(No Model.) 2 Sheets—Sheet 1.

D. GROVE.

WATER HEATER.

No. 384,202. Patented June 5, 1888.

Fig. 1.

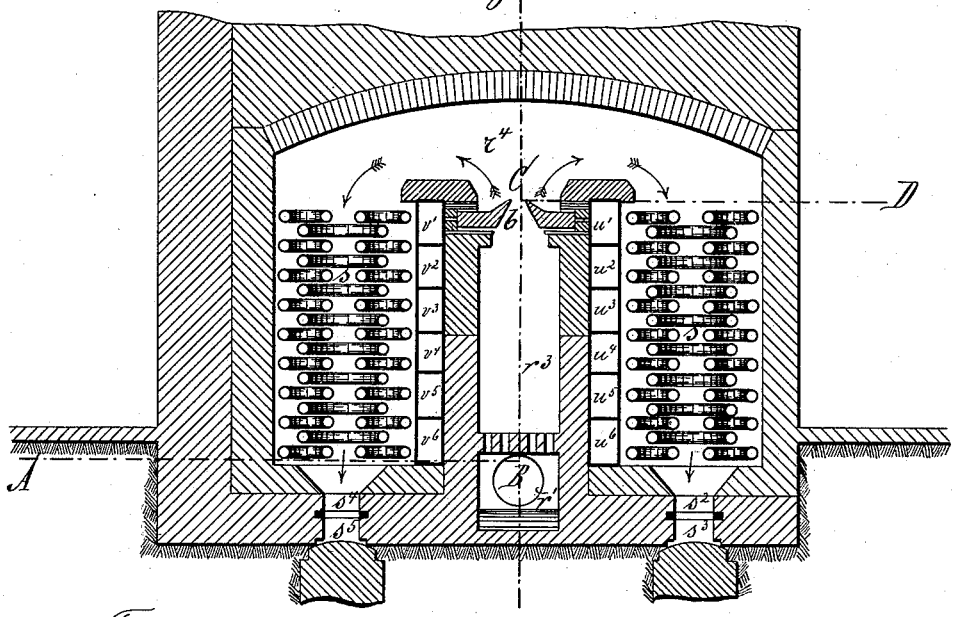


Fig. 3.

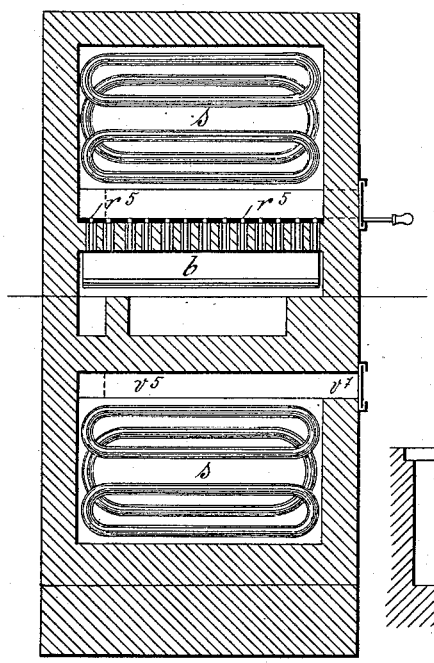
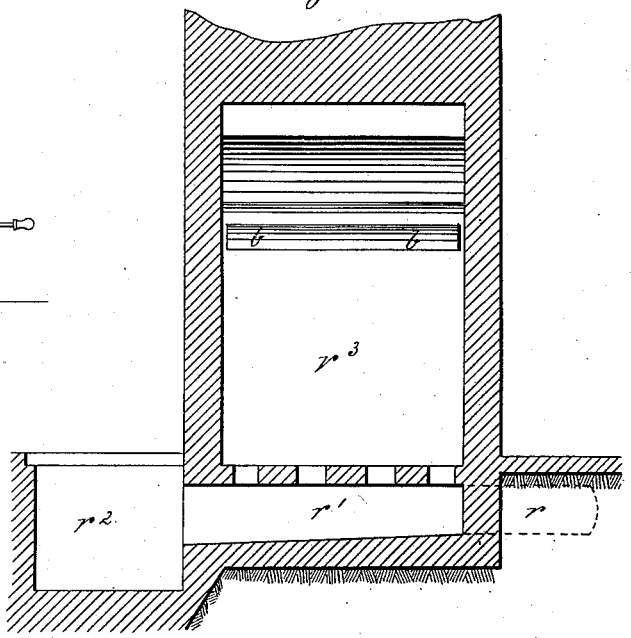


Fig. 2.



Witnesses.
Anthony Steffan.
Jean Hassard.

Inventor.
David Grove,
By his Attorneys.
Edwin A. Brydges.

(No Model.) 2 Sheets—Sheet 2.

D. GROVE.

WATER HEATER.

No. 384,202. Patented June 5, 1888.

