March 18, 1930. S. H. EDMUNDS 1,750,748

METHOD AND APPARATUS FOR MAKING ARTICLES FROM A PLASTIC SUBSTANCE

Filed Jan. 16, 1928 2 Sheets-Sheet 1

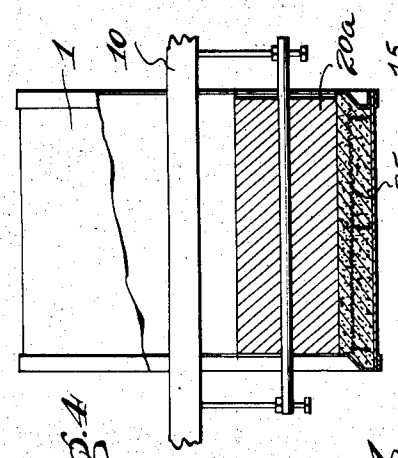


Fig. 4.

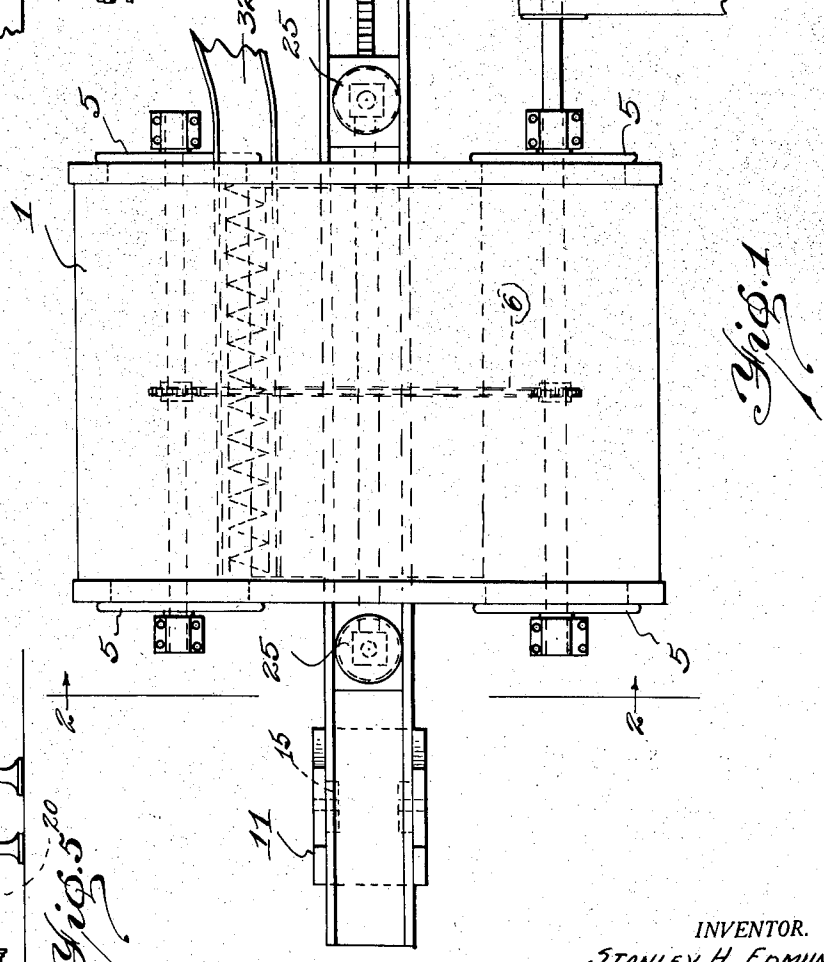


Fig. 1.

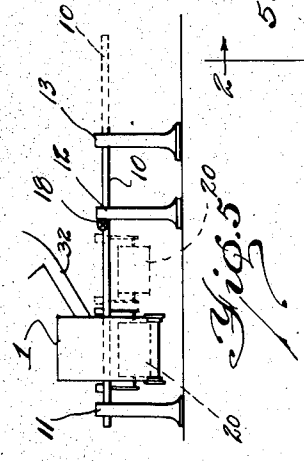


Fig. 5.

