

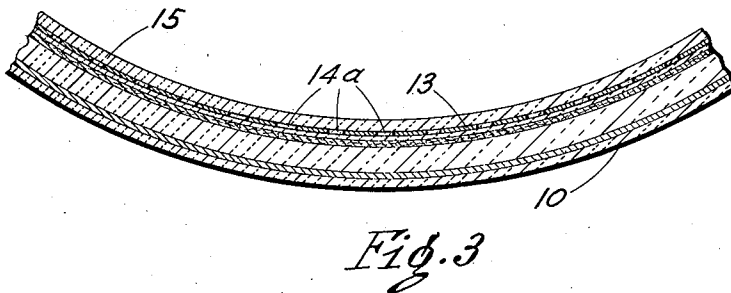
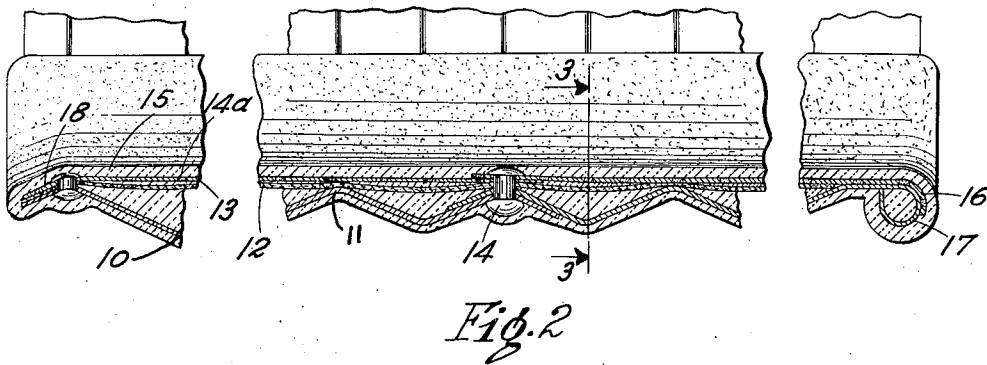
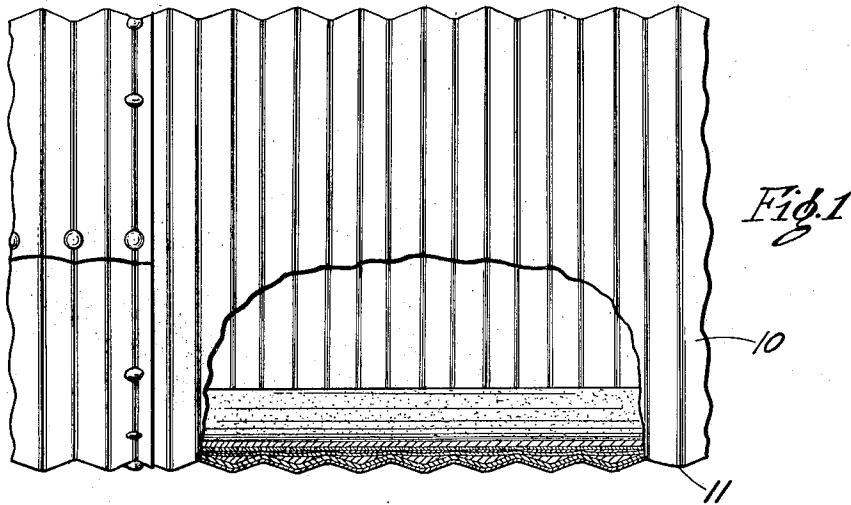
May 25, 1937.

J. KAHN ET AL

2,081,872

CULVERT

Filed Feb. 19, 1937



BY

INVENTORS
JULIUS KAHN
& WALTER F. SCHULZ
Rickey Watts
ATTORNEYS

UNITED STATES PATENT OFFICE

2,081,872

CULVERT

Julius Kahn and Walter F. Schulz, Cleveland Heights, Ohio, assignors to Republic Steel Corporation, Cleveland, Ohio, a corporation of New Jersey

Application February 19, 1937, Serial No. 126,660

8 Claims. (Cl. 138—70)

This invention relates broadly to sheet metal culverts and more particularly to new and improved corrugated sheet metal culverts having new and improved linings.

Heretofore, culverts have been made of relatively thin, corrugated sheet metal and have been protected against the abrasive action of liquids and solids flowing therethru as by a coating of bituminous material covering parts of or all the culvert, or by linings of concrete, metal or other material.

While these various prior constructions possessed certain advantages, they also had certain disadvantages. The bituminous coatings used, whether applied to plane or corrugated metal, was held in place primarily by surface to surface adherence. Since the culvert expanded and contracted somewhat, in response to temperature changes, and was exposed to flowing liquids and solids at various temperatures and the impact forces of such materials, the coating frequently checked or cracked, and parts thereof were often broken away from the metal, thus leaving the metal exposed to the wear and tear of the elements. Where concrete or similar materials were used as culvert linings, the lining was heavy, expensive and liable to breakage during handling or installation as well as during use. Where a sheet metal liner was used without a bituminous coating it was subject to rather rapid deterioration, and when it had such a coating, the latter possessed all the above mentioned disadvantages of such material and the additional disadvantage that it had a weaker attachment to the smooth steel than it would have had to corrugated steel.

