No. 803,338. PATENTED OCT. 31, 1905.

J. G. HAAS.

WATER HEATER.

APPLICATION FILED MAY 1, 1902.

2 SHEETS—SHEET 1.

Fig. 1.

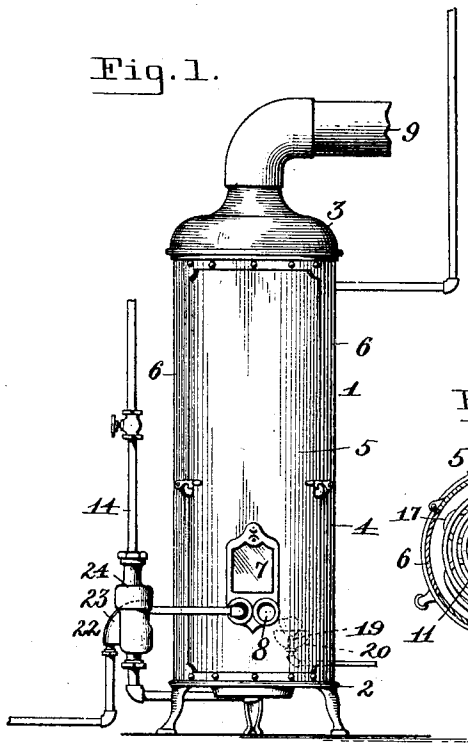


Fig. 2.

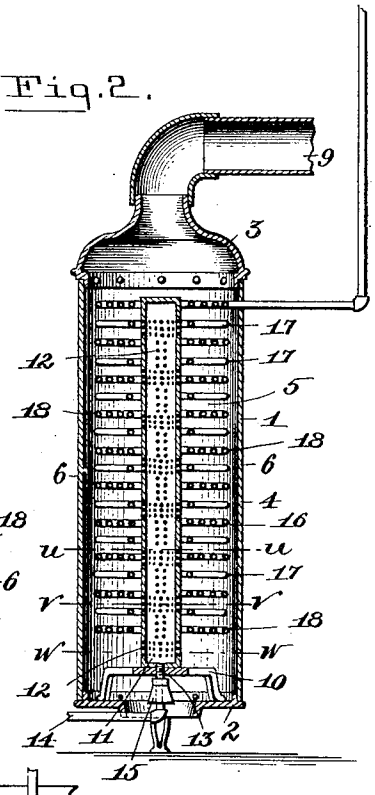


Fig. 3.

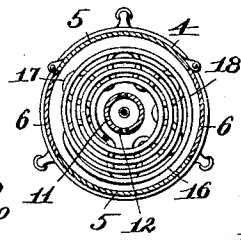


Fig. 6.

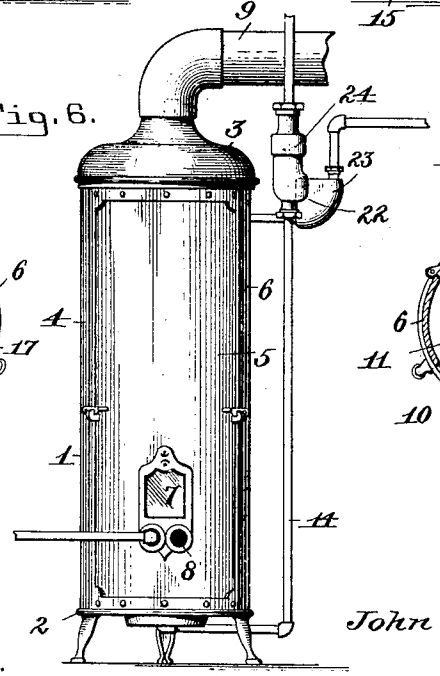


Fig. 4.

