

Dec. 6, 1938.

W. A. GURTLER

2,139,078

CONCRETE FORM

Filed Oct. 18, 1935

4 Sheets-Sheet 1

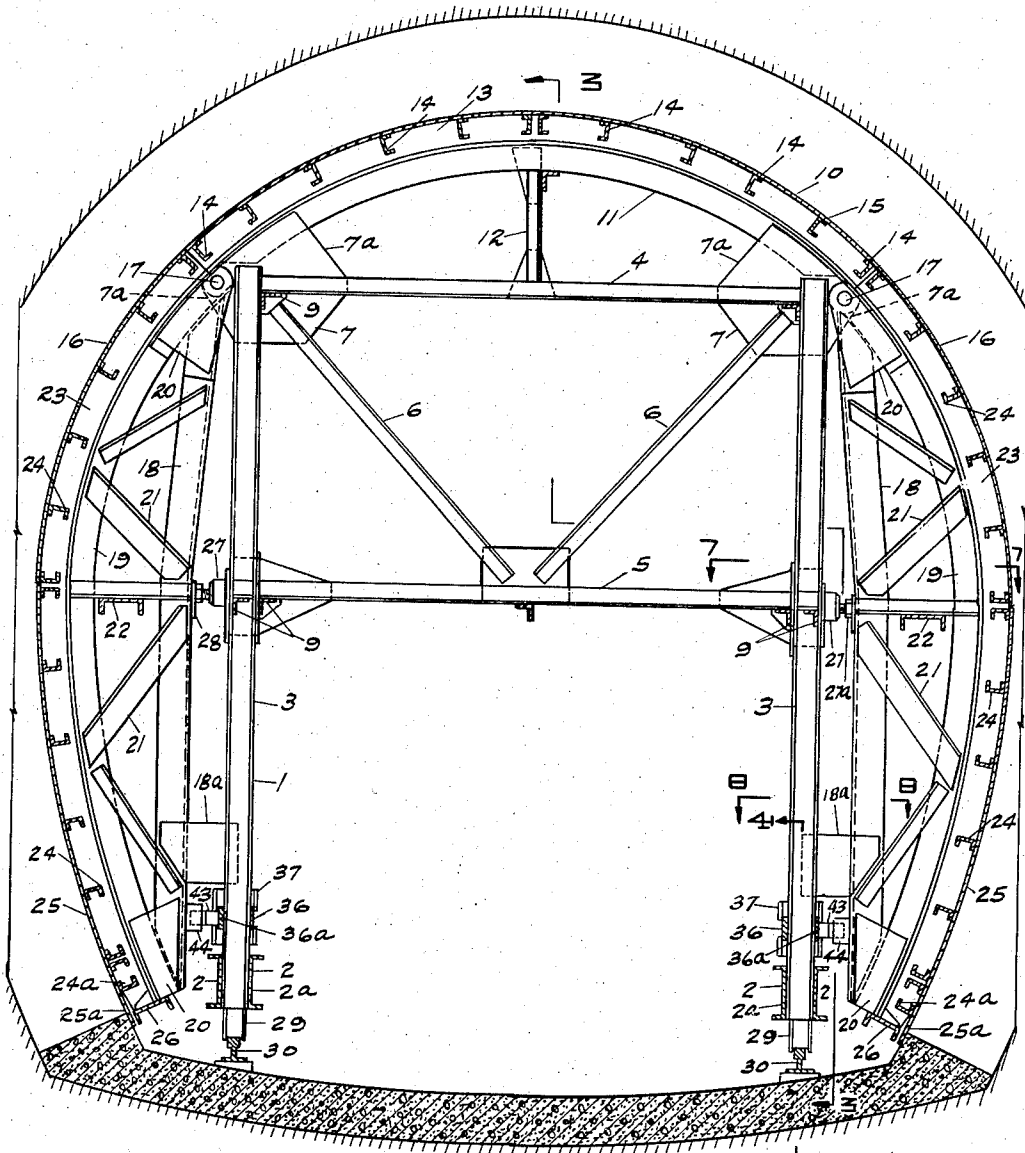


FIG - 1

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4 Sheets-Sheet 2

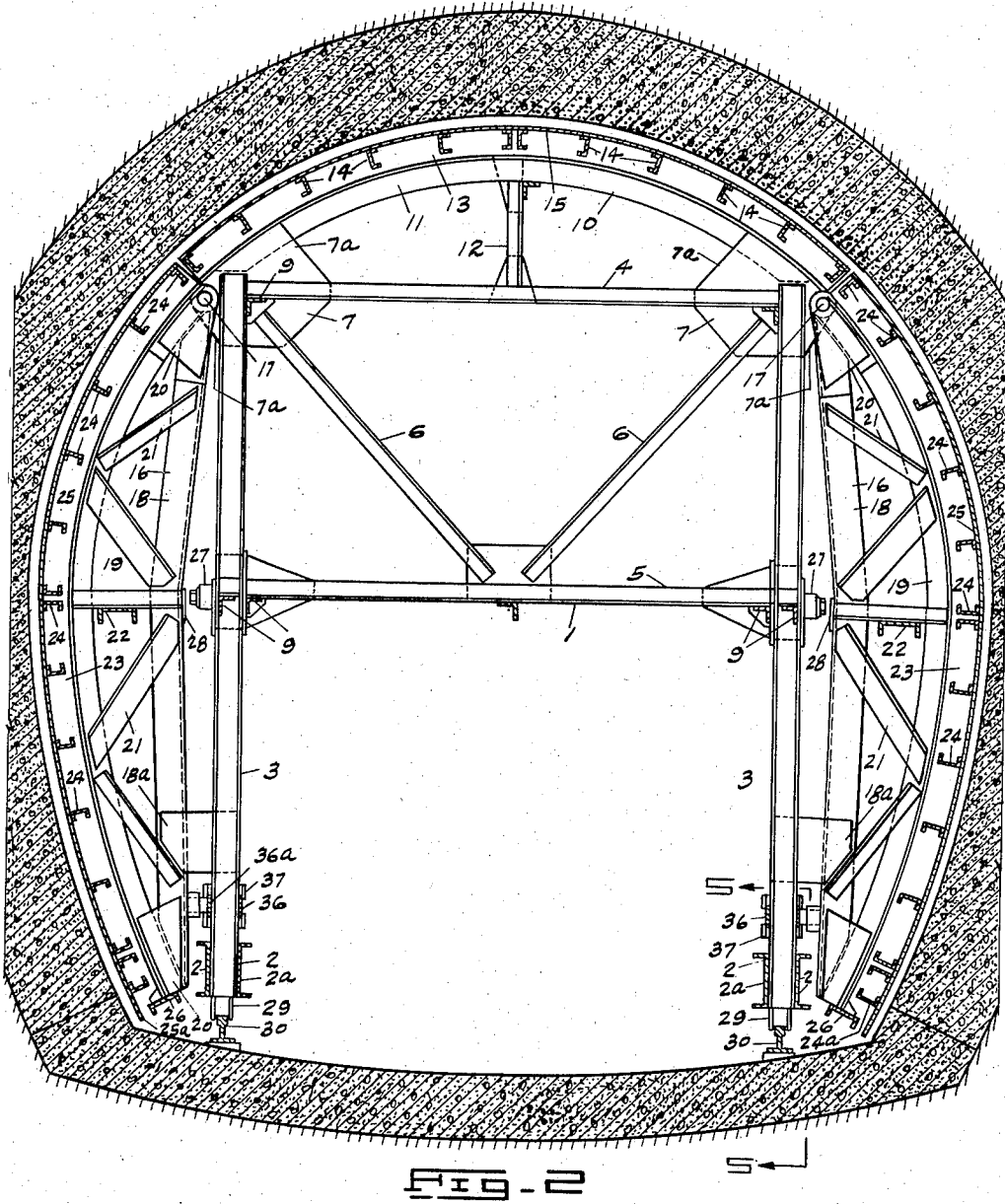


FIG. 2

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4 Sheets-Sheet 3

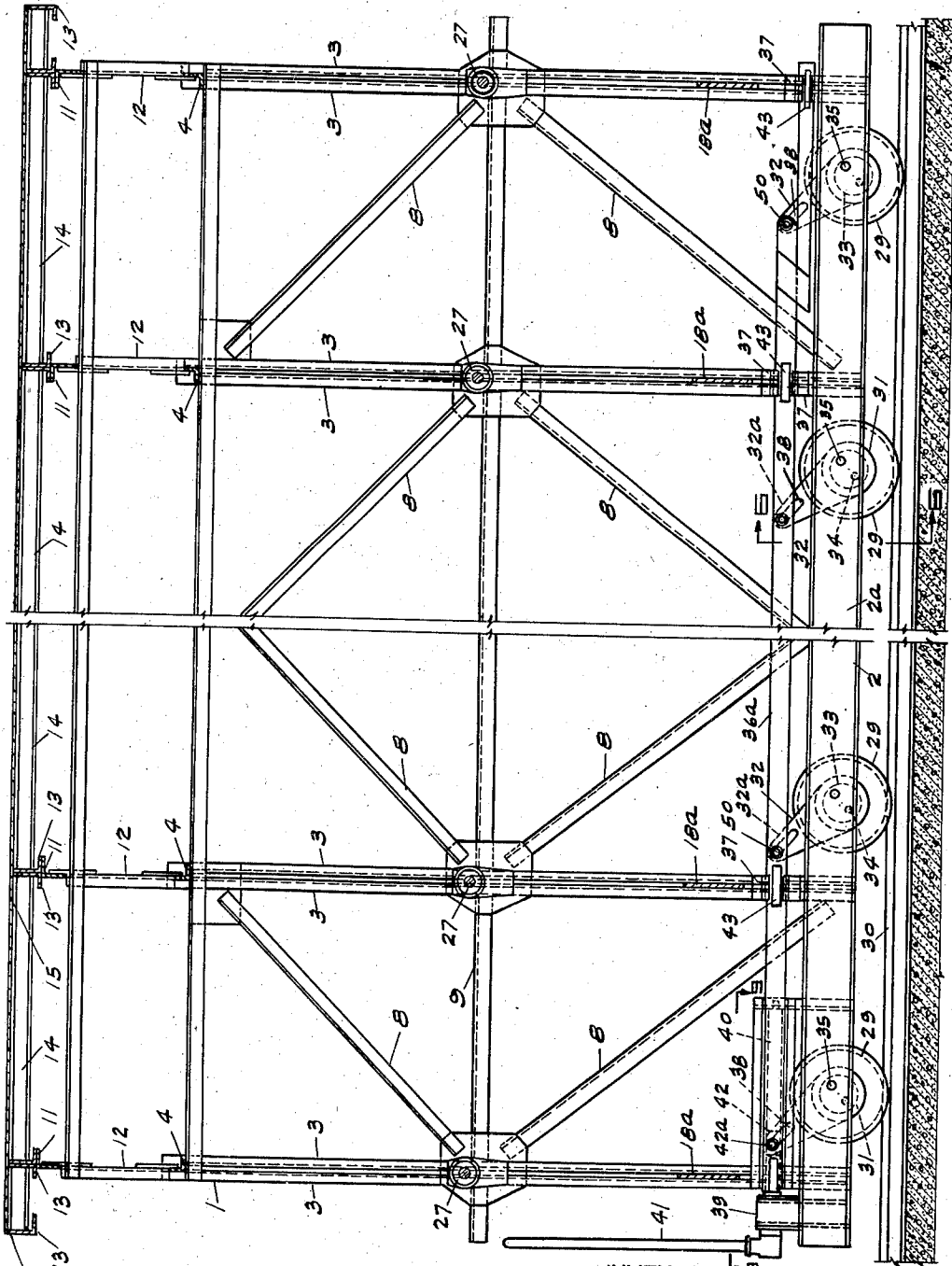


FIG. 2

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4 Sheets-Sheet 4

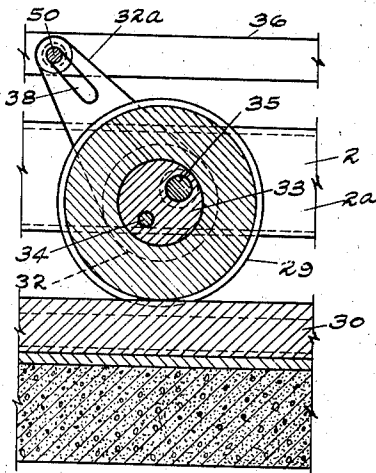


FIG. 4

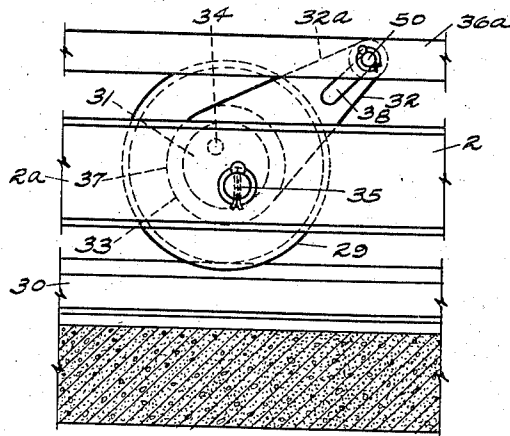


FIG. 5

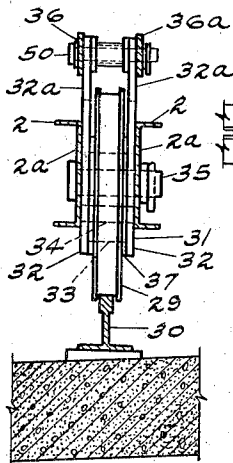


FIG. 6

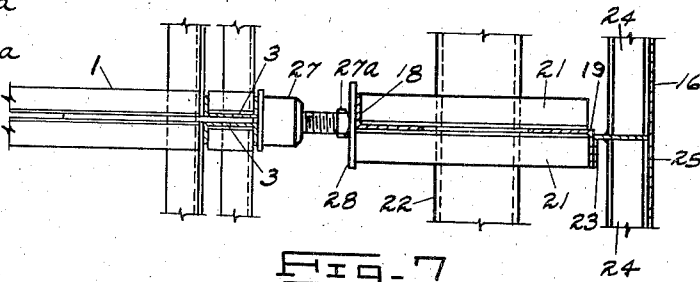


FIG. 7

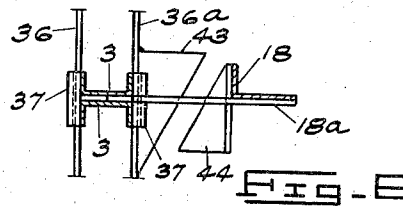


FIG. 8

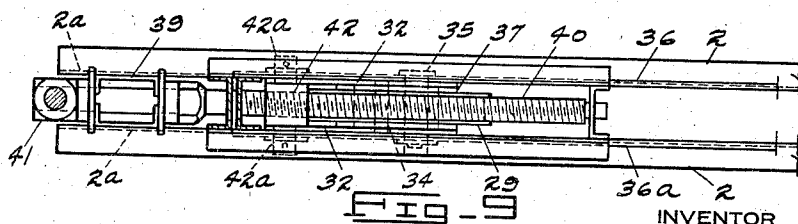


FIG. 9

