(No Model.) 3 Sheets—Sheet 1.

J. JOHNSON.

HEATING APPARATUS.

No. 264,835. Patented Sept. 19, 1882.

Fig. 1.

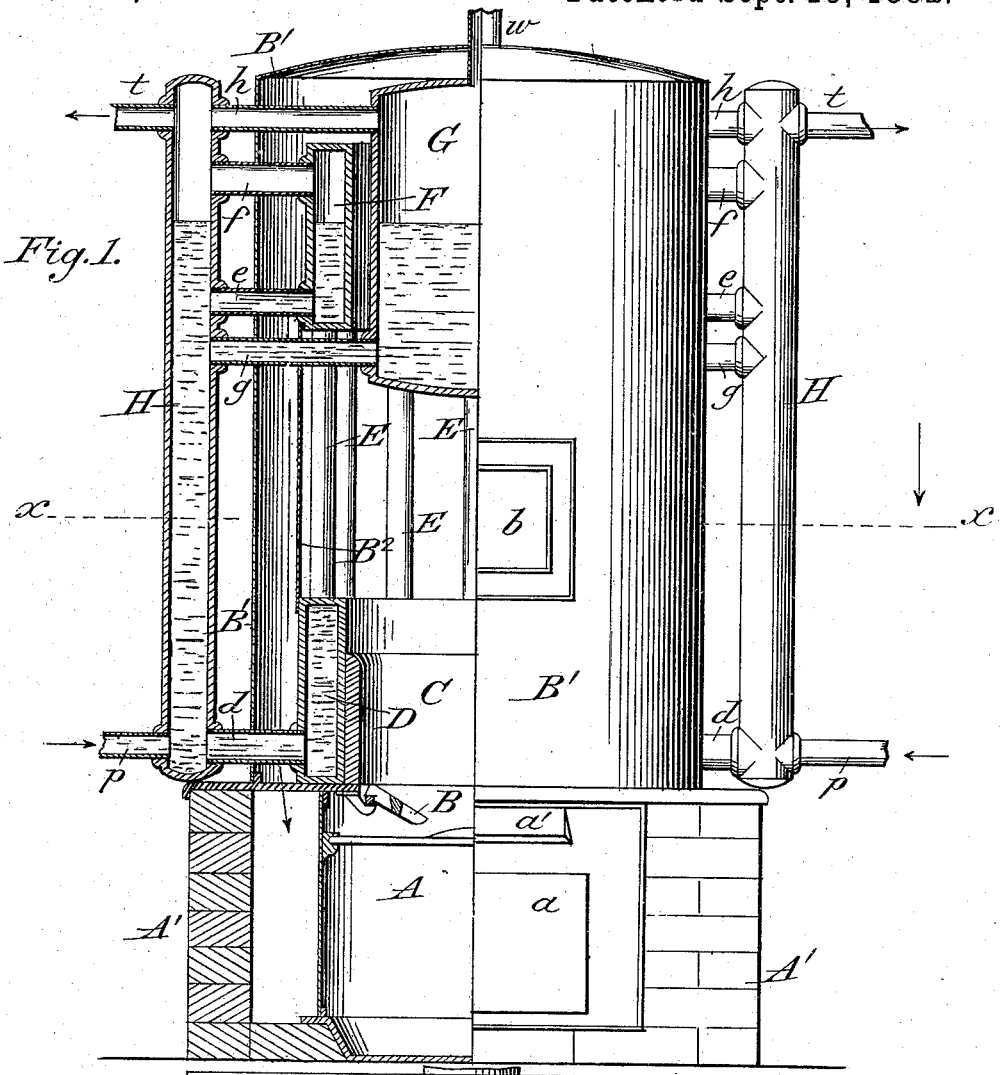
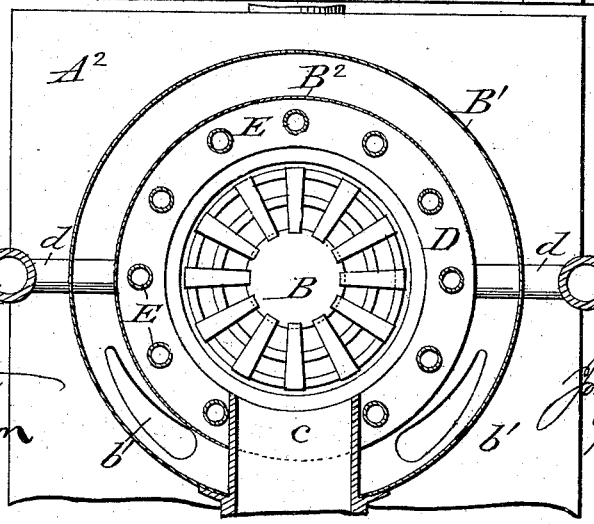


