

H. B. LOXTERMAN.
TUNNEL MOLD FORM.
APPLICATION FILED APR. 12, 1916.

1,285,266.

Patented Nov. 19, 1918.
2 SHEETS—SHEET 1.

Fig. 1

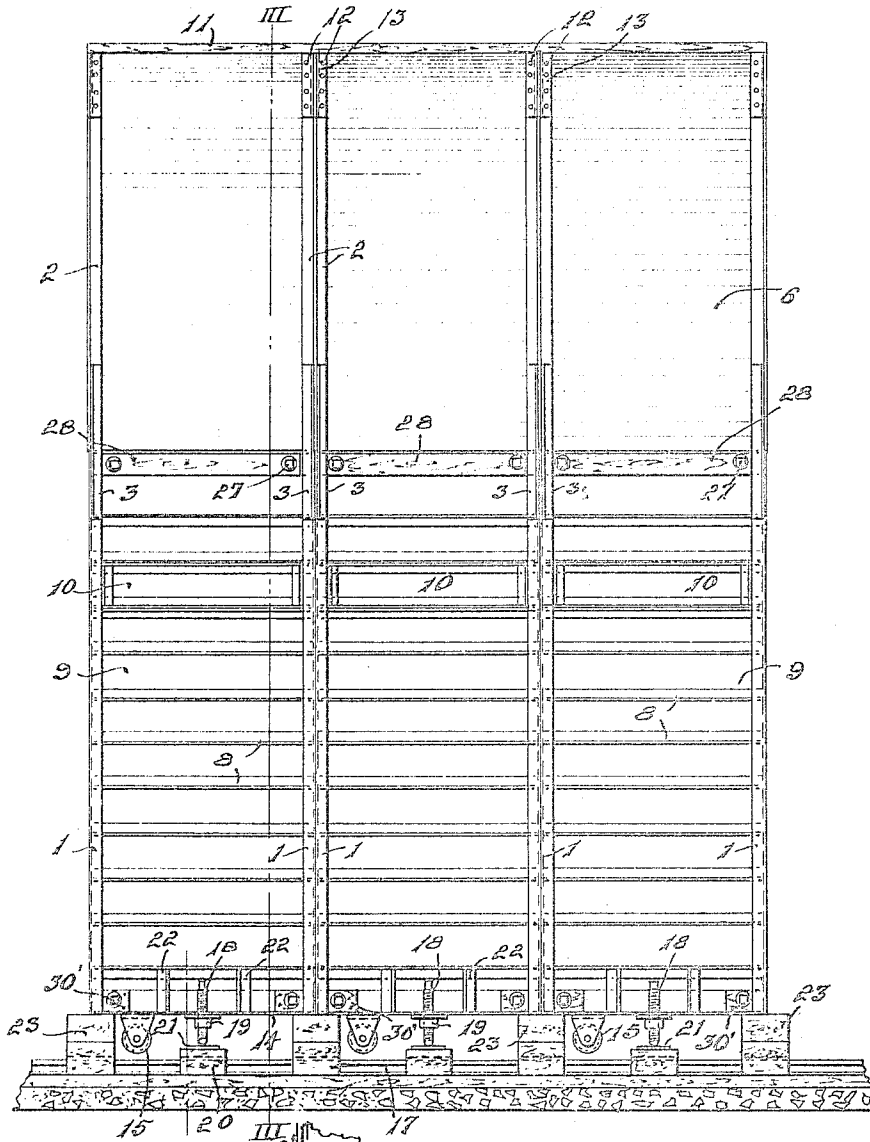
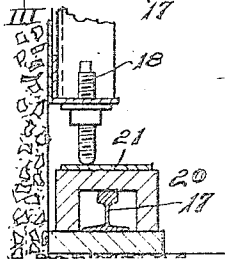


