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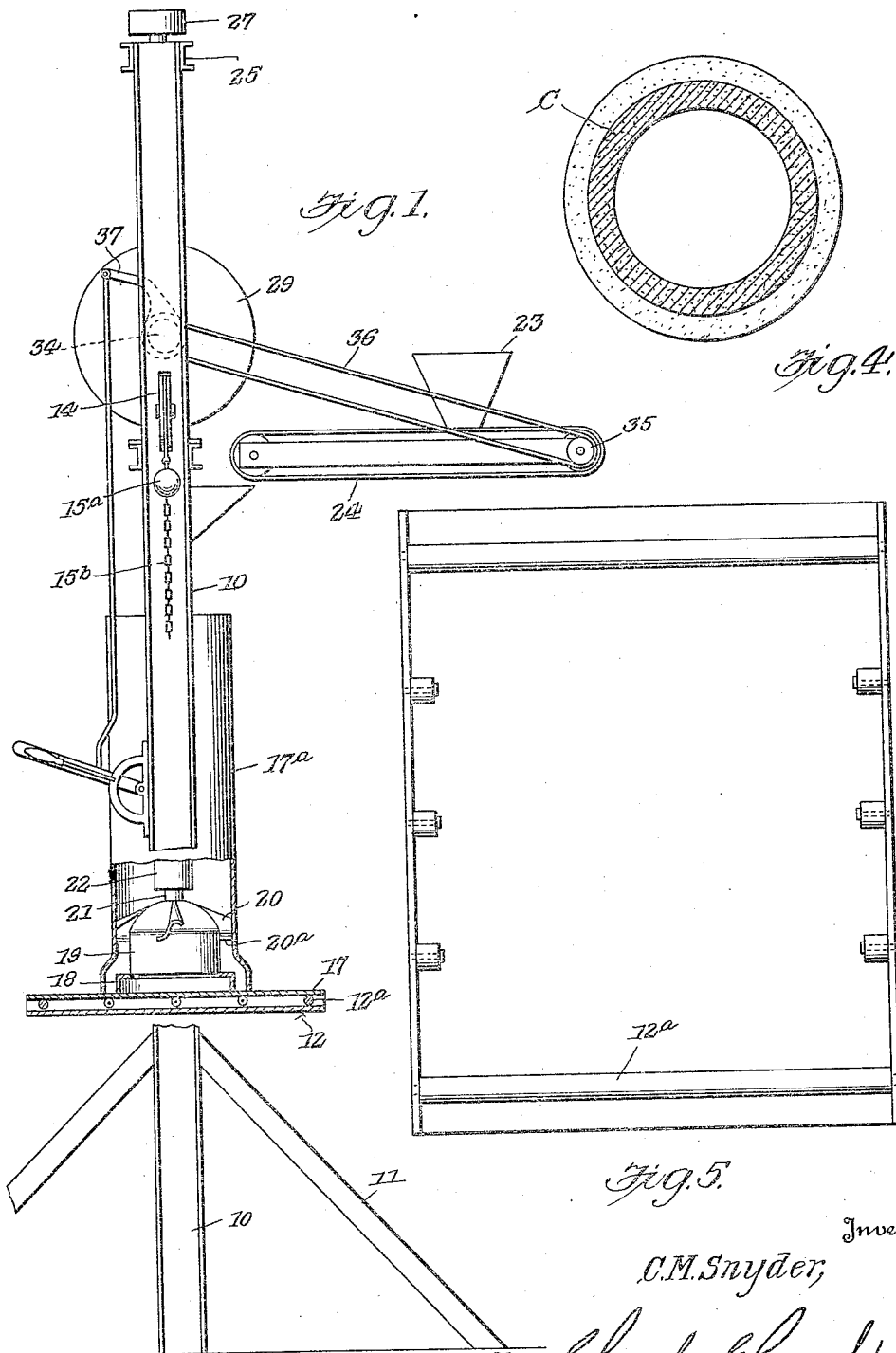
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METHOD AND APPARATUS FOR MOLDING CONCRETE PIPE

