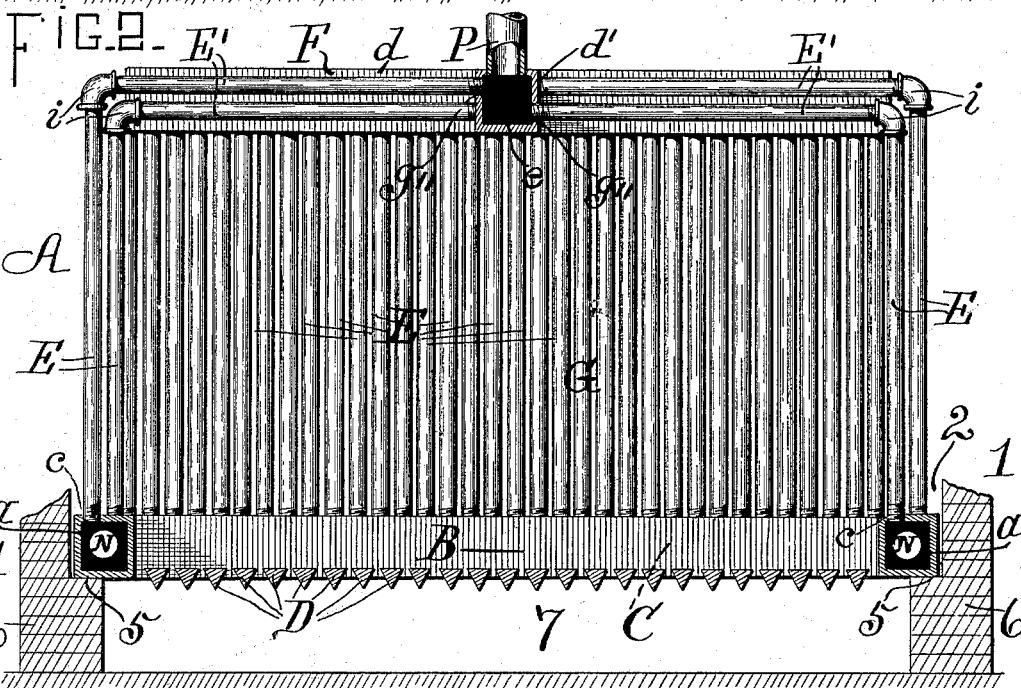


3 Sheets—Sheet 1.

No. 522,755.

Patented July 10, 1894.



WITNESSES:

E. Homlinson.
E. Kaukeneller.

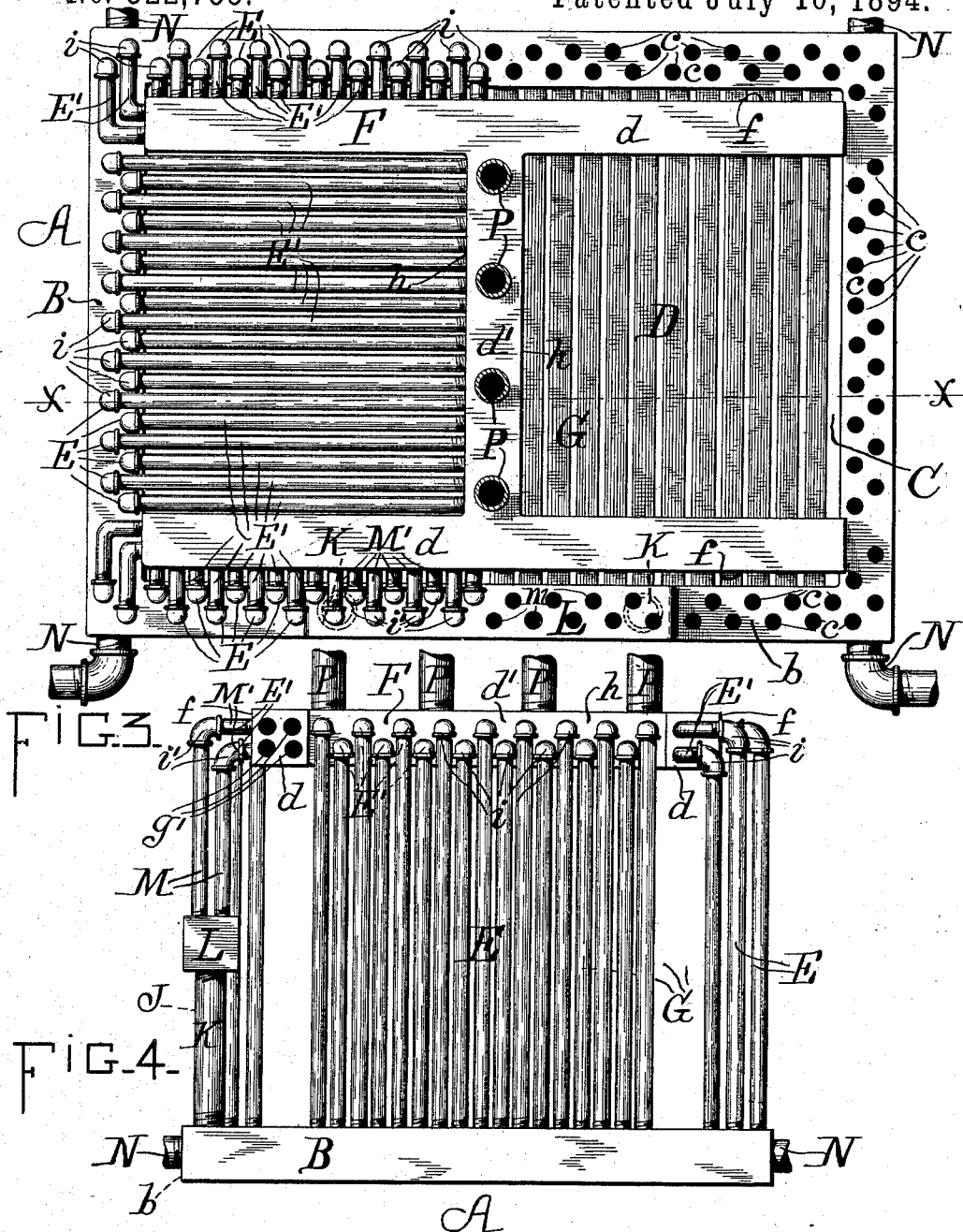
INVENTOR:

