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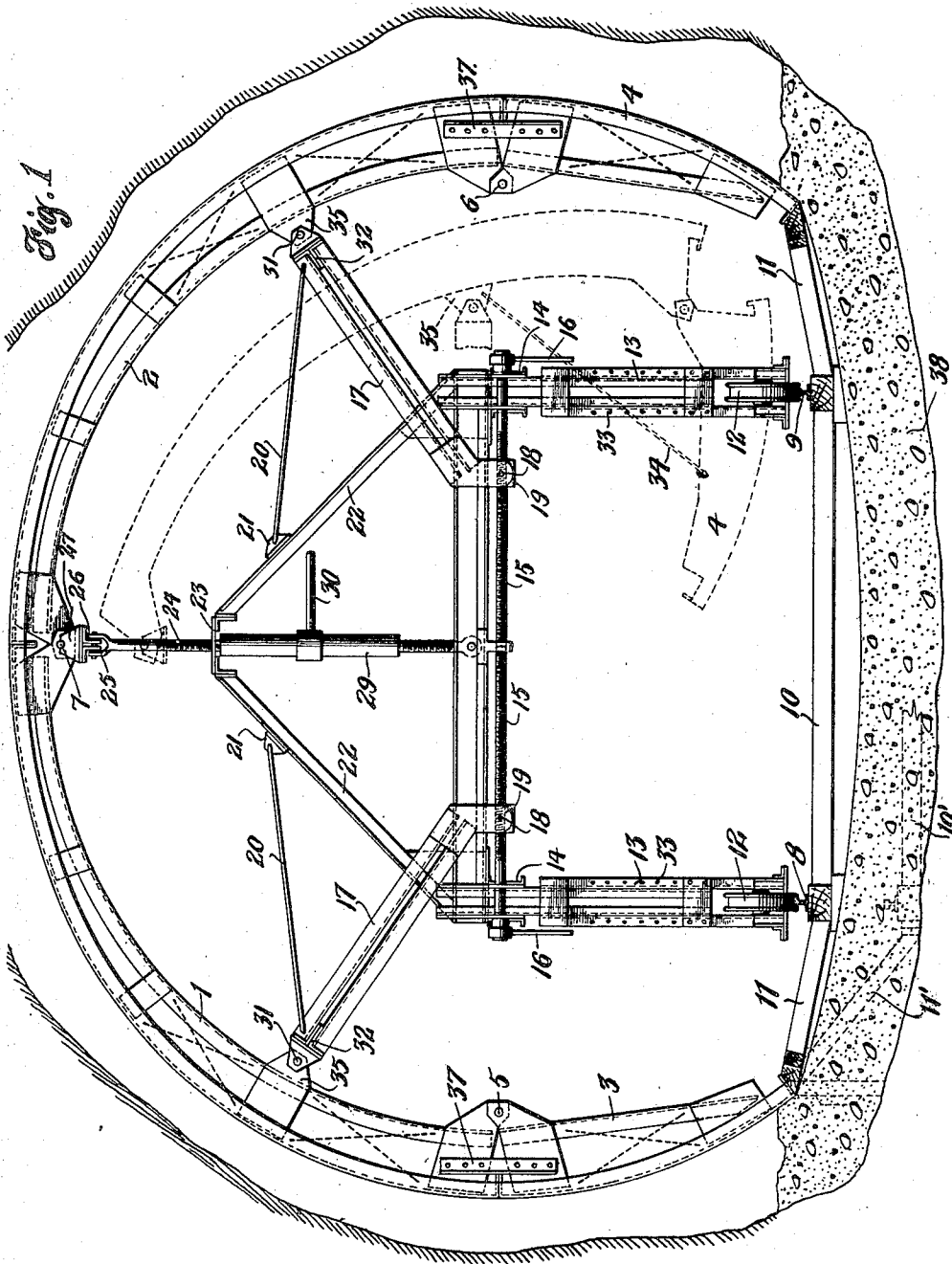
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C. D. McARTHUR

