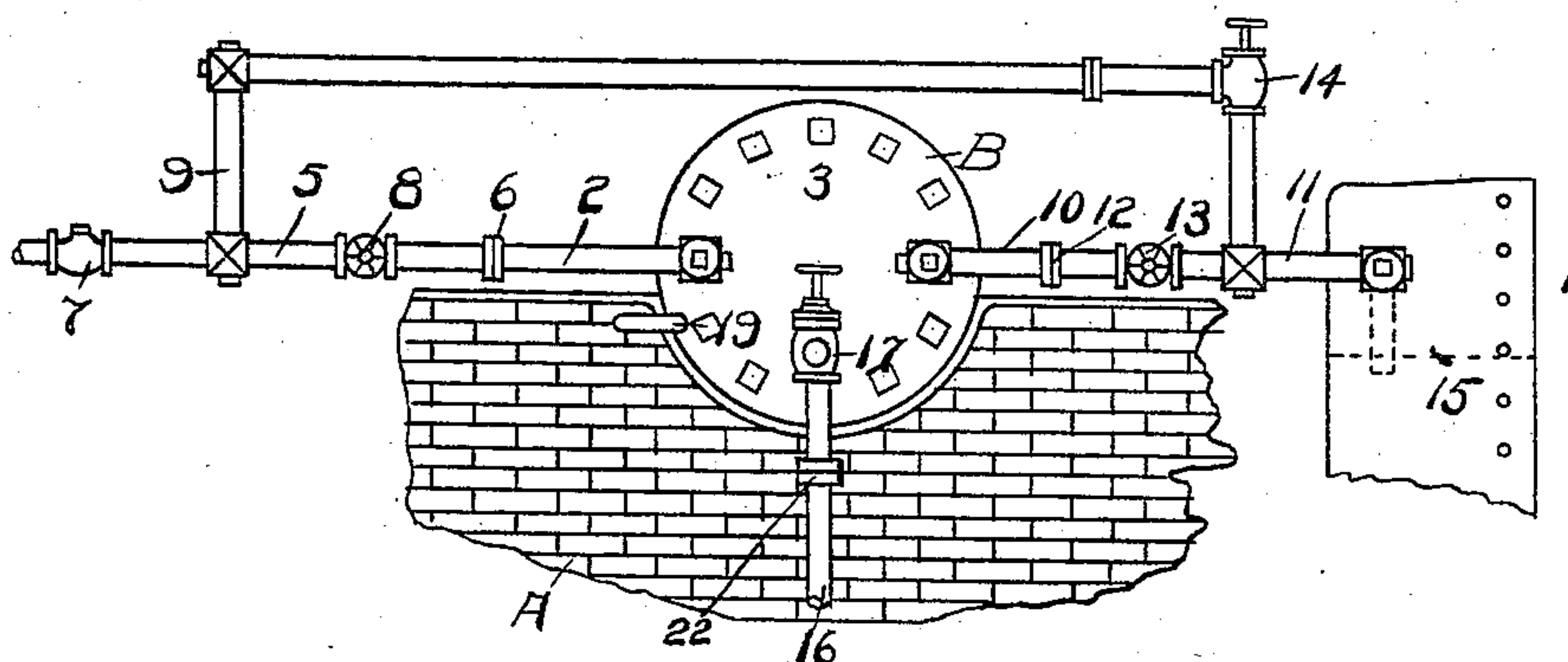
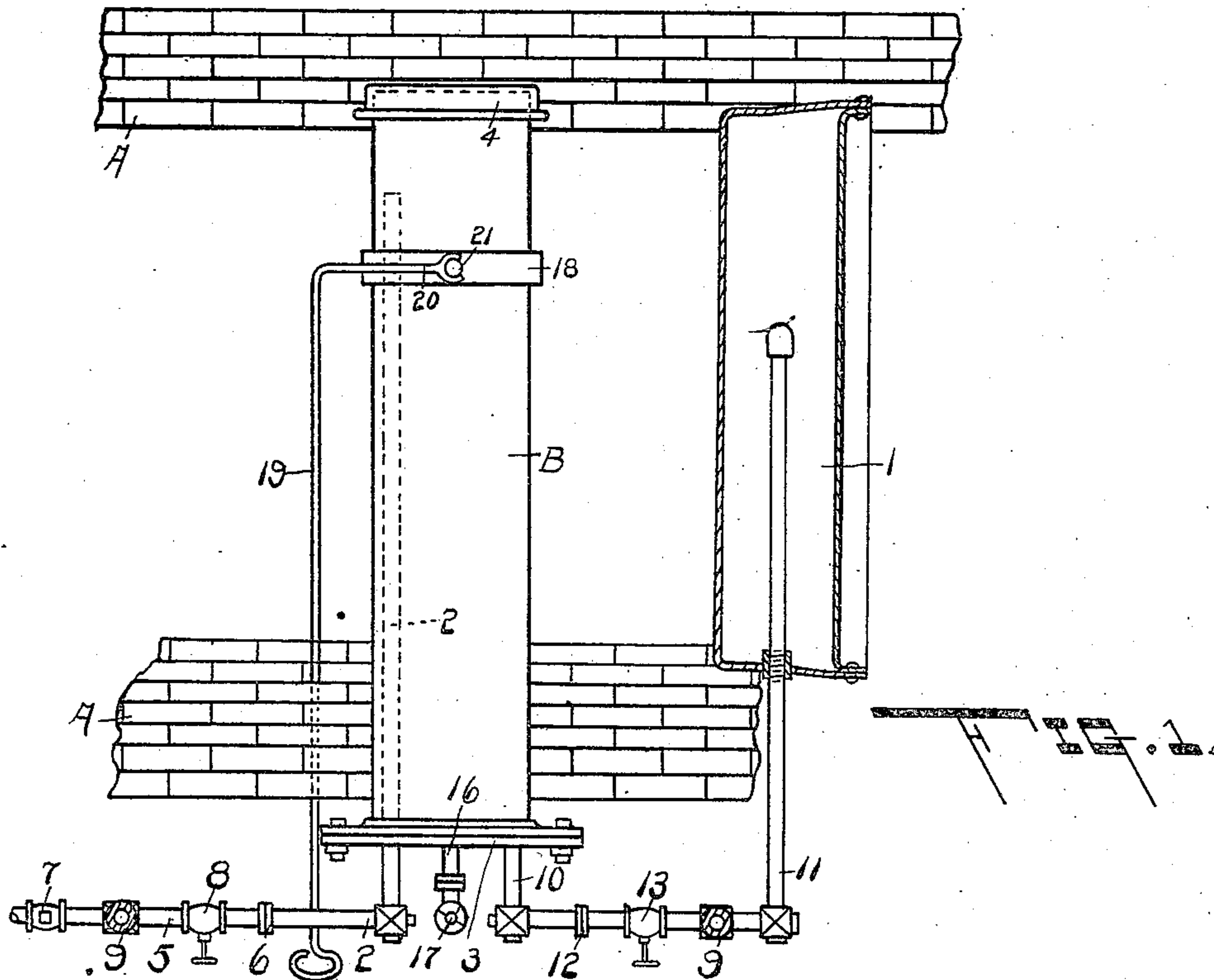