Fig. 2

WITNESS:
Julian H. Ketchum



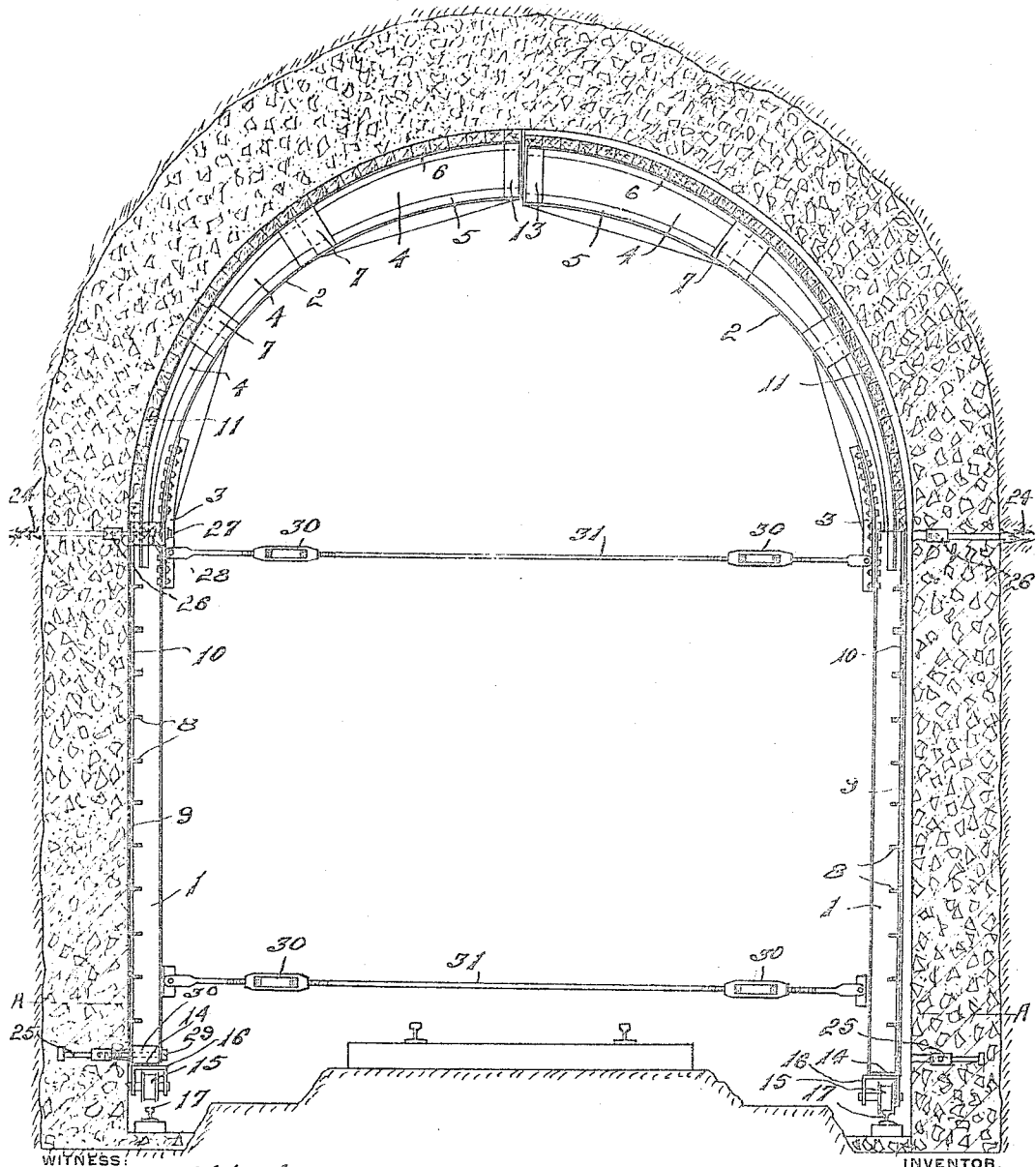
INVENTOR.
H. B. Loxterman
Synner & Bradley
Lehman & Fowler
ATTORNEYS.

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2 SHEETS—SHEET 2.

Fig. 3



WITNESS:

John H. Kennedy

INVENTOR.

H. B. Loxterman
Sydney L. Bradley
Lechner & Fowler

ATTORNEYS.

UNITED STATES PATENT OFFICE.

HOWARD B. LOXTERMAN, OF PITTSBURGH, PENNSYLVANIA, ASSIGNOR TO BLAW STEEL CONSTRUCTION COMPANY, OF HOBOKEN, PENNSYLVANIA, A CORPORATION OF NEW JERSEY.

TUNNEL MOLD-FORM.

1,285,266.

Specification of Letters Patent.

Patented Nov. 19, 1918.

