Nov. 25, 1941. W. W. SMITH 2,264,100

SHEET METAL LAGGING

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Fig. 1.

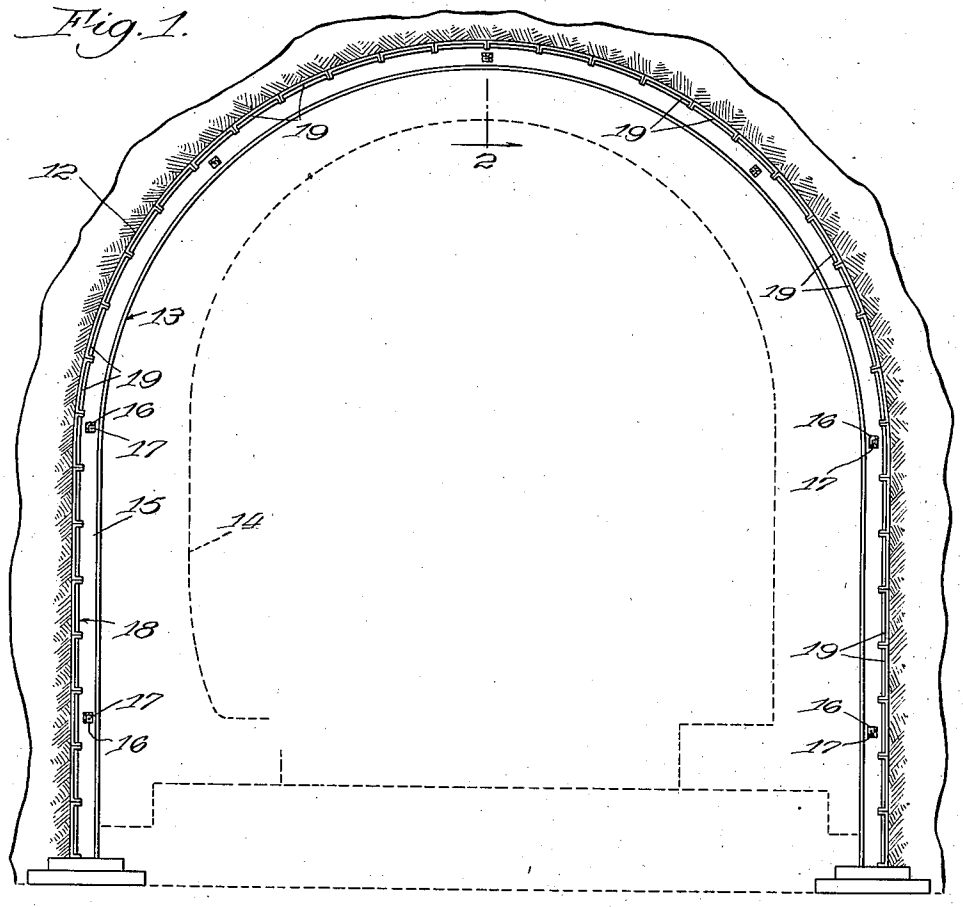


Fig. 2.

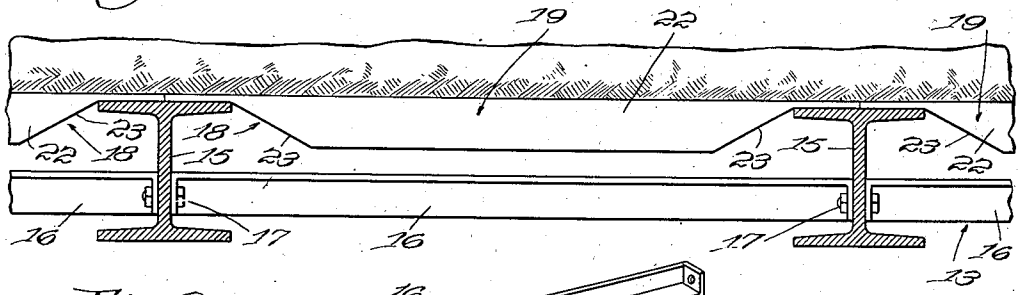
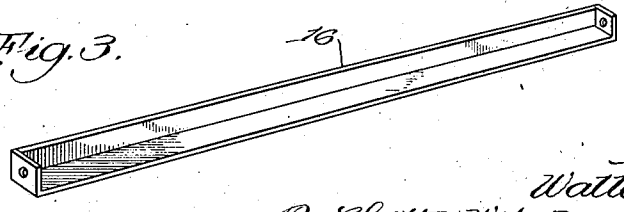


Fig. 3.



