

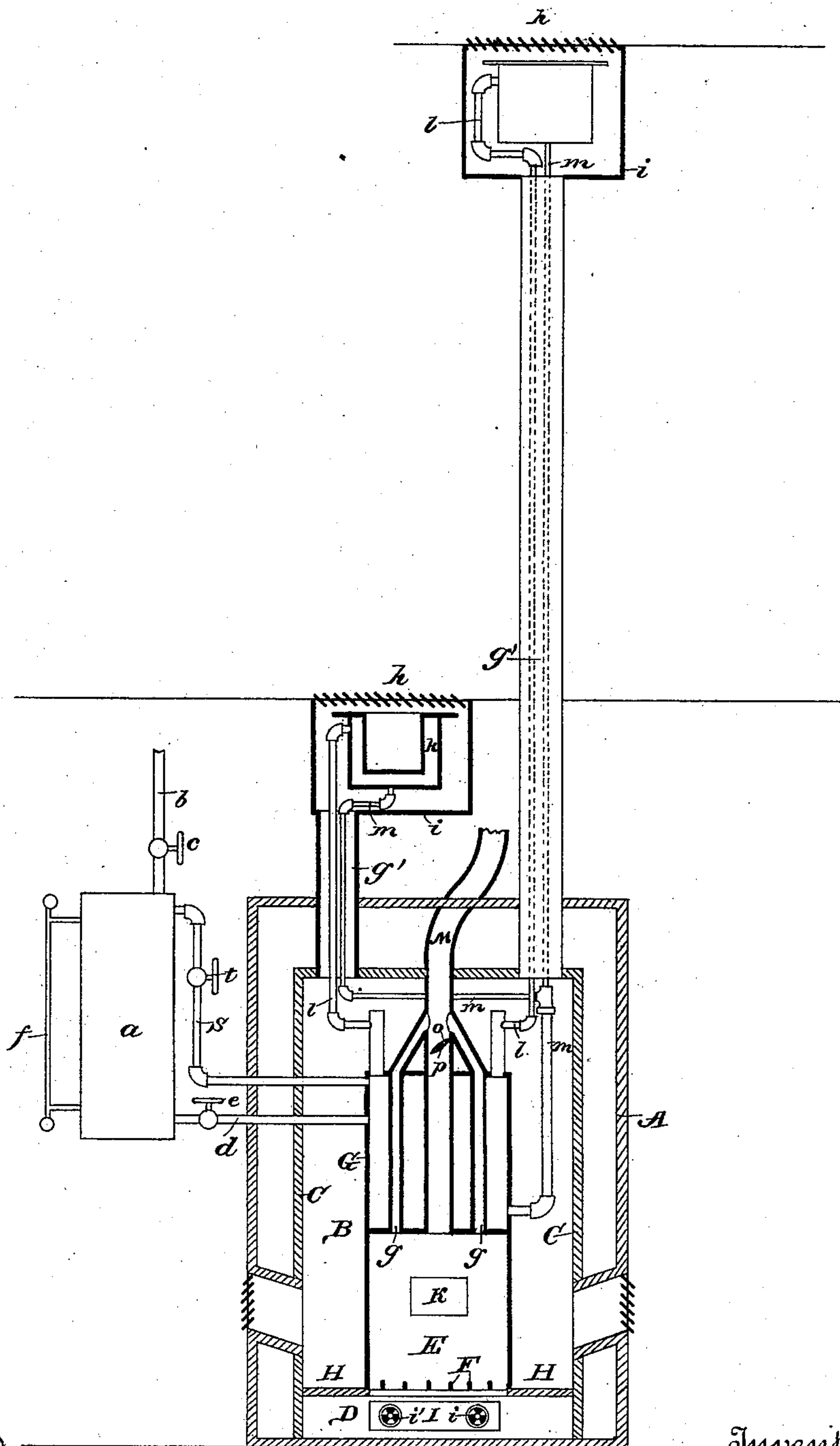
(No Model.)

W. H. DENSLOW.

COMBINED HOT AIR AND STEAM HEATER.

No. 361,350.

Patented Apr. 19, 1887.



Witnesses

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# UNITED STATES PATENT OFFICE.

WILLIAM HURBURT DENSLOW, OF ULSTER, PENNSYLVANIA.

## COMBINED HOT-AIR AND STEAM HEATER.

SPECIFICATION forming part of Letters Patent No. 361,350, dated April 19, 1887.

Application filed March 17, 1886. Serial No. 195,566. (No model.)

*To all whom it may concern:*

Be it known that I, WILLIAM HURBURT DENSLOW, a citizen of the United States, residing at Ulster, in the county of Bradford and State of Pennsylvania, have invented a new and useful Improvement in Combined Steam and Hot-Air Heaters, of which the following is a specification, reference being had to the accompanying drawing.

My invention relates to an improvement in combined steam and hot-air heaters; and it consists of the peculiar construction and combination of parts, that will be more fully set forth hereinafter, and particularly pointed out in the claims.

