3 Sheets—Sheet 1.

T. S. CLOGSTON.

Heating Apparatus.

No. 45,389. Patented Dec. 13, 1864.

Fig. 2

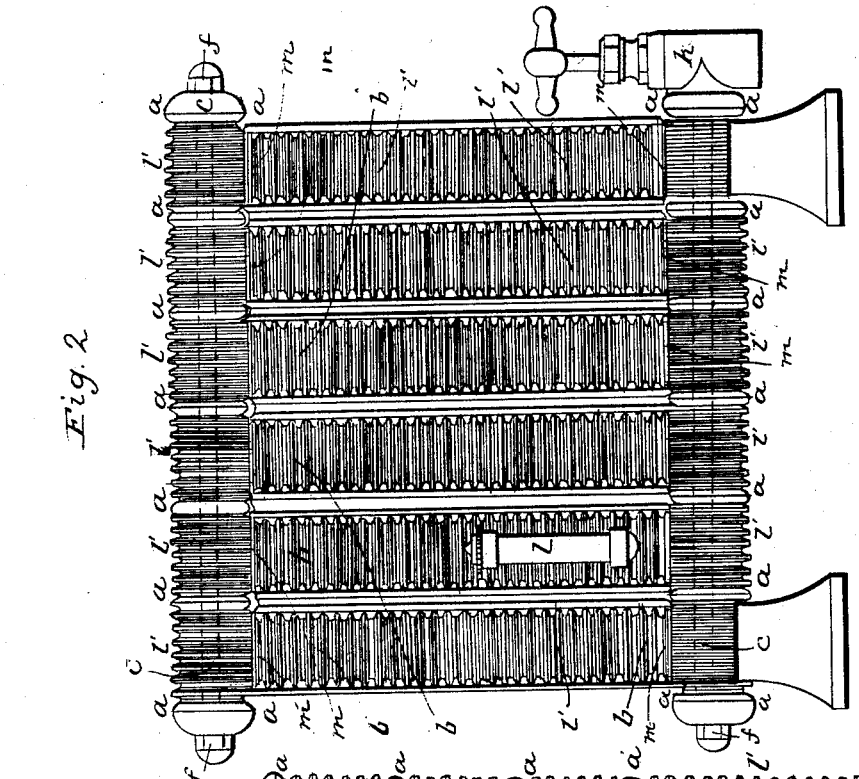
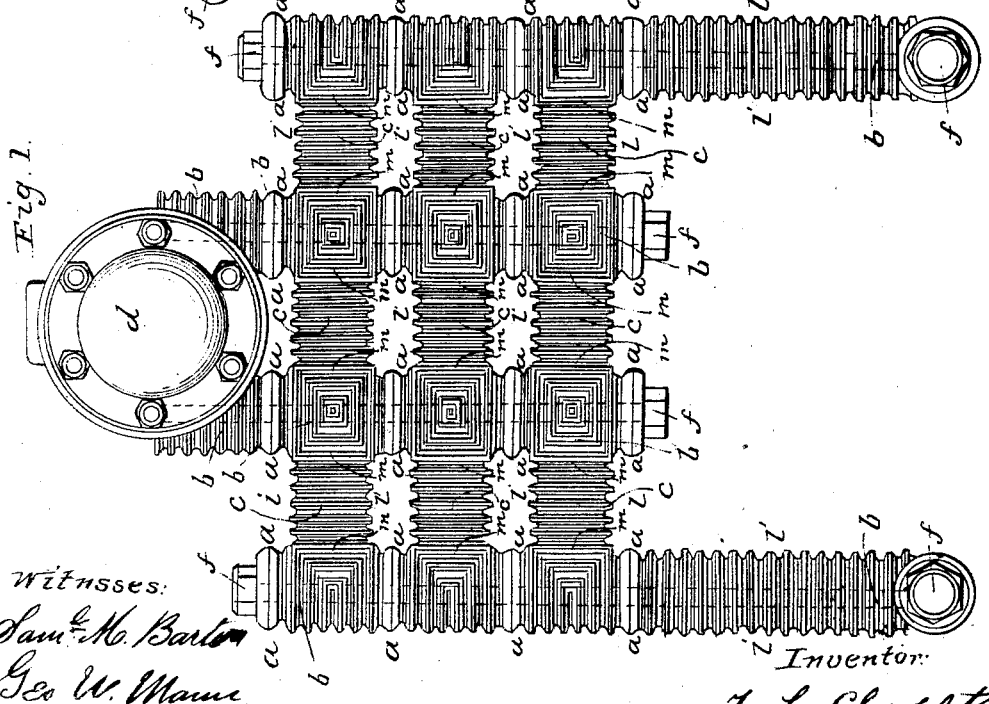


Fig. 1.



Witnesses:
Sam'l M. Barton
Geo W. Manns

Inventor:
T. S. Clogston
Joseph Gaskett Atty

3 Sheets—Sheet 2.

T. S. CLOGSTON.

Heating Apparatus.

No. 45,389. Patented Dec. 13, 1864.

Fig. 3.

