

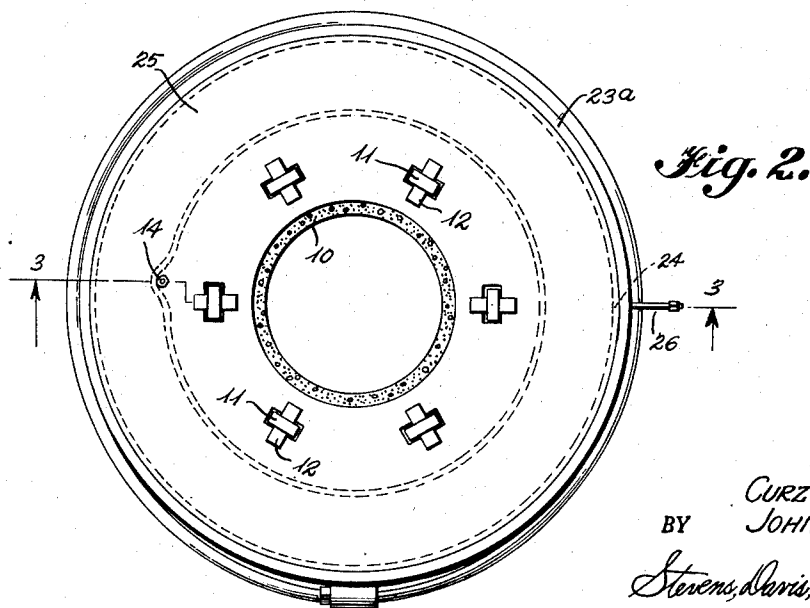
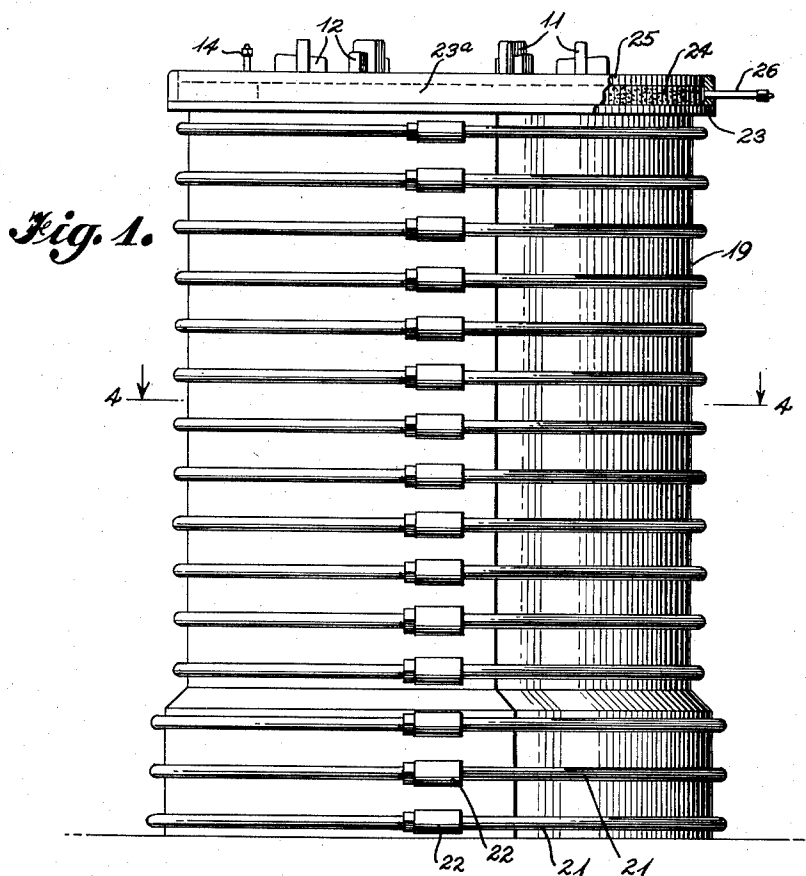
Dec. 25, 1951

J. M. CROM ET AL
CONCRETE PIPE MOLD

2,579,801

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2 SHEETS—SHEET 1



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2 SHEETS—SHEET 2

Fig. 3.