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Fig. 4.

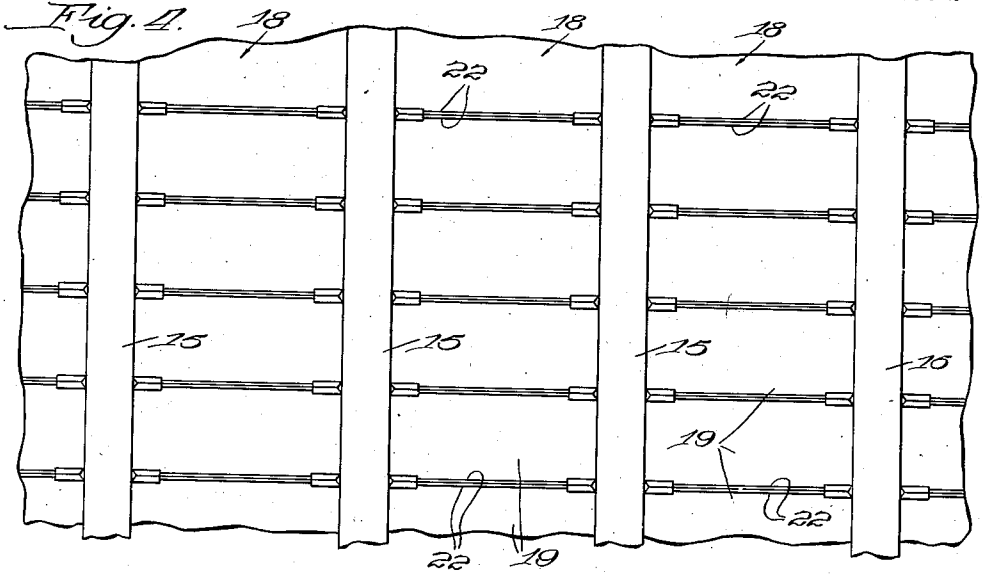


Fig. 5.

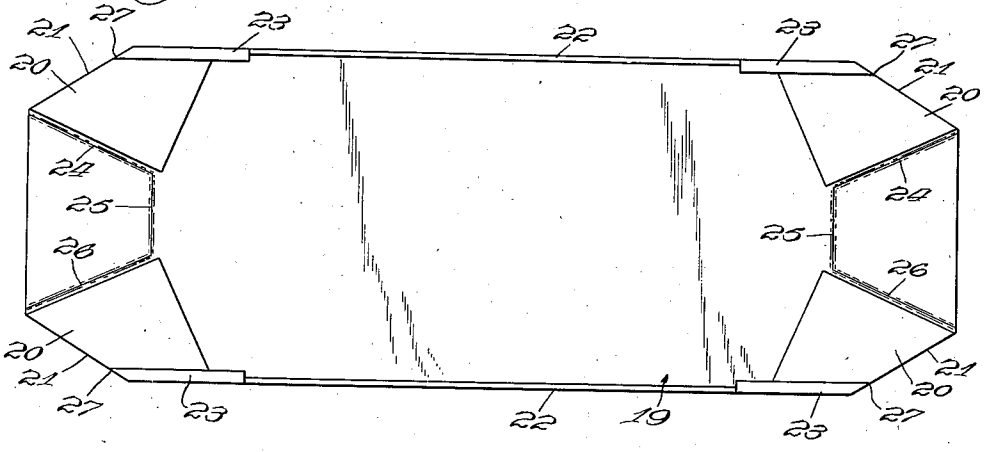
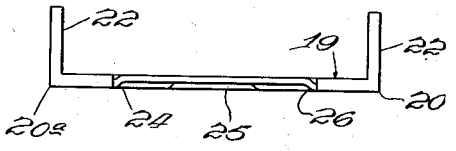


Fig. 6.



