

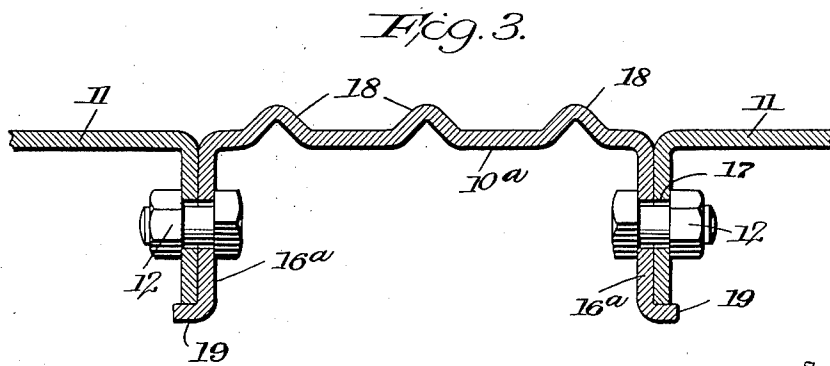
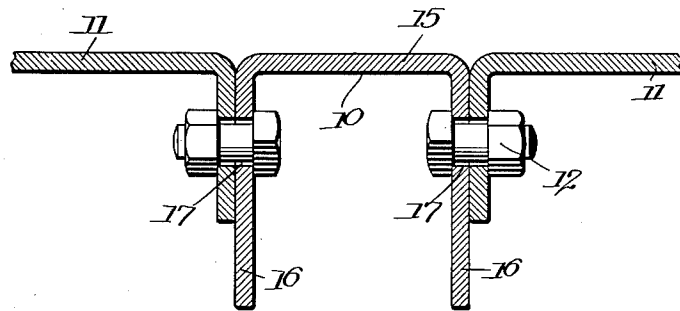
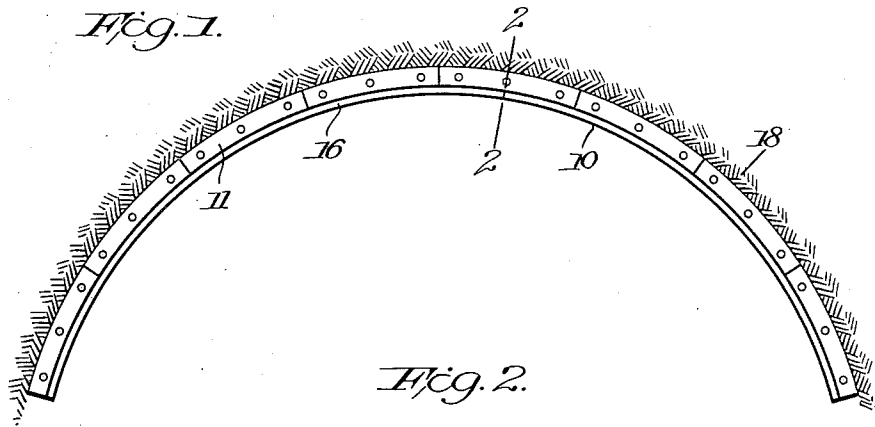
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TUNNEL LINING

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TUNNEL LINING

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9 Claims. (Cl. 61—45)

The present invention relates to tunnel linings, hollow shaftings and like structures which are built up of metal plates and arranged to resist the pressure of earth, water and like materials.

In the construction of tunnel linings for example, a metal shield or lining is usually erected by assembling a plurality of rectangular metal liner plates to progressively line the tunnel shaft as it is progressively dug. For convenience, in the handling of these plates, they advantageously are of minimum weight and in order to give adequate strength to the lining it is the custom to provide a plurality of transversely extending, longitudinally spaced arch ribs to which the plates are bolted. These ribs heretofore have been of structural beam shapes, such as I-beams or T-beams.

With a view to economy of construction and simplicity and ease in assembling the tunnel lining, I have improved the form of arch rib by providing a channel section, preferably of a pressed section adapted to extend across the tunnel and provide support to which the liner plates may be bolted or otherwise suitably secured.

Illustrative of one preferred embodiment of the invention, reference is made to the accompanying drawing and following description illustrating a preferred manner of constructing and using the invention.

In the drawing

Fig. 1 is a transverse view of a tunnel shafting illustrating the improved arch rib and a section of liner plate assembled therein;

Fig. 2 is a detail, transverse sectional view through one of the arch ribs as taken on the line 2—2 of Fig. 1; and

Fig. 3 is a similar view of a modified form of the invention.

In the lining of tunnels and the like an arch rib is provided which may be of suitable size to conform to the cross section of the tunnel shaft, such as circular, semi-circular or other shape. To these arch ribs are bolted the flanged liner plates which form the covering of the tunnel lining and these plates may be of any approved construction, for example, of the type and construction shown in my copending application Serial No. 700,711.

In the illustrated embodiment a semi-circular tunnel lining is illustrated embodying a semi-circular circumferentially extending arch rib 10 to which the liner plates 11 may be secured as by bolts 12.

The arch rib is preferably in the form of a channel having a web portion 15 and inwardly

directed side flanges 16; the side flanges being formed with bolt holes 17 for the reception of the bolts 12, so that the liner plates 11 may be bolted to the flanges 16 in such manner that the upper skin face of the liner plates will be flush with the rib 15. This enables the erection of the lining with a minimum of excavation of earth 18.