The present invention provides a culvert which possesses the advantages of prior sheet metal culverts, but does not have their major disadvantages, and also possesses new and unexpected advantages including greatly increased resistance to abrasion and increased length of life without any large or prohibitive increase in cost. In other words, the culverts of the present invention are better and more satisfactory than prior culverts and are less expensive than the prior culverts when all necessary factors are considered.

In the preferred form, the new and improved culvert of the present invention includes a sheet metal pipe having circumferential corrugations, a perforated, smooth, arcuate, metal liner plate secured thereto and covering a small portion of the inner surface thereof, a sheet or layer of fibrous material, such as tar paper, roofing felt

or the like between the liner and the inner surface of the pipe, and a coating of bituminous material which covers the inner surface of the pipe and of the liner plate, and which substantially fills the liner plate perforations and the spaces between the liner and the inner surface of the pipe.

In the drawing accompanying and forming a part of this specification:

Figure 1 is a side elevational view, partly in section, of part of a corrugated sheet metal culvert embodying the present invention in a preferred form, the coating material on certain surfaces not being shown.

Figure 2 is a longitudinal sectional view of a culvert embodying the present invention, with certain parts being shown in elevation and other parts being broken away, and with the showing of coating material being confined to the lower part of the culvert.

Figure 3 is an enlarged transverse sectional view taken on line 3—3 of Figure 2.

In the drawing, the sheet metal pipe 10 is provided with circumferentially extending corrugations 11. A sheet or layer of fibrous material 12, such as tar paper, roofing paper or the like, covers part of the inner surface of pipe 10 and rests on inner crests of corrugations 11. A smooth, arcuate, metal liner plate 13 of sufficient circumferential length to cover only a part of the inner surface of pipe 10 and having a radius of curvature approximately that of the pipe rests on the layer 12 and is secured to the pipe 10, as by rivets 14 which extend thru and hold sheet 12 in place. The plate 13 is perforated, as at 14a.

The interior and exterior surfaces of pipe 10 and the inner surface of plate 13 are covered with a layer or coating 15 of bituminous material. Such material also substantially fills the perforations 14a and the spaces between the liner and the inner surface of the pipe. The plate 13 is curved outwardly at one end as indicated at 16, about a curved end 17 of pipe 10, such end being the upstream end of the culvert when in use. The downstream end is bent outwardly as at 18, to lie close to the pipe. In this manner the ends of the spaces between the liner and pipe are sealed against ready outflow of liquid bituminous material therein and the coating inside and outside of the culvert is united at the ends.

The material 15 has surface adherence to the pipe and to plate 13 and is additionally anchored to the plate by the material in perforations 14a

which is united to the material which may lie between the plate and the sheet of fibrous material 12. The bituminous material also adheres strongly to the fibrous sheet 12 and is thereby re-
 5 reinforced in its anchorage to the liner 13. Moreover, the sheet 12 is strongly bound to the bituminous material which is between the sheet and the pipe. The sheet 12 also serves as a means for retaining bituminous material between the
 10 pipe and liner 13 for, due to its fibrous nature, it impedes the flow of liquid bituminous material when the pipe is tilted for drainage and thus insures retention of considerable quantities of such material between liner 13 and the pipe. It will
 15 be noted that the bituminous material entirely surrounds plate 13, covering not only the longitudinal sides but also the ends thereof. This complete encasing of plate 13 in bituminous material prevents ready removal of such material in
 20 use of the culvert and thus increases the life of the culvert.

The preferred form of culvert of this invention possesses many advantages. It has exceptionally long life, for the coating on liner 13 has greater
 25 adherence thereto than in prior culverts, due to the anchorages in perforations 14a and the attachment to sheet 12. Even if such coating is removed from the inner surface of the liner, the latter will give long service before it is worn away.
 30 The culvert possesses long life even after removal of the liner 13 for the fibrous layer 12 constitutes a covering for the bituminous material between it and the pipe and, due to its adherence thereto, will protect the bituminous material for a further
 35 period of time, after which such material will still be serviceable for a further long period of time.

The present construction permits the use of lighter gage metal in the pipe and thus the weight
 40 of the preferred culvert may closely approximate that of prior culverts while the life will be much greater.

In manufacturing culverts of this invention, a layer or sheet of fibrous material 12 is placed
 45 on the inner surface of the corrugated pipe 10, and the perforated, smooth, arcuate, liner plate 11 is then placed over the fibrous material and is secured to the pipe as by rivets 14. The pipe is then immersed in a bath of liquid bituminous
 50 material and slowly rotated to insure that the inner surfaces of the pipe and liner will be coated and that the spaces between the liner and the pipe will be substantially filled with such material. The pipe is then withdrawn from the bath
 55 and is inclined at an angle to permit excess bituminous material to drain out.

