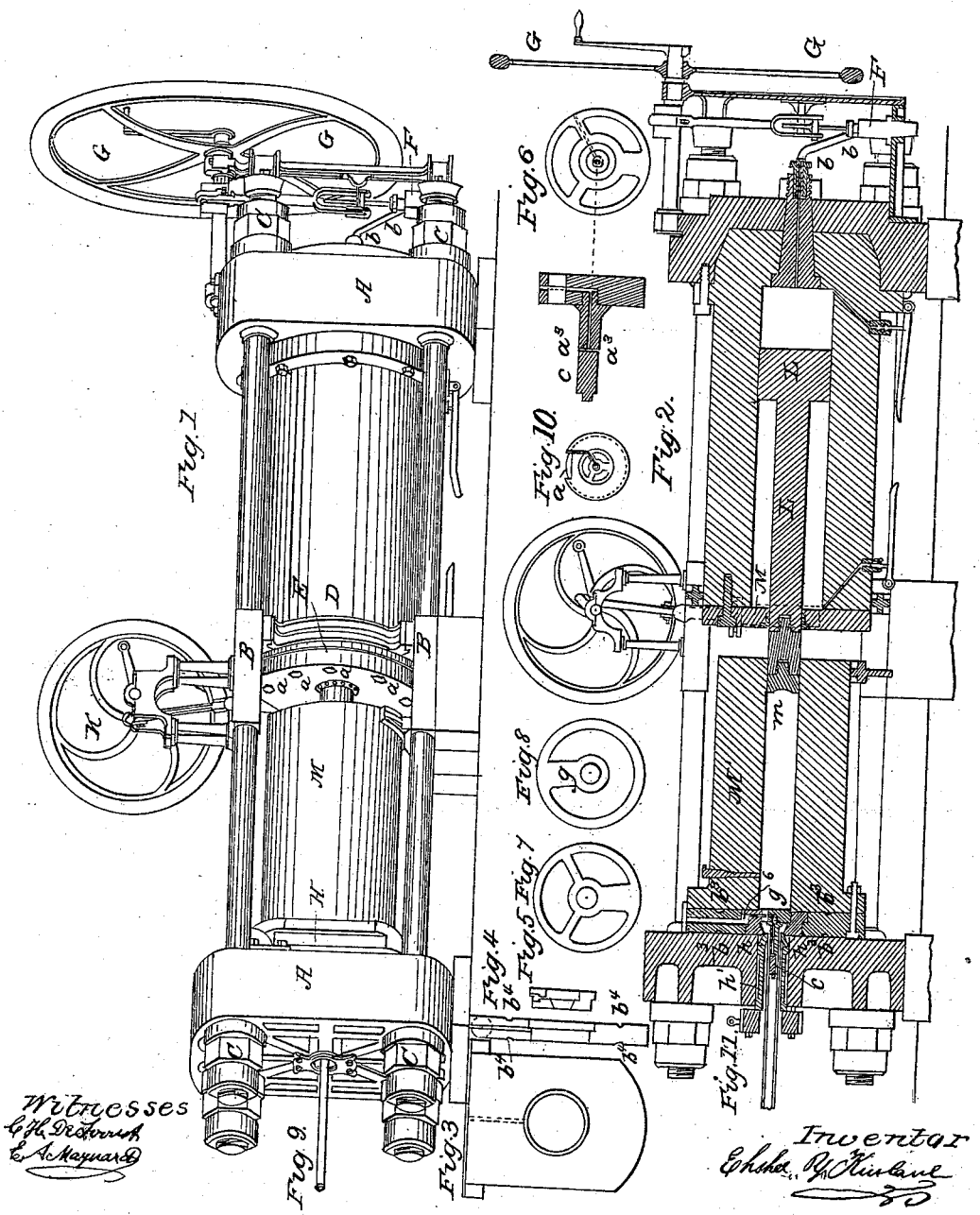
WARD, SELDEN & KNEELAND.

Making Lead Pipe.

No. 3,944. Patented March 12, 1845.



UNITED STATES PATENT OFFICE.

HENRY M. WARD, SAML. L. SELDEN, AND E. Y. KNEELAND, OF ROCHESTER, NEW YORK, ASSIGNORS TO ROBERT W. LOWBER, OF NEW YORK, N. Y.

METHOD OF TINNING LEAD PIPE.

Specification of Letters Patent No. 3,944, dated March 12, 1845.

To all whom it may concern:

Be it known that we, HENRY M. WARD, S. L. SELDEN, and E. Y. KNEELAND, of Rochester, in the county of Monroe and State of New York, have invented a new and useful Improvement in Machinery and Manufacture of Lead Pipe and Turning the same; and we do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, which form a part of this specification, in which—

Figure 1, is a perspective view; Fig. 2 is a vertical longitudinal section; Figs. 3 to 10 inclusive detached parts of the machine more clearly representing them

The nature of our invention consists in forming lead pipe by means of hydrostatic pressure by forcing the lead in a fluid state around a mandrel is a small chamber between it and a die and thence forcing it through said die as it chills; the mandrel being hollow and ejecting fused tin through two holes see a^3, Fig. 6 in the sides thereof which spreads over the surface of the inside of the pipe and tins it, this last part of our improvement can be applied to other machinery now in use of nearly every description.

