Oct. 7, 1930. J. F. NE PAGE 1,777,763

CENTRIFUGAL MOLDING DEVICE

Filed Nov. 1, 1926

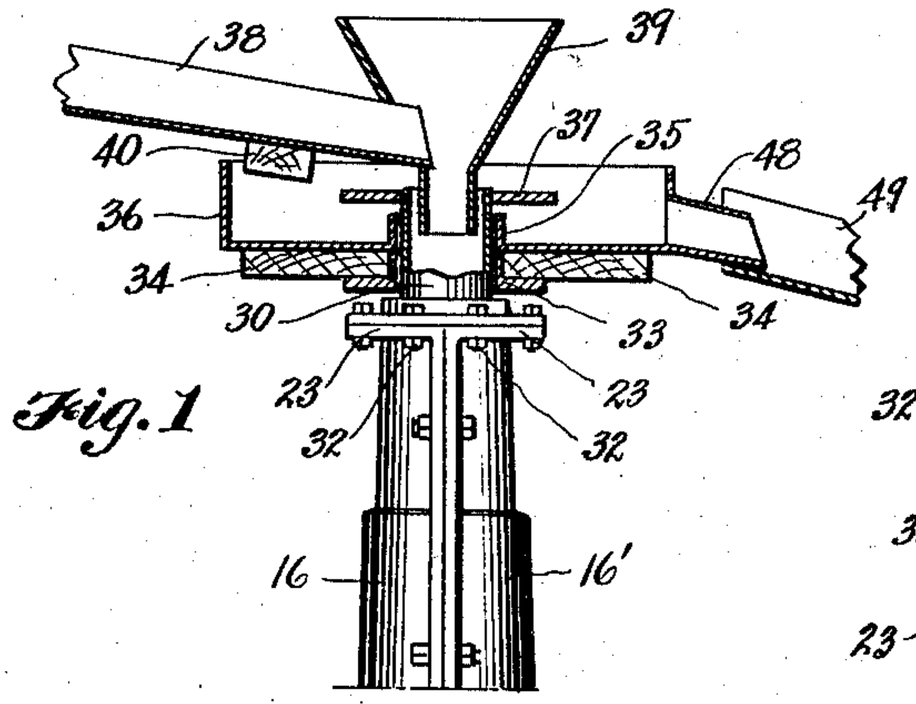