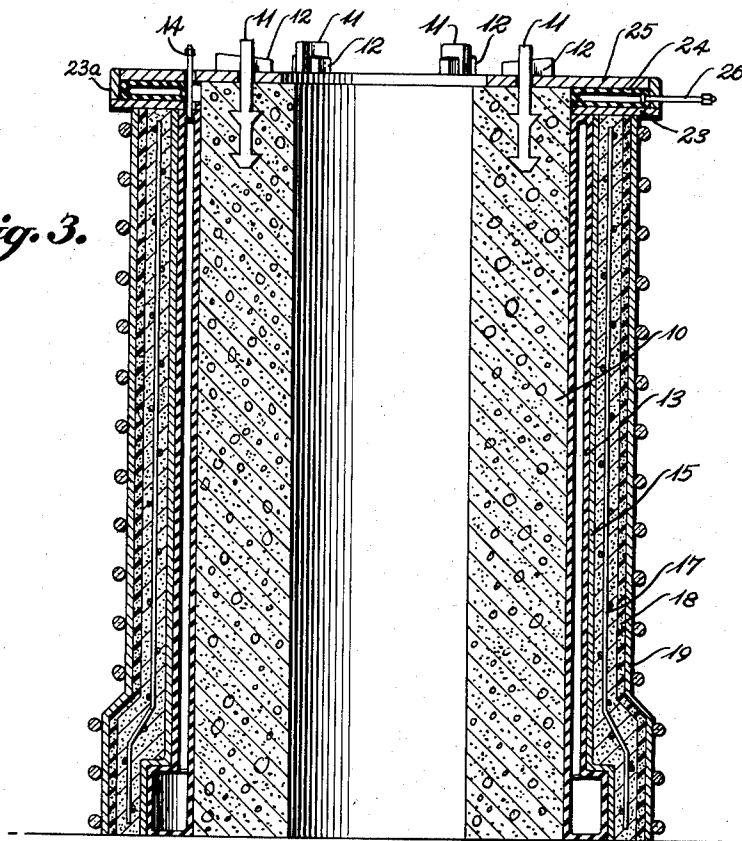


Fig. 4.

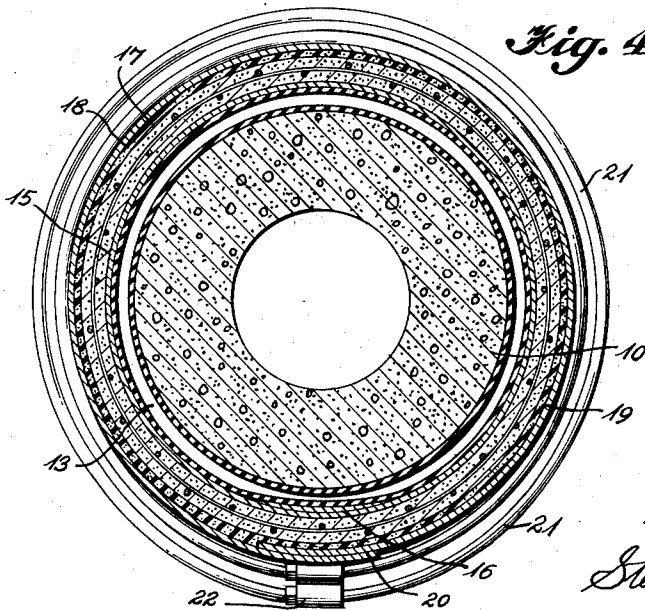
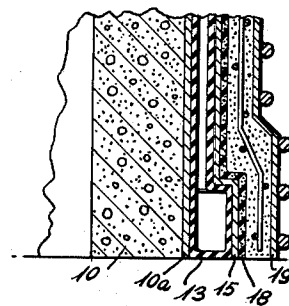


Fig. 5.



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CONCRETE PIPE MOLD

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6 Claims. (Cl. 25-127)

1

This invention relates to the manufacture of concrete pipe sections capable of withstanding relatively high internal pressures and which pipe is dense, non-porous and of generally high quality.

As concrete pipe has come into greater use for the carrying of fluids under pressure, it has become more and more important that the sections of which this pipe is comprised be non-porous so that they will not leak, very smooth on the inside surface, and able to resist high internal pressures without cracking.

Two interesting methods of manufacturing high strength concrete pipe having these general characteristics have been proposed. Eugene Freyssinet proposed in United States Letters Patent No. 2,048,253 to pour concrete around reinforcing material in a rather complicated mould, to put this concrete under pressure to force excess water therefrom and cause the concrete to take on some of the characteristics of a solid, and thereafter to expand the mould, thus pressing the concrete and reinforcement outward so as to pretension the reinforcing material. Freyssinet proposed to hold the concrete pipe section in this expanded condition until it set, thus forming a dense concrete pipe containing reinforcing material under tension. The idea and the product were quite good but the apparatus required was extremely complicated and expensive and it was necessary to form such pipe sections in a well-equipped factory rather than at the location where the pipe sections were to be used.