The outer frame work of the machine consists of two main head-plates of cast iron four feet and five inches square and about fourteen inches in thickness, connected together by four rods or bars of wrought iron six inches in diameter perforating the head plates at the four corners and firmly secured by screws and nuts of great strength upon the ends of the bars outside the head plates each bar having a strong shoulder fitting to the inside of the plates as exhibited in (Fig. 1) on the plan hereto annexed (A, A) representing the head plates (B, B,) the rods, and (C, C,) the nuts, upon the ends of the rods. Each of the head plates has an orifice through the center about nine inches in diameter. This frame is placed horizontally upon a solid foundation of stone.

There are then two cylinders of cast-iron, the larger of which constituting the hydraulic press is five feet long and thirty two inches in diameter with a bore of 14½ inches diameter—the smaller cylinder M′ used for receiving the lead or other metal to be made into pipe is 4 feet long and 2 feet in diameter having a bore of 6 inches diameter this cylinder is made of composition metal. One of the head plates has a conical recess upon its inner surface bored to the depth of several inches, into which one end of the larger or press cylinder is closely fitted as seen in the section (Fig. 2). The other end of this cylinder is supported by a strong cross bar of cast iron running from one of the lower main connecting rods to the other and having a circular or curved bed for the reception of the cylinder. Another curved cross bar passing from one of the upper connecting rods to the other secures this end of the cylinder firmly in its place. Fig. 1, letter D, represents this last cross piece.

The piston is made of steel wrought 6 inches in diameter and made a little smaller than the bore of the smaller or lead cylinder. The head of the piston is 14½ inches in diameter corresponding to the bore of the press cylinder and packed to prevent the water from passing it—letter L, Fig. 2, represents the piston. The end of the piston that enters the small cylinder M has a piece of metal *m* attached to it and forming the head which just fits the bore of the cylinder, and is of the same kind of metal, consequently when heated it expands equally with the cylinder and keeps it packed tight, the face of this piece is concave, and there is a groove turned in it around the outside as shown in the drawing, this avoids the necessity of any other packing.

A circular plate corresponding in diameter to the large cylinder and 4 inches thick is strongly screwed to the lower end of the press cylinder. See Fig. 1, letter E, and Fig. 2, letter M, *a a a* in Fig. 1, representing the heads of the screws by which this plate is secured to the cylinder. This plate has an orifice in the center 6 inches in diameter to admit of the passage of the piston. Packing must be put between this plate and the end of the cylinder to prevent the escape of the water in returning the piston. The water is forced into the press cylinder through the center of the head plate as represented (in Figs. 1 and 3, *b*, *b*,) being the small copper tube through which the water is forced, F the force pump which is worked by means of the fly wheel G driven by a small steam engine all of ordinary construction. The smaller or lead cylinder is placed within the rods at the outer end of the ma-

chine and perfectly in line with the press cylinder. The end of the lead cylinder next the press is supported by a cross piece like the press cylinder but as it has frequently to be taken out it has no fastening on the upper side. The other end of this cylinder is not placed directly against the head plate (A) but is attached in the first instance by means of screws to a large plate 4 inches thick and considerably larger than the end of the cylinder called the die-plate. Fig. 3 on the drawing represents this plate. Also letter H in Fig. 1. This plate is placed against the head plate and is sustained by two brackets or sockets screwed to the head plate into which the arms or ears c, c, seen in Fig. 3 are fitted. It is also sustained and kept immovably in place by a circular bead or projecting rings, b^3, Fig. 2, turned upon its outer surface which is nicely and exactly fitted to a corresponding circular groove b^4 see Fig. 5 on the inner surface of the head plate—thus securing an unchanging center at this end of the machine as was done at the other end by the insertion of the press cylinder into the headplate.

Into the die plate above described are fitted the first or larger set of dies, which can be changed as occasion may require by unscrewing the dieplate from the cylinder. These large dies are about a foot in diameter and of the same thickness with the dieplate and when inserted into the dieplate through an orifice for the purpose the outer side of the die rests against the head-plate. These dies are bored in the center on the inner side next the cylinder from 4 to 5 inches in diameter to a depth within $\frac{3}{4}$ of an inch of the outer side. The orifice is then continued through 3 inches in diameter only. These dies all have a flanch about $\frac{3}{4}$ of an inch wide on the inner edge which fits into a corresponding groove in the dieplate. A sectional view of one of these dies together with a like view of the dieplate into which it is fitted is seen on the plan in Figs. 4 and 5. The mandrel (c) which forms the bore of the pipe is screwed into a projection (g) upon the under side of the inner orifice in this die; to this projection are sometimes added arms extending to the sides of the die. Figs. 7 and 8 give a view of the sides of these fixtures into which the mandrel or core (c) is screwed. The precise form of this fixture for holding the mandrel is immaterial. It should extend beyond the die into the cylinder an inch or more and be so fitted as to leave a clear chamber of near two inches in depth between it and the inner surface of the small die when the latter is put in place as hereafter mentioned. The mandrel or core (C) may be of any length and is screwed into the holder (g) above described extending outwardly through the center of the orifice in the die into the head plate and may be readily changed from without. Fig. 6 shows a side view of one form of holder with a rod attached—and the mode of its insertion in the large die may be seen by looking at this figure in connection with Fig. 5.

