

C. A. BESSER.
 COLLAPSIBLE FORM FOR BUILDING CULVERTS.
 APPLICATION FILED DEC. 4, 1908.

Patented Mar. 22, 1910.

2 SHEETS—SHEET 1.

952,869.

Fig. 1

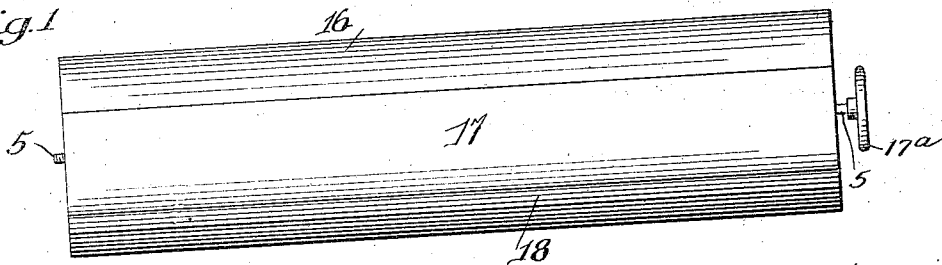


Fig. 2

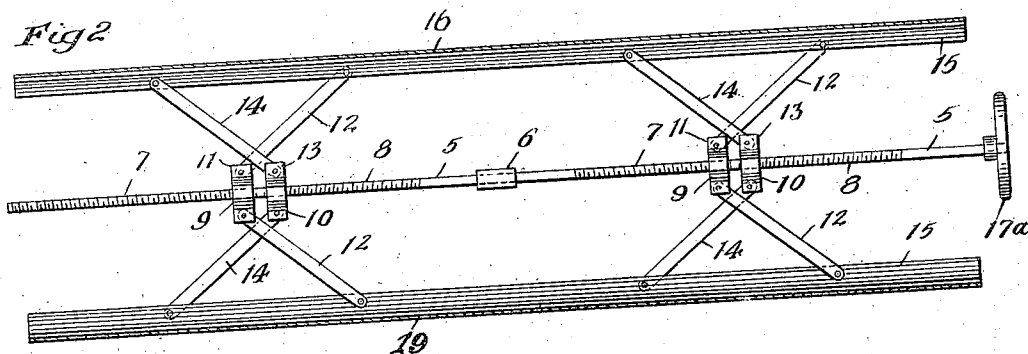


Fig. 3

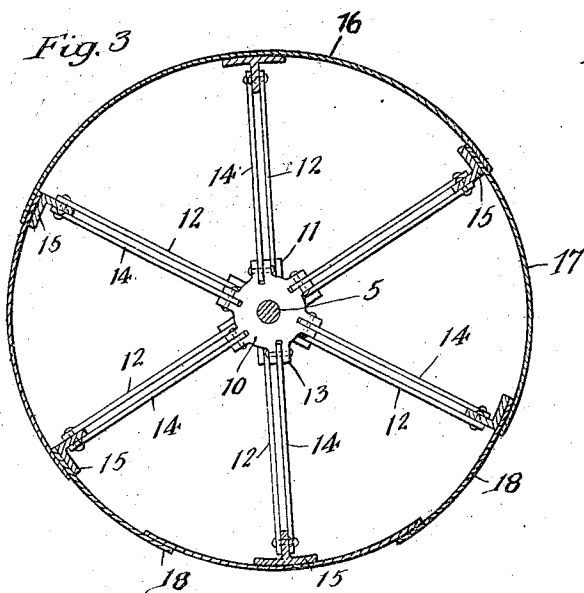
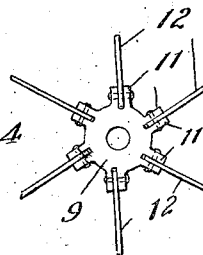


Fig. 4



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Fig. 5.