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Fig. 2

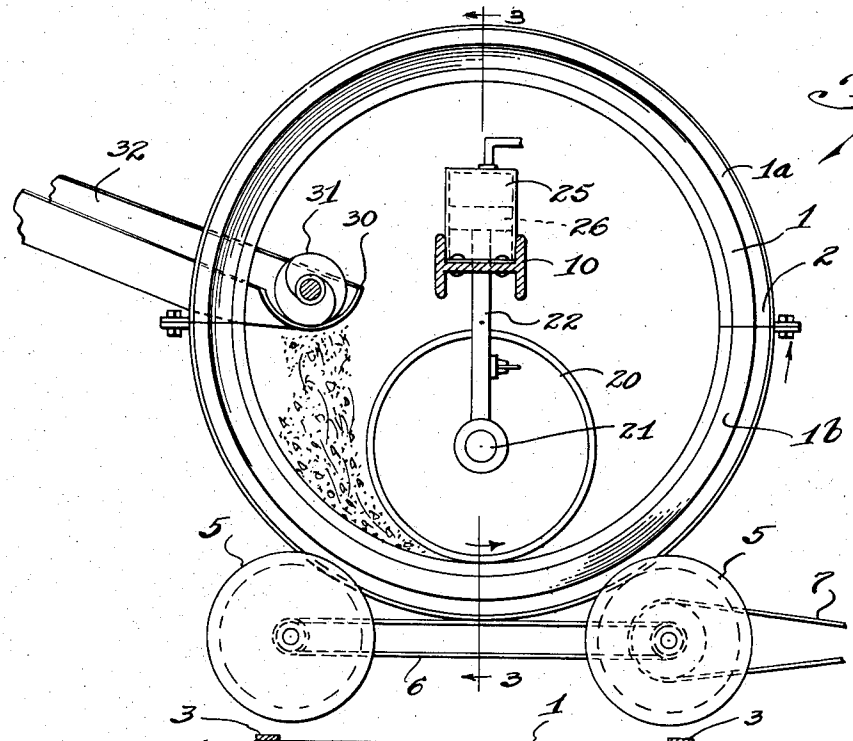
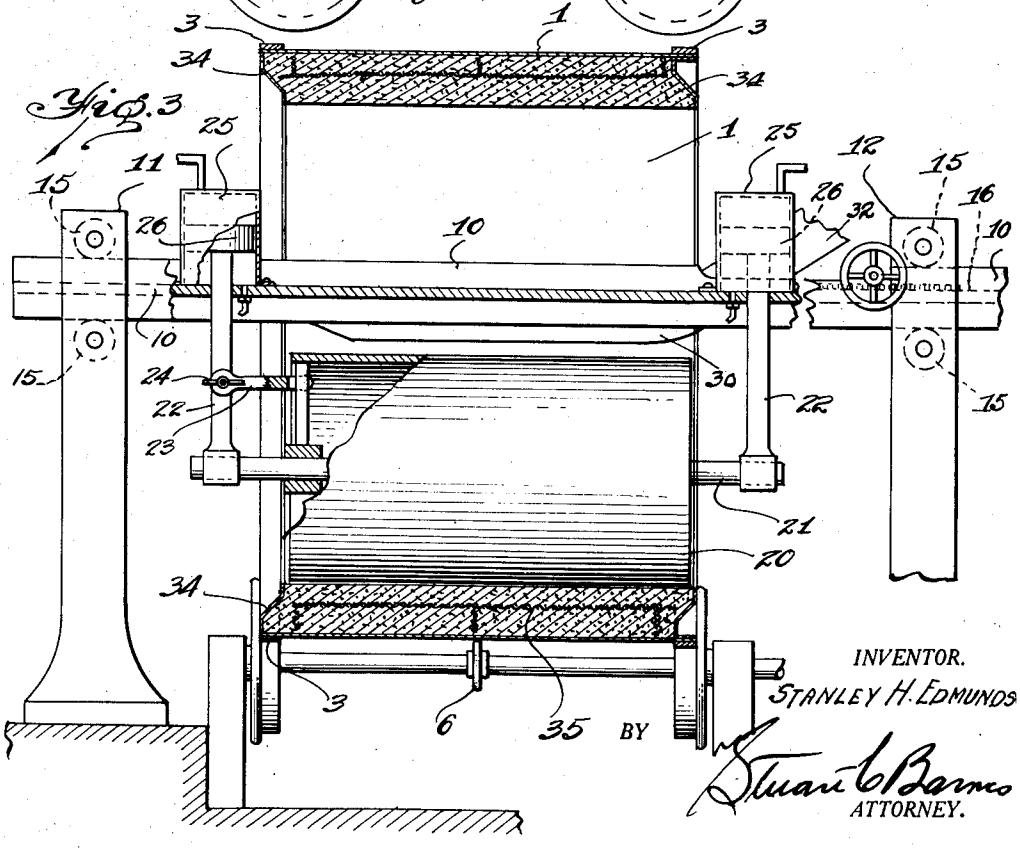