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To all whom it may concern:

Be it known that I, HOWARD B. LOXTERMAN, a citizen of the United States, residing at Pittsburgh, in the county of Allegheny and State of Pennsylvania, have invented certain new and useful Improvements in Tunnel Mold-Forms, of which the following is a specification.

This invention relates to mold forms and more particularly to that class of forms used in the construction of railway and other tunnels dug through the earth and lined with concrete. The invention has for its principal object the provision of mold forms that can be readily set up in the field and moved to various positions; the provision of a mold form adapted to be carried upon rollers and provided with means for relieving the weight of the form and the concrete from the rollers; the provision of mold forms that can be secured to the earth or stone walls of the excavated tunnels and held against displacement without the use of cross braces now commonly used; and such other objects as may hereinafter appear. One embodiment of the invention is illustrated in the accompanying drawings, wherein—

Figure 1 is a side elevation showing the inside of one of the tunnel form sections; Fig. 2 is a detail of the form elevating mechanism; and Fig. 3 is a transverse section on the line III—III of Fig. 1.

Referring to the drawings the mold form comprises a plurality of panels or mold sections which serve to mold the side wall and ceiling of the tunnel when two of the panels are arranged face to face so that their top faces abut one another. Each panel is formed of straight vertical channel irons to which arched truss members 2 are secured by means of fish plates 3 which are securely bolted to the channel irons and the truss members. The trusses 2 are made up of a series of plates 4 which are disposed between and reinforced by marginal angles 5 and 6, and the joints of the plates 4 being reinforced by fish plates 7.

The vertical channels 1 of each panel are connected by longitudinal angles 8 upon which are riveted sheet metal plates 9 which form the side of the mold form. Near the top of the straight portion of the panels a loose rectangular panel 10 is provided in each panel which may be removed when the

panel is in operative position for the purpose of providing an opening in the form through which the concrete may be poured to form the lower portion of the wall of the tunnel. The truss portions 2 of the panels are offset slightly with respect to the straight portions of the panels for the purpose of providing a seat for wood lagging strips which are built up as the concrete is being filled in between the earth and the tunnel form. These lagging boards are adapted to support the concrete and mold the arched portion of the tunnel.

Referring to Fig. 3 it will be seen that two panels arranged to face one another serve to mold the complete tunnel section. When the molds are in operative position the abutting ends of the truss members are secured together by means of bolts which pass through the holes 12 in the angle clips 13, thus forming a complete mold section.

The lower ends of the vertical channels 1 are connected by longitudinally disposed angle irons 14 which serve as a base member for the panels and to which rollers 15 are pivoted by means of yokes 16 securely bolted to the angle irons 14. In operation, the form is first set up and mounted upon the rails 17 upon which the rollers are adapted to travel when the form is being moved into operative position.

Inasmuch as it is desirable to relieve the rollers from the strain of carrying the concrete when the molds are in operative position, jack screws 18 are provided at the center of each panel section for the purpose of raising the forms into operative position and raising the wheels above the rails so that they will not carry any of the load when the form is in such operative position. These jack screws are threaded through flanged sleeves 19 (Fig. 1) which are securely riveted or bolted to the base flange of the angle iron 14, the lower ends of the jack screws bearing upon blocks 20 which straddle the rails 17 and bear both upon the top of the rail and the rail support. The wearing plate 21 is disposed between the block 20 and the jack screw 18 for the purpose of distributing the load over the top surface of the block. The base flanges of the angle irons 14 are reinforced by vertical angles 22 which prevent the base flanges of the angles 14 from bending upward. The

jack screws are only intended to carry the weight of the forms while the forms are being elevated into operative position. When the forms have been elevated a desired amount, blocks 23 are placed beneath the ends of the panels and directly beneath the point where two or more panels are joined. The jack screws are then turned so as to lower the forms slightly so that their entire weight is carried by the blocks 23, as shown in Fig. 1. It will be seen that when the forms are in the position shown in Fig. 1 the rollers are out of engagement with the rail, therefore relieving them of any load that will be placed upon the forms when the forms are in operation. For this reason rollers of much lighter and cheaper construction may be used and the jack screws may also be of light construction inasmuch as they are only intended to carry the load of the forms.

