G. A. COMPTON.

COLLAPSIBLE ARCH FORM.

APPLICATION FILED SEPT. 30, 1916.

1,211,291.

Patented Jan. 2, 1917.

3 SHEETS—SHEET 1.

Fig. 1

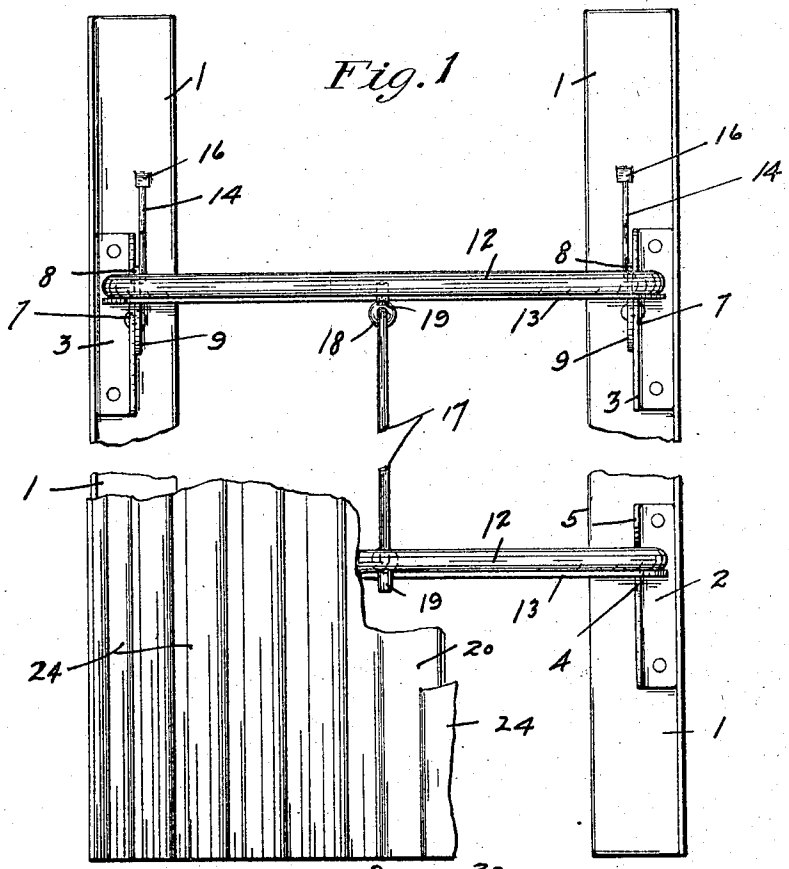
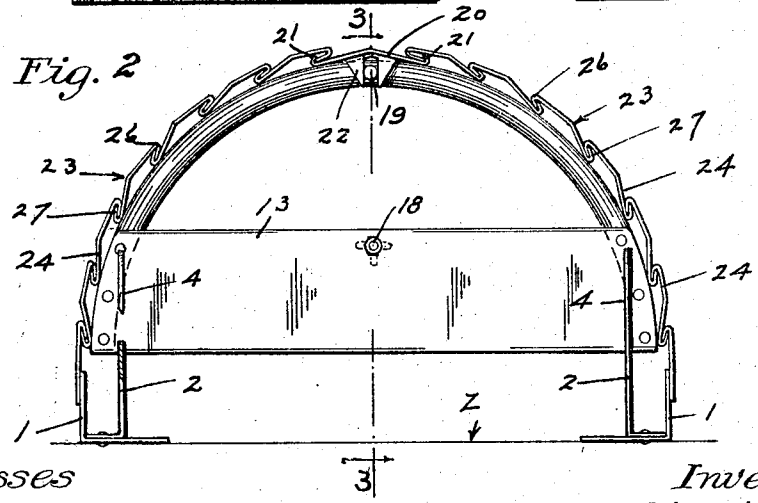


Fig. 2



Witnesses

Y. F. Williamson

E. C. Wells

Inventor

Glenn A. Compton

By his Attorneys

Williamson Merchant

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

G. A. COMPTON.

COLLAPSIBLE ARCH FORM.