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CONCRETE FORM

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Application October 18, 1935, Serial No. 45,603

19 Claims. (Cl. 25—131.6)

This invention pertains to steel forms for moulding concrete culverts such as tunnels, sewers and the like with specific reference to the collapsible type of form which may be readily collapsed and expanded in order to expedite the movement of the form from one location to another. Moreover, the form of the present invention is disclosed by the accompanying drawings for use in constructing arched culverts but it will be understood that the novel features embodied in the present invention may be used in constructing a culvert of any cross-sectional contour. The arched type of form is shown by the accompanying drawings merely as a means of exemplification.

One of the objects of the present invention is the provision of means whereby the top and side walls of the form, as well as the carrier, may be moved in a vertical direction with respect to the supporting wheels in order to collapse the form from a completed concrete section or expanded in alignment with the proposed culvert to be formed.

Another object of the invention is the provision of means whereby the side walls of the form may be moved outwardly of the carrier during the expanding movement of the form.

Another object of the invention is the provision of cantilevered side walls.

It may so develop that the rails, employed to guide the form along the proposed line of construction, are not in horizontal alignment and it is therefore a further object of the invention to utilize the collapsing and expanding mechanism to provide a lateral adjustment to the form.

A still further object of the invention is the provision in the side walls of the form to compensate for the hydrostatic forces exerted upon the side walls by the plastic concrete thereby providing an even surface between the precast concrete invert and the concrete side walls of the culvert.

These and other objects will become apparent to those skilled in the art by referring to the accompanying drawings which form a part of the present specification, in which:

Figure 1 shows a vertical, cross-sectional view taken through a steel form, in expanded position before the top portion of the culvert has been cast, embodying the preferred form of the improvements of the present invention.

