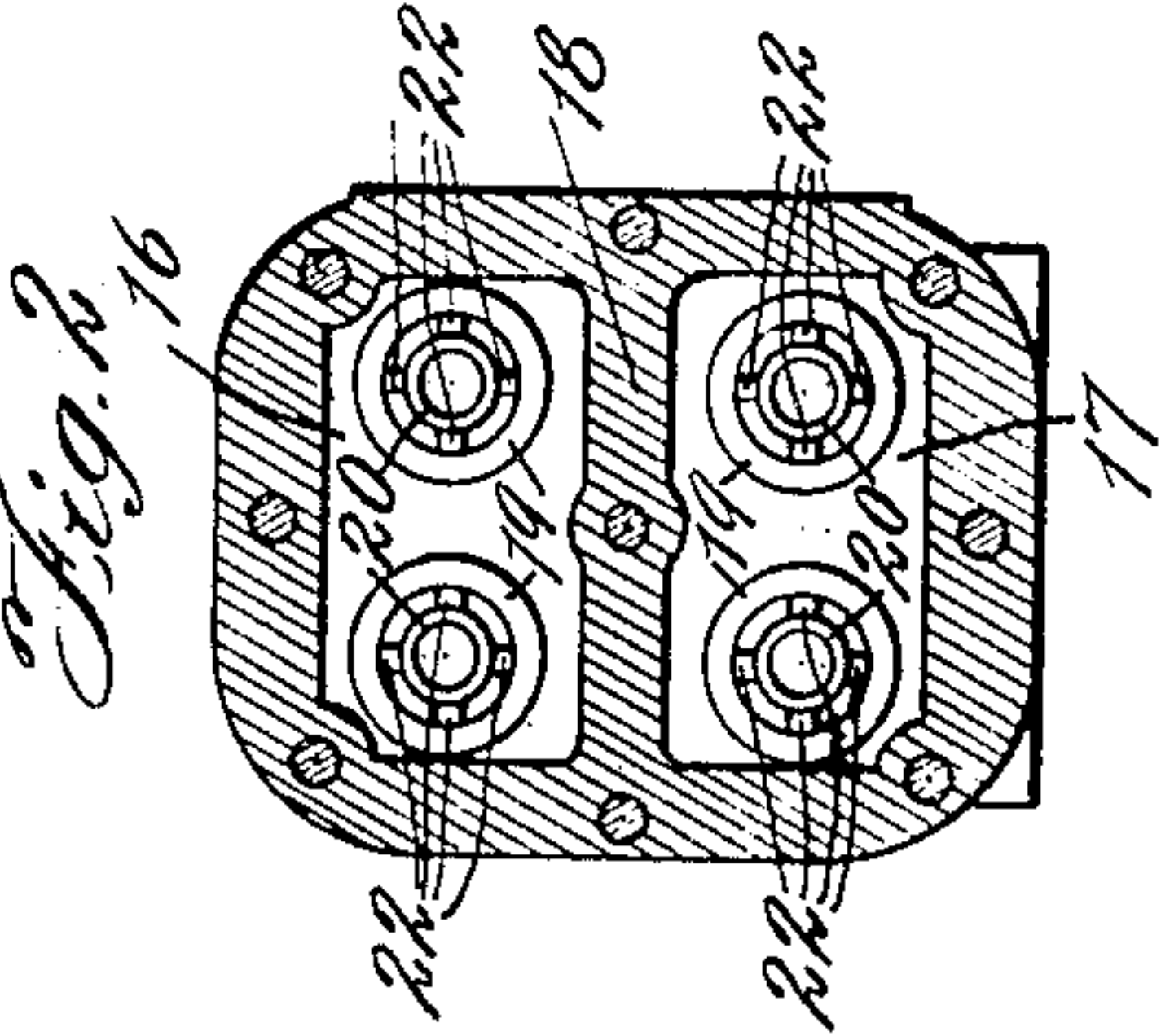
