

UNITED STATES PATENT OFFICE.

STEPHEN J. GOLD, OF NEW HAVEN, CONNECTICUT.

IMPROVEMENT IN WARMING HOUSES BY STEAM.

Specification forming part of Letters Patent No. 11,747, dated October 3, 1854.

To all whom it may concern:

Be it known that I, STEPHEN J. GOLD, of New Haven, in the county of New Haven and State of Connecticut, have invented a new and useful Improvement in Apparatus for Heating Buildings; and I do hereby declare that the following is a full, clear, and exact description of the construction and operation of the same, reference being had to the annexed drawings, forming part of this specification, in which—

Figure 1 is a perspective view of the apparatus. Fig. 2 is a sectional view of the same. Fig. 3 is a section of condenser and radiator, taken through the rivets fastening the plates. Fig. 4 is a section of same, taken between the rivets. Fig. 5 shows the several steps of the process of fastening the plates forming the chambers E and E'.

Similar characters of reference in the several figures denote the same part of the apparatus.

The object of this apparatus is the heating of buildings by radiation from broad thin chambers made the receivers and condensers of steam generated in a suitable boiler connected with the heaters and otherwise arranged, as will be described.

The invention refers to the construction of the condensers and radiators and manner of regulating the action of the steam and condensation of the same.

To enable others skilled in the art to make and use my invention, I will proceed to describe the construction and operation of the same.

In the drawings, *a* is the boiler and furnace, set in masonry *I*, as shown in Fig. 2, *m* being the furnace, fed by the opening *n* and surrounded by the boiler *j*, while the flue *f'* is carried around the outer surface of the boiler.

J is the grate, shown in a revolved position, and *I* is a conical valve filling the feed-opening *n* and regulating the draft of the furnace.

The above-described construction of boiler and furnace is not essential to my heating apparatus, as any suitable boiler and furnace may be employed.

Forming a portion of the main steam-pipe B is the chamber C, in which is a valve *h* of sufficient weight to resist the pressure of the head of steam required and capable of being lifted when the pressure of the steam rises

above the required head, so that the surplus steam will pass by the pipe B' to the condensing-chamber E', the construction of which will be hereinafter set forth. This chamber E' is immersed in a cistern D of cold water, and is connected with the boiler by the pipe B'', a portion *k* of which may be formed of a glass tube, for purposes hereinafter to be set forth.

The radiating and condensing chamber E is connected with the main pipe B by the pipe O'', the valve O regulating the admission of steam to the said radiating and condensing chamber. But one radiating-chamber is shown in the drawings, though in practice one of such chambers is to be situated in each apartment to be warmed, the connecting-pipes of which all enter the main pipe B between the boiler and the valve *h*.

The condensing-chamber E' and the radiating and condensing chambers or heaters E are each composed of two plates *t*, of thin sheet metal fastened together and packed so as to be steam-tight in the following manner, reference being had to Fig. 5.

Diagram V shows the largest plate *t* turned up around the edge of the plate *u* and a cord *g* placed upon the plate *u* and against the turned-up portion of the plate *t*. The upright portion of the plate *t* is next turned down, as seen at W, and then both plates are turned up, bringing the cord *g* upon the edge of plate *u*, as shown at X. Both plates are then turned down, as at Y, and flattened, as at Z, the edge of plate *u* being, during the operation, forced into the cord *g* throughout the length of said edge, so as to form a perfect steam-tight packing in a cheap and expeditious manner. The plates are also fastened at various points of their surface by rivets *f* passed through both plates, one plate being indented to bring its surface in contact with the other plate at the point of riveting, as shown in Figs. 1 and 3. This construction enables the thin metal to resist the pressure of the steam.

The pipe B'' has in its upper surface a perforation R, the importance of which will be seen in the following description of the operation of my improved apparatus.

