June 16, 1931. O. TUERCK 1,810,583

METHOD AND APPARATUS FOR MAKING CONCRETE PIPE

Filed Oct. 2, 1928 4 Sheets-Sheet 1

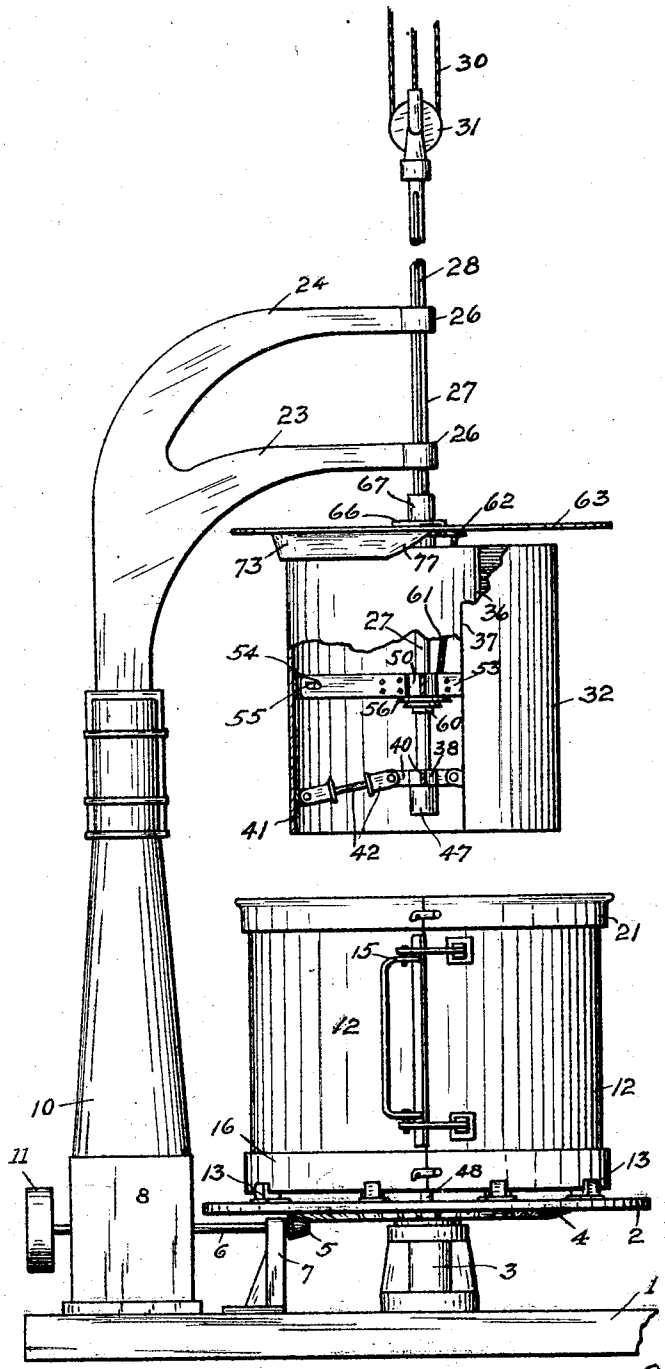



Fig. 1.

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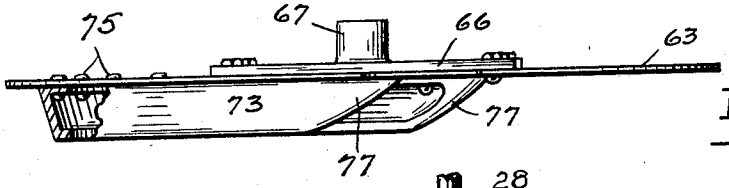



Fig. 8.