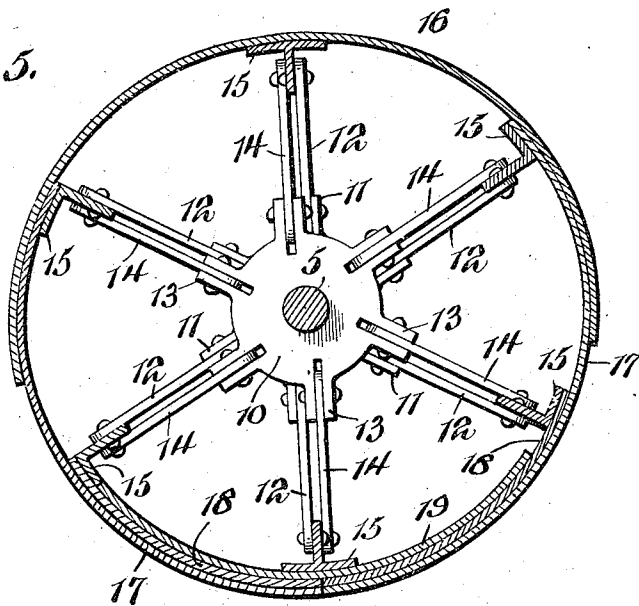
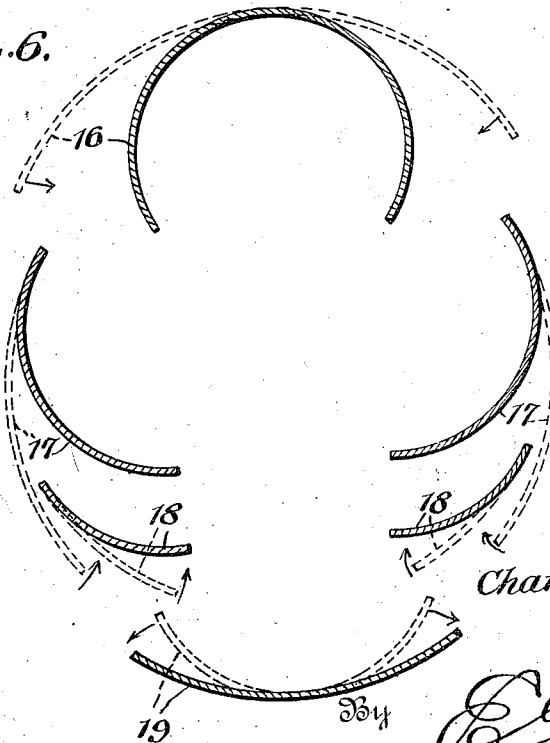


Fig. 6.



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UNITED STATES PATENT OFFICE.

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COLLAPSIBLE FORM FOR BUILDING CULVERTS.

952,869.

Specification of Letters Patent. Patented Mar. 22, 1910.

Application filed December 4, 1908. Serial No. 436,038.

To all whom it may concern:

Be it known that I, CHARLES A. BESSER, a citizen of the United States, residing in Mount Pleasant, in the county of Henry and State of Iowa, have invented a new and useful Improvement in Collapsible Forms for Building Culverts, of which the following is a specification.

This invention relates to a collapsible form or core designed more especially for use in constructing concrete or other culverts, sewers, drains and the like, the concrete being applied to the outside of the form in any approved manner, and the form removed after the concrete has sufficiently set.

The invention has for one of its objects to provide a form which can be adjusted for constructing culverts of different sizes, so that one form will answer the purpose of a number of forms of the various types with which I am acquainted, this result being obtained by the employment of a plurality of curved sheet metal plates so assembled and connected with operating means that the form will preserve its cylindrical shape throughout its range of adjustment from its maximum to its minimum diameter.

A further object of the invention is the employment of a novel arrangement of screw-actuated collars and links connected therewith and with the plates of the cylindrical form, whereby the plates are drawn inwardly or outwardly without having longitudinal movement, and, at the same time, the plates slide freely one over another while preserving the circular shape of the form.

With these objects in view and others, as will appear as the description proceeds, the invention comprises the various novel features of construction and arrangement of parts which will be more fully described hereinafter and set forth with particularity in the claims appended hereto.

In the accompanying drawings, which illustrate one embodiment of the invention, Figure 1 is a side view of the form fully expanded. Fig. 2 is a longitudinal section drawn on an enlarged scale. Fig. 3 is a transverse section, showing the form fully expanded and drawn on a further increased scale. Fig. 4 is a detail view of one of the screw-actuated collars. Fig. 5 is a transverse section of the form fully contracted

and drawn on a larger scale than Fig. 3. Fig. 6 is a diagrammatic view, showing the various plates of the form in their normal shape by full lines, and by dotted lines when placed under tension, the plates being drawn substantially on the scale shown in Fig. 3.

Similar reference characters are employed to designate corresponding parts throughout the views.

In the present instance, I have elected to illustrate the form of the six plate type, which has been found, in practice, satisfactory for constructing culverts varying from two to four feet in diameter, but it is to be understood that the number of plates and their size can be changed according to the diameter of the culvert to be built.

