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HYDRAULIC PIPE.

APPLICATION FILED FEB. 9, 1905.

928,233.

Patented July 13, 1909.

2 SHEETS—SHEET 1.

Fig. 1.

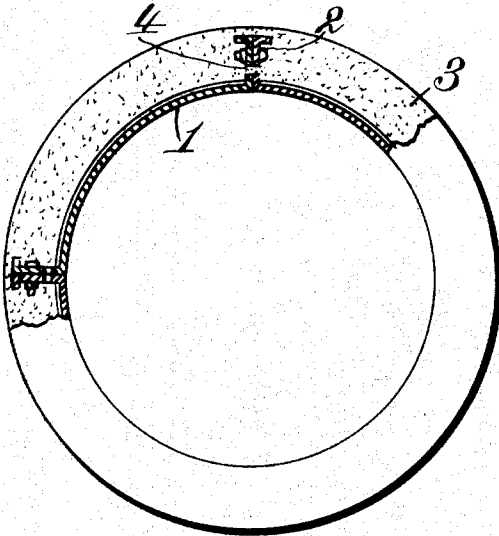


Fig. 2.

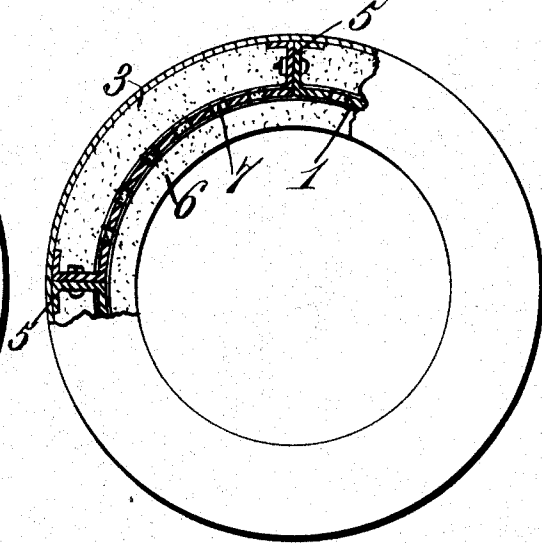


Fig. 3.

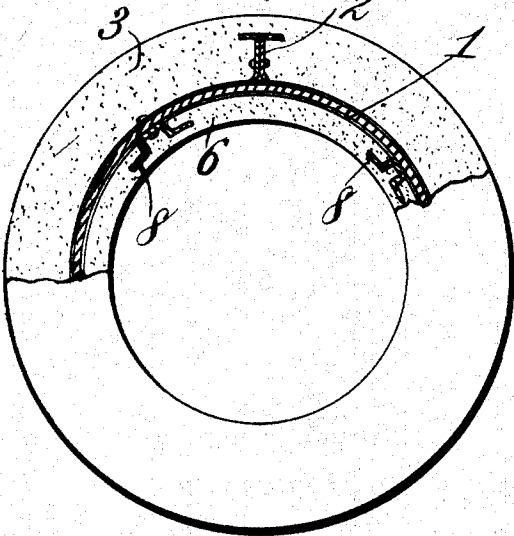


Fig. 4.

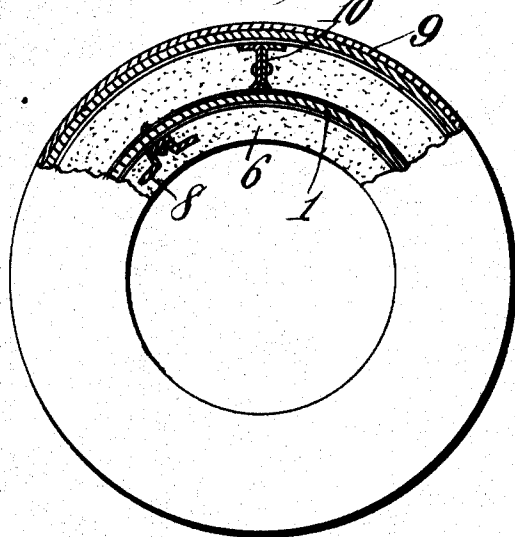
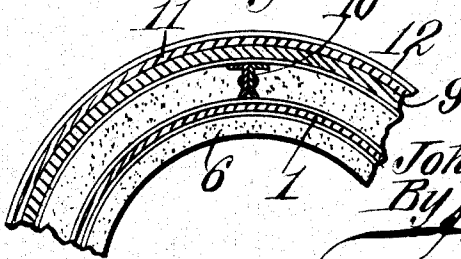


