

Sept. 18, 1928.

1,684,858

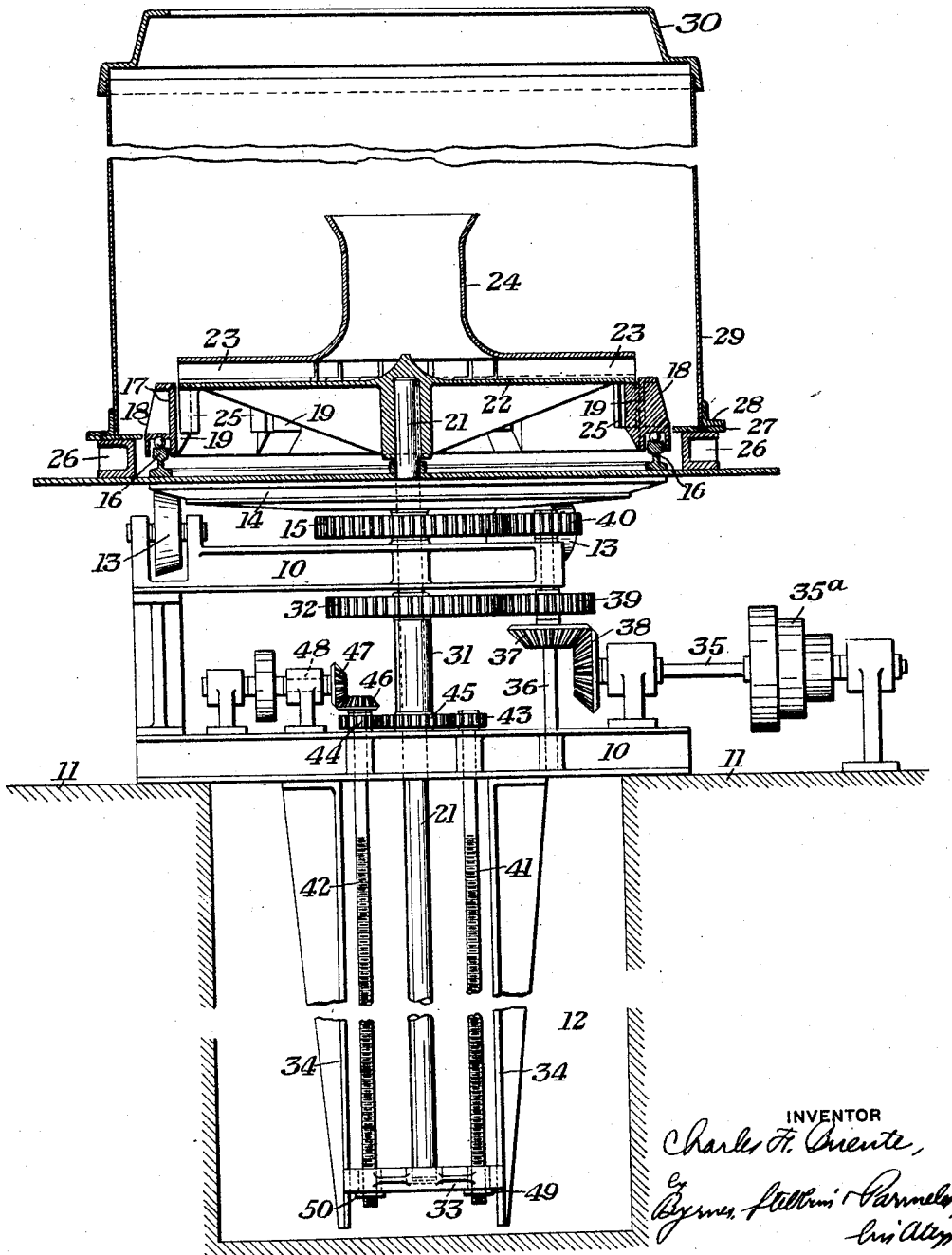
C. F. BUENTE

METHOD OF AND APPARATUS FOR FORMING CONCRETE PIPE

Filed July 25, 1923

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Fig. 1.



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Fig. 2.