Fig. 2



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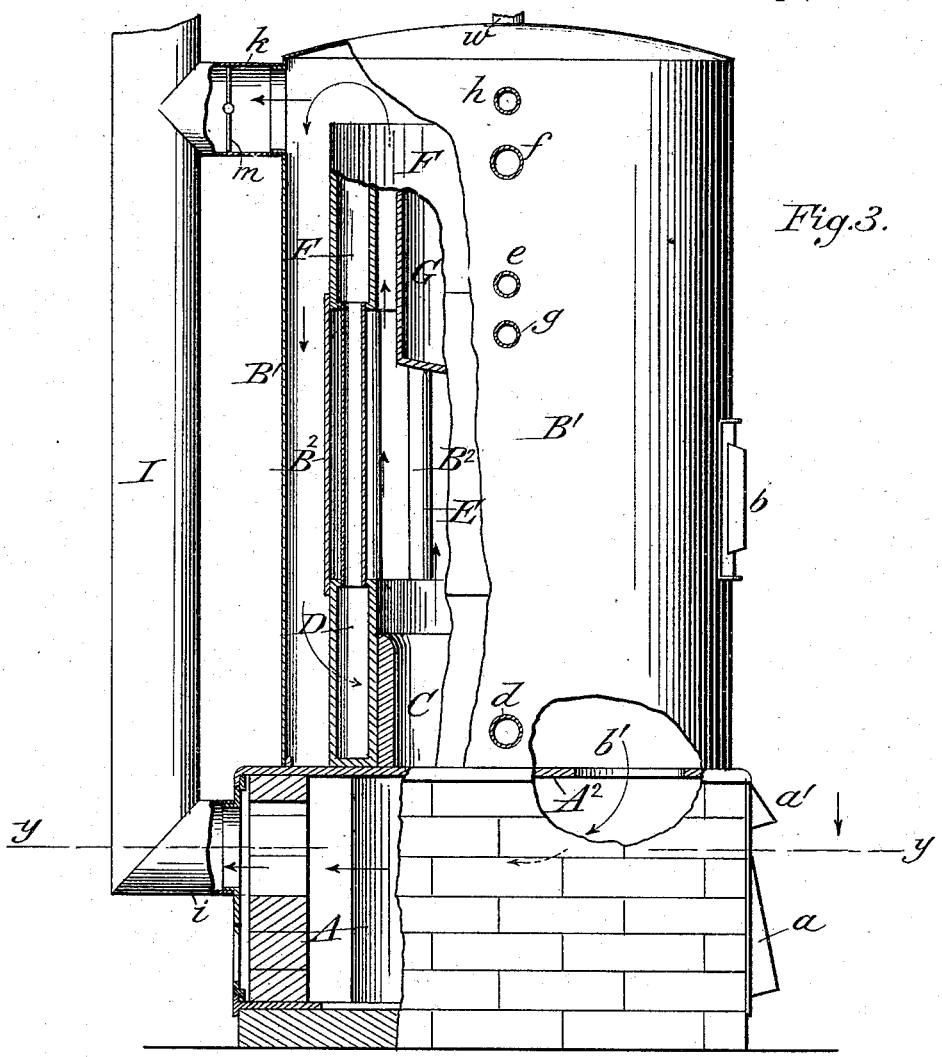

Fig. 3.