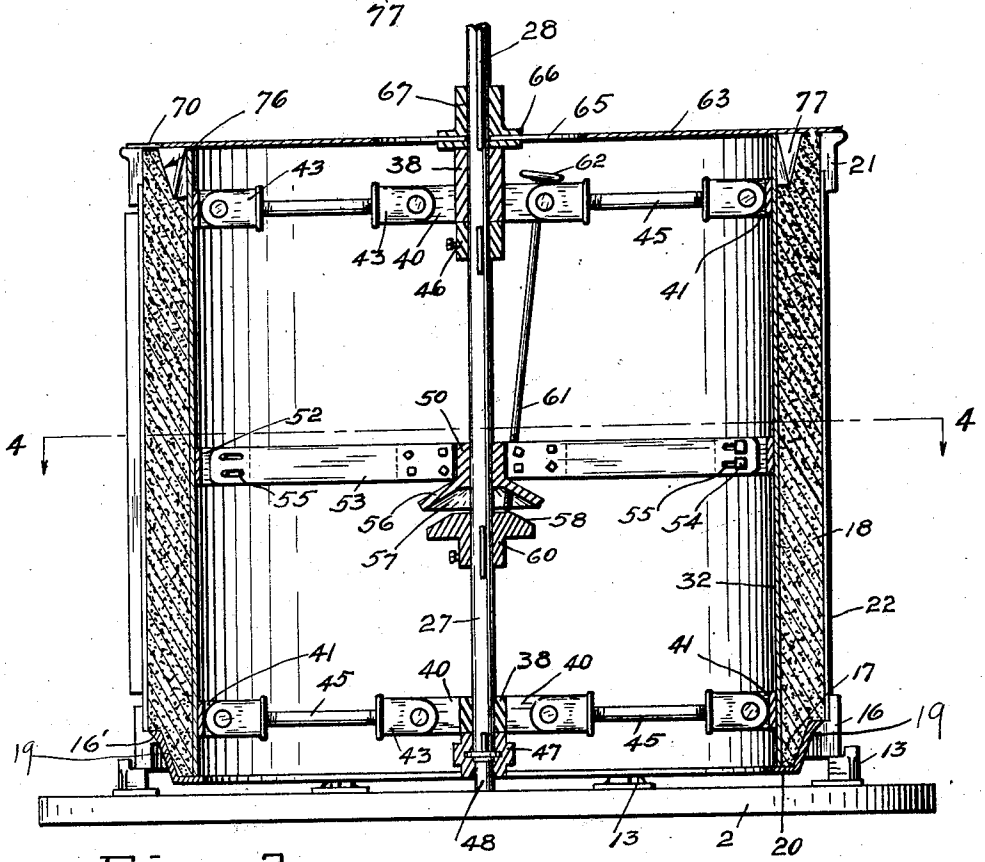



Fig. 2.

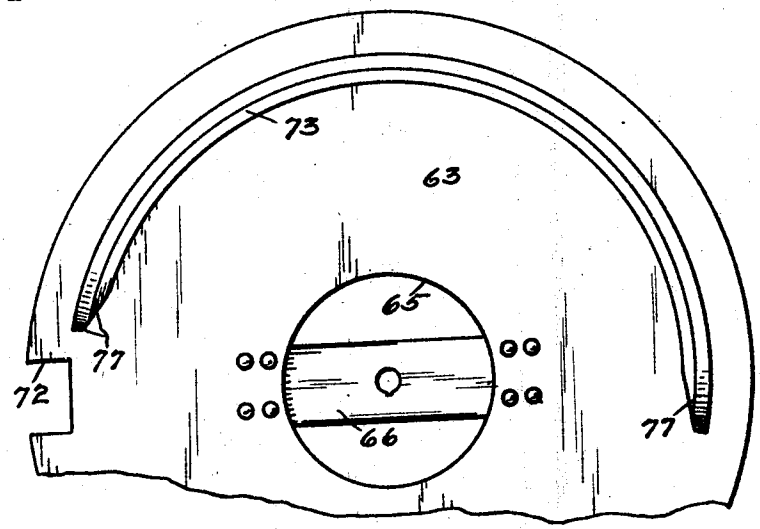
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METHOD AND APPARATUS FOR MAKING CONCRETE PIPE

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Fig. 7.