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BY—
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his ATTORNEY.

A. O. GRASSL.
HOT WATER HEATER.

No. 522,755.

Patented July 10, 1894.



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(No Model.)

3 Sheets—Sheet 3.

A. O. GRASSL.
HOT WATER HEATER.

No. 522,755.

Patented July 10, 1894.

FIG. 5.

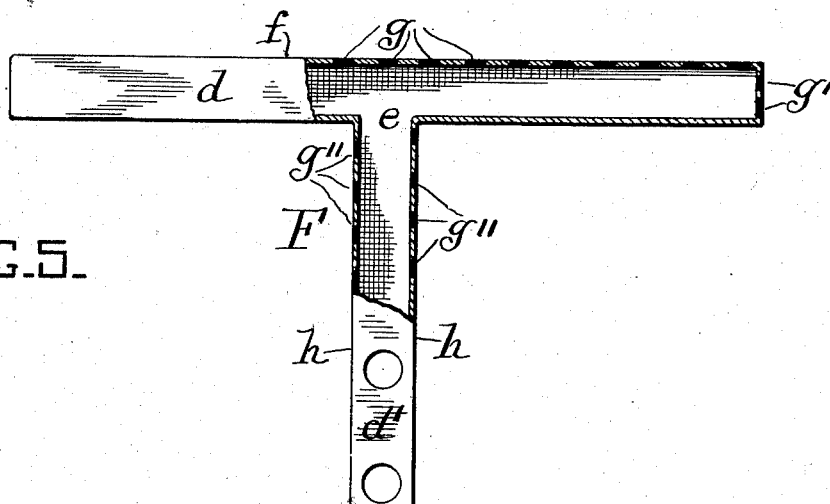


FIG. 6.