Frank L. Fitzpatrick in United States Letters Patent No. 2,395,216 suggested another method and apparatus for accomplishing a similar result. According to this method and apparatus, reinforcement was placed in a cylindrical shell and concrete spun into position within that shell to form a concrete pipe containing reinforcement. With this concrete solidified sufficiently so that it would hold its form, the shell and the concrete pipe inside of it were placed on end, an expansible pressure chamber was placed inside of the pipe and the space between the pressure chamber and the pipe was filled with sand. Thereafter pressure was applied to the expansible pressure chamber, pressing the sand outwardly against the inner surface of the pipe, and any excess water forced out of the concrete was absorbed in the sand. The outer shell was then relaxed slightly so that the pipe could be expanded and the reinforcement pretensioned by pressure of the expansible pressure chamber. The pipe was held in this position until the concrete in it set. Again

2

this method and apparatus required complicated equipment for it was necessary to spin the outer shell to form the pipe originally and hence it was necessary to manufacture such pipe in a factory rather than on location. Furthermore, the pressing of the sand against the inner surface of the pipe tended to roughen the inner surface of the pipe and hence make the pipe less desirable.

It is an object of this invention to provide a simpler and more easily constructed equipment for the manufacture of concrete pipe sections of this general type.

It is an object of this invention to provide an apparatus for the manufacture of concrete pipe sections of this general type which apparatus is capable of manufacturing very high quality pipe sections of this type and which apparatus is capable of use in the field, that is, at the location where the pipe sections are to be used.

According to this invention, the apparatus required for the construction of pipe sections is formed around a cylindrical core that may be constructed on any suitable flat surface, either in doors or out. This cylindrical core is surrounded by a collapsible fluid-tight core bag, of rubber or some other flexible material, which is in turn surrounded by an expansible metal shell, or inner form, which will eventually form the inside mould for the pipe section. Around this metal shell and spaced from it to provide for the reception of the reinforcing material and concrete which is to form the pipe section, is an outer shell, also expansible and also, generally, of metal. Around this outer shell or as a part of this outer shell are arranged suitable retaining means for holding this outer shell against expansion and releasing it for slight expansion as desired.

Between the outer shell and the inner shell, either against the outer shell or against the inner shell is positioned a porous or foraminous blanket that serves to permit the escape of water from the pipe undergoing formation. At the top of the two shells is positioned a sealing ring that prevents the escape of concrete upwardly and on top of the central form is fastened a retaining ring that serves to hold the sealing ring in place. Between the retaining ring and the sealing ring is an expansible fluid-tight sealing bag that can be inflated to press the sealing ring tightly into position, thus sealing the upper end of the mould. Appropriate openings, of course, are provided for the escape of water from the porous blanket and for a fluid supply tube to supply fluid to the core bag which expands to press the pipe section outwardly.

In operation, the core bag, the inner expandible form, the reinforcing material, usually in the form of a preassembled cage, the porous blanket and the outer form are first assembled on the inner core. The mould thus assembled is then filled with concrete, the sealing ring, the sealing ring expandible bag, and the retaining ring, are then assembled into position and the sealing ring expandible bag is inflated to seal the mould. Thereafter, the core bag is inflated to put the concrete under pressure, excess water drains from the concrete into or through the porous blanket, the outer form is relaxed slightly while pressure is maintained on the core bag, and the concrete pipe is thus expanded and the reinforcement in it prestressed. The concrete pipe is then allowed to remain in this position until it has set after which the necessary parts are stripped from the inner core and the concrete pipe section removed.

Further details and advantages of this invention will be apparent from the following detailed description of the preferred embodiment thereof. This embodiment is illustrated in the drawings in which Figure 1 is an elevational view; Figure 2 is a top view; Figure 3 is a sectional elevational view taken on lines 3—3 of Figure 2; Figure 4 is a sectional plan view taken on lines 4—4 of Figure 1; and Figure 5 is a fragmentary elevational view in section, similar to a portion of Figure 3 but showing a modification of the construction illustrated in Figures 1 to 4.

As illustrated in Figures 1 to 4, inclusive, the apparatus of this invention is constructed about a cylindrical concrete core 10 which, for the purpose of conserving concrete, may be made hollow. In the top of this core are cast a series of eye members 11 into which wedges 12 fit for the purpose of fastening the retaining ring in position.

