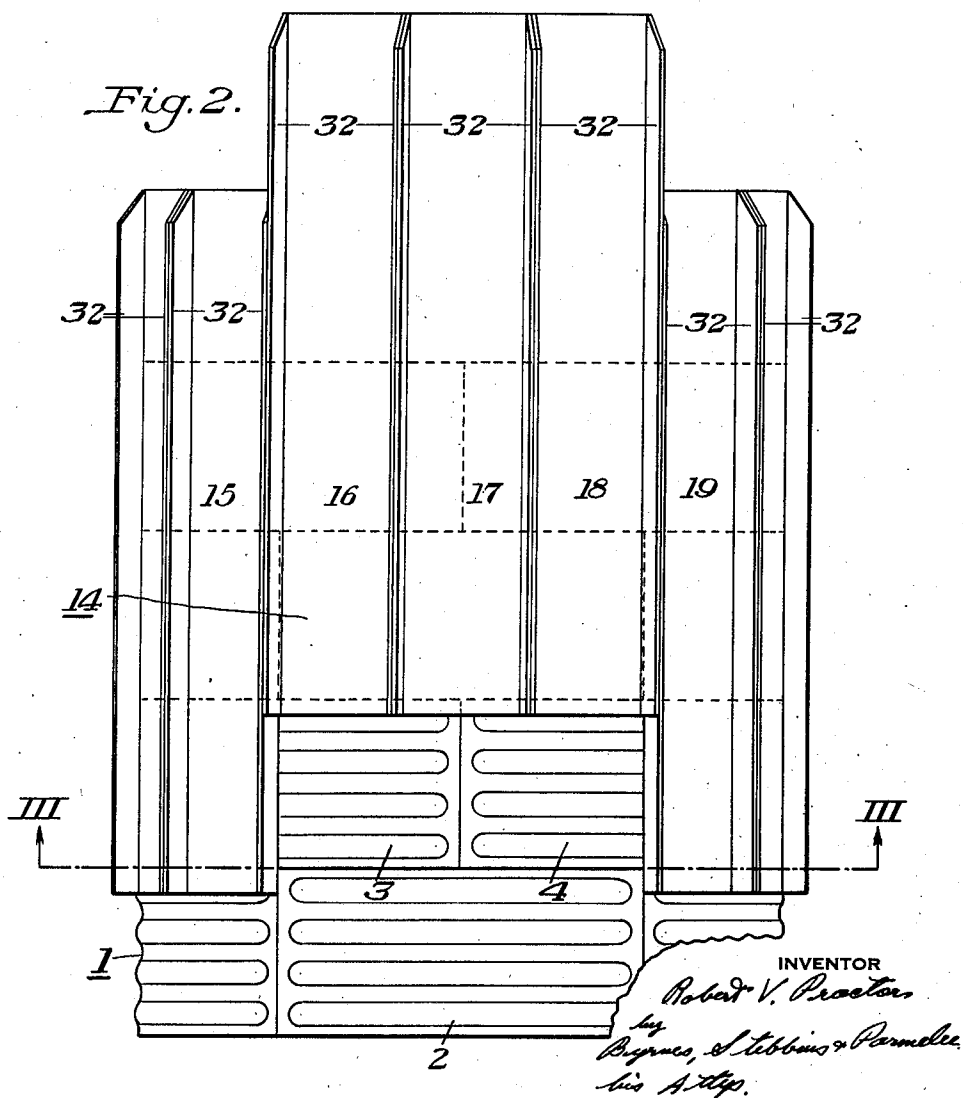
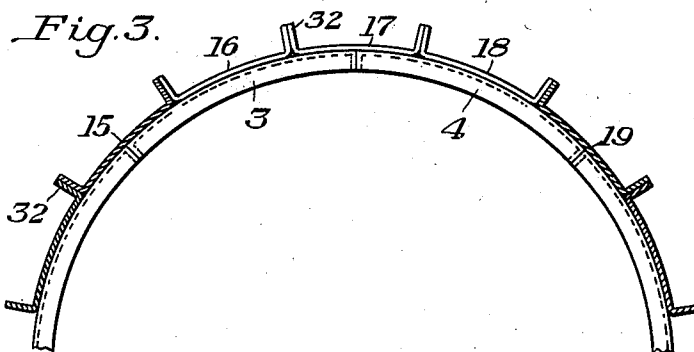
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Fig. 8.