FORM FOR TUNNELS AND CULVERTS

Filed April 13, 1920

2 Sheets-Sheet 1



WITNESS

Gustav Jungling

INVENTOR

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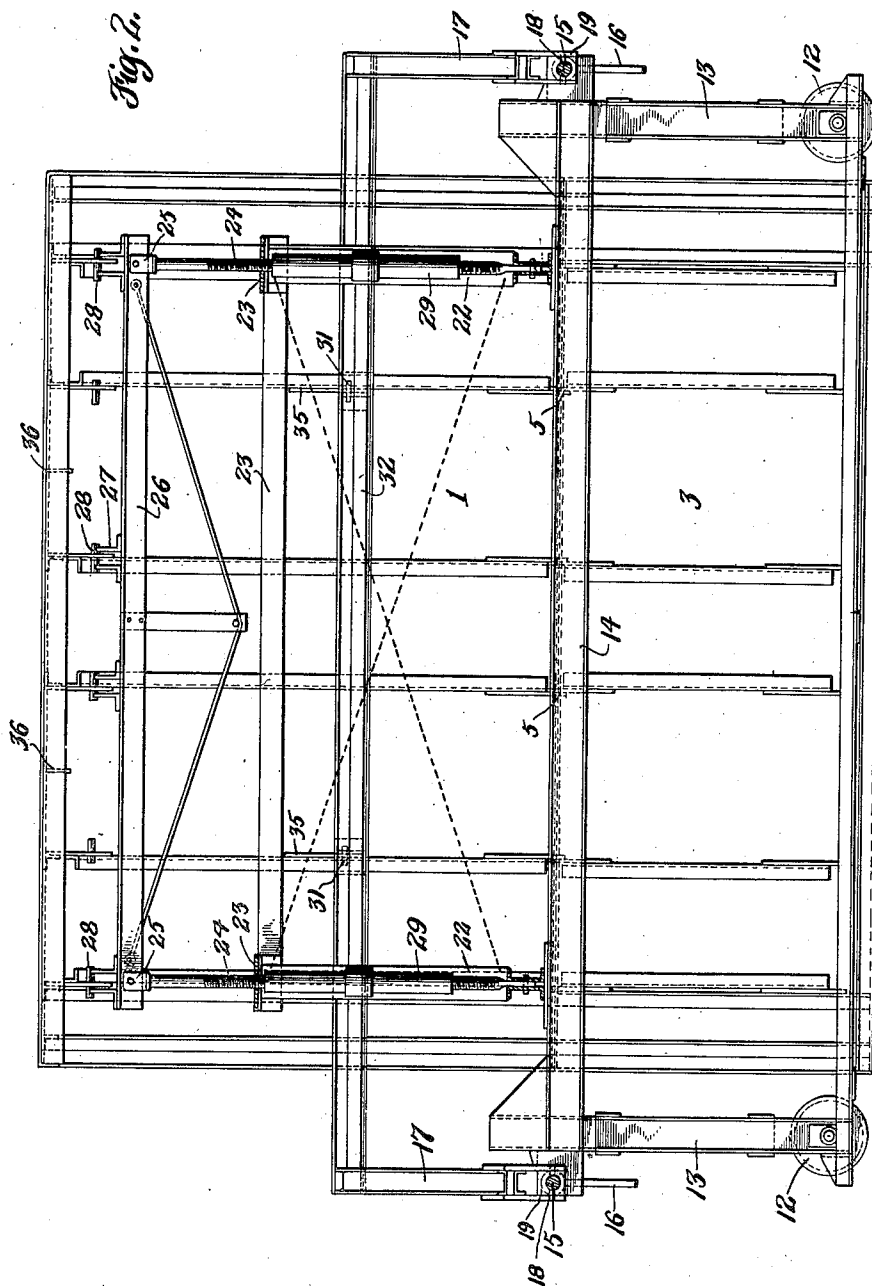
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2 Sheets-Sheet 2



WITNESS

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UNITED STATES PATENT OFFICE.

CHARLES D. McARTHUR, OF PITTSBURGH, PENNSYLVANIA, ASSIGNOR TO BLAW-KNOX COMPANY, A CORPORATION OF NEW JERSEY.

FORM FOR TUNNELS AND CULVERTS.

Application filed April 13, 1920. Serial No. 373,508.

To all whom it may concern:

Be it known that I, CHARLES D. McARTHUR, 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 Forms for Tunnels and Culverts, of which the following is a specification.

This invention has reference to an improved form for use in constructing concrete tunnels or culverts and is particularly applicable for use in places where sections of the form are to be collapsed and carried along by means of suitable carrier mechanism to be erected in another place with the carrier mechanism constructed so that it may be utilized to transport other sections of the form while leaving the first ones transported in operative position.

One of the objects of this invention is the provision of an apparatus of the character specified which can be operated with greater facility than those previously employed and which will rigidly support and carry the several parts while at the same time more readily permit the collapse of the form structure while it is being transported to another position.

The above, as well as such other objects as may hereinafter appear, I obtain by means of a construction which I have illustrated in preferred form in the accompanying drawings, wherein—

Figure 1 is a transverse section through a culvert showing the parts of my invention in end elevation, and Figure 2 is a longitudinal vertical section through my improved apparatus showing more particularly the carrier mechanism and the arrangement of form supporting truss devices which are employed.

