C. H. FREEMAN.

METAL CULVERT.

APPLICATION FILED MAY 24, 1909.

949,568.

Patented Feb. 15, 1910.

Fig. 1

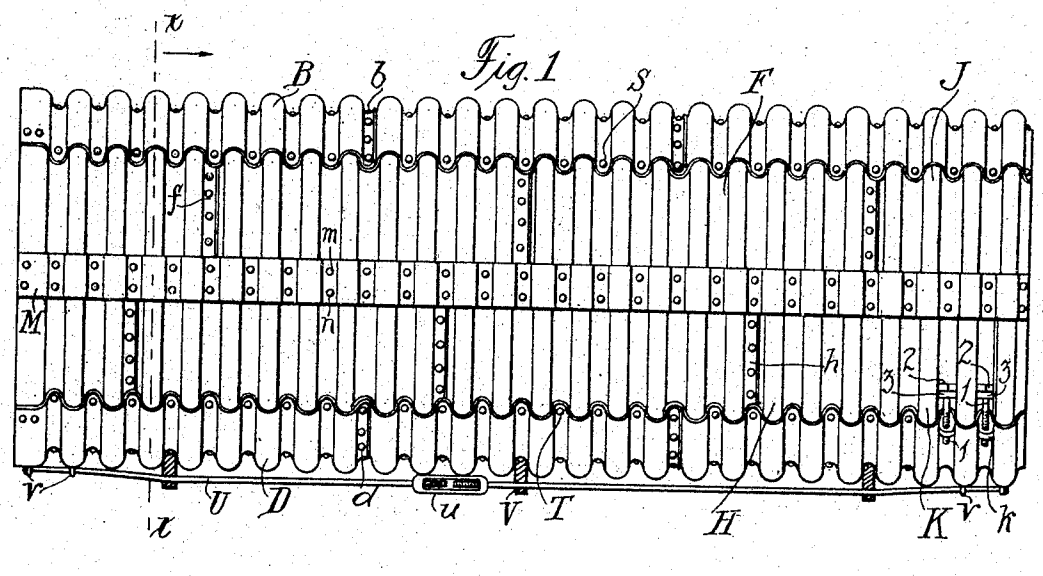


Fig. 3

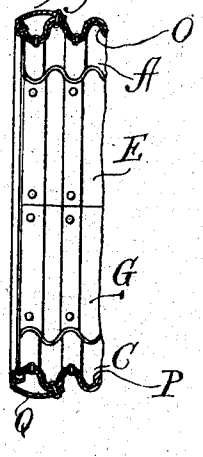


Fig. 2

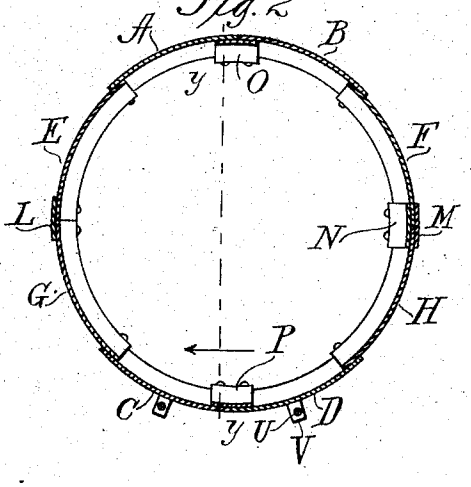
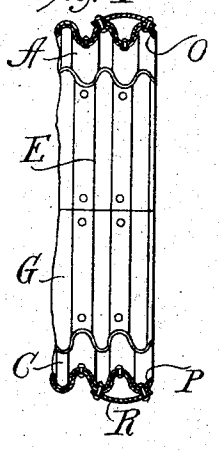


Fig. 4



Witnesses

B. J. Crawford

R. C. Baringer.

Inventor

Charles H. Freeman,

By Edwin Guthrie

Attorney

UNITED STATES PATENT OFFICE.

CHARLES H. FREEMAN, OF BLOOMINGTON, ILLINOIS.

METAL CULVERT.

949,568. Specification of Letters Patent. Patented Feb. 15, 1910.