APPLICATION FILED SEPT. 30, 1916.

1,211,291.

Patented Jan. 2, 1917.

3 SHEETS—SHEET 2.

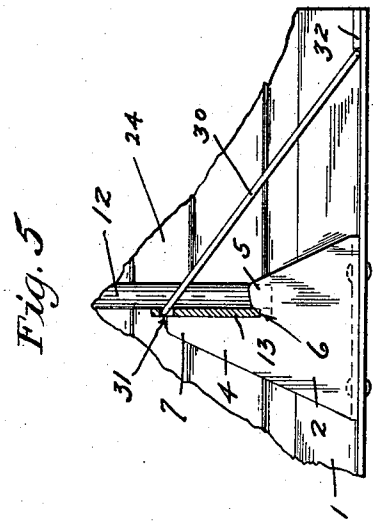


Fig. 5

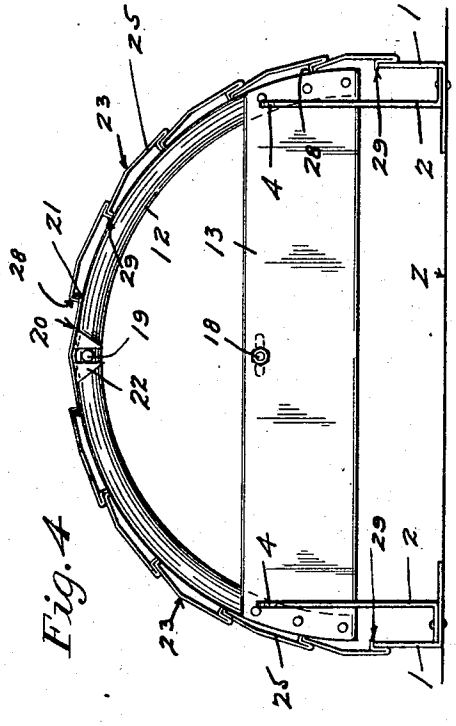


Fig. 4

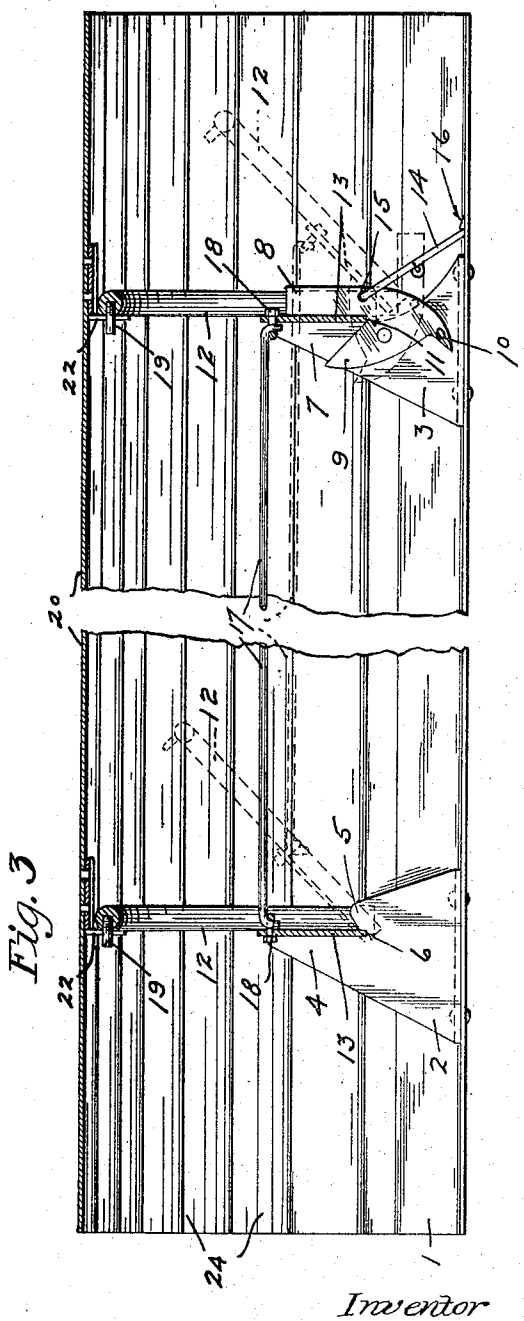


Fig. 3

Witnesses
G. F. Williamson
E. C. Wells

Inventor
Glenn A. Compton
By his Attorneys
Williamson & Merchant

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

G. A. COMPTON.

COLLAPSIBLE ARCH FORM.

APPLICATION FILED SEPT. 30, 1916.

1,211,291. Patented Jan. 2, 1917.

