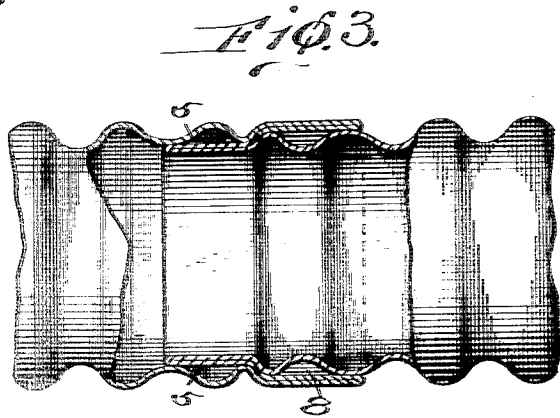
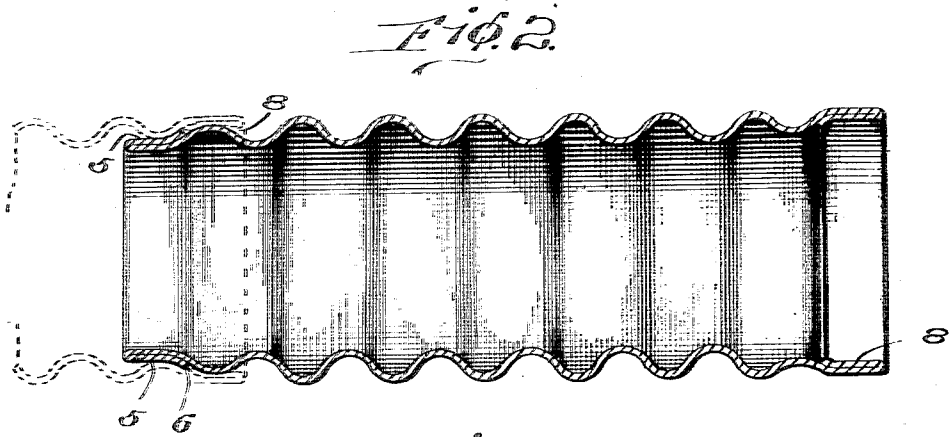
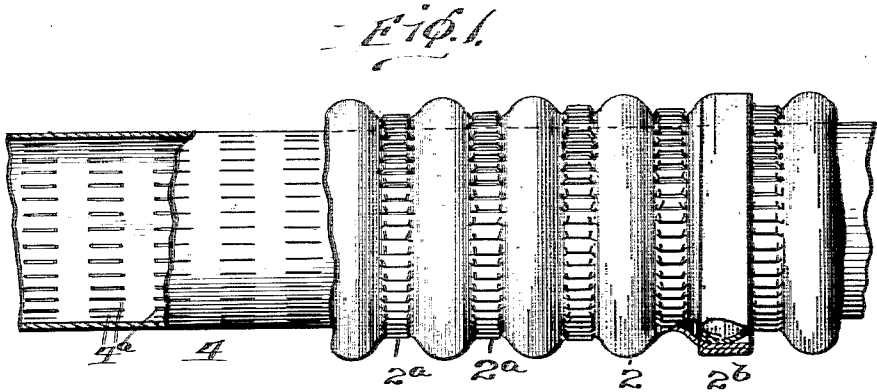


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CORRUGATED METAL CASING FOR CULVERTS, DRAINAGE TILING, &c.
APPLICATION FILED APR. 9, 1912.

1,049,542.

Patented Jan. 7, 1913.
2 SHEETS—SHEET 1.



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2 SHEETS-SHEET 2.

Fig. 4.