In forms of the size required for molding railway tunnels and the like, it has been customary to use cumbersome cross bracing for supporting the forms against both vertical and lateral inward stresses when the concrete was applied, these braces often interfering with the passage of material cars, and to obviate this difficulty the forms are supported against lateral movement inward by means of anchor bolts 24 and 25. The anchor bolts 24 may be of any suitable type adapted to be embedded in the earth or stone walls of the excavated tunnel before any concrete is applied. The free ends of the anchor bolts 24 are provided with enlarged sleeves 26 which are internally threaded to receive bolts 27 carried by the panel sections. The bolts 27 pass through wooden stiffening blocks 28 disposed between the vertical channels 1 of each panel section located adjacent the top of the straight portion thereof and are secured into the internally threaded enlarged sleeve 26 of the bolts 24.

The anchor bolts 25 are embedded in a body of concrete located below the line A at the lower portion of the side wall of the tunnel. This portion of the concrete is molded with the anchor bolts 25 embedded therein before the tunnel form is set into position and is allowed to set before placing the tunnel forms in operative position. The inner ends of the anchor bolts 25 are also provided with an enlarged internally threaded sleeve adapted to receive bolts 29 which pass through wooden filler blocks 30 at the bottom of the panels. The anchor bolts 25 thus serve to securely hold the bottom of the panel sections in position against any displacement toward the center of the tunnel and the anchor bolts 24 serve to hold the top of the straight sections of the panels and the lower ends of the truss sections of the panels against any displacement toward the center of the panel.

Referring to Fig. 3 it will be seen that the panel section forming the left side of the tunnel is in operative position and that the concrete has been completely filled in to complete a portion of the tunnel. It will also be seen that the anchor bolts are firmly holding the mold form in position and that the rollers 14 are out of engagement with the rails 17. In this same figure the panel form at the right-hand of the tunnel is shown in its collapsed or lowered position ready to be removed and advanced into another operative position for forming additional tunnel construction. In order to lower this panel section, the bolts which secure the angles 13 at the joint of the two panels are loosened and the bolts 27 and 29 are also removed from the anchor bolts 24 and 25 respectively. The supporting blocks 23 are then removed, thus placing the weight of the form upon the jack screws 18. As the concrete has already become set the jack screws are required to carry only the weight of the panels. The jack screws are then turned so that the form is lowered until the rollers 15 engage the rails as shown in Fig. 8. During this lowering operation the turn buckles 30 on the tie rods 31 are turned to draw the panels toward the center of the tunnel sufficient distance to permit of the lowering of the form as the jack screws 18 are turned. The tie rods 31 are only put in place when it is desired to collapse the form and are not in the position shown when the concrete is being applied.

The complete operation of the mold forms in constructing a concrete lined tunnel is as follows. First, the lower portion of the side walls below the line A (Fig. 3) is molded with the anchor bolts 25 embedded therein. The forms are then assembled in the field and placed upon the rails in collapsed position. The forms are then moved into the desired position and elevated by means of the jack screws 18 into operative position. The supporting blocks 23 are then supplied beneath the mold form and the bolts 27 and 29 then applied to the anchor bolts for the purpose of securing the forms against lateral displacement, the anchor bolts 24 having first been secured in their proper position before the molds have been moved into place. The top truss portions of the panels are then secured together by means of the bolts passing through the flanges of the angles 13. The mold is then ready for filling in the concrete.

The rectangular panels 10 at the upper portion of the wall mold are removed to permit the concrete to be passed through openings at this point. After the concrete has been filled up to this level the panels 10 are bolted in place and concrete is then supplied above the top of the straight portions of the panels. When the concrete has

been supplied up to this level the lagging boards 11 are applied a few at a time, until the top of the tunnel has been completely formed, the concrete at the extreme top of the tunnel being applied from the end of the section after all the lagging boards have been put in place.

After the concrete has become sufficiently set the panel sections are collapsed in the manner previously described and moved into a new operative position.

It is obvious that certain changes may be made in the details of the construction herein illustrated and described and the invention is not limited to the specific construction herein disclosed.

What I claim is:

A tunnel mold comprising in combination, a mold form having a ceiling mold and two downwardly projecting side wall molds, rollers for carrying the forms pivoted to the side wall molds, rails upon which the rollers travel, jack screws carried by the forms for elevating the forms to operative position, and bearing blocks adapted to straddle the rails and bear on the support therefor and serve as a seat extending on either side of the rail for supporting the jack screws when the form is being elevated and moved to operative position.

HOWARD B. LONTERMAN.