Fig. 5.



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2 SHEETS—SHEET 2.

Fig. 6.

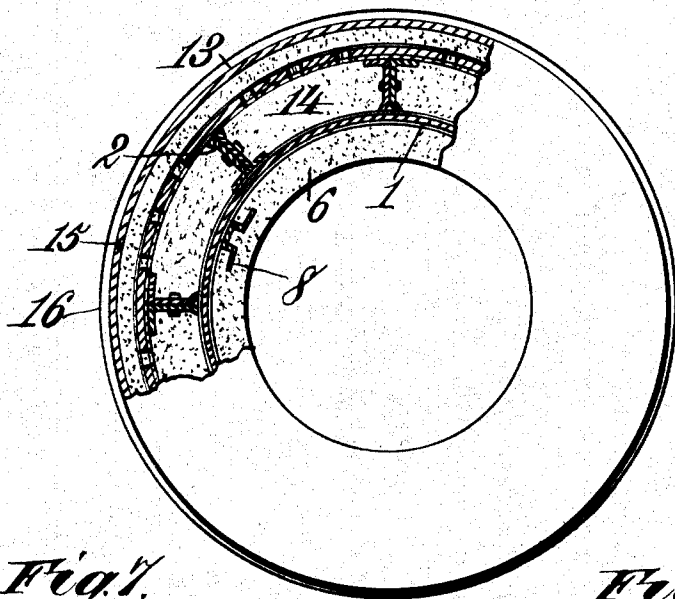


Fig. 7.

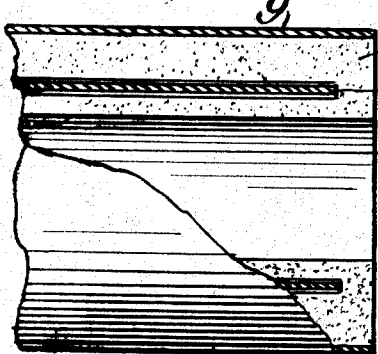


Fig. 8.

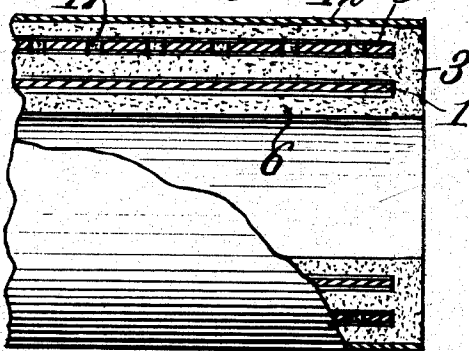
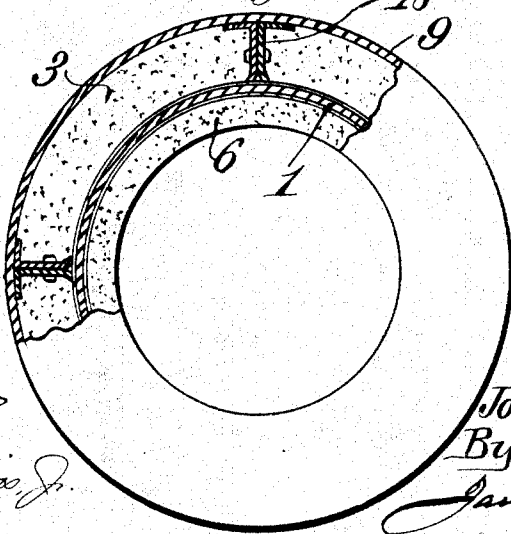


Fig. 9.