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Fig. 7.

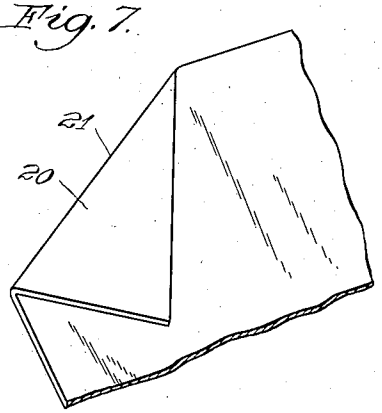


Fig. 8.

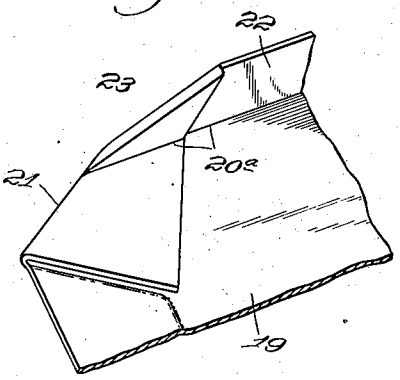


Fig. 9.

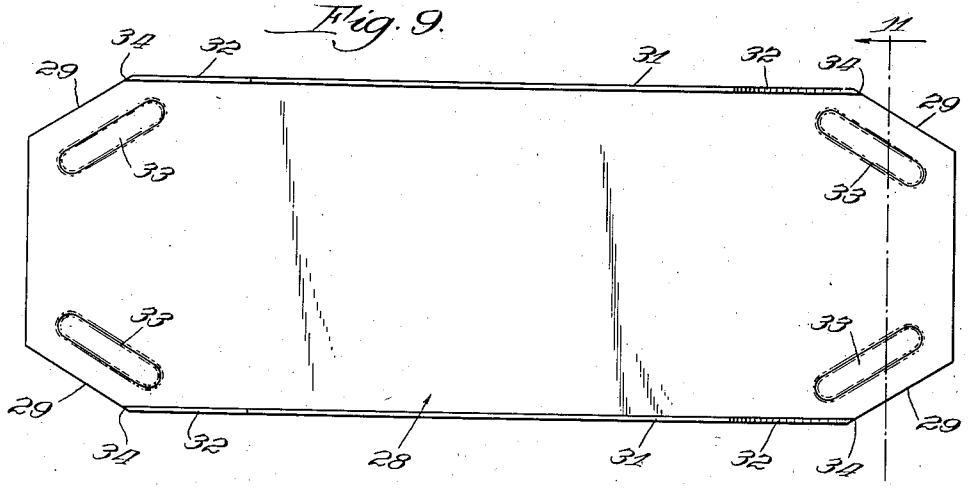


Fig. 10.

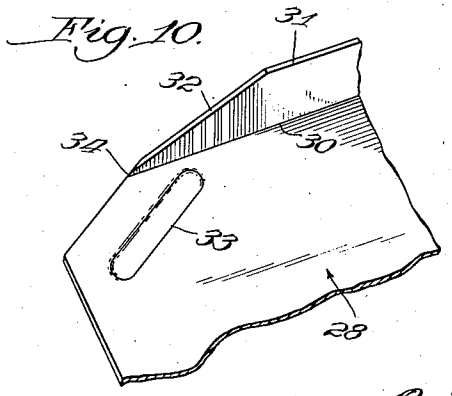
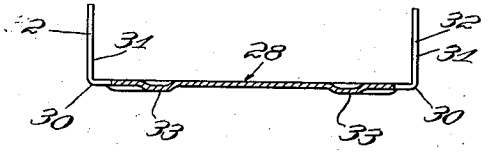


Fig. 11.