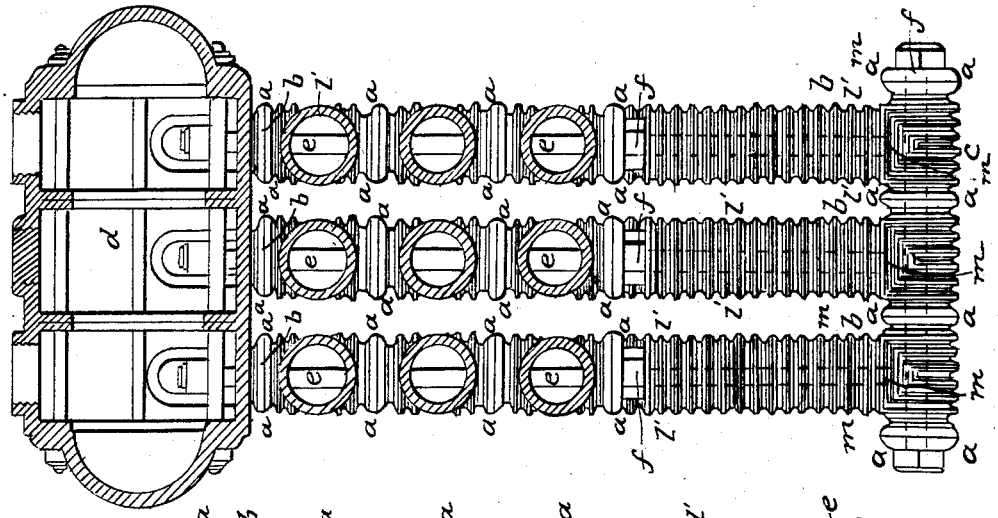


Fig. 4.

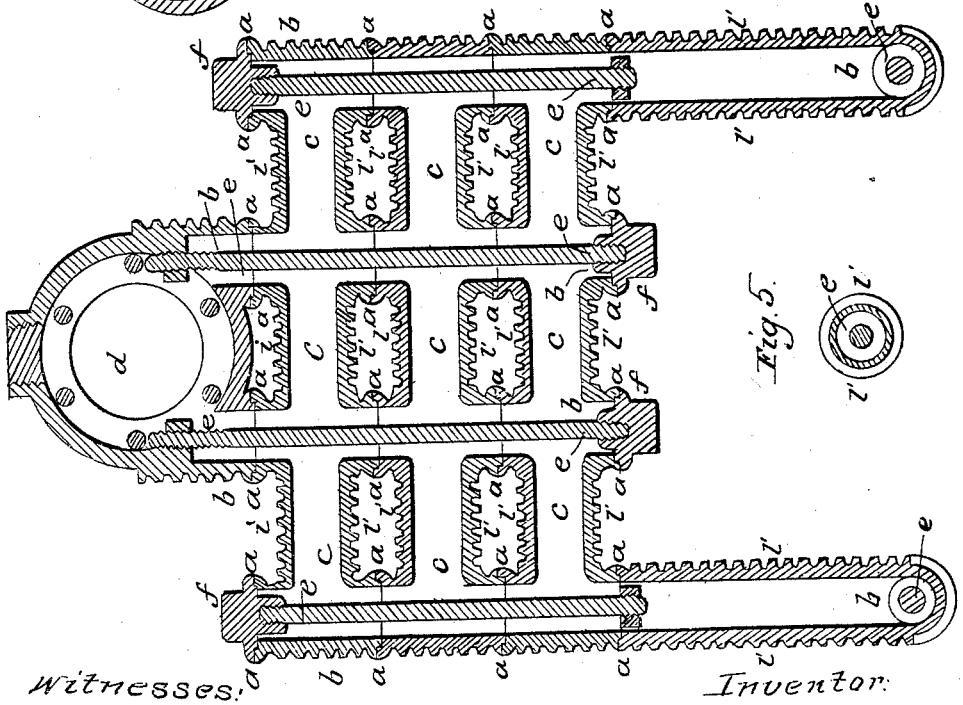


Fig. 5.

Witnesses:

Saml. M. Barton

Geo. W. Mann.

Inventor:

T. S. Clogston.

per. Joseph Gaines

Atty.

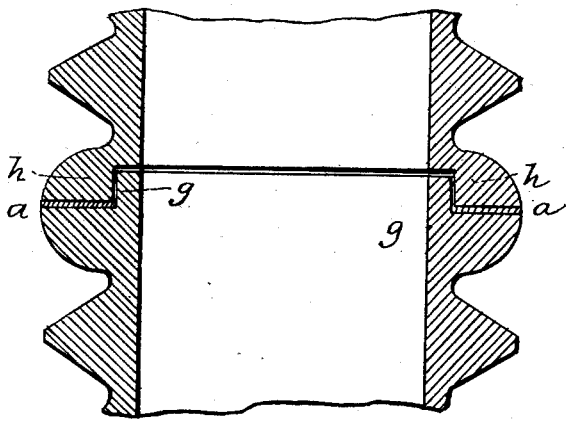
3 Sheets—Sheet 3.

T. S. CLOGSTON.

Heating Apparatus.