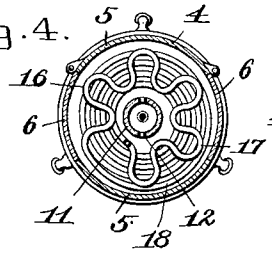
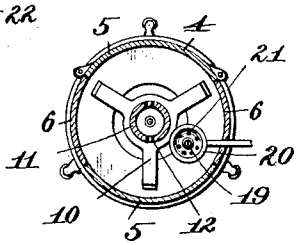


Fig. 5.



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No. 803,338. PATENTED OCT. 31, 1905.

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WATER HEATER.

APPLICATION FILED MAY 1, 1902.

2 SHEETS—SHEET 2.

Fig. 7.

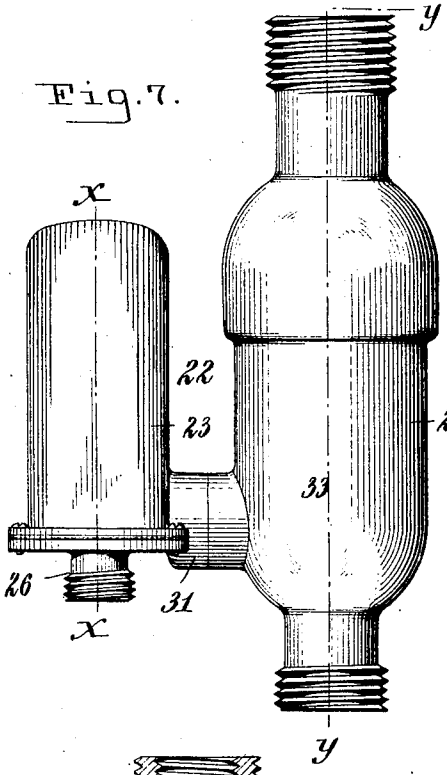


Fig. 8

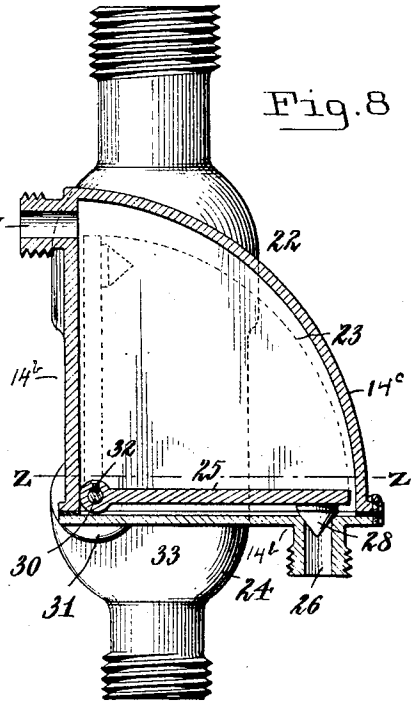


Fig. 9.

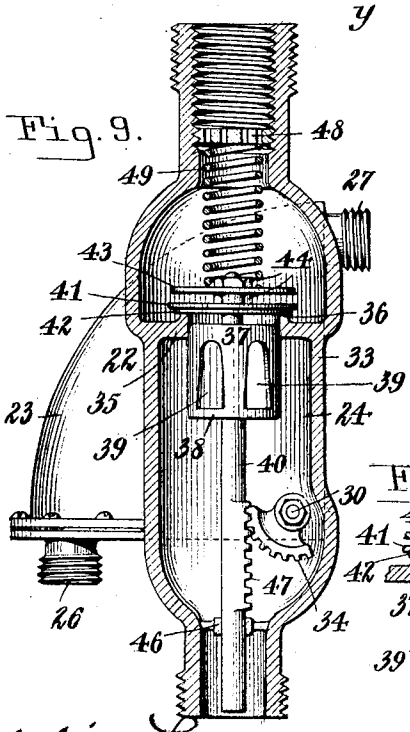


Fig. 10.