Figure 2 discloses a view similar to that shown by Figure 1 excepting that the top portion of the culvert has been cast and the steel form is shown

in collapsed position ready to be moved to an advanced location.

Figure 3 shows a longitudinal view taken along the lines 3—3 of Figure 1.

Figure 4, an enlarged sectional view taken along the lines 4—4 of Figure 1, shows a portion of the collapsing and expanding mechanism when the form is in expanded position.

Figure 5, an enlarged view taken along the lines 5—5 of Figure 2, shows a portion of the collapsing and expanding mechanism when the form is in collapsed position.

Figure 6 shows an enlarged view taken along the lines 6—6 of Figure 3.

Figure 7, an enlarged view taken along the lines 7—7 of Figure 1, shows the preferred means of retaining the side walls in expanded position.

Figure 8, an enlarged view taken along the lines 8—8 of Figure 1, shows the method employed for imparting the initial outward horizontal movement to the side walls during the expanding of the steel form as well as allowing the final inward horizontal movement of the side walls during the collapse of the form.

Figure 9, an enlarged view taken along the lines 9—9 of Figure 3, shows the preferred mechanism employed to control the collapsing and expanding movement of the form.

Referring now in detail to the drawings wherein like reference characters indicate like parts the carrier, comprising the supporting structure for the form and generally designated as 1, has a plurality of spaced sill members 2 extending longitudinally of the carrier substantially the entire length thereof. Spaced vertically disposed side posts 3, extending between and secured to the sill members 2, are connected together adjacent their upper portion by means of the transverse cross bars 4. Angles 5 secured to the vertical posts 3, intermediate the height thereof, assists in maintaining the posts 3 in spaced alignment. Braces 6, reinforcing the carrier against lateral stresses, are connected to the angles 5 adjacent the medial line of the form and diverge upwardly to be connected to the gusset plates 7. The plates 7 which are secured to the carrier adjacent the extremities of the cross bars 4 and posts 3 have a portion 7a projecting outwardly from the carrier 1 beyond the posts 3 and above the plane of the cross bars 4. Angular braces 8 and struts 9 are employed to connect the posts 3 together and thereby reinforce the carrier 1 against longitudinal stresses.

The top wall 10 of the form, preferably comprising an integral part of the carrier 1, extends

across the top of the carrier and includes a plurality of arcuate top beams 11 spaced longitudinally of the carrier 1 and overlying, in spaced relation, the cross bars 4. The top beams 11 attached to the portion 7a of the gusset plates 7 are connected to the cross bars 4 adjacent the vertical medial line of the form by means of the spacers 12. Channel shaped ribs 14 extend between and are secured to the arcuate angular members 13 which are supported by the top beams 11. Completing the top wall of the form is a lagging plate 15 overlying and secured to the ribs 14.

Spaced outwardly of the side posts 3 of the carrier 1 are arcuate side walls 16 suspended from adjacent the top portion of the carrier and providing a continuation of the top wall 10. The side walls are pivotally attached, inwardly of their vertical neutral axis, to the portion 7a of the gusset plate 7 by means of the pins 17 thereby providing a tendency for the side wall to move inwardly toward the carrier 1. The side walls include a plurality of longitudinally spaced trusses having an offset inner chord member 18 and an arcuate outer chord member 19 secured together at their extremities by the gusset plates 20. Diagonal bracing 21 is employed to retain the inner chord members 18 and the outer chord members 19 in spaced relation. Extending longitudinally of the side walls and located between the inner and outer chord members are whaling channels 22 connecting the trusses together intermediate their vertical ends. Attached to the outer chord members 19 are arcuate angular members 23 having longitudinally disposed ribs 24 and 24a extending therebetween and secured thereto. Lagging plates 25, overlying and attached to the ribs 24 and 24a, are in arcuate alignment with the lagging plate 15 of the top wall 10 and have a portion 25a extending beyond the ribs 24a. Spaced inwardly of the portion 25a of the lagging plates 25 are liners 26 extending longitudinally of the side walls and connecting the lower portion of the trusses together.