The channel shaped arch rib 10 may have any desired depth of web 15 and depth of flange 16, suitable for the particular construction in which it is to be used and depending upon the load to be sustained by the lining. Hence the width of web particularly is subject to considerable variation, and serves in part to provide the skin surface of the lining.

The channel rib 10 may, of course, be a rolled section but preferably it is constructed as a pressed section. As such, the side flanges 16 are flexible to an appreciable extent facilitating the accurate lining-up of the liner plates in assembling the lining.

The channel shaped arch rib 10^a may be, in some instances, of considerable width, as shown in Fig. 3. Adequate strength of the rib may be provided by pressing in the web one or more of circumferentially arranged ribs 18 so as to reinforce said rib against deflection and distortion due to the load above it. Likewise the flanges 16^a may be formed with reinforcing ribs 19 (see Fig. 3) and advantageously these may be arranged at the lower edges of the flanges and project outwardly therefrom to function as a stiffening member and also serving to provide a support for the adjacent side flange of an adjoining plate. This enables a single workman to place and bolt the liner plate in position, as is obvious.

Advantages of my invention reside in the simplicity of construction, the increased strength of the lining and the greater ease with which the lining may be erected. Inasmuch as the web of the arch rib constitutes a portion of the lining or skin surface, it is obvious that a fewer number of liner plates are required, thus reducing the cost of both the material and construction of the lining.

Obviously my invention is not restricted to the precise details and arrangements shown but includes equivalent constructions and installations as well.

I claim:

1. A tunnel lining or like metallic structure comprising a plurality of courses, each made up of a series of flanged plates bolted together and

a circumferentially arranged channel shaped band having depending flanges disposed between certain of said courses, the flanges of said band being free and independent of each other at their lower ends to permit flexing thereof and secured to the adjacent flanges of adjoining plates.

2. A tunnel lining or like metallic structure comprising a plurality of courses, each made up of a series of flanged plates bolted together and a circumferentially arranged channel shaped band-disposed between certain of said courses, the flanges of said band being free and independent of each other and secured to the adjacent flanges of adjoining plates, the web of said band constituting a portion of the skin surface of said lining.

3. A tunnel lining comprising a plurality of courses of flanged liner plates which, when assembled together, provided a skin surface of the lining, and a transversely extending circumferentially arranged channel-shaped arch rib disposed between certain of said courses to reinforce the lining, the side flanges of said arch rib being free and independent of each other to permit flexing thereof transversely of said rib, and means for securing the side flanges of said plates to the side flanges of the arch rib.

4. An arch rib for tunnel linings and the like adapted to be positioned between and secured to adjacent courses of liner plates, said arch rib comprising a curved pressed section having a horizontally disposed web and inwardly extending side flanges free and independent of each other at their inner ends to permit flexing thereof, and means formed in the side flanges of said channel whereby adjoining liner plates may be connected thereto.

5. An arch rib for tunnel linings and the like adapted to be positioned between and secured to adjacent courses of liner plates, said arch rib comprising a curved pressed section having a horizontally disposed web and inwardly extending side flanges, the inner ends of the said flanges being free and independent of each other to permit flexing of the side flanges transversely of the rib, circumferentially arranged ribs pressed in the web of said arch rib for reinforcing the web thereof, and means formed in the side flanges of said channel whereby adjoining liner plates may be connected thereto.

6. An arch rib for tunnel linings and the like adapted to be positioned between and secured to adjacent courses of liner plates, said arch rib

comprising a curved pressed section having a horizontally disposed, relatively wide web and inwardly extending side flanges, means for reinforcing the web of said rib, the inner ends of said side flanges being free and independent of each other to permit flexing of the said flanges transversely of the rib, and means formed in the side flanges of said channel whereby adjoining liner plates may be connected thereto.

7. An arch rib for tunnel linings and the like adapted to be positioned between and secured to adjacent courses of liner plates, said arch rib comprising a curved pressed section having a horizontally disposed web and inwardly extending side flanges, circumferentially arranged ribs pressed in the web of said arch rib for reinforcing the web thereof, and means formed in the side flanges of said channel whereby adjoining liner plates may be connected thereto, and the inner ends of the side flanges being free and independent of each other to permit flexing of the side flanges transversely of the rib, the lower edge of said side flanges having a laterally offset portion and constituting a support for an adjoining side of an adjacent liner plate.

8. An arch rib for tunnel linings and the like adapted to be positioned between and secured to adjacent courses of liner plates, said arch rib comprising a curved pressed section having a horizontally disposed web and inwardly extending side flanges, circumferentially arranged ribs pressed in the web of said arch rib for reinforcing the web thereof, and means formed in the side flanges of said channel whereby adjoining liner plates may be connected thereto, and means projecting laterally from the side flanges of said rib and constituting a supporting surface for the adjoining side of an adjacent liner plate.

9. An arch rib for tunnel linings and the like adapted to be positioned between and secured to adjacent courses of liner plates, said arch rib comprising a curved pressed section having a horizontally disposed web and inwardly extending side flanges, circumferentially arranged ribs pressed in the web of said arch rib for reinforcing the web thereof, and means formed in the side flanges of said channel whereby adjoining liner plates may be connected thereto, and means for reinforcing and stiffening the side flanges of said rib including a part projecting laterally from said side flanges and serving as a support for the adjoining side of a juxtaposed liner plate.

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