No. 733,011. PATENTED JULY 7, 1903.

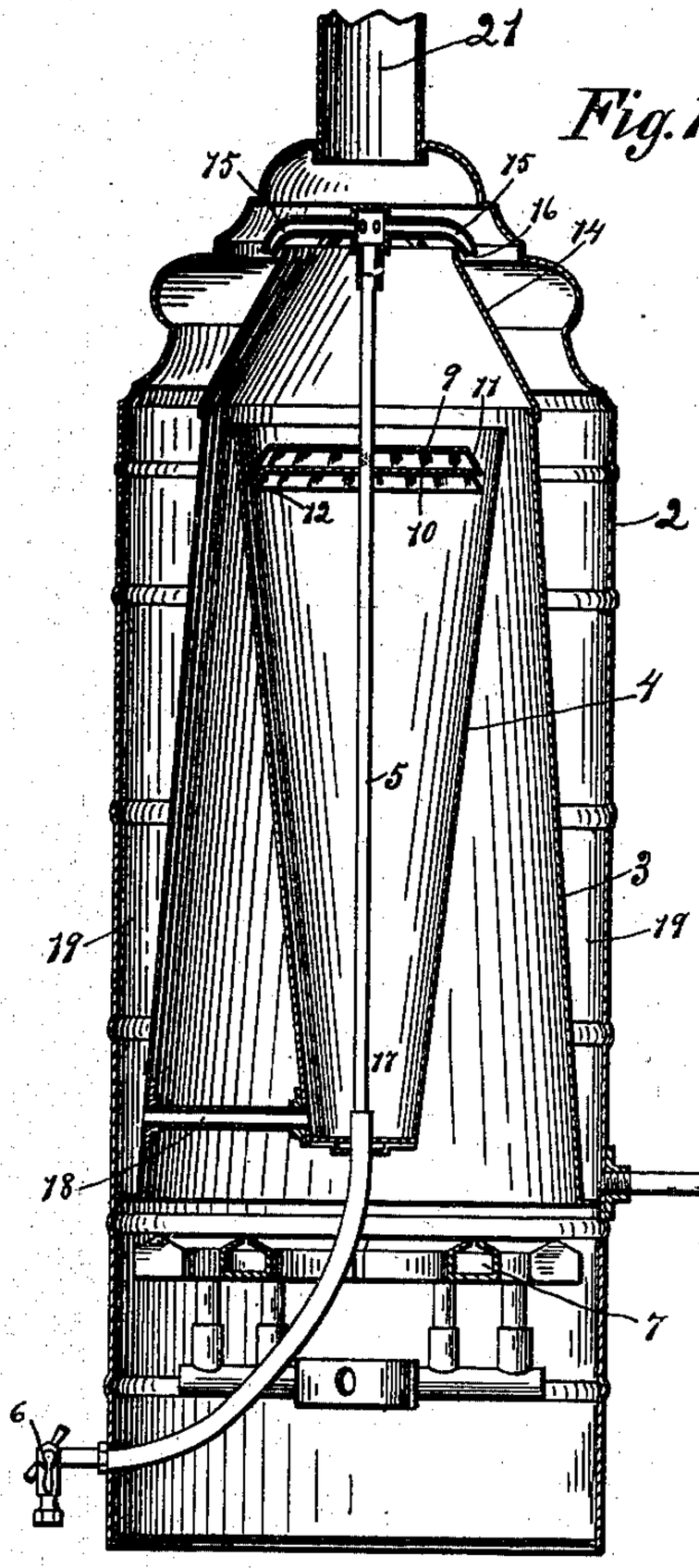
M. I. COHEN.

WATER HEATER.

APPLICATION FILED MAR. 28, 1902.

NO MODEL.

Fig. 1.



