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T. NOSE

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APPARATUS FOR CONSTRUCTION OF CONCRETE CULVERTS

Filed Nov. 12, 1931

Fig. 2.

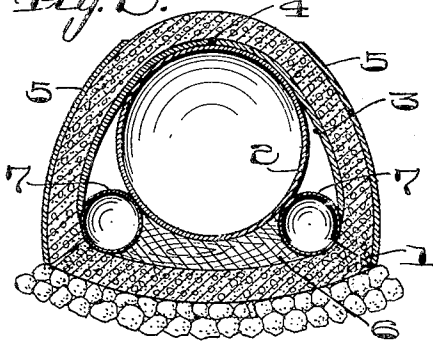


Fig. 3.

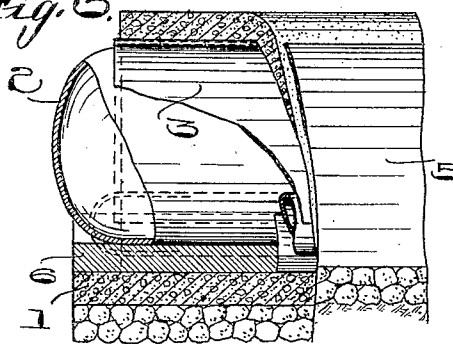


Fig. 4.

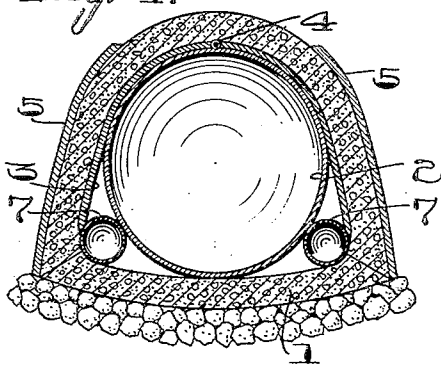


Fig. 6.

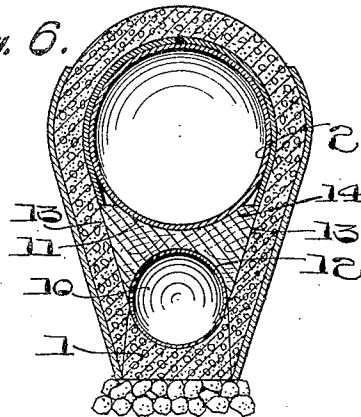


Fig. 5.

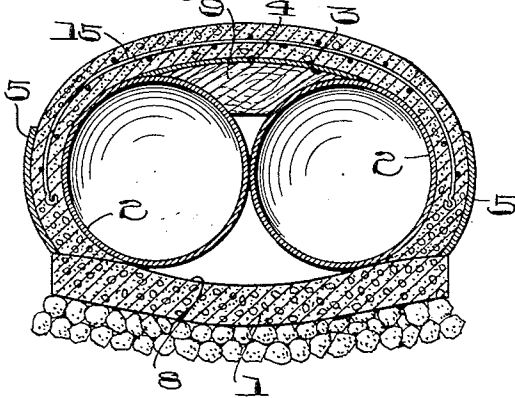
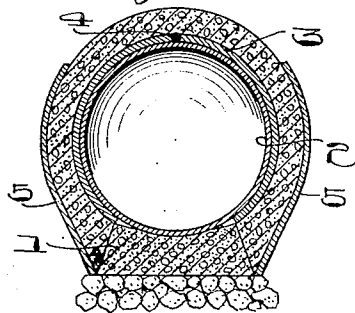


Fig. 7.



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APPARATUS FOR CONSTRUCTION OF
CONCRETE CULVERTSToichi Nose, Kamakura Machi, Kamakura Gun,
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4 Claims. (Cl. 25—128)

The present invention relates to a process and apparatus for constructing culverts or pipes of concrete by inflating a collapsible envelope with compressed air, pouring concrete between the outer form and the said envelope, withdrawing the outer form when the concrete has set and also taking out the envelope by deflating it, characterized by the fact that the greater part of the periphery of the inflated envelope is covered with a collapsibly-hinged metal plate which can collapse automatically and be drawn out when the envelope is deflated after the concrete has set. The primary object thereof is to prevent the inflatable envelope from being damaged, by covering the exterior of the inflated envelope with a metal plate during the construction of a concrete culvert and to enable the said metal plate to be withdrawn easily together with the said envelope when the duct is completed, so as to be used for the next work.

Another object is to construct a concrete duct of any desired form simply and quickly by using a plurality of inflatable envelopes to form ducts of various shapes such as cylindrical, horse-shoe, oval, egg-shape, etc., covering the envelopes with collapsible metal plates of sufficient area to give the desired inner periphery to the duct and pouring concrete between the outer forms disposed in parallel to the envelopes and the metal plates. The accompanying drawing shows several examples of an apparatus embodying the features of the present invention:—

Fig. 1 is a transverse section showing an apparatus for constructing a cylindrical culvert;

Fig. 2, a similar section showing an apparatus for constructing a culvert of horse shoe shape section;

Fig. 3 is a broken away side view of the apparatus shown in Fig. 2;

Fig. 4 is a transverse section showing the construction of a culvert of horse shoe shape section without an auxiliary support and

Figs. 5 and 6 are transverse sections showing the construction of culverts of elliptical section and egg-shaped section respectively.