Filed May 27, 1929

2 Sheets-Sheet 1



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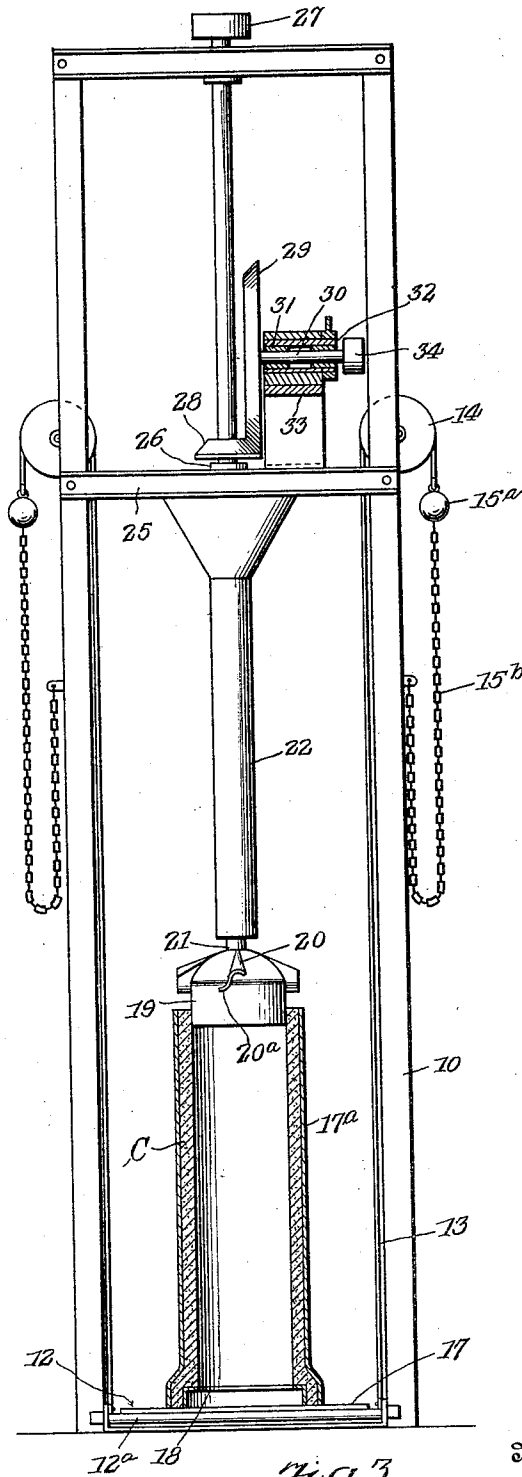


Fig. 3.

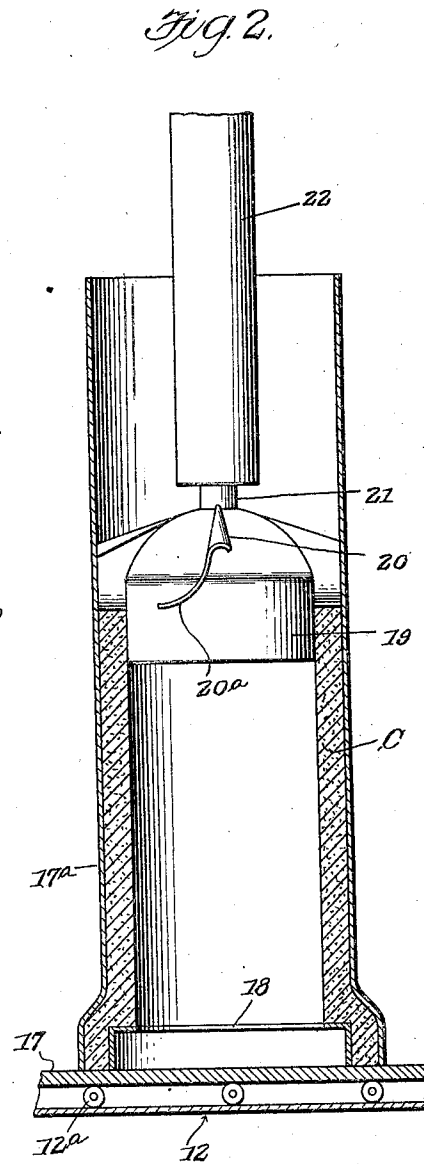


Fig. 2.