Fig. 3



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METHOD AND APPARATUS FOR MAKING ARTICLES FROM A PLASTIC SUBSTANCE

Application filed January 16, 1928. Serial No. 246,971.

This invention covers the method and apparatus for making articles from a plastic substance, and more especially the invention is concerned with the making of concrete pipe.

It has been proposed to make concrete pipe by what is known as the centrifugal method. In this method wet concrete is poured into a revolving cylinder or form which revolves with sufficient speed to hold the wet concrete out against the walls of the cylinder by centrifugal force, and the force effected is designed to be sufficient to adequately pack the concrete. Of necessity it will be seen that the cylinder must revolve at a relatively high speed. The method is objectionable because the centrifugal action separates the mix; the larger stones or gravel are forced to the outside whereas the lighter parts, such as smaller stones and the cement and also the water, are retained on the inside of the pipe. In some instances the inner layer of pipe is practically solid cement, whereas the stones or larger gravel are on the outside. It is obvious that the separation of the mix in this manner is undesirable and lessens the quality of the pipe.

Another method of making concrete pipe which has been proposed, is that wherein a cylindrical form is positioned vertically with the mix poured in at the top, and with tampers for tamping in the mix as it is poured. In this method it is necessary to use a relatively dry mix; the mix used is drier than a mix should be to produce the best results in the finished concrete article. The reason for the use of the dry mix is that a desirable, moist mix can not be tamped down by the tampers because the mix is too fluid, allowing the tampers to sink into the mix rather than tamping it down and compressing it. A concrete pipe is usually reinforced by a mesh of wire embedded in the walls, and relatively large stones catch between the tampers and the wire mesh. Thus, in the tamping method small stones are used in the mix whereas it is desirable, to produce the best results, to use some larger stones.

In the centrifugal method of making concrete pipe, there is a large amount of wear and tear on the machinery due to the high speed at which it operates. In the tamping method the action of the reicprocating tampers sets up a large amount of vibration with the result that large and heavy mechanism must be used. This makes the mechanism practically non-portable so that the pipe has to be made at a central plant.

The present invention aims to provide a method which overcomes the objections above enumerated and by means which pipe of improved quality can be made. The invention makes possible the use of relatively large stones in the mix which is desirable, and at the same time there is no separation of the mix such as there is in a centrifugal action. The apparatus is also an improved and simplified one; there is a minimum amount of wear due to the fact that there is relatively slow movement, and at the same time the apparatus is relatively portable as distinguished from the heavy apparatus required where vibrations must be overcome.

According to the invention, a cylinder is provided which in reality is a mold or form and into this cylinder the wet mix is poured. A rotational movement is given the cylinder when the mix is poured; this movement is relatively slow and not sufficient to set up any substantial centrifugal action. The cylinder is preferably disposed horizontally, and the rotative movement is just sufficient to carry the concrete around with it. During this action pressure is applied to the wet concrete so that it is compressed against the walls of the cylinder thus to compress and tigthly compact the concrete.

