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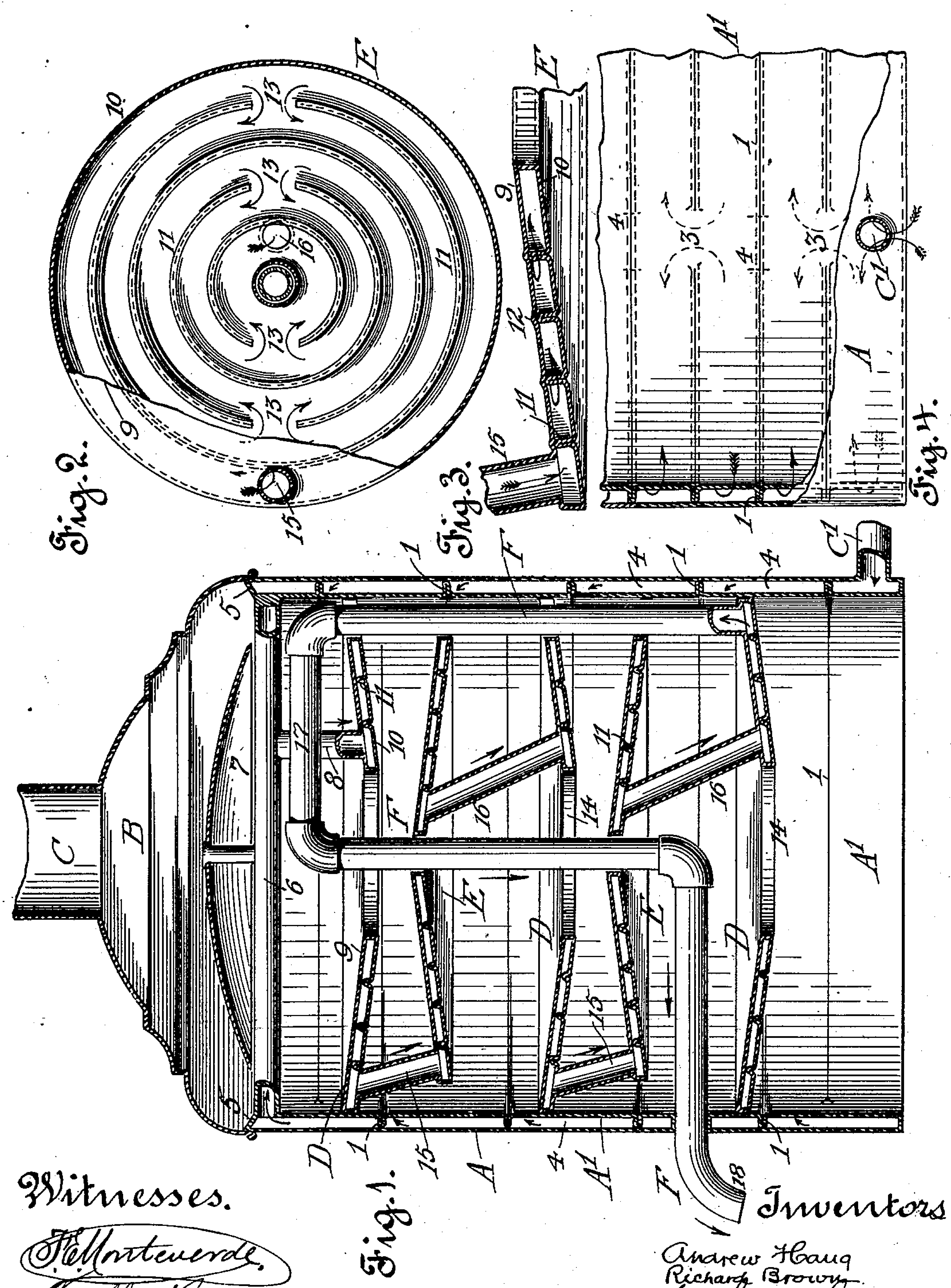
A. HAUG & R. BROWN.