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METHOD AND APPARATUS FOR MOLDING CONCRETE PIPE

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This invention relates to concrete molding and particularly to an improved method and apparatus for producing concrete pipe.

One object of the invention is to produce a method and apparatus with which the pipe section may be quickly produced while, at the same time, the material constituting such pipe sections will be of uniform density or compactness.

A further object is to utilize centrifugal force in placing and compacting the concrete in the form, no pressure from any other source being necessary.

Another object is to provide means for substantially uniformly feeding the concrete to the mold at a rate dependent upon the speed at which the rotor, by which the material is centrifugally compacted, is rotated.

In the present apparatus as has been said, the material is compacted by centrifugal force generated by a rotor that is initially inserted in the lower end of a pipe form and as the concrete is molded in said form the latter is adapted to be moved longitudinally away from the rotor. This movement continues until the rotor has assumed a position substantially free of the mold form. It will be appreciated that as the concrete is molded in the form the weight thereof gradually increases and in view of this the present invention contemplates means for gradually increasing the resistance that must be overcome in order to permit the form to move relatively away from the rotor.

Another object is to simplify the apparatus and method, the apparatus consisting of what is believed to be a minimum number of parts, all of which are of simple and sturdy construction so that the maintenance and upkeep thereof is comparatively inexpensive. The present apparatus is also portable, thereby permitting the pipe to be produced at the point of use.

With these and other objects in view, the invention consists in certain details of construction and combinations and arrangements of parts, all as will hereinafter be more fully described and the novel features thereof particularly pointed out in the appended claims.

In the accompanying drawings, illustrat-

ing one form of apparatus for carrying out the proposed novel method:

Figure 1 is a side elevational view, portions of the supporting structure being broken away for purposes of illustration, and the parts being shown in the positions they initially occupy in producing a section of pipe.

Fig. 2 is a view similar to Fig. 1, but showing only a portion of the apparatus with a section of pipe partially completed.

Fig. 3 is a front elevation with the finished pipe and form shown in section.

Fig. 4 is a cross-section of a finished pipe section.

Fig. 5 is a plan view of the form support.

In accordance with the present method the pipe is made in a mold or form into which a rotor is adapted to be initially inserted, the form being yieldingly held in proper position relative to said rotor. Concrete is delivered to the rotor within the form and distributed and compacted uniformly therein by centrifugal force developed by the rotary movement of the rotor. The form, except for the bell end of the pipe, consists of only one wall, the periphery of the rotor constituting the other or inner wall of the form and as the concrete is compacted in the space between said rotor and outer wall of the form, the form is gradually moved away from the rotor until the latter is practically withdrawn therefrom.

In carrying out the preferred method, the form is supported on a movable pallet and as the pipe is built up in said form the weight on the pallet gradually increases. For this reason the pallet and form are supported in proper position relative to the rotor by counter-balance means of a type wherein the weight of the counter-balance will be gradually increased in accordance with the increasing weight of the pipe being formed. To insure uniform action during the operation of the apparatus the drive mechanism for the rotor is also utilized for governing the feed of concrete or material to the form.