No. 855,486.

PATENTED JUNE 4, 1907.

R. C. STEVENS.  
FEED WATER HEATER.  
APPLICATION FILED JUNE 6, 1906.



**WITNESSES:**

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# UNITED STATES PATENT OFFICE.

ROBERT CLARK STEVENS, OF INDIANAPOLIS, INDIANA.

## FEED-WATER HEATER.

No. 855,486.

Specification of Letters Patent.

Patented June 4, 1907.

Application filed June 6, 1906. Serial No. 320,408.

*To all whom it may concern:*

Be it known that I, ROBERT CLARK STEVENS, a citizen of the United States, residing at Indianapolis, in the county of Marion and State of Indiana, have invented certain new and useful Improvements in Feed-Water Heaters and Purifiers; 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.

This invention relates to a feed water heater and purifier for steam boilers, one object of which is to provide a feed water heater which will more quickly and uniformly heat the water than those placed within the headers or drums.

Another object is the provision of a feed water heater which *per se* will indicate when the water is low in the boiler.

A further object is the provision of a feed water heater which can be dismantled and cleaned or entirely removed when necessary without interrupting the supply of water to the boiler and hence avoiding the trouble and delay incident to drawing the fires heating the boiler.

A still further object of my invention is the provision of a feed water heater which will operate as a purifier for the water and one from which and from whose connecting pipes the sediment can be easily and quickly blown.

