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O. TUERCK ET AL

PROCESS AND APPARATUS FOR MAKING CONCRETE PIPE

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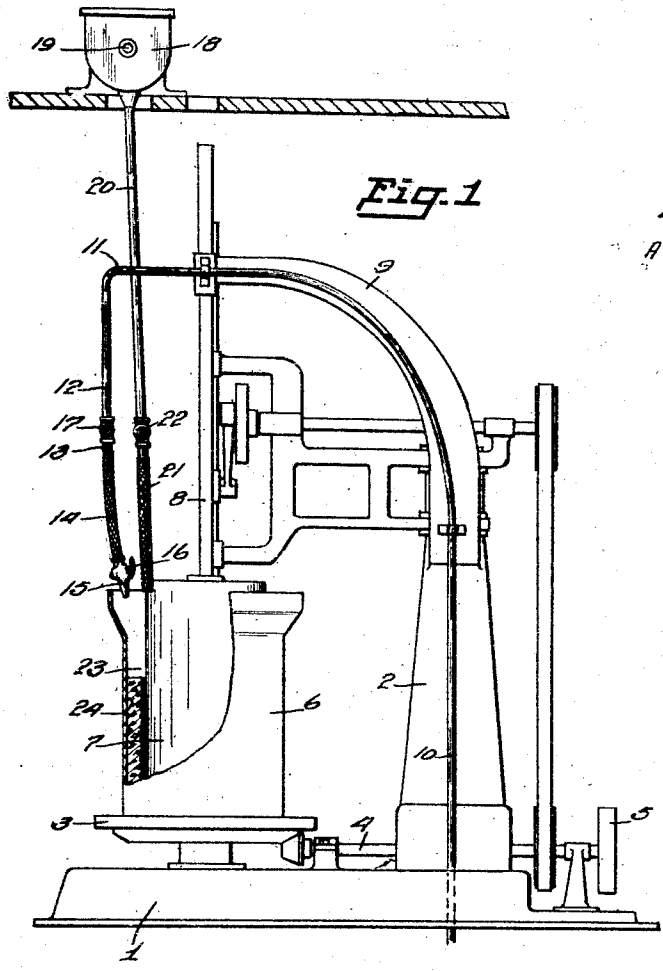


Fig. 1

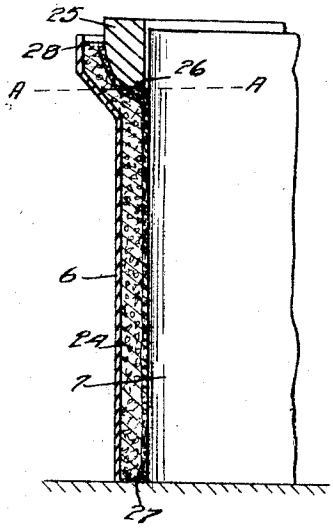


Fig. 3

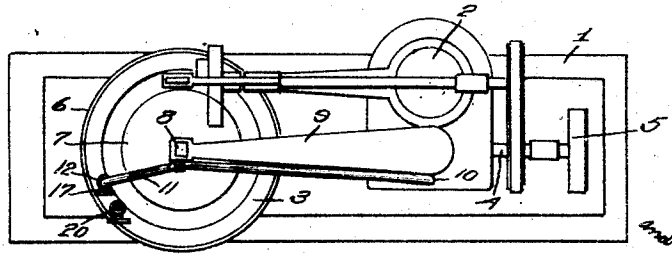


Fig. 2

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UNITED STATES PATENT OFFICE.

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PROCESS AND APPARATUS FOR MAKING CONCRETE PIPE.

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This invention relates to improved processes and apparatus for forming concrete pipe and has for its principle object to provide a novel method of molding concrete pipe of superior quality throughout capable of withstanding all ordinary handling in its formative stages and which will be provided with a closer-grained, floated or troweled inner surface having increased density and impermeability particularly adapted for conduits of liquids under pressure, such as is necessary in irrigation work and for sewers.

It is the further object of our invention to provide a method of making pipe having walls of plastic concrete material of relatively dry mixture to render it firm and stable to better withstand the ordeal of removal of the mold and yard-handling in its green states and to form said pipe with an inner, integral lining of wetter or richer mixture due to the application of water to the inner pipe-mold or core and which penetrates the pipe-wall to some extent under the relative movement of the pipe and the core.

It is the further object of the invention to supply a mixture of thin, neat cement to the interior of the pipe being formed or to particular parts of the pipe requiring additional strength or perfection, or to the entire mixture forming the body of the pipe, thus giving into the hands of the operator in control of the pipe-making machine complete mastery of the conditions entering into the pipe structure and admitting of his correcting certain adverse conditions of the material supplied to the machine without shut-down of the machine or delay.