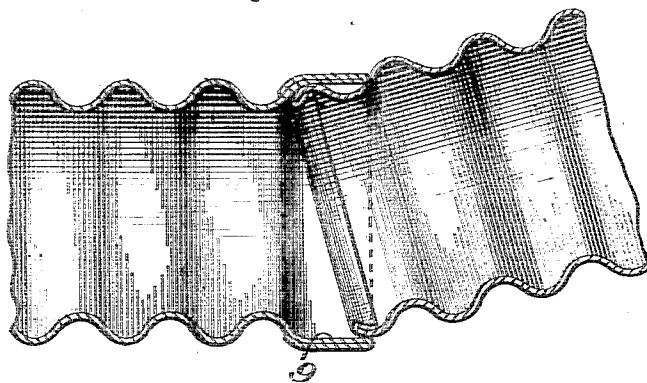


Fig. 5.

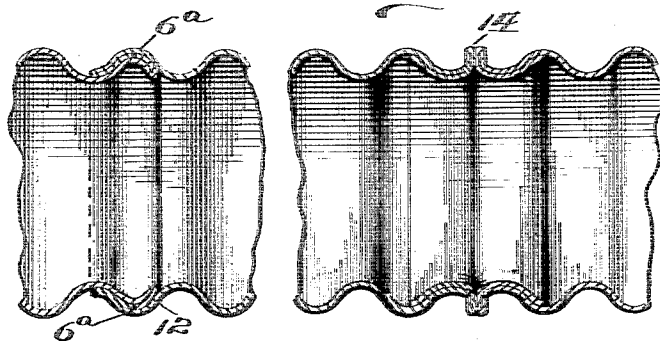
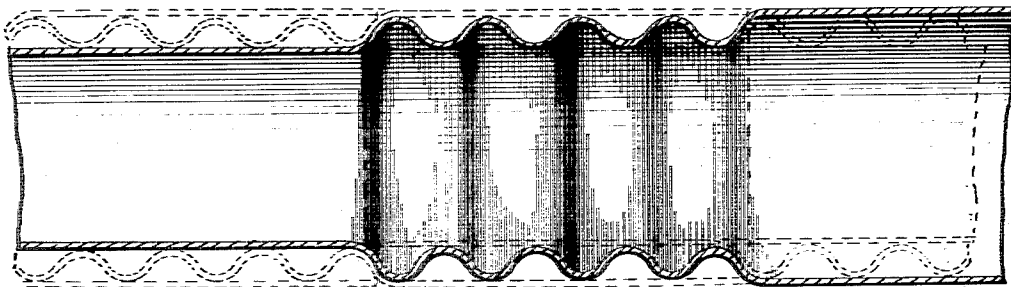


Fig. 6.



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UNITED STATES PATENT OFFICE.

ANDREW SMITH, OF SAN MATEO, CALIFORNIA, ASSIGNOR TO SMITH METAL PERFORATING COMPANY, OF SAN MATEO, CALIFORNIA.

CORRUGATED METAL CASING FOR CULVERTS, DRAINAGE-TILING, &c.

1,049,542.

Specification of Letters Patent.

Patented Jan. 7, 1913.

Application filed April 9, 1912. Serial No. 689,594.

To all whom it may concern:

Be it known that I, ANDREW SMITH, a citizen of the United States, residing at San Mateo, in the county of San Mateo and State of California, have invented certain new and useful Improvements in Corrugated Metal Casings for Culverts, Drainage-Tiling, &c., of which the following is a specification.

My invention relates to corrugated metal casings for conduits to be used in drainage culverts or tiling, irrigation or other conduits.

The main object of my invention is to provide corrugated metal casing sections or units which shall possess the advantages of strength and rigidity of the corrugated form and that may be readily assembled into a continuous casing having reinforced joints which are constructed to resist the stresses occurring by reason of changes in the supporting earth or other causes.

The construction of the joints, therefore, forms an especial feature of my present invention.

The accompanying drawings represent various embodiments of my invention, and in which—

Figure 1 illustrates a double-walled or duplex casing having a corrugated outer member, and both inner and outer members being perforated for drainage purposes; Figs. 2 to 6, inclusive, illustrate various forms of my corrugated casings and show different modifications of my reinforced joint.

