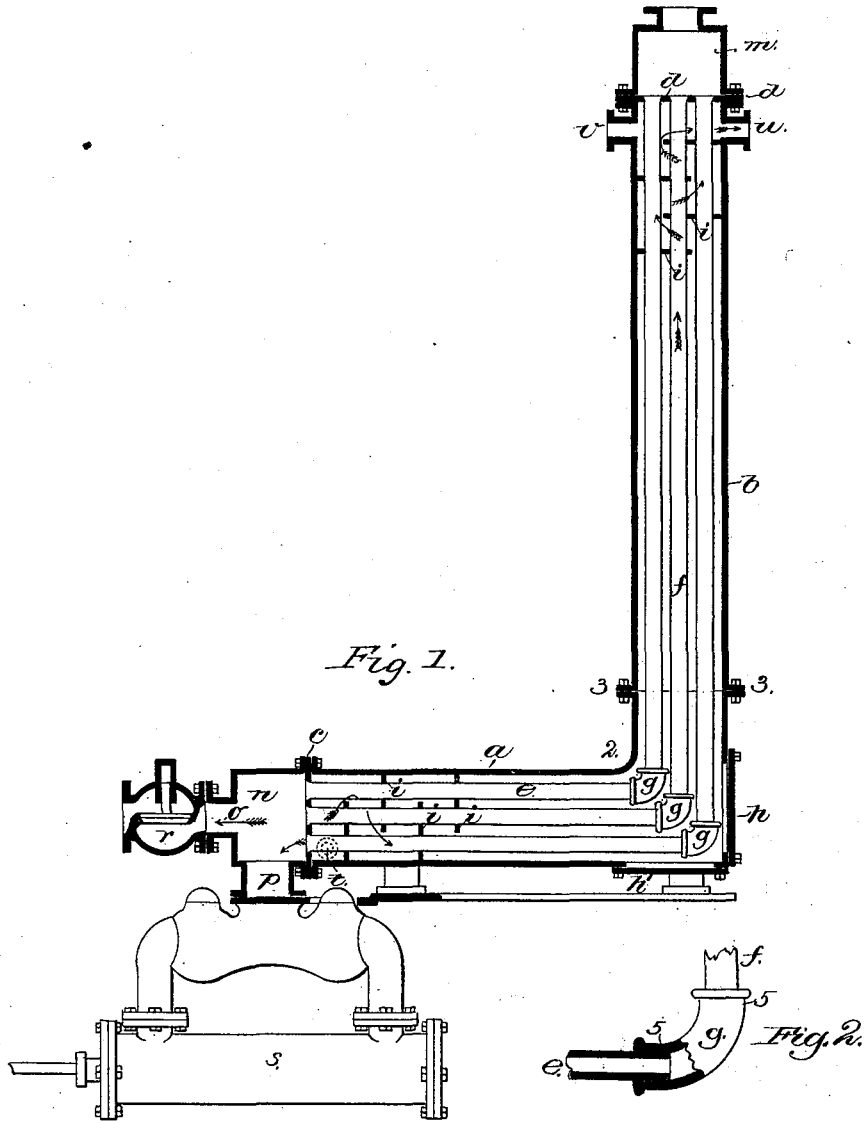


(No Model.)

D. C. STILLSON.
FEED WATER HEATER.

No. 269,243.

Patented Dec. 19, 1882.



Witnesses.
John F. C. Preinckert
Fred A. Powell.

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UNITED STATES PATENT OFFICE.

DANIEL C. STILLSON, OF SOMERVILLE, MASSACHUSETTS.

FEED-WATER HEATER.

SPECIFICATION forming part of Letters Patent No. 269,243, dated December 19, 1882.

Application filed August 24, 1882. (No model.)

To all whom it may concern:

Be it known that I, DANIEL C. STILLSON, of Somerville, county of Middlesex, State of Massachusetts, have invented an Improvement in Feed-Water Heaters, of which the following description, in connection with the accompanying drawings, is a specification.

My invention relates to a feed-water heater of that class in which the feed-water, on its way to the boiler, passes through a casing containing pipes through which the exhaust-steam circulates on its way to an air-pump or to the atmosphere. Considerable difficulty is encountered in the construction of this class of heaters, owing to the unequal expansion and contraction of the outer casing and pipes within it. This difficulty is overcome in my invention by making the casing and pipes with an angle between the inlet and outlet ends, the heater being shown as L-shaped. The steam-pipes are fixed at their ends, in any usual manner, rigidly to the heads of the casing, and are connected at the angle or bend by elbow-fittings, and it will be seen that the longitudinal expansion of either branch of the said pipe will merely spring the other branch laterally an amount that is easily admitted of by the elasticity of the material. In order to prevent the joints between the pipes and the casing-heads from working loose under the lateral straining of the pipes, the said casing is provided with bracing-pieces for the said pipes near their ends, so that the lateral bending is confined to the portion between the said braces and the elbow-joints. The casing is provided with removable bonnets or covers as a means of access to the pipe-joints in putting the apparatus together, and the elbow-fittings are constructed, as hereinafter described, to make a rigid joint with the pipe, so that as the pipes expand the strain will be removed from the threaded joint between the pipe and fitting.