Surrounding the core 10 is a core bag 13 usually of rubber or rubberized fabric and this core bag 13 is provided with an inlet 14 for the air, water or other fluid. Surrounding the core bag 13 is an expandible inner form or diaphragm 15 which as can be seen in Figure 4 is overlapping at one point 16 in its circumference to provide for expansion. If desired, this expandible inner form can be overlapped at several points in its periphery for this purpose and suitable means can be provided for holding various sections slidably together. Surrounding the expandible inner form 15, as illustrated in Figures 3 and 4 is a reinforcing cage 17 which is preferably preformed before being placed in the mould. Around the reinforcing material 17 is a foraminous or porous blanket 18 which is shown in Figures 3 and 4 as fastened to the inside of an outer form 19. This outer form 19 is also expandible and is shown in Figures 4 as overlapping at 20. This outer form also may be made overlapping at two or more points and appropriate arrangements may be made to hold the parts slidably together. Around the outside of the outer form 19 are shown a series of retaining rings 21 joined at their ends by turn buckles 22.

On top of the inner and outer forms 15 and 19 is placed a retaining ring 23, on top of this retaining ring 23 is placed an annular sealing bag 24 and on top of the sealing bag 24 is placed a metal retaining ring 25 held under the wedges 12 in the eye members 11. Around the sealing bag 24 and resting on the retaining ring 23 is placed a cylindrical bag retaining ring 23a. The

sealing bag 24 is preferably of the expandible bag type and has a fluid inlet 26.

The porous blanket 18 is an important part of this invention for it forms a simple and expedient means for the elimination of excess water from the concrete of the pipe sections. One material that has been found quite satisfactory for this purpose is a multipore rubber that contains from around 1,000 to around 7,000 holes per square inch which holes are an average diameter of from around .001 to around .01 inches. In some instances, it is desirable to back this material with a relatively fine wire mesh to provide vertical and horizontal passages through which water may escape and it is possible to use other porous materials either alone or similarly backed by wire mesh. The pores of the material, however, should be small enough so that they will not easily be clogged by cement particles and numerous enough so that the water can easily escape through them. Thus, ordinary wire mesh for example is not satisfactory by itself, although it can be used when it is covered by some very fine porous material. The pores should, apparently, in all instances be no larger than .01 inch and preferably they should be even smaller.

When the porous blanket lies next to the outer form, the outer form can be perforated to provide for the escape of water therethrough or this water can be permitted to drain to the bottom of the porous blanket and openings of sufficient size provided there to permit its escape. When the porous blanket lies next to the inner form, as it does in Figure 5, openings for the escape of water are preferably provided at the bottom of the porous blanket.

As illustrated in Figure 5, the core 10 is surrounded by a core bag 13 as before and this core bag is surrounded by an expandible inner form 15 as before, but in this figure the inner form is surrounded by the porous blanket 18 instead of having the porous blanket lie adjacent the outer form 19 as in Figures 1 to 4, inclusive. Also in Figure 5, the inner concrete form 10, is shown as surrounded on its outer face by a cylindrical steel sheath 10a. The anchors 11 may be formed integral with the upper end of this sheath instead of imbedded in the concrete as shown in Figure 1, or may be attached to the upper edge of this sheath although made separately.

Generally, it will be desirable to cement or otherwise attach the porous blanket to the form next to which it lies and will usually be desirable also to cement or otherwise attach the core bag to the inner core.

Numerous other modifications will immediately be apparent to those skilled in the art and such modifications are intended to be within the scope of this invention and the appended claims. For example, apparatus of this invention may obviously be used to form poles or other solid cylindrical objects by omitting the inner core 10, and providing external hold-down means for the cover plate 25.

What is claimed is:

1. Apparatus for the manufacture of concrete pipe sections that comprises an expandible inner core, said core including an expandible fluid-tight bag surrounded by an expandible metal diaphragm, an outer mould capable of withstanding internal pressure but relaxable to permit limited expansion, a foraminous blanket affixed to an inner surface of the mould formed by the core and the outer mould, and a removable sealing

5

member for sealing the core and the outer mould member at one end.

2. Apparatus as defined in claim 1 in which the foraminous blanket is affixed to the expansible core.

3. Apparatus as defined in claim 1 in which the foraminous blanket is affixed to the outer mould.

4. Apparatus for the manufacture of concrete pipe sections that comprises an expansible inner core, an outer mould capable of withstanding internal pressure but relaxable to permit limited expansion, a foraminous blanket affixed to an inner surface of the mould formed by the core and the outer mould, and a removable sealing member for sealing the core and the outer mould member at one end, said sealing member being removably held in position by an expansible sealing bag and the expansible sealing bag being held in position by a retaining member removably fastened to the mould core.

5. Apparatus as defined in claim 1 further characterized in that the expansible inner core includes a cylindrical concrete member sur-

6

rounded by the said fluid-tight expansible bag that is in turn surrounded by the said expansible metal diaphragm.

6. Apparatus as defined in claim 1 further characterized in that the outer mould form comprises an expansible steel shell and relaxable means for controlling the expansion of the expansible steel shell.

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