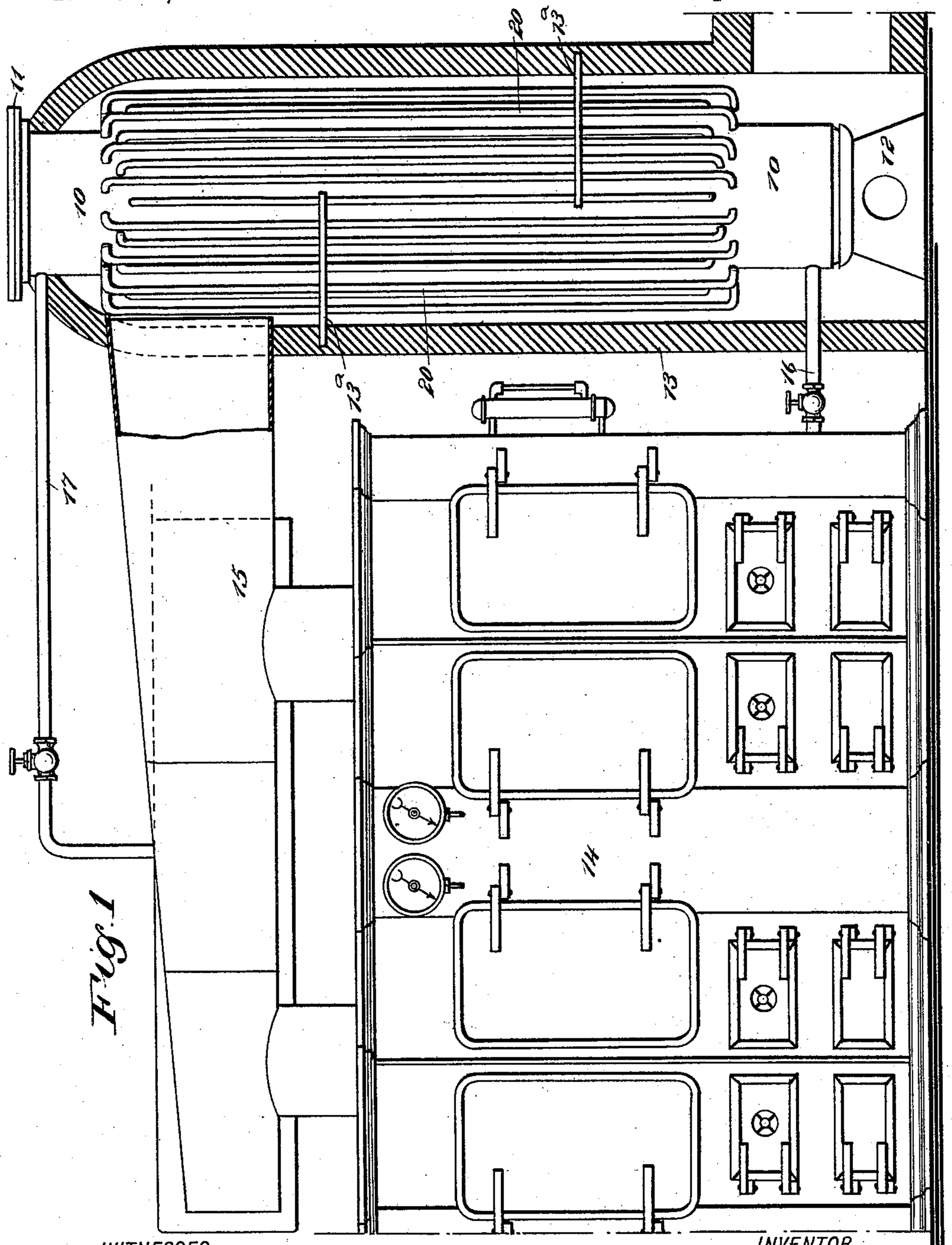
(No Model.) 2 Sheets—Sheet 1

D. M. ROBINSON.

FEED WATER HEATER AND PURIFIER.

No. 538,124. Patented Apr. 23, 1895.



WITNESSES:

John A. Bergstrom

H. B. Hutchinson

INVENTOR

D. M. Robinson

BY Munn & Co

ATTORNEYS.