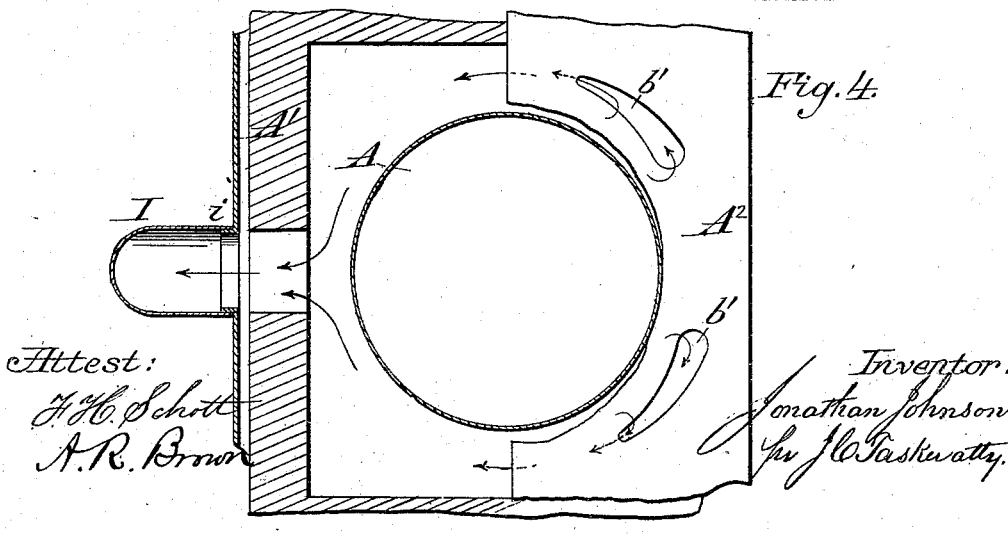

Fig. 4.

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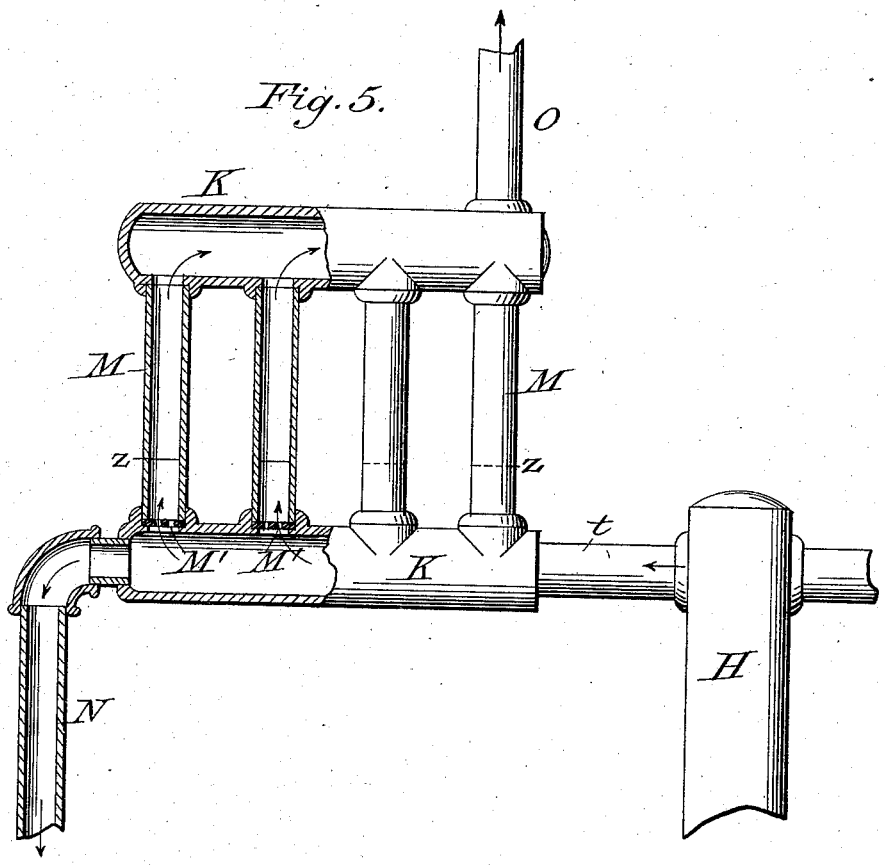
Fig. 5.



