Dec. 23, 1930. D. E. ANDREWS 1,786,385

APPARATUS FOR FORMING HOLLOW ARTICLES OF CEMENTITIOUS MATERIAL

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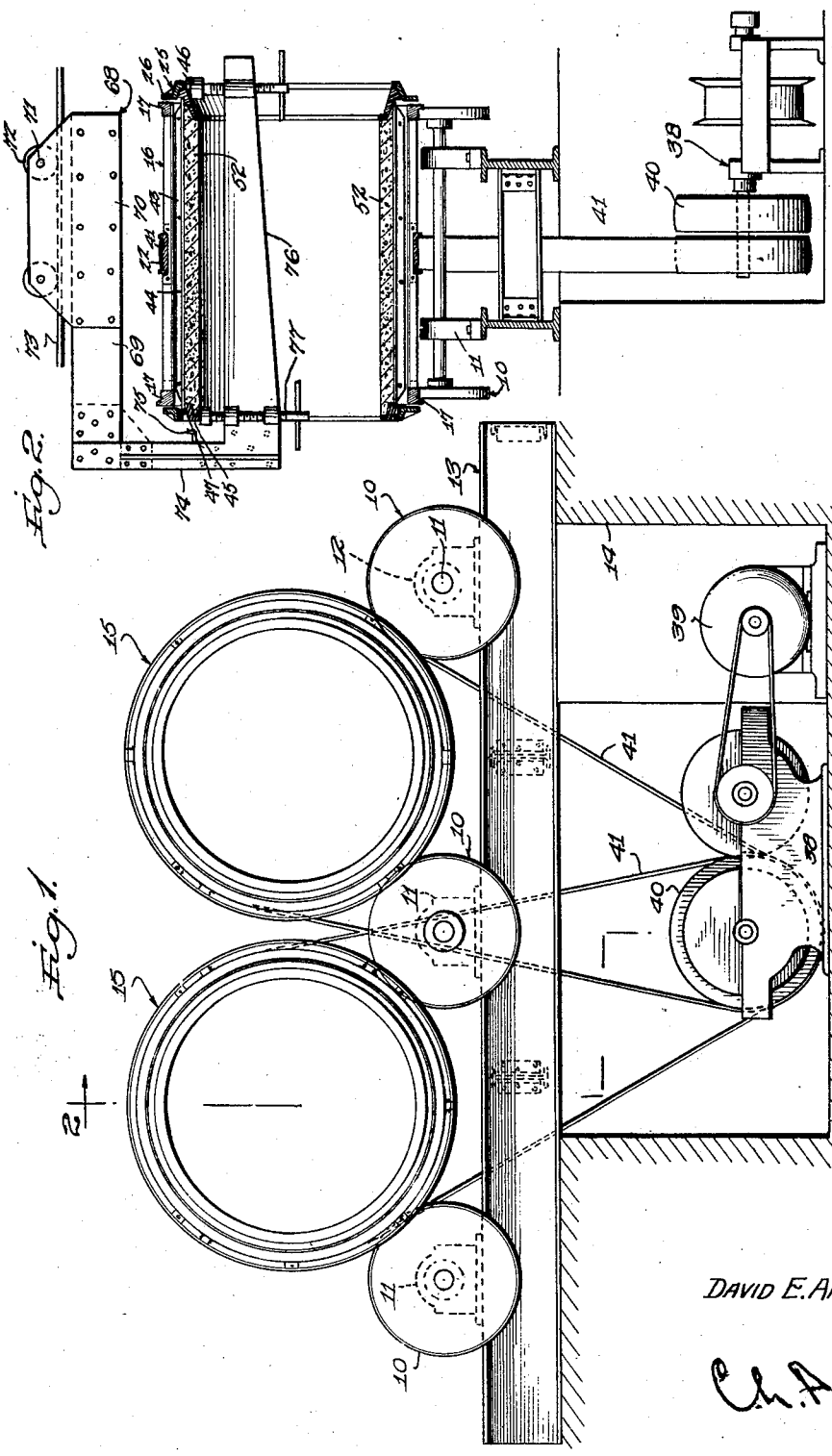


Fig. 2.

Fig. 1.

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Fig. 3.

