2 Sheets--Sheet 1.

P. BALL.

Cement-Lined Sheet-Metal Pipes.

No. 153,298. Patented July 21, 1874.

FIG. III.

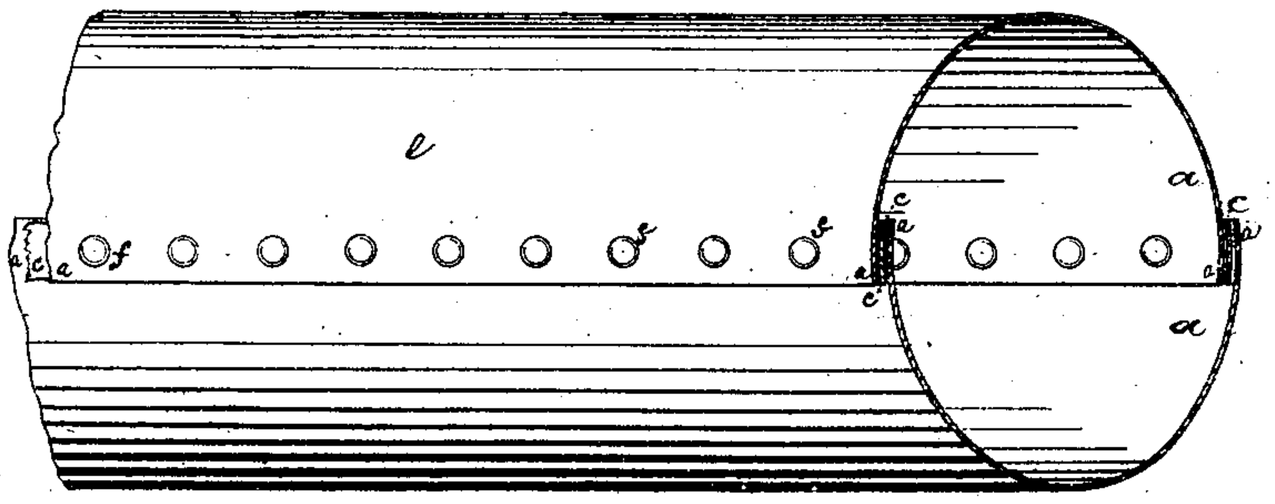


FIG. IV.

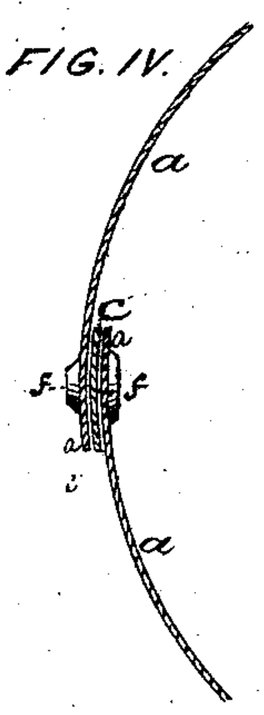


FIG. I.