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UNITED STATES PATENT OFFICE.

JONATHAN JOHNSON, OF LOWELL, MASSACHUSETTS.

HEATING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 264,835, dated September 19, 1882.

Application filed March 3, 1882. (No model.)

To all whom it may concern:

Be it known that I, JONATHAN JOHNSON, a citizen of the United States, residing at Lowell, in the county of Middlesex and State of Massachusetts, have invented certain new and useful Improvements in Heating Apparatus; and I do declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to the letters and figures of reference marked thereon, which form a part of this specification.

This invention relates to that class of heating apparatus which is adapted to be employed as steam or hot-water heaters, or by means of which steam and hot water may be conjointly used for the purpose of heating buildings; and the invention consists in certain peculiarities in the construction and arrangement of parts, as will be hereinafter more fully described and claimed.

In the accompanying drawings, which fully illustrate my invention, Figure 1 is a front elevation of my improved heater, partly in section. Fig. 2 is a horizontal section on the line *x x* of Fig. 1. Fig. 3 is a side elevation, partly in section. Fig. 4 is a horizontal section on the line *y y* of Fig. 3; and Fig. 5 is a view of an attachment in which a radiator is provided with a device for separating steam from the water-circulation and obviating the disagreeable noise usually incident to the passage of hot water and steam through the radiators.

Like letters indicate like parts throughout the several views.

In the annexed drawings, A represents the ash-pit. B is the grate, which may be of any desired form or style, and C is the fire-pot lining. The fire-pot D is an annular reservoir or water-chamber, which may have a lining, C, and communicates, by means of the vertical pipes E E, with an upper annulus or chamber, F. The water-pipes E are arranged in a circle, with intervening spaces, as shown in Fig. 2. Within the space inclosed by the upper annulus is supported a central case or chamber, G, which is adapted to contain a quantity of water, and is so arranged as to expose a large surface to the action of heat. The ash-pit A is surrounded by a suitable casing, A′, of masonry or other material, which casing is provided with doors *a a′*, and is adapted to serve as a support for the body of the furnace or heater. The annular chambers D F and central chamber, G, are surrounded by a suitable metallic shell, B′, having a door, *b*, which communicates, by an inclosed passage, *c*, with the space above the fire-pot. The casings A′ and B′ are so arranged as to leave a considerable space between their inner faces and the exterior of the inclosed parts. Within the shell or casing B′ is an inner shell, B^2, that immediately surrounds the pipes E and connects the opposite ends of the annular chambers D and F, a hot-air space being thus formed between the shells B′ B^2, and also within the inner shell, B^2, beneath the chamber G, and between the latter and the upper annulus. On each side of the casing B′, and exterior thereto, is a vertical water-column, H, which communicates below with the annular chamber D by means of a horizontal pipe, *d*, and also communicates above with the annulus F and chamber G by means of the pipes *e f* and *g h*, respectively, the shell B′ being perforated at suitable points for the passage of said pipes.

