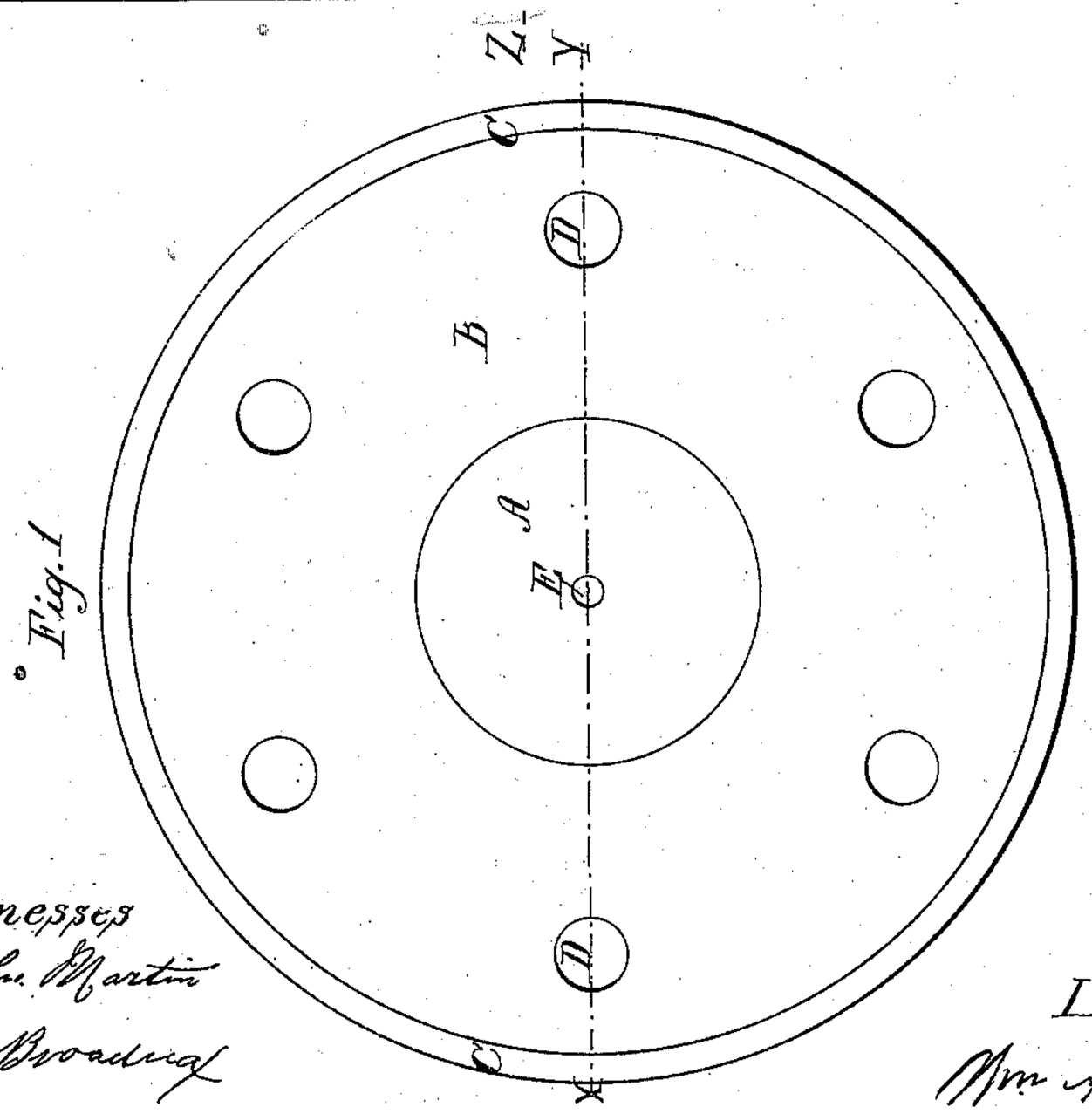
W. A. Shaw.

Making Lead Pipe.

