April 13, 1937. A. E. WILKOFF 2,077,137

TUNNEL LINER

Filed April 23, 1934

Fig. 1.

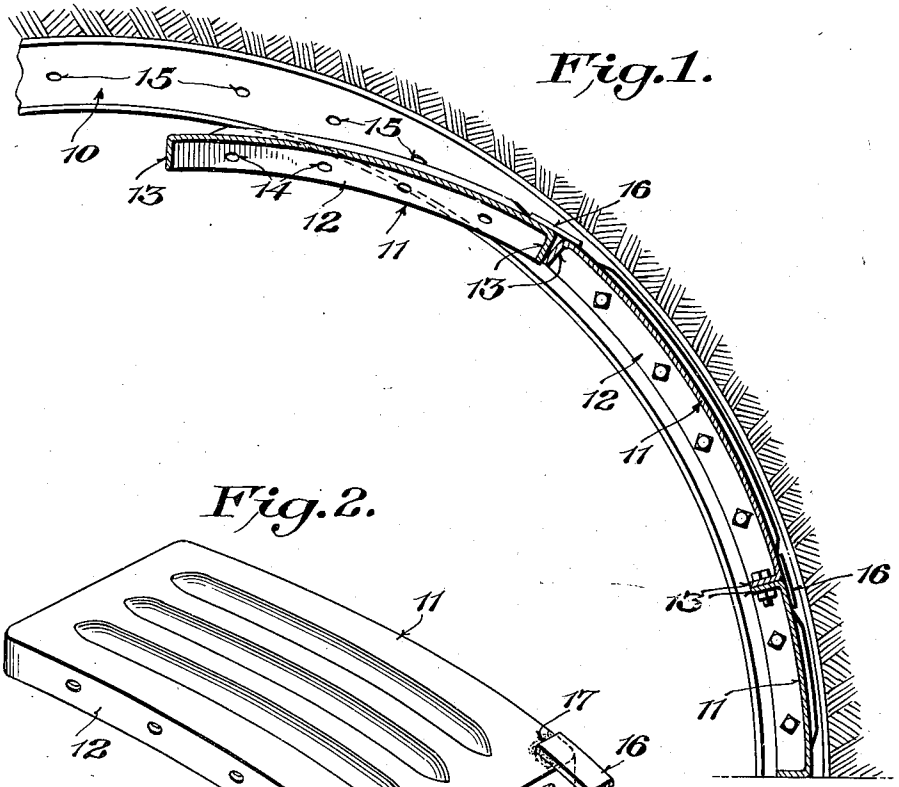


Fig. 2.

Fig. 3.

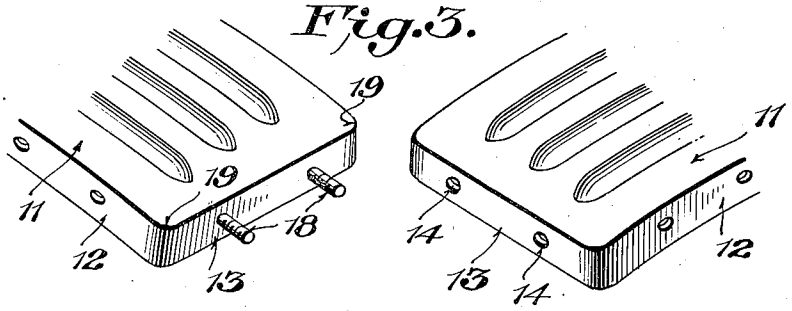
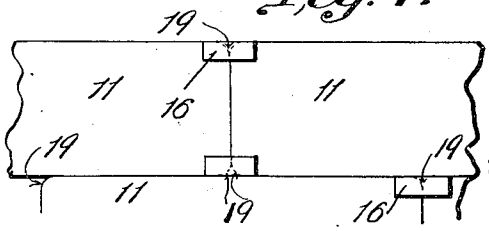


Fig. 4.



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2,077,137

TUNNEL LINER

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Application April 23, 1934, Serial No. 721,979

3 Claims. (Cl. 61—45)

The present invention relates to tunnel liner plates, particularly plates of wrought or other metal adapted to be assembled in tubular form for the lining of tunnels and the like, and the invention aims generally to improve the construction of existing tunnels.

In the construction of tunnels it is customary to line the tunnel opening with metal plates so as to support the earth around the tunnel opening. These plates preferably are of general rectangular shape, and are formed with marginal side and end flanges by means of which the liner sections or segments may be bolted together to provide a substantially continuous lining.

Tunnel liner sections or segments, as customarily used, are quite heavy, being pressed from sheet steel of ⅛" or greater thickness, and usually it requires the service of two men in placing a liner section in position and bolting it fast to the previously assembled construction.

