

1,023,163.

Patented Apr. 16, 1912

Fig. 3.

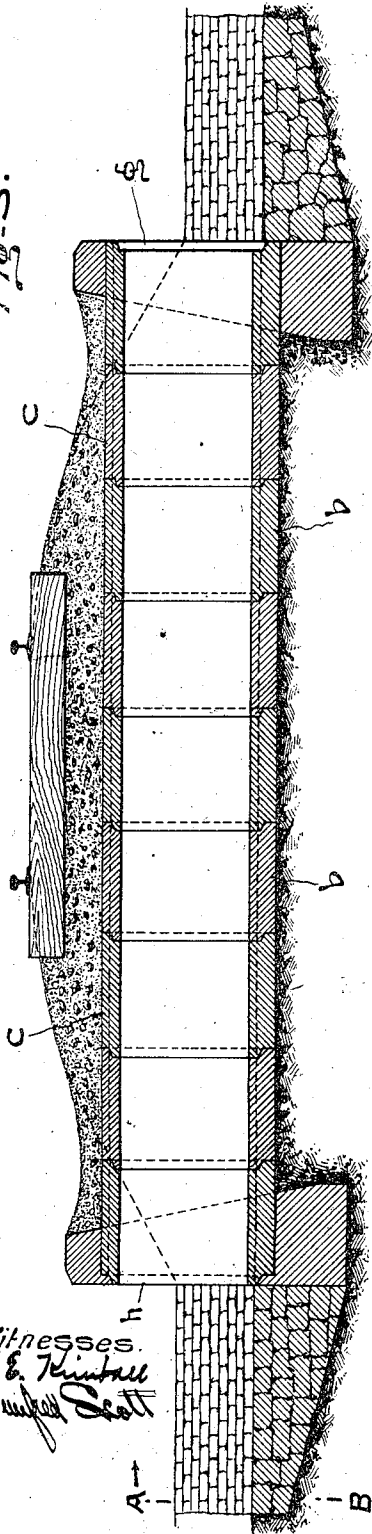


Fig. 4.

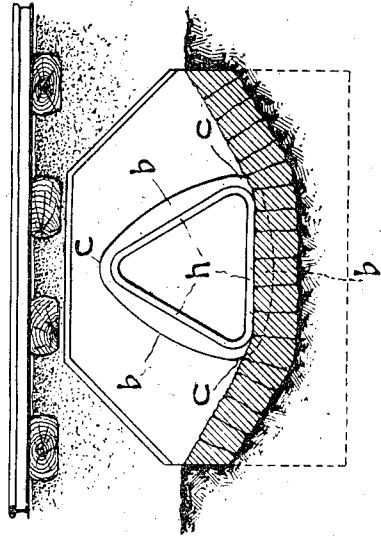


Fig. 2.

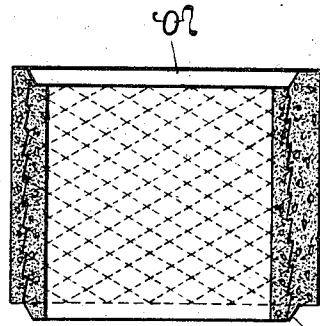
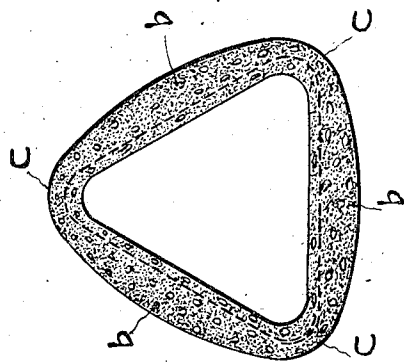


Fig. 1.



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 Inventor.  
 per Attorney.

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# UNITED STATES PATENT OFFICE.

PHILLIPS BATHURST MOTLEY, OF WESTMOUNT, QUEBEC, CANADA, ASSIGNOR TO HIMSELF, CHARLES NICHOLAS MONSARRAT, AND JOHN G. SULLIVAN, ALL OF WESTMOUNT, CANADA.