Fig. 1

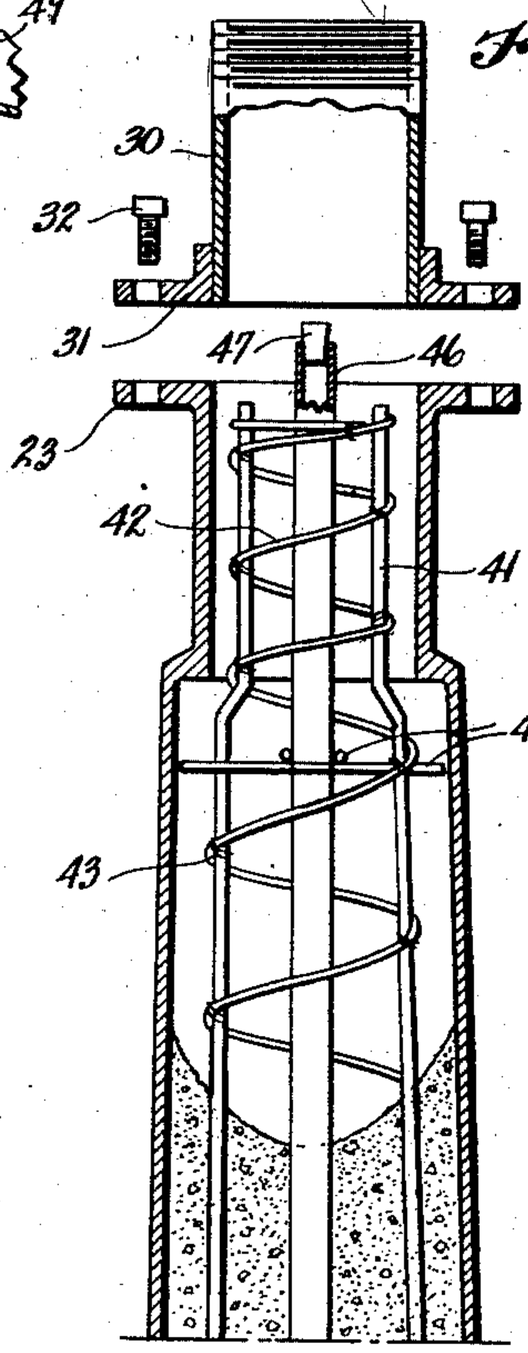
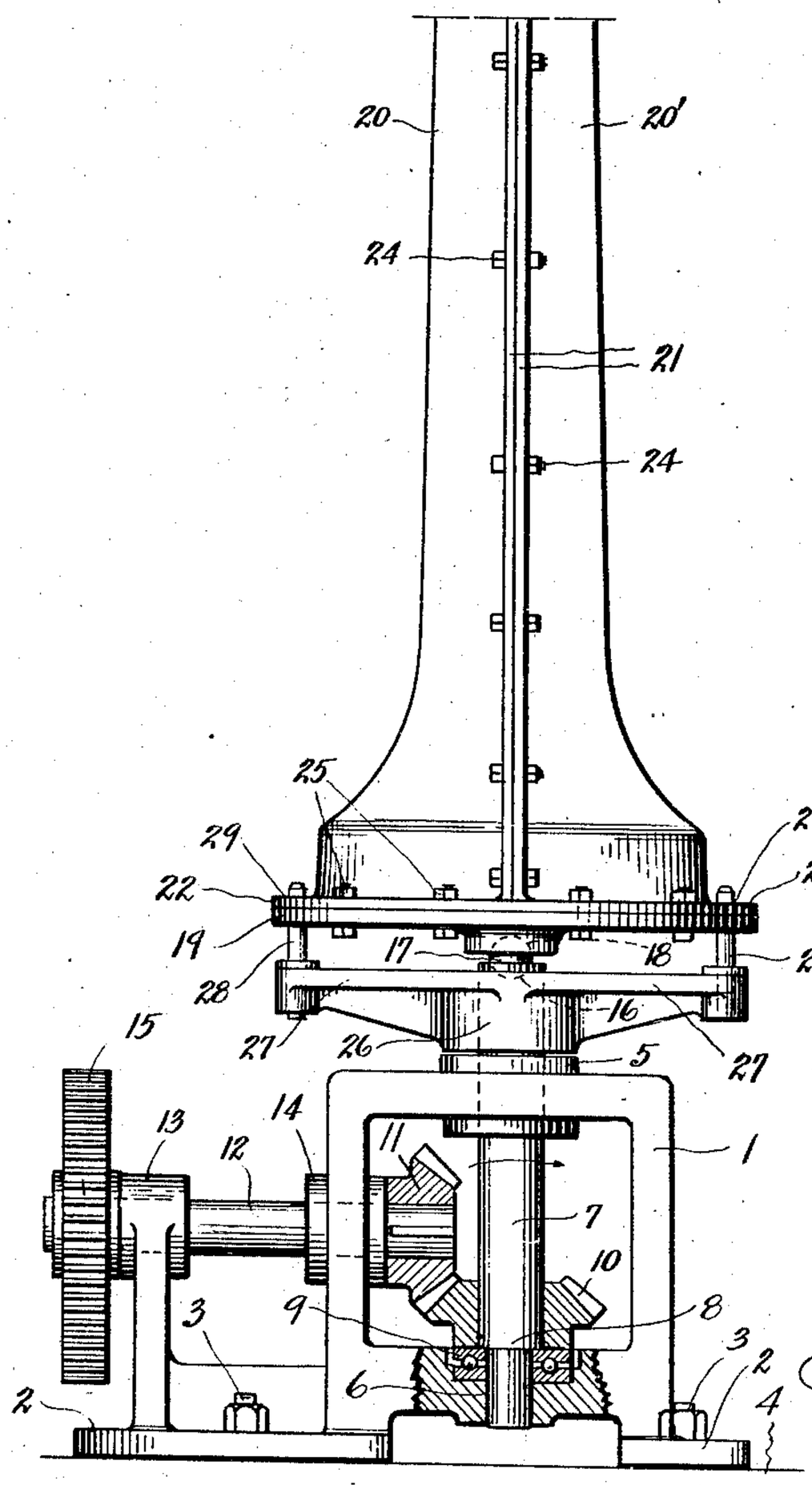