Application filed May 24, 1909. Serial No. 498,018.

To all whom it may concern:

Be it known that I, CHARLES H. FREEMAN, citizen of the United States, residing at Bloomington, in the county of McLean and State of Illinois, have invented certain new and useful Improvements in Metal Culverts, of which the following is a specification.

This invention relates to metal culverts, more particularly to culverts built up of plates of corrugated metal, and the object of this invention is the production of a culvert wherein the plates and seams or junctions possess special construction and arrangement with respect to each other, as hereinafter shown and described.

It is believed that the construction set forth enables the culvert to be more cheaply and expeditiously manufactured and put together, and that the strength of the whole is materially increased thereby.

The accompanying drawings illustrate the construction and arrangement constituting this invention.

Figure 1 of the drawings represents a side view of this invention complete, showing the construction and arrangement of the plates and seams with respect to each other. Fig. 2 is a cross-section on line *x*—*x* of Fig. 1. Fig. 3 illustrates one form of end protector or finishing band employed to render the end of the culvert more rigid, and Fig. 4 shows a modified form of finishing band. The two Figs. 3 and 4 are portions of longitudinal sections taken near the ends of this invention on line *y*—*y* of Fig. 2.

The same letter is used to refer to the same part in the drawings and description.

This culvert is built up of curved corrugated plates, of which plates A and B are arranged at the top exteriorly, and the plates C and D are located at the bottom, as illustrated in Fig. 2.

The side plates are designated by letters E, F, G, and H.

In the main body of this culvert, the plates mentioned above are ordinarily of similar extent, and, near the ends, in order that a certain length may be obtained, fractional plates J and K may be introduced.

In practice the plates are joined by lapped joints such as the seams *b*, *d*, *f*, and *h*. Or, adjoining plates may have their edges brought directly together and the corrugated lapping strips L and M applied over the meeting line externally. Or, the strips may be applied both externally and internally, as strips M and N. It will be understood that the strips M and N are substantially duplicates. The plates F and H are brought together edge to edge, as shown in Fig. 2, and the corrugated strip M, also shown in Fig. 1, of suitable length is placed outside over the joint. A like strip N is placed correspondingly inside the culvert and the rivets which pass through each plate, pass through both strips, making a particularly rigid and unyielding joint. Or, the strips may be applied internally only, as strips O and P in Fig. 2.

It is advantageous to protect the ends of this culvert and to increase the rigidity of the ends by means of the finishing plates Q and R, shown in Figs. 3 and 4. The plate Q has a portion extended over the edge of the ends of the plates and riveted thereto. The plate R is simply a curved annular plate riveted to the high parts of the two end corrugations.

It will be noted in Fig. 1 that the longitudinal seams or rows of rivets *m*, *n*, S, and T, extend in an unbroken line from one end to the other of this culvert, and that the transverse seams *b*, *d*, *f*, and *h* are staggered. The purpose in thus arranging the joints and seams is to facilitate the riveting of the seams running lengthwise by having the rivets in continuous lines. It is believed that by forming relatively short transverse seams arranged at separated points as shown, a stress tending to bend the culvert between its ends will be more strongly resisted. In other words, let it be assumed that the ends of this culvert were rigidly supported while the middle might through some failure of filling in earth be less fully upheld. The result would be that a load from above might exert a bending or bowing effect. It is thought that the strain thus produced would find a weaker resistance from a seam or joint entirely encircling the culvert, than it would in the separated transverse seams shown and described.

Considering Fig. 2 it will be understood that a load from above the seam strip O would operate to press plates A and B toward each other. The reaction from below would have a like tendency with regard to the plates C and D. The edges of those plates abut and the pressure is adequately resisted. Further considering the effect of

a load from above, it will be seen that the side plates F and H would, if displaced at all, be additionally bowed. That result would, clearly, throw extra strain upon the joint covered by the strips M and N, and, as a precautionary measure and where overloading is to be apprehended, the joint is made with outside and inside strips.