In the accompanying drawing:

Fig. 1 is a plan view of an apparatus constructed in accordance with the invention, showing the manner in which the revolving cylinder or form may be mounted, and showing the structure for supporting the compressing device within this cylinder.

Fig. 2 is a sectional view taken on line 2—2 of Fig. 1 showing, in end elevation, the cylinder and compressing means.

Fig. 3 is a sectional view taken on line 3—3 of Fig. 2.

Fig. 4 is a sectional view of reduced size

showing another arrangement for the concrete compressing device.

Fig. 5 is a diagrammatic view of the device illustrating the manner in which the compressing device is removed from the cylinder.

The apparatus as shown consists of a cylinder or drum 1. As shown in Fig. 2 the drum is preferably made up in two sections, 1^a and 1^b, connected by any suitable means, as at 2. The drum may advantageously be in the form of sheet steel provided at its edges with reinforcing bands 3. These bands may be permanently secured to the drum and are also divided in halves, as is the drum.

This cylinder or drum is mounted so that it can be rotated, and for this purpose it may rest upon supporting rollers 5. One or more of these rollers is rotated by any suitable means to cause rotation of the drum. Preferably, however, all of the rollers rotate, and for this purpose the shafts for the rollers may be connected by a suitable chain 6 running over sprockets, and a suitable power means, as shown at 7, is provided for driving one of the shafts. With this construction it will be noted that the drum is rotated by frictional engagement with the supporting rollers, and wherein all of the rollers are positively moved there is no substantial slippage. Positive driving means, such as gears, or chain and sprocket can be used if desired.

Within this cylinder there is disposed the concrete compressing device which contacts the surface of the concrete which forms the interior of the surface of the pipe. For this purpose a beam 10 extends through the cylinder substantially on the axis of the cylinder. This beam may be supported by suitable supporting posts 11 on one side of the cylinder, and posts 12 and 13 on the other side. This may be of the usual steel I-beam construction and mounted so that it can be removed from the cylinder. For this purpose the posts may be provided with suitable rollers 15, and the I-beam with a rack 16 engaged by a pinion 17 mounted upon a shaft carrying a hand wheel 18. This I-beam supports a roller 20 which in operating position is disposed within the cylinder, as shown in Fig. 3, the roller being mounted upon shaft 21 carried by arms 22. Mounted upon the I-beam 10 are cylinders 25 each having a piston 26 to which the supporting arms 22 are connected. These supporting arms may be in the form of piston rods or may be separate links connected to separate piston rods. This, however, is a detail of construction, and either construction falls within the invention.

Suitable hydraulic means (not shown) may be connected by suitable conduits to opposite sides of the cylinders for the purpose of controlling, and more specifically, raising and lowering the roller 20, for a purpose that will presently be brought out. The concrete may be placed within the cylinder by hand or by suitable mechanism, and as shown in Fig. 2, a trough 30 having a screw feeding means 31, is provided. A suitable chute 32 feeds the concrete into the trough. Viewing Fig. 3, it will be noted that the cylinder is provided with rings or flanges 34 on opposite sides which are shaped so as to form a concrete section of the pipe with a male and female end for connection to adjacent sections of pipe after completion thereof in the usual manner.

In carrying out the method the cylinder is set into motion with the roller 20 in position, as shown in Fig. 3. The concrete is then poured into the cylinder after the manner shown in Fig 2. Ordinarily, a concrete pipe is reinforced by a suitable wire mesh, or the like, and this is first placed into the cylinder, as indicated at 35 in Fig. 3. The cylinder is revolved at a relatively low rate of speed, which speed is just sufficient to carry the wet concrete around with it. The speed to which the cylinder is rotated will vary under varying conditions, for example in the making of pipe of different size. It has been found that a speed of about 60 revolutions per minute is sufficient for making concrete pipe having an inside diameter of 30 inches; larger pipe would require slightly greater speed, and smaller pipe could be made with decreased speed. As the operation continues, the concrete comes into contact with the roller 20, which is held in position by the hydraulic means above described, thus the concrete is compacted between the roller and the walls of the cylinder. A very solid concrete pipe is thus formed. It has been found that even where one or more intermediate layers of wire mesh are provided for reinforcing the concrete that the concrete is compressed with such a degree of force as to fill in the concrete entirely underneath this wire mesh, leaving no air pockets or spaces.