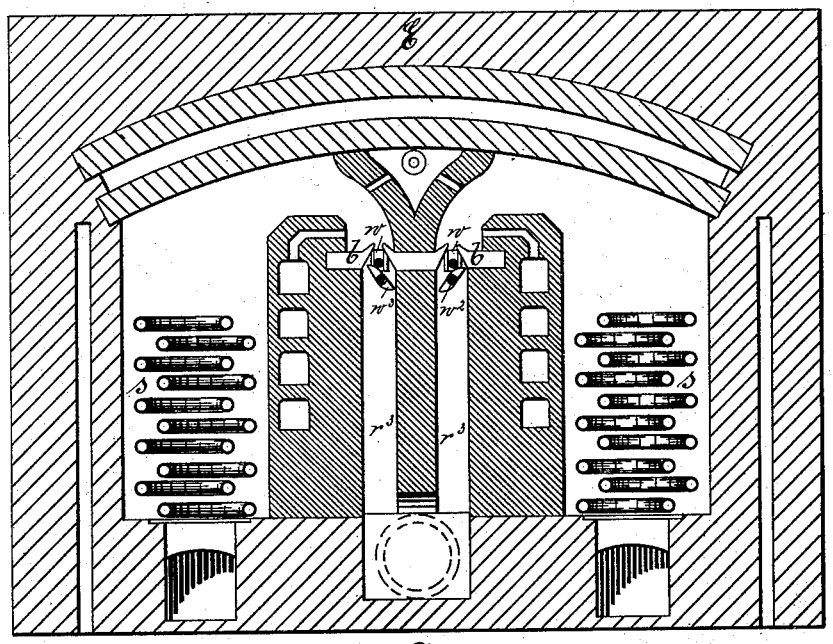
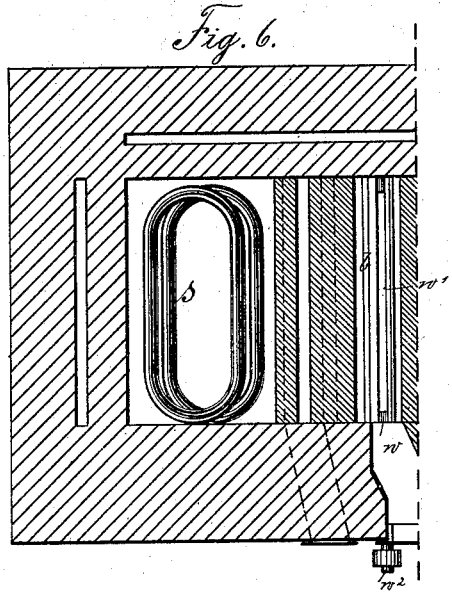
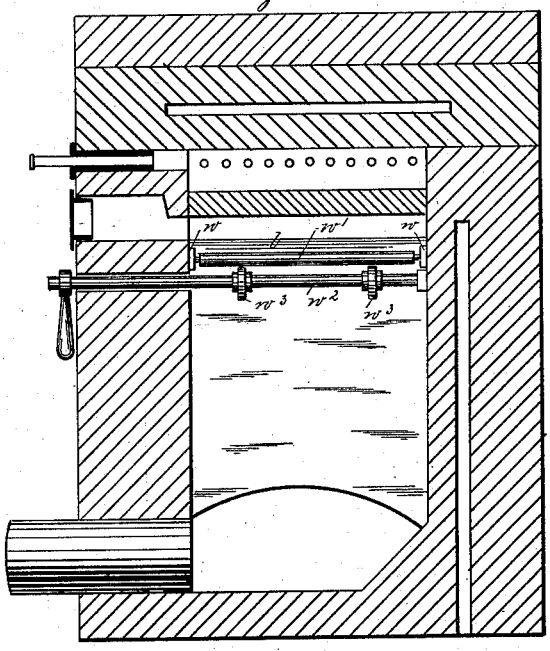


Fig. 4.

Fig. 5.

Fig. 6.





Witnesses.
Anthony Steffen.
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Inventor.
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UNITED STATES PATENT OFFICE.

DAVID GROVE, OF BERLIN, GERMANY.

WATER-HEATER.

SPECIFICATION forming part of Letters Patent No. 384,202, dated June 5, 1888.

Application filed November 16, 1885. Serial No. 182,969. (No model.) Patented in Germany April 18, 1882, No. 20,730, and in England January 4, 1883, No. 61.

To all whom it may concern:

Be it known that I, DAVID GROVE, of the city of Berlin, in the Kingdom of Prussia, and German Empire, have invented certain new and useful Improvements in Water-Heaters, (which have been partly patented to me in Germany under No. 20,730, dated April 18, 1882, and in England under No. 61, dated January 4, 1883,) of which the following is a specification.

My invention relates to improvements in apparatus for heating dwellings, hotels, and other establishments by the use of warm water, the water-coils being located within a heating-chamber, the heating medium employed being regenerative gas and heated air for the combustion of the same.