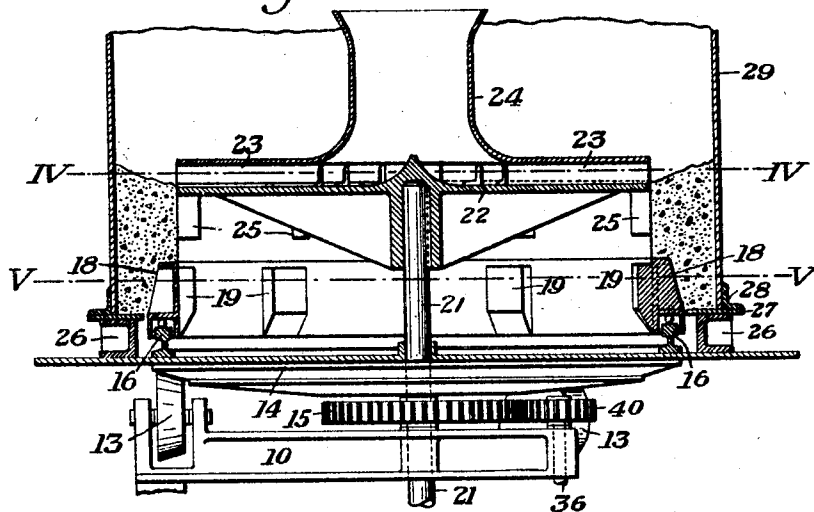
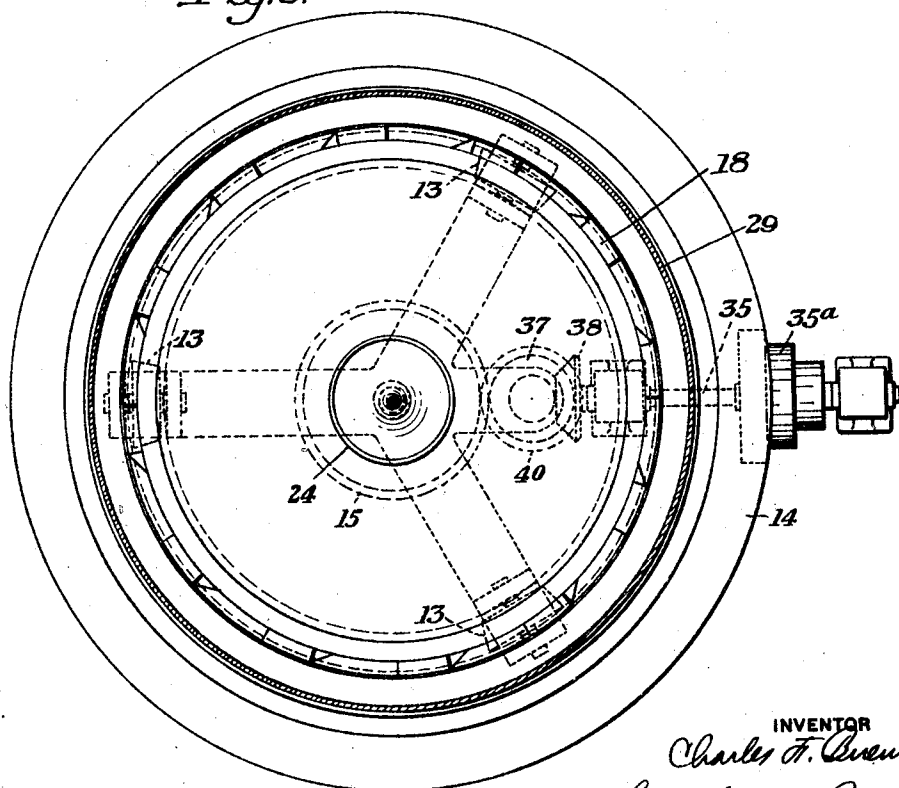


Fig. 3.



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Fig. 4.

