

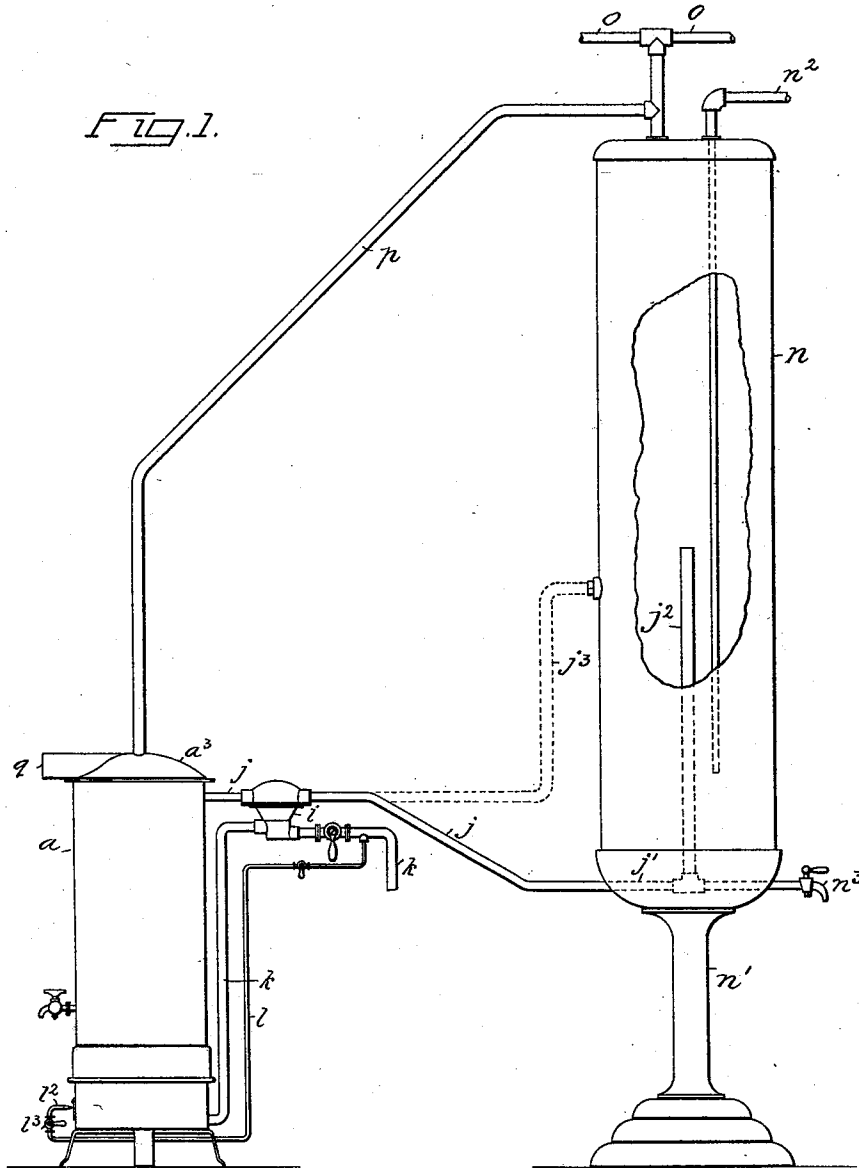
(No Model.)

3 Sheets—Sheet 1.

C. H. PAGE, Jr.
APPARATUS FOR HEATING WATER.

No. 521,916.

Patented June 26, 1894.



WITNESSES:

John W. Ackard
Katie M. Gilligan.