The rod being inserted the three inch orifice in the outer side of the large die above described through which the rod projects in contracted to the size of the outer surface of the pipe to be made by the application of a small die (h) Fig. 2, through the opening in the head plate. This small die is slipped on over the rod and just fits into the large die. It is thin and cup shaped on the outside and is held in its place by a small iron cylinder or tube (h') one end of which is placed against the small die to which it is fitted and the other rests against, and is supported by a strong iron plate which is secured to the outside of the head-plate by 4 strong screws. Fig. 9 in Fig. 1 shows this last plate which holds the small die with a section of pipe issuing through it. Letter I in Fig. 1 also shows the same plate as screwed to the head plate. By means of the screws which hold this plate the position of the small die in refernce to the center rod may be adjusted so as to correct any inequality of thickness in different sides of the pipe. In applying the process for trimming the pipe to the machine above described a small hole (i) is first bored from the top of the die plate H (see Fig. 1) downward until it strikes the upper edge of the large die where it communicates with a small chamber or reservoir (k) in the top of the die (see Fig. 10) capable of containing a few pounds of melted tin. From one end of this chamber a hole is bored downward through the die until it strikes the end of one of the arms of the fixture for holding the rod or core. It is then continued through that aim to the end of the rod where it is screwed into the holder; the rod or core itself is bored or made hollow so as to continue this channel to a point beyond where the pipe is formed. The channel is there made to communicate through some small lateral apertures with the outer surface of the rod. At this point a recess is made on the outside of the rod entirely encircling it, that is, the rod is made considerably smaller there than elsewhere, this recess is deepest toward the die becoming gradually more shallow toward the end until the rod becomes of its original size. The channel above described may be traced on the annexed plan in Fig. 11 from its commencement (at a) on the top of the die plate through the chamber in the upper part of the die at b to its termination in the recess or throat of the rod (at c).

In manufacturing as soon as the pipe has started melted tin is poured into the orifice at the top of the die plate which immediately makes it way through the channel described to the recess or chamber on the outside of the rod which is kept constantly full by the pressure of the tin above. Of course every part of the inner surface of the pipe as it passes along the rod is brought in contact with the melted tin and the coating of tin is necessarily perfect.

The parts of the machine which contain the tin must be carefully kept up to the degree of heat necessary to keep the tin in a state of fusion.

The process of manufacture is as follows: The lead cylinder is first heated by means of a small furnace constructed for that purpose underneath and around it to nearly or quite the temperature of melted lead. The cylinder is then filled through a small hole near the die plate with lead raised to a temperature much above the fusing point. The hole through which the lead is poured is stopped by an iron plug. The machine is immediately put in motion without giving the metal time to set in the cylinder, the lead is thus forced from the cylinder while fluid past the holder into the chamber in the large die. This die being inserted, not in the cylinder, but in the large die-plate which is not exposed to the same degre of heat as the cylinder itself is, of course of a temperature far below that of the cylinder. Consequently as soon as the metal enters this chamber it begins to set and if by reason of its being a little too hot it is not cooled sufficiently by the large die, the moment it touches the small outer die, which is comparatively cold it becomes solid and issues in the form of pipe.

Much care is requisite to keep the different parts of the machine at the proper temperature. For if the heat be too great the metal will not cool in the large die but is forced out in a liquid state. If, on the other hand, too little heat is used the lead will not pass the holder of the rod in a fluid state and the pipe made is imperfect and useless and has to be manufactured. After one charge or cylinder full of lead is forced out, the piston is returned home by means of a return pump affixed to the side of the machine which forces the water into the lower end of the press cylinder below the head of the piston. K K in Figs. 1 and 2 represent the apparatus for working this pump.

Having thus fully described our machine and its operation what we claim therein as our invention and desire to secure by Letters Patent is—

The method herein described of tinning the inside of lead pipes in the course of manufacture by passing the melted tin down into the mandrel and out at the side thereof as above made known, whether applied to this machine or any other substantially as described.

HENRY M. WARD.
SAML. L. SELDEN.
ELISHA Y. KNEELAND.

Witnesses to the signatures of Ward and Selden:

ELLEN BARNARD,
L. A. WARD.

Witnesses to signature of Kneeland:

W. H. BL— — —
JAMES G. DICKIE.