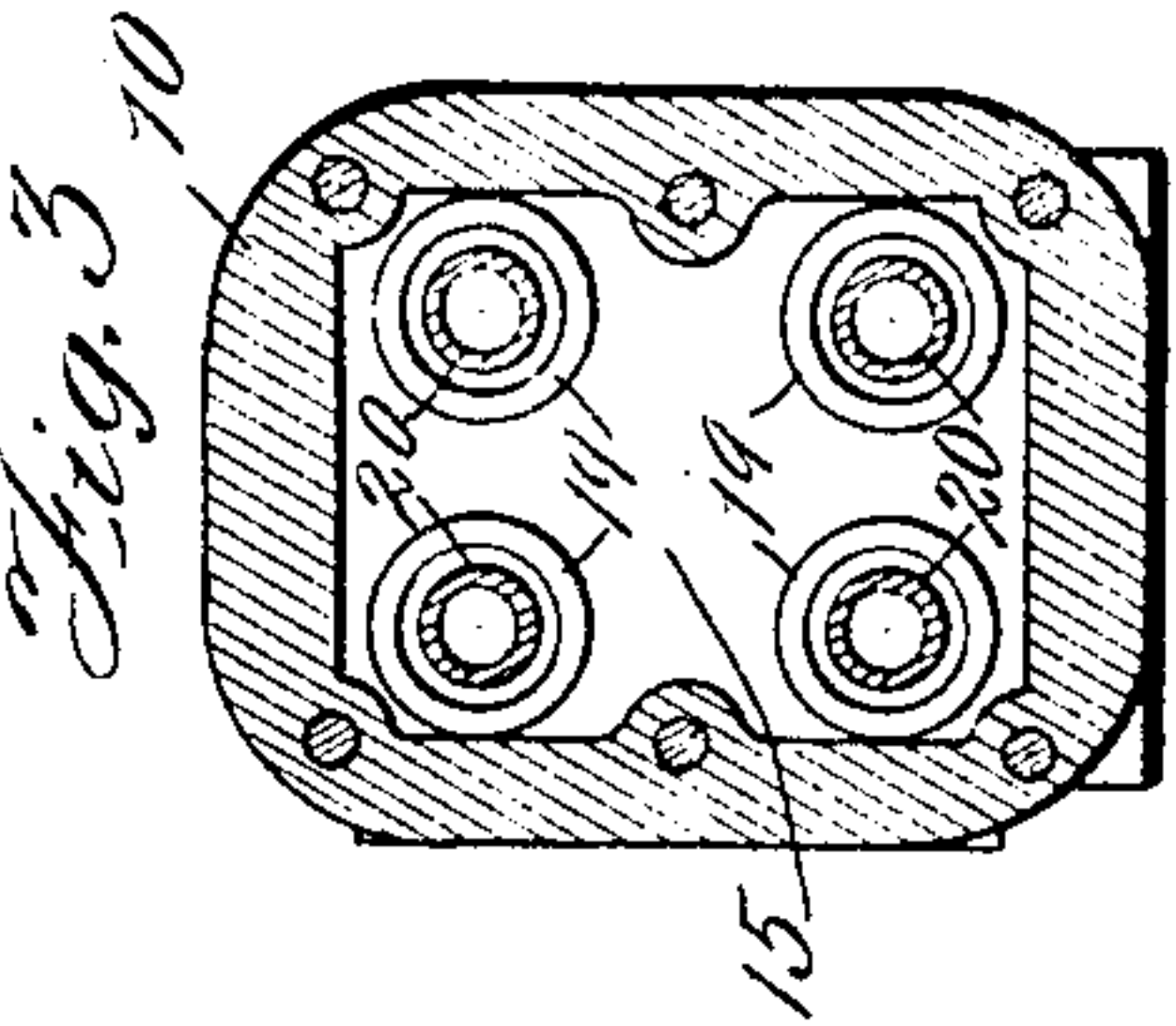
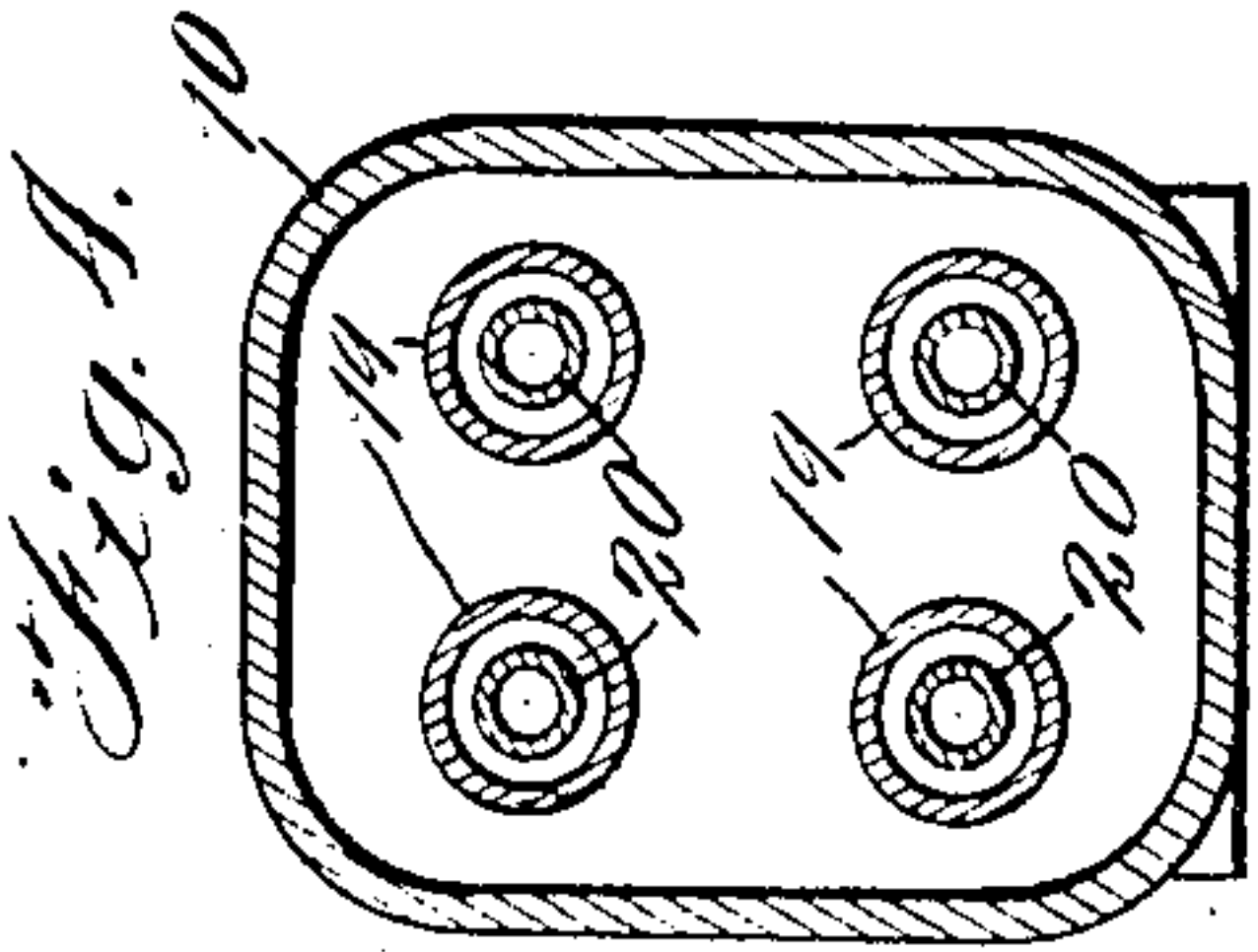