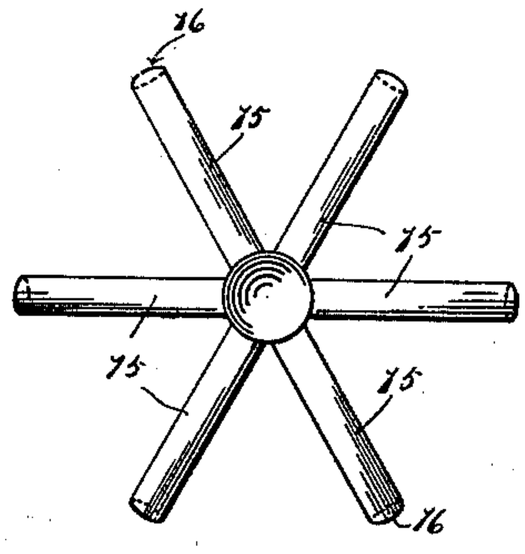


Fig. 2.

Fig. 3.

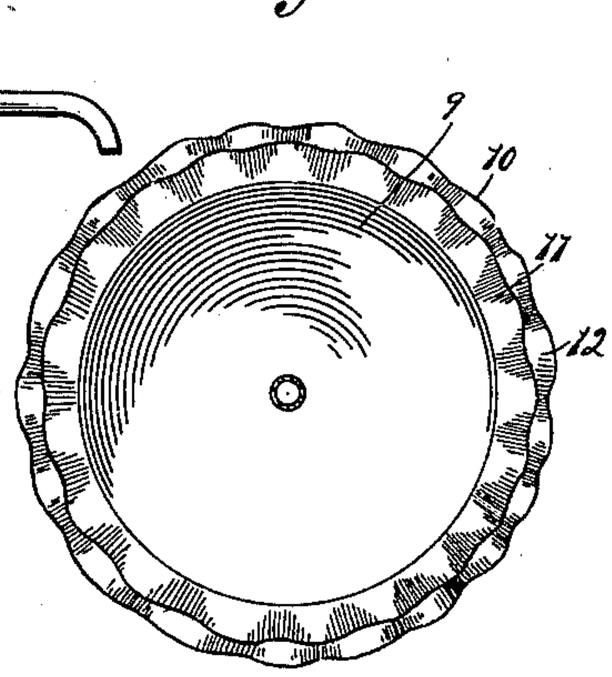
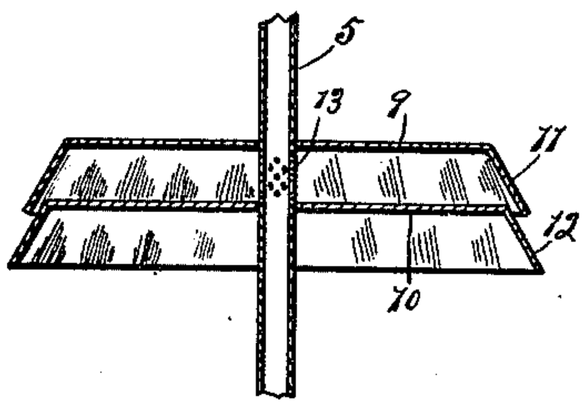


Fig. 4.



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No. 733,011. Patented July 7, 1903.

UNITED STATES PATENT OFFICE.

MORRIS I. COHEN, OF CHICAGO, ILLINOIS.

WATER-HEATER.

SPECIFICATION forming part of Letters Patent No. 733,011, dated July 7, 1903.

Application filed March 28, 1902. Serial No. 100,441. (No model.)

To all whom it may concern:

Be it known that I, MORRIS I. COHEN, a citizen of the United States, residing at Chicago, county of Cook, and State of Illinois, have invented certain new and useful Improvements in Water-Heaters, of which the following is a specification.