In Fig. 1, I have shown the outer casing member corrugated, and the concave portions perforated or slotted as shown at 2^a, with the walls upon one side of the slots projecting outwardly. The reinforced ends of the sections 2, 2', fit one into the other as indicated at 2^b. The inner casing member 4, may be a smooth pipe having slots 4^a in its walls. The inner section members or units abut at their meeting ends and telescope within the outer members, the lengths alternating with or breaking joints with the outer members so that the joints 2^b of the outer sections are in effect reinforced by an intermediate unbroken portion of the inner section. The perforated duplex casing shown in Fig. 1, is especially adapted

for drainage tiling, including culverts, and for water conduits in sub-irrigation work.

In Fig. 2, I have shown a corrugated casing provided with my reinforced joints at the terminals of each section. The metal is folded back upon itself as shown at 5, and this reinforced portion extends over or under the end corrugation of the mating section and beyond the bearing point of said end corrugation, so that two corrugations are included in the joint or connection. Another feature of this joint resides in the juxtaposition of the ends of the reinforcing portions at 6. In the outer or female member of the joint, the metal is folded inwardly, while the inner or male member is folded back outwardly. The adjacent corrugation in each section is preferably shallower than the regular corrugations so that the bore or channel of the casing shall be uniform throughout. This form of joint is exceedingly rigid and capable of sustaining great stresses without bending. The terminal at the larger end of each unit is returned or folded back as at 8, and the adjacent corrugation is made somewhat shallower so that the telescoping end of the cooperating unit may rest against said shallow corrugation without projecting into the bore of the casing, the diameter of the opening at the joint being the same as at any intermediate portion. At the left of the figure I have indicated in dotted lines the manner in which the larger end of the section telescopes the smaller end of the adjacent section.

In Fig. 3, I have shown a modification of the terminal joint above described, in which the terminal annulus or cylindrical portion extends over or within two corrugations, which are made shallower than the normal size. The additional bearing surface in this form of my reinforced joint adds to the rigidity and strength of the casing at this portion, and prevents any sagging or displacement of the joint even though the underlying earth may have sunken. The importance of this feature will be appreciated by engineers. It will also be observed that the reinforced ends of the sections assist materially in preventing any distortion during transportation.

My reinforced joint with the cylindrical terminals permits one section to be turned

to quite an angle with respect to the co-operating section without separating the sections, as illustrated in Fig. 4. This is frequently desirable when there is a change in elevation or in direction along the line of the casing. To form such an angular joint, I use an outer section having a cylindrical reinforced terminal, such as described in connection with Figs. 2 and 3, and an inner section having a corrugation at the terminal, preferably reinforced. This angular joint may be formed by reason of the extended cylindrical inner surface 9, which permits one side of the inner section, in this case the lower side, to be swung outwardly along said cylindrical surface, while the opposite side rotates and simultaneously slides inwardly against the curved surface of the adjacent corrugation so that the outer perimeter of the inner member remains constantly in contact with the inner walls 9 of the outer member and maintains a tight joint. It will be observed that the passage or bore of the casing is not contracted at the joint, which is important because a sweeping tool used to clean the conduit may be threaded around the bend or angle without interference.

It is frequently desirable to connect a number of lengths of casing at the mill into a single unit or section, and it is important that the intermediate joints should be strong and rigid. My reinforced joint is admirably adapted to this purpose. I have shown at 12, Fig. 5, an intermediate joint, both the inner and outer parts of which are corrugated and completely interlocked. The reinforcement of the outer member preferably extends to the middle of the adjacent concavity of the coöperating section which effectually locks the parts together so that the joint may resist enormous stresses tending to separate the parts longitudinally. To provide against transverse strains tending to distort or bend the casing at the joint, the edges of the metal at the inner ends of the reinforcements are in contact at 6* and resist any tendency of one portion to swing out of axial alinement with the other. This tendency is also resisted by the ends of the outer member bearing against the concavity into which they project. The joint may also be riveted, "spot welded," or otherwise united if desired, but in most cases this additional locking means will be entirely unnecessary.