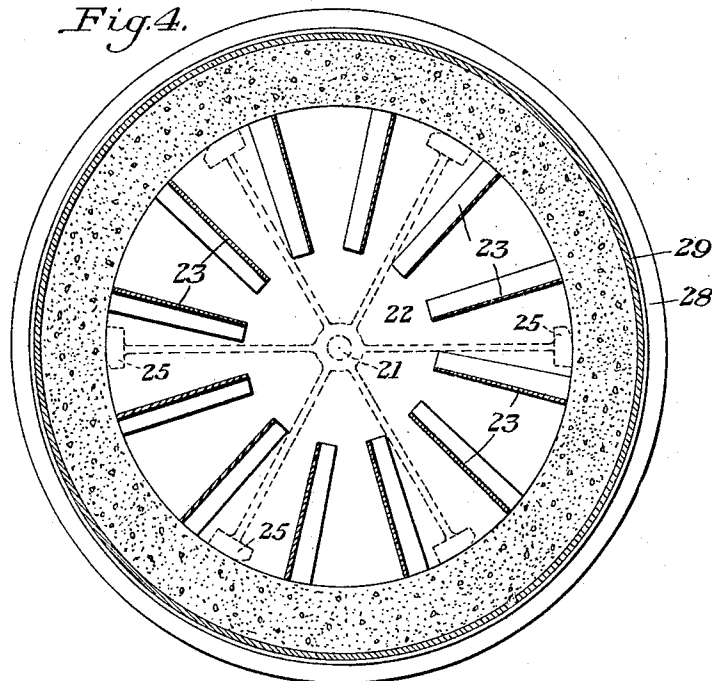
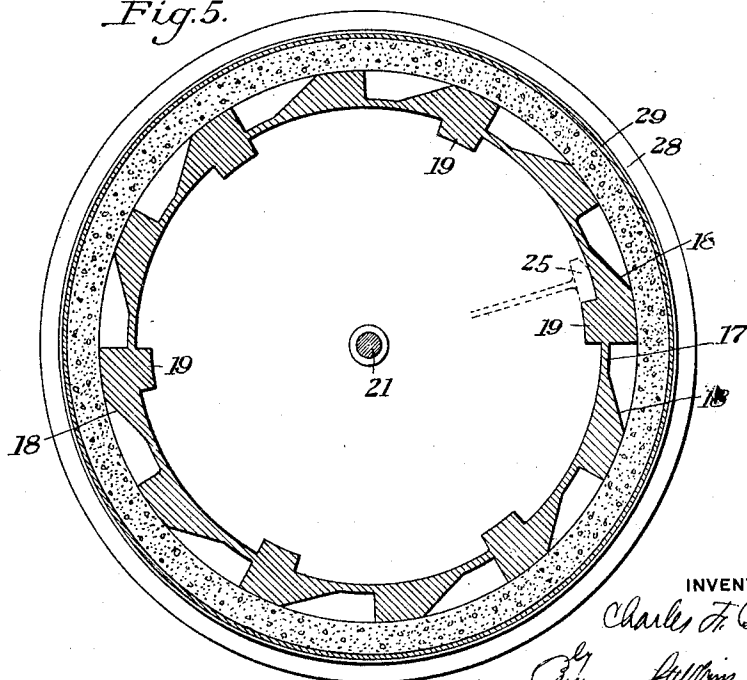


Fig. 5.



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METHOD OF AND APPARATUS FOR FORMING CONCRETE PIPE.

Application filed July 25, 1923. Serial No. 653,661.

This invention relates to an improvement in a method and apparatus for forming concrete pipe and more particularly relates to the art of forming such pipe by centrifugal force.

One of the objects of my invention is to provide a method and apparatus whereby I am enabled to avoid segregation of the heavier particles of the aggregate at the outer portions of the pipe and thus form pipe having substantially the same mix throughout the structure.

Another object of my invention is to provide means for forming pipe in which the concrete is compacted to a high degree, as well as a pipe in which the inner surfaces are troweled, so as to form a smooth inner surface.

Still another object of my invention is to form such pipe in which the inner surface of the socket end which engages the outer surface of the spigot end of the next section of pipe when laid, is troweled, while the outer surface of the spigot end of the pipe, which seats in the socket end, is formed finished.

The precise nature of my invention will be best understood by reference to the accompanying drawings, it being premised, however, that various changes may be made in the details of construction and the general arrangement of the parts, without departing from the spirit or scope of my invention, as defined in the appended claims.

In the drawings:

Fig. 1 is a vertical section through one form of apparatus built in accordance with my invention and which illustrates a form of apparatus for making pipe in accordance with my invention;

Fig. 2 is a view similar to Fig. 1 showing a portion of the device, and in which a portion of a pipe has been formed;

Fig. 3 is a plan view of the apparatus shown in Fig. 1;

Fig. 4 is a sectional view on the line IV—IV of Fig. 2; and

Fig. 5 is a similar view on the line V—V of Fig. 2.

In these drawings, the reference character 10 designates a frame or support on a suitable

foundation 11, having a pit 12. Rotatably mounted on three rollers 13 journaled in the frame 10 is a turntable 14, having a depending sleeve carrying a gear wheel 15, the hub of which rests on a bearing in the frame 10. Connected to the upper face of table 14 is an annular track 16, on which is supported a trowel or slicker 17, by means of balls interposed between the under surface of the trowel and the track 16. The slicker 17 is provided with exterior cam surfaces 18 and internal driving projections 19, for the purpose hereinafter described.