Fig. 2



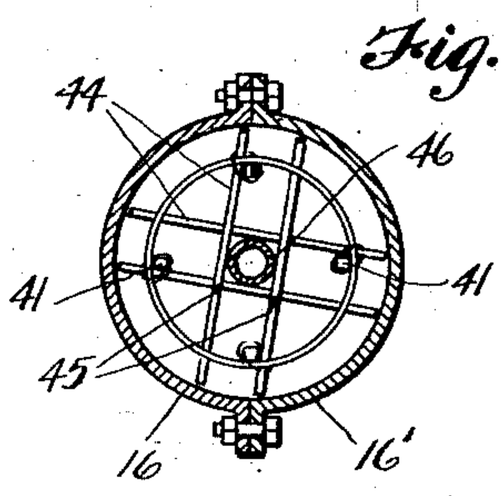


Fig. 3

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CENTRIFUGAL MOLDING DEVICE

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This invention relates to an improved method of forming concrete poles, or posts; more particularly, for forming reinforced concrete poles for supporting electric street lighting systems, and it is the object of the invention to provide means for the manufacture of poles and the like, whereby all air pockets, water, bubbles or pipings are eliminated and a dense, homogeneous, uniform article with a smooth exterior is produced.

Heretofore, where the tamping and other methods have been employed, it has been practically impossible to produce poles which were free from surface and interior defects caused by voids. Due to the fact that, in a mold of considerable length as is required for the formation of poles of the present character and especially when containing reinforcing rods, or pipes for the passage of circuit wires, tamping cannot be done with any degree of success, and consequently, excessive water and bubbles cannot be eliminated and produce the objectionable voids referred to.

The present method contemplates the use of a centrifugal molding apparatus disposed vertically, meaning any substantially upright position for carrying out the process and rotated at such speed that when concrete or other concretious material, is poured into the top of the mold at a slow rate, the excess water and air will be squeezed to the center and top as the relatively heavy material builds up in the mold and is centrifuged against the walls thus forming a basin-like depression in which the water and air bubbles, or "suds" are carried upwardly until spilled from the top of the mold.

In carrying out the process, I have provided a suitable mechanism of the centrifugal type as illustrated in the accompanying drawings, wherein—

Figure 1 is a side elevation of a molding machine suitable for this purpose.

Figure 2 is a vertical center section of the removable top journal and upper end of the mold, showing a conduit pipe, reinforcing rods, etc., and illustrating the manner in which the formative material builds up within the mold to squeeze the water and air bubbles to the center.

Figure 3 is a transverse, sectional view through the mold.

Referring more in detail to the drawings—

1 designates a frame structure provided, at its base, with laterally turned flanges 2 for receiving anchor bolts 3 whereby the frame may be fixed to any suitable foundation, as designated at 4. The frame comprises upper and lower bearings 5 and 6 in which a shaft 7 is rotatably mounted; the shaft being reduced in diameter near its lower end to provide a downwardly facing shoulder 8 that seats upon a thrust bearing 9.

Fixed on the shaft 7, between bearings 5 and 6, is a bevel gear wheel 10 that is adapted to be driven by a bevel gear 11 mounted on the end of a drive shaft 12. The shaft 12 is supported horizontally in bearings 13 and 14 and may be driven by any suitable means, such as through the spur gear as indicated at 15.

The upper end of shaft 7 is cupped to form a seat 16 for a hardened steel ball 17 which provides a universal bearing for mounting the mold, coaxial with the shaft by means of cupped seat 18 in the base plate 19 of the mold; whose sides are made up of a plurality of complemental side sections 20 and 20′ having vertical flanges 21, bottom flanges 22, and top flanges 23. Bolts 24 passing through flanges 21 are used to assemble the side sections and form tight vertical joints. Base plate 19 is securely fastened to flanges 22 by means of bolts 25.

A torque member having a hub 26, radial arms 27 and torque pins 28, is fixedly mounted near the upper end of shaft 7. Torque pins 28 pass through easy fitting apertures 29 in base plate 19 and flanges 22, and serve to rotate the mold about its vertical axis; the upper end of the mold being maintained in a substantially true vertical position by means of a tubular top journal 30, having a flange 31 secured by bolts 32 to top flanges 23, and rotatively mounted in bearing 33 supported by suitable cross members 34 that, in turn, are removably fastened to a tower-like struc-

ture (not shown) which is adapted to facilitate the work of the operator.