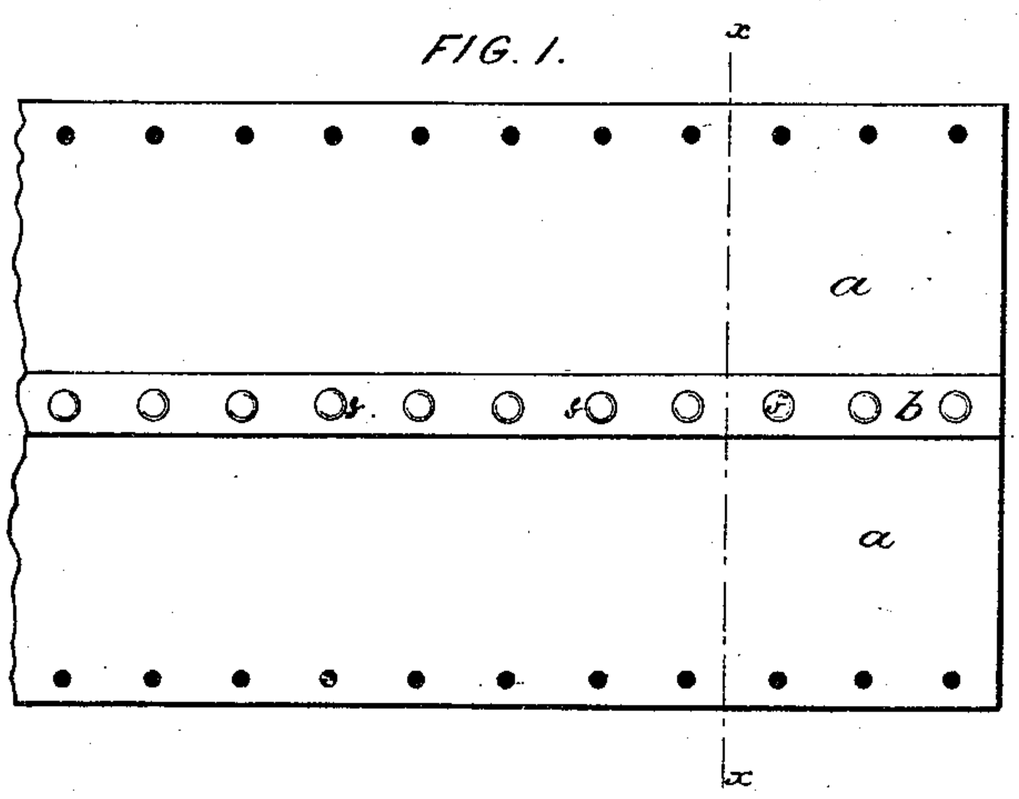


FIG. II.

FIG. V.

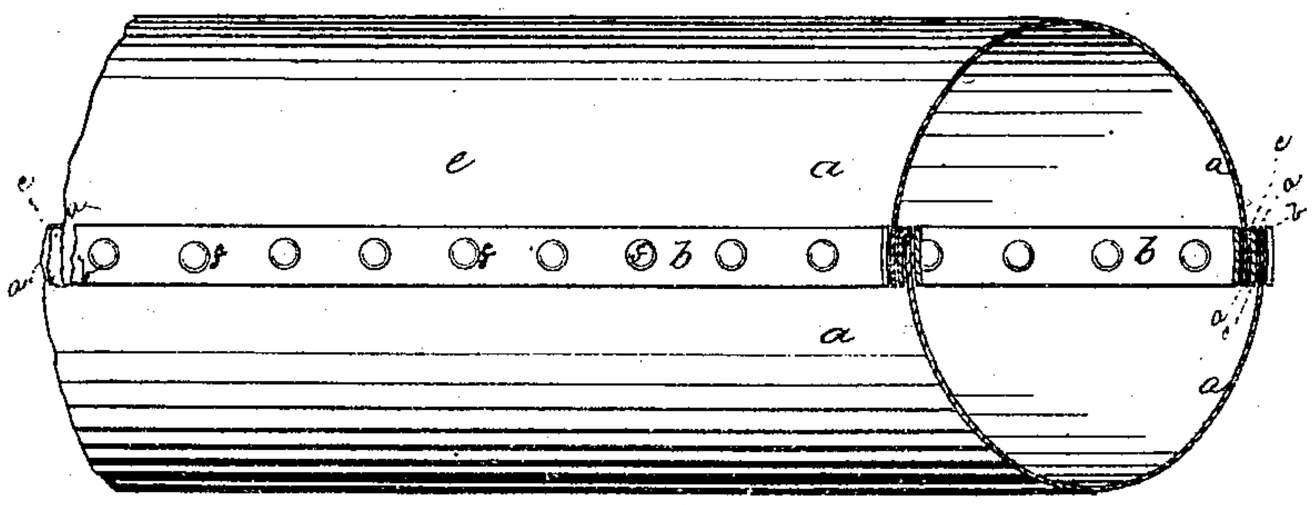
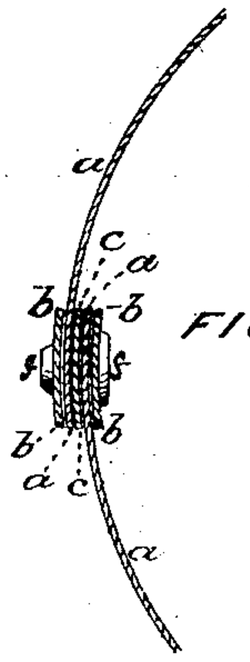


FIG. VI.