Referring to Figure 1, 1 is a concrete bottom made previously by the ordinary method and serves as a support for an inflatable envelope 2 which eventually forms a part of the concrete duct. 3 designates a pair of collapsible metal plates hinged together at 4 which serve to cover the upper part of the envelope 2 when the latter is inflated. 5 is the outer form disposed substantially in parallel to the envelope and preferably has its upper part left open. According to

the present method, firstly the concrete bottom is laid so as to support the inflatable envelope 2, which, after being inflated by compressed air, has a substantial portion of its outer periphery covered by the metal plates 3, the latter thus constituting the inner form. Then, the outer form 5 is disposed as shown in the figure and concrete is poured between it and the metal plate. When the concrete has set and after its upper part has been finished properly, the envelope is deflated and drawn out whereupon the metal plates 3 will swing upon the hinge 4 into collapsed condition so that they can be taken out easily.

In Figs. 2 and 3, a small envelope is used at either side of the large one and in contact therewith. A saddle 6 is laid on the concrete bottom 1 and the large envelope 2 is put on its upper curved surface, while the small envelopes are inserted in arc-shaped recesses at opposite sides of said curved surface. These envelopes, when inflated, come into contact with the central core-forming envelope, as shown in the drawing and are supported firmly by both the concrete bottom 1 and supporting saddle 6. The cover plates 3 are hinged together at 4 and, when they are placed upon the envelope 2, the central hinged part comes into contact with the envelope 2 and thus the plates are supported by the latter, while their lower edges rest upon the outside of the small envelopes 7, so that said plates constitute the inner form of the desired concrete duct. 5 is the outer form situated in parallel to the said plate. When the envelopes are deflated after the concrete poured between the outer and inner forms has set, it is possible easily to withdraw them as well as the supporting saddle 6 and the collapsed inner form 3 from the molded duct.

The structure shown in Fig. 4 is similar to that shown in Figs. 2 and 3 in all respects except that the large envelope 2 and small envelopes 7 are supported directly on the concrete bottom 1 previously laid without the intervention of a supporting saddle.

To construct a culvert of elliptical section, a part of the upper surface of the concrete bottom 1 is so formed as to constitute a part of the ellipse and similar envelopes 2 are placed in contact with each other on said bottom as shown in Fig. 5. Between the said envelopes and above the same is disposed a distance piece 9 the upper surface of which is arc-shaped to conform to the elliptical formation of the culvert, said distance piece supporting on its upper side a pair of metal plates 3 hinged together at their meeting edges, as indicated at 4, the upper surface

of the plates 3 also being curved in conformity with the elliptical form of the culvert. With the members 2, 3, 5 and 9 assembled as shown in Fig. 5, concrete is poured between the inflated envelopes 2 and the outer form 5 and also upon the upper surface of the cover plates 3. After it has set, the envelopes are deflated and removed. Then, both the distance piece 9 and the cover plates 3 may readily be removed and the desired elliptical culvert is obtained. 15 indicates a reinforcing member which may be embedded in the concrete forming the wall of the culvert.

Fig. 6 illustrates the construction of a culvert of egg-shape. 1 is the concrete bottom which supports a small envelope 10 on its upper surface. A saddle 14 is placed upon the inflated small envelope 10, said saddle having arc-shaped recesses 11 and 12 for seating the large envelope 2 and small envelope 10 on its upper and lower surfaces respectively. The saddle 14 has an inclined surface 13 at either side thereof adapted to constitute a part of the inner form. The cover plates 3 cover the large envelope 2 and have their lower ends inclining inwardly to align with the saddle 14. Thus, the outer surfaces of the cover plates, the inclined surfaces 13 of the saddle 14 and the upper curved surface of the concrete bottom 1 together constitute the inner periphery of the concrete duct sought to be constructed. Therefore, by pouring concrete between them and the outer form 5 disposed in substantial parallelism to them a concrete culvert of egg-shape section can be obtained.

It will be observed that in all of the forms herein disclosed, the plate members constituting the collapsible inner form are widely separated from each other along their lower edges and are retained in this relation only by the pressure of the inflated envelopes. Consequently, when the envelopes are deflated the parts of the inner form will readily swing on their hinge connection toward each other.

I claim.

1. Apparatus for constructing concrete culverts, comprising an outer form, an inflated envelope disposed within said form in spaced relation therewith, and a two-part collapsible inner form supported on and partially encompassing said envelope whereby on deflation of the envelope the parts of said inner form are movable toward each other.

2. Apparatus for constructing concrete culverts, comprising a pair of oppositely disposed side members spaced apart at their top edges and cooperating to constitute an open-top outer form, an inflated envelope disposed within said form in spaced relation thereto and a two-part collapsible inner form supported on said envelope and covering the same below the opening between the side members, the parts of said inner form being collapsible toward each other when the envelope is deflated.

3. Apparatus for constructing concrete culverts, comprising an open-top outer form, an inflated envelope disposed within said form in spaced relation thereto, and a pair of metallic members supported on said envelope and covering the same below the top opening of the outer form, said members being hinged together along one side edge thereof whereby the members are movable toward each other when the envelope is deflated.

4. Apparatus for constructing concrete culverts, comprising an open-top outer form, an inflated envelope disposed within said form in spaced relation thereto, said envelope forming a core, a pair of inflated envelopes of smaller diameter than said core-forming envelope disposed contiguous thereto at opposite sides thereof, and a pair of covering members supported on said core-forming envelope below the top opening of the outer form and having their lower edges in contact with said smaller envelopes whereby said members are movable toward each other when the envelopes are deflated.

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