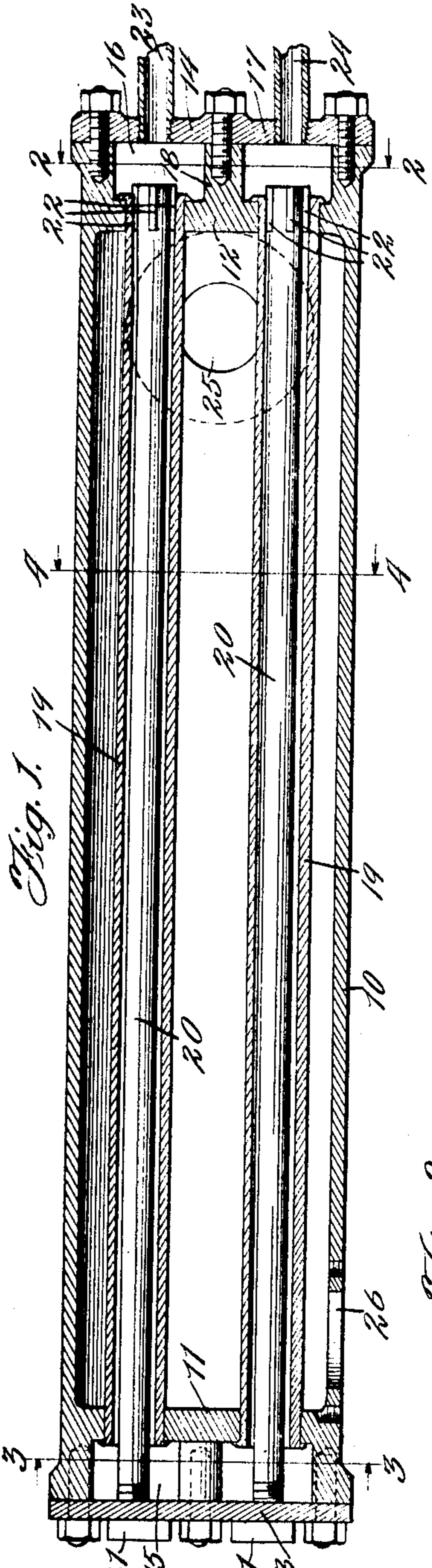