Referring now more particularly to Figure 1, it will be seen that I have therein shown a transverse section through a culvert, the arch and sides of which are supported while in process of formation by means of a metallic sheet metal form made of two half truss portions 1 and 2 with suitable surface plates and having wing sections 3 and 4, pivoted to the half truss portions by means of the pins at 5 and 6 respectively. The use of the two sections 1 and 2 pivoted together at 7 and provided at their lower edges with the wing sections 3 and 4, carried by the pivotal supports 5 and 6, in connection

with a wheel supported carrying device, or traveller is known in the art, but in carrying on my invention I provide novel means for raising and lowering the said parts and swinging them into and out of operative position, and also for supporting them while they are being transported to a new position for reuse.

Upon the rails 8 and 9 which are mounted on the floor of the tunnel and held in proper position by the distance pieces 10 and 11, I mount a carrier or traveller comprising a truss or carriage which is provided with four wheels 12 carried at the lower ends of the four extensible vertical legs or supports 13 which in turn carry the frames 14 at their upper ends, there being provided at each end of the frames 14 a pair of transversely disposed, screw threaded shafts 15 with actuating handles 16, which are preferably of a ratchet type, which shafts 15 are constructed to move the inclined arms 17 toward or away from the center of the traveller as clearly indicated in Figure 1. The arms 17 are pivotally secured at 18 to the nuts 19 which engage the screw shaft 15 and the outer ends of the arms 17 may be held in raised position as shown in Figure 1 by the supporting rods 20 that are hooked into lugs 21 carried by the sloping frame 22.

Extending longitudinally along the upper central portion of the traveller I provide a longitudinal beam 23 at each end of which there is a vertically disposed double threaded jack rod 24 carrying a fork 25 at its upper end. These forks engage a truss member 26 which in turn carries a series of angularly shaped supporting socket pieces 27 constructed to engage pins 28 which, being in alignment throughout the successive adjoining members of the mold, form the pivotal support of the two members 1 and 2 of the mold structure.

It will be observed that the turn buckle device at 29 which is preferably provided with an actuating ratchet handle 30, will serve to raise and lower the truss 26 so as to bring the series of socket pieces 27 into engagement on the underside of the pivot pins 28 and thus take the weight of the form parts when they are to be collapsed or elevated in position. The turn buckle members 29 with the screws 24 and the truss 26 form together a kind of U-shaped structure which I will term a top truss.

As a lateral or radial support for the parts of the form 1 and 2, I provide the arms 17, which are secured to the form members by means of removable pins 31 arranged at intervals along the longitudinal beam member 32, which latter is supported at its ends by the radial arms 17 carried by the horizontal screws 15. This arrangement of the longitudinal member 32, the radial arms 17 and the supporting means for the latter constitutes again a kind of U-shaped truss formation which is somewhat longer than the top truss having the horizontal beam 26. This truss can be raised or lowered as required and is indicated in its lower position in dotted lines in Figure 1. Its movement is accomplished without interference of any kind from the top truss 26 or other parts of the structure. The supporting mechanism comprising the beam 32 and the arms 17, I have designated a side truss member.

As a convenient method of securing the requisite vertical adjustment of the legs 13 of the carriage I provide a series of adjustment holes 33 in which removable pins or bolts may be inserted to hold the parts in adjusted position.

In order to support the wing members 3 and 4 when they are in collapsed position as indicated in dotted lines in Figure 1, I provide hanger rods 34 constructed to be hooked into stiffening flanges on the members 3 and 4 and a projecting lug 35 on the mold members 1 and 2.

In carrying out my invention I make the carriage composed of the legs 13 and the horizontal members 14 of sufficient length to carry a plurality of form sections the showing of Figure 2 indicating three such sections joined at the parts marked 36, the wing members 3 and 4 on all three sections being free to swing inwardly between the carriage legs 13 into collapsed position when the form is to be carried forward to be erected in a new place.

By making the side truss members composed of the arms 17 and the horizontal members 32 of greater length than the carriage structure, I am enabled to locate the screws 15 on the outer ends of the beams 14 which facilitates their operation.

When the form parts are in erected position as shown in full lines in Figure 1, I hold the wing members 3 and 4 in proper relation to the side members 1 and 2 by means of angles or straps 37 which are removably attached by the use of suitable bolts or other convenient fastening means.