Referring to the drawings, 5 designates an operating shaft for contracting or expanding the form, the same being composed of parts connected together by a sleeve or other coupling 6, and each part has a right and left thread 7 and 8, respectively. Engaging these threads are collars 9 and 10, which are adapted to move toward or away from each other by the rotation of the shaft 5. The collar 9 is formed with outwardly-extending slotted lugs 11 for receiving the inner ends of a set of links 12 that are pivotally connected with the lugs and have their outer ends connected with the parts of the cylindrical form or shell. The collar 10 is also provided with outwardly-extending peripheral slotted lugs 13 for receiving the inner ends of a second set of links 14. As shown in Fig. 4, the lugs are offset from a radial line, and, as shown in Fig. 3, the lugs of the collar 9 are slightly staggered with respect to the lugs of the collar 10, so that the set of links 12 can overlap or extend across corresponding links of the set 14. The outer ends of both sets of links are connected with internal longitudinally-extending ribs formed by tee or angle bars 15 secured to the various parts of the cylindrical form. By this arrangement, the turning of the shaft 5 causes the parts of the form to move inwardly or outwardly by the collars 9 and 10 traveling toward or away from each other and thereby actuating the two sets of links.

The cylinder or shell of the form is composed of a plurality of arcuate sheet metal plates so nested together that the circular shape of the form is maintained throughout the range of adjustment of the form. In

the present instance, the shell consists of a top plate 16, a pair of opposed upper side plates 17, a pair of opposed lower side plates 18, and a bottom plate 19. The top and bottom plates 16 and 19 have their angle bars 15 fastened thereto in a median line, while the angle bars of the side plates are connected to the upper edges of the latter. By this arrangement, both longitudinal edges of the top and bottom plates, and the lower edges of the side plates, are free to move inwardly and outwardly between the full and dotted line positions shown in Fig. 6 during the expanding and contracting of the form. All the plates, except the bottom plate 19, have a normal curvature equal to or less than the minimum diameter of the form, while the bottom plate has a normal curvature equal to or greater than the maximum diameter of the form. The free edges of the top plate 16 overlap and bear against the outer faces of the plates 17, the free edges of the plates 17 overlap and bear on the outer faces of the plates 18, and the free edges of the plates 18 overlap and bear on the outer face of the plate 19. It will thus be seen that the lap joints are so disposed that water cannot enter the form but is shed away from the joints. When the form is fully expanded, as shown in Fig. 3, the radial arms or links 12 and 14 connected with the plates 17 and 18, withstand the inward tension of the plates 16 and 17, while the inward tension of the plates 18 is opposed by the outward tension of the plate 19.

When the form is contracted to its minimum diameter, its circumference is composed of the plates 16 and the two plates 17, the plates 18 and 19 being nested within the cylinder, as shown in Fig. 5. The plates correspond in this figure to the full line position of the plates shown in Fig. 6, with the exception of the bottom plate 19, which is in its dotted line position. During the contraction of the cylinder, the plates 18 slide over the plate 19 and meet at the center of the latter, and the plates 17 slide over the plates 18 and come together opposite the meeting edges of the last-mentioned plates, while the plate 16 slides over and partially covers the plates 17. When the screw shaft is turned in the opposite direction to expand the cylinder, the plates slide in the reverse order to uncover the plates until the maximum diameter shown in Fig. 3, is reached. The shaft 5, which is manipulated by a hand wheel 17^a at one end of the form, is disposed at approximately the axis about which the several plates are struck as a center, and the links or arms 12 and 14 are arranged in pairs sixty degrees apart, and one pair for each plate. Each pair of links 12 and 14, connected with the same reinforcing rib or bar 15, are pivoted at opposite sides of the inwardly or radially

disposed flange or the rib, so that the two links can move across each other without contact.

In practice, the form is set up in the position where the culvert is to be built and the screw shaft turned to produce the proper diameter for the form. The concrete or other plastic material is then applied around the form and allowed to set for a sufficient time, when the form is loosened and removed. In order to loosen the form, it is merely necessary to turn the screw in a direction to draw the plates inwardly for reducing the diameter to permit of the ready withdrawal of the form longitudinally. In manipulating the screw, the plates of the form cannot move longitudinally by reason of the crossed relation of the links 12 and 14.

From the foregoing description, taken in connection with the accompanying drawings, the advantages of the construction and of the method of operation will be readily apparent to those skilled in the art to which the invention appertains, and while I have described the principle of operation of the invention, together with the device which I now consider to be the best embodiment thereof, I desire to have it understood that the device shown is merely illustrative, and that such changes may be made when desired as are within the scope of the claims appended hereto.

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

1. A collapsible form including a plurality of arcuate plates changeable in curvature to vary the diameter of the form, one plate having a curvature approximating the maximum diameter of the form, and another plate approximating the minimum diameter thereof.

2. A cylindrical expansible and contractible form composed of a plurality of arcuate sections, one of the sections having a normal curvature approximating the maximum diameter of the form and another section a normal curvature approximating the minimum diameter of the form.

3. A contractible and expansible cylindrical form composed of sheet metal curved plates arranged in overlapping relation and slidable one on another, certain of the plates having a curvature equal to the minimum diameter of the form and another plate having a curvature equal to the maximum diameter of the form.