At the back of the furnace is a smoke-pipe, I, which communicates, by means of a branch or elbow, *i*, with the space surrounding the ash-pit, and, by a branch, *k*, with the upper part of the shell or casing B′, the latter branch being provided with a damper, *m*, that may be turned so as to cut off the direct draft, and, by diverting it downward to the branch *i*, serves to retain the heat and the products of combustion for a longer time in contact with the water circulating through the annular chamber D at the bottom of the apparatus. By this means I am enabled to effect a large economy in the quantity of fuel ordinarily required, and at the same time produce more satisfactory results than are possible when the draft is allowed to pass off at steam-heat.

The heater is supplied with water at one or both sides through the pipes *p p*, which enter at the lower ends of the vertical columns H H. The water passes first into the lower ends of said columns and through the pipes *d* into the lower annulus, D, and when this is filled it ascends through the vertical pipes E into the

upper annulus, F, and thence passes through the pipes *e e* into the upper parts of the water-columns H, whence it passes through the horizontal pipes *g* into the central chamber, G. It is evident that a perfect circulation is thus secured, and that when necessary the entire capacity of the various pipes and chambers may be utilized for the reception of water, or when it is desired to generate steam the water-line may be maintained at any desired point. In practice, however, the water-line will be at a point a little above the center of the annulus F and central chamber, G, as shown in Fig. 1, when the apparatus is used as a steam-heater; but when it is used for circulating hot water as well as steam through the radiators the water-line will be at about the point *z*. (Shown in Fig. 5.) An exit for the passage of steam from the upper annulus, F, is afforded through the pipes *f f*, and from the chamber G through the pipes *h h*. These pipes communicate with the upper ends of the equalizing water-columns H H, as before described, and from thence the steam or water, as the case may be, is permitted to escape through the pipes *t t* to the radiators. If desired, a safety-valve may be attached to an opening or pipe, *w*, at the top of the central chamber. After the steam has passed through the radiators and is condensed the resulting water may be returned through suitable pipes to the inlets *p p*, and thus caused to re-enter the circulation within the furnace.

When a large body of water is exposed to the action of heat, or if the quantity of water is smaller but heated in a confined space, the sudden generation of steam is liable to cause the water to "prime" with violence, thus creating a partial vacuum at the bottom of the boiler or water-receptacle, which space, being instantly filled by the gases or vapors developed by the intense heat, often subjects the boiler to serious injury. My invention obviates any liability of injury to the boilers or water-chambers from the cause just mentioned. It is obvious that the sudden generation of steam and consequent priming of water into the steam-passages is instantly compensated by the descent of the water in the equalizing water-columns H H and its passage thence into the lower parts of the annular chambers D F and central chamber, G. The lower portions of these chambers, being thus instantly supplied with a suitable quantity of water, are thereby protected from the disastrous effects of overheating. The interior of the fire-pot or annular water-chamber D being provided with a lining, C, that covers the lower part of said annulus, the latter is thereby protected from the direct action of the fire, thus preventing the generation of steam at the bottom of the body of water and reducing the tendency to prime. It is also apparent that by conducting the smoke and heated currents upward on the inner sides of the annular chambers D F and thence downward from the top of the heating apparatus on the outer sides of said chambers and causing the draft to pass finally through an opening below the lower level of the fire-pot, a better opportunity is afforded for the absorption of heat by the water contained in the various pipes and chambers inclosed within the furnace-shell. By reference to the annexed drawings it will be seen that the heated currents rising from the fire-pot, after passing upward within the inner shell, B^2, and between the upper annulus, F, and central chamber G, may be allowed to escape into the smoke-pipe I through the connection *k*; but if the damper *m* in said connection or pipe *k* is closed, the smoke and other products of combustion will be diverted and caused to pass downward in the annular space between the concentric shells B' and B^2, and thus be brought in contact with the outer surfaces of the annular chambers F and D, so as to again subject their contents to the action of heat. In this case the smoke follows the course of the arrows shown in Figs. 3 and 4 and passes down through the openings *b' b'*, which are formed in a plate, A^2, that separates the space surrounding the ash-pit from the upper parts of the heater. From this lower space the smoke and products of combustion finally escape to the smoke-pipe through the branch or elbow *i* at its lower end.