Tubular journal 30 is made of sufficient length to project through a loose fitting cylindrical aperture provided in the bottom of a discharge basin 36 removably supported by cross members 34. A horizontally disposed, internally threaded, annular disc 37 is screwed onto the threaded top of journal 30, after discharge basin 36 is placed in position, the several parts functioning as hereinafter described. A trough 38 having a funnel-like end 39 and suitably supported, as at 40, is used to facilitate pouring the fluid concrete into the mold.

This construction permits the use of molds of various lengths and greatly facilitates the carrying out of the process. The ball universal bearing, supporting the mold, and the torque pins greatly reduce the time required to mount the mold over former methods, and assure the smooth operation of the apparatus even when there is considerable variation in the coaxial alinement of the axis of shaft 7 and axis of the mold.

The mold sections may be constructed to form poles of a wide variety of designs having circular, hexagonal, fluted or other cross sectional shapes. The mold here shown, for simplicity, has been made of circular cross section.

If the poles are to contain vertical reinforcing bars 41 and spirals 42, as illustrated in Figures 2 and 3, these are assembled preferably as a unit by means of tie wires 43, two or more sets of cross rods 44, welded at their junction points 45, being used to position the reinforcement centrally in the mold. A conduit pipe 46 to carry electric circuit wires may also be located centrally of the mold by means of cross rods 44 as shown. The reinforcement unit and conduit are preferably placed within the mold prior to securing the mold sections together. Plugs or corks 47 are used to close the ends of the conduit until after the concrete is set.

The rotation of the mold is preferably opposite to the direction traced in following down the spiralling of the reinforcement, as indicated by the arrow across the near side of shaft 7 for the spiral reinforcing illustrated in Figure 1. This has been found to facilitate the process in the elimination of voids, by working the concrete downward as it enters the mold.

In carrying out the process, the mold and apparatus are assembled as illustrated in Figure 1 and the mold rotated at a suitable speed by means of an electric motor or other motive power (not shown), while fluid concrete, or other material, is poured slowly into the mold.

Means (not shown) are provided whereby the operator may adjust the speed of rotation of the mold to such value that the solids build up within the mold in the form of a basin resembling a vertical paraboloid into which the air bubbles and excess water, or suds, are squeezed as the solids are centrifuged against the walls and settle at the center of the mold. Much care is taken during the pouring process to prevent the trapping of air or excess water by too rapidly pouring in the material; and the paraboloidal basin is maintained by proper speed control for the various diameters. As the concrete rises within the mold, the suds are spilled from the tubular top journal 30 over annular disc 37, from which it is centrifuged into discharge basin 36 and from there flows away from the apparatus through spout 48 and trough 49. In this way, top journal 30 and bearing 33 are effectively protected from the suds which are conducted to a desirable point of discharge. After the mold is thoroughly filled the rotation is stopped, trough 38 is removed and disc 37 is unscrewed, thus permitting the removal of bearing 33 and its supports 34 preparatory to removing the mold from the rotation apparatus by a crane or other suitable means. Tubular journal 30 is then taken off by removing bolts 32 and the concrete smoothed off level with flanges 23, thus exposing the end of conduit pipe 46. After the material has sufficiently set, bolts 24 and 25 are removed and the mold sections stripped from the finished article.

The centrifuging of fluid concrete with the mold is so effective in precipitating the solids that the "suds" spilled from the top do not contain even a practicable amount of cement.

It has been found by following out the steps of the above described process that poles and posts may be made that are absolutely free from surface or interior voids, and checks; and that the exterior follows faithfully the contour of the mold, thus making it commercially practicable to manufacture concrete street lighting standards of any desired design.

Having thus described my invention, what I claim as new therein and desire to secure by Letters-Patent, is:

1. The process of manufacturing poles, or the like, which consists in mounting a mold vertically for axial rotation, slowly pouring a concretious material into the upper end of the mold while it is rotating at such speed so as to cause the material to build up within the mold in the form of a basin.

2. The process of manufacturing poles, or the like, which consists in mounting a mold vertically for axial rotation, slowly pouring a concretious material into the upper end of the mold while it is rotating at such speed as to cause the material to build up within the mold in the form of a paraboloidal basin in which the excess water squeezed from the

material will be carried upwardly and finally spilled from the top of the mold, then stripping the mold from the pole after the material has set.

3. The process of manufacturing poles containing a longitudinally disposed conduit pipe, which consists of mounting a mold vertically for axial rotation, placing a conduit pipe axially within the mold and pouring a concretious material into the upper end of the mold while it is rotated at such speed as to cause the material to build up within the mold in the form of a paraboloidal basin and then removing the mold from the pole after the material has set.