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A. McCallum

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Attorney

THE GRAPHIC CO. PHOTO-LITH. 39 & 41 PARK PLACE, N.Y.

2 Sheets--Sheet 2.

P. BALL.

Cement-Lined Sheet-Metal Pipes.

No. 153,298. Patented July 21, 1874.

FIG. VII

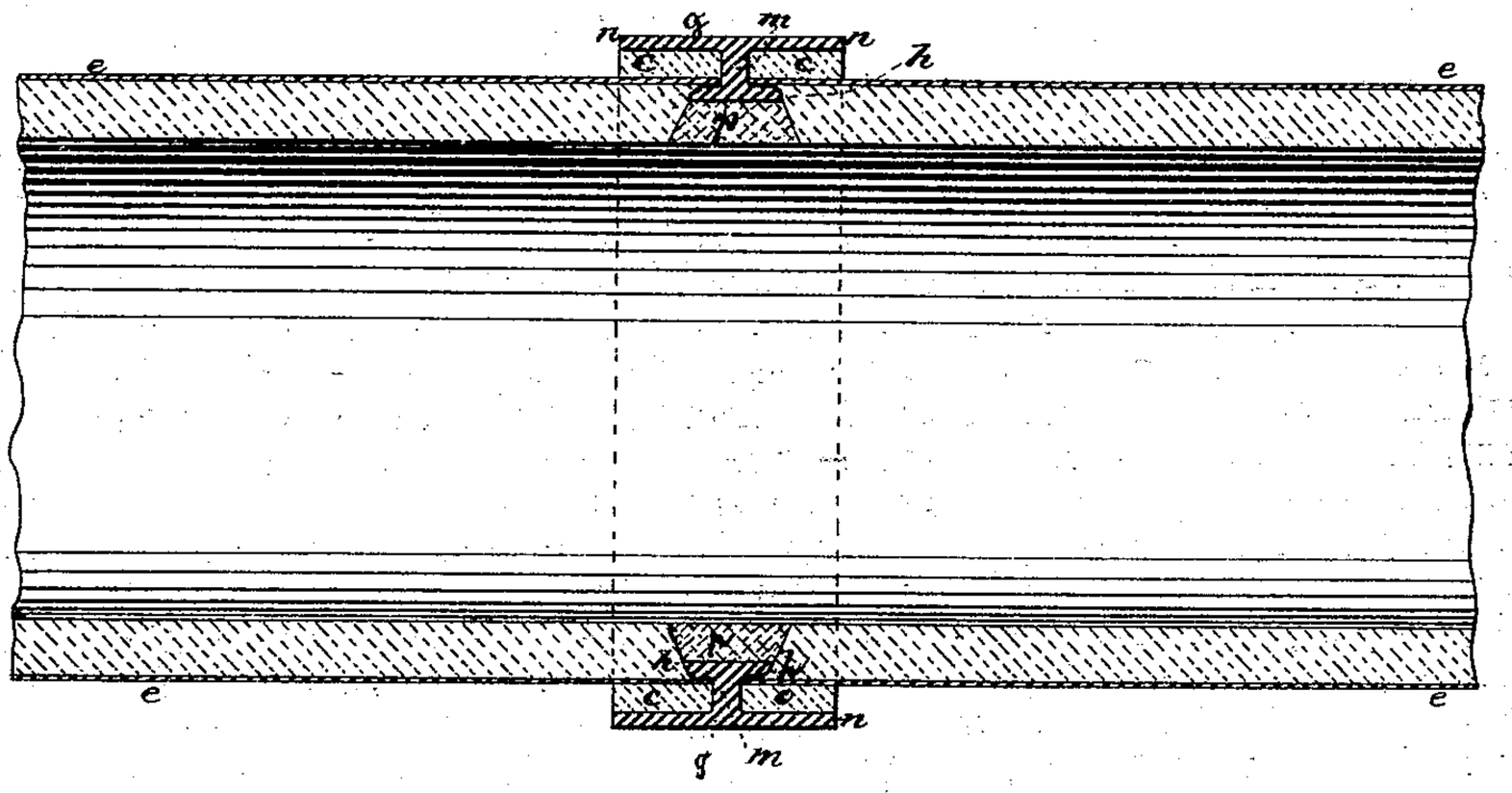
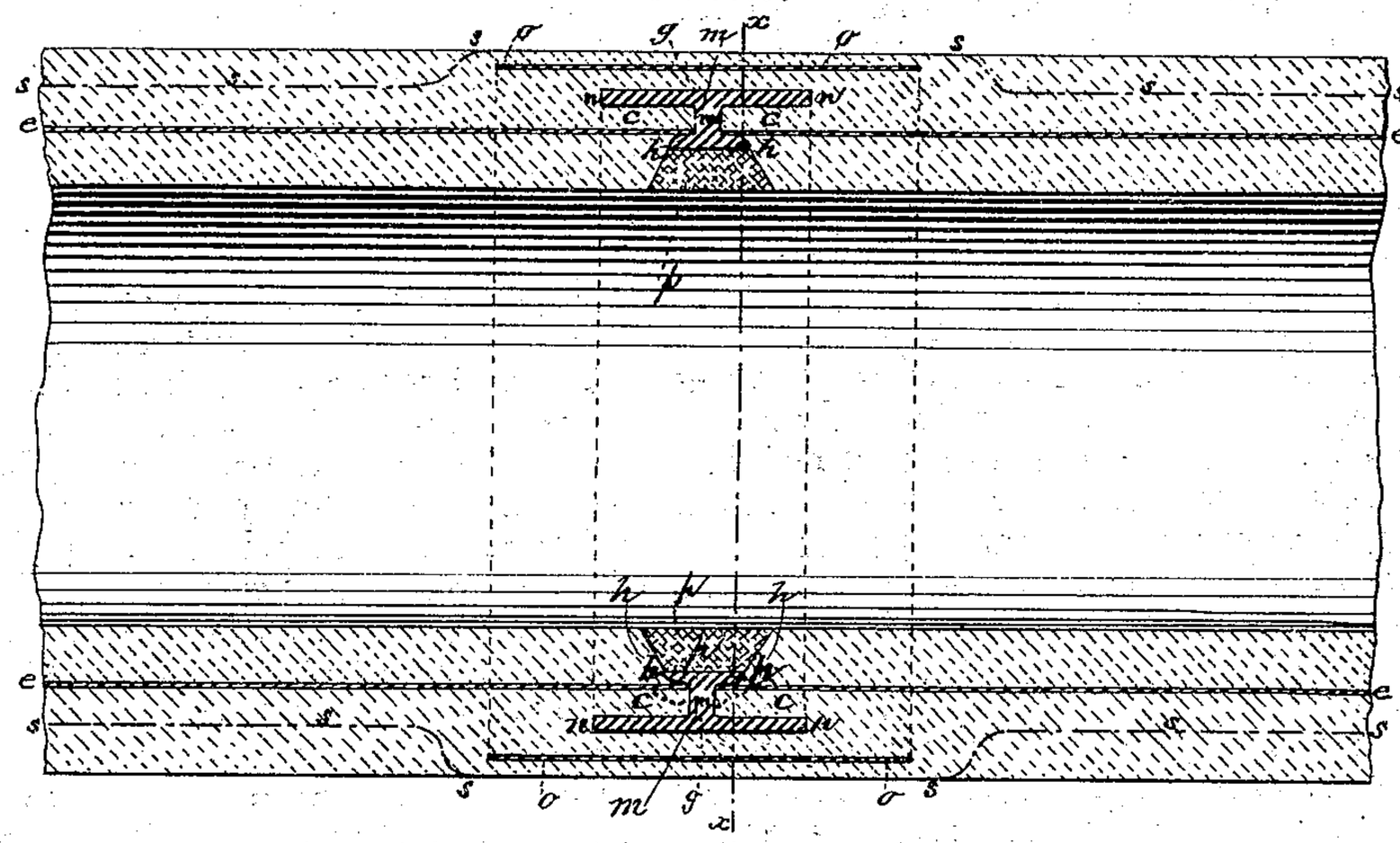