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UNITED STATES PATENT OFFICE

2,264,100

SHEET METAL LAGGING

Wallace W. Smith, Chicago, Ill., assignor to Inland Steel Company, Chicago, Ill., a corporation of Delaware

Application November 18, 1939, Serial No. 305,195

3 Claims. (Cl. 61—45)

My invention relates generally to sheet metal lagging plates preferably of steel, and to the method of manufacturing the same; and more particularly to lagging plates and their manufacture for use in connection with the constructing of underground tunnels to prevent caving in of the earth surrounding the tunnel-bore.

My improved lagging plates were devised for use more particularly, though not exclusively, in connection with the forming of retaining walls for underground tunnels involving an inner wall structure of concrete extending over the inner surface of a metal retaining wall of a type employing arched ribs spaced apart lengthwise of the tunnel structure with the spaces between the arched ribs spanned by sheet metal lagging plates.

My object generally stated, is to provide a novel and simple construction of lagging plate which will present the desired resistance to the pressure of the earth to which it is subjected when installed for use and which may be constructed at less cost than former structures of this character; and to provide a novel and desirable method for manufacturing such plates.

Referring to the accompanying drawings:

Figure 1 is a cross sectional view of an underground tunnel utilizing a retaining wall comprising lagging plates in accordance with my invention.

Figure 2 is an enlarged fragmentary sectional view, the section being taken at the line 2 on Fig. 1 and viewed in the direction of the arrow.

Figure 3 is a perspective view of one of the similar struts for spacing the arched ribs of the wall.

Figure 4 is an inner face view of a side of the retaining wall.

Figure 5 is a plan view of one of the similar sheet metal lagging plates shown in Figs. 1–4.

Figure 6 is an end view of the lagging plate of Fig. 5.

Figures 7 and 8 are fragmentary perspective views illustrating successive steps in the forming of the lagging plate of Figs. 5 and 6.

Figure 9 is a plan view of a sheet metal lagging plate of another form embodying my invention.

Figure 10 is a fragmentary perspective view of one of the similar ends of the lagging plate of Fig. 9; and

Figure 11, a section taken at the line 11 on Fig. 9 and viewed in the direction of the arrow.

I have illustrated my invention in connection with a tunnel structure of the general character above referred to, the drawings showing at 12 the arched bore tunneled out of the earth, the inner surface of which is to be walled; the retaining wall structure for the bore 12 being represented at 13 and the inner concrete wall at 14; the retaining wall structure 13 comprising arched ribs 15 spaced apart in a direction lengthwise of the tunnel and held in spaced relation by struts 16 extending at intervals along the arched ribs and secured to the arched ribs by bolts 17; and arched continuous platelike portions 18 located outwardly beyond the arched ribs 15 and against which the earth at the bore 12, bears.

The platelike portions 18 are formed of sheet metal lagging plates 19 which span the spaces between the arched ribs 15 and are confined at their ends between the arched ribs and the wall of the bore 12; the plates 19, after the arched ribs are positioned in the bore 12 in which position they are slightly inwardly spaced from the wall of the bore, being inserted into the position stated to extend horizontally and in edge-to-edge relation as shown, to fill in the spaces between the arched ribs.

The lagging plates 19 according to the construction shown in Figs. 5–9 are formed from any suitable sheet metal, as for example steel, provided of rectangular form, each sheet having its corner portions 20 bent inwardly along diagonal lines 21 to overlie a face of the body of the sheet as shown, this first step in the production of the lagging plate being illustrated as to one of the corners in Fig. 7. Opposite edge portions of the sheet and the bent-over corners 20 are then bent along parallel lines 20a in the same direction as the corners 20 were bent, to form flanges 22 along these edges of the sheet which extend angularly to the body of the sheet as shown, these flanges thus presenting beveled end edges as represented at 23 which reach short of the end edges of the ends of the body portion of the sheet, as illustrated.

Either after forming the flanges 22, or in the operation of forming these flanges, the body portion of the sheet at its end portions is offset toward the infolded corners 20 along the lines 24, 25 and 26 to cause the portions of the sheet between these lines to lie in the plane of those portions of the infolded corners 20 which lie flatwise against these ends; the offsets along the lines 24 and 26 extending generally lengthwise of the sheet from one side to the other of the points of juncture 27 of the ends of the flanges 22 with the body portion of the sheet.