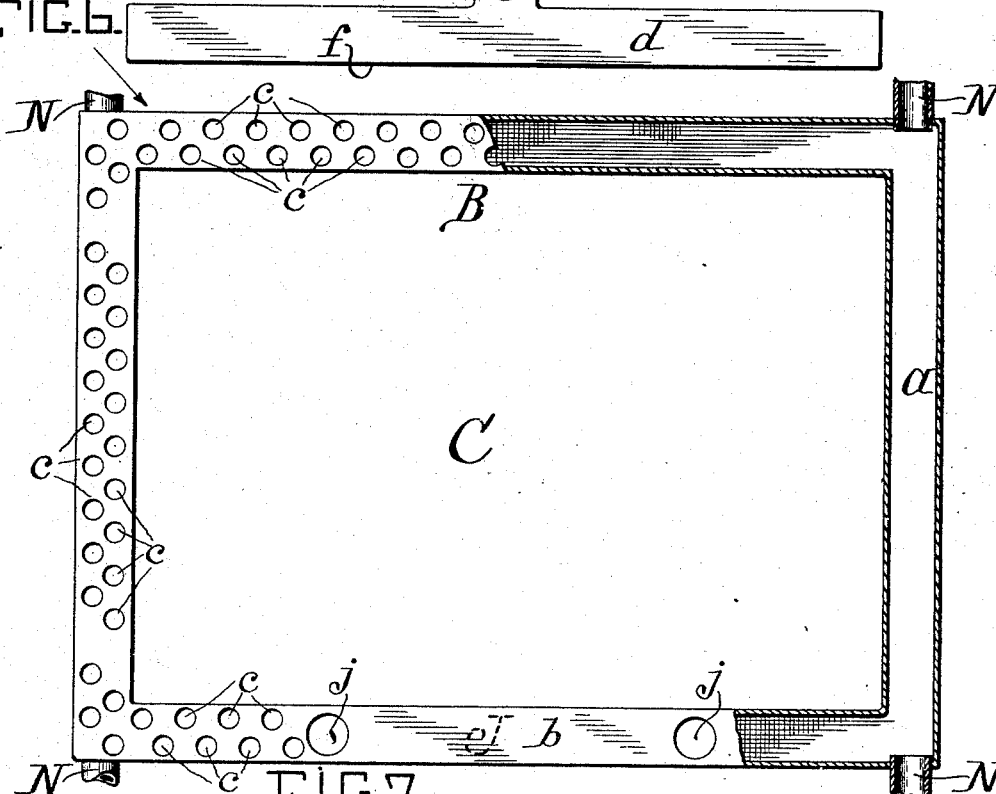
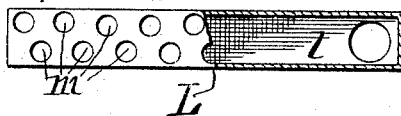


FIG. 7.

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UNITED STATES PATENT OFFICE.

AUGUST O. GRASSL, OF SYRACUSE, NEW YORK.

HOT-WATER HEATER.

SPECIFICATION forming part of Letters Patent No. 522,755, dated July 10, 1894.

Application filed April 10, 1894. Serial No. 507,076. (No model.)

To all whom it may concern:

Be it known that I, AUGUST O. GRASSL, a citizen of the United States, residing at Syracuse, in the county of Onondaga and State of New York, have invented certain new and useful Improvements in Hot-Water Heaters; and I do hereby 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, in which—

Figure 1 is a front elevation of my improved hot-water heater (or boiler), the forward brick casing or jacket being shown broken-away about half its length and bringing to view the contiguous internal construction or portions embodied in my apparatus; Fig. 2 a longitudinal vertical section of my device taken about a third of the distance backward of the front, as indicated by dotted line *x, x*, in the following figure. Fig. 3 is a top-plan view of my heating apparatus as appearing with the confining casing removed; Fig. 4 an end-elevation of my device as devoid of its brick casing; Fig. 5 a detached detail, in top-plan and sectional, of the H-shaped horizontally disposed upper shell appertaining to my formation of heater; Fig. 6 a detached detail, combined plan and longitudinal section, of the lower disposed horizontal rectangular-shaped shell entering into the construction of my hot-water heater; and Fig. 7 is a detached detail, in top-plan with a portion broken open, illustrating the elongated straight shell disposed intermediately the upper and lower shells before referred to.

Throughout the several views corresponding letters and figures of reference indicate similar parts.

My invention has especial reference to that class or species of heating or warming devices designed for the warming of stores, dwellings, halls, green-houses, &c., commonly denominated as hot-water heaters, or, in some instances, as hot-water boilers.

The object of my invention is the construction of a heating apparatus of the character aforementioned, of comparatively simple and inexpensive formation; embodying simplicity of operation combined with efficiency and reliability thereof; insuring a maximum degree

of heat with a comparatively slight amount of fuel; the greatest direct heating capacity with but a minimum of friction of the water circulating through the apparatus; a device readily and economically operated, and wherein the various tubes, &c., admit of ready connection or disconnection for replacing of worn parts, or other needful repairs; and, in other hereinafter to be described details of construction calculated to add to the durability and efficiency of an apparatus of this character.

My invention consists in the novel features of construction, combination and co-adaptation of parts, and operation, as hereinafter set forth, and which are specifically enumerated in the clauses of claim hereto annexed.