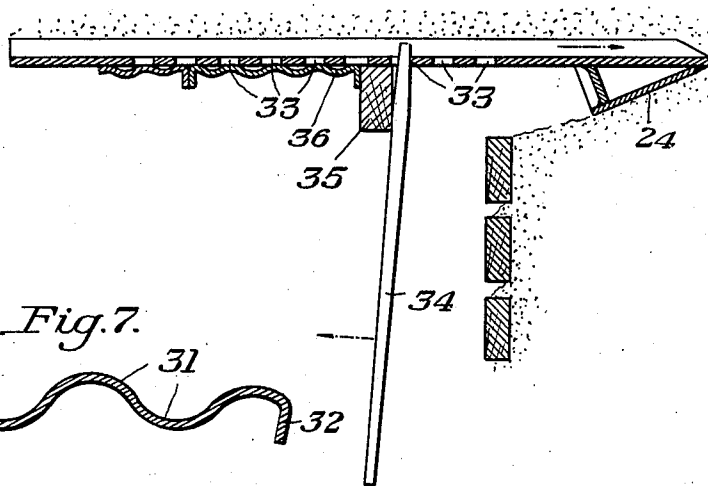


Fig. 7.



Fig. 5.

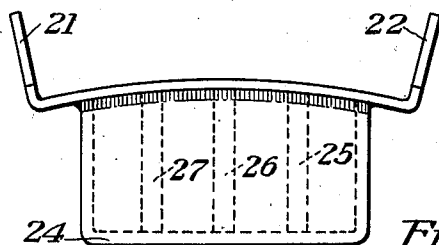


Fig. 4.

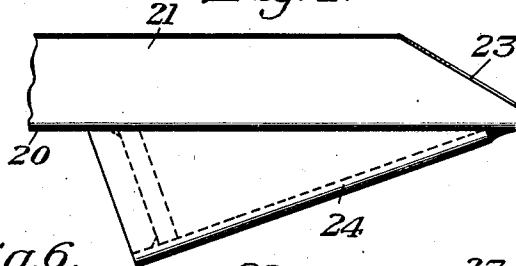
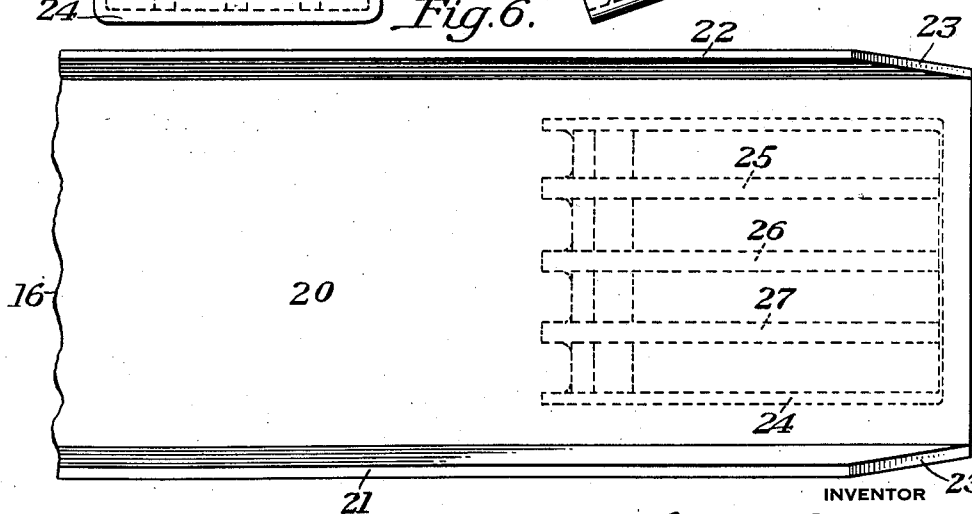


Fig. 6.