INVENTOR

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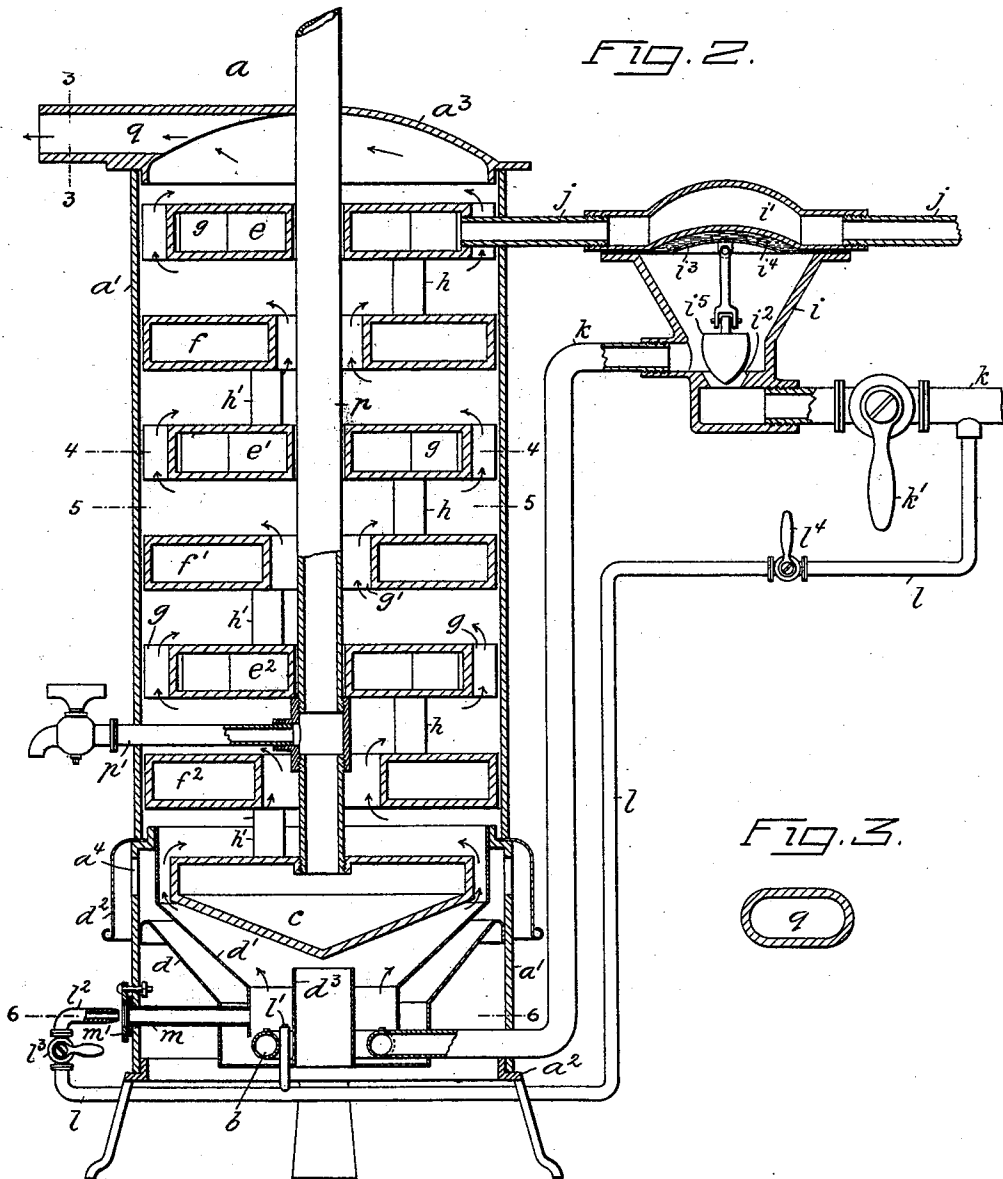
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C. H. PAGE, Jr.
APPARATUS FOR HEATING WATER.

No. 521,916.

Patented June 26, 1894.



WITNESSES:

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(No Model.)

3 Sheets—Sheet 3.

C. H. PAGE, Jr.
APPARATUS FOR HEATING WATER.

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Fig. 4.

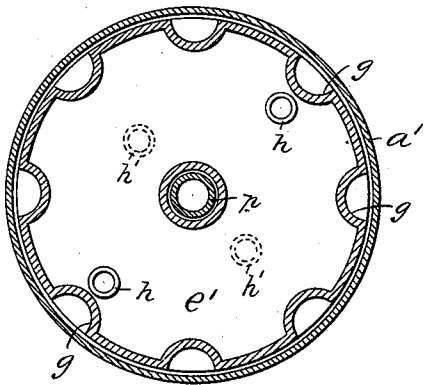


Fig. 5.

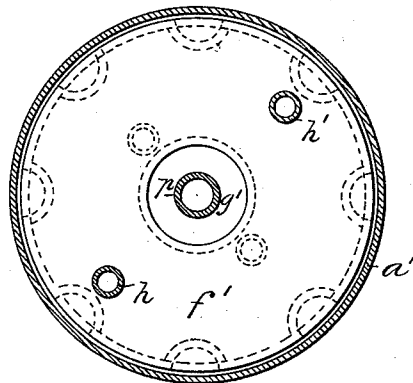


Fig. 6.

