

No. 857,584.

PATENTED JUNE 25, 1907.

J. M. BOYLE.

APPARATUS FOR AND METHOD OF MOLDING HOLLOW OBJECTS FROM CEMENT.

APPLICATION FILED JAN. 23, 1907.

Fig. 1.

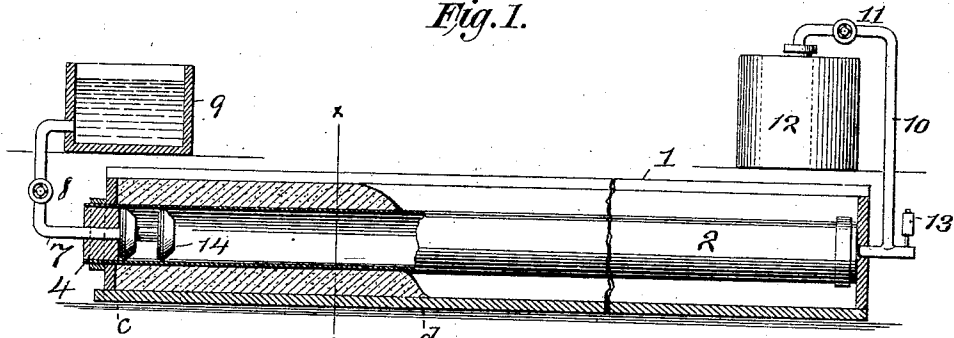


Fig. 2.

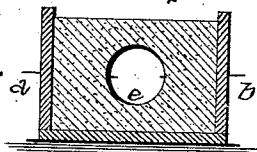


Fig. 3.

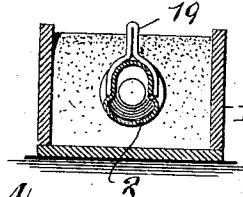


Fig. 4.

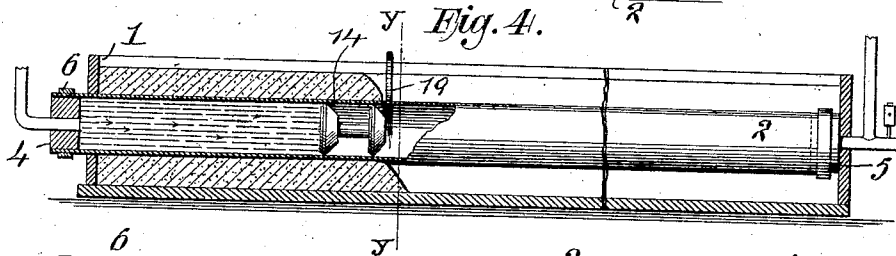


Fig. 5.

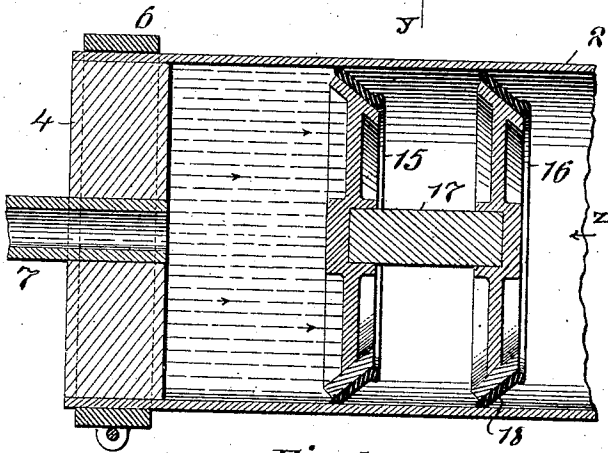
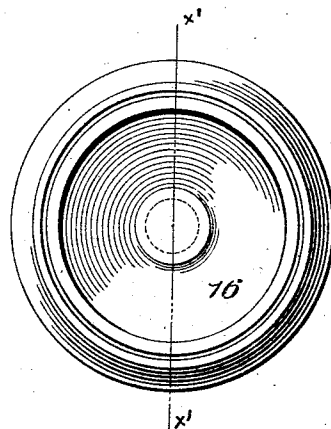


Fig. 6.