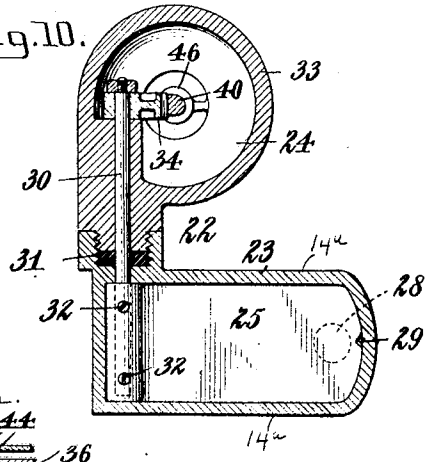
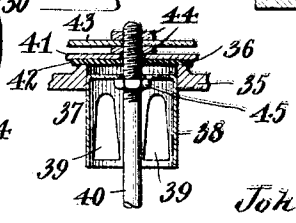


Fig. 11.



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By Neuhart & Burkhart,

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Julius Lauckes,
Edwin Maier } Witnesses.

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UNITED STATES PATENT OFFICE.

JOHN G. HAAS, OF MONACA, PENNSYLVANIA.

WATER-HEATER.

No. 803,338. Specification of Letters Patent. Patented Oct. 31, 1905.

Application filed May 1, 1902. Serial No. 105,509.

To all whom it may concern:

Be it known that I, JOHN G. HAAS, a citizen of the United States, residing at Monaca, in the county of Beaver and State of Pennsylvania, have invented certain new and useful Improvements in 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.

My invention relates to that class of water-heaters known as "instantaneous" heaters in which the opening of a faucet in the supply-line permits the water to flow through the heater and in which the flow of gas to the burner of the heater is regulated proportionate to the flow of water.

The objects of this invention are, first, to provide a heater in which the water-coil therein is subjected to the heat of the gas-burner equally at all points thereof, to provide a water-coil which is positively efficient in its purpose, and to otherwise improve the heater to overcome objections now common to such devices, and, second, to provide a positive gas-regulating valve controlled by the flow of the water through the medium of an automatically-operated abutment located in the supply-pipe and which is of such construction as to be as readily applicable for use on the outlet side of the heater as on the inlet side thereof, and when applied to the supply-pipe on the outlet side of the heater it prevents reaction when closing a cold-water faucet on the supply-line, such reaction being objectionable, for the reason that the gas-valve is opened by the movement of the abutment, which permits the flow of gas to the burner, where it is ignited by the pilot-light, and therefore gas is consumed unnecessarily and without purpose.

The invention consists in the new and novel arrangement and combination of parts, as will be fully described hereinafter, and particularly pointed out in the subjoined claims.

In order that the invention may be fully understood, I will now describe it, with reference to the accompanying drawings, in which like numerals of reference refer to like parts in the several figures.

Figure 1 is a front elevation of my improved heater. Fig. 2 is a central vertical section of the same. Fig. 3 is a horizontal section taken on line *u u*, Fig. 2. Fig. 4 is a similar section taken on line *v v*, Fig. 2. Fig. 5 is a horizontal section taken on line *w w*, Fig. 2. Fig. 6 is a front elevation of a heater having the gas-regulating valve applied to the outlet-pipe of the same. Fig. 7 is a side elevation of the gas-regulating valve on an enlarged scale. Fig. 8 is a vertical section taken on line *x x*, Fig. 7, looking toward the right. Fig. 9 is a similar section taken on line *y y*, Fig. 7, looking toward the left. Fig. 10 is a horizontal section on line *z z*, Fig. 8. Fig. 11 is a vertical section of the graduating gas-valve and its seat.

In the drawings the numeral 1 designates the heater-casing, which may be of any form or shape to confine and house the water-coil, gas-burner, and pilot-light; but in the preferred construction it consists of a base 2, having a central opening for the admission of air to the burner, a cap or hood 3, and a cylindrical body 4, comprising two segmental plates 5, riveted or otherwise secured to the base and hood, and segmental doors 6, hinged to said segmental plates in any convenient manner. The front plate 5 is provided with a sight-opening 7 and an aperture 8 for convenience in lighting the pilot-light. A draft-pipe 9 is held on the hood 3, which may be led to a chimney, if desired.