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UNITED STATES PATENT OFFICE

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TUNNEL APPARATUS

Application filed May 4, 1928. Serial No. 275,137.

This invention relates to tunnel apparatus and more particularly to a sectional shield comprising a plurality of poling plates.

The sectional shield or plurality of poling plates is particularly adapted to be used in connection with a tunnel liner, such as described in the application of R. V. Proctor and H. M. Schaab, Serial No. 170,827, filed February 25, 1927.

According to my invention I provide a sectional shield made up of a plurality of metallic poling plates, the shield being arranged on and supported by the tunnel liner at the forward end of the tunnel liner. The poling plates forming the shield are driven forwardly into the earth, the earth underneath the poling plates is dug out and thereafter additional tunnel liner plates are placed in position and riveted to the tunnel liner plates of the tunnel liner. The apparatus hereinafter disclosed is particularly useful in tunneling through earth which has little or no cohesion and will therefore cave in if not supported. Such material having little cohesion comprises quick sand and certain types of loose mixtures of sand and gravel which run like sugar whether it is wet or dry.

In the accompanying drawings which illustrate the present preferred embodiment of my invention,

Figure 1 is a longitudinal section through a tunnel and showing the apparatus of my invention;

Figure 2 is a partial plan view of the tunnel liner plates and poling plates;

Figure 3 is a sectional view taken on the line III—III of Fig. 2;

Figure 4 is a side elevation of a poling plate;

Figure 5 is an end elevation of the poling plate shown in Fig. 4;

Figure 6 is an enlarged plan view of the poling plate;

Figure 7 is a sectional view of a modified form of poling plate; and

Figure 8 is a view similar to Fig. 1, but showing a modified form of poling plate.

In the illustrated embodiment of the invention shown in Figures 1, 2 and 3, a tunnel liner designated generally by the numeral 1

is made up of a plurality of tunnel liner plates 2, 3 and 4. The tunnel liner plates, the construction of which is more fully described in the application above referred to, are provided with side flanges 5 and 6, and end flanges 7 and 8. These flanges are provided with openings adapted to receive rivets 9. As shown in Fig. 1, the tunnel liner has a front row of liner plates 10, 11 and 12, supported by a jack 13.

The sectional shield designated generally by the numeral 14 comprises a plurality of poling plates 15, 16, 17, 18 and 19. This sectional shield is arranged adjacent the forward end of the tunnel liner on the outside of the tunnel liner and is supported thereby.

Each of the poling plates 15, 16, 17, 18 and 19, as shown more particularly in Figures 4 to 6, comprises a main body portion 20 which is provided along its side edges with flanges 21 and 22. Adjacent the front end of the poling plate these flanges are formed at an angle, as shown at 23, so that the poling plates may be more easily driven forward. The undersides of the poling plates adjacent their forward ends are provided with wedge members 24 adapted to receive a driving member. The wedge members are secured to the poling plates by any desired means, but preferably by welding the wedge members and poling plates together. As shown in Figs. 5 and 6, the wedge members are provided with a plurality of ribs 25, 26 and 27 which may be welded to the poling plates.

In using the apparatus above described in order to form a tunnel, the front row of the tunnel liner comprising tunnel liner plates 10, 11 and 12 is supported, for example, by a jack 13. The sectional shield comprising the poling plates 15, 16, 17, 18 and 19 is arranged on and supported by the tunnel liner at its forward end. A timber 28, such as a 2 x 4, is arranged with one of its ends contacting with the wedge 24 of the poling plate 17. Pressure is applied to the opposite end of the timber 28 either by a pneumatic hammer or by a sledge hammer so as to drive the poling plate 17 forward. The usual distance that the poling plate 17 is moved forward is either 16" or 32", if liner plates of

the size shown, which are 16" wide, are used to form the tunnel liner.