One of the principal objects of the invention is to improve the construction of tunnel liners so that one man may readily and conveniently lift them in place and bolt them to the adjacent assembled sections.

Illustrative of the invention, reference may be had to the accompanying drawing in which

Fig. 1 is a fragmental cross-section view of a section of tunnel lining, and illustrating the manner of using my invention;

Fig. 2 is a perspective view of one form of tunnel liner embodying my invention; and

Fig. 3 is a similar view of another embodiment of the invention.

Fig. 4 is a view of an assembly of a plurality of liner plates.

The lining of tunnels and the like is customarily accomplished by spacing a plurality of arch ribs 10 at spaced intervals along the tunnel opening and bridging the space between the ribs 10 with liner plates 11. Advantageously the arch ribs are of I-beams or other structural shapes and are curved, as shown to conform generally to the cross-sectional shape of the tunnel opening.

The tunnel liner plates or segments are advantageously of general rectangular form and are provided with marginal side and end flanges 12—13 provided with bolt holes 14. The web of the arch rib is likewise provided with bolt holes 15, the spacings of which coincide with the spacing of holes in the side flanges of the liner plates so that the liners may readily be bolted in an assembled relation with the arch ribs.

The assembling of the liner plates begins at one lower side and progresses upwardly to an overhead position. Particularly in this overhead position, the services of two men are required, one to hold the liner plate in place until the other has inserted a sufficient number of bolts or fastenings to keep the plate in place.

According to my invention, I provide one or more supporting means on the liner plates, having a portion thereof extending substantially beyond the marginal side or end flange of the liner and adapted to be inserted over or back of the previously assembled plate, by means of which the liner plate is supported at one end, so that a single workman may readily raise the liner plate into position with one hand, and with the other hand insert two or three bolts between the marginal side flanges and arch rib or other assembled structure. After the operator has inserted one or two bolts, through the bolt holes 14, the liner will be sufficiently held in place that further support from the workman is unnecessary.

The invention in its simplest form may comprise one or more pieces of flat metal 16, such as steel, welded or otherwise attached as at 17 to the upper surfaces of the liner so that a substantial portion of the support projects laterally beyond the end flange of the liner as is shown in Fig. 2. Or the liners may be formed with bolts 18 welded or otherwise attached to one end of the flange and projecting laterally beyond the flange (as in Fig. 3) and adapted to be inserted in aligned bolt holes 14 in the end flange of an adjacent section.

In the use of tunnel liners it is desirable that means be provided to close the openings between corners of adjacent liners when assembled. It has heretofore been proposed to fabricate the liner with relatively sharp corners so as to minimize, as much as possible, seepage of loose sand through the openings, but such fabrication is expensive and only partially satisfactory. According to my invention, I prefer to construct the supports 16 of flat steel plates, welded to the upper surface of the liner at opposite corners of one end, so that the supports not only act as a support for the liner section during assembly as above described, but also adequately cover up any corner openings that exist between rounded corners 19 of adjacent liner sections. This permits constructing the liner section with corners 19 between the flanges of larger radii, as for example, a corner radii of one half inch to one inch, thus eliminating many problems in the manufacture of the liner.

The present application is a continuation in

part of the subject-matter of my prior application of December 2, 1933, Serial No. 700,711, now Patent No. 1,980,963, granted November 13, 1934.

Having described one preferred embodiment of the invention, I claim:

1. A tunnel lining comprising a staggered assemblage of pressed metal liner plates, each having a skin portion and continuous upstanding side and end flanges substantially of uniform thickness, the corners of said flanges at their juncture being relieved providing openings between adjacent plates, connecting means extending through adjacent flanges of adjoining plates to hold said plates together in assembled relation, a closure plate for said openings having a portion welded to said plate and having a part projecting laterally beyond said relieved corners.

2. A tunnel lining comprising a plurality of pressed metal tunnel liner plates, each having a skin portion and continuous upstanding side and end flanges substantially of uniform thickness, the corners of said flanges at their juncture being relieved providing openings between adjoining plates, connecting means extending through adjacent flanges of adjoining plates to hold said plates together in assembled relation, and closure means for each of said openings comprising a member secured to said plates and extending beyond said relieved corners to prevent the seepage of material therethrough.

3. A tunnel lining comprising an assemblage of at least three rectangular liner plates assembled in staggered relation so that the ends of two longitudinally disposed plates are adjacent to a side flange of the third plate, said plates having relieved corners providing a substantially triangular shaped opening at the juncture of said three plates, means connecting the adjoining portions of each two adjacent plates to hold said plates together in assembled staggered relation, and means fastened to the surface of at least one of said plates and covering the opening formed at their juncture to prevent seepage of material through said lining.

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