The speed at which the cylinder revolves is not sufficient to set up a substantial centrifugal force which would separate the mix. Accordingly, a desirable wet mix, including large stones, can be used and the finer particles, the cement and water, are not separated from these large stones.

In the making of the concrete pipe in this manner, it is found that the inside of the pipe is roughened a little bit. This results from the rolling of the pressure roller and lifting itself away from the concrete as it rolls. This is but a slight roughening of the inside of the pipe, but causes friction to the flow of fluid within the finished pipe. It is desirable to have the inside of the pipe as smooth as possible. In order to smooth off the pipe, the inside roller 20 may be locked against rotation by any suitable means, as, for example, the latch 23 pivotally mounted upon a rod 22. This latch may have a bifur-

cated end to engage on opposite sides of a spoke of the roller, and it may be held in place by a winged nut 24. The roller may now be raised just a slight bit by the hydraulic means so that it contacts with the inner surface of the pipe with slight pressure so that in the rotation of the cylinder it acts in the nature of a trowel and smooths off the inside surface of the pipe.

After a section of pipe has been thus formed the roller 20 may be further raised by means of the hydraulic cylinders and then may be moved out of the cylinder by operation of the hand wheel. This removes the supporting beam from the supporting post 11, but it is held in horizontal position by cantilever action by the two posts 12 and 13. This permits removal by any suitable crane or other lifting means of the cylinder, together with the completed concrete pipe so that it may be laid aside and the concrete allowed to dry and a new cylinder put into place.

A different form of device is shown in Fig. 4. In this form the cylinder and supporting beam are the same, but the variation comes in the roller 20^a which is merely a heavy roller suspended from the supporting beam. In this case the hydraulic means for effecting the compression of the concrete, is not used, but reliance is made upon the heavy roller. Very good results have been obtained by using a construction of this nature wherein the roller has a weight of approximately nine hundred pounds. This shows a very simplified construction by which the concrete pipe can be made in accordance with the method. With this construction, however, the removal of the roller must be made without lifting of the same, and this is accomplished by merely sliding the roller lengthwise out of the cylinder while in contact with the concrete. However, a suitable hand operated lifting means for the roller can be provided if the same is found to be advisable or necessary.

Thus it will be seen that the invention provides for the making of concrete pipe which overcomes the objections to the centrifugal method and the tamping method. Among the most important points which I have remedied is that there is no separation of the mix, such as occurs in the centrifugal method, and that a wet mix can be used, if desirable, whereas in the tamping method a mix too dry to obtain best results must be used.

It will also be noted that the apparatus is one which does not need to be extraordinarily heavy in order to overcome vibration or high speed, and accordingly, the apparatus can be made portable. For example, the cylinder and the associated mechanism can be mounted on a vehicle and transported to the place where the pipe is to be used, thus eliminating the necessity of transporting finished pipe from a central manufacturing plant.

It has been found advantageous to use a compression roller which was in the nature of an idler, in that it was rotated by frictional contact with the concrete, and this is thought to be preferred. However, it is within the invention to positively rotate this compression roller by any suitable power means. When operation is first started in the making of the pipe, the roller may be permitted to extend down between the flanges or rings 34, but in any event they will not extend between these flanges further than the reinforcement. As shown in Fig. 4 the roller can slide down in between the flanges by reason of the nuts on the ends of the supporting rods which permits this, and the roller is raised up gradually as the concrete fills in.

