

Sheet 1 of 2 Sheets

W. A. Shaw.

Making Tin-Lined Lead-Pipe.

Patented Feb. 18, 1868

N<sup>o</sup> 74612

FIG. 3

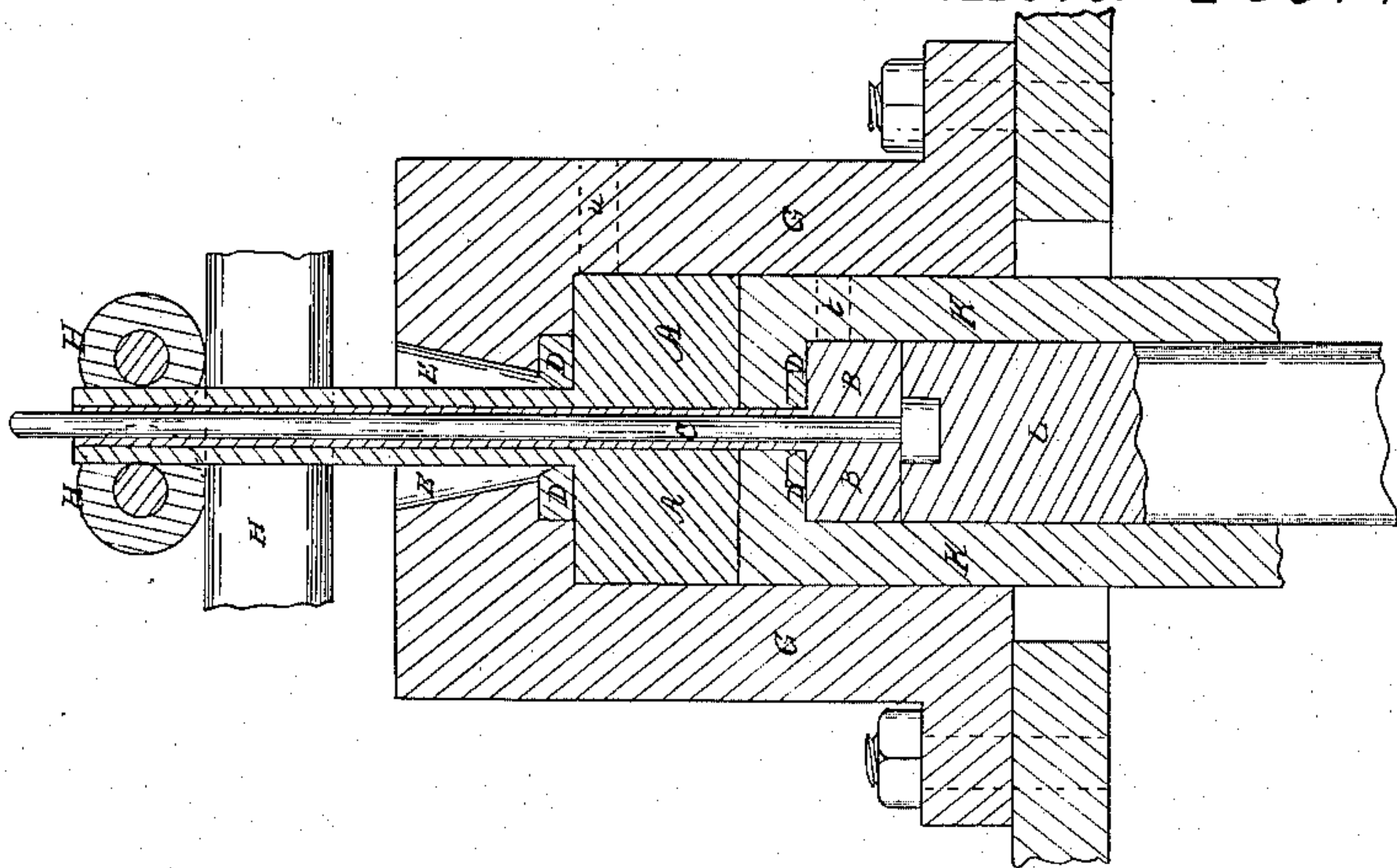


FIG. 2