This invention relates to that class of apparatus commonly known as "instantaneous water-heaters," which are designed to quickly heat for domestic uses a stream of water as it flows from any suitable source of cold-water supply. As is well known, the general principle underlying all systems of so-called "instantaneous water-heating" is that for the same volume of water the greater the area of heat-radiating surface over which it flows and the thinner or shallower the stream the higher the temperature to which it may be brought in a given interval of time. The general objects sought to be consummated in the construction of these devices would thus seem to be to increase to the greatest possible extent the area of heat-radiating surface over which the water is designed to flow, to entirely cover this surface with the thinnest possible sheet of running water, and to heat said surface to as high a temperature as is consistent with safety and economy. At the same time it is evident that in endeavoring to increase the area of heat-radiating surface within the heater the size of the device as a whole must be kept at a minimum and the amount of fuel required to sufficiently heat said surface must not be excessive. These heaters are of various constructions, the largest number consisting of an outer shell or casing together within an inner shell or shells to provide the heat-radiating surfaces.

This invention relates particularly to heaters employing two concentric inner shells, one within the other, the annular space between them constituting the upper part of the combustion-chamber and serving as a flue for the hot waste gases of combustion, the water to be heated flowing down the exterior face of the outer heating-shell and the interior face of the inner heating-shell in exceedingly thin or shallow sheets or layers, becoming rapidly heated from its contact with said heated shells and being subsequently united and discharged at a convenient point in its heated state.

In heaters now in use provided with two inner shells both of said inner shells are more commonly in the form of concentric upright truncated cones with faces consequently substantially parallel, or one or both may be cylindrical, which form is not so common and to the best of my knowledge only employed where at least one of said shells is corrugated. It is evident that when two upright conical shells are employed with faces substantially parallel, the base of the inner shell being closed and the combustion-chamber limited to the space underneath said shells and between their faces, but a limited amount of air is available for combustion and the quantity of heat generated thereby limited. When this limit has been reached, the supplying of additional fuel, usually in the form of an inflammable gas, will result in smothering the flame, decreasing combustion and the amount of heat generated, and an increase in the flow or pressure of the fuel-gas will result in a waste of gas, which will pass off unconsumed through the flue.

The principal object of my invention is therefore to increase the size of the combustion-chamber to permit of the perfect combustion of a larger amount of gas in heaters employing a double inner shell without increasing the size of the heater or its cost of manufacture or diminishing its capacity or the temperature of the finally-discharged water.

Further objects of my invention are to provide for a more uniform distribution of the water over the heating-surfaces, to properly insure a proportionately equal division of the water between the two heating-shells, and to secure its ultimate reunion and proper discharge at a convenient point in a heated state.

To this end my invention consists generally in a heater provided with two heating-shells, both conical, the larger and outer one being upright and the smaller and inner one being inverted, thus materially increasing the area of the combustion-chamber and diminishing to an insignificant extent only the area of heating-surfaces; and my invention further consists in novel means for controlling the

volume, character, and uniformity of the discharge of water to both surfaces from a single pipe, and particularly of the discharge to the inner shell; and my invention further consists in the various details of construction and in combinations of parts, all as hereinafter described, and particularly pointed out in the claims.

My invention will be more readily understood by reference to the accompanying drawings, forming a part of this specification, and in which—

Figure 1 is a vertical central section of a heater embodying my invention. Fig. 2 is a top plan view of the upper spraying or discharge apparatus. Fig. 3 is a top plan view of the double plate controlling the discharge to the inner shell. Fig. 4 is a central vertical section of Fig. 3.

Referring now to the drawings in detail, the numeral 2 refers to the exterior casing of the heater, which may be of usual size, construction, and design. Within this exterior casing is the inner shell 3, preferably in the form of a truncated cone, the bottom or lower edge of which is attached to the inner wall of the outer casing by any suitable water-tight connection. Within the inner shell 3 is another shell 4, also in the form of a truncated cone, but inverted, with the smaller end at the bottom. Extending upwardly through the center of these concentric oppositely-disposed conical shells is the water-supply pipe 5, connected with any suitable source of supply, the flow of water therein being controlled by a convenient valve or cock 6 outside the casing. The burners 7, adapted for the use of ordinary illuminating or other combustible gas as a fuel, may be of any suitable pattern and construction and are supplied in the usual manner, being located just underneath the lower termination of the inner shells 3 and 4.

