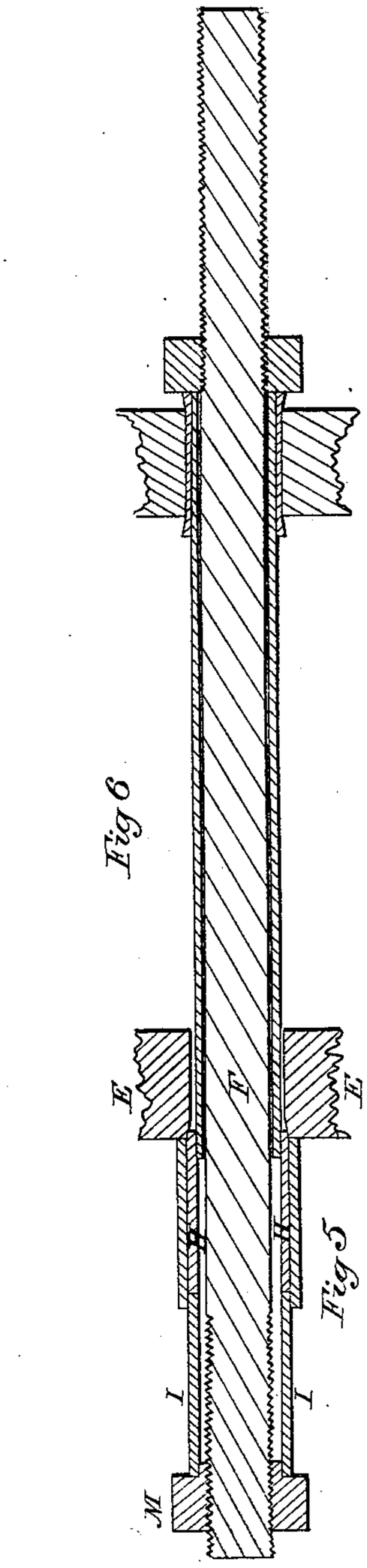
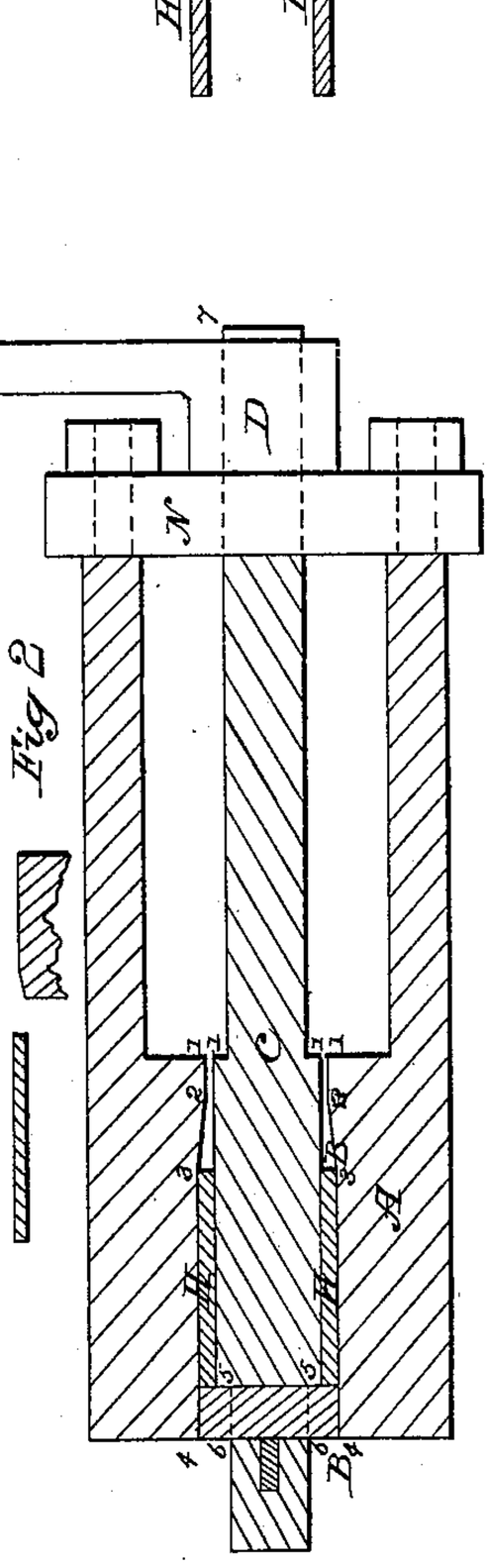
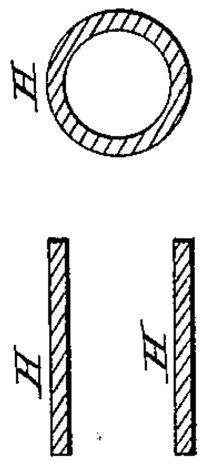
H. Allen,