FIG. VIII.



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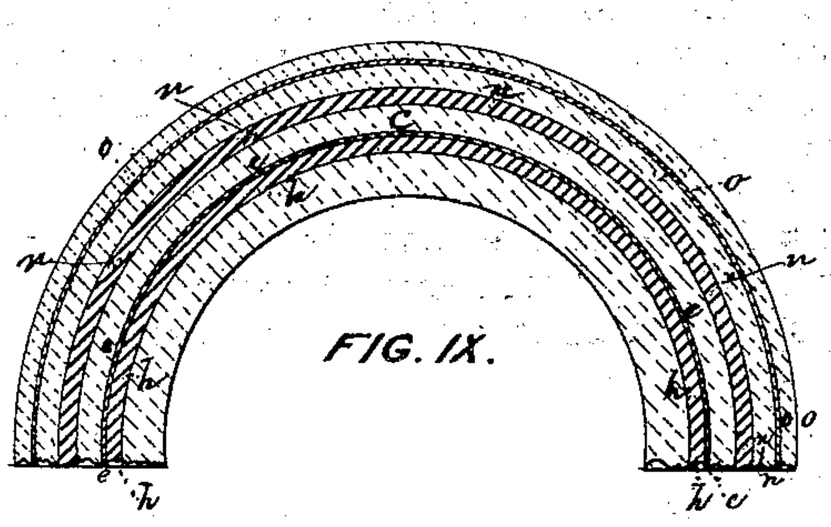

FIG. IX.

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UNITED STATES PATENT OFFICE.

PHINEHAS BALL, OF WORCESTER, MASSACHUSETTS.

IMPROVEMENT IN CEMENT-LINED SHEET-METAL PIPES.

Specification forming part of Letters Patent No. **153,298**, dated July 21, 1874; application filed May 18, 1874.

To all whom it may concern:

Be it known that I, PHINEHAS BALL, of Worcester, in the county of Worcester and State of Massachusetts, have invented certain new and useful Improvements in Cement-Lined Sheet-Metal Pipes; and I do hereby declare that the following is a full, clear, and exact description thereof, which will enable others skilled in the art to which it pertains to make and use the same, reference being had to the accompanying drawings, and to the letters of reference marked thereon, which form a part of this specification, in which—

Figure 1 represents two sheets or strips of metal, of a length sufficient to form a pipe of the required length, riveted together lengthwise and ready to be bent around and riveted together at their other edges to form my improved pipe; and Fig. 2 a transverse section of the same, as taken through the line *x x* of Fig. 1. Fig. 3 represents a view of a portion of a pipe having my improvement applied thereto, as used in connection with a piece of soft metal interposed between the joints of the plates, so as to make a water-tight joint; and Fig. 4 a detail drawing of the same. Fig. 5 represents a modification of Fig. 3, and Fig. 6 a detail drawing of Fig. 5. Fig. 7 represents a longitudinal section of two of these pipes as connected together through the instrumentality of an annular webbed or T-girder joint-piece; and Fig. 8, a similar view of the same parts, but the joint-connection completed. Fig. 9 represents a transverse section of the same, taken through the line *x x* of Fig. 8.