It will be understood from the above description that the heating of the building is to be produced by the continual condensation of steam in the several chambers E, connected

with the main pipe B. A description of the action of the steam in the apparatus figured in the drawings will illustrate, therefore, the general operation of the heating apparatus, however modified in construction and arrangement of parts by location and other circumstances. The boiler being supplied with water and the fuel in the furnace ignited, steam will be evolved, and passing into the pipe B, as shown by arrow 1, will, within the limit of the weight of the valve *h*, exert a pressure on the water in the boiler, forcing a portion of it into the tube *k* until an equilibrium is produced between the pressure of the head of steam and the hydrostatic column in the tube *k*, the height of which column is dependent on the pressure of steam permitted by the weight of the valve *h*, and the production of which is due to the perforation R in the top of the pipe B'. That such is the effect of the perforation R is evident from well-known philosophical principles (not here requiring demonstration,) as the surplus air is necessarily expelled by pressure and the column in the tube *k* acted upon by uncompressible air. The construction of the said tube of glass permits the height of the column to be seen. When the pressure of the steam exceeds the weight of the valve *h*, (which is adjusted to the head required,) the valve rises and permits the passage of the surplus steam through the pipe B' to the condensing-chamber E', as indicated by arrows 2 and 3, and when the equilibrium is restored the valve drops. The steam which enters the chamber E' is instantly condensed as said chamber is immersed in the cold water of the well D, and is by its construction calculated to effect speedy condensation. The water from the condensing-chamber flows through the pipe B'' to the boiler, as indicated by arrows 4, 5, and 6.

The above description shows the operation of the apparatus in preserving the equilibrium of the head of steam and the hydrostatic column on the supposition that there is no communication with the radiating-chamber. When, therefore, the valve O is opened, a supply of steam will flow through the pipe O''' to the chamber E, and being there distributed into a thin stratum between the plates *tu* is immediately condensed and the heat evolved in condensation radiated from the surface of the chamber, the water flowing back to the boiler by the pipes O''' and B. The chamber E is regulated in size by the cubic contents of the apartment to be warmed and is placed in any convenient position and has its surface suitably ornamented.

The valve O regulates the supply of steam admitted to the radiating-chamber; but besides that adjustment the chamber is provided with a valve O' O', communicating with the external air and a tube S, (see Fig. 3,) which reaches nearly to the bottom of the chamber and at its lower extremity opens into said

chamber. The object of this valve and tube is the expulsion of air from the chamber on the admission of the steam, so that the whole surface of the heater may act. The air, when steam is admitted to the chamber, will be forced into the corners, as shown by dotted lines in Fig. 1. Consequently it must be discharged from the bottom, and as there would be a drip from the condensed steam if the valve O' O' was placed in the lower portion of the chamber the tube S is used, so as to receive the air at the bottom of the chamber and discharge it by the valve O' O' at the top. The valve also serves to admit any desired quantity of air to the chamber E when but a small degree of heat is desired in the apartment, the effect being to diminish the diffusion of steam in the chamber and consequently decrease the radiating-surface of the heater.

The valve O O of the chamber E' serves as a means of furnishing water to the boiler from the cistern D, though another opening to the boiler is provided, which is not shown in the drawings.

The advantage of this apparatus for heating buildings consists in a great measure in the economy of fuel which it admits of, as a very low pressure of steam is required for the heating purpose, the thin sheets forming the condensing and radiating chambers producing rapid condensation and radiation. This advantageous result of the use of thin sheets in the construction of the chambers is due to the peculiar mode of securing their sides by the rivets *f* and the manner of fastening and packing their edges, which enables the thin sheets to bear the strain of the steam without leakage.

The self-regulating property of this apparatus is another advantage in its use. This is owing to the perforation R in the pipe B'', which forms the hydrostatic column for sustaining the head of steam necessary for the heating operation, while all steam above the required pressure is passed to the condenser and returned as water to the boiler through the hydrostatic column. This self-regulating property gives a security to the use of steam as a heater not possessed by any other apparatus, as nothing is required but to keep up the fire, and the necessary amount of steam, and no more, will be conveyed to the condensers and radiators in the several apartments to be warmed.

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

1. The combination of generator, radiator, and condenser, as herein described, for the purpose of heating buildings when the connection between the generator and condenser is perforated, as specified, so as to admit of the formation of a hydrostatic column balancing the pressure of steam on the valve *h* and permitting the water from the condensation of the steam to return to the generator, as hereinbefore specified.

2. The mode of regulating the quantity of

steam admitted to the radiator by means of the valve O' O' and tube s, constructed and operating as set forth.