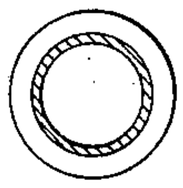
Steam-Boiler Tube-Joint.

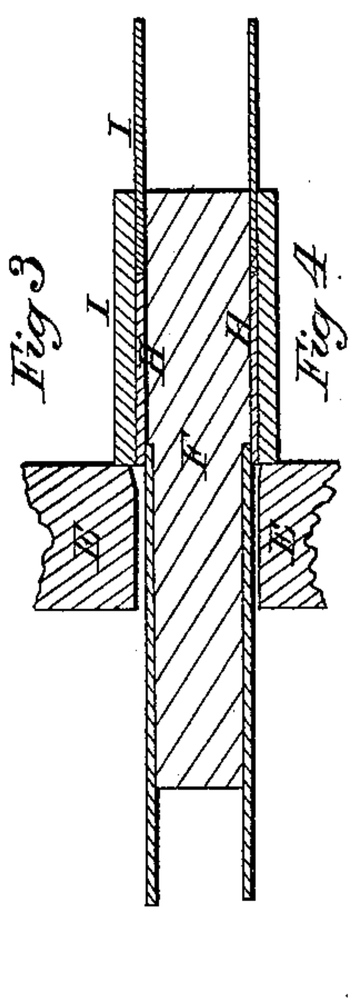
No. 20,927. Patented July 20, 1858.











Witnesses:

Thos. Fitzpatrick

Charles Nelson

Inventor:

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UNITED STATES PATENT OFFICE.

H. ALLEN, OF NEW YORK, N. Y.

TUBE-JOINT FOR CONDENSERS.

Specification forming part of Letters Patent No. 20,927, dated July 20, 1858; Reissued May 8, 1866, No. 2,237.

To all whom it may concern:

Be it known that I, HORATIO ALLEN, of New York, in the State of New York, have invented a Mode of Making the Joints of the Tubes of Condensers and Similar Instruments, of which the following is a specification.

Various modes have been devised for making the connection of the tube, with the head which it passes through, in such manner that perfect tightness against leakage, or passage of air or fluid may be secured, and at the same time a freedom for the expansion or contraction of the tube is provided, which does not impair the tightness of the joint. The plan which I have invented effects these essential ends with great certainty, simplicity and economy; and with the use of materials, of great durability; and also provides for the easy renewal of each tube and of the renewal of the joint.

It is well known that white pine (and other woods of same character) when thoroughly dried lose about $\frac{1}{20}$th of their original thickness, and that when placed in water the piece will return to its original thickness; it is also a fact that well seasoned white pine, and other woods of same character can be compressed to less than half their thickness, and retain their tenacity, and will then be of increased density and will bear to be driven into a sity and then will bear to be driven into a joint with considerable force. When a piece of dry white pine (which is named as the best wood,) either uncompressed or compressed is driven into a joint and the joint is immersed in water, the dry piece and the compressed piece will tend to return to their original thickness before being dried. Where simply seasoned wood is used the joint will be tight up to a pressure of about 15 pounds per square inch, but at a pressure exceeding that number of pounds to the inch, water will be forced to some extent through the pores of the wood. But when compressed dry wood is used, it will require a higher degree of pressure to force water through the wood, according as the piece has been compressed to a greater degree before it was inserted.

The joint which I have invented for making the joints of tubes rests on these facts. The hole in the tube plate is drilled from $\frac{1}{12}$th to $\frac{1}{8}$th of an inch larger diameter than that of the tube which is to enter it. For about $\frac{3}{16}$th of an inch of the depth of the hole, it is reamed out bell mouthed to a slight degree. A tube of dry white pine of suitable thickness, and about $\frac{3}{8}$th of an inch longer than thickness of tube sheet, is used to make the joint by being driven into it, the thickness of the wooden tube being as much greater than that of the joint, as will allow it to be driven or forced into the joint. For light pressure say not over 20 pounds to the square inch, the wooden tube need not be compressed, but for greater pressure, and to make a more perfect joint it is preferable to use tubes of compressed wood, carrying the compression to the highest degree consistent with preserving the tenacity of the wood.