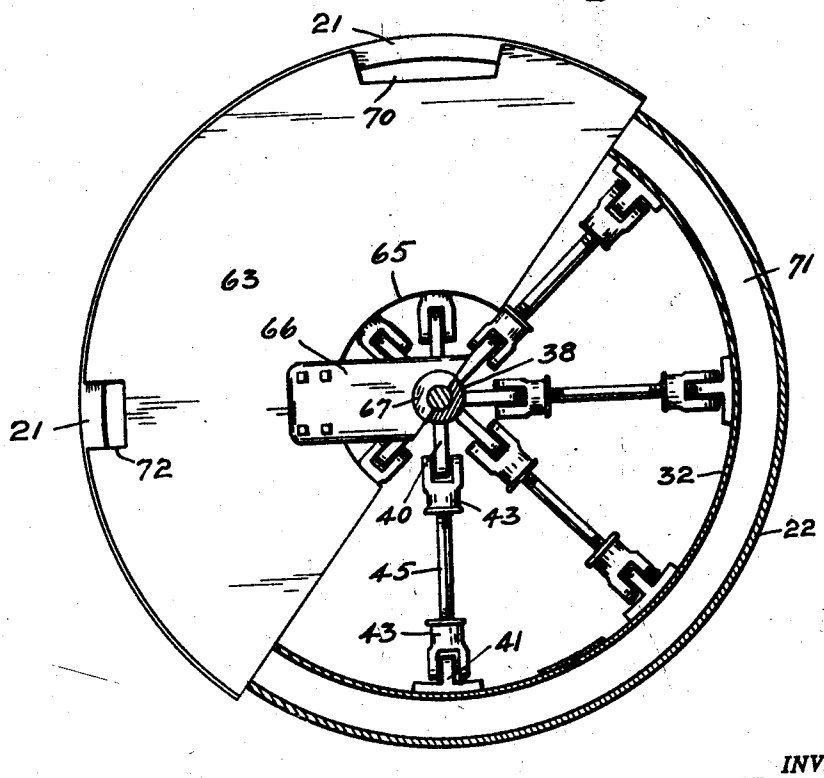




Fig. 3.

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METHOD AND APPARATUS FOR MAKING CONCRETE PIPE

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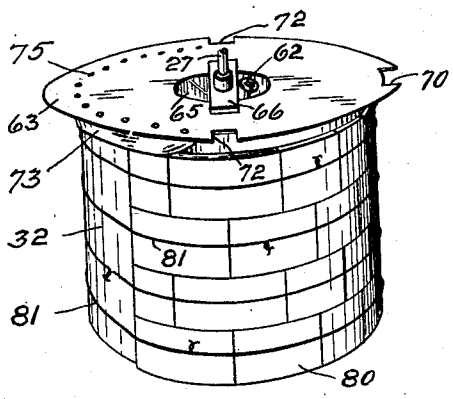