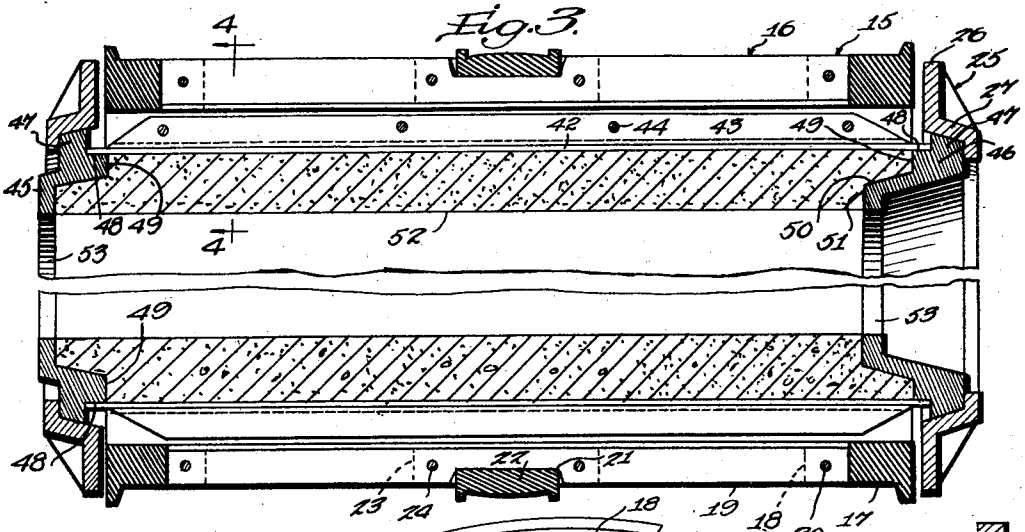


Fig. 4.

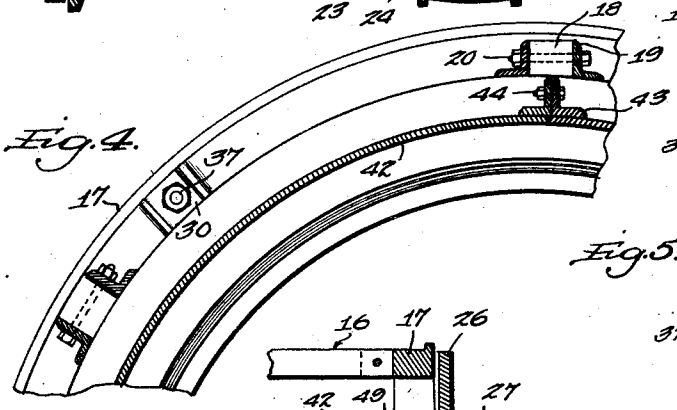
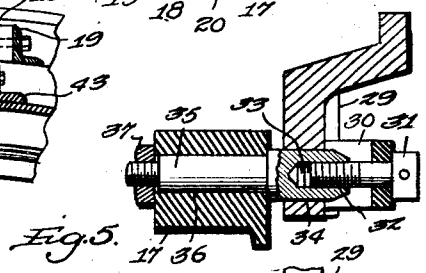


Fig. 5.



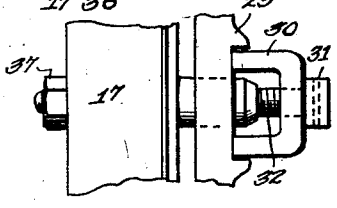
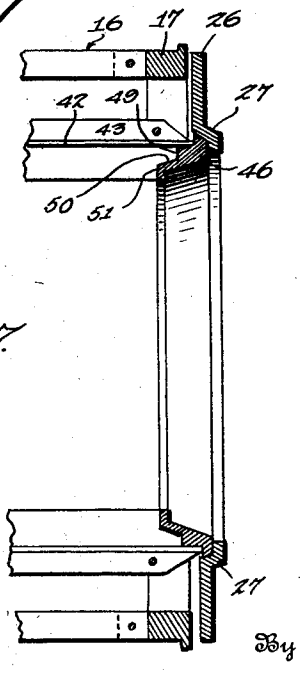


Fig. 6.

Fig. 7.



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Fig. 8.