Figure 1 is a longitudinal section of a heating apparatus constructed in accordance with this invention, and Fig. 2 a detail of the elbow-joint on a larger scale.

The casing consists of two castings, *a b*, the former having an angle or bend at 2, and the two portions being bolted together, as at 3. The said casing is closed at its ends by heads or plates *c d*, provided with openings, in which the steam-pipes *e f* are set in the usual man-

ner to afford a tight rigid joint. The said pipes are connected at the angle of the heater by elbow-fittings *g*, the portion *a* of the casing having removable bonnets *h*, to afford access to the said fittings in putting the apparatus together. It will be seen that the pipes *e*, being fixed at one end to the head *c*, will in expanding move the other end, which movement will be merely resisted by the lateral stiffness of the connected pipe *f*, which is not sufficient to bring any appreciable strain upon the casing or joint of the pipe therewith. In a similar manner the pipes *f*, in expanding, will bend or spring the pipes *e* laterally. In order to prevent the joint of the pipes with the heads of the casing from working loose under the lateral strains brought on the pipe, the casing *a b* is provided near the heads with braces, shown as partitions *i*, extending alternately from each wall of the casing part way over to the other wall. The said partitions are provided with holes, through which the pipes *e f* pass, with a close fit, each pipe thus having a bearing in two or more of the said bracing-partitions, by which it is kept straight and prevented from moving for a portion of its length near its joint with the casing, the lateral spring or movement of the pipes thus being confined to the portion between the braces *i* and the elbow-joint *g*. The casing *a b* is provided at its ends with chambers *m n*, the former receiving steam directly from the engine, and the latter shown as provided with two outlet-passages, *o p*, the former provided with an outwardly-opening check-valve, *r*, and leading to the atmosphere, and the latter leading to an air-pump, *s*, which may be of any usual construction. The steam, entering the chamber *m*, passes through the pipes *f e* to the chamber *n*, and thence to the atmosphere or air-pump and hot-well, the said steam imparting its heat to the water in the casing around the pipes. The said casing has an inlet, *t*, for water near the steam-outlet chamber *n*, and the said water passes in an opposite direction to the steam, receiving the heat thereof, to an outlet-passage, *u*, near the steam-inlet chamber *m*, from which the heated water is conveyed to the boiler by suitable pipes. The casing is provided with a blow-off passage, *v*, shown as opposite to the outlet *u*, so that by opening a cock in the blow-off pipe leading from the said passage *v* the water will

be driven out by the boiler-pressure in the pipe leading from the passage *u*, and the casing will be cleared from sedimentary matter. Another blow-off passage may be provided near the water-inlet *t*, at the lower portion of the casing. In cutting the threads on pipes for their joints with fittings the metal is removed from the outside of the pipe, thus reducing its thickness and strength, the said threaded portion usually terminating near or outside of the opening of the fitting. In order to avoid thus weakening the pipe at the joint, and to prevent the strain from coming on the threads or just at the end of the threaded portion of the pipe, instead of coming upon the unthreaded portion of the pipe and being taken up in the lateral bending thereof, I provide the fittings with a bearing-sleeve, *5*, extending over and fitting closely upon the unthreaded portion of the pipe, as shown in Fig. 2, thus affording a strong joint by which rocking motion of the fitting relative to the pipe is prevented and the thread relieved of strain, the said thread serving to hold the fitting from longitudinal movement on the pipe.

I claim:—

1. In a feed-water heater, the casing consisting of a straight portion and a portion *a*, having a bend or angle and provided with removable

bonnets at either side thereof, combined with steam-pipes passing through the said portions of the casing and rigidly connected therewith at their ends, the said pipes being connected together by elbow-joints at the angle of the casing, substantially as and for the purpose described.

2. The L-shaped casing, closed at its ends, combined with the steam-pipes having an elbow-joint at the angle of the casing and a rigid joint at the ends thereof, and the braces for the said pipes near their ends, substantially as and for the purpose set forth.

3. The combination, with the pipes threaded at one end, of a fitting having a corresponding thread, and a bearing-sleeve fitted to the outside of the said pipe beyond its threaded portion, whereby the said fitting is securely held from rocking or lateral motion upon the said pipe without strain upon the threads, substantially as and for the purpose set forth.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

DANIEL C. STILLSON.

Witnesses:

JOS. P. LIVERMORE,
B. J. NOYES.