3 SHEETS—SHEET 3.

Fig. 6



Fig. 7

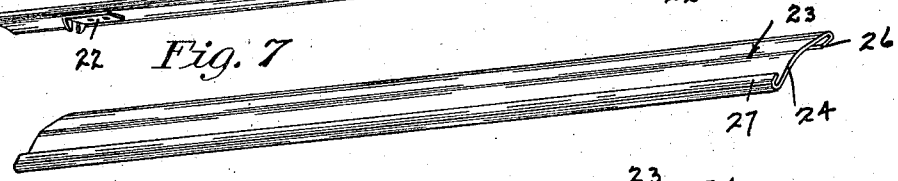


Fig. 8

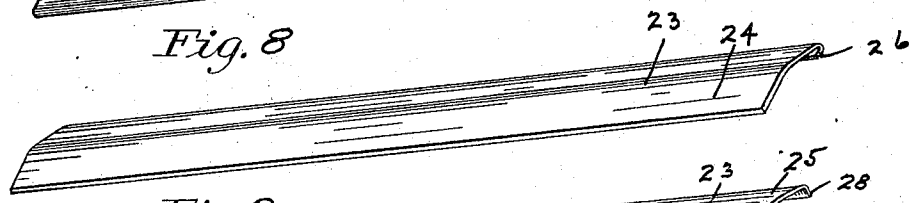


Fig. 9

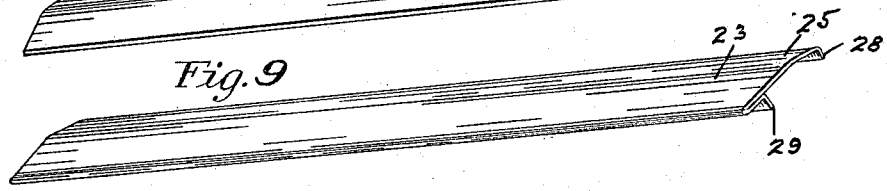


Fig. 10

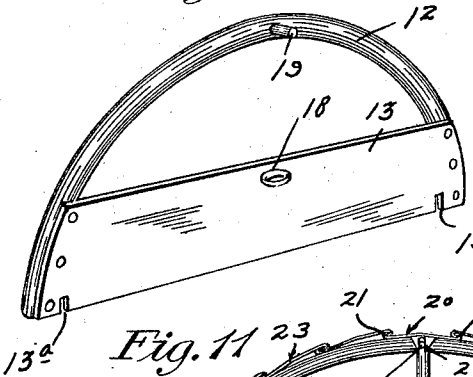


Fig. 12

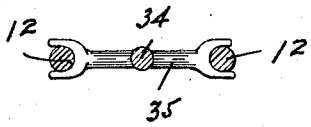
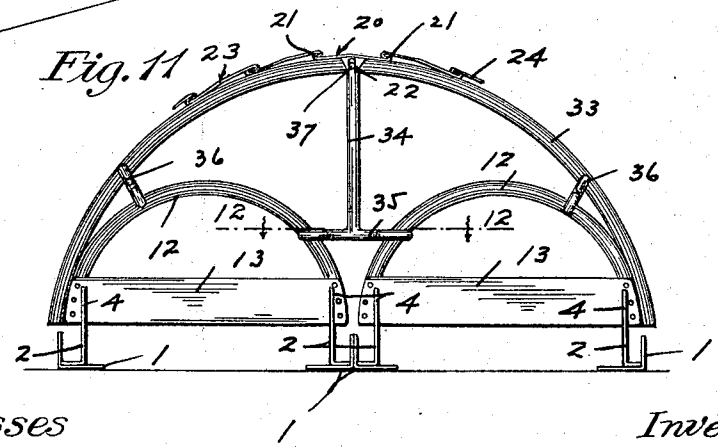


Fig. 11



Witnesses

G. F. Williamson

E. C. Wells

Inventor

Glenn A. Compton

By his Attorneys

Williamson & Merchant

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

UNITED STATES PATENT OFFICE.

GLENN A. COMPTON, OF MINNEAPOLIS, MINNESOTA.

COLLAPSIBLE ARCH-FORM.

1,211,291. Specification of Letters Patent. Patented Jan. 2, 1917.

Application filed September 30, 1916. Serial No. 123,032.

To all whom it may concern:

Be it known that I, GLENN A. COMPTON, a citizen of the United States, residing at Minneapolis, in the county of Hennepin and State of Minnesota, have invented certain new and useful Improvements in Collapsible Arch-Forms; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to improvements in collapsible arch forms, especially adapted for use in the construction of concrete bridges, culverts, conduits, and the like.

To the above end, generally stated, the invention consists of the novel devices and combinations of devices hereinafter described and defined in the claims.

In the accompanying drawings, which illustrate the invention, like characters indicate like parts throughout the several views.

Referring to the drawings, Figure 1 is a fragmentary plan view of the invention; Fig. 2 is an end elevation of the same with some parts broken away and some parts shown in section; Fig. 3 is a longitudinal central section taken on the line 3—3 of Fig. 2, with some parts broken away; Fig. 4 is a view corresponding to Fig. 2, but showing a slightly modified form of the side plates; Fig. 5 is a fragmentary detail view in section showing a modified method of securing the arch bars in upright position; Fig. 