In Fig. 5 is illustrated one manner in which my improved furnace may be connected with a radiator, the connection being made through the vertical water-columns H H and the branches *t t* at their upper ends. This radiator consists of the horizontal pipes K K and vertical connecting-pipes M M. The lower horizontal pipe is provided with a branch or return pipe, N, through which the water and condensed steam are returned to the inlet-pipes *p p*, thus maintaining a constant circulation. The upper horizontal pipe is provided with one or more eduction pipes or branches, O, through which steam may be allowed to pass to a radiator or radiators located upon an upper floor or floors of the building. This radiator, as before mentioned, may be used for heating entirely by steam or entirely by hot water, or partly by steam and partly by the circulation of hot water, the water-line being varied according to the requirements of varying circumstances.

In order to obviate the disagreeable noises incident to the combined employment of steam and hot water for heating puposes, the lower ends of the vertical pipes M are partly closed by perforated plates M', which serve to prevent the sudden and violent upward passage of steam and hot water from the lower horizontal portion of the radiator to the vertical pipes or passages M. The perforations in these plates are of such size as will permit the ready passage of the heating medium without allowing the steam and heated water to pass upward with the violent and noisy rush that is so often incident to many forms of heating apparatus in which hot water and steam are

used. This arrangement of the radiator K M also provides an excellent device for separating steam from the hot-water circulation when it is desired to heat some apartments by steam and some by means of hot water, it being only necessary to regulate the water-line according to the requirements of each case.

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

1. The combination, in a hot-water or a steam heater, of annular water-chambers provided with vertical connecting-pipes, a central interior case or water-chamber exposed to the direct action of the products of combustion, vertical water-pipes exterior to the furnace-case, and lateral tubes connecting the exterior pipes with the lower annulus and with the upper water-chambers, said lateral tubes being arranged to connect with said upper chambers respectively at a point near the top and a point near the bottom thereof, whereby the chambers are constantly supplied with water, substantially as set forth.

2. The combination of the lower casing, A′, upper concentric shells or casings, B′ B², lower annular water-chamber, D, arranged within the inner casing and adapted to serve as a fire-pot, upper annular water-chamber F, vertical pipes E, connecting said annular chambers, inner water-chamber G, vertical pipes H, exterior to the furnace and connected with the inner water-chambers by means of lateral pipes, and the flue I, communicating with the lower part of the furnace below the level of the fire-pot, whereby all the chambers are constantly supplied with water and the products of combustion are carried up over the inner faces of said chambers and downward over their outer faces, substantially as set forth.

3. In a heating apparatus, the combination of the lower annular water-chamber, D, upper annular chamber, F, vertical pipes E E, connecting said chambers, central water-chamber, G, supported at the upper part of the apparatus, vertical water-columns H H, exterior to the furnace-shell, and provided with inlets *p p* and exits *t t*, the horizontal pipes *d*, connecting the water-columns with the lower annulus, and other horizontal pipes respectively connecting said columns with the upper annulus and with the central chamber both at a point near the top and a point near the bottom thereof, substantially as set forth.

4. In a heating apparatus, the combination of the lower shell or casing, A′, plate A², supported thereon, and having draft-openings *b′ b′*, upper concentric furnace-shells, B′ and B², annular water-chambers D and F, connected by vertical pipes E E, central water-chamber, G, vertical water-columns H H, connected by lateral pipes with the inner water-chambers, and the smoke-pipe I, communicating with the lower part of the furnace below the level of the fire-pot, substantially as set forth.

5. In a heating apparatus, the combination, with the inner water-chambers, D, F, and G, and exterior water-columns, H H, having inlets *p p* and exits *t t*, of the steam-separating radiator K M, having perforated plates M′, eduction-pipes O, and return-pipe N, substantially as set forth.

In testimony whereof I affix my signature in presence of two witnesses.

JONATHAN JOHNSON.

Witnesses:
PHILIP MAURO,
A. R. BROWN.