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 Sheet-Metal Casings for Culverts, Conduits, &c., of which the following is a specification.

My invention relates to sheet metal casings for culverts, irrigation tunnels, drainage and conduits, tunnels and the linings of oil and water wells, and the especial object of my present invention is to provide 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 or conduit without the necessity for auxiliary union or connecting members, while possessing the same strength at the joints as at the intermediate portions.

My present invention provides a casing which is adapted to resist the enormous pressures and lateral thrusts induced by the load supported by a conduit, especially where they underlie road-crossings and railway embankments and also the longitudinal and torsional stresses and strains to which the casing may be subjected when used as a lining or strainer for wells, which are frequently required to be bored to a depth of several thousand feet.

One of the chief difficulties heretofore encountered in the use of metal casings and linings has been caused by the joints between the several units or sections. It is desirable that auxiliary connecting members should be eliminated because they offer obstructions to the passage of the casing through a tunnel or the bore of a well, and furthermore, they necessitate the use of rivets or other fastening devices, which require additional labor and also become a source of weakness in the finished structure.

When the casing sections are joined by telescoping their meeting ends, or when a duplex casing is formed by telescoping the sections for one half their length, the joint between the sections becomes the weakest part of the casing. This invention enables a continuous casing or conduit to be formed having joints which are of triple thickness, these multiplex joints being as rigid as the intermediate portions.

Another object of my invention is to provide a casing which shall present substantially smooth and unobstructed interior or exterior walls.

In the accompanying drawings Figures 1, 2 and 3 are longitudinal sections of corrugated casings embodying my invention; Fig. 4 is a longitudinal section of a casing having a smooth inner wall; Fig. 5 is a similar view of a casing having a smooth outer wall; and Fig. 6 is a longitudinal section of a casing having smooth inner and outer walls. All of the figures show my three-ply or multiplex joints.

In Fig. 1, I have shown a casing constructed of similar spirally corrugated sections which taper uniformly from end to end and which are telescopically threaded to form a duplex casing with three-ply joints. It will be observed that each unit or section, as section 2, forms the inside wall between the points a, b, becomes the intermediate member at the joint which extends from b to c and then forms the outer wall from c to d. The metal at the several joints is, therefore, three-fold and the overlapping metal may extend over two or more corrugations. The sections may be provided at the larger end with lugs 4, extending between adjacent corrugations and which may serve as abutments to be engaged by the tongs or machines which are used to twist the pipe and thread the sections into telescopic union.

In Fig. 2, the casing is single-walled except at the joints which are three-ply. I have illustrated a different form of corrugated pipe in which the corrugations 5 are connected by straight tubular portions 6. For the purpose of securing a three-fold thickness of metal at the joints, I return the metal upon itself, preferably for a distance of two or more corrugations, at the larger end of each section, as shown at 8. It is apparent that this reinforcement of the metal may be secured by rolling the sheet, 100 from which the pipe is made, with a double thickness at the portion which constitutes the reinforcement, the thickened portion extending a distance of two or more corrugations. The reinforced bands of metal resist lateral strains, while the reinforced corrugations form an exceedingly rigid anchor against longitudinal strains tending to pull the sections apart or to crush the joint. By cementing the smaller ends within a cor...
rugation as shown at 10, the ends present no obstructions within the conduit.

In Fig. 3, I have shown a casing of the same type as Fig. 2, applied to the duplex form. This construction provides a casing having duplex walls at intermediate points and partly triple and partly quadruplex walls at the joints. The metal at the larger end of each section is returned or folded back upon itself preferably for a distance of two or more corrugations. Each section forms the outer wall for a portion of its length and then the inner wall for the remainder of its length and terminates at an intermediate point of the joint, as shown at 12. The joints are therefore, four-folded throughout a portion of their length and three-fold throughout the remaining portion.

It is frequently desirable to provide a casing which is smooth either upon its interior or upon its exterior or upon both interior and exterior. Fig. 4, illustrates a casing having three-fold joints with a smooth interior wall. Each section of the casing tapers from end to end, the larger end 28 being spirally corrugated and the smaller end 29 being a plain tubular or conical portion. The joints are three-ply and comprise the upper corrugated end of one section, the intermediate portion, including the terminal corrugations, of another section with which it interlocks, and the smaller corrugated end of a third section.

Fig. 5, illustrates a construction which is the reverse of Fig. 4, in that the plain uncorrugated part of each section is the larger end and consequently forms the outer wall portion. This form of casing is frequently desirable because it offers the minimum external resistance when driven through a tunnel or well bore.

Fig. 6, illustrates a casing combining the features of Figs. 4 and 5, and is useful when smooth walls are desired upon both the exterior and the interior of the casing. In this form the casing is four-fold at the joints and three-fold throughout the intermediate portions, thus constituting an exceedingly rigid casing.

In the forms shown in Figs. 4, 5 and 6, the smooth walls present no obstruction in the direction of the arrows. As illustrated, there is a slight offset at the end of each section equal to the thickness of the metal but it is evident that by graduating the height of the corrugations the ends could be made flush with the interior wall of the adjacent corrugation. For all practical purposes, however, the constructions as illustrated present smooth walls.

The importance of this invention in providing a corrugated casing which can be interlocked without auxiliary connecting members and which is stronger at the joints than throughout the intermediate portions will be appreciated by engineers. It is evident that the casing may be perforated in the manner disclosed in my application Serial No. 684177 filed March 16, 1912, if desired to adapt it for drainage or filtering purposes.

I have described in detail the constructions illustrated in the accompanying drawings for the purpose of disclosing embodiments of my invention but I am aware that changes may be made therein without departing from my invention.

I claim:--

1. A sheet metal casing for culverts, conduits, drainage tiling, etc., comprising interlocking spirally corrugated sections having multiplex reinforced joints formed of integral portions thereof, said reinforced joints extending around the entire periphery of the casing.

2. A sheet metal casing for culverts, conduits, drainage tiling, etc., comprising interlocking spirally corrugated sections having three-fold walls throughout the joints of integral portions thereof.

3. A sheet metal casing for culverts, conduits, drainage tiling, etc., comprising interlocking corrugated sections having their smaller ends overlap to form reinforced joints of three or more thicknesses extending over a plurality of corrugations.

4. A sheet metal casing for culverts, conduits, drainage tiling, etc., comprising interlocking corrugated sections having three-fold walls throughout the joints, the assembled casing having smooth interior walls.

5. A sheet metal casing for culverts, conduits, drainage tiling, etc., comprising interlocking corrugated sections having three-fold walls throughout the joints, the assembled casing having smooth unobstructed exterior and interior walls.

6. A sheet metal casing for culverts, conduits, drainage tiling, walls, etc., comprising interlocking corrugated sections having three-fold walls throughout the joints, the assembled casing having smooth exterior walls.

7. A sheet metal casing for culverts, conduits, drainage tiling, walls, etc., comprising tapering interlocking corrugated sections having reinforced joints.

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

ANDREW SMITH.

Witnesses:

EUGENE C. BROWN,
JAMES M. SPEAR.