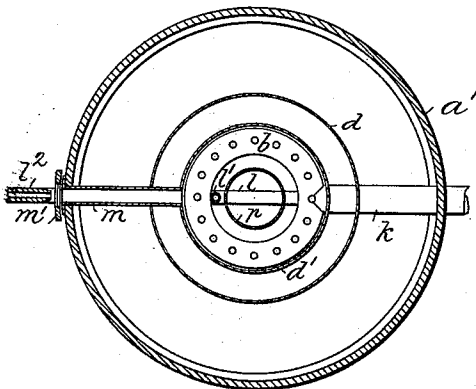
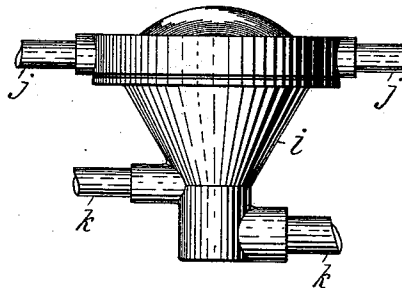


Fig. 7.



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UNITED STATES PATENT OFFICE.

CARTER H. PAGE, JR., OF PHILADELPHIA, PENNSYLVANIA, ASSIGNOR TO THE
UNITED GAS IMPROVEMENT COMPANY, OF SAME PLACE.

APPARATUS FOR HEATING WATER.

SPECIFICATION forming part of Letters Patent No. 521,916, dated June 26, 1894.

Application filed September 25, 1893. Serial No. 486,400. (No model.)

To all whom it may concern:

Be it known that I, CARTER H. PAGE, JR., a citizen of the United States, residing at the city of Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented certain new and useful Improvements in an Apparatus for Heating Water, of which the following is a specification.

The principal object of my present invention is to provide a compact, reliable and comparatively inexpensive apparatus for heating water by means of the combustion of fuel in such manner that the heated water is exposed to a higher temperature than that of the outgoing or escaping products of combustion.

My invention consists in the improvements hereinafter described and claimed.

The nature, objects, characteristic features, and scope of my invention will be more fully understood from the following description taken in connection with the accompanying drawings forming part hereof and in which—

Figure 1, is an elevational view partly in section illustrating an apparatus embodying features of my invention in application to an ordinary domestic or kitchen boiler. Fig. 2, is a transverse sectional view drawn to an enlarged scale and illustrating the apparatus shown at the left-hand side of Fig. 1. Fig. 3, is a sectional view taken on the line 3—3 of Fig. 2. Fig. 4, is a horizontal section taken on the line 4—4 of Fig. 2, and showing one of a series of drums arranged to permit of the passage of the products of combustion around its exterior edge or periphery. Fig. 5, is a similar view taken on the line 5—5 of Fig. 2, and illustrating one of a second series of drums arranged for the passage of the products of combustion around its inner edge and through an opening at its center. Fig. 6, is a similar view taken on the line 6—6 of Fig. 2, and illustrating a main burner and a pilot burner and its accessories, and Fig. 7, is a side elevational view of the thermostatic fuel supply regulating device illustrated at the right-hand side of Fig. 2.

In carrying my invention into effect, the incoming water is caused to travel downwardly and horizontally into proximity with the source of heat and the products of com-

bus tion from the source of heat are caused to travel upwardly and horizontally in a direction opposite to that of the incoming water and away from the source of heat; so that the highly heated water is exposed to the hottest products of combustion and to the source of heat, whereby excellent and economical heating effects are insured.

A description will now be given of a form of apparatus especially adapted for the practical application of the above described mode of heating water by means of the employment of gaseous fuel.

In the drawings, *a*, is a water heater comprising, in the present instance, a cylindrical shell *a'*, supported upon a legged base *a²*, and surmounted by a cap *a³*.

b, is a gaseous fuel burner having, in the present instance, a circular form, Fig. 6.

c, is a hot water receptacle mounted above the burner *b*, and as shown in the drawings having the form of an inverted cone, depending from the base of a cylinder, Fig. 2.

Air is supplied to the burner *b*, through inlet openings *a⁴*, cut or otherwise formed in the curved walls of the shell *a'*, of the water heater *a*, and is deflected and guided to the base of the burner through the annular space included between the depending funnel shaped shields *d'* and *d*, of which the latter is provided with a bottom plate.

d², is a baffle-plate or skirt encircling the shell *a'*, and depending over and a short distance from the inlet openings *a⁴*, in order to prevent the accidental introduction or admission of drafts there-through to or upon the burner *b*. Additional air is supplied above the burner *b*, and upon the conical surface of the hot water receptacle *c*, which is exposed to the direct heat radiated from the burner *b*, by means of a cylindrical inlet or pipe *d³*, that extends from the base of the heater up through the center of the bottom plate of the shield *d*, and of the burner *b*, into proximity with the apex of the conical portion of the hot water receptacle *c*. In this connection, it may be remarked that a portion of the air as it is discharged from the cylindrical inlet *d³*, spreads over the conical surface of the hot water receptacle *c*, and thus forms

as it were, a sort of layer or skin over the same, which prevents undue heating, due to the direct radiation from the burner *b*.

e, *e'* and *e²*, are a series of externally heated drums provided at their peripheries with indentations or notches *g*, Fig. 4, that afford passages, through which the products of combustion may pass around the outer edges of the drums.

f, *f'* and *f²*, are a second series of externally heated drums, having the openings at their respective centers larger than the openings at the respective centers of the drums *e*, *e'* and *e²*, in order to afford passages *g'*, Fig. 5, through which the products of combustion may pass around their inner edges.