In practice, it is sometimes convenient and cheaper to construct this culvert in relatively short lengths, and to leave a greater or less length of one or more seams at the ends disconnected. That is to say, bottom plate D and plate K, for a short distance at the end of the culvert, may have their edges lapped but not riveted. To secure the edges of the plates together there are provided one or more clamping devices comprising, for example, the screws 1 having heads 2. The screws are first passed through lugs 3 constructed on plate K, and into the threaded lugs *k* constructed on plate D, and the edges of the plates are in this manner detachably secured together. The plates may, therefore, be slightly separated and the end of the culvert or section thereof enlarged sufficiently to be slipped over the end of another section and clamped thereon, thus securing the two sections together. The use of the clamps permits the culvert to be constructed and shipped in sections of any desired length.

It is advantageous in practice to provide means which will as far as practicable prevent the sagging of the culvert between its ends, whatever may be the load resting upon it. It is often difficult to place the culvert in position and avoid relatively supporting the ends under less load than is applied to the middle portion from above. To resist the tendency to sag between the ends, there is introduced a truss rod U, as shown in Fig. 1, or more than one, as shown in Fig. 2, and to provide a turnbuckle at some point of the rod. The turnbuckle is marked *u* in Fig. 1. The rod extends along beneath the culvert and is spaced below it by the truss blocks V, of which there may be any number. The ends of the rod are secured to the end corrugations by staples *v*, or in any effective way. It is believed to be now clear that by suitably operating the turnbuckle, tension is applied to the rod U, which materially aids the stiffness of the special construction and arrangement set forth.

Having now described this invention and explained the nature of its operation, what I claim is:—

1. A metal culvert, comprising the curved corrugated top and bottom plates, and curved corrugated side plates, the said plates being constructed and arranged and riveted together whereby the longitudinal rows of rivets extend in direct lines between the ends of the culvert, and the transverse rows of rivets are staggered with respect to each other.

2. A metal culvert, comprising the curved corrugated top and bottom plates, the said top plates having edges arranged directly together, and the bottom plates having edges arranged directly together, corrugated strips placed over the meeting edges of the plates and riveted to each plate, and curved corrugated side plates, the said plates being constructed and arranged and riveted together whereby the longitudinal rows of rivets extend in direct lines between the ends of the culvert, and the transverse rows of rivets are staggered with respect to each other.

3. A metal culvert, comprising the curved corrugated top and bottom plates, the said top plates having edges arranged directly together, and the said bottom plates having edges arranged directly together, corrugated strips placed over the meeting edges of the plates and riveted to each plate, and curved corrugated side plates having edges arranged directly in contact, corrugated strips placed over the meeting edges of the plates and riveted to each plate, all said plates being constructed and arranged and riveted together whereby the longitudinal rows of rivets extend in direct lines from end to end of the culvert and the transverse rows of rivets are staggered with respect to each other.

4. A corrugated metal culvert having the protective finishing plates secured at the ends thereof.

5. A corrugated metal culvert having the protective annular finishing plates secured at the ends thereof.

6. A metal culvert comprising curved corrugated plates riveted together, and having the protective finishing plates secured at the ends thereof.

7. A metal culvert, comprising curved corrugated plates riveted together, and having the longitudinal seams thereof extending in direct lines from one end to the other of the culvert, and the transverse seams thereof staggered with relation to each other, a portion of the longitudinal junction of two plates near the end of the culvert being unriveted, and clamps connected with the said plates and extending across said junction whereby the edges of the plates may be drawn together.

8. A metal culvert, comprising a cylinder formed of corrugated metal, and having on its lower surface exteriorly a truss rod, the said rod having its ends secured to the ends of the culvert, the said rod being provided with means for adjusting its length, and blocks arranged at intervals between the rod and the corrugations of the culvert.

9. A metal culvert, comprising a cylinder formed of curved corrugated metal plates

riveted together, the transverse seams or junctions of the said plates being staggered with relation to each other, the said culvert having on its lower surface exteriorly a truss rod, the said rod having its ends secured to the ends of the culvert, the said rod being provided with means for adjusting its length, and blocks arranged at intervals between the rod and the corrugations of the culvert.

In testimony whereof I affix my signature in presence of two witnesses.

CHARLES H. FREEMAN.

Witnesses:

NED E. DOLAN,

HARRY A. HUMES.