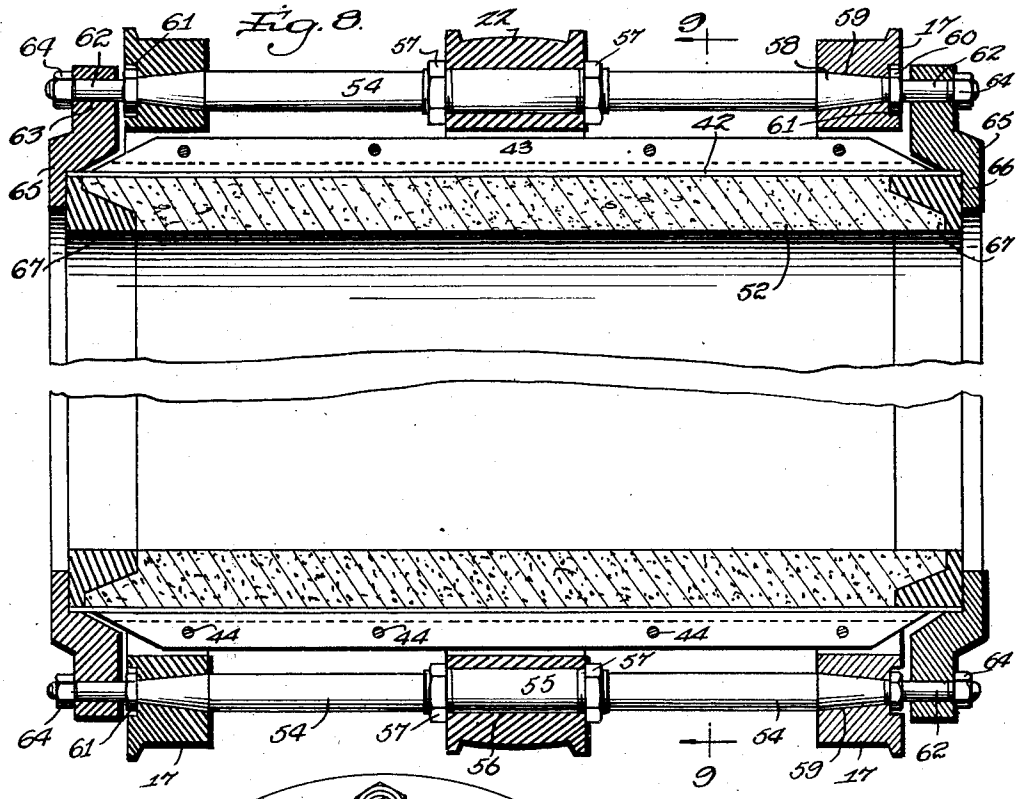
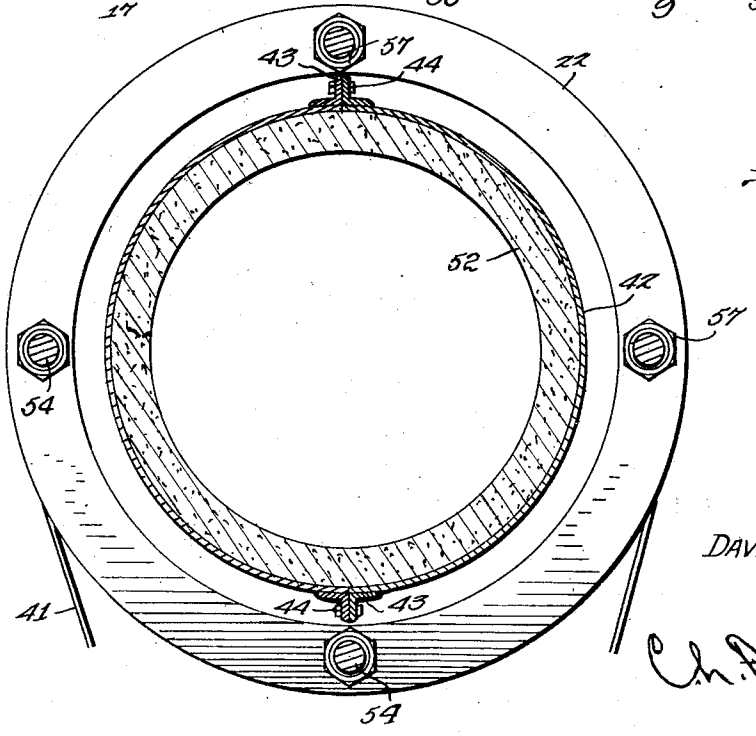


Fig. 9.



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UNITED STATES PATENT OFFICE

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APPARATUS FOR FORMING HOLLOW ARTICLES OF CEMENTITIOUS MATERIAL

Application filed November 17, 1927. Serial No. 233,994.

This invention relates to an apparatus for forming hollow articles of cementitious material, and more particularly to an apparatus for the centrifugal manufacture of concrete and similar pipes.

An important object of the invention is to provide novel means for supporting the forms for rotation.

A further object is to provide a novel form of cage for holding the forms, the latter being readily removable from the cage.