To effect the compression of the wooden tube an instrument is used represented in Figure 3. Through the brass A is the circular hole B. This hole from 1 to 2 is of the same diameter, as that of the outside of the wooden tube when compressed; from 3 to 4 it is of the diameter of the wooden tube before compression, and that part of the hole between 2 and 3 is conical connecting the two holes, the surfaces being made very smooth. Through the hole B passes the rod C. The diameter of the rod C from 1 to 5 is that of the inside diameter of the wooden tube which (as has been said) is that of the outside of metal tube. From 5 to 6 is a collar C which is held on the rod by the key, which collar is of the diameter of the wooden tube before compression. The rod from 1 to 7 is of less diameter than from 1 to 5 and passes through the piece N, and is cut to receive the nut D. By the removal of the collar C, the wooden tube to be compressed is inserted on the rod B, and by keying the collar on, the instrument is prepared to effect the compression of the piece. This is done by turning the nut D, by which means the wooden tube will be forced through the cone and made to take dimensions of the joint from 1 to 2, and will come out compressed to about one-half the original thickness.

In most cases it will not be necessary to compress the wood any more than can be effected in forcing it into the joint. To enable that to be done readily and with a good degree of power, means are provided and used as represented in Fig. 5.

The hole in the tube plate E being made of requisite diameter to make the joint of the proper size, (which will usually be about $\frac{1}{10}$ of an inch) and being reamed out bell mouthed for above $\frac{1}{5}$th of an inch, and the dry wooden tube, either uncompressed or compressed being ready for insertion, a rod F is run through the tube; on the part extending beyond the tube a screw is cut; the dry wooden tube H is placed over the rod and entered in the bell mouthed entrance; the outer guide piece I, is placed over the wooden tube, and the forcing piece L, is placed on the rod and against the end of the wooden tube. The nut M is screwed on the rod F, and by continuing to turn the nut, its action through the forcing piece I, will force the wooden tube into the joint. While this insertion of the wooden tube is being made the metal tube must be held firm at the farther end. The wooden tube can also be inserted by being driven in by a mallet. After the wooden tube is inserted in the joint the surface of the external ends of the tubes should be rubbed and coated with red lead or other similar substance, for the purpose of closing the pores of the wood; which retain the capacity of permeability to water even after considerable compression.

Instead of making the wooden tubes of one cylindrical piece, the same kind of joint would be made and same end effected but with more risk of imperfect joints, by making the tube of pieces or small staves of compressed or uncompressed wood.

Fig. 1, represents a section of tube plate, and metal tube showing the space provided for the insertion of the wooden tube, and the bell-mouthed entrance at. Fig. 2, represents the wooden tube either compressed or uncompressed, ready for insertion in the joint. Fig. 6, represents the wooden tube after it has been inserted and saturated with water—the ends at O, to be covered with red lead or other similar substance. Fig. 4, represents means used when the wooden tube is forced in by blows.

I am aware that in lines of pipes for conveying water, short pipes of wood banded at the ends with iron, have been used to connect the iron pipes, the iron pipe being driven into the wooden pipe, or the wooden pipe on to the iron pipe. But this combination is not one for making an imperfect joint tight, but is a combination of wooden and iron pipes the joints of which shall not form the material used be imperfect. And I do not claim such combination of wooden and meteal pipes as embraced within my device.

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

Making the joint formed by two metal surfaces (as in the joints of tubes in the tube sheets of surface condensers, and other similar instruments) tight, by inserting between the tube and tube sheet, a tube of seasoned or compressed wood, made either in one or several pieces; relying on the expansion of the wood after being saturated by water to make the joint tight; and on the freedom of the metal tube to move endwise without affecting the tightness of the joint, to avoid injurious results from the expansion and contraction of the metal tube—all substantially in the manner and for the purposes herein set forth.

HORATIO ALLEN.

Witnesses:
THOS. FITZPATRICK,
GEO. W. ARMSTRONG.

[FIRST PRINTED 1911.]