Feb. 2, 1926. 1,571,412

R. IRVIN

METHOD OF PRODUCING SHEET METAL PIPE

Filed Dec. 21, 1922

FIG. I.

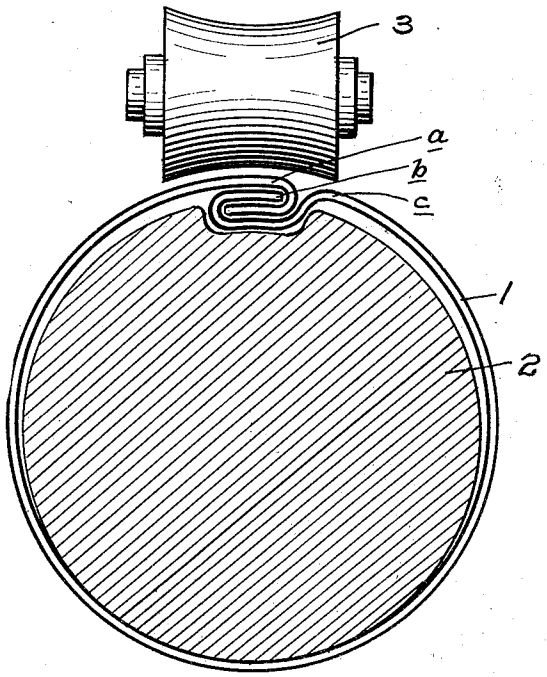
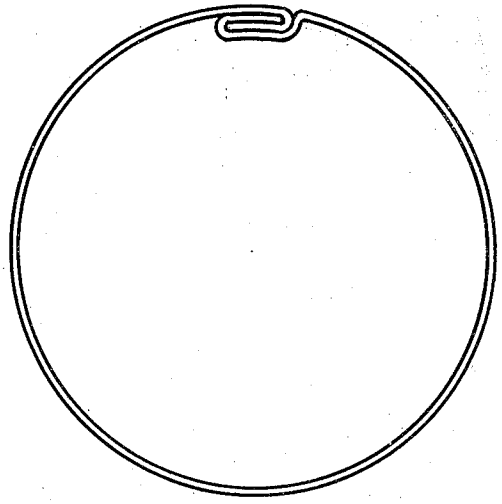


FIG. II.



WITNESSES

J. Herbert Bradley.

Percy A. English.

INVENTOR

Richard Irvin

by Christy and Christy

his attorneys

Patented Feb. 2, 1926. 1,571,412

UNITED STATES PATENT OFFICE.

RICHARD IRVIN, OF KNOXVILLE, PENNSYLVANIA.

METHOD OF PRODUCING SHEET-METAL PIPE.

Application filed December 21, 1922. Serial No. 608,306.

To all whom it may concern:

Be it known that I, RICHARD IRVIN, residing at Knoxville, in the county of Allegheny and State of Pennsylvania, a citizen of the United States, have invented or discovered certain new and useful Improvements in Methods of Producing Sheet-Metal Pipe, of which improvements the following is a specification.

My invention relates to sheet metal pipe, and its object is the production of sheet metal pipe such in nature and character as to be applicable in a far wider range of utility than sheet metal pipe hitherto produced.

Sheet metal pipe as hitherto produced is formed of sheet material, steel, copper, etc., rolled to proper gauge, cut, bent to cylindrical form, and completed by the interlock of the adjacent edges, or by soldering, or by both interlock and soldering. It is used for stove pipes, for rain-water conductors upon buildings, for speaking tubes, and for various other purposes; but its use is limited, in that it is not strong to withstand any considerable internal pressure.

I form the sheet-metal pipe of my invention out of a material new for that purpose, namely, lead-clad steel, that is to say, sheet steel having a closely adherent surface of lead. I do not mean to limit my invention to particular dimensions, but, by way of example, in the ordinary practice of my invention I employ lead-clad steel sheets of 30 to 20 gauge having on both sides coatings of commercially pure lead approximately two one-hundredths of an inch thick. The particular qualities and characteristics of this material, by virtue of which I achieve my invention and produce a sheet metal pipe adapted for new uses, are the presence in one and the same sheet of the high tensile strength which the steel affords, the protection from corrosion which the lead coating affords, and the possibility of welding at atmospheric temperature or substantially so, under pressure attainable in ordinary pipe-making methods.