A further object is to provide novel means for properly centering the forms, such means permitting ready removal of the forms without removing the cage from the rotating means.

A further object is to provide a cage having end rings secured thereto and adapted to engage the end members of the forms for properly centering the latter and holding them in proper position, either of the rings being removable from the cage to permit the form to be removed from the cage without lifting the latter from the rotating means.

A further object is to provide the form with end members having tapered portions adapted to engage similarly shaped portions of the end rings of the cage whereby the form will be secured in position during rotation and will be properly centered.

A further object is to provide an apparatus of the character referred to wherein the form is supported in position wholly by the end rings of the cage whereby removal of either of the end rings permits the form to be withdrawn from the cage without disconnecting any fastening means.

A further object is to provide an apparatus which is adapted for the manufacture of pipes and similar articles of varying diameters.

A further object is to provide a novel form from which the finished articles are readily removable.

Other objects and advantages of the invention will become apparent during the course of the following description.

In the drawings I have shown several embodiments of the invention. In this showing,

Figure 1 is a side elevation, the foundation being shown in section,

Figure 2 is a section taken substantially on line 2—2 of Figure 1,

Figure 3 is an enlarged central longitudinal sectional view of one of the cages and associated elements,

Figure 4 is a fragmentary detail sectional view on line 4—4 of Figure 3,

Figure 5 is a fragmentary detail sectional view showing the connecting means between one of the annular trackways and its associated end ring,

Figure 6 is a detail elevation of the same,

Figure 7 is a fragmentary longitudinal sectional view showing the apparatus adapted for making articles of smaller diameter,

Figure 8 is a central longitudinal sectional view of a modified form of cage and associated elements, and,

Figure 9 is a section on line 9—9 of Figure 8.

Referring to Figs 1 to 7 inclusive, the numeral 10 designates a plurality of rollers mounted upon shafts 11 journalled in bearings 12 preferably of the roller type. These bearings are supported upon a suitable steel framework 13 which, in turn, is secured to a concrete or similar foundation 14.

In the drawings I have illustrated three sets of the rollers 10 the adjacent pairs of which are adapted to supporting molding units 15. It will be apparent that the use of three sets of rollers 10 permits the simultaneous operation of two of the molding units although theinvention obviously is not limited to any particular number of the units.

Except as hereafter specified, the molding units are identical, and only one need be referred to in detail. Referring to Figures 2, 3 and 4, each unit 15 comprises a cage 16 in which the molding form to be described is arranged. The cage includes a pair of annular flanged trackways 17 which are arranged upon the rollers 10 to be rotatably supported thereby. The trackways are provided with inwardly extending alined lugs 18 which are received between pairs of angle irons 19 or other connecting means, bolts 20 being employed for securing the angle irons

to the lugs. Intermediate their lengths, the angle irons 19 are provided with cut out portions 21 to receive a belt pulley 22. This pulley is provided between each pair of angle irons 19 with outstanding lugs 23 and bolts 24 pass through these lugs and the angle irons 19 to secure the pulley in position. The cage further includes a pair of end rings 25 each of which includes an annular outstanding flange portion 26 and a conical portion 27 for a purpose to be described.

The preferred manner of securing the trackways to the end rings is illustrated in Figures 5 and 6 of the drawings. At spaced intervals, the outer face of the annular flange portion 26 of each end ring is provided with a pair of spaced lugs 29 and each pair of lugs is adapted to receive therebetween the arms of a U-shaped clip 30. A screw 31 is rotatable in the base portion of each clip and is threaded at its outer end as at 32 for reception in the enlarged inner end of a stud 33 which projects through an opening 34 formed in the adjacent flange portion 26. The outer end of each stud is reduced as at 35 and projects through an opening 36 formed in the adjacent annular trackway, and a nut 37 is arranged on the outer end of each stud. It will be apparent that the screws 31 are operable to draw the rings 25 inwardly toward each other.

Referring to Figures 1 and 2, the numeral 38 designates a change speed transmission preferably of the type commercially known as the "Reeves unit". This unit is adapted to be driven by any suitable source of power such as an electric motor 39, and the output side of the transmission is provided with a pair of pulleys 40 about which pass belts 41. As previously stated, the two cages illustrated are substantially identical, but it will be apparent that the belt pulleys 22 of these units are offset with respect to each other to be arranged in proper alinement with their drive pulleys 40.