10 designates a tripod or jack which is supported on the base of the heater, and on this tripod the burner 11 is designed to rest. This burner is cylindrical in cross-section and has its axis coincident with the axis of the casing. It is designed to extend from the said tripod to a point near the top of the body portion of the casing and is provided with perforations 12, arranged the full length of the same in any suitable manner. The manner in which the burner is held on the said tripod is by means of an externally-threaded pipe 13, which passes through a correspondingly-threaded aperture in the tripod and enters a like aperture in the bottom of the burner. The said pipe forms a part of the gas-supply pipe 14, which is provided with the usual air-mixer 15.

16 designates the water-coil, which surrounds the burner and extends from a point near the bottom of the same to a point near the top of the body portion of the casing. This water-coil is arranged alternately in circular serpentine and spiral layers 17 and 18, respectively, which not only prevents concussion or reaction of the water on the abutment when affixed to the outlet-pipe thereof, but also forms reticular spaces for the flame

and hot air, thereby more effectively and instantaneously heating the water as it passes through the coils. The said layers provide a vertical opening for the reception of the burner to be hereinafter described. This arrangement dispenses with the use of supporting and spacing blocks between the several layers, as the circular serpentine layers support the spiral layer immediately above the same and are themselves supported by the spiral layer located immediately below.

The upper and lower ends of the water-coil are secured to the water-supply pipe, which may be directed to any point or points in the building and which is connected to the water-main directly or indirectly, as may be most convenient. The heater may therefore be located at any point in the supply line or pipe, and for convenience in describing the invention I will call that portion of the supply-pipe connected to the lower end of the water-coil the "inlet-pipe" of the heater, and the portion connected to the upper end of the water-coil I will term the "outlet-pipe" of the heater or the "hot-water-supply pipe."

A pilot-light 19 is provided, which may be connected to the gas-supply pipe at any desired point. The light may be of any form suitable for the purpose. A semispherical shield 20 is affixed to the gas-pipe of the pilot-light, and it has a series of perforations 21 formed therein, through which the necessary air is fed to the light from the bottom. This shield serves to protect the light from air-drafts, which would extinguish the same.

The numeral 22 designates the gas-regulating device, which comprises an abutment in a chamber 23 and a gas-valve 24, connected together to cause the latter to operate with the former. The abutment-chamber 23 is located in the water-supply pipe and may be located in the inlet-pipe or in the outlet-pipe of the heater, as desired, while the gas-valve 24 is located in the gas-supply pipe 14. The abutment-chamber comprises two side walls 14^a, connected together by two angular walls 14^b, one of which is longer than the other, and a curved or segmental wall 14^c, which connects the distant ends of said angular walls, and in said chamber a pivoted abutment 25 is held, which is pivoted at the angle formed by said two angular walls. In the bottom of the chamber or near the end of one of said angular walls an inlet 26 is provided, and near its upper end or near the end of the other angular wall it has an outlet 27. This abutment is movable between the inlet and outlet and has a conical stud or projection 28 formed on its under side, that fits the inner end of the inlet 26, which is ground to make a perfect fit and cause the said stud to effectually close the same. The abutment also has an incision or notch 29 formed in its outer or free end to permit a quantity of water to pass through the casing without moving the abutment to an extent sufficient to cause the gas-valve to rise and permit the gas to pass to the burner. This is very essential in cases where leaking faucets may be in the supply-line, as no gas will be fed to the burner uselessly, which would, however, be the case if it were necessary to cause the abutment to rise sufficiently to permit the water to pass the outer free edge of the same. The relative positions of the axis of the segmental casing and the pivotal point of the abutment 25 are such that the outer or free end of the latter when in its normal or lowermost position fits snugly against the segmental wall of the casing and is raised by the water passing through the casing when a faucet on the supply-line is opened to provide a free passage for the same. The abutment when raised by the water-pressure leaves a passage between the edge thereof and the segmental wall, which passage becomes enlarged as the abutment is lifted higher, as clearly illustrated in Fig. 8. By this construction an abutment is produced which can be as readily used on the outlet of the heater as on the inlet thereof, as no springs are necessary, which would be caused to lose their temper by the action of hot water thereon and would therefore be rendered useless for the purpose designed. The conical stud 28 serves to a great extent to prevent reaction of the water against the abutment when a cold-water faucet in the supply-line is being closed, as the concussion is directed against the said stud and deflected to the side of the inlet, which greatly lessens the tendency of deflecting the abutment, particularly so since the area of the stud is much less than the area of the abutment. The said stud, in connection with other specially-designed features to be presently described, is absolutely necessary to prevent movement of the abutment when the same is placed in the inlet-pipe of the heater, as said abutment would otherwise be caused to move when a faucet in the supply-pipe is being closed and would therefore admit gas to the burner, which would become ignited by the pilot-light. The feeding of gas to the burner at such times is useless, expensive, and even dangerous, as the water in the heater would become heated sufficiently to generate steam.