The danger of checking, cracking or breaking away of the bituminous material in a culvert of the present invention, during handling or installation as well as during use, is greatly reduced
 60 if not entirely avoided through the use of the perforated liner and the layer of fibrous material. Since the fibrous material is attached to the bituminous material on its opposite sides and is flexible, it may respond to temperature changes
 65 of the bituminous material without breakage and, in case such material actually checks or cracks, can act to retain the pieces of such material in place.

Culverts of this invention, when subjected to standard tests, have been found to possess surprising results. For example, they have shown
 70 substantially no damage to the coating material inside the culvert even after having been subjected, for several times the time required, to the

standard tumbling test in which pieces of bricks, stones or the like, and water are violently agitated in the culvert.

Obviously many of the foregoing advantages are possessed by a modified construction in which the
 5 liner 13 is not provided with perforations, such as 14a. Also, many advantages are possessed by a construction which does not include the sheet or layer of fibrous material. Accordingly, such
 10 modifications are considered as a part of the present invention.

Having thus described the invention, what is desired to be obtained by Letters Patent is defined by what is claimed.

What is claimed is:—

1. A culvert comprising a corrugated sheet metal pipe, lining means for a part of the inner
 15 circumferential length of said pipe, said means including an arcuate, sheet metal plate having a radius approximating that of the pipe and a
 20 sheet of fibrous material between the plate and the pipe, means securing the lining means within said pipe, and bituminous material covering the inner surface of said plate, substantially filling the spaces between the outer surface of said plate
 25 and the inner surface of said pipe, and adhering to said sheet of fibrous material.

2. A culvert comprising a corrugated sheet metal pipe, lining means for a part of the inner
 30 circumferential length of said pipe, said means including an arcuate, perforated, sheet metal plate having a radius approximating that of the pipe and a sheet of fibrous material between the plate and the pipe, means securing the lining
 35 means within said pipe, and bituminous material covering the inner surface of said plate, substantially filling the perforations in said plate and the spaces between the outer surfaces of said plate and the inner surface of said pipe, and adhering to said sheet of fibrous material.

3. A culvert comprising a corrugated sheet metal pipe, a sheet metal liner for the pipe having
 40 a radius of curvature approximating that of the pipe and a circumferential length much less than that of the pipe, a sheet of fibrous material between the liner and pipe, means securing said
 45 liner and sheet in said pipe, and bituminous material covering the inner surface of said liner, substantially filling spaces between the liner and the pipe and adhering to said sheet.

4. A culvert comprising a corrugated sheet metal pipe, a sheet metal liner for the pipe having
 50 a radius of curvature approximating that of the pipe and a circumferential length much less than that of the pipe, said liner having a plurality of perforations extending therethru, a sheet of fibrous material between the liner and pipe, means
 55 securing said liner and sheet in said pipe, and bituminous material covering the inner surface of said liner, substantially filling said perforations and spaces between the liner and the pipe and adhering to said sheet.

5. A culvert comprising a corrugated sheet metal pipe, a sheet of fibrous material resting on
 60 inner crests of corrugations of the pipe, an arcuate, sheet metal plate resting on said sheet and covering only a small part of the inner circumferential length of said pipe, means securing the plate, sheet and pipe in assembled relation, and bituminous material covering the inner surfaces
 70 of said pipe and plate, substantially filling spaces between said plate and said pipe and adhering to said sheet.

6. A culvert comprising a sheet metal pipe, a sheet of fibrous material resting on inner crests
 75

of corrugations of the pipe, an arcuate sheet metal liner on the inner side of said sheet and covering only a small part of the inner circumferential length of said pipe, said plate when assembled with said pipe and said sheet forming spaces between itself and the inner surface of the pipe, said plate being shaped at one end to lie close to the end of said pipe and substantially to seal the adjacent end of the space between said plate and pipe, means securing the liner, sheet and pipe in assembled relation, and bituminous material covering the inner surfaces of said pipe and liner, substantially filling spaces between said liner and pipe and adhering to said sheet.

7. A culvert comprising a corrugated sheet metal pipe, a sheet of fibrous material resting on inner crests of corrugations of said pipe, an arcuate sheet metal liner on the inner side of said sheet and covering only a small part of the inner circumferential length of said pipe, said liner

forming spaces between itself and the inner surface of said pipe, said liner being shaped at its ends to lie close to the ends of said pipe and substantially to seal the ends of spaces between said liner and pipe, and bituminous material covering the inner surfaces of said pipe and liner, substantially filling spaces between said plate and pipe and adhering to said sheet.

8. A culvert comprising a corrugated sheet metal pipe, lining means secured therein and including an arcuate sheet metal plate relatively short in circumferential length as compared with the circumferential length of said pipe, a sheet of fibrous material on the outside of said plate, and bituminous material encasing said lining means, and bituminous material on exterior surfaces of said pipe and united at the ends of the latter to said encasing material.

JULIUS KAHN.

WALTER F. SCHULZ. 20