When the side walls have been moved outwardly of the carrier to the fully expanded position it will be observed, by referring to Figure 1 of the drawings, that the portion 25a of the lagging plates 25 has been forced inwardly of the side walls toward the liners 26. This stress is placed in the portion 25a of the lagging plates in order that when the hydrostatic forces created by the plastic concrete tends to force the side walls inwardly the portion 25a will, due to the short leverage between the end of the portion 25a and the adjacent rib 24a, remain against the precast invert. By thus compensating for the hydrostatic forces exerted upon the side walls of the form the joint between the precast invert and the newly cast concrete side walls will result in a smooth surface.

Plates 18a, secured to the inner chord members 18 and extending outwardly of the side walls 16 to a position between the side posts 3 of the carrier 1, acts as guides to the lower portion of the side walls during the collapsing and expanding movement of the form.

The side walls are moved to their final expanded position and retained fully expanded by a plurality of compressive members, preferably screw jacks, 27 which are secured to the outer surface of the posts 3 intermediate the height thereof and extending outwardly of the carrier 1. The screw jacks 27 have a portion 27a adapted to engage the buffing plates 28 secured to the

inner chord members 18 of the side wall trusses. It will be noted that the side walls form a cantilever due to the supporting pivotal connection between the side walls and the carrier adjacent the top portion thereof and the jacks 27 located intermediate the vertical height of the side walls.

The carrier is transported from one location to another by means of the wheels 29 adapted to travel upon the rails 30. The wheels 29 are rotatably mounted on eccentric axles generally designated as 31. It will be observed from the following description that the form comprising a carrier 1, top wall 10 and spaced side walls 16 is collapsed and expanded solely by means of the vertical movement of the supporting wheels and associate members. The wheels 29 are spaced at convenient intervals longitudinally of the carrier between the sill members 2. The eccentric axles 31 comprise spaced levers 32, cams 33, pins 34 and bearing rods 35. The cams 33 are of sufficient diameter to fit the bore of the wheels 29 and preferably of a length equal to the thickness of the hubs 37 of the wheels. The spaced levers 32, positioned between the sill members 2 and the opposite sides of the wheels 29, have a portion 32a projecting above the top plane of the sill members the purpose of which will be hereinafter explained. The pins 34 located at a position spaced from the center of the cams 33 extends through the cams and spaced levers 32 and are retained in position by the webs 2a of the sill members 2. Bearing rods 35, located on the opposite side of the center line of the cams 33 from the pins 34, extend through the webs 2a of the spaced sill members 2, spaced levers 32 and cams 33 providing a pivotal connection between the wheels 29 and the carrier 1. It will be noted from the preceding description that the wheels 29 are adapted to rotate on the cams 33 while the form is supported by the wheels and the bearing rods 35 through the medium of the spaced levers 32.

Extending longitudinally on each side of the carrier and positioned above the sill members 2 are spaced operating bars 36 and 36a which control the collapsing and expanding movement of the form. The operating bars are slidably connected to the opposite sides of the vertical posts 3 by means of the guide clips 37. Secured to and spaced at intervals longitudinally of the operating bars 36 and 36a are bolts 50 extending beyond the sides of the bars and engaging the slots 38 of the levers 32. Due to the weight of the carrier 1, top wall 10 and spaced side walls 16 being transmitted to the wheels 29 through the spaced levers 32 a tensional force will be created within the bars 36 and 36a.

Supports 39, extending above the sill members 2 adjacent the one end thereof, are secured to the webs 2a of the sills and provide a journal for the longitudinally disposed screws 40. Attached to one end of the screw 40, in juxtaposition to the supports 39, are ratchet jacks 41 adapted to impart a rotatory motion to the screws 40. The nuts 42, located on the opposite side of the support from the ratchet jack, are provided with oppositely disposed projections 42a engaging the slot 38 in the adjacent levers 32 and the spaced operating bars 36 and 36a.

Secured to the outer surface of the operating bars 36a are a plurality of wedges 43 positioned to engage the wedges 44 which are attached to the outer surface of the inner chords 18 of the side walls thereby providing the initial outward horizontal movement of the side walls during the

expanding movement of the form. The wedges 43 and 44 will also permit the final inward horizontal movement of the side walls during the collapse of the form.