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UNITED STATES PATENT OFFICE.

JOHN T. LANGFORD, OF NEWTON, MASSACHUSETTS; ELLEN M. PRIEST ADMINISTRATRIX
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HYDRAULIC PIPE.

No. 928,233.

Specification of Letters Patent.

Patented July 13, 1909.

Application filed February 9, 1905. Serial No. 244,995.

To all whom it may concern:

Be it known that I, JOHN T. LANGFORD, a citizen of the United States, residing at Newton, in the county of Middlesex and State of Massachusetts, have invented new and useful Improvements in Hydraulic Pipes, of which the following is a specification.

This invention relates to certain improvements in cement or composite pipes, and particularly those which comprise a reinforcing metal casing, lined and coated with cement, and has for its object the production of a composite pipe, which shall be proof against oxidation or electrolytic action. I accomplish this object by the means shown in the accompanying drawing, and by methods hereafter described.

In the specification and claims, the word "cement" is intended to include an adhesive substance, or material of any suitable nature for lining or coating metal frames or metal pipes together to form composite pipes.

In the accompanying drawing:—Figure 1 is a cross sectional view showing the internal shell or pipe provided with wings and the external surface thereof covered by, and the wings incased, with a filling of cement or analogous material. Fig. 2 is a sectional end elevation, showing a cement filling within the internal perforate shell or pipe, and an outer incasing or covering between which and the internal shell or pipe a cement filling is interposed. Fig. 3 is a cross sectional view showing the inner shell or pipe having internal wings incased in a cement lining, and also external wings and a filling of cement covering the external surface of the inner shell or pipe and the external wings. Fig. 4 shows a cross sectional view illustrating the inner shell or pipe with internal and external wings, and an outer shell connected to the external wings and a protective covering surrounding the outer shell, the interspace between the inner and outer shells being solidly filled with cement, and the interior of the inner shell lined with and having its wings solidly incased in cement or analogous material. Fig. 5 is a cross sectional view showing the inner shell or pipe with external wings, an outer shell surrounding the external wings and connected therewith, and having an outer covering secured thereto, metal bands located at the ends thereof, the

interspace between the inner and outer shells being solidly filled with cement, and the inner shell lined with cement or analogous material. Fig. 6 is a cross sectional view showing the inner shell or pipe having internal and external wings, a perforated shell, a cement coating extending from the inner shell or pipe through and around the perforated shell, and an outer waterproof covering surrounding the outer shell and having metal bands at the ends thereof for protecting and attaching purposes. Fig. 7 is a longitudinal section of a portion of a pipe, showing the inner and outer shells both of an imperforate nature and the inner shell shorter than the outer shell or covering and the inner cement lining and cement filling united at the terminals thereof. Fig. 8 is a view similar to Fig. 7, showing the outer shell alone perforate and the cement filling between the inner and outer shells united to the protective covering through the openings in the outer shell, and also united at the ends, the inner and outer shells being made the same length while the outer covering is made longer, the cement extending to the end of the outer covering thus uniting the cement and incasing all metal in cement at the terminals. Fig. 9 is a cross sectional view of a pipe embodying the features of the invention wherein the ribs are carried alone by the outer shell and project inwardly radially with respect to the inner shell.

Similar characters of reference are employed to indicate corresponding parts in the several views.

The composite pipe embodying the features of the invention has been illustrated progressively to illustrate from the simplified form shown by Fig. 1 by additional steps or features, acquisitions to the composite pipe within the domain of the invention.