Rotatably mounted within the sleeve of the table 14 is a shaft 21, having secured to its upper end a feeder for the concrete. The feeder comprises a table 22 of circular form, the outer diameter of which is substantially equal to the interior diameter of the pipe to be formed, and connected to the upper surface of the table 22 are feed vanes 23, which extend in a generally radial direction. Supported on the tops of the vanes 23 is a feed hopper 24, which is substantially concentric with the axis of the shaft 21, and which hopper preferably extends outwardly over the tops of the vanes, as clearly illustrated in Figures 1 and 2. The bottom of the feed device is provided with a plurality of projections 25, which are arranged to engage projections 19 of the trowel or slicker, in order to drive said slicker as hereinbefore described.

Secured to the upper face of the table 14 are a plurality of chairs 26, on which is secured an annular palette 27. Connected to the upper face of the palette 27 by means of a flanged ring 28 is an annular form 29; and connected to the upper end of the annular form 29 is a flange forming ring 30. The shaft 21 extends downwardly through the sleeve of the table 14 and is arranged to rotate therein, but is splined to hub 31 of the gear wheel 32. The lower end of the shaft rests in a step bearing in a plate 33, which is arranged to be raised and lowered by mechanism hereinafter described along guides 34 in the pit 12 and which extend downwardly from the frame 10.

Rotatably mounted in suitable bearings is a power shaft 35 having a cone pulley

35 thereon, whereby the shaft 35 is driven. 36 is a vertical shaft mounted in bearings on the frame 10, and connected to the shaft 36 is a bevel gear 37, which is driven by a bevel gear 38 on the shaft 35. Connected to the shaft 36 are pinions 39 and 40, which mesh with gear wheels 32 and 15, respectively.

Rotatably mounted in bearings in the frame 10 are the upper ends of screws 41 and 42, to which are connected pinions 43 and 44, respectively. These pinions mesh with an idle gear 45, which is rotatably mounted about the shaft 21. The upper end of screw 42 is connected to a bevel pinion 46, which is in turn driven by a bevel gear 47 on a shaft 48, which shaft may be driven in any desired manner to raise and lower the feed device, as hereinafter described. The lower ends of the screws 41 and 42 extend through nuts 49 and 50 in plate 33, respectively, the arrangement being such that when shaft 48 is rotated in one direction, shaft 21 together with the feed device will be raised, and when shaft 48 is rotated in the other direction, the feed device will be lowered.

The operation of the device is as follows:

At the beginning of the formation of a pipe, the parts are in the position shown in Figure 1. The power is applied to the shaft 35, and the concrete is fed to the hopper 24, which is rotated at a sufficient speed to project the concrete outwardly against the form where it will form the pipe socket forming portion of the mold, and which pipe socket portion is then formed by the trowel or slicker 17. The slicker 17 is rotated at the speed of the feeder and differs from the speed of the form, preferably at a slower speed. After the pipe socket has been formed, the speed of the form and feeder is increased to produce a thorough centrifugal action and the concrete is projected into position against the form. After sufficient concrete has been fed to form the socket end of the pipe, power is applied to the shaft 48, rotating the screws 41 and 42 in the proper direction to raise the feed device. The concrete is fed in a continuous manner to the hopper 24, and the feed device is now raised in a continuous manner upwardly until it passes beyond the upper end of the ring 30, and as soon as projections 25 on the feed device pass above projections 19, the slicker or trowel 17 will be rotated with the table 14 and the concrete in the form 29. As the feeder moves upwardly, the concrete will be fed outwardly by the feeder, and as before stated, will be projected at a high velocity during the upward movement of the feeder.

The outer periphery of the feeder will trowel the inner surface of the pipe, so that the interior of the pipe will be formed with

a smooth surface concentric with the axis of the form.

The concrete mixture is projected outwardly by centrifugal force to its position in the mold, thus enabling the use of a relatively dry mixture, that is, a mixture having a quantity of water but slightly in excess of that required for proper hydration of the cement. Such a mixture avoids the formation of inert laitance and also avoids segregation of the coarse and fine particles of the aggregate and the cement which does occur in wetter mixes. The centrifugal action of the form further compacts the concrete and expels any excess water that may remain in the concrete to the inside of the pipe.

After the pipe has been completed, the feeder is lowered through the pipe to the position shown in Figure 1, by reversing the direction of rotation of the shaft 48. The entire form, together with the palette is then removed from the chairs, the slicker or trowel 17, however, remaining in position upon the trackway 16.

Another form and palette are then placed in position on the chairs and the next pipe is formed in the above described manner.