The preferred form of apparatus for carrying out this method comprises a supporting frame work of uprights 10 and braces 11, said

uprights serving as guides for a platform 12 which has cables 13 attached to opposite sides thereof. These cables 13 extend over pulleys 14 journaled in the uprights 10 and at their free ends have attached thereto counter-balance means preferably in the form of a body 15a and a chain 15b. Chain 15b has one end supported from the frame 10 so that as the body 15a is raised it will successively, so to speak, pick up and support additional links of the chain for purposes which will presently appear. Journaled in the platform 12 is a series of rollers 12a to facilitate movement of pallets, one of which is indicated at 17, onto and off of said platform. These pallets are adapted to have placed thereon the forms for the pipe sections to be produced, said forms constituting an outer shell 17a and an inner member 18. Outer shell 17a corresponds in length to the length of the pipe section to be produced and is flared at one end whereby, in conjunction with the inner mold member 18, the bell end of the pipe section may be formed. A pallet containing one of these forms is placed on platform 12 and, because of the weight of the counter-balance means, is raised to the position shown in Fig. 1, wherein the rotor 19 for distributing the concrete in the form member 18. With the parts in the positions shown in Fig. 1, concrete is deposited in the form and rotor 19 driven at the desired speed in a counter-clockwise direction. On the upper surface of said rotor there are a plurality of radially disposed vanes 20 so that as the concrete falls on the upper surface of said rotor it is distributed radially thereof by centrifugal force. Not only is it distributed by the centrifugal force generated by the revolving head, but it is also compacted in the space between the inner and outer shells 17a, 18, until that space is filled after which the material which is continuously supplied to the form gradually fills the space between shell 17a and the periphery of the rotor. As this latter space is filled, the material, indicated at C, builds up until it reaches a point where it is engaged by vanes 20a on the periphery of the rotor, vanes 20a being continuations of vanes 20, if desired. As will be understood, as the concrete is compacted by centrifugal force in the form, the vanes 20a gradually depress the support 12 against the pressure exerted by the counter-balance means, this operation continuing until rotor 19 protrudes above the upper end of shell 17a, at which time the section of pipe is completed. A section of pipe partially completed is illustrated in Fig. 2, and a completed section in Fig. 3. The movement of the form relatively away from the rotor is smooth and constant due to the slight restraining action of the counter-balance means. In this way, the position of the form is automatically co-

ordinated with the placement of concrete, the vanes acting always upon concrete previously placed and compacted by the action of centrifugal force. In actual operation the vanes 20a are usually about an inch below the point where the concrete leaves the upper surface of the rotor, thus eliminating any tendency of the concrete to pile up and clog the vanes 20. It will also be understood that after one pipe section is completed another pallet, with a form thereon, is placed on the carriage or support 12 after the previously formed pipe section and its form have been removed. The smoothness of the movement of the carriage and form away from the rotor is assured by reason of the character of the counter-balance means previously described. That is, when the carriage is in its uppermost or initial position, most of the chain 15b is suspended from the support 10, but as the pallet and carriage are lowered, additional links of the chains are picked up and suspended from the ends of the cables 13. In other words, as the weight of the concrete in the form increases, the weight of the counter-balance increases, thereby securing a uniformity in the movement of the carriage away from the rotor during the production of the entire pipe section. A further advantage of compacting material by the action of centrifugal force is that the width of vanes 20a need not equal the thickness of the walls of the pipe section so that, if desired, reinforce elements may be incorporated in the pipe, it only being necessary that such reinforce elements be positioned in the forms at a point beyond the outer edges of the vanes 20a.

The rotor 19 is mounted on a shaft 21 extending through a chute 22 by which the concrete is delivered to the interior of the form. The material, concrete, is preferably delivered from a hopper 23 by an endless traveling conveyor 24 whose rate of movement is governed entirely by the rate of movement of the rotor, as will be pointed out. Shaft 21 is journaled in cross members 25 of the supporting frame, thrust collars 26 on the shaft engaging said members 25. At its upper end shaft 21 is provided with a pulley 27 to which power may be supplied from any suitable source. Mounted on shaft 21 is a beveled drive wheel 28 adapted to be engaged by a friction wheel 29 which is mounted on a shaft 30 journaled in bearings 31 in a sleeve 32 eccentrically arranged in a box 33 supported from the cross members 25. Also mounted on shaft 30 is a pulley 34 which is connected to a pulley 35 by a belt 36, pulley 35 being mounted on a shaft carrying one of the rollers for the feed belt or endless conveyor 24. Sleeve 35 is capable of being rocked in box 33 by an operating lever 37 so as to move friction wheel or disk 29 into or out of engagement with the drive

wheel 28 when and as desired. With this arrangement the rate of movement of the endless conveyor 24 is entirely dependent upon the speed of rotation of rotor 19.