WITNESSES:

*Gushakovitch.*

*Edwin H. Britten.*

INVENTOR

*James M. Boyle*

BY *Paul Benjamin*  
his ATTORNEY

# UNITED STATES PATENT OFFICE.

JAMES M. BOYLE, OF NEW YORK, N. Y., ASSIGNOR TO MONOLITHIC DUCT COMPANY, A CORPORATION OF NEW YORK.

APPARATUS FOR AND METHOD OF MOLDING HOLLOW OBJECTS FROM CEMENT.

No. 857,584.

Specification of Letters Patent.

Patented June 25, 1907.

Application filed January 23, 1907. Serial No. 353,695.

*To all whom it may concern:*

Be it known that I, JAMES M. BOYLE, a citizen of the United States, residing at New York, in the county of New York and State of New York, have invented a certain new and useful Improvement in Apparatus for and Methods of Molding Hollow Objects from Cement, of which the following is a specification.

The invention relates to a monolithic conduit or like hollow object molded upon a fluid distended core of flexible material, substantially as set forth in U. S. Letters Patent No. 830,204, granted to me September 4, 1905.

The invention consists in the method and apparatus hereinafter described, whereby the conduit is molded in successive sections upon a continuous gas distended flexible core, and as each section is completed, liquid under pressure is admitted to the portion of the core embedded in said section to replace the gas.

In the accompanying drawings—Figure 1 is a vertical longitudinal section showing a mold, a core therein, and means for supplying gas and liquid under pressure to opposite ends of said core and also illustrating the initial position of the traveling piston. Fig. 2 is a section on the line  $x x$  of Fig. 1. Fig. 3 is a section on the line  $y y$  of Fig. 4. Fig. 4 is a section similar to Fig. 1, showing the position of the traveling piston after liquid has been admitted to so much of the core as is embedded in the completed conduit section. Fig. 5 is an enlarged section on the line  $x' x''$  of Fig. 6, of one end of the flexible core showing the construction of the traveling piston, and Fig. 6 is an end elevation of the piston taken in the direction of the arrow  $Z$ .

Similar numbers of reference indicate like parts.

In making the monolithic conduit to which my present invention relates, I preferably first place in a suitable mold, for example, as the trough or box 1, a bed of the chosen material measuring in depth about one-half the thickness of the completed conduit; or up to the line  $a b$ , Fig. 2. The length of the bed is to be a fraction of that of the entire conduit, represented by the distance  $c d$ , Fig. 1. In this bed, by any suitable means, I form a semi-circular groove  $e$ , for the reception of the fluid distended core 2 of flexible material, and then, upon said core and the bed al-

ready formed, I apply further cement to complete the conduit. After the cement has hardened sufficiently to retain its shape, the core may be removed, so that the cross section of the finished conduit will be as shown in Fig. 2.

The present invention has more particular reference to the making of the conduit in successive lengths or sections.

The mold or trough 1 may be of indefinite length. The core 2 may be of an impervious flexible material, such as rubber coated fabric. It is closed at both ends by any suitable plugs 4, 5, held in place by clamping rings 6. The interior of the core at the end at which the construction of the conduit is to begin, is connected to any source of liquid supply, (preferably water) under pressure. Thus, to illustrate, in Fig. 1 the pipe 7 provided with valve 8 connects the interior of the core with the elevated water tank 9. At the other end the interior of the core is connected to any source of gas, preferably air, under pressure. Again to illustrate in Fig. 1, the pipe 10 provided with valve 11 connects the interior of the core with the compressed air tank 12. In an extension of pipe 10 is arranged any suitable form of air relief valve 13, set to blow off when the air pressure in the core exceeds that normally established. Within the core is a traveling piston 14 here shown as composed of two beveled disks 15, 16, connected by an axial bar 17 and provided on their peripheries with elastic packing 18 to form a tight joint with the core wall.