WATER HEATER.

APPLICATION FILED JULY 18, 1900.

NO MODEL.



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UNITED STATES PATENT OFFICE.

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WATER-HEATER.

SPECIFICATION forming part of Letters Patent No. 722,703, dated March 17, 1903.

Application filed July 18, 1900. Serial No. 24,068. (No model.)

To all whom it may concern:

Be it known that we, ANDREW HAUG and RICHARD BROWN, citizens of the United States, residing at San Francisco, in the county of San Francisco and State of California, have invented certain new and useful Improvements in Water-Heaters, of which the following is a specification.

Our invention relates to devices for heating running water; and our object is to produce a simple, cheaply-constructed, and effective heater having an extremely large heating-surface and provided with means for directing the course of the water and the heat so as to expose the former for the greatest possible time to the influence of the latter.

The construction in which our invention is embodied is shown in the accompanying drawings.

Figure 1 is a vertical section of the apparatus. Fig. 2 is a horizontal section of one of the inner disks, showing one plate in plan view, the other broken away, and the peculiar arrangement of water-passages. Fig. 3 is an enlarged cross-section of one of such disks. Fig. 4 is a vertical section of part of the inclosing shell with inner disks removed.

The apparatus is inclosed by a shell, preferably of circular cross-section, having a cover B, with a chimney-outlet C for the escape of heat. The shell has a bottom opening and is adapted to be placed upon or above any suitable source of heat, such as a gas or oil burner. The apparatus inclosed by the shell is specially constructed to retard the passage of heat as much as possible and to compel it to take a tortuous or circuitous course, exposing every part of the interior to its influence, as hereinafter explained. The shell or jacket is double-walled, as shown at A A', and one wall is beaded, as shown at 1, so as to establish a series of partitions with horizontal circular channels between them. These partitions are not arranged in a continuous spiral, so as to afford means for a rapid continuous flow of water through them, but are horizontal, and each is entirely separate and distinct from the others of the series. By comparing Figs. 1 and 4 the course of the water in ascending between the walls of the jacket can be easily followed. The water entering at the inlet C' near the bottom strikes the inner wall and divides, flowing to right and left horizontally in the lowest channel, as shown by the entering arrows in Fig. 4. Directly opposite the inlet the two streams meet and mingle and are partly checked in their flow. At that point an opening 3 is left in the bead or partition 1, through which the water flows upwardly, and as it is again met by a solid wall it again divides to right and left and returns in the second channel to the inlet side, where another opening 4 is found in the second bead or partition. These openings in the partitions alternate in position throughout the series, there being but one escape for water in each partition, which is on the side opposite to like openings in the partitions next above and next below. The water is compelled to divide after passing each opening and to meet and mingle before entering the next opening. This movement of the water, with intermittent retardations, continues throughout the horizontal channels which compose the series, and the water is always in contact with the heated wall as it ascends.

At the top of the shell the space between the double walls is closed, as shown at 5, and the water having traversed the last horizontal passage enters a horizontal pipe 6, whose other end is closed. This pipe acts partly as a cross-brace to the shell and also may support the upper heat-spreader 7, which is directly above and retards the heat, so that pipe 6 and the top of the upper disk are thoroughly exposed to it. The water either escapes directly from pipe 6, if in a small stream, through a pipe 8 or only partly escapes directly, a portion of a large stream passing pipe 8 and then being returned from the closed end of pipe 6; but all the water ultimately escapes through pipe 8. The latter communicates with a peculiar and novel system of interior hollow heating-disks D and E, of which five are shown in the drawings for purposes of illustration, although any number may be employed. Figs. 2 and 3 illustrate the main features of the construction of all of these disks. Each disk consists of two plates 9 and 10, placed parallel and apart, so as to leave a space between. One plate is beaded, as shown at 11, so as to form partitions between the two, and the other is preferably slightly beaded, as shown at 12, Fig. 3, in order to make a better soldered joint at their connection.