Claims:

1. The method of making an article of plastic substance, such as concrete, which comprises, utilizing a slowly moving form, pouring the concrete into the form as it moves with the concrete moving with the form independent of other support, and compressing the concrete into shape as it moves with the form.

2. The method of making an article of plastic substance, such as concrete, which comprises, utilizing a slowly moving form, pouring the concrete into the form as it moves, and compressing the concrete against the form as the form moves along a longitudinal inner circumferential line.

3. The method of making concrete pipe or the like, which comprises, employing a cylindrical form, pouring concrete into the form, and as the concrete is poured rotating the form with the speed sufficient to carry the concrete with it independent of other support but without setting up any substantial centrifugal action, and shaping the concrete as the form rotates.

4. The method of making concrete pipe or the like, which comprises, employing a cylindrical form, pouring concrete into the form, and as the concrete is poured rotating the form with a speed sufficient to carry the concrete with it independent of other concrete supporting means but without setting up any substantial centrifugal action, and compressing the concrete to form the walls of the pipe as the form rotates.

5. The method of making a concrete pipe or the like, which comprises, employing a horizontally disposed cylindrical form, pouring the concrete into the form and rotating this form with a speed sufficient only to carry the concrete around with the form as it rotates, and shaping the concrete into walls of the pipe as the form rotates.

6. The method of making a concrete pipe or the like, which comprises, employing a hori-

zontally disposed cylindrical form, pouring the concrete into the form and rotating this form with a speed sufficient only to carry the concrete around with the form as it rotates, and compressing the concrete against the walls of the form as the form rotates.

7. A method of making a concrete pipe or the like, which comprises, employing a horizontally disposed cylindrical form, pouring concrete into the form and rotating the form with a speed sufficient only to carry the concrete around with it, and compressing the concrete by a rolling action against the walls of the cylinder to shape the walls of the pipe.

8. The method of making a concrete pipe or the like, which comprises, employing a horizontally disposed cylindrical form, pouring concrete into the form while rotating the form at a relatively slow speed sufficient to carry the concrete around with the form and not sufficient to set up any substantial centrifugal action, and compressing the concrete against the walls of the form as the same rotates.

9. The method of making a concrete pipe or the like, which comprises, employing a horizontally disposed cylindrical form, pouring concrete into the form while rotating the form at a relatively slow speed sufficient to carry the concrete around with the form and not sufficient to set up any substantial centrifugal action, and compressing the concrete against the walls of the form substantially at the point where the concrete is introduced into the form and while the form is rotating.

10. The method of making a concrete pipe or the like, which comprises, utilizing a horizontally disposed cylindrical form, introducing concrete into the form, effecting a relatively slow movement of the form sufficient to carry the concrete with the form but insufficient to set up substantial centrifugal action, compressing the concrete by a roller action against the walls of the form and finishing the inside walls of the pipe by troweling the same as the cylindrical form rotates.

11. An apparatus for making a concrete pipe or the like, comprising a cylindrical form mounted for rotational movement, a compression roller within the form adapted to compress the concrete against the cylindrical form, thus to shape the walls of the pipe, and means for locking this compression roller against movement whereby the same smooths off the inside surface of the formed pipe.

12. An apparatus for making a concrete pipe or the like, comprising, a cylindrical form mounted for rotational movement, a compression roller within the form adapted to compress the concrete against the cylindrical form, thus to shape the walls of the pipe, means for locking this compression roller against movement whereby the same smooths off the inside surface of the formed pipe, and means for removing this roller from the pipe to permit change of cylindrical forms.

13. An apparatus for making a concrete pipe or the like, comprising, a cylindrical form mounted for rotational movement, a compression roller within the form adapted to compress the concrete against the cylindrical form, thus to shape the walls of the pipe, means for locking this compression roller against movement whereby the same smooths off the inside surface of the formed pipe, means for lifting this roller so that it may engage the concrete with light pressure to smooth the inside of the pipe, and means for removing this roller from the pipe to permit change of cylindrical forms.

In testimony whereof I affix my signature.

STANLEY H. EDMUNDS.