The joints or connections between adjacent units or sections may be formed as shown at 14, by bending the outer portion of the reinforced ends into an annular flange. The metal which is bent back upon itself, preferably extends to the middle of the adjacent corrugation, as shown, which gives great rigidity and strength to the joint and the adjacent portions of the casing. The abut-

ting flanges may be fastened by means of bolts, clamping rings, or in any other manner desired. The returned metal of the reinforcement not only stiffens the flange and the adjacent parts, but serves as an auxiliary attaching-means for the flange, since the reinforcement flares out into the recess of the adjacent corrugations and constitutes an anchorage against both longitudinal and transverse stresses. This feature is new in this art, and its importance will be recognized by engineers.

In Fig. 6, I have shown another form of my reinforced connections in corrugated casings. The intermediate corrugated portion extends one-third the length of the section, and upon either end the metal is formed into cylindrical portions which are of such diameter as to telescope respectively into and over the corrugated portions of the adjacent sections upon either side, as indicated by the dotted outlines. The joint, therefore, consists of the outer cylindrical terminals of the two adjacent sections which telescope respectively over and under the corresponding corrugated portions of said sections. The telescoping corrugated and cylindrical portions mutually reinforce and brace each other, and offer great resistance to any transverse stresses tending to distort the casing. In this form the corrugations are inclosed between smooth exterior and interior walls which present no obstructions to offer resistance to fluids passing therethrough.

For purposes of illustration, I have only shown perforated casings in Fig. 1, but it is to be understood that the casings disclosed in any of the figures of the accompanying drawings may be perforated for drainage purposes when the casing is used as a drainage tiling such as culverts, for draining the soil, or for sub-irrigation.

I have described in detail the several embodiments of my invention disclosed in the accompanying drawings, but I am aware that changes may be made therein without departing from the spirit of my invention or the scope of my claims.

I claim:—

1. A sectional metallic conduit having corrugated sections provided at their meeting ends with integral reinforced terminal portions, the returned metal forming the reinforcement extending back upon the wall of the adjacent corrugation and conforming thereto, whereby the wall of the corrugation constitutes an abutment to resist longitudinal stresses transmitted through said reinforcement.

2. A sectional metallic conduit having corrugated sections provided at their meeting ends with integral reinforced terminal portions, the returned metal forming the reinforcement extending back against the

5 wall of the adjacent corrugation, and the end of the reinforcement of one section being in juxtaposition to the corresponding end of the reinforcement of the mating section.

10 3. A sectional metallic conduit, comprising sections having telescoping ends, said ends having cylindrical portions arranged to bear respectively upon the outer and inner convexities of the adjacent end corrugations of the mating section, whereby the cylindrical end portion of each section is reinforced by a corrugated portion of the mating section.

15 4. A sectional metallic conduit, comprising corrugated sections having telescoping reinforced ends, said ends being arranged to bear respectively upon the outer and inner convexities of the adjacent end corrugations of the mating section.

20 5. A sectional metallic conduit, comprising corrugated sections having cylindrical telescoping reinforced ends, said ends being arranged to bear respectively upon the outer

and inner convexities of the adjacent end 25 corrugations of the mating section and to extend beyond the bearing point of said corrugations.

6. A sectional metallic conduit, comprising corrugated sections having telescoping 30 reinforced ends, said ends being arranged to bear respectively upon the outer and inner convexities of the adjacent end corrugations of the mating section, and said end corrugations being of less depth than the 35 other corrugations of the sections.

7. A sectional metallic conduit, comprising corrugated sections having telescoping reinforced terminal portions, one of said terminal portions being cylindrical and arranged to extend over and contact with the 40 terminal corrugation of the mating section.

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

ANDREW SMITH.

Witnesses:

JENNIE TINSLEY,
E. C. BROWN.