With the present apparatus there are a comparatively small number of parts, all of simple construction so that the initial cost of the apparatus as well as its maintenance and upkeep is exceedingly low. In producing pipe with the present apparatus and method, the sections are of uniform density and they can be produced very expeditiously. The material is so thoroughly compacted throughout the entire section that the form can be removed within a few moments after completion, thereby rendering it unnecessary to keep a large number of forms on hand and also reducing the cost of operation. The apparatus is also of a portable nature, the supporting structure being capable of being easily transported wherever desired so that the pipe can be manufactured at the point of use. It is also believed that the uniformity of density of the finished product is aided by reason of the fact that the apparatus and method include means for co-ordinating the feed of material with the rate of movement of the rotor as well as means for gradually increasing the resistance offered to the movement of the form support away from the rotor as the weight of the pipe being formed gradually increases.

It is of course understood that the concrete is actually placed and compacted by centrifugal force, said placement and compacting being the result of one mechanical effort. It might be said that the compacting is really the result of impact between the material being forcibly thrown into place, and the material previously placed.

The density of any joint or section of pipe being molded may be varied by varying the speed of the rotor, as it is upon said speed of rotor and the impact produced by the speed of material leaving the rotor the density depends, and not upon the action of the compensating counterweights as might be construed.

The monolithic construction of the completed section or joint of pipe is in itself unique, as this is accomplished in one continuous mechanical action, and assures an evenly compacted and dense pipe section throughout.

What I claim is:

1. In a concrete pipe making apparatus, the combination of a form, means for compacting concrete in said form, said form being movable away from the compacting means by the pressure of concrete placed in the form against said compacting means, and means for gradually increasing the resistance offered the movement of said form as the weight of the concrete placed in the form increases.

2. In a concrete pipe making apparatus, the combination of a form, means for compacting concrete in said form, means for yieldingly supporting the form in cooperative relation with respect to said compacting means, said form being movable away from said compacting means by the pressure of concrete in the form against the compacting means, and means for increasing the resistance offered the movement of the form away from said compacting means, as the weight of the concrete in the form increases.

3. In a concrete pipe making apparatus, the combination of a form, a rotor having a cross section conforming to the inner surface of the pipe to be produced and adapted to be inserted in said form, radially disposed vanes on said rotor, a second set of vanes on the periphery of said rotor, and means for delivering concrete to said form, said form being adapted to be moved longitudinally away from said rotor by pressure of concrete placed in the form against said second set of vanes.

4. In a concrete pipe making apparatus, the combination of a form, a rotor having a cross section conforming to the inner surface of the pipe to be produced and adapted to be inserted in said form, radially disposed vanes on said rotor, a second set of vanes on the periphery of said rotor, and means for delivering concrete to said form, said form being adapted to be moved longitudinally away from said rotor by pressure of concrete placed in the form against said second set of vanes, the width of the vanes of said second set being less than the thickness of the pipe wall.

5. In a concrete pipe making apparatus, the combination of a form, a rotor having a cross section conforming to the inner surface of the pipe to be produced and adapted to be inserted in said form, and means for delivering concrete to said rotor at a rate dependent upon the speed of rotation of said rotor, said form being adapted to be moved longitudinally away from said rotor by the pressure of concrete placed therein against said rotor.