In use the lagging plates are positioned in the spaces between the arched ribs 15 with their flanges 22, which form stiffening means for the

plates, extending toward the center of the bore 12, and with their flat end portions positioned against the outer sides of the arched ribs 15 as shown.

As will be understood, the stress of the earth against these plates is inwardly and tends to inwardly deflect these plates and deform them at their ends along lines extending crosswise of the plate coincident with the ends 27 of the flanges 22. The desired resistance to such bending, however, is presented by the plate, by the double thickness of metal at the ends of the plate and the provision of the strengthening offset portions along the lines 24 and 26, while the deformed portions between the lines 24, 25 and 26 at opposite ends of the plate afford, with the adjacent infolded corner portions, board, flat bearing surfaces for seating the plate at its ends against the arched ribs 15.

By constructing the lagging plate as described, it is possible to use relatively light gage metal without sacrificing the desired strength, and to perform at relatively slight expense the necessary operations on the sheet to produce the plate.

In accordance with the modification shown in Figs. 9, 10 and 11, the lagging plate, herein shown at 28, is formed of any suitable material, such as for example sheet steel, provided of rectangular form. In producing this plate the corners thereof are cut off along the diagonal lines 29 and opposite edge portions of the sheet are bent along parallel lines 30 to extend angularly to the body portion of the sheet and form flanges 31 corresponding with the flanges 22 of the previously described plate. As the juncture of the flanges 31 with the body portion of the sheet along the lines 30 intersects the diagonal corner lines 29, the flanges 31 at their ends present the beveled surface indicated at 32 and reach short of the end edges of the sheet, as shown.

To stiffen the ends of the plate against deformation in use as described of the plates 18, the plate is deformed to produce offset portions 33 at each end of the plate, these offset portions, preferably provided in pairs and converging toward the respective ends of the plate, and thus extending generally lengthwise of the sheet, extending from one side to the other of the points 34 of juncture of the flanges 31 with the body portion of the plate as shown and thus across those portions of the plate against which the most severe bending stress is exerted by the earth when the plates are positioned for use.

As will be noted, the angularly disposed flanges of both of the illustrated plates are flat; and that by beveling the ends of these flanges the plates may be manipulated into set position behind the arched ribs without difficulty as compared with plates in which the flanges present abrupt end edges.

While the construction of Figs. 9–11 does not appear to present the same degree of resistance to deformation at its ends when positioned for use as the construction shown in Figs. 5 and 6 when constructed of the same gage of sheet metal, nevertheless the fact that it may be manufactured economically and that it embodies the end stiffening feature of my invention renders it a desirable construction for use.

While I have illustrated and described certain particular embodiments of my invention and have disclosed certain procedures involved in the manufacture of lagging plates, I do not wish to be understood as intending to limit my invention thereto as the structures shown may be variously modified and altered; and the invention embodied in other forms of structure, and the procedures for forming the plates varied, without departing from the spirit of my invention.

What I claim as new and desire to secure by Letters Patent, is:

1. A sheet metal lagging plate formed from a substantially rectangular sheet of metal with its corners bent back upon the body of the sheet at the same side thereof and opposite edge portions of the sheet and certain portions of said bent-back corners bent in the same direction as the corner portions and forming flanges extending angularly to the body of the sheet.

2. A sheet metal lagging plate having flanges at opposite edges thereof and portions integral with said flanges located at the inner sides of said flanges and overlying the ends of the plate, portions of the ends of the plate between said overlying integral portions being offset into the spaces between, and into substantially the plane of, said overlying portions.

3. A sheet metal lagging plate having flanges at opposite edges thereof and portions integral with said flanges located at the inner sides of said flanges and overlying the ends of the plate, portions of the ends of the plate between said overlying integral portions being offset into the spaces between, and into substantially the plane of, said overlying portions, said flanges reaching short of the end edges of the plate and said offset portions extending from one side to the other of a line connecting the points of juncture of the ends of said flanges with the plate.

WALLACE W. SMITH.