## HOLLOW SECTION

1,023,163.

Specification of Letters Patent.

Patented Apr. 16, 1912.

Application filed February 2, 1911. Serial No. 606,219.

*To all whom it may concern:*

Be it known that I, PHILLIPS BATHURST MOTLEY, a subject of the King of Great Britain, residing at Westmount, in the Province of Quebec, Dominion of Canada, have invented certain new and useful Improvements in Hollow Sections, of which the following is a specification.

My invention has for its object to provide a concrete or cement structure having the inherent strength to support an extreme load or to resist what have heretofore been considered excessive stresses, and at the same time serve as a conduit, and useful, particularly, in the construction of railway culverts.

The invention may be said, briefly, to consist of a hollow concrete or cement member monolithic in character and of triangular cross-section with sides formed to present the nature of beams and struts.

For full comprehension however of my invention reference must be had to the accompanying drawings forming a part of this specification in which similar reference characters indicate the same parts and wherein:

Figure 1. is a transverse sectional view of a railway culvert member constructed according to my invention; Fig. 2. is a longitudinal sectional view of a portion of a culvert; Fig. 3. is a transverse vertical sectional view of a railway embankment with my improved culvert in place; and Fig. 4. is a vertical sectional view taken on line A B Fig. 3.

Specifically speaking the improved hollow member consists of three equal sides  $b$  united by rounded corners  $c$ , each side presenting a flat interior and convex exterior, the flat interiors and curves of the convexities, merging into the inside and outside curves, respectively, of the corners, the total exterior, in transverse section, being thus made up of easy curves, while the flat interior surfaces present straight lines leading into the curved corners. The ends of each member are formed to present a socket  $g$  and a spigot  $h$  corresponding therewith, in order to enable an effective joint to be made between a series of members in building an integral culvert or other hollow structure of considerable length.

By the construction of the hollow member above described each side is of beam

formation with a straight tension side and convex compression side and supported at its ends on the curved corners through which it transmits its load to the two other sides; and, owing to the straight lines presented by the flat sided interior, these beam sides constitute diverging struts capable, when the triangle is arranged as shown in Fig. 1, of sustaining a maximum load and transmitting it to the base the beam character of which renders it capable of carrying the load. This construction is such therefore as to effectively resist the component forces that are due to the passage of trains thereover the position of each side contributing to the strength of the member. This member is preferably molded in concrete and the tension sides of its beam sides are reinforced by a sheet of expanded metal  $e$  within the walls and extending completely around the member with its ends overlapping as at  $f$  and united by wiring  $d$ . The member thus constructed is monolithic in character and with its combined beam and strut sides is adapted to resist what have heretofore been considered excessive forces and to sustain them when acting against such member from any direction; and the said member therefore advantageously meets all the requirements of a railway culvert for strength and durability and to take care of small streams close to the base of the rail level. This application of the invention is illustrated in Fig. 3 where it is subjected to and effectively sustains a considerable load and impact. The easy curves of the exterior permits the loose members to be rolled from place to place thus facilitating the work of construction of culverts or other structures of considerable length.

The triangular cross-section with rounded corners of culverts constructed according to this invention has considerable utility in that the level floor of relative great width widens out the normal small stream and presents an unobstructed passage therefor, and the upwardly curved side walls formed by the rounded corners afford greater accommodation for the stream when swollen without having the disadvantageous effect of damming and increasing the surface level thereof.

What I claim is as follows:

1. A hollow member for use as a culvert of triangular cross section with interiorly

rounded corners and each side whereof is straight inside and convex outside to present combined strut and beam formation.

2. A hollow member for use as a culvert  
5 of triangular cross-section and the sides whereof are each straight inside and convex outside to present combined strut and beam formation.

In testimony whereof I have signed my name to this specification in the presence of two witnesses.

PHILLIPS BATHURST MOTLEY.

Witnesses:

NORVAL DICKSON,  
E. NOONAN.