At or near the top of the shell 4 and occupying almost the entire horizontal sectional area of the shell at that point is a double plate composed of the two inverted-pan-shaped disks 9 and 10, said disks being provided, respectively, with the downwardly-flaring rims 11 and 12. The upper disk 9 is slightly less in diameter than the lower disk 10, so that when arranged, as shown in Figs. 3 and 4, with the rims in loose contact a narrow circular chamber will be formed between said disks, which are capable of vertical adjustment with reference to each other to control the volume of water which is designed to be discharged from said chamber through the interstices between said rims. To provide such interstices and to better control the uniformity of the discharge, I prefer to provide both of said rims with corresponding vertical corrugations, as shown in Fig. 3. The pipe 5 is provided with a plurality of small orifices 13, opening into the chamber between said disks, through which is discharged a sufficient quantity of water to keep said chamber full of water under a slight pressure. These disks being substantially horizontal a comparatively uniform discharge of water is thus provided for around the whole circumference of said disks, which water falls in small streams upon the inner face of the shell 4, whereon it is evenly distributed in the form of a thin downwardly-flowing sheet.

Capping or crowning the shell 3 is another and smaller truncated cone-shaped shell 14, open at both base and top, the lower rim thereof being designed to snugly fit over and incase the top of the shell 3. The upper extremity of the pipe 5 is closed and preferably provided with a plurality of horizontally-radiating tubes 15 15, dividing the stream into an equivalent number of smaller streams, which are subsequently discharged upon the shell 14 through somewhat flattened orifices 16 16 at the extremities of the tubes 15 15, which extremities are preferably slightly downwardly turned to insure the proper direction to said discharge. It is apparent that the water discharged from these tubes and striking the shell 14 will be gradually distributed over a larger area of surface until the shell 3 is reached, down the exterior face of which the water will flow in a thin and comparatively uniformly distributed sheet.

As the water accumulates at the base of the chamber 17, formed by the shell 4, it is permitted to run off through a suitable connecting-pipe 18 into the chamber 19 between the shell 3 and the casing 2. The bottom of this chamber 19 is closed and water-tight and is preferably somewhat lower than the bottom of the shell 4 to provide for the proper flow of the water which would otherwise accumulate within the shell 4 into the chamber 19. The final discharge-pipe 20 may be located at any convenient point circumferentially in the outer casing at the bottom of the chamber 19, and I prefer that the plane of the connection between the shell 3 and the outer casing 2 shall not be horizontal, but shall be inclined slightly toward the orifice and final discharge-pipe 20 to provide proper drainage of the chamber 19.

It will be apparent that I have provided a much larger combustion-chamber than would be possible where both cones are upright with faces substantially parallel, thus providing for the consumption of a larger amount of fuel-gas and securing a higher temperature without increasing the area of the heat-radiating surfaces, and consequently the size of the heater. The hot gases of combustion ascend between the shells 3 and 4, exposing the entire area of each to the heat of combustion. These gases pass through the annular space between the tops of the shells 3 and 4, through the space between the radiating water-tubes 15 15, and out through the final discharge-flue 21 at the top of the heater. It will be apparent, furthermore, that from the moment the water enters that portion of the pipe 5 which lies within the casing it is at all times subject to

the heat of combustion. The part of the water flowing down the inner face of the shell 4 and the part flowing down the outer face of the shell 3 are equally subject to the heat of the radiating-surfaces. The connecting-pipe 18 between the shells 3 and 4 is also in immediate proximity to the burners subject to the action of the heat and tends to increase the temperature of the water conveyed therethrough.

Many modifications of the minor details of my improved heater will doubtless readily suggest themselves to those skilled in the art to which it appertains, and I therefore do not desire to limit my invention to the specific details of construction herein shown and described.

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

1. In a water-heater, the combination, with the outer casing, of two concentric, oppositely-disposed, conical shells within said casing, a water-supply pipe extending longitudinally completely through said shells, and means for dividing the water supplied through said pipe into thin sheets flowing down the two non-adjacent faces of said shells.