In the drawing the single figure is a vertical sectional view of a heater embodying my improvement.

A represents an outside casing, which may be of any preferred shape. In this casing is located a heater, B, which consists of the casing C, ash-chamber D, combustion-chamber E, grate F, and steam-boiler G, which is located on top of the combustion-chamber. The sides of the casing C are some distance from the sides of the combustion-chamber and boiler, so as to leave a space for the circulation of hot air. The ash-chamber extends entirely across the lower end of the casing C, and has a top plate, H, which divides it from the air space between the sides of the combustion-chamber and boiler and the casing C.

The casing C is made of any suitable metal, and is covered with asbestos or other non-conducting material, (not shown,) so as not to radiate heat, and thus avoid heating and injuring the outer casing, A. A door, I, in the casing A, having dampers *i*', communicates with an opening in the ash-chamber, and a door, K, in the casing A, communicates with the combustion-chamber. Vertical flues *g* pass through the boiler and lead to a smoke-pipe, M.

*a* represents a water-reservoir, which is supplied from any suitable source by a pipe, *b*, in which is located a stop-cock, *c*. The bottom of the reservoir *a* is nearly on a level with the top of the boiler and communicates therewith through a pipe, *d*, which enters the boiler at the top of the water-line. A stop-cock, *e*, is

provided for the pipe *d*, and a water-gage, *f*, is provided for the reservoir.

S represents a pipe that leads from the top of the reservoir to the top of the boiler. This pipe has a stop-cock, *t*.

*g*' represents hot-air pipes, which extend from the casing C to registers *h*, which are located at any desired point in the building in which the heater is placed. Each of the registers is provided with a casing, *i*, with which the hot-air pipes communicate, and in the said casing are located steam-heat radiators, which are preferably formed of cylindrical vessels open at their upper end and nested the one within the other, whereby a space, *k*, is left between the inner and outer vessel and surrounding the inner vessel on all sides. The open end of the steam-radiator is opposed to the register.

*l* represents steam-pipes, which extend from the steam-boiler through the hot-air pipes to the register-casings and communicate with the steam-radiators, so as to discharge live steam from the boiler into the spaces *k*. Pipes *m* lead from the lower sides of the steam-radiators through the hot-air pipes and communicate with the boiler below the water-line thereof, to convey the steam and water of condensation back from the steam-radiators to the boiler.

In the central flue or smoke pipe, M, of the boiler, below the point where the flues *g* communicate therewith, is located a damper, *o*, which may be operated by means of a rod, *p*. When a sufficient quantity of steam is generated, this damper may be closed, sending the smoke or heat up against and into the central flue and passing through the outer flues above the damper into the main smoke-pipe, thus making a distinct and independent draft through the boiler.

Before raising the steam in the boiler the latter is filled with water to the proper level, by opening the stop-cocks *c* and *e* and allowing the water to pass from the reservoir into the boiler. The stop-cock *c* is then closed and the cock *t* opened. When the water descends below the proper level, steam finds its way through the pipe S into the upper end of the reservoir, and its pressure on the water therein



forces water from the water-reservoir into the boiler, by which means the boiler is fed automatically and the proper quantity of water always maintained therein. By locating the steam-pipes in the hot-air pipes loss of steam is prevented by condensation, owing to radiation of heat.

Having thus described my invention, I claim—

10 1. The combination, with the combustion-chamber E, of the steam-boiler located above the same and having the same diameter, the central flue or smoke pipe, M, in the boiler, the flues *g* around the central flue, all of said  
15 flues communicating at their lower open ends with the combustion-chamber, the flues *g* having their upper ends opening into the central flue outside the boiler, and the damper *o*, located in the pipe M, below the point where  
20 the flues enter the said pipe, as set forth.

2. The combination of the boiler and heater with the casings *i*, having the registers *h*, the steam-radiators located in the casings *i*, but not communicating therewith, the said radiators comprising the inner and outer vessels  
25 forming the confined spaces *k* between them, the pipes leading from the heater to the casings *i* to convey hot-air thereto to be dis-

charged through the registers, and the steam-pipes extending from the boiler to the radiators and returning from the same, the said  
30 pipes communicating with the spaces *k* in the radiators, but not with the casings *i*, whereby the steam in the radiators does not mingle with the hot-air in the casings *i*, substantially  
35 as described.

3. The combination of the hot-air casing *i*, having the register *h* on one side, and the pipe to supply hot-air to the casing, with the steam-radiator located in the casing and having the  
40 central recess open on the side presented to the register, the said radiator comprising the inner and outer vessels or walls, forming the space *k* between them, which space does not  
45 communicate with the interior of the casing, and the steam-pipes communicating with the radiator to circulate steam through the same, substantially as described.

In testimony that I claim the foregoing as my own I have hereto affixed my signature in  
50 presence of two witnesses.

WILLIAM HURBERT DENSLOW.

Witnesses:

CHAS. C. MILLER,

F. E. COGSWELL.