30 designates a shaft which passes through a stuffing-box 31 on the casing and to which the abutment 25 is secured by means of screws 32 or otherwise.

33 designates the gas-valve casing into which the shaft 30 extends. This casing is separated from the abutment-casing by an intervening space, which permits the air to circulate between the two, and thus keep the gas-valve and its controlling-spring cool at all times. A toothed segment 34 is secured to the end of the shaft 30 in any approved manner. A horizontal diaphragm 35 is provided between the ends of the casing, and therein a valve-seat 36 is formed. The gas-valve 37

consists of a cylindrical shell or cup 38, having apertures 39, which gradually increase in size downwardly, and a disk 41, beneath which a gasket 42 is placed. The said shell and the disk 41 and gasket 42 are held loosely on a valve-stem 40 between a disk 43, held between nuts 44 at the upper end of the stem, and a nut 45, secured to said stem a short distance from its upper end. This arrangement permits the disk 41 and gasket 42 to remain seated during the initial movement of the valve-stem, during which movement the graduating-shell 38 is carried with said stem without allowing the passage of gas to the burner. The disk 41 does not become unseated until the movement of the valve-stem is sufficient to bring the shell 38 against said disk to elevate the same, after which the gas passes through the apertures in the shell. The valve-stem 40 is guided in a hub-like guide 46, formed integrally with the casing. The valve is actuated by the toothed segment 34, which engages coacting teeth 47, formed on the valve-stem.

When a faucet on the supply-line is opened to draw water, the abutment is swung upward to an extent proportionate to the flow of water from the said faucet, and this action, through the medium of the shaft 30 and segment 34, elevates the gas-valve to a proportionate extent, thereby permitting the gas to flow through the apertures 39 to the burner in the heater, where it is ignited by the pilot-light.

The abutment rises and lowers with the opening and closing of a faucet in the hot-water-supply line, and when, for instance, a faucet is opened to permit water to be drawn therefrom and it is opened still farther to increase the flow or when another faucet in the line is opened the abutment is raised in proportion to the increased flow, which necessarily raises the gas-valve also to a like degree and exposes the perforations in the graduating-shell thereof above the diaphragm to a greater extent, so that a larger quantity of gas may flow to the burner to increase the size of the flame, and thus have a heating capacity equal to the increased and accelerated flow. The inlet end of the gas-valve is internally threaded and has a perforated adjusting-disk 48, through which the gas passes. A spiral spring 49, bearing with one end against said adjusting-disk and with its other end against the upper end of the gas-valve, serves to keep the latter in its closed or normal position. More or less pressure may be brought to bear on the said valve by raising or lowering the adjusting-disk in the inlet of the gas-valve, as may be necessary, depending entirely on the pressure of the water in the water-main.