Referring to Fig. 1, the simplified form of the pipe, the numeral 1 designates an inner solid shell or pipe 1, having external perforate wings 2, the external surfaces of the shell and wings being coated with cement 3, the thickness of the latter being regulated in accordance with the use and dimensions of the inner shell. The cement in this form of the device, between the wings 2, becomes connected through the apertures or perforations 4, in the wings to more positively key or attach the segmental portions of the ce-

ment covering between the wings and more effectively enhance the value of the structure of the composite pipe from a standpoint of homogeneity.

5 Referring to Fig. 2, the improved composite pipe is shown as having a perforate inner shell 1, similar to the shell shown by Fig. 1, and external imperforate wings 5, so arranged as to provide recesses between
10 them for the reception of a cement filling 3, also similar to that shown by Fig. 1; and the main difference in this instance with respect to the pipe shown by Fig. 1, aside from the imperforate nature of the wings 5,
15 is that the interior of the shell 1 is provided with a cement lining 6. The inner shell in this instance has a series of perforations 7 therein, which permit the inner lining 6 of the shell 1, and the filling 3 between the
20 inner and outer shells to become connected and strengthen the entire pipe structure.

In Fig. 3, the inner shell or pipe 1 has an inner cement lining 6, similar to that shown by Fig. 2, and internal wings 8 in-
25 cased in said lining in addition to the external wings 2, and cement filling 3. The wings and inner shell in this instance may be perforate or imperforate to provide for uniting the lining and filling and both of the
30 latter with respect to different parts of each other through the wings, as indicated by the construction heretofore set forth.

In Fig. 4 the same construction is shown as in Fig. 3, with the exception of an outer
35 shell 9 connected to flanges 10 of the wings projecting outwardly from the inner shell and a protective covering surrounding this outer shell, like reference numerals being used in this instance to designate parts cor-
40 responding to those shown by Fig. 3. The form of device shown by Fig. 5 has an inner shell with outer wings solely, an outer shell, similarly numbered, and an outer covering
45 11, of a non-conductive or other suitable material, and end securing bands 12, which operate to support the cement terminals and to hold the covering in place and also serve as means for establishing a leaded, or other
50 joint between the contiguous ends of the pipe sections.

Fig. 6 shows the inner shell or pipe with internal and external wings, as heretofore described and correspondingly numbered, an
55 outer perforate shell 13, a cement coating or filling 14, extending from the inner shell or pipe through and around the perforate shell, and an outer shell or waterproof covering 15, surrounding the outer cement and having metal bands 16 similar to those shown
60 by Fig. 5, and for a like purpose.

Fig. 7 illustrates more clearly the means for uniting the cement lining of the inner shell and the intermediate cement filling
65 between the inner and outer shells or outside covering by making the inner shell shorter

than the outer shell or covering thus uniting the bodies and showing a composite pipe with monolithic terminals.

Fig. 8 is specially intended to illustrate the connection of the cement lining and fill-
70 ings with the outside protective covering as shown at the ends of the pipe, and by means of perforations 17, in the outer shell.

Fig. 9 shows ribs or wings 18, carried by the outer shell alone and projecting into and
75 incased by the intermediate cement filling, and in Figs. 7, 8, and 9 the parts having similar structures to those heretofore set forth, bear like reference numerals.

From the various modifications hereinbefore noted it will be understood that it is intended to make the inner and outer shells either perforate or imperforate or to make
85 perforate or imperforate the several ribs, wings, or resisting means and also to have the same either attached to or forming integral parts of the inner and outer shells and of such configuration as will render
90 them best adapted for the purpose. In some instances, as indicated by the accompanying drawings, the ribs or wings of the outer shell will intersect the wings or ribs of the inner shell, and the outer
95 shell may or may not be directly attached to the wings of the inner shell, or the inner shell attached to the wings of the outer shell. From this disclosure and the accompanying drawings it will be noted that the salient features of the invention are: First,
100 the provision of the reinforcing wings or strengthening, resisting and engaging means, to render the inner pipe and the structure frame rigid, so that the composite pipe can be made of extra length and stand transpor-
105 tation without injury to the cement. Second, the connection of the cement linings and coverings in, through and at the ends of the pipe, to render them more positive in their positions with respect to the parts with
110 which they engage, as well as increase their durability and effectiveness and to prevent electrolysis. Third, the protective covering adapted to do service to which the pipe is to be applied.