3. The herein-described method of producing a steam-tight connection between the plates of the condensing and radiating chambers E E' by means of a cord packed between the edges of the plates, substantially as set forth.

4. The securing of the thin metallic sheets forming the chambers E and E' by depressing and riveting, as shown in Fig. 3, for giving the requisite strength to withstand the

outward pressure of the steam in a simple and economical manner, the mode of securing the sheets by stays, as used by Watt and others, being expressly disclaimed, as also the employment of the thin metallic sheets as radiators.

In testimony whereof I have hereunto signed my name before two subscribing witnesses.

STEPHEN J. GOLD.

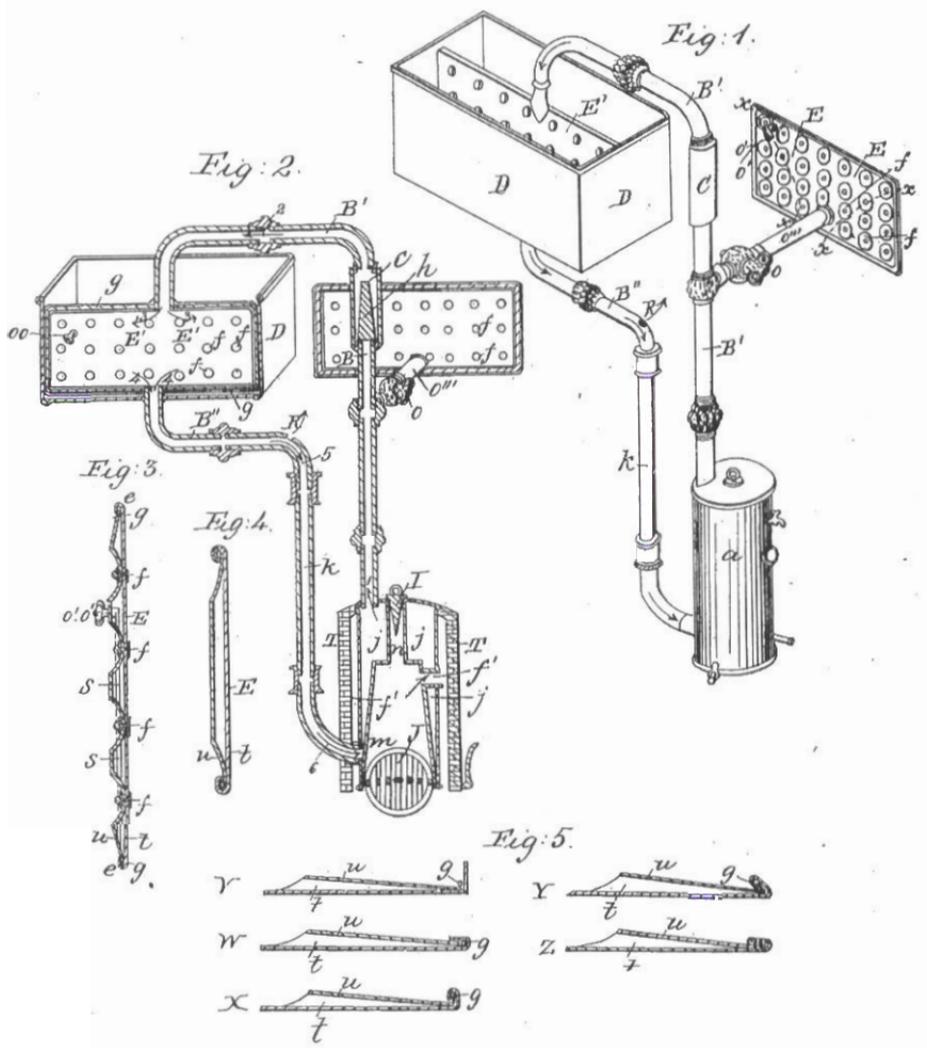
Witnesses:

GEO. PATTEN,
SAML. GRUBB.

S. J. GOLD.
Heating Apparatus.

No. 11,747.

Patented Oct. 3, 1854.





BERNARD GREEN, 1841
BARNUM, 1844, THE
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