Fig- 6-

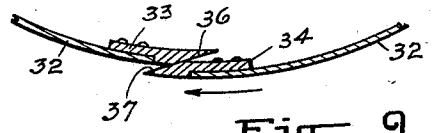



Fig- 9-

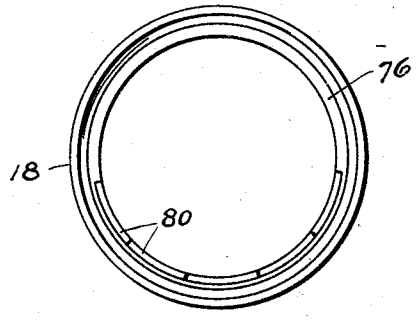



Fig- 5-

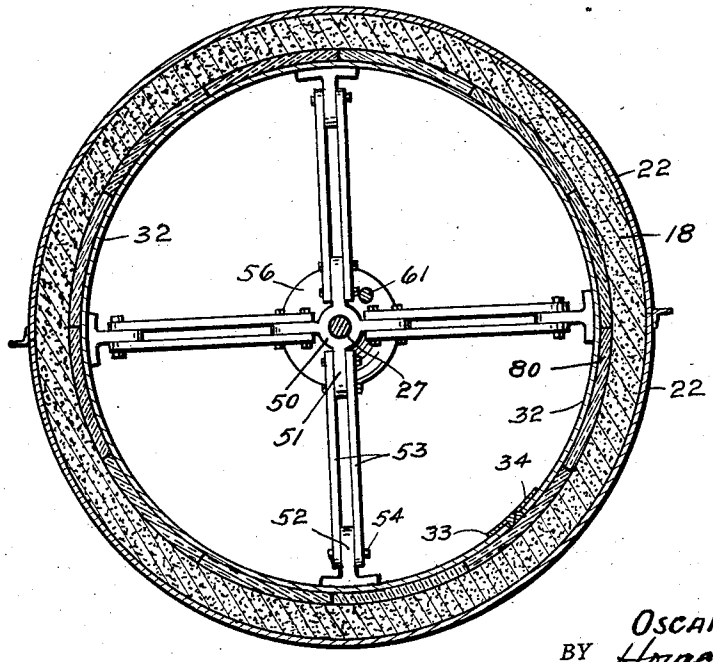



Fig- 4-

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1,810,583

# UNITED STATES PATENT OFFICE

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## METHOD AND APPARATUS FOR MAKING CONCRETE PIPE

Application filed October 2, 1928. Serial No. 309,736.

This invention relates to improvements in the method of making lined concrete pipe together with the core-apparatus employed in the mold for making the same and other varieties of pipe.

The object of the invention is to provide a novel method of forming concrete pipe having an interior lining of non-corroding, impervious or wear-resistant material, such as vitrified clay tiles.

A further object of the invention is the provision of a core or inner removable mold-wall to which tiles or other lining material for the pipe to be formed therein may be secured for introduction within the mold and which is collapsible to admit of smoothing and finishing the interior surface of the pipe and to facilitate its removal from the finished pipe.

Other objects and advantages of my invention, and objects relating to details in the structure of the apparatus employed in the invention will be readily apparent in the course of the full description to follow.

The accompanying drawings illustrate by way of example a representative form of apparatus with which my improved method may be carried out, in which:

Figure 1 is a view in side elevation of a pipe-making machine illustrating my improved collapsible core and actuating mechanism, parts being broken away to show the interior of the core in collapsed condition.

Fig. 2 is a view in vertical cross-section of a mold-jacket and collapsible core therefor with a finished pipe-section shown therein.

Fig. 3 is a view partly in top plan and partly in horizontal section of the mold-jacket and core.

Fig. 4 is a view in horizontal section on line 4—4 of Fig. 2.

Fig. 5 is a top plan view of a pipe-section detached from the mold, illustrating the finished pipe with a segment of the interior surface shown lined with tiles or the like.

Fig. 6 is a perspective view of a core with the liner tiles secured thereto preparatory to their introduction within a mold.

Fig. 7 is a fragmentary underside plan view of the covering plate for the mold.

Fig. 8 is a detached view in side elevation of the covering plate with parts thereof broken away.

Fig. 9 is a fragmentary view in plan of the core illustrating the vertical joint in the core-sheet.

Referring to said views, wherein similar reference characters indicate like parts in the several views, the reference numeral 1 designates the base of a concrete-pipe forming machine of well known construction upon which a turntable 2 is mounted for rotation. Said turntable is rotative in a vertical bearing 3 and is shown as having a circular rack-gear 4 on its underside engaged by a pinion 5 by which it may be driven. The pinion 5 is secured on a shaft 6 mounted for rotation upon suitable bearings, such as 7, and extends through the base 8 of a column 10 where power may be applied thereto through a belt-pulley 11.