Where found necessary in attaching a
115 water-proof or non-conducting material of different nature to the inner structural frame or to the outer surface of the pipe, corresponding adhesive material may be employed, and in some instances it will be
120 understood that the outside protective covering may be of a non-conductive water-proof cement character, particularly where it is desired to unite the same with the inter-
125 mediate filling by aperturing the outer shell or with the cement surrounding the structural frame.

In the simplified form of the invention, as shown in Figs. 1, 2 and 3, the outer protec-
130 tive covering, when used, may be applied

directly to the cement covering the structural frame, and secured thereto by suitable means.

The connection of the cement lining and filling at the ends of the inner pipe or shells or inclosed reinforce to render them as heretofore set forth, is present in all the forms of the device shown, as before indicated, and particularly the extension of the cement over the ends, as shown by two of the figures and intended when necessary to be used in all of the structures illustrated, providing monolithic ends and shielding the inclosed pipe, shells and reinforcing structures with advantage in wear and durability of the composite pipe. The terminals of the structural frame also have the additional advantage of being electrically non-conductive to practically adapt the pipe for use in containing and inclosing electrical conductors, from which there is always more or less electrical leakage, and, furthermore, to prevent the parts of the pipe, when the latter is used for other purposes, from being the least affected by electrical conductors adjacent to the pipe.

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

1. The herein described composite pipe, having an inner shell provided with outer strengthening wings, an outer shell surrounding said wings and attached thereto and also having wings projecting inwardly therefrom to the inner shell, a body of cement formed as a lining on the interior of the inner shell, and a body of cement filling in the interspace between the inner and outer shells and solidly filling the said space and forming a coating upon the shells and incasing the wings projecting from the shells.

2. The herein described composite pipe, having an inner shell provided with surface strengthening means, an outer shell surrounding said means and connected thereto, a protective covering surrounding and connected to the outer shell, metal bands around the ends of the covering, and a cement filling interposed between the shells and engaging the said means.

3. The herein described composite pipe, having a shell provided with surface strengthening wings, an outer shell surrounding and connected to the wings, a protective covering surrounding and connected to the outer shell, metal bands around the ends of the covering, a cement lining on the interior of the inner shell, and a filling of cement in the interspace between the inner and outer shells and engaging the said wings.

4. The herein described composite pipe, having a shell provided with surface strengthening wings and also inner wings, an outer shell surrounding and connected to the surface strengthening wings, a protective covering surrounding and connected to the

outer shell, metal bands around the ends of the covering and shells, an interior protective lining in the inner shell, and a filling in the interspace between the inner and outer shells solidly introduced and fully taking up such space and incasing the outer wings.

5. The herein described composite pipe, having an inner shell provided with surface strengthening wings projecting therefrom, a perforate shell surrounding the said wings and connected thereto, a protective covering surrounding the perforate shell, the latter also having wings extending inwardly to the inner shell, and the said inner shell provided with inwardly extending wings, a lining of cement on the inner shell, and a body of cement disposed against the outer shell and engaging the perforate shell, the protective covering, and wings.

6. The herein described composite pipe having an interior shell supported by a resisting means, an outer shell concentrically surrounding the interior shell and cooperating with said resisting means, a cement filling interposed between the inner and outer shells, an inner cement lining for the interior shell, the cement lining and filling being projected beyond the ends of the shells and rendered homogeneous to provide monolithic terminals, and a protective covering surrounding the outer shell.