The adjacent poling plates 16 and 18 are then moved forward in a like manner. The bulk-head 29 is then removed and after digging out the earth from the bulk-head to the forward position of the poling plates 16, 17 and 18, the bulk-head 29 is moved forwardly to the position indicated at 29'. A tunnel liner plate is then inserted in the cavity formed by the removal of the sand and is held at the top of the tunnel by means of a jack arranged in a slanting position, so that the jack supports the tunnel liner plate which has been inserted in the cavity. Since each of the poling plates shown in the drawings is 12" wide and since each of the tunnel liner plates are 36" long, it will be seen that it is necessary to drive three poling plates forward and to remove the earth underneath the poling plates before a tunnel liner plate may be arranged in the cavity and supported by a jack. Three poling plates on each side of the poling plates 16, 17 and 18 are then driven forward, the bulk-head 30 is removed and after digging away the earth between the bulk-head 30 and the forward position of the poling plates, the bulk-head 30 is moved forward to the position indicated at 30'. Other tunnel liner plates are then arranged on each side of the tunnel liner plate held by the jack arranged in a slanting position, and the tunnel liner plates riveted to each other. This process is continued until the desired number of tunnel liner plates has been riveted together to form the tunnel liner.

In Figure 7 there is shown a modified form of poling plate. In this modification the main body of the poling plate instead of being flat is provided with ribs 31 producing a corrugated poling plate. In this modification the side flanges 32 are turned downwardly rather than upwardly as shown in the embodiment previously described. The ribs 31 and flanges 32 are preferably of the same depth so that when the poling plates are arranged on the tunnel liner the poling plates are supported both by the flanges and the ribs. The corrugated form of poling plate provides greater strength than is obtained by making the main body of the poling plate flat. This strengthening of the poling plate by forming corrugations therein aids in keeping the poling plate in the desired direction when force is applied by a driving member, that is, the tendency of the corrugated form of poling plate to bend is not as great as in the form where the main body portion of the plate is flat. The corrugated form of poling plate therefore tends to stay in the desired direction. Furthermore, the corrugated form of poling plate has less of its surface in contact with the top of the tunnel liner. For this reason, there is less resistance to be overcome in

driving the corrugated form of poling plate forward than is encountered when the main body portion of the poling plate is flat.

In place of or in addition to providing the wedge members 24 I may also provide the poling plates with openings 33, as shown in Fig. 8. In this modification a bar 34 may be inserted into one of the openings 33 and a timber 35 arranged between the forward end of the tunnel liner plate 36 and the bar 34. The timber forms a fulcrum about which the bar may be rotated in order to aid in moving the poling plate forward.

Although I have specifically illustrated and described several preferred embodiments of my invention, it is to be understood that the invention is not so limited, but may be otherwise embodied within the scope of the following claims.

I claim:

1. Tunneling apparatus comprising a tunnel liner, and a sectional shield composed of a plurality of metallic poling plates having ribs extending longitudinally thereof and being provided along their side edges with flanges which extend toward the tunnel and contact with the flanges of adjacent poling plates, said plates being supported by the tunnel liner and having substantially wedge shaped projections on their lower surfaces for cooperation with means for driving the poling plates forward.
2. Tunneling apparatus comprising a tunnel liner, and a sectional shield composed of a plurality of metallic poling plates having ribs extending longitudinally thereof and being provided along their side edges with flanges which extend toward the tunnel and contact with the flanges of adjacent poling plates, said plates being supported by the tunnel liner, the ribs and flanges being of substantially the same depth whereby the poling plates are supported by contact of both the ribs and flanges with the tunnel liner, said plates having substantially wedge shaped projections on their lower surfaces adjacent their forward end for cooperation with means for driving the plates forward.

3. A sectional shield adapted for use in tunneling operations, comprising a plurality of poling plates, said plates having corrugations extending longitudinally thereof and forming alternate ribs and grooves, said plates having flanges at their side edges which are of substantially the same depth as the grooves, whereby when the shield is placed on a tunnel liner the flanges and the portions of the shield adjacent the bottom of the grooves contact with the liner, and means adapted to be contacted by a driving member to drive the poling plates forward.

In testimony whereof I have hereunto set my hand.

ROBERT V. PROCTOR.