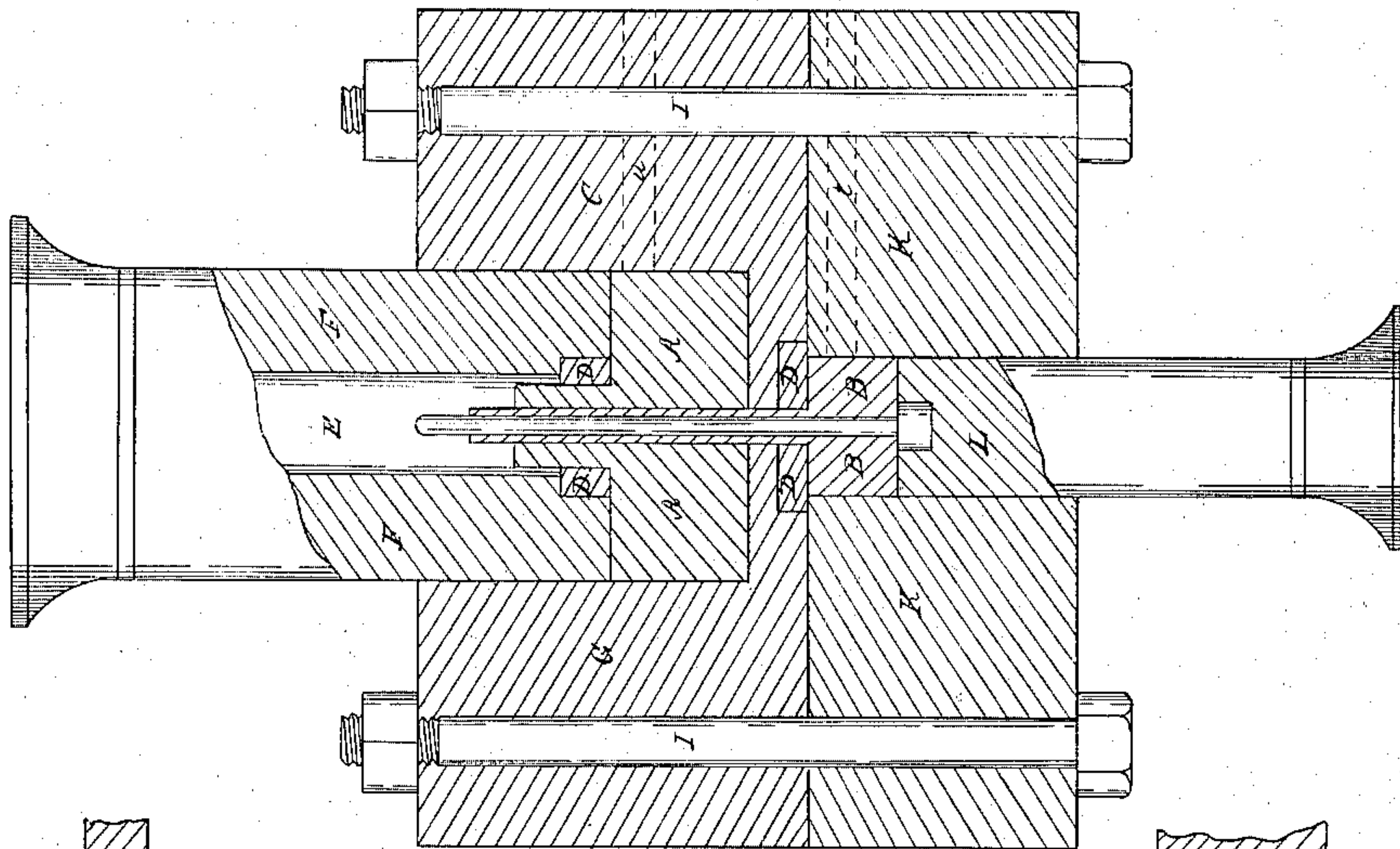
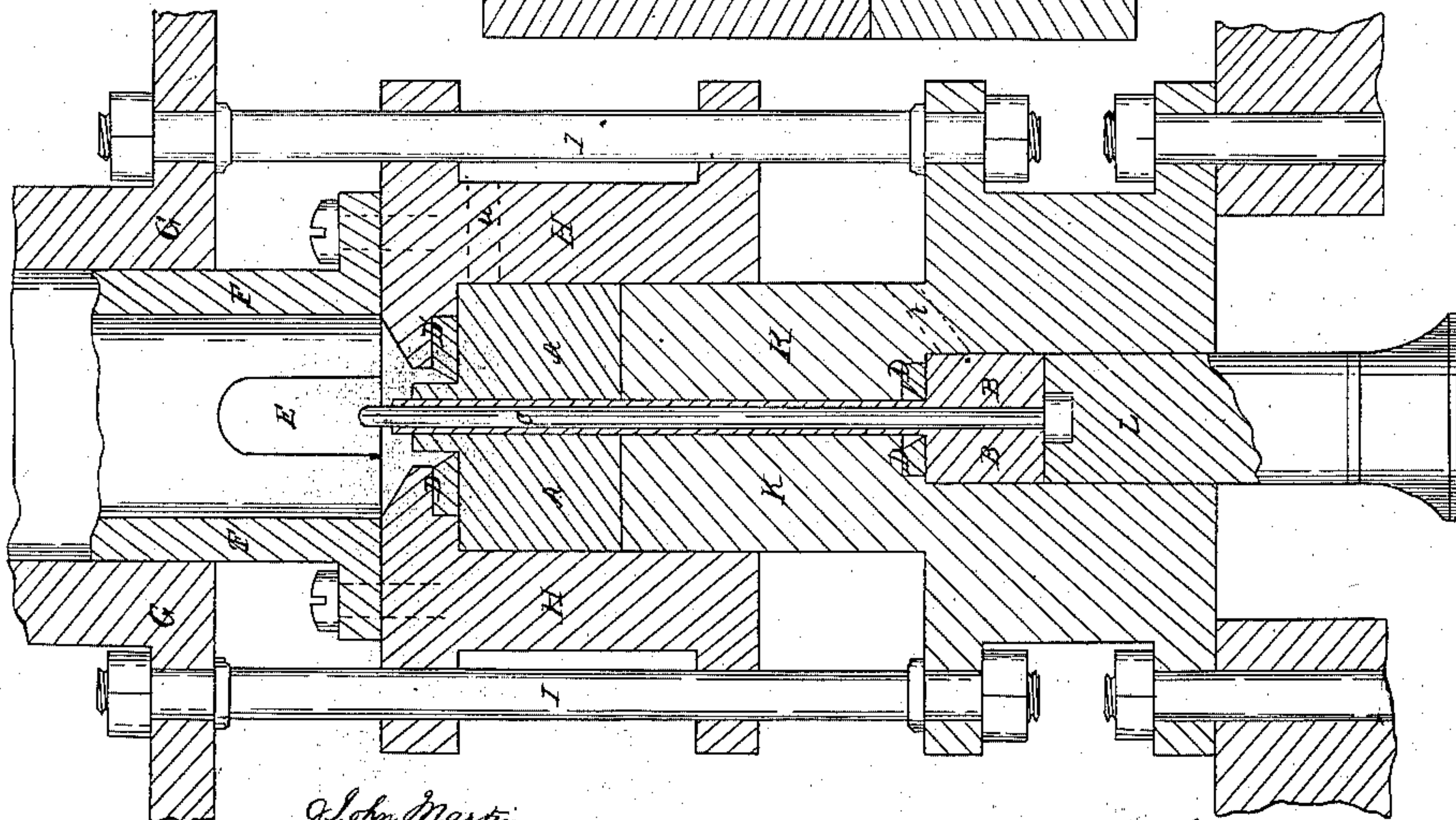