Other objects and advantages of the invention, and objects relating to improved effects obtained by our invention in improved quality of the pipe produced; its especial adaptation for the production of pipe having high resistance to seepage or penetration; avoidance of scouring and undue wear upon the core; obtaining stronger and more perfect pipe-ends both at the bell- and spigot-ends; prevention of high temperatures and the reduction of friction between the pipe and the core whereby burning of the pipe is avoided and larger sizes of pipe may be made with the same expenditure of power as hitherto; these and other objects and incidental advantages will be readily apparent in the course of the detailed description to follow.

The accompanying drawings illustrate by way of example apparatus of my invention adapted to carry out our invention, in which:

Figure 1 is a view in side elevation of a concrete pipe making machine incorporated with which is the apparatus for carrying out our invention, partly broken away.

Fig. 2 is a plan view of the same.

Fig. 3 is a view in cross section of a pipe-mold and partially completed pipe therein illustrating the process.

The apparatus by which our process may be carried out may be described as follows: Referring to said views, the reference numeral 1 indicates the base of a machine for forming concrete pipe and 2 a vertically disposed standard rigid with said base. 3 indicates a turntable rotatably mounted upon said base and actuated through a shaft 4 by power applied through a pulley 5. A sectional mold 6 of cylindrical configuration is supported upon said turntable to rotate therewith. A non-rotatable core 7 is rigid with a square shaft 8 and is movable vertically into concentric relation within said mold. The upper end of shaft 8 is slidably supported in the outer end of an arm 9 rigidly secured to the standard 2.

A pipe 10 connected to a source of water supply under pressure is supported upon the standard 2 and the arm 9 from whose outer extremity it is extended, as at 11, to overlie the outer perimeter of the largest sizes of pipe made upon the machine and is thence directed vertically downward at 12 terminating in a fitting 13 to which a relatively short length of flexible hose 14 may be attached. The portion 12 of said pipe is positioned outwardly of the core 7 so that it will not interfere with the vertical movements of the core. A spray-nozzle 15 is connected to the lower end of the hose 14 and is provided with a self-closing valve therein of any suitable type, not shown, which may be actuated by depressing an external lever 16 to open said valve and emit a finely divided spray of water. A shut-off valve 17 may be included in the pipe-portion 12.

Conveniently located above the machine a mixing container 18 is positioned having a rotatable mixing device 19 therein. A pipe

20 leads from the bottom of said container downwardly within proximity of the lower end of the pipe 12 where a short flexible hose 21 is connected. A valve 22 in the pipe 20 is positioned within convenient reach of the operator.

Our new process and method of forming concrete pipe may be described as follows: The concrete mixture to form the body walls of the pipe is prepared in the usual way in mixing apparatus, not shown, wherefrom the supply is controlled by the operator. Such mixture is combined with sufficient water to make what is usually termed a "dry mix", that is, enough moisture is provided therein to cause the cement to set but containing little water over that necessary amount.

With the turntable and exterior mold in rotation with the core 7 held stationary the said mixture is allowed to pour into the annular molding space 23 and is mechanically tamped in the usual manner. The operator then manipulates the spray-nozzle 15 and directs a spray of water against the upper end of the core 7 which runs downwardly thereon in a thin film and mingles with the concrete mixture that adjoins the surface of the core.

The pipe material 24 being tamped and molded into a pipe section rotates with the mold and the water thus caused to flow downwardly and spread over a considerable area of the core is taken up by the concrete, being absorbed evenly throughout the revolving mass of relatively dry material to a relatively slight depth depending upon the quantity of water used. The depth of penetration of the water will be regulated by the operator in the amount of water used which will be spread and distributed evenly about the pipe and to a uniform depth. The water is thoroughly and evenly incorporated into the mixture by the movement of the forming pipe relative to the core-surface and the disturbance thereby caused in the material next to core-surface. Such material being given an additional amount of water as described is more plastic and admits of this disturbance or mixing effect being more active and results in a more finely troweled, close-grained texture upon the inner surface of the pipe than would otherwise be the case.

As the top of the pipe is approached and at or about the level of the pipe as formed when the bell-core 25 is to be placed, as indicated by line A—A of Fig. 3, the top of the pipe-material is sprayed with water or with the neat cement from the pipe 20 or with both water and the cement mixture through which two results are obtained. After such spraying upon the horizontal surface of the material the bell-core is placed in position and being secured to the core 7 remains stationary and works upon the wet material thereunder to form a clean-cut, well-worked shoulder 26 which is strong and perfect to make a good connection with the spigot end of the adjoining pipe-section when laid in a conduit. Again, the addition of water or cement solution at the lower end of the bell of the pipe lends an element of added strength at this region where fracture is sometimes experienced.