(No Model.) 2 Sheets—Sheet 2

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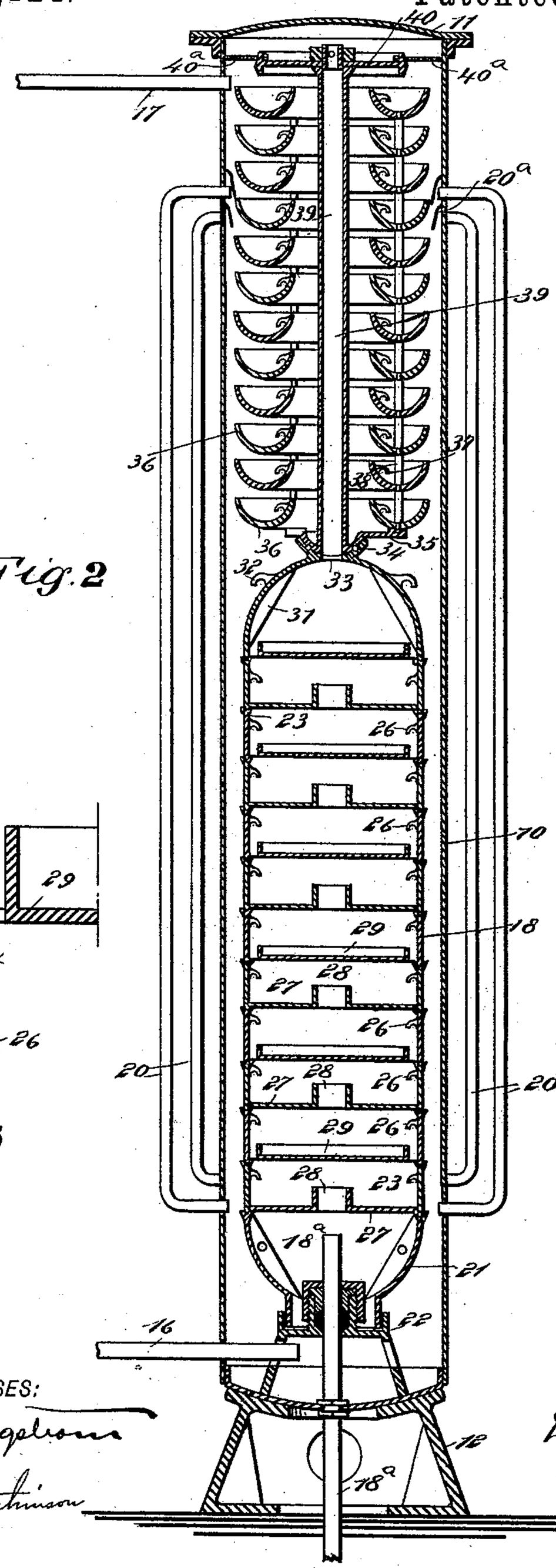

Fig. 2

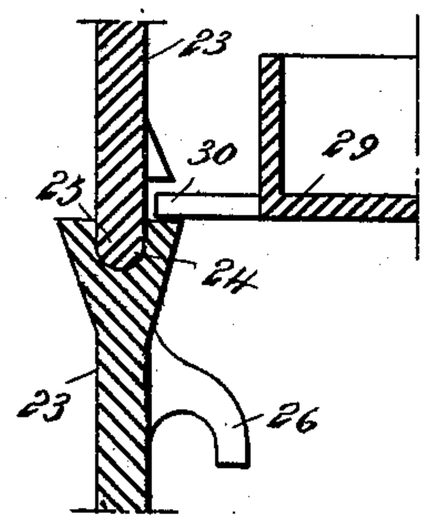

Fig. 3

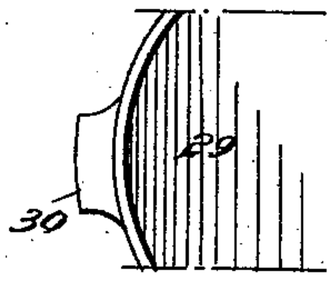

Fig. 4

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UNITED STATES PATENT OFFICE.

DANIEL M. ROBINSON, OF BAY CITY, MICHIGAN.