The partitions 11 are not helical and continuous, but each forms nearly a complete independent circle broken by an opening 13 at one side. In the series of partitions these openings are placed alternately on opposite sides, so that water entering any opening is opposed by a solid wall and compelled to divide, (arrows in Fig. 2.) This figure represents a plan view of one of the plates in which the partitions are formed, the other plate being partly shown, but mostly broken away. By reference to Fig. 1, where the whole series of disks is shown in position, it will be seen that the disks D are relatively wider than disks E and extend to the inner wall of the shell, while a space is left surrounding the disks E. Moreover, disks D have a relatively large central opening 14, while in disks E the central opening makes a substantially close fit with the water-discharge pipe F. The disks are connected by pipes 15 and 16. Pipes 15 connect the outside channel of disk D to the outside channel of disk E, and pipe 16 connects the inside channel of disk E to the inside channel of disk D, Fig. 1. Moreover, each disk is sunken or dished in an opposite relation to the adjacent disk throughout the series for a purpose hereinafter explained.

The water from pipe 8 enters the inner channel of the highest disk, strikes the bottom and solid walls, and is compelled to divide and flow around in two directions to the opposite side, where the two streams meet, mingle, and are retarded. They escape from the oppositely-placed opening, but are again compelled to divide in the next concentric channel and to flow in two streams around that until the escape-opening into the third channel is reached. At each opening the meeting, mingling, and retarding of the two streams take place, and beyond each opening is another compelled division or separation. The water progresses in this manner around the disk, as clearly shown by arrows in Fig. 2, until from its outer channel it escapes through the pipe 15 into the outer channel of disk E. Its progress through disk E is from the periphery toward the center, whence the pipe 16 carries it to the next disk D, and so on through the series of disks. From the last channel in the lower disk rises the discharge-pipe F, in which the water is compelled to rise again and after passing through an elbow 17 to descend and escape at the outlet 18 near the bottom of the apparatus, thus being exposed to heat throughout the extent of the discharge-pipe. As the discharge-pipe rises above the disks, and as water always stands therein, it protects the disks, which must also always remain filled with water, and hence cannot burn out.

The construction of disks described while offering a very large heating-surface for water, as well as means for retarding its flow, has also important functions in relation to the economical and effective use of the heat. The larger disks D, downwardly dished and having only a central opening, check and retard the hot air and deflect a large proportion of it against the walls of the shell, producing heat-eddies beneath. The smaller disks, upwardly dished and having closed centers, produce another retarding effect, and the heat is spread in currents and eddies horizontally toward the walls of the shell, where it rises around the edges of said disk E. Thus between any two disks the heat is compelled to travel either from side to center or from center to side, and so to heat not only the disks, but the walls of the shell. This progress of the heat continues until after being finally retarded by the spreader at the top it escapes by the outlet provided.

It is unnecessary to dwell further upon the advantages of this construction as to the amount of heating-surface provided or as to the effective application of heat to all parts of the apparatus; but it may be mentioned that cheapness in construction is one of the objects sought and attained. Both between the double walls and in the disks independent horizontal partitions, forming separate passages communicating by openings in said partitions, are cheaper and easier to construct than continuous spiral tubing or coils of any kind.

We do not limit ourselves to precise details of construction and arrangement herein described and shown, as we desire to avail ourselves of such modifications and equivalents as fall properly within the spirit of our invention.

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

In a water-heater, a double-walled shell, a water-inlet into the annular space formed thereby, a vertical series of independent horizontal partitions in the said space, and a single water-opening in each horizontal partition, such water-opening in each partition being on the opposite side of the shell from a similar water-opening in the adjacent partition; whereby water traveling through the annular space is forced to flow around on each horizontal partition before passing vertically to the next partition.

In testimony whereof we have affixed our signatures, in presence of two witnesses, this 7th day of July, 1900.

ANDREW HAUG.
RICHARD BROWN.

Witnesses:
L. W. SEELY,
F. M. BURT.