6. In a concrete pipe making apparatus, the combination of a form a rotor having a cross section conforming to the inner surface of the pipe to be produced and adapted to be inserted in said form radially disposed vanes on said rotor a second set of vanes on the periphery of said rotor, a shaft on which said rotor is mounted, means operatively connected to said shaft for delivering concrete to said form, and means for yieldingly resisting movement of said form longitudinally away from said rotor.

7. In a concrete pipe making apparatus, the combination of a form, a rotor having a cross section conforming to the inner surface of the pipe to be produced and adapted to be

inserted in said form, radially disposed vanes on said rotor, a second set of vanes on the periphery of said rotor, a shaft on which said rotor is mounted, means operatively connected to said shaft for delivering concrete to said form, means for yieldingly resisting movement of said form longitudinally away from said rotor, and means for gradually increasing the resistance offered the movement of the form away from said rotor, as the weight of concrete placed in said form increases.

8. In a concrete pipe making apparatus, the combination of a vertically movable form, means for placing and compacting concrete in said form, means for yieldingly forcing the form upwardly so that the growing top edge of the pipe being formed bears continuously against said placing means, said last specified means including a counterpoise accurately compensating for the increase in the weight of the pipe as it is being formed, thereby providing movement of said form directly proportional to the rate of formation.

9. In a concrete pipe making apparatus, the combination of a form, a rotor having a cross-section conforming in size to the inner surface of the pipe to be produced and adapted to be inserted in said form, radially disposed vanes on said rotor, a chute for delivering concrete mix solely to the inner portions of said vanes well inwardly from the periphery of the rotor and the outer ends of the vanes, and means for turning said rotor and the vanes mounted thereon at such a high rate of speed that the mix deposited at the inner ends of the radial vanes is centrifugally hurled from the rotor and compacted radially against the internal surface of said form.

10. In a concrete pipe making apparatus, the combination of a form, a rotor having a cross-section conforming in size to the inner surface of the pipe to be produced and adapted to be inserted in said form, radially disposed vanes on said rotor, a chute for delivering concrete mix solely to the inner portions of said vanes well inwardly from the periphery of the rotor and the outer ends of the vanes, means for turning said rotor and the vanes mounted thereon at such a high rate of speed that the mix deposited at the inner ends of the radial vanes is centrifugally hurled from the rotor and compacted radially against the internal surface of said form, and means for axially moving the rotor relatively to the form to smooth the inner surface of the pipe as it is formed.

11. In a concrete pipe making apparatus, the combination of a form, a rotor having a cross-section conforming in size to the inner surface of the pipe to be produced and adapted to be inserted in said form, radially disposed upstanding vanes on said rotor, means for delivering concrete mix solely to

the center portion of the rotor and the innermost portions of the vanes, and means for turning said rotor and the vanes mounted thereon at such a high rate of speed that the mix fed to the inner portions of the radial vanes is centrifugally hurled therefrom and compacted radially against the inner surface of the form.

12. The method of forming concrete pipe which comprises providing an external form to which the outer surface of the pipe is to conform, feeding concrete mix to the center of said form completely out of contact with the form and subsequently radially projecting and uniformly distributing the centrally placed concrete mix by centrifugal action at such velocity as to completely compact it against said inner form surface without troweling.

13. The method of forming concrete pipe which comprises providing an external form to which the outer surface of the pipe is to conform, slowly feeding concrete mix into the center of the form completely out of contact with the form and progressively radially projecting said concrete mix, as fed, and uniformly circumferentially distributing the centrally fed concrete mix by centrifugal action at such velocity as to completely compact it against said inner form surface without troweling.

14. The method of forming concrete pipe which comprises providing an external form to which the outer surface of the pipe is to conform, slowly feeding concrete mix into the center of the form completely out of contact with the form and progressively radially projecting said concrete mix, as fed, and uniformly circumferentially distributing the centrally fed concrete mix by centrifugal action at such velocity as to completely compact it against said inner form surface without troweling, and automatically progressively moving said form axially at a rate directly proportional to the rate of pipe formation.

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