FEED-WATER HEATER AND PURIFIER.

SPECIFICATION forming part of Letters Patent No. 538,124, dated April 23, 1895.

Application filed January 31, 1895. Serial No. 536,858. (No model.)

To all whom it may concern:

Be it known that I, DANIEL M. ROBINSON, of Bay City, in the county of Bay and State of Michigan, have invented a new and Improved Feed-Water Heater and Purifier, of which the following is a full, clear, and exact description.

My invention relates to improvements in feed water heaters and purifiers, and is an improvement on the apparatus for which I filed an application for Letters Patent of the United States August 14, 1894, Serial No. 520,261.

The object of my invention is to produce a simple and durable apparatus, which is not very expensive, which is adapted to be incased in the flue or masonry of an ordinary boiler, so that the waste heat may be utilized for heating the feed water, which has provision for holding the water in it under boiler pressure and at the same level as the water in the boiler, which is constructed in such a way that it may be very conveniently put together or taken apart, and which is adapted to precipitate the matter when in the form of loose sediment or carbonates or other matter contained in the water, and deliver the water practically pure and hot to the boiler.

To these ends my invention consists in certain features of construction and combinations of parts, which will be hereinafter fully described and then pointed out in the claims.

Reference is to be had to the accompanying drawings, forming a part of this specification, in which similar figures of reference indicate corresponding parts in all the views.

Figure 1 is a sectional elevation of my improved feed water heater as applied to a battery of boilers. Fig 2 is a central vertical section of the feed water heater. Fig. 3 is an enlarged detail sectional view showing the manner in which the abutting sections of the settling cylinder are connected; and Fig. 4 is a broken detail plan of one of the pans of the settling cylinder.

The apparatus is provided with a vertical shell 10, which is closed at the top by a suitable head 11, and which also has a suitable head at the bottom resting on a support 12, which is preferably an open casting, and the shell and the parts connected with it are contained in the masonry 13, which forms a part of the masonry of the boilers 14, the stack 15 of which delivers into the casing, and the products of combustion are deflected back and forth by the ordinary deflectors or baffle plates 13^a.

The shell 10 connects with the boiler or boilers by a pipe 16, which leads from the lower end of the shell, and a pipe 17 leads from the steam dome of the boiler or boilers to the upper part of the shell, so that the water in the shell is under boiler pressure, and moreover the dry, hot steam entering the upper part of the shell has a tendency to crystallize and precipitate the matter contained in the water and which would otherwise enter the boiler with injurious results.

The water is delivered into the feed water heater through a pipe 18^a which extends through a stuffing box and into the settling cylinder 18, which cylinder has a rounded bottom 21, resting on a support 22 in the bottom of the shell 10. The cylinder 18 is made up of a series of sections 23, each of which is widened and formed into a socket 24 at the top, and has a rounded lower edge 25, so that the lower edge of one section rests securely in the socket of the next one beneath. The sections are provided with the usual lifting lugs 26, in order that they may be conveniently handled and assembled.

Within the settling cylinder 18 is a series of settling plates 27 and pans 29, these being alternated, as shown clearly in Fig. 2, and the settling plates rest on the upper edges of the cylinder sections and are provided with holes for the passage of water, the holes in each plate being surrounded by a flange 28, so that the sediment collecting on the plate will not wash back through the hole. The pans 29 have side lugs 30, see Fig. 4, which rest on the edges of the sections 23 of the cylinder 18, and thus the water can pass upward around a pan, while the sediment which collects in it cannot wash back. As the pans and plates are alternated, the water as it flows inward and upward through the cylinder has a zig-

zag course, thus giving it time to heat, and also enabling the sediment to collect in the pans 29 and on the plates 27.

The water which passes up through the cylinder 18 goes up through the hole 33 in the rounded top of the cylinder, which top is provided with internal bracing ribs 31 and with external lifting lugs 32, the water going through the said hole 33 and up through a pipe 39, to be presently referred to. The top of the settling cylinder is provided with a concave seat 34, which supports the base 35, carrying a series of pans 36 which encircle the pipe 39, and are preferably semi-circular in cross section, these pans being provided with lifting lugs 37, and being supported one above the other by rods 38, which extend from the bottom of one pan into a socket in the next pan beneath.