It is evident from the foregoing that the disk 41 and gasket 42 of the gas-valve serve to effectually close against the diaphragm 35 through the efforts of the spring 49 and that the upper end of the valve-shell 38 is normally held against the nut 45 and below the upper face of the said diaphragm when the valve-stem 40 is in its lowermost position. The said stem on being elevated raises the gas-valve and, owing to the position of the valve-shell on said stem, prevents the passage of gas through the diaphragm during the initial movement of the said stem and the abutment in the water-supply controlling the movement of said stem, and thus serves to prevent heating of the water in the heater by any movement of the abutment caused by the reaction or concussion of the water against the same when a faucet in the cold-water supply is being closed.

When applying the regulating-valve to the outlet-pipe of the heater the conical stud 28 on the abutment may be dispensed with. In such cases I preferably arrange the water-valve with its pivotal point at the upper end of the valve-casing, as shown in Fig. 6.

By arranging the water-valve on the outlet side of the heater, the reaction, owing to the expansive propensities of the water-coil when heated, will only pass through a portion of the coil, which on account of its length, circuitous passage, and heated condition will take up or check the reaction of the water before passing entirely through the coil and prevent concussion on the abutment. This prevents the unnecessary opening of the gas-valve, which causes a continual waste of gas. In this position of the abutment no sand or other foreign matter can lodge in the casing thereof and impair the effectiveness of the same, for the reason that on being raised by the water it will force the settlings up and the water passing through the casing will force the same out through the outlet of the said casing. The abutment is held in its closed or normal position through the efforts of the spring in the gas-valve, the action of which is imparted, through the valve-stem 40, toothed segment 34, and shaft 30, to the abutment. This obviates the necessity of a spring in the water-valve, which if placed on the outlet of the heater would in a very short time, through the action of the hot water, lose its temper and become useless.

Having thus described my invention, what I claim is—

1. In a water-heater, the combination with a gas-valve, of a segmental casing having an inlet and an outlet, an abutment pivotally secured in said casing and being movable between said inlet and outlet to form a passage between the end of the same and the casing, said abutment controlling the gas-valve and having a conical stud adapted to close the inlet in said casing.

2. In an automatic regulator for water-heaters, the combination with a gas-valve, of a casing in the water-pipe having an outlet and an inlet, and a pivoted abutment serving as a motor to control the gas-valve and being confined in said casing, said abutment being mov-

able between the outlet and inlet, and having a conical stud adapted to close the inlet of said casing, substantially as set forth.

3. The combination with the water-receptacle having a water-supply pipe leading thereto and therefrom, and a burner contiguous to said water-receptacle and having a supply-pipe leading thereto, of a segmental casing in the water-supply pipe comprising side walls, two angular walls of which one is longer than the other, and a segmental wall connecting the side walls and the distant ends of the angular walls, a shaft located in said casing and extending out through the same, an abutment secured to said shaft and normally held against the shorter of said two angular walls, and a valve in the gas-supply pipe operatively connected with said shaft.

4. In a hot-water heater, a gas-regulating device comprising a segmental casing in the water-supply pipe having two angular walls connected by a curved wall, one of said angular walls being longer than the other and each having a water-passage therein, a swinging abutment in said casing, and a gas-valve operatively connected with said abutment.

5. In an automatic regulator for water-heaters, the combination of a water-pipe connected to the heater, a casing located in said pipe and having a segmental wall, a pivoted abutment confined in said casing and having its pivotal point nearer one end of said segmental wall than the other end thereof, a valve for controlling the supply of gas to the heater, and operative connections between said valve and the abutment.

6. In a water-heater, an automatic regulator comprising a casing having a curved wall, a pivoted abutment movable by the flow of water through said casing and having its pivotal point nearer one end of said curved wall than the other end thereof, a confined gas-valve, and operative connection between said gas-valve and the abutment, said connection having means to permit the actuation of the gas-valve during the initial movement of the abutment without causing said valve to become unseated.

7. In a water-heater, an automatic regulator comprising a casing having a curved wall, a pivoted abutment movable by the flow of water through said casing and having its pivotal point nearer one end of said curved wall than the other end thereof and a gas-valve operatively connected with said abutment.

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

JOHN G. HAAS.

Witnesses:
J. J. ALLEN,
N. WURZEL, Jr.