It is constructed as follows:

A is my apparatus *per se*, inclosed by a casing or jacket 1, of brick or other satisfactory material, and suitably mounted in operative position in the rectangular-shaped chamber 2 (combustion-chamber) created by the casing. Said casing may be of any ordinary or preferred construction, and comprising right-angular meeting front, rear, and end vertical walls and requisite overhead arch; the vertical walls resting upon any suitable foundation; the front wall being provided midway its length with a fire-opening closed by a suitable fire-door 3, and one or two ash-pit doors 4 closing openings leading to a customary ash-pit, which door or doors are located a distance underneath the fire-door before referred to. And, obviously, a satisfactory stack or chimney communicates with the combustion-chamber 2, at a proper point, to permit of the escape of smoke and other products of combustion therefrom, and moreover insuring requisite draft.

Referring to the water-heating and circulating structure or apparatus A, the letter B denotes a rectangular frame-like shell of suitable cast-metal, horizontally erected upon the shelf or abutting ledges 5, 5, of the base portions 6, 6, of the casing walls in the ordinary manner; and of course similarly resting upon the base portions of the front and rear walls of the casing.

The horizontally resting shell B, mounted at a sufficient height to insure an ash-pit or receptacle 7 beneath it occupying the area of

the chamber thereat, and which lower-located water-circulating shell is in plan of rectangular or \square -outline, comprises a straight forward and rearward flue or pipe portions and similar end portions, creating a frame-shaped water-circulating chamber or duct a extending from one given point rectangularly around to the same, the conduit right-angularly communicating sections all being integral, and said frame-like water-circulating and heating shell leaving a central open and free space C , as indicated in Fig. 2 of the drawings, and also in detail Fig. 6, existing by reason of the frame-like rectangular disposed conduit-sections of said shell B . Transversely, at any portion of its integral right-angular meeting lengths or sections, the same is of square formation, producing thereby a circulating chamber of like contour for the heated or warm water therein.

D are grate-bars of any common or preferred form, erected horizontally across from front to rear of the opening or space C bounded by the skeleton-like rectangular frame shell B ; which series of bars are disposed at or about the plane of the bottom of the said shell, and secured at their ends to the oppositely facing conduit portions thereof by any suitable means.

The upper portion of the frame-like water-shell B throughout its continuous rectangular length, is, except for a moderate distance along the central portion of its forward section b , pierced by two rows of circular apertures c, c , arranged alternately one to the other, as very clearly represented in Figs. 3 and 6 of the drawings.

E are double rows of vertical water-tubes (or pipes) of wrought-iron, copper or other satisfactory metal, the tubes of one row disposed alternately with those of the companion row, which respective tubes are, by their lower threaded ends screwing snugly into the interiorly-threaded apertures c, c , firmly retained in upright position, and freely communicating at their lower ends with the water-circulating interior of the square frame-shaped shell B as illustrated, and very clearly brought out in the major figures of the drawings.

F indicates the upper or top water-circulating and heating shell appertaining to my apparatus; which horizontally disposed shell is in top (or bottom) plan of an H -shape or configuration longitudinally, while oppositewise it resembles in plan an H turned one-fourth around; the said shell being upheld in proper position within the interior of the casing and at some considerable distance above the bottom shell B by means of the double rows of vertical water-tubes E upwardly connecting therewith. This upper shell, comprising the parallel lengths d, d lying longitudinally the apparatus, and the centrally located transverse length d' connecting the aforesaid midway their length, and located on the same horizontal plane, is preferably

formed of an integral casting as illustrated; the lengths or sections embodied by its formation being in cross-section of square contour, whereby the water chambers e , thereof are, also, transversely rectangular. Said upper shell-formation F is, along its two outer sides f, f , provided with a double row of circular threaded-apertures g, g , arranged alternately one to the other; while the square-shaped ends of the respective lengths d, d , are provided with a group of like apertures g' ; and moreover either side h, h , of the cross-length d' is provided with double parallel rows of like threaded apertures g'' , located alternately one to the other. All the aforementioned apertures, as is obvious, communicate with the interior of the integrally-formed shell F .

The series of water-tubes E forming the quadrangular fire-chamber G of my apparatus, and which, extending vertically from the lower water shell B upward the height of the top shell F , and terminating on slightly different horizontal planes, *i. e.*, the inner and outer rows of the water-tubes; are thereat provided with L 's i , connecting the aforesaid vertical tubes with horizontally lying water-tube sections E' , of varying lengths, that communicate with the interior of the water-heating shell F by reason of their threaded ends fitting into the threaded apertures hereinbefore referred to located at stated portions of said shell.

The vertical water tubes E located at the respective ends of the lower shell communicate with the cross-length d' of the upper shell as shown, the horizontal tubes E' bringing them in communication with the central section of the shell F being of some considerable length necessarily, the sets approaching from either end the central cross portion of the upper shell and there communicating with its interior, covering over in an open work manner the fire chamber existing in the quadrangular space created by the water-tubes.