The drums *e*, *e'* and *e²*, and *f*, *f'* and *f²*, are alternated and mounted one above the other in the shell or casing *a'*, and have their interior portions connected with each other and with the hot water receptacle *c*, by means of pipes *h* and *h'*. In this connection, it may be remarked that the pipes *h*, and *h'*, penetrating the top wall of each of these drums are not in alignment with, but are disposed at an angle of about forty degrees to and at different distances from the center than the pipes *h* and *h'*, penetrating the bottom of each of these drums, Figs. 4 and 5, in order to produce a horizontal circulation of the downwardly flowing water through the interior of the drums. Moreover a horizontal circulation of the upwardly escaping products of combustion around the exterior of the drums is insured by reason of the location of the succeeding flues or passages at the center and at the periphery of the alternate drums.

i, is a thermostatic fuel supply regulating device comprising a conduit *i'*, interposed in the induction pipe *j*, and a valve setting and seat *i²*, interposed in the gas supply pipe *k*.

i³, is an arched diaphragm brazed or otherwise secured at its edges to the arched bottom wall of the conduit *i'*, in order to form a space or receptacle *i⁴*, for containing a supply of a volatile substance or material. From the arched diaphragm *i³*, depends a valve *i⁵*, adapted for co-operation with the seat *i²*, in such manner that an increase in the temperature of the water flowing through the conduit *i'*, causes the volatile substance or material to expand and depress the diaphragm *i³*, and thus cause the valve *i⁵*, to be projected toward its seat, and in such manner that a decrease in the temperature of the water flowing through the conduit *i'*, permits the volatile substance or material to contract and cause the diaphragm *i³*, to spring upward and thus draw the valve *i⁵*, from its seat. In this connection it may be remarked that the thermostat above described and illustrated in the accompanying drawings constitutes the subject matter of a divisional application for a Patent, Serial No. 495,241, filed by me on the 30th day of December, 1893, and consequently is not claimed herein.

l, is a gas pipe branching from the gas pipe

k, and extending to the base of the heater *a*. This branch pipe *l*, is provided with a pilot burner *l'*, disposed in proximity to the burner *b*, Fig. 6, and with a light-jet *l²*, and its complementary stop cock *l³*.

m, is a tube adapted to conduct the jet from the jet-burner *l²*, through the shields *d* and *d'*, to the pilot burner *l'*.

m', is a swing door for closing the tube *m*, and which may be provided with an ising-glass or other type of window as shown.

l⁴ and *k'*, are stop cocks or valves for controlling the passage of gas through the pipes *k* and *l*.

For the sake of a further description of my invention, it will be assumed that the heater *a*, is to be employed in connection with a boiler such as is commonly used in dwelling houses, and consequently I shall proceed to describe my invention in connection therewith, although it is applicable in whole or in part to other apparatus.

Referring more particularly to Fig. 1, *n*, is a receptacle supported upon a base *n'*, and comprising what is commonly called a boiler and placed in a kitchen for domestic use. This boiler *n*, is provided at the top with the usual hot water distributing connections *o*, and these connections *o*, communicate with the eduction pipe *p*, of the heater *a*. In this connection it may be remarked that the eduction pipe *p*, is, for convenience, located at the center of the shell or casing *a'*, and passes through the heater *a*; however the eduction pipe *p*, is not a heating surface and serves merely to convey the highly heated water from the hot water receptacle *c*.

p', is a branch eduction pipe provided with a faucet or spigot and adapted to afford means for obtaining a supply of hot water direct from the hot water receptacle *c*.

The lower portion of the boiler *n*, communicates with the induction pipe *j*; in the present instance, the boiler *n*, is assumed to be of such large proportions as that it is unnecessary to have the hot water extend all the way to the bottom thereof; consequently the induction pipe *j*, is extended upward toward the top of the boiler *n*, either internally as indicated by the pipes *j'* and *j²*, or externally as indicated in dotted lines by the pipe *j³*, the result in either case being the same.

n², is a pipe through which cold water is introduced into and discharged near the bottom of the boiler *n*, and *n³*, is the usual draw-off spigot.