2. In a water-heater, the combination, with the outer casing, of two concentric, oppositely-disposed, conical shells within said casing, a water-supply pipe extending upwardly completely through the common center of said shells, means upon said pipe for discharging a portion of the water supplied therethrough upon the top of the interior face of the inner shell, means for discharging the remainder of the water supplied therethrough upon the top of the exterior face of the outer shell, and means for reuniting and finally discharging said water from said casing.

3. In a water-heater, the combination, with the casing and heating means therein, of two concentric, oppositely-disposed, conical shells within said casing, a water-supply pipe extending longitudinally completely through both of said shells and terminating at its upper extremity in means for discharging water upon the exterior face of the outer shell, means upon said pipe substantially opposite the top of the inner shell for discharging water against the interior face of said inner shell, and means for reuniting and finally discharging the water in its heated state.

4. In a water-heater, the combination with the outer casing, heating-shell and a central and vertical water-supply pipe of a double plate comprising two horizontal disks, concentrically mounted on said pipe, said disks being provided with downwardly-flaring rims and said rims being in loose contact with each other and corrugated to provide a plurality of thin interstices around the periphery of said plate, and means for permitting the flow of water from said pipe into the chamber between said disks.

5. In a water-heater, the combination with the outer casing, heating-shell and a central and vertical water-supply pipe of a double plate comprising two horizontal disks, concentrically mounted on said pipe, the upper disk being slightly less in diameter than the lower disk, said disks being provided with downwardly-flaring rims, said rims being in loose contact with each other and corrugated to provide a plurality of thin interstices around the periphery of said plate, and means for keeping the chamber between said disks full of water under pressure.

6. In a water-heater, the combination with the outer casing, a double heating-shell and a vertically-disposed water-supply pipe terminating within said casing of a plurality of horizontally-radiating tubes from the upper extremity of said pipe, a double plate comprising two horizontal disks, concentrically mounted on said pipe, said disks being provided with downwardly-flaring rims and said rims being in loose contact with each other, and means for permitting the flow of water from said pipe into the chamber between said disks.

7. In a water-heater, the combination with the outer casing, a double heating-shell and a vertically-disposed water-supply pipe of a plurality of horizontally-radiating tubes from the upper extremity of said pipe, the ends of said tubes being downwardly bent to give proper direction and flattened to give proper shape to the jets discharged therefrom, a double plate comprising two horizontal disks, concentrically mounted on said pipe, said disks being provided with downwardly-flaring rims and said rims being in loose contact with each other, and means for permitting the flow of water from said pipe into the chamber between said disks.

8. In a water-heater, the combination with the outer casing of two concentric, oppositely-disposed, conical shells therein, which shells form the upper walls of the heating-chamber, a water-supply pipe within said shells, and extending longitudinally thereof, a plurality of horizontally-radiating tubes from the upper extremity of said pipe adapted to discharge water upon the outer face of the outer shell, a double plate comprising two horizontal disks, concentrically mounted on said pipe, said disks being provided with downwardly-flaring rims and said rims being in loose contact with each other, and means for permitting the flow of water from said pipe to the chamber between said disks.

9. In a water-heater, the combination with the outer casing of two concentric, oppositely-disposed, conical shells therein, which shells form the upper walls of the heating-chamber, a water-supply pipe within said shells and extending longitudinally thereof, a plurality of horizontally-radiating tubes from the upper extremity of said pipe, the ends of said tubes being downwardly bent to give proper direc-

tion and flattened to give proper shape to the jets discharged therefrom, means for conveying the water discharged by said jets to the top of the outer face of the outer shell, a double plate comprising two horizontal disks, concentrically mounted on said pipe, said disks being provided with downwardly-flaring rims and said rims being in loose contact with each other, and means for permitting the flow of a portion of the water conveyed by said pipe into the chamber between said disks.

In testimony of the foregoing I have hereunto set my hand, this 20th day of March, 1902, in the presence of two subscribing witnesses.

MORRIS I. COHEN.

Witnesses:
P. F. BOUGH,
J. A. SAXTON.