A sectional outer mold or jacket 12 is detachably secured to the turntable to rotate therewith and is supported upon blocks 13 adjustable thereon to maintain the jacket in concentric relation with the axis of rotation of the turntable. The jacket-sections are secured together by clamps 15 or by other suitable means and each comprise a semi-circular base-casting 16 having a beveled ledge 16′ with which a pallette 19 is engageably supported. Said pallette is formed to mold the spigot-end 17 of the pipe 18 and includes an inwardly directed flange 20 extending horizontally. At its upper end each said jacket-section includes a semi-circular rim-casting 21 and between the castings 16 and 21 a metal sheet 22 is secured in semi-circular form to mold the exterior surface of the pipe.

The column 10 extends upwardly and over the turntable in two rigid branches 23 and 24 terminating in spaced bearings 26 in vertical alignment with the axis of rotation of the turntable. A shaft 27 is longitudinally slidable in said bearings and is maintained against rotation therein by a feather-key 28. The shaft 27 may be lifted in said bearings by any suitable means, indicated by the cable

30, running through the sheave-block 31 mounted in the upper end of the shaft.

An inner mold or core for the pipe to be formed is mounted upon the lower end of the shaft 27 and consists in a sheet-metal drum 32 having its vertical edges adapted to abut or to overlap to respectively maintain the full diameter of the core or to reduce such diameter to a relatively slight extent in such positions. Such vertical edges terminate in strips 33 and 34 having, respectively, oppositely inclined abutment surfaces 36 and 37 to facilitate their abutting and overlapping movements.

Hubs 38 are slidably mounted upon the shaft 27 at the upper and lower extremities of the core or at other desired positions therein, and from which extend a plurality of evenly spaced lugs 40 in radial directions. Complementary lugs 41 are rigidly secured to the inner surface of the core-sheet. Links 42 are provided respectively connecting each said pair of lugs and may each comprise heads 43 at their opposite ends pivotally connected to the respective lugs and are each joined by a rod 45 oppositely screw-threaded at their opposite ends extending into screw-threaded bores, not shown, in the respective heads whereby the effective lengths of said links may be adjusted, somewhat in the manner of a turnbuckle.

Collars 46 and 47 are pinned to the shaft below the respective hubs 38 and are arranged to engage the hubs when the shaft is lifted to move the hubs along the shaft and thereby pull the links into inclined positions, as indicated in Fig. 1, and thus draw the core-sheet inwardly to a relatively slight extent to reduce its diameter through such inward pull which the consequent overlapping of its edges 33 and 34 will admit.

The lower collar 47 is cupped on its underside and engages with a centering pin 48 extending upwardly from the center of the turntable whereby the core is maintained in concentric relation with the outer jacket.

Medially between the hubs 38 a further hub 50 is loosely mounted on the shaft from which extend lugs 51 in radial directions with which fixed lugs 52 on the core-sheet co-operate. Pairs of arms 53 are rigidly secured upon opposite sides of the lugs 51 extending in horizontal directions and each such pair is respectively slidably secured to the lugs 52 by means of one or more bolts 54 extending laterally from the lugs and protruding through horizontally directed slots 55 in the outer ends of the arms, whereby the core-sheet may move slightly inwardly or outwardly in response to the pull or thrust of the links 42 and wherein the extent of the contraction may be limited by the size of the slots.

The lower portion of the hub 50 is flared, as at 56, having a conical recess 57 on its under side to receive a cone-head 58 of a clutch-member 60 pinned to the shaft. Said clutch-parts are engaged when the shaft is lifted, as indicated in Fig. 1, and disengaged when the core is expanded by lowering the shaft relative to the core-sheet, as shown in Fig. 2. A screw-rod 61 extends through the hub 50 or flared portion thereof 56 and extends upwardly in proximity to the top of the core where it terminates in a wheel-handle 62 within easy reach of the operator whereby the rod may be screwed down upon the cone-head 58 when the clutch-parts are separated and thus lock them in such separated condition. The rod 61 is screwed down to separate the clutch-parts only when it is desired to lift the core while in expanded condition or when it is desired to lower the core while fully expanded.