The object of the invention is to heat the water-coils by the use of gas, and to heat the air necessary for combustion before it reaches the burner.

Figure 1 represents the longitudinal section of the heating-chamber in a water-heating arrangement in which regenerative gas is employed. Fig. 2 is a cross-section of Fig. 1; Fig. 3, a cross-section on the lines A B and C D in Fig. 1. Fig. 4 is the longitudinal section of a modification of the hot-water heating arrangement. Fig. 5 is a cross-section, and Fig. 6 a part section, of Fig. 4 on the line E F.

The gases, produced from any suitable generator, pass through the connecting-pipe r to the canal or flue r', said canal or flue being in communication with a suitable tar-pit, r^2. From this canal or flue r' the gases pass to a second canal or flue, r^3, and from here they pass through an elongated opening, forming the burner b.

The burner is formed at the top of the canal r^3 by cheeks or jaws b, which project out into the canal and form the elongated and contracted burner-opening. These jaws are made of fire-proof clay or other suitable material, and the opening between them may be increased or diminished by the adjustment of one of the jaws. The gas passes up through the elongated opening into the combustion-chamber, and as it issues from the said opening it is intimately mixed with heated air, which passes from the openings r^5 directly above the burner-opening, the said openings r^5 communicating with the hot-air ducts arranged within or alongside of the walls forming the canals r^3. As shown in Fig. 1, these air-ducts are a succession of tubes or passages, (indicated at one side at v' to v^6 and upon the other side at w' to w^6,) and as they are connected at their ends they form a sinuous passage upon each side. As shown in Fig. 3, a suitable inlet for the outer air is provided, and this inlet is closed with a valve, which may regulate the amount of air admitted. The air is admitted at the bottom, and successively passes through each passage, being thoroughly heated, and is discharged at the point of combustion, as described. The water-coils are arranged, as shown, upon either side of the canal r^3 within the combustion-chamber, and these pipes are in connection with a water-reservoir and with an exit for the hot water leading to the rooms to be heated. The passage leading to the chimney is in the bottom part of the heating-chamber, (indicated at s^2 to s^4,) so that the products of combustion must pass between the coils in order to escape up the chimney. These pipes are shown at s.

Figs. 4 to 6 represent a modification of the heating-chambers for a warm-water heating arrangement, as shown in Figs. 1 to 3.

The regulating device, as represented in Figs. 4 to 6, contains two fixed cheeks or jaws, b, which have their bearings in the walls of the gas-canals r^3.

A rod, w', which has its bearings w in the front and rear walls of the generator, is moved up in order to close the opening or slot formed between the two cheeks or jaws of the burner and down to allow free passage of the gas through the same. The vertical movement of this rod w', which runs beneath the entire length of the slot formed by the two cheeks of the burner, is effected by a shaft or axle, w^2, which can be operated from the outside of the apparatus, and is provided with two or more cams or tappets, w^3, which operate so as to raise the rod or shaft toward the slot of the burner, and thus reduce the area of the way through which the gas passes.

I do not claim in this application an adjustable burner, as I have shown, described, and claimed this in another pending application, Serial No. 186,383.

I claim—

1. In a heating apparatus, a heating-cham-

ber, water-coils located within said chamber, a gas-flue leading from a suitable generator to a canal within said heater, a burner provided at the upper part of said canal, and an air-duct opening above said burner for supplying air for the combustion of the gases, with an exit or chimney for the products of combustion, substantially as described.

2. In a heating apparatus, a heating-chamber, coils for containing the water to be heated arranged within said chamber, a canal or duct within said chamber in connection with a suitable gas generator or reservoir, a burner at the termination of said canal, air-passages arranged within said heating-chamber, and openings from said air-passages into the chamber above the burner, with an exit to the chimney for the products of combustion, substantially as described.

3. In a heating apparatus, a heating-chamber, water-coils in said chamber, and a gas-canal in the center of said chamber, terminating in a burner and in connection with a suitable gas reservoir or generator, with air-passages arranged between said canal and the water-coils, said passages being in connection with each other, with an inlet-opening to the bottom one, and with an outlet from the upper one above the burner, with an exit or chimney for the products of combustion, substantially as described.

4. The combination of the gas-chambers r^3, the canals or flues r r', and the burner b with the coils $\bar{s}$ and canals or flues s^2 s^3 s^4 s^5, substantially as described and shown.

5. In a heating apparatus, a heating-chamber, water-coils arranged therein, a canal or duct for the gas or other heating medium, said canal terminating in a burner, and a valve arranged within said canal in proximity to the burner, with devices for regulating the same, substantially as described.

6. The combination of the rod or shaft w' with the shaft or axle w^2 and the cams or tappets w^3, and the burner b, substantially as described and shown.

In witness whereof I have hereunto signed my name in the presence of two subscribing witnesses.

DAVID GROVE.

Witnesses:
B. ROI,
M. W. MOORE.