No. 74,613. Patented Feb. 18, 1868.



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WILLIAM ANTHONY SHAW, OF NEW YORK, N. Y.

Letters Patent No. 74,613, *dated February* 18, 1868; *antedated February* 6, 1868.

IMPROVEMENT IN THE MANUFACTURE OF TIN-LINED LEAD PIPE.

The Schedule referred to in these Letters Patent and making part of the same.

TO ALL WHOM IT MAY CONCERN:

Be it known that I, WILLIAM ANTHONY SHAW, of the city, county, and State of New York, have invented a certain new and useful Improvement in the Manufacture of Tin-Lined Lead Pipe; and I do hereby declare the following to be a full, clear, and exact description of the same, reference being had to the annexed drawings making part of this specification, in which—

Figure 1 is a top view of my said improvement, and

Figure 2 is a vertical section through the same, on the line *x y*.

This invention relates to the manufacture of tin-lined lead pipe, or lead-encased tin pipe, upon the plan stated in the patent granted to me on the tenth of March, 1863, which patent was afterwards assigned and reissued.

In manufacturing this kind of pipe upon the plan stated in said patent, or said reissued patent, great difficulty is experienced in obtaining a uniform thickness of lining in the pipe. The lining will be thicker in one place than another, sometimes in one end and sometimes on one side, and then, again, the lining will be nearly or quite uniform through the entire length of the coil, thus developing a want of certainty in the manufacture of this variety of pipe which militates very much against the practical value of the invention. The prime cause of this difficulty is undoubtedly owing to the fact that the two metals are both placed in one retaining-cylinder, from whence they have to be forced through one die.

The difficulty thus resulting from placing the two metals together in the same cylinder, as indicated in the patent aforesaid, is due to the fact that, in pressing an ingot of soft metal out of a retaining-cylinder through a die, the centre of the ingot is forced out with greater rapidity than the circumference, and especially during the latter part of the stroke. This may be owing to the greater friction of the metal on the sides and bottom of the retaining-cylinder, or it may be owing to the fact that the centre of the metal, near the axis of the ingot, is nearest the place of exit through the die, the particles of soft metal passing more freely by each other than by the side of the cylinder, the circumference of the ingot breaking down continually under the end of the ram or applied power, thus forcing the centre of the ingot forward.

Whatever may be the cause of this phenomenon may be difficult to exactly determine, but of its existence there is no doubt; for, by putting the two metals together in the same cylinder and pressing them out, as in the case of the patent above alluded to, the course and disposition of the metal are at once revealed.

Now, in the manufacture of lead-encased tin pipe, upon the plan of said patent, the tin ingot must be placed around the axis of the mandrel, and, per consequence, is first forced out through the die with the greatest rapidity, making the lining in the end of the pipe first formed too thick, and disappearing nearly or wholly in the last end of the coil. This difficulty has been met, and, to a certain extent, overcome, by a peculiar formation and adjustment of the two ingots, in respect to each other and to the die and cylinder.

The peculiar formation and adjustment of these ingots in relation to each other, the die and cylinder, for the purpose of overcoming the difficulty above pointed out, have been hitherto patented by me, but the difficulty, though mitigated, has not entirely disappeared.

In making this variety of pipe, I have found that the top of the two ingots, or charge, moves down, without change of form, for a certain distance, or until it comes within the influence of the escaping current at the die. The distance that the charge or ingots will thus move down without change of form depends upon the size of the die and the core, and also upon the depth of the cylinder and its diameter.

To overcome the objections above pointed out, the two ingots must be so formed, proportioned, and adjusted in relation to each other, the die, cylinder, and mandrel, that the lead ingot, under the operation of the applied power, will not distort the tin ingot to such an extent as to destroy its uniform discharge through the die, and the equal thickness of the tin lining or tube in the lead encasement.