The mode of operation of my invention may be described in connection with the foregoing apparatus as follows: Assuming that the water contained in the boiler *n*, pipes *j'*, *p*, drums *e*, *e'* and *e²*, and *f*, *f'* and *f²*, and hot water receptacle *c*, is cold, it follows that the volatile substance or material contained in the receptacle *i⁴*, is condensed and consequently permits the diaphragm *i³*, to lift the valve *i⁵*, from its seat as shown in Fig. 2.

To start the apparatus, the valves l^3 and l^4 are opened so that gas is supplied to the pilot burner l' , and to the jet-burner l^2 , whereupon a match, taper, or other lighting device is applied to the latter so that a lighted jet is projected through the tube m , and lights the pilot burner; it being understood that the door m' is open for this purpose. As soon as the pilot light l' is lighted, the valve l^3 is closed. The valve h' is then opened and permits a supply of gas to flow past the valve i^3 , through the pipe k , and escape at the burner b . The pilot light l' , immediately causes the gas escaping from the burner b , to be ignited. It may be remarked that the pilot light l' , is constantly burning and affords means for igniting any gas that may be permitted to escape from the burner b . The burner b , imparts its radiated heat to the water contained in the receptacle c , and the products of combustion traversing the casing a' upwardly and horizontally as indicated by the arrows, escape at the off-take q . The heating of the water in the receptacle c , induces a circulation from the top of the heater a , through the pipe p , into the top of the boiler n , out at the bottom of the boiler n , through the pipe j , and conduit i' , and thence downwardly and horizontally through the drums e, f , &c., and pipes h and h' , and back to the chamber c . As the temperature of the water flowing from the boiler through the pipe j , rises, in consequence of the heat imparted by the burner b , it causes the volatile material or substance contained in the receptacle i^4 , to be expanded with the result that the diaphragm i^3 , is caused to wholly or partially close the valve i^5 , and thus regulate or shut off the supply of gas to the burner b . If the water should subsequently become cooler by reason of the drawing off of water through the connections o , or for any other reason, the volatile substance in the chamber i^4 , would be condensed and thus permit of the opening of the valve i^5 , whereupon an additional supply of gas will be permitted to find its way to and escape from the burner b , and the pilot light l' , will immediately cause such escaping gas to be ignited.

From the foregoing description it will be obvious that the temperature of the water entering the heater a , serves to regulate automatically the quantity of gas consumed, whereby a considerable economy is effected. Moreover the water on entering the heater a , traverses the interiors of the drums e, f, e', f', e^2, f^2 , in the order named both downwardly and horizontally, while escaping products of combustion rise about the exteriors of these chambers in reverse order and in upward and horizontal directions, so that the incoming water is exposed to the coolest products of combustion and the highly heated water is

exposed to the hottest escaping products of combustion, whereby a material saving of heat and the rapid attainment of a high temperature in the water is effected.

It will be obvious to those skilled in the art to which my invention relates that modification may be made in details without departing from the spirit thereof, hence, I do not limit myself to the precise construction and arrangement of parts hereinabove set forth and illustrated in the drawings, but,

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

1. The combination in a water heater, of a casing or shell having at its base a burner, a closed hot water receptacle disposed above said burner and clear of the curved walls of the shell or casing, an eduction water pipe communicating with said receptacle and leading directly out of the shell or casing and through which the hottest water rises, a series of closed communicating drums through which cooler water descends into the receptacle and around which the gaseous products circulate, a water induction pipe for supplying cooler water to the uppermost drum, and a pipe communicating with the lowest drum and with the hot water receptacle, substantially as described.

2. The combination in a water heater of a casing or shell having at its base a burner, a closed hot water receptacle disposed above said burner and clear of the curved walls of the shell or casing, a series of closed communicating drums whereof alternate drums have large openings at their centers and have their peripheries fitted to the curved walls of the casing or shell and whereof the intermediate drums have smaller openings at their centers and have parts of their peripheries fitted to the curved walls of the shell or casing and have their other parts indented and provided with flues separating the water and products of combustion, a water eduction pipe leading from the top of the water receptacle through and past the central openings in the drums to prevent the passage of the products of combustion at the centers of the intermediate drums, a water induction pipe for supplying cooler water to the uppermost drum, and a pipe communicating with the lowest drum and hot water receptacle, substantially as described.

In testimony whereof I have hereunto subscribed my name in the presence of two witnesses.

CARTER H. PAGE, JR.

Witnesses:

KATIE M. GILLIGAN,
A. B. STOUGHTON.