4. The process of manufacturing reinforced poles containing a longitudinally disposed conduit pipe which consists of mounting a mold vertically for axial rotation, placing a conduit pipe axially within the mold, placing reinforcing members within the mold, filling the mold with a concretious material poured slowly into its upper end as the mold is rotated at such speed as to cause the material to build up about the pipe in the form of a paraboloidal basin, then stripping the mold from the pole after the material has set.

5. The method of manufacturing poles of the character described containing spiral reinforcement which consists of placing the spiral reinforcement in a mold, mounting the mold vertically for axial rotation, slowly pouring a concretious material in the mold into the upper end as said mold is rotated opposite to the direction traced by following down the spiralling of the reinforcement.

6. A device of the character described comprising an upright mold adapted to be filled through its upper end, a universal bearing axially alined with and on which the mold rests, an alinement bearing for the upper end of the mold, and means for rotating the mold.

7. A device of the character described, comprising a vertical, revolubly driven shaft, an upright mold adapted to be filled through its upper end and supported at its lower end concentrically on the upper end of said shaft through the intermediacy of a universal bearing, an alinement bearing for the upper end of the mold and means fixed to and extending laterally from the shaft and operatively connected to rotate the mold with the shaft.

8. A device of the character described comprising a vertical, revolubly driven shaft, an upright mold adapted to be filled through its upper end having its base mounted centrally on the upper end of said shaft through the intermediacy of an interposed universal bearing, an alinement bearing rotatably containing the upper end of the mold, a torque arm fixed to the shaft and pins on the arm engaging the base of the mold to cause it to be rotated with the shaft.

9. A device of the character described comprising a vertical revolubly driven shaft, an upright mold having its base centrally supported on the upper end of said shaft through the intermediacy of a universal bearing, a torque arm fixed to the shaft, pins extended upwardly from the arm and engaging the base of the mold to cause it to rotate with the shaft, an upper frame structure having a cylindrical opening forming an alinement bearing, a tubular journal extending coaxially from the upper end of the mold and rotatably contained in said bearing and adapted to receive the material therethrough for filling the mold.

10. A device of the character described comprising a vertical, revolubly driven shaft, an upright mold having its base centrally supported on the upper end of said shaft through the intermediacy of a universal bearing, a torque arm fixed to the shaft, pins extended upwardly from the arm and engaging the base of the mold to cause it to rotate with the shaft, an upper frame structure, a discharge basin mounted by said upper frame structure and having a cylindrical aperture forming an alinement bearing, a tubular journal mounted on the upper end of the mold and extending rotatably through said alinement bearing and adapted to receive the material therethrough for filling the mold.

11. A device of the character described comprising a vertical, revolubly driven shaft, an upright mold having its base centrally supported on the upper end of said shaft through the intermediacy of a universal bearing, a torque arm fixed to the shaft, pins extended upwardly from the arm and engaging the base of the mold to cause it to rotate with the shaft, an upper frame structure, a discharge basin mounted by said upper frame structure and having a cylindrical aperture forming an alinement bearing, a tubular journal mounted on the upper end of the mold and extending rotatably through said alinement bearing and adapted to receive the material therethrough for filling the mold and an annular disk mounted on the upper end of said journal.

12. A device of the character described comprising a vertical, revolubly driven shaft, an upright mold having its base centrally supported on the upper end of said shaft through the intermediacy of a universal bearing, a torque arm fixed to the shaft, pins extended upwardly from the arm and engaging the base of the mold to cause it to rotate with the shaft, an upper frame structure, a discharge basin mounted by said upper frame structure and having a cylindrical aperture forming an alinement bearing, a tubular journal mounted on the upper end of the mold and extending rotatably through said alinement bearing and adapted to receive the material therethrough for filling the mold,

an annular disk mounted on the upper end of said journal and means for feeding a concretious material into the mold through the tubular journal.

13. The process of forming poles of the character described, which consists of mounting a mold vertically for axial rotation, preparing a mixture of concrete having a high water-cement ratio to render the mixture excessively fluid, pouring the mixture into the mold while the latter is rotated at such speed as to cause the material to build up within the mold in the form of a paraboloidal basin in which the excessive water squeezed from the material will be carried upwardly and finally spilled from the top of the mold.

Signed at Seattle, Washington, this 27th day of August, 1926.

JUSTUS F. NE PAGE.