The operation is as follows: The bottom bed of cement being laid, and the receiving groove formed therein, the piston 14 is inserted into the open end of core 2 and the plug 4 is secured in place. The valve 8 being closed, the valve 11 is opened. The core then becomes distended with compressed air from tank 12, and is placed in its groove in the already laid bed of cement, as already described. The additional cement to bring the conduit to the desired thickness is then applied. The conditions will then be as shown in Fig. 1: that is to say, a section of the conduit of the length  $c d$ , has been completed, and another and following section is to be made. The core is filled out with compressed air only and the traveling piston 14 is held by the air pressure against the plug 4.

It is now desirable to substitute water for air as the distending medium of the core, in so much of the core as is embedded in the section of the conduit just completed, the object being to avoid leakage of fluid through the fabric of the core, which would occur if air were left therein during the making of the succeeding conduit sections. As is well known a compressed gas will penetrate pores in a fabric which are substantially impervious to water. Further, if the core be kept filled with liquid during the setting of the cement a smoother surface on the interior of the conduit is obtained than when air is used. I first produce in the core and at the end of the section already completed, a constriction. Any convenient way of doing this may be adopted. One way is to use a fork 19, as shown in Fig. 3, straddling the core and compressing it between its arms. The valve 8 is now opened, and as the liquid is to be at a pressure greater than that of the air, it drives the piston 14 in front of it, causing said piston to travel onward until the constriction in the core caused by fork 19 is reached. Any excess pressure of air in the core ahead of the piston and due to the movement thereof will be relieved at the relief valve 13. The water will then be sealed in the completed section by the piston, and the next section of conduit will be made in the manner already described. When it is completed, a constriction will be produced at the end of the section as before, and the fork 19 being removed, the incoming water will drive the piston again forward until the new constriction is reached. In this way, the core of each conduit section will be filled with water under pressure as that section is formed.

It is, of course, to be understood, that the drawings do not show proportions of parts. The core, for example, represented in Figs. 1 and 2 may be several hundred feet in length, and made in twenty foot sections in the manner described, one after the other. The shape of the traveling piston and its relative dimensions as here shown are not essential, since obviously they may be varied in many ways, without altering the result achieved.

In practice, the distended core is no obstacle to the laying of the cement bed for sections after the first, as it can easily be lifted to one side of the other of the mold. After the last section is completed, the end plug 4 is removed and the water allowed to escape from the core, while the removal of the end

plug 5 allows of the piston 14 being taken out by hand.

I claim:

1. In an apparatus for the manufacture of hollow objects, conduits and the like, from plastic material capable of hardening, a tubular distensible core of flexible material and means for filling a predetermined length of said core with liquid under pressure and the remainder of said core with gas under pressure.

2. In an apparatus for the manufacture of hollow objects, conduits and the like, from plastic material capable of hardening, a tubular distensible core of flexible material, means for filling said core with gas under pressure and means for filling a predetermined length of said core with liquid under pressure and simultaneously expelling the gas therefrom.

3. In an apparatus for the manufacture of hollow objects, conduits and the like, from plastic material capable of hardening, a tubular distensible core of flexible material, means for admitting to one end of said core gas under pressure and means for admitting liquid under pressure to the other end of said core.

4. In an apparatus for the manufacture of hollow objects, conduits and the like, from plastic material capable of hardening, a tubular distensible core of flexible material, a piston movable in said core, means for admitting gas under pressure to one end of said core and means for admitting liquid under pressure to the other end of said core.

5. The method of making a monolithic conduit which consists in first, embedding a gas distended core of flexible material in a body of externally molded cement, forming a section of the conduit; second, admitting liquid to said embedded core to expel said gas and simultaneously sealing said liquid in said section; third, embedding a new length of said gas distended core in cement to form an immediately succeeding section; fourth, removing the seal and admitting said liquid to expel the gas from said new section and sealing said liquid therein; and so on until the desired length of conduit is completed.

In testimony whereof I have affixed my signature in presence of two witnesses.

JAMES M. BOYLE.

Witnesses:

JEANNIE HASTIE,  
GERTRUDE T. PORTER.