6 is a perspective view of the ridge plate; Fig. 7 is a perspective view of one of the uppermost or intermediate sections of the side plates, shown in Fig. 2; Fig. 8 is a perspective view of one of the bottom sections of the side plates, shown in Fig. 2; Fig. 9 is a perspective view of one of the sections of the side plates, shown in Fig. 4; Fig. 10 is a perspective view of one of the arch bars; Fig. 11 is a fragmentary end elevation of an arch made up of a major arch bar, a plurality of minor arch bars and a strut connecting said arch bars; and Fig. 12 is a detail view in section taken on the line 12—12 of Fig. 11.

The numeral 1 indicates a pair of laterally spaced angle arch bars, the vertical flanges of which are turned upward and the horizontal flanges of which are turned toward each other and rest upon the ground or other support Z, on which the arch of the bridge or other structure is to be constructed.

Two bearing brackets 2 and 3 are rigidly secured to the horizontal flanges of each base bar 1, near the ends thereof. On top of each bearing bracket 2, is a relatively high extension 4 and a relatively low rounded extension 5, edgewise spaced to afford therebetween a seat 6. The extensions 4 are located outward from the seats 6, with respect to the arch, and their edges adjacent to said seats are plumb. The bearing brackets 3 are also provided with extensions 7, like the extensions 4, and their plumb edges face in the same direction as the plumb edges of the extensions 4. A latch finger 8 is pivoted to each bearing bracket 3 and, when in an operative position, extends parallel to the respective bracket extension 7. Integrally formed with each latch finger 8, is an ejector finger 9 and a lug 10. These ejector fingers 9 extend at angles to the latch fingers 8 and are spaced to afford therebetween seats 11. The latch fingers 8 and lugs 10 are located at diametrically opposite points, with respect to the pivots for said latch fingers.