FIG. 1



WITNESSES

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2 Sheets. Sheet 2

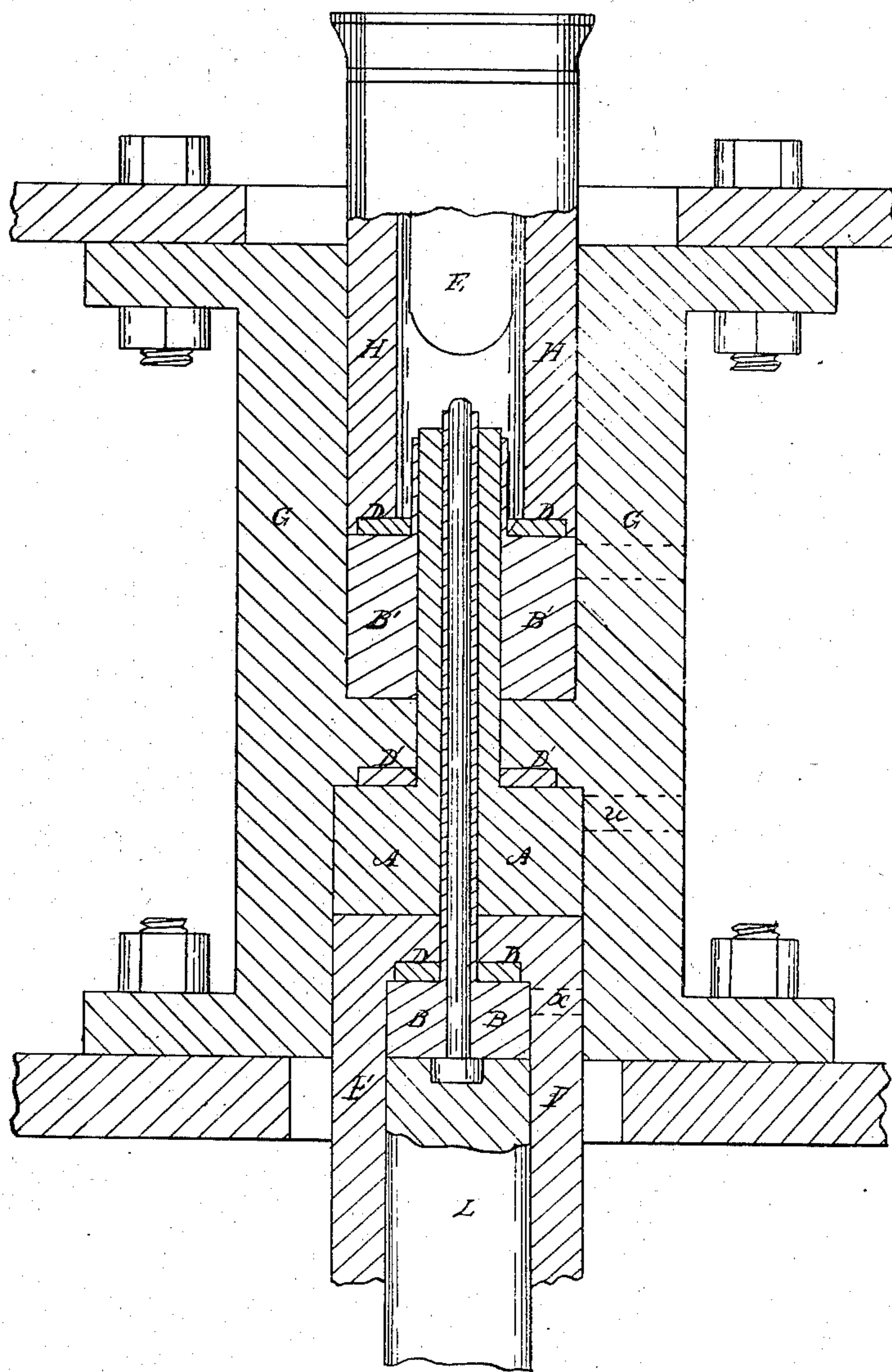
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Fig. 4.



WITNESSES

John Martin

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# UNITED STATES PATENT OFFICE.

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

## IMPROVEMENT IN THE MANUFACTURE OF TIN-LINED LEAD PIPE.

Specification forming part of Letters Patent No. **74,612**, dated February 18, 1868; antedated February 6, 1868.

*To all whom it may concern:*

Be it known that I, WILLIAM ANTHONY SHAW, of the city and county of New York, in the State of New York, have invented certain new and useful Improvements 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 drawing, making part of this specification, in which the various figures illustrate different modifications of my invention.

On the 10th of March, 1863, Letters Patent of the United States were granted to me for my improvement in the manufacture of tin-lined lead pipe, which Letters Patent were subsequently assigned and reissued.

In the machine for which the aforesaid Letters Patent were issued there is but one containing-cylinder, one die, and one ram used, both metals, the tin and the lead, being forced out of the cylinder through the die over the mandrel at one and the same time by the motion of a single ram, the cylinder remaining stationary. In that machine the respective ingots of metal have to be made of a peculiar form, and adjusted in respect to each other and the machine with great nicety, to insure a lining of uniform thickness in the pipe.