Lead-clad steel has not until recently been practically attained but latterly methods of production have been improved and that material is now produced commercially.

No sheet metal pipe has hitherto been produced having a welded seam; the nearest approach has been a soldered seam, which of course is inferior in strength. Such pressure as hitherto has been applied to the interlocked edges of the blank, in the course of sheet-metal pipe production, has been applied merely for the purpose of compressing and rendering mechanically more secure the seams so formed; never has any welding been attained. The materials hitherto used have been non-weldable at atmospheric temperature, and production hitherto has been at atmospheric temperature.

Referring to the accompanying drawings, I there illustrate in diagrammatic manner my method and the product of the method. The two figures are both views in cross section, Fig. I of the blank in course of fabrication, Fig. II of the completed pipe.

A properly cut blank of lead-clad steel sheet is bent in usual manner to form the cylindrical blank 1 with interlocked edges. When the blank has been so assembled the seam is compressed between an internally arranged mandrel 2 and an externally applied roll 3, with adequate pressure, and the lead coatings which so are compressed surface upon surface are welded one to another, and so the seam is completed and secured, not by the mechanical strength arising from the mere interlocking of the edges of a somewhat rigid blank, but from the adhesion of the components of the seam of sheet-metal pipe of ordinary construction, surface to surface. The ordinary inturned and compressed seam is not integrated, but remains penetrable; the welded seam of my invention is a true integration and the joint is hermetically tight.

By such compression the double thickness of lead, which in the seam here illustrated is interposed between steel and steel at three points, *a*, *b*, and *c*, is by welding changed from six thin layers to three layers of double thickness integrated with the steel, and so constituting an integrated joint throughout. The completed pipe is shown in Fig. II, and will be understood without further explanation.

No particular preparation of the material for this welding operation is required, beyond this, that I am careful, as a metal worker should be, to form my pipe out of the sheet material as it comes fresh and clean from the mill.

I have said that I perform the welding at or substantially at atmospheric temperature. It will be understood that it may be performed at any temperature at which the

welding of lead may under the available pressure be achieved, but necessarily the temperature will not exceed the melting point of lead.

The pressure which is present between mandrel and roller to effect welding is, in the operation as I have conducted it, at atmospheric temperature or substantially such, approximately 1000 pounds. I give this figure merely by way of illustration, and do not intend to limit the invention thereby, but mean to cover welding pressure generally, whatever be its actual value.

My invention is achieved in the formation of the welded seam I have described. I may, and commonly do fortify and reenforce the seam so formed by running solder upon it. In this soldering I employ a liquid flux compounded of "cut acid" (that is to say, a muriatic acid which has reacted upon zinc until exhausted), a little turpentine, and a little salammoniac. I use the ordinary solder of commerce, and the solder may be run on with a soldering iron.

I proceed slowly with the soldering operation, to the end that the seam may be heated and that the solder may, therefore, penetrate deeply into the crevice and approach nearly the margin of the welded area.

I find that, whereas the ordinary sheet metal pipe formed of tinned or galvanized steel may withstand an internal pressure of not more than 20 pounds to the square inch,—beyond which point a higher pressure will cause the seam to gape open, a pipe otherwise similar, but formed of lead-clad steel according to the method I have described, and without supplementary soldering, will withstand an internal pressure of 150 pounds, and if the supplementary soldering be resorted to, the pipe of my invention will withstand an internal pressure of 250 pounds, without gaping open. The joint of my invention in its strength measurably approaches the strength of the sheet material used, and not infrequently in my tests, the sheet itself has torn apart before the welded seam has opened.

Manifestly a sheet metal pipe strengthened to such degree becomes available for use in places to which ordinary sheet metal pipe is quite inadequate. The non-corrosive character which a lead-clad pipe possesses within and without, together with the strength afforded by my invention, render my pipe peculiarly valuable for use in the drainage of mines. This is a mere illustrative use. Manifestly the range of utility is wide.

I claim as my invention:

The method herein described of producing sheet-metal pipe which consists in shaping from lead-clad metal a blank with interlocked edges and by pressure alone and without any addition of heat, other than that incident to pressure, welding together the interlocked edges.

In testimony whereof I have hereunto set my hand.

RICHARD IRVIN.