5 The operation of the form is as follows: Assuming the form is in collapsed position and advanced to a new location and it is desired to expand the form in order to cast a section of the culvert. By manipulating the ratchet jacks
10 41 a rotatory motion will be imparted to the screws 40 thereby providing a horizontal movement, in a direction toward the supports 39, to the nuts 42 and operating bars 36 and 36a. The horizontal movement of the operating bars will
15 move the wedges 43 beneath the wedges 44 and thus imparting the initial outward movement of the side walls about the pins 17. The horizontal movement of the operating bars will also create a rotatory motion, in a counter-clockwise direc-
20 tion, to the spaced levers 32 about the bearing rods 35 and consequently a vertical motion to the wheels 29 in respect to the carrier. The vertical movement of the wheels 29 will force the carrier
25 1, together with the attached top wall 10 and spaced side walls 16, to move upwardly. If it is found that the form is not in alignment with the precast section of the culvert it may be shifted laterally by the manipulation of either of the ratchet jacks 41.

30 When the top wall of the form has been positioned in alignment with the proposed line of construction the compression members or screw jacks 27 are rotated thereby forcing the side walls outwardly away from the carrier. This
35 additional movement of the side walls will space the wedges 44 away from the wedges 43.

After the concrete has been poured and set sufficiently to become self sustaining a reversal of the above enumerated steps will place the
40 form in collapsed position.

It will of course be understood by those skilled in the art that two of the present forms may be connected together and operated by the one set of ratchet jacks and further, that a number of
45 changes may be made to the construction as disclosed by the accompanying drawings without departing from the scope of the appended claims.

Having thus described the invention what I claim as new and desire to secure by Letters
50 Patent is:

1. In a concrete form, in combination, side walls, framing members comprising a portion of the side walls, a lagging plate secured to said framing members, and a liner member extending
55 longitudinally of the side walls adjacent the lower portion thereof; said liner member being spaced inwardly of the lagging plate thereby allowing the lower edge of the lagging plate to spring inwardly when forced into contact with an invert
60 so as to compensate for hydrostatic pressure due to the filling of the form which will tend to move the lagging plate inwardly of the invert.

2. In a concrete form, in combination, a carrier, top and side walls secured to the carrier,
65 spaced levers pivotally connected to said carrier having wheels eccentrically journaled therebetween, and means slidably mounted on the carrier and connected to the spaced levers.

3. In a concrete form, in combination, a carrier, top and side walls secured to the carrier,
70 wheels mounted on eccentric axles, and bars slidably associated with said carrier and pivotally associated with said axles for selectively raising and lowering the form.

75 4. In a concrete form, in combination, a car-

rier, top and side walls secured to the carrier, wheels mounted on eccentric axles secured to the carrier, and means slidably connected to the carrier and pivotally connected to said axles for
5 expanding and collapsing the form.

5. In a concrete form, in combination, a carrier, top and side walls secured to the carrier, wheels mounted on eccentric axles secured to the carrier, and longitudinally extending bars slidably
10 connected to the axles and carrier adapted to selectively expand and collapse the form.

6. In a concrete form, in combination, a carrier, top and side walls secured to the carrier, wheels mounted beneath the carrier, bars connected to the wheels adapted to raise and lower
15 the form, wedges on said side walls, said bars having wedges adapted to engage the wedges on the side walls for providing a horizontal movement to the side walls.

7. In a concrete form, in combination, a carrier, top and side walls pivotally secured to the carrier adjacent the top portion thereof, wheels
20 mounted beneath the carrier, means extending longitudinally of the carrier connected to the wheels and adapted to selectively expand and collapse the form; said means providing a horizontal
25 movement to the side walls.

8. In a concrete form, in combination, a carrier, top and side walls secured to the carrier, spaced sill members extending longitudinally of
30 the carrier axles extending between said sills, wheels mounted on said axles, levers pivotally connected to the sills and secured to the axles, and a bar extending longitudinally of the carrier connected to the levers; said bar adapted to
35 impart a rotary motion to the levers thereby raising and lowering the form.

9. In a concrete form, in combination, a carrier, top and side walls pivotally secured to the carrier, spaced sill members extending longitudi-
40 nally of the carrier, axles extending between said sills and pivotally connected thereto, wheels rotatably mounted on said axles, spaced levers pivotally connected to the sills and secured to said axles, and a bar extending longitudinally of
45 the carrier connected to the levers in a plane above the wheels; said bar being slidably mounted on the carrier and adapted to impart a rotary motion to the levers thereby raising and lowering
50 the form.