The tin and the lead being both put in the same cylinder, the two metals must bear a certain form, proportion, and density in respect to each other, in the form of ingots, or they will not bear their proper relation and proportion to each other when formed in pipe, because, in forcing an ingot out of a retaining-cylinder through a die by means of a piston or ram, that part of the metal nearest the center of the ingot is forced out most rapidly, owing, as is supposed, to the greater friction of the metal against the sides and bottom of the cylinder; but, whether this phenomenon be owing to the aforementioned cause or not, its existence remains, and exercises a controlling influence in the manufacture of tin-lined lead pipe, or any other laminated pipe made in this way, when the different metals are put together in one cylinder. In the case of tin-lined lead pipe, for example, the lead being farthest from the center or axis of the core, the tin will be forced out most rapidly during the whole of the stroke, and especially toward

the last part of it, which will make the lining thick at one end of the pipe and thin at the other, unless the ingots be made of a peculiar form, density, and proportion in respect to each other, the dies, and the cylinders. It will therefore be readily seen by any one familiar with this branch of the arts that to properly proportion and adjust these ingots, as aforesaid, so as to yield the desired result, will be always difficult, and has hitherto been found impossible. To avoid the necessity for this accuracy in the formation and adjustment of the respective ingots, and the consequent uncertainty in the manufacture of the pipe, is one of the objects of this invention.

In the manufacture of pipe after the manner substantially as stated in the patent aforesaid, and in the manufacture of lead pipe after the method practiced heretofore, the cylinder of the press is first charged with the metal to be used, which is worked off. The cylinder is then charged again, and so on, each succeeding charge being put in the cylinder on the top of the preceding one. Now, in working off the successive charges, the place of junction between the old and new charge is plainly visible, the pipe being defective at that point, a very little tortionate strain being necessary to twist it off, and but comparatively little strain is necessary to burst it, so that, practically, in the manufacture of lead pipe, as well as tin-lined lead pipe, after the plan of the patent above alluded to, the pipe has to be cut in coils equal in length to that produced by the respective charges.

To overcome this difficulty, and to produce a continuous coil either of lead or lead-incased tin pipe without said defect, is another of the objects sought to be accomplished by this improvement; and a third object is to incase a tube of lead between two tubes of tin, or, vice versa, a tube of tin between two tubes of lead.

These objects I accomplish by the use of two cylinders, two rams, and two dies, combined with one mandrel; and in some cases I propose to use three cylinders, three rams, and three dies, in case I desire to use more than two kinds of metal, or to put a coating of one kind of metal on both the inside and outside of the pipe or tube, as will be hereinafter more fully described.

In the drawing, Figure 1 shows a vertical



section through a press consisting of the aforementioned combination of rams, dies, cylinders, and mandrel.

One of the rams, in this modification of my invention, is stationary, and is represented by K; and in the bottom side thereof a cylinder is formed, in which the ram or piston L is fitted, substantially in the manner shown; a die, D, being fitted in the bottom of the cylinder, through which the tin is forced up around the mandrel C, which is secured in the end of the ram L and passes up through a hole made through the center of the ram to receive it, said hole being made about equal in diameter to the hole of the die, which is equal to the external diameter of tin lining or tube of tin to be incased in the lead pipe.

The upper cylinder, in this modification of the invention, is represented by H. It is movable, and is worked up and down on the guide-rods I I and the ram K. In the bottom of said last-mentioned cylinder a die is fitted, which is equal in diameter to the external diameter of the pipe it is intended to make in the press. The aforesaid cylinder H is operated by means of a hydraulic ram, F, which is made hollow and fitted into a cylinder, G, which last-mentioned cylinder is supported upon the columns or guide-rods I I, the lower ram, L, being also operated by means of a hydraulic press of the usual construction.

The operation of this machine will be as follows—that is to say: The rams or pistons are first drawn out of their respective cylinders. The ingot of tin B and the ingot of lead A are then put in said cylinders, as shown. The mandrel C is then put in its place, and the two ingots pressed home by putting the bottom ram and the top cylinder in motion. The power is then applied to the ram L, and the tin forced up through the die D, the ram K, and the ingot of lead A until it has entered the upper die, D, the hole in A, the lead ingot, being made large enough to allow the tin tube to pass up through it. The power is now applied to the cylinder H, which forces the lead up through the die D and around the tin tube, the motion of the lower ram being continued and adjusted to supply the tin lining as fast as the lead pipe is formed and pressed through the upper die. The pipe thus formed is delivered through the opening E made in the bottom part of the ram F.