7. The herein described composite pipe having an interior shell with openings therein, an inclosing covering means cooperating with said shell, resisting means being interposed between the shell and covering means, a filling of cement interposed between the inner shell and covering means, and a lining of cement in the interior shell which connects with the filling through the openings in said shell, and also rendered homogeneous at the opposite ends of the shell and projected beyond said ends to provide monolithic terminals.

8. The herein described composite pipe having a solid pipe reinforced by strengthening, resisting and engaging means, and a body of cement disposed internally and externally as a lining and coating upon said pipe and means, engaging and enveloping the same and forming non-conductive monolithic terminals.

9. The herein described composite pipe having a solid pipe reinforced by strengthening, resisting and engaging means, a body of cement disposed internally and externally as a lining and coating upon said pipe and means, and engaging and enveloping the same and forming non-conductive monolithic terminals, and a protective covering.

10. The herein described composite pipe having a pipe reinforced by strengthening, resisting and engaging means, a body of cement disposed internally and externally as a lining and coating upon said pipe and

means and engaging and enveloping the same and forming non-conductive monolithic terminals, a protective covering, and bands for joint making and other purposes.

- 5 11. The herein described composite pipe having a solid pipe reinforced by strengthening, resisting and engaging means, an outer shell concentrically surrounding and co-operating therewith, and a body of cement
10 disposed internally and externally as a lining and coating upon said pipe, shell and means and engaging and enveloping the same and forming non-conductive monolithic terminals.
- 15 12. The herein described composite pipe having a pipe reinforced by strengthening, resisting and engaging means, an outer shell concentrically surrounding and co-operating therewith, a body of cement disposed
20 internally and externally as a lining and coating upon said pipe, shell and means, and engaging and enveloping the same and forming non-conductive monolithic terminals, and a protective covering.
- 25 13. The herein described composite pipe having a solid pipe reinforced by strengthening, resisting and engaging means, an outer shell concentrically surrounding and co-operating therewith, a body of cement disposed
30 internally and externally as a lining and coating upon said pipe, shell and means, and engaging and enveloping the same and forming non-conductive monolithic terminals, a protective covering, and bands for joint
35 making and other purposes.

- 40 14. The herein described composite pipe consisting of a structural frame comprising an inner shell strengthened and supported by resisting and engaging means, an outer shell concentrically surrounding and co-operating with the inner shell, a body of cement disposed as a lining upon the inner shell, a filling between the inner and outer shells, and a coating upon the outer shell, the lin-

ing, filling and coating being connected at 45 the ends of the pipe to insure the solidity and tightness of the cement and preserve the structural frame within the pipe.

15. The herein described composite pipe consisting of a structural frame comprising 50 an inner shell strengthened and supported by resisting and engaging means, an outer perforated shell concentrically surrounding and co-operating with the inner shell, a body of cement disposed as a lining upon the 55 inner shell, a filling between the inner and outer shell, and a coating upon the outer shell, the lining, filling and coating being connected at the ends of the pipe and through perforations in said shell to insure 60 the solidity and tightness of the cement and preserve the structural frame within the pipe, and a protective covering surrounding the pipe.

16. The herein described composite pipe, 65 consisting of a structural frame, comprising an inner shell strengthened and supported by resisting and engaging means, an outer perforated shell concentrically surrounding and co-operating with the inner shell, a body 70 of cement disposed as a lining upon the inner shell, a filling between the inner and outer shells, and a coating upon the outer shell, the lining, filling and coating being connected at the ends of the pipe and 75 through perforations in said shell to insure the solidity and tightness of the cement, and preserve the structural frame within the pipe, a protective covering surrounding the pipe, and bands for joint making and other 80 purposes.

In testimony whereof I have hereunto set my hand in presence of two subscribing witnesses.

JOHN T. LANGFORD.

Witnesses:

ALPHEUS SANFORD,
THOMAS M. VINSON.