No. 888,110.

PATENTED MAY 19, 1908.

G. W. MORRIS.
WATER HEATER.

APPLICATION FILED JUNE 17, 1907.



Witnesses:
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UNITED STATES PATENT OFFICE.

GEORGE W. MORRIS, OF RACINE, WISCONSIN.

WATER-HEATER.

No. 888,110.

Specification of Letters Patent.

Patented May 19, 1908.

Application filed June 17, 1907. Serial No. 379,438.

To all whom it may concern:

Be it known that I, GEORGE W. MORRIS, a subject of the King of Great Britain, residing at Racine, in the county of Racine and State of Wisconsin, have invented certain new and useful Improvements in Water-Heaters, of which the following is a specification, reference being had to the accompanying drawings.

10 This invention relates to devices for heating water, and is designed particularly for use in heating feed-water for boilers.

It relates to water-heaters of the kind shown in Letters Patent No. 621,693, dated 15 March 21, 1899, granted upon my application, and is an improvement upon the construction shown in said patent. In said patented device water is forced into a shell or casing and through a series of tubes suitably 20 held therein, through which tubes pipes project centrally leaving in each tube only a narrow space between the tubes and their inclosed pipes for the passage of water, and into such shell or casing steam is injected 25 around the water tubes to heat the water passing through such tubes—proper provision being made, of course, for the discharge of the steam and the heated water.

In my present invention I employ the same 30 idea of tubes through which project pipes for the purpose of forming within each tube a narrow passage for the water between each tube and its inclosing pipe, but I provide an improved construction whereby the water is 35 brought to a higher temperature,—all as illustrated in the accompanying drawing and as hereinafter specifically described.

That which I believe to be new will be pointed out in the claims.

40 In the drawing,—Figure 1 is a longitudinal central section through my improved heater; Fig. 2 is a cross-section taken at line 2—2 of Fig. 1; Fig. 3 is a cross-section taken at line 3—3 of Fig. 1; Fig. 4 is a cross-section taken 45 at line 4—4 of Fig. 1; Fig. 5 is a detail, showing one end of one of the pipes through which the water is passed; and Fig. 6 is an end elevation of the pipe shown in Fig. 5.

Referring to the several figures of the 50 drawings, in which corresponding parts are indicated by like reference numerals,—10 indicates a shell or casing of the shape shown in cross-section in Figs. 2, 3 and 4, or of any other desired shape.

55 11 and 12 indicate tube-sheets extending across the shell or casing,—the tube-sheets

being located near opposite ends of the shell or casing, and each located a short distance from the end, in order that when the end-plates 13 and 14, respectively, are applied 60 and secured to the shell or casing chambers will be left at each end of the shell or casing. At the steam-discharge end of the device there is thus left a single chamber which is designated by the numeral 15, while at the 65 opposite end, or that end near which the steam is admitted, there are formed two chambers designated by the numerals 16 and 17,—the space at this end being formed into these two chambers 16 and 17 by a division 70 wall 18 that extends out from the tube-sheet 12, and against which division wall the end-plate 14 bears.