The above-described method of charging the press contemplates the casting of the ingots or charge first, and the subsequent introduction of them in the respective cylinders; but a better plan, and the one now pursued, is to first cast the tin into the lower cylinder, through the hole *f*, and force the tin tube up to the die D, and then cast the lead in the top cylinder, through the hole U, on the tin tube, the top cylinder and bottom ram being then simultaneously started, first allowing the lead time to cool. By these means the lead and tin tubes are thoroughly welded together.

A second modification of my invention is

represented by Fig. 2, by which is shown a vertical section through the dies, rams, cylinders, and mandrel of a machine differently arranged from those shown in Fig. 1, though embracing essentially the same features. In this figure G represents the upper cylinder, and K the lower one; F, the upper ram, and L the lower one; A, the lead, and B the tin, ingot; D' the top, and D the bottom, die, C representing the mandrel in this figure, as in Fig. 1.

After the respective ingots or charges have been placed in the machine, as illustrated in the drawing and as described above for the machine illustrated by Fig. 1, the operation of the machine commences by the application of power to the ram L, which forces the tin up around the mandrel and through the lead ingot until it has just passed through the die D. The power is then applied to the ram F, by which the lead is forced up around the tin tube, the motion of the two rams being so graduated in respect to each other as to force the two metals with equal velocity, though in different quantities, through the respective dies, the lead die being made the largest, as in the case of the machine shown by Fig. 1. The ram F, in this case, is made hollow, the pipe being carried up through the center thereof, as indicated by the drawing.

The cylinders illustrated in this figure are simply to show the relation of the dies, cylinders, and rams, omitting to show any means of securing them in the press. This omission, however, will be readily supplied by any one acquainted with the manufacture of hydraulic presses, my invention contemplating nothing but the ordinary mechanical devices for operating the various parts of the machine.

A third modification of my invention is represented in Fig. 3. Here there is but one cylinder, as such, which is represented by G, the other cylinder being formed in the ram F, which, in this case, fills the double function of ram and cylinder. The lower ram is represented by L, the lead ingot or charge by A, and the tin one by B. The upper die, in this case, as in the two former ones, is shown by D', and the lower one by D.

In operating this machine, the ingots of the two metals are first supplied to their proper cylinders, the same as in the case of the other two machines, after which the rams are moved up against them, as shown in the drawing. The power is then applied to the ram L, and the tin forced up through the lead ingot and top die, as in the other machine. The power is then applied to the ram K, and the lead forced up around the tin tube, the motion of the two rams being graduated to move in relation to each other, so as to force the two metals through their respective dies with equal velocity, substantially as in the case of the two modifications of the invention heretofore described. In the figure last described there is also shown a rolling attachment, consisting of two or four rollers, grooved to span the pipe, and arranged one above the other, as shown



by H H H. The object of these rollers is to catch the pipe and draw it down on the mandrel, in case of need, to the size required.

A fourth modification of my invention is shown by Fig. 4, which is, perhaps, rather an extension of the invention than a modification of it, the object in this case being to press a coating of tin on the outside of the pipe, as well as on the inside thereof, or, in other words, to form a laminated pipe consisting of three tubes, disposed one inside of the other.

In the drawing illustrating this modification of my invention, G represents a cylinder, both ends of which are bored out, leaving a partition in the center, thus forming a cylindrical chamber in each end to receive the two rams H H and F F, the latter of which is bored out to receive a smaller ram, L. In the upper end of the ram L the mandrel C is fitted, and arranged to reach up through the center of the main cylinders, and has large rams. In the end of the ram H a die, D'', is fitted, through which the outside coating of tin is pressed, and in the partition of the main cylinder a die, D', is fitted, through which the lead is pressed; and in the bottom of the ram F a die, D, is fitted, through which the inside coating of tin is pressed, the two ingots of tin being represented by B' B, and the ingot of lead by A.