A pair of arch bars 12 have their respective ends connected by a relatively wide tie plate 13 set edgewise and riveted or otherwise rigidly secured to one side of the respective arch bar. The arch bars 12 are extended transversely of the base bars 1 and their tie plates 13 are mounted, the one on the seats 6 of the bearing bracket 2 and the other on the seats 11 of the bearing bracket 3. To hold the base bars 1 properly laterally spaced, the lower edges of the tie plates 13 are notched at 13^a to receive the seats 6 and 11. The outer faces of these tie plates 13 bear against the plumb edges of the extensions 4 and 7 and thereby hold the arch bars 12 in upright positions. The fingers 8, when in operative positions, engage the inner face of the tie plate 13 mounted on the seats 11 and hold the same against outward swinging movement toward the right hand end of the form, with respect to Fig. 3.

A pair of toggle braces 14 are provided for holding the latch fingers 8 in operative position. The upper ends of these braces 14 have laterally bent ends, which are inserted through perforations 15 in the latch fingers 8. The lower ends of the braces 14 bear

directly against small lugs or abutments 16 on the horizontal flanges of the base bars 1. The joints of these toggle braces 14 are so arranged that said braces may be buckled toward the adjacent end of the arch.

The arch bar 12, mounted in the seat 6, is held against swinging movement toward the other arch bar 12 by a horizontal tie rod 17, the ends of which are bent vertically downward and detachably seated in eye-bolts 18 secured to the tie plates 13 at their longitudinal centers and near their upper horizontal edges. At the crown of each arch bar 12, is a horizontal lock pin 19, which projects toward the left hand end of the form, with respect to Fig. 3.

Detachably supported on the arch bars 12, is a ridge plate 20 having its longitudinal edges turned upward and inward to afford hook-like flanges 21. On the under side of this ridge plate 20, is a pair of bifurcated lugs 22, the prongs of which straddle the lock pins 19 and hold said ridge plate against edgewise movement on the arch bars 12, but with freedom for endwise separation from the lock pins 19.

Removably supported on the arch bars 12, are side plates, each of which is made up of a plurality of slats detachably connected to the ridge plate 20 and the one to the other by flexible overlapping joints. By flexibly connecting the slats of the several side plates, the same may be used in connection with arch bars having different arcs and they will adjust themselves thereto. These slats are all bent outward to form at their transverse centers longitudinal ridges 23, which greatly strengthen the slat and prevent the same from bending, under the weight of the material from which the arch is being constructed. By thus bending the slats, the straight portions thereof, on each side of the ridges 23, extend tangentially to the arch bars 12, so that only the longitudinal edges of the slats rest on the arch bars, irrespective of the arc thereof.

The slats of each side plate shown in all of the figures, with the exception of 5 and 8, are indicated by the numeral 24, and the slats, shown in Figs. 4 and 9, are indicated by the numeral 25. Referring first to the slats 24, the same have their upper longitudinal edges bent inwardly and upon themselves to afford hook-like flanges 26 and their lower longitudinal edges bent outward and upon themselves to afford hook-like flanges 27. Adjacent flanges 26 and 27 interlock to support the slats of each side plate, one from the other, and to afford the flexible joints therebetween. The flanges 26, on the uppermost slats 23, interlock with the flanges 21 on the ridge plate 20 and afford the flexible joints therebetween. The lowermost slat 23 of each side plate has no flange 27 and overlaps the vertical flanges of the base bars 1. Referring now to the slats 25, shown in Figs. 4 and 9, the same are all alike and their upper longitudinal edges are bent laterally inward to afford flanges 28, and their lower edge portions are bent inward upon themselves and then laterally to afford flanges 29. The slats 25, unlike the slats 23, are not all hung from the ridge plate 20, but only the uppermost one of each side plate. The remaining slats 25 are supported, one upon the other from the vertical flanges of the base bars 1. By reference to Fig. 4, it will be noted that the lowermost slats 25 overlap the vertical flanges of the base bars 1 and their flanges 29 rest directly thereupon. The remaining slats 25 overlap one another at their flexible joints and their flanges 29 rest directly upon the flanges 28 of adjacent slats.