19 indicates a series of tubes—four in number in the construction shown—extending 75 from the tube-sheets 11 and 12, through which tube-sheets they pass and being suitably secured in place to such tube-sheets. Each of these tubes opens into the chamber 15, and half of them open at the other end 80 into the chamber 16, while the remainder at that end open into the chamber 17.

20 indicates pipes passing centrally through the tubes 19, each pipe being of sufficiently 85 less diameter than its inclosing tube to leave a narrow passage all around the pipe between it and its inclosing tube. Each of these pipes is screw-threaded at one end, and at that end projects sufficiently beyond the end of its inclosing tube 19 to enable it to be 90 screw-threaded into the end-plate 13 and into bosses 21 formed on the outer face of such plate 13. The opposite end of each pipe has a series of radial wings 22 formed on its exterior which fit against the inner wall of 95 the inclosing tube in which the pipe is located so as to insure the pipe being held centrally in its tube. At this winged end each pipe terminates at about or just slightly beyond the end of its inclosing tube. The end- 100 plates 13 and 14 can be removed, of course, at any time to permit access to the interior for the purpose of placing or removing the pipes.

23 indicates a pipe screw-threaded into a suitable opening in the end-plate 14, or otherwise suitably secured therein, through which 105 pipe cold water is adapted to be forced.

24 indicates a pipe similar to pipe 23 also passing through the end-plate 14 but at the opposite side of the division wall 18. 110 Through this pipe 24 the heated water is adapted to be discharged from the device.

25 indicates an opening in the wall of the shell or casing, through which steam is admitted to fill the interior of such shell or casing, and 26 indicates a discharge opening for such steam—the openings 25 and 26 being, as shown, near opposite ends of the device.

In operation, with the parts assembled as shown, the water to be heated is forced through the pipe 23 into the chamber 16 and will pass up into the pipes 20 that communicate with such chamber 16, but, of course, cannot escape at the other end of such pipe as such pipe is closed by being screw-threaded into the end-plate 13. Water will also pass into the tubes that communicate with this chamber 16 and from thence pass into the chamber 15 and be forced down through the oppositely-located tubes that communicate with the chamber 17,—such water passing into the chamber 17 also filling up the pipes in such last-named tubes. From this chamber 17 the heated water will pass through the pipe 24 to the boiler or other desired point. Inasmuch as all of the tubes have a large portion of their interior occupied by the pipes 20, it is evident that all of the water that passes through the tubes is necessarily kept very close to the wall of the tubes and is therefore capable of being very quickly heated by the steam with which the interior of the shell or casing is filled, as fully pointed out in my said former patent. My present construction, however, is a very decided improvement over that shown in said patent in that the water is more highly heated than was formerly the case, inasmuch as it is forced from one end of the device to the other and then back again and is thus discharged from the same end of the device at which it enters. Furthermore, in my present device one end of each of the pipes is left open so that such pipes become filled with water, which water, after the device has been in use a short time, becomes very considerably heated and thus

aids in heating the flowing stream of water passing between them and the inclosing tubes.

That which I claim as my invention, and desire to secure by Letters Patent, is,—

1. In a water-heater, the combination with a shell or casing provided with a tube-sheet near each end, of a plurality of tubes secured in said tube-sheets, said shell or casing having a chamber at one end with which all of said tubes communicate and two chambers at the other end with each of which part of said tubes communicate, pipes in said tubes closed at the single-chamber end of the device and opening into the two chambers at the opposite end, pipes for admitting water to one of said two chambers and discharging it from the other, and openings for admitting and discharging steam to and from said shell or casing.

2. In a water-heater, the combination with a shell or casing provided with a tube-sheet near each end and plates attached to the ends of the shell or casing whereby chambers are formed at each end of the shell or casing between said end-plates and tube-sheets, of a division plate dividing one of said chambers, a plurality of tubes secured in said tube-sheets and communicating with the chambers at each end, pipes in said tubes projecting through the single chamber at one end and secured to the adjacent end-plate of the shell or casing and communicating with the divided chamber at the opposite end, a pipe for admitting water to one side of said divided chamber, a pipe for conducting water from the other side of said divided chamber, and openings for admitting and discharging steam to and from said shell or casing.

GEORGE W. MORRIS.

Witnesses:

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