10. In a concrete form, in combination, a carrier, top and side walls secured to the carrier, spaced sill members extending longitudinally of
55 the carrier, wheels interposed between said sills, levers pivotally connected to the sills and connected to the wheels, and a bar extending longitudinally of the carrier slidably connected to said levers adjacent the upper portion thereof; said
60 bar adapted to impart a rotary motion to the levers thereby raising and lowering the form.

11. In a concrete form, in combination, a carrier having spaced sill members and vertically disposed posts secured to said sill members, a top wall overlying and connected to said posts,
65 spaced side walls pivotally secured to said carrier adjacent the top portion of the posts, wheels journaled on eccentric axles between said sill members, and longitudinally extending bars connected to said axles for raising and lowering the
70 form; said bars adapted to impart a substantially horizontal motion to said spaced side walls.

12. In a concrete form, comprising a carrier, a top wall and spaced side walls, a plurality of wheels mounted on eccentric axles for support-
75 ing said form, and means connected to said axles

for raising and lowering the form; wedges on said side walls adapted to be engaged by complementary wedges on said means for imparting movement to said side walls transversely of said form.

13. In a concrete form, in combination, a carrier having spaced sill members and vertically disposed posts secured to said sill members, a top wall secured to the carrier adjacent the top portions of the posts, spaced side walls pivotally secured to the carrier adjacent the horizontal extremities of the top wall, wheels journaled on eccentric axles interposed between said sills, levers secured to said axles interposed between the wheels and sills, and longitudinally extending bars pivotally connected to said levers.

14. In a concrete form, in combination, a carrier, a top wall secured to and overlying the carrier in spaced relation thereto, spaced side walls pivotally secured to the carrier, and jacks secured to the carrier intermediate the height thereof adapted to engage the side walls in abutting relation to retain said side walls in expanded position; said side walls comprising a lagging plate and a liner spaced inwardly therefrom adjacent an edge portion thereof, thereby allowing the said lagging plate to be urged inwardly of the form toward said liner when forced into contact with an associated element so as to compensate for hydrostatic pressures due to the filling of the form.

15. In a concrete form, in combination, a carrier, side walls secured to said carrier, framing members comprising a portion of the side walls, a lagging plate secured to said framing members outwardly thereof, a liner secured to said framing members adjacent the lower portion thereof being spaced inwardly of said lagging plate to compensate for the hydrostatic forces exerted upon the side walls, and means extending outwardly of the carrier engaging the side walls for retaining the side walls in expanded position.

16. In a concrete form, in combination, a carrier, spaced side walls supported by said carrier, means on said carrier adapted to slidably engage said side walls to move said side walls toward

expanded position, and additional means on the carrier for moving said side walls away from said first-named means and retaining the side walls in fully expanded position; said side walls comprising a lagging plate and a liner spaced inwardly therefrom adjacent an edge portion thereof, thereby allowing the said lagging plate to be forced inwardly of the form toward said liner when urged into contact with an associated element so as to compensate for hydrostatic pressures due to the filling of the form.

17. In a concrete form, in combination, a carrier, a top wall secured to and overlying the carrier in spaced relation thereto, trussed side walls pivotally secured to the carrier adjacent the top portion thereof, and means rigidly secured to the carrier adapted to engage the side walls intermediate the height thereof and in abutting relation thereto, said means acting as the sole means for retaining the said side walls in expanded position; said side walls comprising a lagging plate and a liner spaced inwardly therefrom adjacent an edge portion thereof, thereby allowing the said lagging plate to be forced inwardly of the form toward said liner when urged into contact with an associated element so as to compensate for hydrostatic pressures due to the filling of the form.

18. In combination, a concrete form comprising a carrier, wheels mounted on eccentric means secured to the carrier adjacent the lower portion thereof, and additional means slidably connected to said eccentric means and carrier for raising and lowering the form.

19. In a concrete form, in combination, a side wall having a lagging plate, a member associated with said side wall adjacent an edge of said lagging plate, said member being spaced inwardly of said lagging plate, thereby allowing the said edge of the lagging plate to be urged inwardly of the form toward said member when forced into intimate contact with an associated element so as to compensate for hydrostatic pressures due to the filling of the form which will tend to move the lagging plate inwardly of the element.

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