A pair of complementary semi-circular forms 42 are adapted to be arranged within each cage 15 and are preferably formed of sheet metal. The longitudinal edges of the complementary members are preferably provided with angle irons 43 through which bolts 44 are passed to secure the complementary members together to comprise a cylindrical form.

End members 45 and 46 are arranged adjacent opposite ends of the cylindrical form as clearly shown in Figure 3. Each of the end members is provided with a conical portion 47 adapted to be received in the conical portion of the corresponding end ring 25 and each of the end members is further provided with a cylindrical face 48 adapted to be received in one end of the cylindrical form. Inwardly of the cylindrical face 48, each end member is provided with an annular shoulder 49, while the two end members are provided with tapered intermediate portions 50 terminating in annular squared extremities 51. It will be apparent that the shapes defined by the faces 49, 50 and 51 of the two end members correspond in such a manner that the ends of finished pipes are adapted to interfit. The cylindrical form and the end members constitute a mold adapted to receive plastic material to form a finished pipe or similar article 52, as shown in Figure 3, and the plastic material may be introduced through center openings 53 formed in both of the end members. It will be obvious that the diameters of the openings 53 are the same and that they determine the thickness of the finished pipe.

The modification illustrated in Figure 7 is identical with the form previously described, except that it is adapted for the manufacture of pipes of different inside diameter with the same cage as previously referred to. In the modified form of the device, the annular flange portion 26 of the end ring is materially wider; thus reducing the diameter of the conical portion 27. This conical portion obviously will accommodate a smaller end member 46, while the cylindrical face 48 of the latter obviously is adapted to be received in a smaller cylindrical form. Thus it will be apparent that a single cage may be employed for manufacturing articles of different inside diameters.

The form of the device illustrated in Figures 8 and 9 varies from the form previously described only in structural details. In place of the spacing members 19 and the means previously described for securing the end rings to the annular trackways, I may employ a plurality of longitudinally extending rods 54. Each of these rods is provided with an enlarged central portion 55 extending through an opening 56 formed in the belt pulley 22. The rods are secured in position with respect to the belt pulley by nuts 57, as shown in Figure 8. Each rod is provided adjacent its outer ends with tapered portions 58 received in tapered openings 59 formed in the trackways 17. Nuts 60 are threaded on the rods adjacent the tapered portions thereof and are received in recesses 61 formed in the outer faces of the trackways. Beyond the nuts 60 the rods are provided with extensions 62 passing through openings 63 formed in end rings 65 and nuts 64 are arranged on the extremities of the rods to draw the end members inwardly as will be apparent. The end rings 65 are not provided with tapered portions to receive corresponding portions of the ends members, but are provided with inwardly extending annular flanges 66 against which slightly different end members 67 are adapted to seat. The end members are constructed so as to form interfitting ends on the finished pipes as in the

case of the form previously described. The ends of the cylindrical form 42 are adapted to fit over the outer portions of the end members as shown in Figure 8.

Convenient means may be employed for facilitating the filling of the forms and the removal of the finished articles. Referring to Figure 2, the numeral 68 designates a crane as a whole including an upper horizontal arm 69 provided at opposite sides thereof with plates 70 between the upper portions of which are vertical shafts 71 supporting wheels 72. These wheels are adapted to travel upon a suitable trackway 73 arranged parallel to the axis of the cage, for a purpose to be described. The crane further includes a depending arm 74 to the inner side of which is connected a hook 75, and a lower arm 76 is carried by the depending portion 74 beneath and parallel to the upper arm 69. Jack screws 77 are carried by opposite portions of the lower arm 76 and are adapted to engage the end members of the mold when it is desired to remove the latter from the cage.

The operation of the apparatus is as follows:

The cages with the forms in place therein are arranged on the rollers 10 and the cages are rotated by the belts as will be apparent. Any desired speed of rotation may be obtained by proper manipulation of the speed change mechanism. As previously stated, the apparatus is particularly adapted for the simultaneous manufacture of two of the articles at a time, but it will be apparent that only one cage and its associated form may be operated. The cementitious material may be placed in the form by pouring it through the openings in the end members, and the diameters of these openings obviously will determine the thickness of the finished article. After the forming of the article has been completed, the drive mechanism is stopped whereupon the crane 68 is brought into position, as indicated in Figure 2. The jack screws 77 are operated to bring the upper ends thereof into engagement with the end members, whereupon the end ring adjacent the hook 75 may be disconnected from the cage and placed upon the hook to be supported thereby. The crane is then moved longitudinally, thus withdrawing the form and its associated end members from the cage, together with the molded article, the cage remaining in position on the rollers 10. The form may be deposited wherever desired and the article may be removed therefrom by separating the complementary members of the form and removing the end members.