No. 45,389. Patented Dec. 13, 1864.

Fig. 6.



Witnesses:
Saml. M. Barton
Geo W. Mann

Inventor:
Judah Garrett
Atty for
T. S. Clogston

UNITED STATES PATENT OFFICE.

THOMAS S. CLOGSTON, OF BOSTON, MASSACHUSETTS.

IMPROVED HEATING-APPARATUS.

Specification forming part of Letters Patent No. **45,389**, dated December 13, 1864.

To all whom it may concern:

Be in known that I, THOMAS S. CLOGSTON, of Boston, in the county of Suffolk and State of Massachusetts, have invented certain new and useful Improvements in Steam Heating Apparatus; and I do hereby declare that the following description, taken in connection with the accompanying plate of drawings, hereinafter referred to, forms a full and exact specification of the same, wherein I have set forth the nature and principles of my said improvements, by which my invention may be distinguished from all others of a similar class, together with such parts as I claim and desire to have secured to me by Letters Patent.

The figures in the accompanying plate of drawings represent my improvements. Figure 1 is an elevation of the generator; Fig. 2, an elevation of the radiator; Fig. 3, a transverse vertical section of the generator; Fig. 4, a longitudinal vertical section of the same; Fig. 5, a horizontal section showing annular projections; and Fig. 6, a detail view, to be hereinafter referred to.

The present invention relates to certain new and useful improvements in the construction of apparatus used mostly for heating purposes, by means of steam or hot water, but also applicable to boilers for the generation of steam for motive power. In this kind of apparatus it has been found of late desirable to construct them of cast metal in preference to wrought material, more especially on the score of economy of manufacture; but the chief difficulty in making them of cast metal has arisen from their liability to fracture, and, in those which were composed of sectional parts, of forming strong and tight joints, they being liable to sag and leak.

The object of my improvement is, first, to so construct the apparatus as to combine the greatest degree of strength in the parts with the largest amount of radiating-surface; and, second, in so constructing the joints that they can neither sag nor leak.

In my new apparatus, which is a tubular one, the outer surface of each tube or passage through which either steam or hot water passes is composed of a series of annular projections of any desired shape—such as circular, polygonal, spiral, elliptical, &c.—forming encompassing rings or bands, which not only greatly strengthen the tubes, but add greatly to their radiating-surface. The joints of the different sections are formed with lips and grooves fitting into each other in such a manner that when drawn together by suitable bolts they can neither be pulled apart by expansion or contraction, nor become leaky.

In the accompanying drawings, my improvements are represented as applied to a steam generator and radiator, each of which is put together in sections, the various joints being represented at *a a a a a*, &c. The generator is composed of a series of vertical tubes, *b b*, &c., and a series of horizontal tubes, *c c*, &c., arranged at right angles to each other in such a manner that, although communicating each with the other, flue-spaces are left between each for the free passage of the heat around them, so that each tube or passage is heated to precisely the same temperature as the remainder. This peculiar arrangement, and the advantages thereof, need not be herein more particularly described, as I intend to make it the subject of a separate application for Letters Patent.

On the top of the generator is placed a steam-chamber, *d*. It will be evident that one or more of these can be added by placing them side by side, according to the capacity of the apparatus. The different tubes *b b*, &c., *c c*, &c., are united together by means of screw-bolts *e e*, &c., and nuts *f f*, &c., as shown more particularly in Fig. 4. The joints *a a*, &c., of the sections forming each tube is a lip, *g*, that fits into a corresponding groove or channel, *h*, as shown in Fig. 6, so that when suitably packed and drawn together by the screw-bolts and nuts they support each other so as to prevent their sagging or leaking.

In the drawings it will be observed that each tube has around its periphery a series of rings or annular projections, *i i*, &c., of the shape shown. These rings or projections, it will be evident, give great strength to the tubes, which, being composed of cast metal, would otherwise be liable to fracture, both from their expansion and contraction, and other causes. They also greatly increase the amount of radiating-surface, as will be apparent without further explanation.

The generator being set in brick-work, having the requisite fire chambers and flues, is partially filled with water, the heat, as heretofore stated, circulating around each pipe

separately. The steam generated passes into the steam-chamber *d*, which, being also exposed to the same heat, becomes a superheater. The steam is then delivered to the radiator through a proper valve, *k*, which can be opened or closed at pleasure, the air in the radiator being first allowed to escape to permit the free passage of the steam by a self-acting valve, *l*, which closes when the air has been expelled.

I construct the radiator in a peculiar manner, the vertical pipes having T's *m m*, &c., formed in them, which, when fastened together, form the upper and lower horizontal pipes. If the horizontal pipes did not thus constitute a part of the vertical tubes, but were formed independently thereof and then fastened thereto, the unequal expansion of the different parts of the radiator, in consequence of one tube heating faster than another, would have a tendency to separate the joints between the vertical and horizontal tubes, whereas by the construction described such a result cannot possibly occur.

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

Constructing and arranging a heating apparatus in the manner described.

T. S. CLOGSTON.

Witnesses:
JOSEPH GAVETT,
SAML. M. BARTON.