The pans 36 are arranged around the pipe 39, and beneath a shallow pan 40, which is secured to the top of the pipe 39, and adjusted by set screws 40^a which extend through the pan and impinge on the inner wall of the cylinder 10, so that the water rising from the settling cylinder 18 passes upward through the pipe 39, overflows into the upper pan 36, and then passes downward overflowing from one pan into another, the rounded bottoms of the pans 36 facilitating this action, and thus the water is exposed to the heat of the steam entering from the pipe 17, as well as from the heat of the shell 10. The excessive heat in this part of the shell causes the water to be freed of sulphates, such as sulphates of lime and magnesia, which collect on the under sides of the pans 36.

After the water has traveled down from pan to pan, it is held around the settling cylinder 18, and in order that a free circulation of water in the pans may be kept up and the water made hot before entering the boiler, the shell 10 is provided with circulation pipes 20, which are arranged outside the shell 10 and extend from the lower to the upper part thereof, the upper ends of the pipes being in part covered by baffle plates 20^a, which are secured to the shell and which prevent the excessive splashing of water as it enters the said upper part of the shell.

It will be seen from the foregoing description that the water entering the feed water heater passes through the settling cylinder 18, where all the sediment and carbonates have time to deposit on the plates 27 and the pans 29, so that the water is then dropped into the pans 36, after which it flows in a film so as to free it from its other impurities, that the circulation is kept up through the pipes 20, and that the water is in condition to pass to the boiler through the pipe 16, practically pure.

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

1. A feed water heater and purifier, comprising an outer shell having suitable connections with the boiler, a settling cylinder within the shell, the cylinder being made up of a series of superimposed sections, a pipe leading from the settling cylinder to the upper part of the shell, and a series of pans arranged one beneath the other and adapted to receive the overflow from the said pipe, substantially as described.

2. A feed water heater and purifier, comprising an outer shell having boiler connections, a settling cylinder within the shell into which the supply pipe delivers, a discharge pipe leading upward from the settling cylinder, and a series of pans arranged one above another and adapted to receive the overflow from the discharge pipe, substantially as described.

3. The combination, with a shell having suitable boiler connections, of a settling cylinder within the shell adapted to connect with a water supply pipe, a discharge pipe leading from the top of the settling cylinder, a pan to receive the overflow from the discharge pipe, and a series of pans encircling the discharge pipe and arranged one above the other, the series of pans being adapted to receive the overflow from the pans on the discharge pipe, substantially as described.

4. In a feed water heater and purifier, the combination with a settling cylinder formed of sections resting one upon the other, each section having a widened upper end, of settling pans and plates arranged alternately in the cylinder and supported upon the widened ends of the sections of the cylinder, the plates being apertured and the pans provided with side lugs, substantially as described.

5. In a feed water heater, a settling cylinder, comprising a series of sections arranged one upon the other, the intermediate sections having their upper ends widened forming supports for settling pans and formed with sockets in the top thereof and their lower ends rounded, substantially as herein shown and described.

6. In a feed water heater and purifier, the combination with a casing and a settling cylinder in the lower part of the casing, of a pipe leading from the top of the settling cylinder up into the upper part of the casing, and a series of pans surrounding the pipe, and receiving the water flowing through the said pipe substantially as described.

7. The combination, with a shell and the settling cylinder therein, of the discharge pipe leading upward from the settling cylinder, an overflow pan on the upper part of the discharge pipe, and a series of pans encircling the discharge pipe beneath the overflow pan, the said series of pans being adapted to overflow one into the other, and each pan of said series being provided with a central opening for the discharge pipe and with a support extending from the bottom of the one pan to the next pan beneath, substantially as described.

8. In a feed water heater and purifier, the combination with a casing, of a settling cylinder in the casing, a delivery pipe projecting through the casing into the settling cylinder, a pipe leading from the top of the settling cylinder, pans surrounding the pipe and receiving the water flowing through said pipe and circulating pipes connected with the top and bottom of the casing, substantially as described.

DANIEL M. ROBINSON.

Witnesses:
WILBUR N. BAILEY,
WILLIAM O. ROBINSON.