In setting up the improved collapsible arch form, the base bars 1 are first positioned and the arch bars 12 placed on the bearing brackets 2 and 3. The lock fingers 8 and tie rod 17 will hold the arch bars 12 in upright position, after the toggle braces 14 are set in position. With the arch bars 12 locked in operative positions, the ridge plate 20 is placed thereon and the two uppermost slats 23 hung, one from each longitudinal edge of said ridge plate. The remaining slats 24 are then hung, one from the other, until they overlap the vertical flanges of the base bars 1, as shown in Fig. 2. Or, in case the slats 25 are used, the lowermost two of the side plates are placed on the vertical flanges of the base bars 1 and then the one upon the other, until they overlap and engage the flanges 21 of the ridge plate 20, as shown in Fig. 4.

With the form properly set up, the arch is built thereover and the form left a sufficient length of time to permit the material from which the arch is constructed to set. The collapsible form is then removed from the constructed arch by first buckling the braces 14, which draws the lock fingers 8 out of engagement with the adjacent tie plate 13. This movement of the lock fingers 8 will carry the ejector fingers 9 into contact with the respective tie plate 13 and thereby swing the respective arch bar 12 on the seats 11 and away from the extension 7. The connecting rod 17 will impart a like swinging movement to the other arch bar 12. As the hooked ends of the connecting rod 17 extend only a short distance into the eyes 18, the same will not prevent free swinging movement of the arch bars 12. The swinging movement of the arch bars 12 withdraws the lock pins from the bifurcated lugs 22 and also allows the side plates made up of the several slats to collapse. The several parts of the form may then be removed from the arch. The buckling of the braces 14 may be accomplished by means

of a rod having a hooked end, thus making it unnecessary for the workmen to go within the arch, in order to collapse the form.

In case the buckling movements of the braces 14 do not impart sufficient movement to the ejector fingers 9 to displace the arch bars 12, the lock finger 8 may be engaged by said rod and moved the required distances.

In Fig. 5, the bearing brackets 2 are identical at both ends of the base bars 1 and, in place of the lock fingers 8, relatively long brace rods 30 are provided for holding the adjacent arch bar 12 against outward swinging movement. The upper ends of these brace rods 30 are inserted in apertures 31 formed in the adjacent tie plate 13 and their lower ends engage abutments 32 on the horizontal flanges of the base bars 1. In collapsing a form, wherein the rods 30 are used, the lower ends of said rods are first driven laterally out of contact with the abutments 32 to release said braces. In place of the brace rods 14 for holding the lock fingers 8 in operative positions, rods, not shown, may be attached to the lugs 10 and to eccentrics mounted on the base bars 1 and arranged to impart endwise movements to said rods.

In Fig. 11, is shown two complete sets of base bars 1 and arch bars 12 placed side by side for use in the construction of a relatively large arch, in comparison with an arch constructed, as shown in Figs. 2 and 4. In this construction, the arch bars 12 may be termed "minor" arch bars, which support over each end pair thereof a major arch bar 33. The intermediate portion of the arch bar 33 is supported by a strut 34 from the inner end portions of the arch bars 12. This strut 34 has, at its lower end, a transverse bar 35 with bifurcated ends, which straddle the arch bars 12 and support the strut 34 thereon. Relatively short struts 36 are interposed between the outer end portions of the arch bars 12 and the arch bars 33 and have bifurcated ends, which embrace said arch bars and hold the same thereon. The arch bars 33 are provided at their crowns with horizontal lock pins 37, with which the bifurcated lugs 22 of the ridge plates 20 interlock. The slats 23 of the side plates are supported on the arch bars 33 in the same manner as on the arch bars 12.