To return the parts to operative position to receive another charge of cementitious material a new form is placed in position on the jack screws and the crane is moved longitudinally to the position shown in Figure 2 to place the new form within the cage. The end ring of the cage is then lifted from the hook 75 and replaced in operative position, whereupon the form is ready for a new charge of material to form another finished article.

It will be apparent that the crane is adapted to be moved into either end of the cage since both of the end rings are removable. These elements are readily removable by operation of the screws 31, and when the end ring previously removed is replaced after placing a new form in position in the cage, the screws 31 are tightened to draw the end ring inwardly. In the form of the invention shown in Figures 1 to 7 inclusive, it will be apparent that the coacting conical faces of the end members and end rings cause the form to be properly centered in the cage. The ends of the cylindrical form contact with portions of the end members and are tightened in position by properly operating the screws 31.

The operation of the form of the device shown in Figures 8 and 9 is identical with that previously described except that different means is provided for securing the end rings in position. It will be noted that either end ring may be detached merely by removing one set of nuts 64, the other nuts 57 and 60 retaining the other elements of the cage in fixed position. It also will be noted that in the modified form of the device, the ends of the form contact directly with the end rings rather than with the end members of the form, but this structural difference does not affect the operation of the apparatus in any manner. Both forms of the apparatus are adapted to be driven by belts 41 passing around the pulleys 22, the pulleys of the two cages being offset in the manner previously stated.

It will be obvious that articles of different diameters readily may be formed by using the end rings, end members and form illustrated in Figue 7. It will be noted that the end rings described are materially wider than those previously referred to, thus adapting the apparatus to accommodate smaller forms and end members.

It is to be understood that the forms of the invention herewith shown and described are to be taken as preferred examples of the same and that various changes in the shape, size and arrangement of parts may be resorted to without departing from the spirit of the invention or the scope of the subjoined claims.

I claim:—

1. Apparatus of the character described comprising a cage, means for rotatably supporting said cage, a form adapted to be arranged in said cage and provided with ends having tapered portions, said cage being provided with tapered portions adapted to receive the corresponding portions of said

form, one of the tapered portions of said cage being detachable to permit withdrawal of said form from said cage, and means for rotating said cage.

2. Apparatus of the character described comprising a cage, annular rings carried by the end portions of said cage, means for rotating said cage about its axis, and a form adapted to be arranged in said cage, said cage including a substantially cylindrical body portion and detachable annular end portions and adapted to be clamped between the annular rings, at least one of said rings being detachable from said cage to permit said form to be withdrawn therefrom, said rings and the annular end portions of said form being provided with tapered engaging faces which decrease in diameter outwardly of the end of said cage.

3. Apparatus of the character described comprising a cage including a pair of annular trackways, means for rigidly connecting said trackways to each other, and end rings carried by said cage outwardly of said trackways, means engaging said trackways to support said cage for rotation, a form adapted to be arranged in said cage, and annular end members having portions receiving the extremities of said form, said end members and said ring having contacting tapered faces decreasing in diameter toward the ends of said cage, one of said rings being detachable from said cage to permit said form to be withdrawn therefrom.

4. Apparatus of the character described comprising a cage including a pair of annular trackways, end rings arranged outwardly of said trackways, a plurality of studs carried by said trackways, said end rings being provided with openings through which said studs project, screws engaging the projecting portions of said studs for securing said trackways to said rings, and a form adapted to be arranged in said cage and supported by said rings.

5. Apparatus of the character described comprising a cage including a pair of annular trackways, end rings arranged outwardly of said trackways, a plurality of studs carried by said trackways and provided with longitudinally projecting ends having internally threaded openings, said end rings being provided with openings through which the projecting ends of said studs extend, screws engaging in the threaded openings of said studs for securing said end rings to said trackways, and a form adapted to be arranged in said cage and wholly supported by said rings.

6. Apparatus constructed in accordance with claim 5 wherein said end rings and said form are provided with tapering contact faces.

7. Apparatus of the character described comprising a cage including a pair of annular trackways, fastening elements carried by said trackways and projecting longitudinally therebeyond, end rings arranged outwardly of said trackways and connected to said fastening elements, and a form adapted to be arranged in said cage and supported by said end rings, said form and said end rings being provided with tapering contact faces.

In testimony whereof I affix my signature.

DAVID EDWARD ANDREWS.