Numeral 63 indicates a plane sheet metal plate of circular configuration having a central aperture 65 through which the shaft 27 extends and which is connected to the shaft by means of a bridge-bar 66 extending diametrically across said aperture and bearing a hub 67 slidably mounted upon the shaft by means of a feather-key 28 to prevent its rotation thereon. The plate 63 normally rests upon the upper of the hubs 38 and when the core is in fully expanded condition within the jacket the outer rim of the plate rests upon the core and the jacket. A recess 70 is formed in the perimeter of the plate through which the removable feed-spout, not shown, of the concrete-mixture supply devices protrudes whereby the concrete is fed to the space 71 between the core and the jacket where the pipe is formed. Recesses 72 may likewise be formed in the marginal edge of the plate through which may extend tamping-rods, not shown, for compacting the pipe material in the mold.

Upon the underside of the plate 63 a cast-metal plow 73 is secured by bolts 75 extending concentrically for approximately 180 degrees about the circular plate and inset from its marginal edge to enter the mold-space in contact on its inner face with the outer surface of the core-sheet 32. Said plow may be of hollow construction with an open side contiguous to the core-sheet and is formed in cross-section to conform to the desired shape of the socket 76 which it is designed to mold upon the bell-end of the pipe. The ends 77 of said plow are shaped in tapered form, see Fig. 8, to engage the pipe material as it revolves with the mold against the plow and thus compact the material at its side and bottom and molding an annular channel constituting the socket 76 to receive the spigot-end 17 of an adjoining pipe-section.

In the operation of my apparatus for making concrete pipe of monolithic construction the jacket is assembled and secured to the turntable when the core is elevated there-

above, as indicated in Fig. 1, in which position the core is in its reduced condition of girth due to the inward pull of the links 42. When ready the core is lowered with the shaft 27 concentrically within the jacket so that the core-sheet 32 will rest upon the flange 20 of the pallette whereupon the shaft will continue to move downwardly by its gravity to seat upon the pin 48 and in so doing will thrust out the links 42 in causing them to extend in horizontal positions, as seen in Fig. 2, thereby expanding the core-sheet and allowing the edge-strips 33 and 34 to abut and the core-sheet to assume its fully cylindrical condition.

Simultaneously with the seating of the shaft at its lowermost position the clutch-member 60 will be released from its engagement with the hub 50 and the plate 63 is then brought to rest upon the upper hub 38 and jacket with the plow 73 entering the mold-space and engaging the core-sheet upon its inner side.

In such condition of the mold the operation of feeding the pipe material into the mold and tamping it into desired form and firmness may be consummated. The core will rotate with the turntable and jacket and about the rigidly held shaft. The plate 63 will also remain stationary with the shaft and maintains the plow 73 firmly against the rotating concrete material in the mold-space and thus forms the socket, as described, as the material is fed to the top of the mold and finished at its upper margin by contact with the plate.

When the feeding and tamping steps are completed the shaft is pulled upwardly by means of the cable 30 for a short distance sufficient to engage the clutch-elements 57 and 58 and to draw the links 42 upwardly at their inner ends which tends to pull the core-sheet inwardly and thus cause its diametrical dimensions to be reduced somewhat and the edge-strips 33 and 34 to overlap, as indicated in Fig. 9. In the same upward movement of the shaft the plate 63 is elevated with it through engagement by the upper hub 38 and the plow is thereby removed from the socket in the pipe just formed through its instrumentality.