4. An expansible and contractible form composed of a plurality of curved resilient sections arranged to slide one over another, some of the sections tending at all times to assume a curvature approximating the minimum diameter of the form, and mechanism for moving the sections inwardly or outwardly in a radial direction and simulta-

neously sliding the plates on each other to change the diameter of the form.

5. A contractible and expansible form composed of a plurality of sections slidable one over another and all contributing to constitute the form when the latter is fully expanded and certain of the sections entirely covering other sections when the form is completely contracted, some of the sections having a normal curvature approximating the minimum diameter of the form, with a mechanism connected with the several sections for expanding and contracting the form.

6. A contractible and expansible cylindrical form composed of a plurality of sections slidable one over another and all contributing to constitute the form when the latter is fully expanded and certain of the sections entirely covering other sections when the form is completely contracted, with a mechanism connected with the several sections for expanding and contracting the form, certain of the sections having a normal curvature equal to the minimum diameter of the form and another section having a curvature equal to the maximum diameter of the form.

7. A hollow expansible and contractible form composed of flexible sheet metal sections disposed parallel and each slidable on the adjacent sections and changeable in curvature during the sliding movement, and radially-disposed links, some of which are connected with the middle portions of certain of the sections and the others connected adjacent one of the longitudinal edges of the remaining sections, and means for shifting the links to slide the sections on each other for contracting and expanding the form.

8. A hollow contractible and expansible form consisting of a plurality of arcuate plates overlapping and slidable one on another, links connected with the middle portions of two diametrically-disposed plates, links connected with one edge of each of the remaining plates, and means for actuating the links for contracting and expanding the form; all the plates except one of the said diametrically-disposed plates having a normal curvature approximating the minimum diameter of the form and the other plate having a normal curvature approximating the maximum diameter of the form.

9. A form of the character described comprising a top plate, upper side plates having their upper marginal portions disposed under the marginal portions of the top plate, lower side plates having their upper marginal portions disposed under the lower marginal portions of the upper side plates, and a bottom plate having its marginal portions disposed under the lower marginal portions of the lower side plates, the top and side

plates having a normal curvature equal to the minimum diameter of the form, and the bottom plate having a normal curvature equal to the maximum diameter of the form, in combination with a mechanism for expanding and contracting the form, said mechanism including links connected with the middle portions of the top and bottom plates and upper marginal portions of the side plates.

10. A form of the character described comprising a top plate, upper side plates having their upper marginal portions disposed under the marginal portions of the top plate, lower side plates having their upper marginal portions disposed under the lower marginal portions of the upper side plates, and a bottom plate having its marginal portions disposed under the lower marginal portions of the lower side plates, the top and side plates having a normal curvature equal to the minimum diameter of the form, and the bottom plate having a normal curvature equal to the maximum diameter of the form, and stiffening bars secured to the middle portions of the top and bottom plates and upper marginal portions of the side plates, in combination with a mechanism for expanding and contracting the form, said mechanism including a plurality of radially-disposed links connected with the said bars, and means for actuating the links.

11. In a collapsible form, the combination of a plurality of overlapping slidable plates of different transverse dimensions and some of the plates having a normal curvature less than the maximum diameter of the form, sets of oppositely-inclined and crossed links connected with the plates, aligned collars to which the sets are independently connected, and an operating screw having right and left threads engaging the collars respectively.

12. In a collapsible form, the combination of a plurality of resilient arcuate plates arranged in overlapping relation and slidable one on another, certain of the plates being tensioned to spring inwardly when the form is expanded, separate sets of links arranged within the form and reversely inclined, corresponding links of both sets being disposed parallel with each other and connected with the same plate of the form and also crossing each other, a collar to which each set of links are connected, and a screw having right and left threads engaging the respective collars.

13. In a collapsible form, the combination of a plurality of resilient arcuate plates arranged in overlapping relation and slidable one on another to change in curvature as the form expands and contracts, with a mechanism for expanding and contracting the form, said mechanism comprising two sets of links reversely inclined to the axis of the

form and corresponding links of both sets being parallel and disposed one across the other, pivotal connections between the outer ends of the links and plates, alined collars, 5 pivotal connections between the links and collars, and a screw having right and left threads engaging the respective collars, there being as many pairs of links as there are plates.

10 14. A collapsible form comprising an arcuate top plate, a pair of arcuate upper side plates of less width than the top plate and extending under the latter, opposite lower 15 side plates of less width than the upper side plates and extending under the latter, a bottom arcuate plate of greater width than the

lower side plates, reinforcing members extending longitudinally of the plates at the middle portions of the top and bottom plates and upper edges of the side plates, the lower 20 edges of the top and side plates tending to spring inwardly and the edges of the bottom plates tending to spring outwardly, in combination with means for expanding and contracting the form, said means including 25 elements connected with the said members, and an actuator connected with the elements.

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Witnesses:

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