In practicing this modification of my invention, the cylinder is first charged with the respective metals, the same as in the case of the machines heretofore described. The power is then applied to the ram L, by which the tin tube is pressed up around the mandrel until it reaches the die D' of the lead ingot A, when the power is applied to the ram F, which moves forward with the ram L, forcing the tin and lead tubes forward, together until they reach the die D, whereupon the ram H is put in motion, which forces a tube of tin up around the lead, the motion of the three rams being graduated with respect to each other to force the respective metals forward around the mandrel with equal velocities.

By means of this invention it will be seen the layers of the different metals forming the pipe will be of uniform thickness through its entire length whatever may be the shape, size, or density of the different ingots or charges, and that the charge of tin may be made large enough to work off two or three charges of lead; or the lead charge may be made large enough to work off two or three charges of tin, by which means a continuous length of laminated pipe can be formed, avoiding entirely the defect in the pipe resulting from the failure of the successive charges to unite, as in the ordinary pipe-press. This feature of my invention is, of course, just as applicable to the manufacture of lead pipe as lead-incased tin pipe; for, instead of charging one cylinder with lead and the other with tin, they may both, or all three, be charged with lead in different quantities, thus enabling the operator to

make a continuous length or coil of lead pipe by first working off the smallest charge, which, being renewed, will work off the next largest charge, and so on continuously, breaking the joints in the different layers of metal composing the pipe.

The drawing shows the presses, illustrating the different modifications of my invention, standing in a vertical position, and the description has been confined, for the most part, to the use of lead and tin; but it is my intention, in case of need, to set the presses on a horizontal or diagonal plane, and to use any of the soft pressible metals or their alloys instead of those referred to above.

The various methods of practicing my invention, which I have herein shown and described, do not include every modification which may be made to embrace the essential elements of the invention; but enough has been shown and described to illustrate the advantage and utility of my invention and the almost infinite modifications of which it is susceptible.

The principal features which characterize the invention are, first, the manufacturing of tin-lined lead pipe, or lead-incased tin pipe, by forcing the two metals or their alloys together in the form of a laminated pipe out of two separate cylinders and through as many separate dies, instead of forcing them together out of one cylinder and through one die, as is the case in the patent alluded to; and, second, in the manufacture of laminated pipe, consisting, first, of a tube of tin, then a tube of lead, and then a tube of tin again, duly welded together, or the alloys of said metals, by forcing said metals together in the form of pipe, as aforesaid. The drawing shows a method of doing this out of three cylinders; but it will readily be seen that either two of the metals may be put together in one cylinder and the third metal in a second cylinder, and so pressed together, substantially in the manner already described. But all these different modifications embody the same general principle of operation, and so fall within the scope of my invention, which also includes the manufacture of a continuous length of laminated pipe, whether composed of tin and lead, or pure tin, or other metal suitable for this purpose.

In stating my claim, therefore, I do not wish to be understood as limiting myself to any particular mechanical modification embodying the aforementioned principle of operation; but

What I claim, and desire to secure by Letters Patent, is—

1. The formation of a metallic pipe by forcing two or more of the ductile metals together in the form of tubes over a mandrel or core, out of two or more cylinders, and through, on, or in two or more dies, substantially as described.

2. The use of two or more cylinders, two or more rams, and two or more dies, or their equivalents, when combined with a mandrel



or core, substantially as described, for the purpose of making laminated pipe, whether said pipe be made of metal or other material.

3. The manufacture of a metallic pipe consisting of three tubes of soft metal, such as a tube of lead pressed between two tubes of tin, by forming and forcing them together through three dies, out of three cylinders, over one core or mandrel, in the manner described.

4. In combination with a pipe-press, a set of drawing or stretching rollers, for the purpose of drawing or stretching the pipe on the mandrel or core as it issues from the press, substantially as described.

5. The manufacture of a continuous metal

pipe, whether of lead or of composition, from metal disposed in two or more retaining-cylinders, by forcing it out of the same in the form of two or more tubes, over a mandrel or core, and in such proportion that the retaining-cylinders shall not both or all be exhausted at the same time, so as to avoid the defect in the pipe resulting from the failure of the successive charges to thoroughly weld, as in the ordinary press, substantially as described.

WM. ANTHONY SHAW.

Witnesses:

P. D. KENNY,  
AMOS BROADNAX.