In the container 18 a relatively thin, neat mixture of cement and water is mixed and maintained which flows by gravity through the pipe 20 and hose 21 and is applied by the operator in the same manner as heretofore indicated with respect to the use of water. At his discretion the core-wall may be sprayed with the cement mixture in place of water and he may incorporate a portion of this richer mixture in certain portions of the pipe as it is being made to increase the tensile strength of certain parts that may be more subject to strain or damage. For instance, it may be applied to the base of the bell-portion of the pipe, as has been described, or at the spigot end 27 and in finishing the extreme upper end 28 of the pipe.

It will be seen that a pipe formed by our process is provided with a body wall of relatively firm, dry material as a base capable of withstanding the strains of handling and stripping from the mold while in its raw state to the best advantage and given while in the process of formation an inner lining homogeneous therewith of wetter consistency which is worked and troweled into the surface material by its rotating movement against the core. The fine grained texture of such interior surface extending into the pipe from one-eighth to a quarter of an inch in depth provides a pipe especially adapted for irrigation and sewer purposes in being sufficiently impervious to water to withstand the highest tests of permeability and pressure.

Labor and manufacturing costs are reduced in that the pipe is more easily handled after stripping from the mold as the drier mixed material forming the outside of the pipe will not easily lose its shape under usual conditions. Stripping from the mold is more easily accomplished than when the exterior of the pipe is relatively wetter and suction is thereby produced.

The present process admits of the operator in actual charge of the pipe-making controlling practically all of the conditions in the manufacture of the pipe including the mixture of the material. The cement body material of the pipe may be supplied with a water content at or near the minimum and he can apply the additional water into the body material as it is fed into the mold if in his judgment added water would be desirable.

The provision of a water spray to be

worked into the inner superficial area of the pipe and against the core causes the pipe to be more easily turned against the core and affords a saving in power and admits of larger pipe sizes being formed upon a given machine. It also reduces the abrasion of the material against the core and results in a considerably longer life of the core with a consequent reduction in cost and repair of the machine. Also the danger of overheating or "burning" the pipe by the friction developed between a dry mixture and the core is entirely obviated as the friction is reduced to a minimum and can be controlled by the amount of water used. At the present time sewer pipe and irrigation pipe are often given an interior coating of cement laid on by hand after removal from the machine to give a smooth, inner surface of greater impermeability.

Having described our invention, what we claim, is:—

1. The herein described process of making concrete pipe, consisting in depositing concrete material within a mold having a revolving outer part and a stationary core, and spraying the core with water to combine with the rotating concrete material next the core-surface.

2. The herein described process of making concrete pipe, consisting in depositing concrete material within a circular mold and against a concentric core, revolving the outer mold and concrete material deposited therein against the relatively stationary core, and spraying the core with water to combine with the rotating concrete material next the core surface.

3. The herein described process of making concrete pipe, consisting in forming a concrete pipe section between a revolving outer mold and a stationary core, revolving said pipe-section against the core, and wetting the interior surface of the pipe in contact with the core as the pipe is formed.

4. The herein described process of making concrete pipe, consisting in forming a concrete pipe-section by depositing concrete material containing a minimum amount of water within a revolving mold and against a stationary core, and spraying the core with water to combine with the concrete material next the core surface.

5. The herein described process of making concrete pipe, consisting in depositing a relatively dry concrete mixture within a revolving mold to rotate therewith against a stationary core, and wetting the interior surface of the pipe in contact with the core with water as the pipe is formed.

6. The herein described process of making concrete pipe, consisting in depositing relatively dry concrete material within a revolving mold and against a stationary core, spraying the core with water to combine with the concrete material next the core surface, and supplying additional water to other selected portions of the pipe-section as the same is being formed.

7. The herein described process of making concrete pipe, consisting in depositing concrete material within a circular mold and against a concentric stationary core, and applying a thin mixture of neat cement and water to the exterior of said core to combine with the material rotating with said mold and against the core.

8. In a concrete pipe-making machine, including a frame, a turntable, a circular mold upon said turntable, and a stationary core in said mold, of means to spray said core with water.

9. In a concrete pipe-making machine, a frame, a turntable, a circular mold upon said turntable, and a stationary core in said mold, of a pipe to convey water from a source of supply under pressure, a flexible hose connected at one end to said pipe, and a self-closing spray-nozzle at the opposite end of said hose.

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