What I claim is:—

1. A collapsible form for use in the construction of arches comprising a pair of arch bars, and side plates supported on the arch bars and made up of a plurality of slats detachably and flexibly connected.

2. A collapsible form for use in the construction of arches comprising a pair of arch bars, and side plates supported on the arch bars and made up of a plurality of slats detachably connected by overlapping and flexible joints.

3. A collapsible form for use in the construction of arches comprising a pair of arch bars, a ridge plate supported on the arch bars, and side plates hung from the ridge plate and supported on the arch bars.

4. A collapsible form for use in the construction of arches comprising a pair of arch bars, a ridge plate supported on the arch bars, and side plates flexibly connected to the ridge plate and supported on the arch bars.

5. A collapsible form for use in the construction of arches comprising a pair of arch bars, a ridge plate supported on the arch bars, and side plates flexibly connected to the ridge plate and comprising a plurality of slats flexibly connected and supported on the arch bars.

6. A collapsible form for use in the construction of arches comprising a pair of arch bars, a ridge plate supported on the arch bars, and side plates supported on the arch bars and connected to the ridge plate by overlapping and interlocking joints, each of said side plates comprising a plurality of slats connected by interlocking and overlapping joints.

7. A collapsible form for use in the construction of arches comprising a pair of arch bars, a ridge plate supported on the arch bars and having flanges at its longitudinal edges, and side plates supported on the arch bars and having flanges at their upper longitudinal edges which detachably interlock with the flanges on the ridge plate.

8. A collapsible form for use in the construction of arches comprising a pair of arch bars supported for swinging movement longitudinally of the arch, a ridge plate detachably secured to the arch bars, and side plates connected to the ridge plate and made up of a plurality of slats supported on the arch bars.

9. A collapsible form for use in the construction of arches comprising a pair of base bars having bearing brackets, a pair of arch bars supported on said bearing brackets in upright positions but with freedom for swinging movement toward one end of the arch, means for temporarily holding the arch bars against said swinging movement, and side plates supported on the arch bars.

10. A collapsible form for use in the construction of arches comprising a pair of base bars having bearing brackets, a pair of arch bars supported on said bearing brackets, in upright positions but with freedom for swinging movement toward one end of the arch, means for temporarily holding the arch bars against said swinging movement, a ridge plate supported on the arch bars, means for securing the ridge plate to the arch bars against longitudinal edgewise movement thereon but with freedom for endwise separation therefrom, and side plates detachably supported on the arch bars.

11. A collapsible form for use in the construction of arches comprising a pair of base bars having bearing brackets, a pair of arch bars supported on the bearing brackets, said bearing brackets having extensions which hold the arch bars in upright positions with freedom for swinging movement toward one end of the arch, a rod connecting the arch bars, a latch on one of said brackets and engageable with the arch bar supported thereon for holding the same against said swinging movement, and side plates supported on the arch bars.

12. A collapsible form for use in the construction of arches comprising a pair of base bars having bearing brackets, a pair of arch bars supported on the bearing brackets, said bearing brackets having extensions which hold the arch bars in upright positions with freedom for swinging movement toward one end of the arch, a rod connecting the arch bars with freedom for said swinging movement, a latch on one of said brackets and engageable with the arch bar supported thereon for holding the same against said swinging movement, said latch having an ejector finger arranged to engage the respective arch bar for imparting the initial swinging movement to the arch bars, and arch plates supported on the arch bars.

In testimony whereof I affix my signature in presence of two witnesses.

GLENN A. COMPTON.

Witnesses:
CLARA DEMAREST,
HARRY D. KILGORE.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."