As is observant, the vertical tubes E arising from the front and rear sections of the lower shell communicate with the overhead shell at its parallel front and back sides by means of the abbreviated horizontal tubes E' , while one, two, or more of them at the extremities of the tube rows attain communication with the chamber of the upper shell through the medium of the L -shaped pipe sections E' that severally enter the shell at the respective ends of its longitudinally parallel portions d, d .

The H -shaped shell F occupies an area sufficiently smaller than that of the under water-shell to adapt the tubes arising therefrom to be properly connected therewith, the advantages and necessity of its occupying a lesser degree of space as compared with the underneath shell, being readily apparent upon consideration.

My apparatus at its front portion is provided with a feed or fire opening J , with which the doorway having the fire-door opens into,

said feed or fire opening permitting ready access for fuel, &c., into the central fire-chamber bounded by the rows of water-tubes. Said fire opening or fire-arch J breaking partially the continuity of the forward rows of vertical water tubes centrally the front of my apparatus, is created by the large vertically standing wrought-iron pipes K, K, fitting at their lower ends in the circular openings *j, j*, located in the top of the front length of the rectangular shaped frame shell B contiguous the termination of the apertures *c, c*, at either side of the front, the said large pipes K, K, extending upward about a third the height of my structure and there entering through coincident underneath openings a straight abbreviated shell L disposed horizontally parallel with the underneath shell B and spanning the open space existing between the two apart pipes K K upholding the said fire-arch shell L in position. Evidently the open space existing within the confines of the aforesaid pipes and the overhead connecting shell forms a fire opening or arch for ready access into the fire-chamber located above the grate-bars. The carrying capacity for water of these two large pipes is calculated to be equal to that of a number of tubes occupying the space reserved for the fire-arch or opening.

l denotes the water-circulating chamber existing in the casing L. The top side of said shell is provided throughout its length with small circular apertures *m* arranged alternately, in two rows, into which fit at their lower ends a double row of water tubes M extending upward to the plane of the top water-circulating shell F, whence by *L's i'* connecting them with the upper horizontal tubes M' communication is had with the said shell through apertures in the front face of its forward section.

N are large inflow or feed pipes for cold water, leading from the outside of the casing 1 of my apparatus and communicating with the tubular portion thereof by their entering the shell B at or contiguous the four corner portions thereof; the said pipes, as is obvious, connecting outwardly with any satisfactory source of water supply.

P are the large outflow or discharge pipes for the hot-water circulating and becoming heated in my apparatus, which pipes, usually two, three, or four, are connected to the central transversely disposed section *d'* of the upper H-shaped shell F, arranged at suitable distances apart along the length of said sec-

tion and arising vertically therefrom, and by suitable connecting pipes the hot water discharged and flowing outward through same conducted to radiators, coils, hot-water tank or other desired distributing points in the customary way.

As is evident, owing to the peculiar formation of my hot-water-heating apparatus, it may, in instances when so desired, readily be utilized for steam heating by simply erecting a steam chest or dome at the upper portion of the device over the series of tubes, pipes and shells, and having the pipes P lead to and communicate therewith; such variation or adaptation requiring merely the exercise of ordinary mechanical skill.

The peculiar arrangement of my water-tubes in connection with the novel-formed water-circulating shells, &c., insures extraordinary heating capacity of my apparatus with but a moderate amount of fuel; besides possessing by reason of its peculiar construction other self-evident qualities of excellence.

The cool water entering into the shell B through the medium of the inflow-pipes, circulating in the chamber thereof, first commences to get warm, and ascending the water tubes, &c., grows very hot, while in the circulation of the same through the upper shell F it becomes intensely hot prior to its passage through the out-flow distributing pipes.

Practical tests of my apparatus upon my part, as to its workings, heating qualities, fuel consumption, &c., thoroughly demonstrate its efficiency and value.

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

A hot-water heater comprising a frame-shaped water shell or chamber horizontally mounted on a suitable support, a series of vertical water-tubes arranged in the form of a square, extending upward from the aforesaid shell and communicating with an overhead H-shaped water shell located horizontally, and water-inflow openings in the bottom shell, and water out flow openings in the upper shell, all combined and operating substantially as described.

In testimony whereof I affix my signature, in presence of two witnesses, this 13th day of September, 1893.

AUGUST O. GRASSL. [L. s.]

Witnesses:

WM. C. RAYMOND,
E. RAUKEMOELLER.