My invention relates, first, to a new and improved mode of making sheet-metal pipes, when constructed of two or more sheets or strips of metal. Secondly, it relates to a new and improved mode of connecting the ends of such sheet-metal pipes together, so as to form a water-tight joint, and is more especially adapted to that class of sheet-metal pipes termed cement-lined water-pipes.

Heretofore, in making sheet-metal pipes of large diameter it has been usual to make them of two or more sheets, as no single sheet can conveniently be made of sufficient size to form such pipe. In making these pipes the mode heretofore adopted has been to take sheets of metal of such length as, when bent around, form a short cylinder of the diameter of pipe required, each section having but one longitudinal joint, and then riveting the ends of two or more of these short sections together, by means of the ordinary circular and riveted joint, in order to form a pipe of the length required. Thus made, the circular joints are with the greatest difficulty made passably water-tight. Moreover, the adjacent ends of these sections which form the pipe have to be, respectively, formed less and greater, the one than the other, and rarely, if ever, fit snugly the one to the other, so as to form a perfectly water-tight joint, and hence give rise to great waste of metal and loss of time in making a good joint, and consequent increase of cost in manufacturing them.

To remedy these troubles, and, at the same time, to form a simple, efficient, and strong water-tight joint at the point of connection between the adjacent pipes, is the object of my present improvement.

My invention, for these purposes, consists, first, in forming each pipe of two or more sheets or strips of metal, each of which must be of sufficient length to make the length of pipe required, and of a width, when riveted together, to form a pipe of the diameter required when bent around and properly riveted together lengthwise by longitudinal joints or seams. This mode entirely avoids the difficulties above referred to as incident to the forming of a water-tight circular joint, while in practice it is found easy to produce a longitudinal water-tight joint.

Secondly: My invention consists in connecting the adjacent ends of sheet-metal pipes through the interposition of a T-shaped annular girder, which at once affords a firm internal and endwise support to the end of each tube, thus keeping it in a true circle while being tamped to form a water-tight joint, and to prevent the back filling of the trench in which the pipe is laid from compressing the pipe into the form of an ellipse.

To enable others skilled in the art to make, construct, and use my improvement, I will now proceed to describe it in detail.

My improved pipe is represented in the draw-

ing as being made of two long strips, *a a*, riveted together longitudinally. These strips, while they must be of equal length, need not, of necessity, be of equal width, but I prefer to make them of equal width. Again, but two strips, *a a*, are represented, while three or more may be used, according as circumstances may dictate.

In making the longitudinal joints the latter may be formed by simply lapping and riveting their edges together in the ordinary way; but I prefer to make them in one or other of the modes which I will now proceed to describe, through which a stronger and more perfect water-tight joint may be obtained.

In Figs. 1 and 2 I form the joint by lapping the edges of the sheets together and interposing two strips of metal, *b b*, one on each side of the joint, between the rivet-heads and the sheets *a* of metal, and then securing the whole together by means of rivets *f* common to all; or I form the joint by interposing between the lapping edges of the sheets *a a* a strip, *c*, of soft metal throughout the entire length of the joints, and then securing the whole together by means of rivets *f*, common to all, as shown in Figs. 3 and 4; or it may be formed as in Figs. 5 and 6, in which both forms are combined together—that is to say, a strip, *c*, of soft metal is interposed throughout the entire length of the lapping edges of the sheets of metal *a a*, and two strips, *b b*, then placed along the line of said joint, the one on the outside, and the other on the inside, and the whole firmly secured together by means of rivets *f*, common to all.

In each or all of these cases, if desired, the joints may afterward be staked and calked to make a perfectly water-tight joint.

