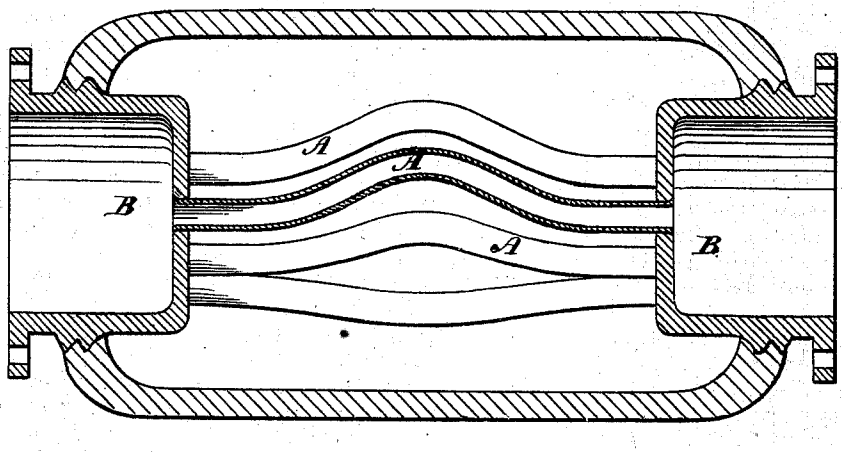
J. WHEELOCK.

Tubes and Flues of Feed-Water Heaters.

No. 146,733. Patented Jan. 20, 1874.

Fig. 1


Fig. 2.

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## IMPROVEMENT IN TUBES AND FLUES OF FEED-WATER HEATERS.

Specification forming part of Letters Patent No. **146,733**, dated January 20, 1874; application filed March 27, 1873.

*To all whom it may concern:*

Be it known that I, JEROME WHEELOCK, of the city and county of Worcester, in the State of Massachusetts have invented a certain new and useful Improvement in Feed-Water Heaters; and I do hereby declare that the following specification, taken in connection with the drawings furnished, and forming a part of the same, is a clear and true description of my invention, and of feed-water heaters and boilers involving the same.

My invention relates to that class of feed-water heaters which are intended to utilize exhaust-steam; and it consists in constructing a section of the exhaust-pipe of one exterior jacket, two heads, and several interior exhaust-pipes, which are curved or bent, and which have an aggregate capacity for permitting the free passage and discharge of the steam, which is equal to, or greater than, the exhaust-pipe between it and the engine, or between it and the point from which it is finally discharged.

Referring to the drawings, Figure 1 represents a bent or curved flue, suitable for use with my heaters. Fig. 2 represents, in longitudinal section, one of my horizontal feed-water heaters.

A denotes, in each instance, one of the bent or curved flues. It differs from others of its general kind only in being curved or bent. The curve commences at a short distance from each end. The portion of the tube adjacent to its joint with the heads of the heater is straight. The extent of the curve may, of course, be varied, but the deviation from a straight line at the middle of the tube, of a distance equal to from three to eight times its diameter, will generally be sufficient to secure the desired effect. B denotes the heater-heads, in which the tubes are fitted after the usual manner of boiler tubes or flues. When a feed-water heater, like that shown in Fig. 2, is in proper position, it is connected by means of flanges, as usually employed, at one end with the exhaust-steam pipes which connect with the engine, and at the other end with the exit exhaust-pipe. It is generally laid horizontally, as shown, and properly connected with the feed-pump and the usual water-pipe connections. In practice it will often occur that the water will get so low in the feeder that some or all of the pipes will get unduly heated, and be made to expand and lengthen to a degree which will greatly endanger the joints at their ends, if no means be provided to prevent it. With the straight pipes, as heretofore used, the leakage at the joints was a frequent occurrence. To such an extent was this the case that their use has been practically abandoned, for all leakage of water into the exhaust-pipe must necessarily have to be ejected by the steam, or it would find its way down to the cylinder, and there injuriously affect the working of the engine. It is, however, of great economical importance that the exhaust steam be utilized, and it can be readily and practically accomplished with my heater. With pipes or flues, curved or bent, as described, the same, or even a greater degree of actual longitudinal expansion occurs, but the expansive force is diverted from the longitudinal line of the tube to a line at right angles thereto, which practically relieves the joints from all strain.

Cast-iron heads can be fitted with my tubes, and then be inclosed or combined with an iron barrel or shell cast thereon in a mold, as is common in the art of casting. Such a heater is safe, inexpensive, and, on account of the non-liability of the joints to leak, of great durability.

In vertical as well as in horizontal heaters it is to be remembered that the variation in the tubes from a straight line should be as little as possible, in order that the passage of the steam shall not be so much retarded as to induce objectionable back pressure. The aggregate area of the openings in the several flues should, in most cases, be from one-quarter to one-half greater than the area of opening in the main exhaust-pipe.

I am aware that bent and curved steam-pipes have been heretofore proposed, with a view to protecting their end joints from such injury as they would be liable to receive from undue longitudinal expansion; but I am not aware that a feed-water heater has ever, prior to my invention, been composed of a number of bent or curved exhaust-pipes, communicat-

ing in the aggregate at each end with lengths or ordinary exhaust-pipe, and an inclosing jacket to form a feed-water receptacle.

Having thus described my invention, I claim as new, and desire to secure by Letters Patent—

A feed-water heater, adapted to serve as a section of exhaust-steam pipe, and composed of several bent or curved exhaust-pipes, having an aggregate delivery capacity which is equal to, or greater than, that of the sections of pipe with which they are to be collectively connected, and an inclosing-jacket, as described.

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