In such condition of the core the jacket and pipe therein continue to revolve in the direction of the arrow in Fig. 9 while the core is held stationary by the clutch, and while reduced in size to a relatively slight amount it will still engage the pipe but with greatly reduced frictional contact and with an effective saving in power than would be the case if attempt should be made to check the rotation of the core relative to the pipe while in full engagement therewith. The continued rotation of the pipe against the core affords an effective trowelling action upon the inner surface of the pipe thoroughly smoothing the inner wall and making the same less penetratable to liquids. When such trowelling action is completed the shaft is again actuated to lift the core entirely free from and above the jacket and pipe, as shown in Fig. 1, whereupon they can be removed from the turntable and separated as desired.

The provision of the apparatus just described affords opportunity to employ a novel method of pipe construction wherein the pipe is provided with a lining of other material than concrete. For sewers, or for other uses where a protective lining is believed to have more resistance to disintegrating gases and other corrosive agents than concrete material, vitrified clay plates or tiles laid and embedded in its inner surface are sometimes employed. In such where a lining is required I expand the core while still removed from the jacket, as by supporting the core-sheet upon short planks, not shown, laid across the top of the jacket, and locking the core in such condition by screwing down the screw-rod 61 upon the clutch-head 58. I then lay tiles 80 or analogous lining plates formed to the proper curvature upon the exterior of the core-sheet, as seen in Fig. 6, either entirely about its circumference, as shown in Fig. 4, or partially thereabout, as the specifications may require. The tiles may be laid upon the core in staggered rows and with cement grouting in the joints therebetween.

I then tie each said row with bands 81 of wire or other suitable material cinching the tiles closely to the core-drum. In such condition the core may be lowered into the jacket which places the tiles in the mold-space 71. The pipe is then formed in the usual manner which will embed the tiles in the inner surface thereof. Should the lined sector desired be less than the entire inner circumference of the pipe, as shown in Fig. 5, the concrete portion and the tiled portion will present a uniformly cylindrical surface while the ties 81 will remain in the pipe walls as valuable adjuncts of reinforcement. The core is then shrunk to its reduced dimensions for finishing the interior of the pipe and is removed in the manner before described.

Having described my invention, what I claim, is:—

1. The method of making lined concrete pipe, consisting in mounting and securing lining plates upon the exterior of a mold-core, inserting said core and attached plates within the exterior mold-jacket, and feeding concrete pipe material within the mold-space between the core and jacket to embed said lining plates in the interior wall of the pipe.

2. The method of making lined concrete pipe, as specified in claim 1, wherein the jacket and core are revolved in unison while the pipe material is being fed into the mold and holding the core against rotation while

the jacket and pipe continue to revolve after the pipe is formed whereby the interior wall of the pipe is smoothed.

3. The method of making lined concrete pipe, consisting in mounting and securing lining plates upon the exterior of a mold-core, inserting said core and attached plates within an exterior mold-jacket, feeding concrete material within the mold-space between the core and jacket to embed said lining plates in the interior wall of the pipe, revolving the jacket and core in unison while the pipe material is being fed into the mold, contracting the core after the pipe-material is poured, and simultaneously securing the core against rotation while the jacket and pipe continue to revolve.

4. The method of making concrete pipe, consisting in mounting lining plates upon the exterior wall of a mold-core, banding said plates to the core by metal ties, inserting said core and attached plates within an exterior mold-jacket, and pouring concrete pipe material within the mold-space between the core and jacket to embed said lining plates and ties in the interior wall of the pipe, and shrinking said core and removing it from the interior of the pipe with said ties remaining in the pipe wall to afford reinforcement therefor.

5. In concrete pipe making apparatus, a rotatable mold-jacket, a vertically movable, non-rotatable shaft, a cylindrical core mounted on said shaft and movable therewith into said jacket, said core being rotatable with the jacket when the shaft is in its lowermost position, and frictional means to brake the rotation of said core when the shaft is lifted.

6. In concrete pipe making apparatus, as specified in claim 5, wherein the core comprises a sheet-metal drum having a vertically disposed joint adapted to abut at its edges when expanded and to overlap thereat when contracted, and means operable by the lowering and raising of the shaft to expand and contract the core, respectively.