The pipes thus made are then ready to be coated with a suitable cement mortar,-or with asphaltum, or any suitable preparation of asphaltum and other substances, and then joined together in any known manner, save that of riveting; but I prefer to unite them through the instrumentality of the following devices, shown in Figs. 7, 8, and 9, in which *g* represents a cast-iron ring, having two sets of circular flanges, *n n* and *h h*, connected together at their middle by means of a web, *m*, thereby forming, as it were, a circular T-girder, of which the outer periphery of the inner flanges *h* is made to fit the internal diameter of the sheet-metal pipes *e*. The outer periphery of these flanges, toward their edge, is slightly beveled, so as to allow the pipes to slip easily on and be pressed tightly up to form a water-tight joint, as shown in Figs. 7 and 8. The pipe thus inserted, a filling, *c c*, of Portland cement, or of lead, is then forced in between the outer flanges *n* and the end of the pipes *e*, before the sleeve *o* is put over and filled, as shown in Fig. 7.

Where lead is used as a packing at the joint *c c*, it may then be tamped in the usual manner of lead joints, and this tamping may be done with perfect safety, as the end of the metal of the pipe bears firmly against the outer periphery of the inner flanges *h* of the cast-iron ring *g*. The ends of the two contiguous pipesf *e*, may be inserted at the same time and their joints filled, or they may be done one after the other, each undergoing the same operation, the ring *g* having a set of flanges for each.

This joint having been made, the sleeve *o* is then slipped over so as to range centrally with the cast-iron annular girder *g*, and concentrically with the pipe. The space between it and the annular girder *g* is then filled up with the usual cement mortar, as shown in Figs. 8 and 9.

The cast-iron ring *g* nearly fills the sheet-metal sleeve *o*, and therefore forms a bridge, as it were, which aids in preventing the cement from being pushed through during the operation of filling.

The space *p*, between the ends of the cement lining *x* on the inside of the contiguous pipes, is then filled with Portland cement. The outside of the pipes are then coated over with cement mortar, or with the asphaltum, or preparation of asphaltum, in the usual manner, and may be made of any required thickness by shaping it as shown in dotted lines *s s*, Fig. 8.

It will be clear that this mode of making the joints is adapted to any kind of sheet-metal pipe, whether joined with circular and longitudinal joints, or simply with longitudinal joints.

Thus joined, the pipes possess the following advantages, to wit: First, the cast-iron annular T-shaped girder *g*, being practically of a true circular form, on being inserted between the ends of the two contiguous pipes preserves the form of the pipes, and prevents the back filling of the trench from compressing them into the form of an ellipse, and also enables the joints *c c*, when filled with lead, to be properly tamped to make them water-tight. These are points of great importance in making cement or asphaltum lined sheet-metal water-pipes. Secondly, the ring, by being so made, can be covered on the inside with an ample depth of cement, or other suitable material, to protect it from corrosion, as shown at *p*, Figs. 7 and 8. Moreover, this filling up of the space *p* with Portland cement, or other suitable material, aids in making the entire joint perfectly water-tight. And, lastly, as the cast-iron annular girder *g* is placed at the center of the joints of the pipe, and rises above the pipe, it forms a means of always telling when the center of sheet-metal sleeve *o* is over its own center, and thereby avoids a source of difficulty in making perfect cement joints. Moreover, as the ring *g* is of the T-girder form, through the web *m*, which connects its double set of inside and outside flanges, it gives great lateral strength with the expenditure of but a small amount of metal.

I am aware that sheet-metal pipes have been made of a single piece of metal without the use of circular riveted joints, as in the case of stove-pipes, &c., and therefore I do not claim such; but

What I do claim is—

1. A sheet-metal pipe, *e*, made of two or more strips or sheets of metal, *a a*, in the line of their length, and each of length sufficient when riveted together by means of longitudinal joints, and without the aid of a single circular riveted joint, to form a pipe of the length required, for the purpose set forth.

2. The combination of a metallic annular T-shaped girder, *g*, with two contiguous sheet-metal pipes, *e e*, and a cement or analogous lining or packing, for the purpose set forth.

3. The combination of the sleeve *o* and annular T-girder *g* with the ends of two contiguous pipes, *e e*, for the purposes set forth.

In testimony that I claim the foregoing as my own I affix my signature in presence of two witnesses.

PHINEHAS BALL.

Witnesses:

JOHN P. K. OTIS,

JOHN C. OTIS.