In operating my device it will be seen that, assuming the parts to be in the position shown in Figure 1, if the pins 31 be removed, the arms 17 moved inwardly, and the jacks 29 operated to lower the parts 25, at the top of the screws 24, out of contact

with the pins 28, the braces or beams 11, arranged as shown in Figure 1, will hold the mold parts in place while the traveller or carrier is moved to another position. In this new position it may be raised again into the position shown in full lines in Figure 1, and secured to a form structure, which can then be brought down into the position shown in dotted lines on one side of Figure 1 after first swinging the wing sections 3 and 4 inwardly between the legs 13 and holding them in place by the suspension rods 34. The main sections 1 and 2 are brought down by rotating the screws 15 so as to draw the arms 17 inwardly and downwardly toward the center of the structure thus bringing the parts 35 down into a position in which the arms 17 are substantially horizontal, the rods 20 being unhooked to permit this lowering of the arms 17.

The side truss members 17 can move down to the position indicated without interfering with the diagonal bracing 22 or other parts of the mechanism because the said side truss members are of greater longitudinal dimension than the other parts above the beams 14.

With the form parts supported in the manner just described, the traveller can then be moved along the tracks 8 and 9 to a new position in which the operation of the several actuating parts being reversed the form will be erected into the position shown in full lines in Figure 1.

When the form is used in a culvert, the invert 38 is finished first and the bracing members 10 and 11 placed upon it but when used in a tunnel, the invert is finished last and the bracing is placed as indicated in dotted lines in Figure 1 at 10' and 11'.

I claim:

1. A form carrier or traveller for concrete tunnels and the like, comprising in combination a top truss, a longitudinal side truss, and a carriage for both of said trusses, the side truss being supported at its ends by means located outside the plane of the ends of the top truss.

2. A form carrier or traveller for concrete tunnels and the like, comprising in combination a top truss, a longitudinal side truss, and a carriage for both of said trusses, the side truss being supported at its ends by means located outside the plane of the ends of the top truss, said traveller having supporting means at its ends spaced farther apart than the maximum dimension of the form to be carried thereby.

3. A form carrier or traveller for concrete tunnels and the like, comprising in combination a top truss, a longitudinal side truss, and a carriage for both of said trusses, the side truss being supported at its ends by means located outside the plane of the ends of the top truss, and means at the ends of the side truss for moving the latter toward

and away from the center line of the traveller.

4. A form carrier or traveller for concrete tunnels and the like, comprising in combination a top truss, a longitudinal side truss, and a carriage for both of said trusses, the side truss being supported at its ends by means located outside the plane of the ends of the top truss, and means at the ends of the side truss for moving the latter toward and away from the center line of the traveller, said means comprising horizontally disposed screw threaded rods carried at the ends of the carriage frame.

5. A form carrier or traveller for concrete tunnels and the like, comprising in combination a top truss, a longitudinal side truss, and a carriage for both of said trusses, the side truss being supported at its ends by means located outside the plane of the ends of the top truss, and means for adjusting the height of the carriage frame.

6. A form carrier or traveller for concrete tunnels and the like, comprising in combination a top truss, a longitudinal side truss, and a carriage for both of said trusses, the side truss being supported at its ends by means located outside the plane of the ends of the top truss, and means for raising and lowering the top truss.

7. A form carrier or traveller for concrete tunnels and the like, comprising in combination a top truss, a longitudinal side truss, and a carriage for both of said trusses, the side truss being supported at its ends by means located outside the plane of the ends of the top truss, and means for raising and lowering the top truss, said raising and

lowering means being carried upon the carriage frame at points within the ends of the side frame truss.

8. A form carrier or traveller for concrete tunnels and the like, comprising in combination a top truss, a longitudinal side truss, and a carriage for both of said trusses, the side truss being supported at its ends by means located outside the plane of the ends of the top truss, the traveller being of sufficient longitudinal dimension to straddle the mold structure.

9. A form for constructing concrete tunnels and the like comprising in combination a traveller with a top truss, a side truss, and a carriage carrying said top truss and side truss, and mold members supported by said top truss and side truss and having wing sections at the lower ends constructed to swing within the ends of the traveller.

10. A form apparatus for concrete tunnels, culverts and the like comprising a collapsible form, and a traveller therefor having collapsing mechanism, said traveller having at least one end extending beyond the form and provided with means for actuating the collapsing mechanism.

11. A form apparatus for concrete tunnels, culverts and the like comprising a form having an inwardly swinging section, and a traveller for the form of greater length than the swinging section and constructed to permit the said section to be swung thereinto.

In testimony whereof, I have hereunto signed my name.

CHARLES D. McARTHUR.