To meet these conditions, I make the tin ingot in the form of a double frustum of a cone, as represented in the drawing by A A, making the upper frustum to contain a little more metal than the lower one, and also a little shorter and more tapering than the latter, placing the lead ingot B around the tin, in the manner shown. By these means the tin will be forced out of uniform thickness, or nearly so, from one end of the charge to the

other, the shape of the top frustum being gradually transformed to that of the lower one, as the charge works off. These frusta may be made separately, that is, parted on the transverse dotted line *z*, in fig. 2, or, in casting, they may be parted longitudinally through the centre, or they may be cast in one piece of ingot, as experience may seem to dictate.

The same object, that is to say, a uniform thickness of lead and tin through the whole length of pipe, may be approximately obtained even when a cylindrical central ingot is used, or one that is nearly cylindrical, by coring out the lead ingot, to reduce the quantity of metal, and the consequent excessive density thereof towards the last part of the charge, by which the proper relative proportion of the tin and lead in the pipe is destroyed, the lead being in excess and the tin too thin, but by making the cavities D in the top of the ingot, the metal has an opportunity to spread, and relieve the tendency to force out the centre or middle of the ingot. But to get the best result from the preparation of the charge, and to prevent the lead from alloying excessively with the tin, and to save the waste of time incidental to the chilling of the central or tin ingot, as now practised, I first make two moulds, of the form of a frustum of a cone, as represented by the two parts of the lead ingots B and C, when separated on the line *z*. I then make two cores, of the forms respectively of the top and bottom parts of the tin ingot A. I then put one of the last-mentioned cores in each of the aforementioned moulds, and cast the two parts of the lead ingot, which is divided on the line *z* separately, in their respective moulds. These two parts of the lead ingot are then put together in a metal receiver, made for that purpose. I then set the mandrel E in the centre of the lead ingot B, thus formed, and cast the tin ingot around the mandrel, and afterwards cast the lead ingot C either in the cylinder of the press, or in a separate mould around the ingot B.

By this means, I avoid completely the excessive alloying and waste of time above alluded to, and, at the same time, get the lower part of the charge the hottest; for, by making the intermediate ingot like an inverted frustum of a cone, and casting the melted lead around it, I get the greatest mass of hot lead in the bottom of the cylinder, and heat the ingot at the desired point previous to the application of the power thereto. The intermediate ingot may be of lead, or some suitable alloy, as lead and zinc, or lead and copper, or lead and antimony, or it may be of any alloy which will melt at a somewhat higher temperature than tin, thus improving the pipe, by strengthening it, and affording better facility for making the joints with solder, removing, as it does, all danger of melting the lining in the pipe, as sometimes happens in the case of pure tin.

The proportion and form of the central and intermediate ingots may be somewhat modified, and the ingot B may be made much smaller, leaving room for the cavities D in the outside casing C. But the intermediate ingot, B, should be about of the form of the frustum of a cone, and the central ingot, A, should be of the form of a double frustum of a cone, or nearly so.

This general form, I think, it will be well to preserve, without meaning to confine my claim to the exact form, or to any given taper or proportion of the respective ingots, or to the above-described order of making them. The idea which this invention is intended to reduce to practice is to so form and proportion the two ingots or metals in respect to each other, the cylinder, die, and mandrel, that, notwithstanding the change which takes place in their relative shapes or forms under the operation of the applied power, they will nevertheless dispose themselves in their proper relative position and proportion when forced out of the die in the form of pipe.

I desire it understood, therefore, that, although I claim the manner of preparing the described charge of metal, I do not intend to limit my patent to making it in three parts or pieces, nor do I intend to limit it to the exact outline of a double frustum of a cone in the one part, or a single frustum of a cone in the other, but

What I do claim as my invention, and desire to secure by Letters Patent, is—

1. Making the charge of metal in three distinct parts, as described, and uniting them either before or after they are put in the cylinder.

2. Making the central ingot or charge of tin, in the form of a double frustum of a cone, or its equivalent, for the purpose of securing a uniform thickness of tin in the lead tube or pipe.

3. Making the intermediate lead or alloy ingot in the form of a frustum of a cone, substantially as described.

4. Making the cavities D in the upper end of the charge, substantially as described, for the purpose specified.

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Witnesses:
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