The advantages of my invention result from the provision of a method and means of forming pipe by centrifugal force, whereby the plastic material is positioned in the form by centrifugal force and then further compacted by the centrifugal force of the form. Still another advantage of my invention results from the provision of means for troweling the entire inner surface of the pipe, whereby I am enabled to form a socket having a smooth surface, as well as a pipe having a smooth inner surface throughout its entire length.

Of course it will be understood that the concrete is not fed in a hit and miss manner into the hopper 24, but such feed must be fast enough to supply the material required at a sufficient rate to form the pipe, but not so rapidly that the mouths of the feed ports between the ribs 23 are choked.

In some cases when forming articles having thick walls, it may be desirable to form the article in stages. In such cases the concrete is applied in layers, the last layer being smoothed by the slicker to form the inner surface of the article.

I claim:

1. The method of forming concrete articles having a circular inner surface, comprising feeding and placing plastic material into the interior of a rotating form and subjecting the material to centrifugal force within the form during the feeding thereof and before the material is influenced by the centrifugal force of the form, subjecting the placed material to further centrifugal force by the movement of the form, and troweling the in-

terior of the article after the material has been placed, substantially as described.

2. The method of forming concrete articles having a circular inner surface comprising feeding relatively dry plastic concrete material within a rotating form, placing said plastic material into the interior of the form by centrifugal force during the feeding thereof and before the material is influenced by the centrifugal force of the form, subjecting the placed material to centrifugal force by the movement of the form, moving the feeder longitudinally of the form during the forming of the article and troweling the interior of the pipe from end to end during the formation thereof, substantially as described.

3. The method of forming concrete articles comprising projecting plastic material into position within a rotating form by centrifugal force through a feeder, and moving said feeder from end to end of the article during the formation thereof, and further compacting the projected material by the centrifugal action of the form, substantially as described.

4. The method of forming concrete articles having a circular inner surface, comprising projecting plastic material into position within a rotating form by centrifugal force through a feeder, moving said feeder from end to end of the article during the formation thereof and troweling the inner surface of the article in a continuous manner from end to end of the article while the placed material is being subjected to the centrifugal force of the form, substantially as described.

5. Apparatus for forming concrete articles including a mold, a rotatable feeder having a radially extending portion adapted for imparting centrifugal force to the material, said portion terminating in a discharge opening which lies substantially at the interior face of an article formed in the mold and means for rotating the feeder.

6. In an apparatus for forming concrete pipe by centrifugal force, a mold for forming the outer surface of the pipe, a feeder, means for rotating the mold, means for rotating the feeder relative to the mold, a bell forming portion within the mold, means for rotating the bell forming portion relative to the mold, means for rotating the feeder, and means for moving the feeder longitudinally of the mold, substantially as described.

7. The method of making concrete articles in a form which includes supplying concrete material substantially centrally of the

form, dividing the material and projecting the divided portions radially by centrifugal force, and guiding the material into proximity with the form, substantially as described.

8. Apparatus for making concrete articles including a form, a feeder therein extending into proximity with the form, and means on the feeder for dividing the concrete material supplied thereto into portions, substantially as described.

9. Apparatus for making concrete articles including a form, a feeder having a table adapted to direct the material into proximity with the form, the table proximating the internal dimensions of the articles being formed, means for producing relative rotary motion between the feeder and the form, and means for troweling or slicking the interior of the formed article, substantially as described.

10. Apparatus for forming hollow concrete articles, comprising a form, means for rotating the same, a rotatable table within the form extending substantially to the interior face of an article formed in the apparatus, the table being adapted to receive plastic material and discharge it outwardly against the form, and means for moving the table and the form relative to one another in an axial direction.

11. The method of making a concrete pipe, which comprises forcibly projecting plastic concrete against the inner surface of a rotating mold and troweling the interior of the compacted mass of concrete immediately after the same has been projected against the wall of said mold.

12. The method of making a concrete pipe, which comprises forcibly projecting plastic concrete against the inner surface of a rotating mold at substantially a normal to the said surface of concrete, the concrete being applied progressively throughout the length of the mold and trowelling the interior of the compacted mass of concrete progressively with the progressive projection of the concrete against the wall of said mold.

13. The method of forming concrete articles having a circular inner surface, comprising feeding and placing plastic material into the interior of a rotating form, subjecting the placed material to centrifugal force by the movement of the form, and trowelling the interior of the article after the material has been placed.

In testimony whereof I have hereunto set my hand.

CHARLES F. BUENTE.