7. In concrete pipe making apparatus, as specified in claim 5, manually operable means to maintain the braking devices out of operative engagement.

8. In concrete pipe making apparatus, a vertically movable, non-rotatable shaft, a cylindrical core mounted for rotation on said shaft and consisting in a sheet-metal drum having a vertically disposed abutting joint, links pivotally connected to the interior of said core-drum and slidable on said shaft to releasably retain the core-drum in expanded condition, and means operable with said shaft to contract said core-drum when the shaft is lifted by drawing said links inwardly.

9. Concrete pipe making apparatus, as specified in claim 8, in which horizontally directed arms extend rigidly from a hub through which the shaft slidably extends and which are connected to said core-drum to admit of contraction thereof.

10. Concrete pipe making apparatus, as specified in claim 8, wherein a braking device is provided between the hub and the shaft and operable when the shaft is lifted to prevent rotation of the core when the core is contracted.

11. In concrete pipe making apparatus, a vertically movable, non-rotatable shaft, a cylindrical core mounted for rotation on said shaft and consisting in a sheet-metal drum having a vertically disposed abutting joint, links pivotally connected to the interior of said core-drum and slidable on said shaft to releasably retain the core-drum in expanded condition, means operable with said shaft to contract said core-drum when the shaft is lifted by drawing said links inwardly, cooperative braking devices connected on said shaft and with said core, respectively, operable when the shaft is lifted to prevent the rotation of the core, and manually operated means to maintain said braking devices in separated condition.

12. Concrete pipe making apparatus consisting in combination with a rotatable turntable and an outer mold-jacket mounted thereon having an inwardly directed flange at its lower end, of a vertically movable, non-rotatable shaft disposed in the axis of rotation of said jacket, a collapsible core-drum arranged to be supported upon said jacket-flange and connected with said shaft for lowering and raising within the jacket, pivotally connected links slidable on said shaft for expanding and contracting the core-drum.

13. Concrete pipe making apparatus, as specified in claim 12, including a plate mounted against rotation on the shaft and having means provided on its underside entering the mold-space between the jacket and core-drum for forming a bell-socket in the upper end of the pipe.

14. Concrete pipe making apparatus, as specified in claim 12, wherein a non-rotatable plow-device is provided adapted to be entered into the mold-space between the jacket and the core whereby the pipe material is rotatably moved against said device which is thus adapted to form a bell-socket in the upper end of the pipe.

15. Concrete pipe making apparatus, consisting in a vertically movable, non-rotatable shaft, a collapsible core-drum, a pair of hubs slidable on said shaft and a plurality of links pivotally connected at opposite ends to said hubs and to said core-drum for expanding and contracting the core-drum.

16. Concrete pipe making apparatus, as specified in claim 15, in which horizontally directed arms extend rigidly from a hub through which the shaft slidably extends and which are connected to the core-drum by a radially slidable connection to admit of the

contraction and expansion of the core-drum.

17. Concrete pipe making apparatus, as specified in claim 15, wherein a braking-clutch is provided between the shaft and the core-drum to prevent the rotation of the core when the core is contracted.

18. Concrete pipe making apparatus, as specified in claim 15, wherein means are provided on said shaft for moving said links upwardly at their inner ends to contract the core-drum when the shaft is lifted and simultaneously braking the rotative movements of the core-drum.

19. Concrete pipe making apparatus, consisting in a rotatable mold-jacket, a vertically movable, non-rotatable shaft extending axially of said mold-jacket, a cylindrical core mounted on said shaft and movable therewith into said jacket, and a plow-device non-rotatably mounted on said shaft and adapted to enter into the mold-space between said mold-jacket and the core whereby the pipe material is rotatably moved against said device which is thus adapted to form a bell-socket in the end of the pipe formed in said mold-space.

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