Another object of my invention is the provision of a cleaner in combination with the feed water heater, which cleaner is adapted to remove the soot and scale from the outer surface of the heater.

To these and other ends, therefore, my invention consists in certain novel features and combinations of parts and their equivalents, such as will be more fully described hereinafter and particularly pointed out in the claims.

In the accompanying drawings, Figure 1 is a top plan view of a feed water heater and purifier embodying one form which my invention may assume, and Fig. 2 is an end elevation thereof, parts being broken away to show the connection between the feed water heater and header.

Hitherto it has been customary to place the feed water heater within the headers or drums where it is subjected only to a degree of heat equal to that to which the steam is

heated, say from two-hundred-and-fifty degrees to three-hundred-and-fifty degrees. Also the location of a feed water heater within the boiler renders it extremely inaccessible for repairs, and the usual manner of thoroughly cleaning the feedwater heater is to have a workman climb inside the boiler and remove the scale by hand. Obviously, this necessitates the shutting down of the boiler. In contradistinction to this, I prefer to locate my feed water heater outside the boiler in the path of the hot gases after they have left the heating surface and just before they enter the stack or breeching, where it is subjected to a temperature of from five-hundred degrees to six-hundred degrees, whereby the water is heated much more rapidly and hotter, nor does it rob the boiler of heat as do those heaters located inside the boiler.

In the accompanying drawings, A indicates a suitable support, as, for instance, the brickwork or breeching of a boiler setting which incloses the boiler. The headers are supported within the setting, a portion of the rear header (1) being shown.

B indicates the feed water heater and purifier, preferably received in a cradle formed by recessing the upper edges of the opposite walls (A) at a point above the combustion chamber and in the uptake of the furnace. This feed water heater preferably comprises a cylindrical shell suitably closed at opposite ends and lying parallel with the header (1). An inlet pipe (2) passes into the heater through the front head (3) thereof and preferably at a point on the horizontal diameter of the heater intermediate the top and bottom thereof, the inlet pipe extending nearly to the rear head (4) of the heater and parallel with the axis of the cylinder. At its outer end, the inlet pipe is provided with a lateral extension, the free end of which is in communication with a feed water supply pipe (5), the two being connected by means of a union (6). The feed water supply pipe is provided with a check valve (7) and a globe or other cutoff valve (8) between which is located one leg of a bypass (9).

Opposite and preferably in a horizontal plane with the projecting end of the inlet pipe (2) is the outlet pipe (10), the outer end of which may be laterally extended to communicate with the header pipe (11) by means of a union (12), the header pipe being provided with a cutoff valve (13) back of which is lo-



cated the remaining leg of the bypass, which latter is itself provided with a cutoff valve (14).

From the foregoing it will be seen that I locate my feed water heater directly in the path of the hot gases so that the temperature of the feed water is raised to a much higher degree than if the heater was located within the boiler.

The feed water passes from the feed water pipe (5) past the check valve (7) and cutoff valve (8) into the inlet pipe (2) and is conveyed to the rear end of the heater before it is discharged from the pipe, the water being supplied under pressure by reason of which it comes into contact with the sides of the heater and is broken up so that it may be more easily heated. From the heater it passes out of the outlet pipe (10) and into the header pipe (11) past valve (13) and thence to the rear header (1), it being discharged into the header through a depending section (15), the lower end of which normally lies below the level of the water in header (1). Now, if it be desired to gain access to the interior of the heater or to remove the entire feed water heater, all that need be done is to close valves (8) and (13) and open valve (14), after which pipes (2), (10), and (16) may be disconnected at the unions (6), (12), and (22), and the head (3) removed or the entire heater withdrawn from its setting without interrupting the flow of water to the boiler.

In the event that the water in the boiler should get too low, its level would drop slightly beneath the end of the depending section (15); and in view of the fact that the level of the water in the header fluctuates in height owing to the high ebullition, the end of the depending section will be submerged by an increasing level or left uncovered to admit the cooler feed water to the steam space above the water level, thereby condensing the steam, as a result of which a sort of water hammer will be caused, the sound of which will attract the attention of the boiler tender so that proper steps can be taken to supply the boiler with more water.

By reason of the location of the inlet and outlet pipes (2) and (10) of the feed water heater at points intermediate the top and bottom of the heater, the sediment and impurities of the water are deposited on the bottom of the heater and are not carried into the header. Furthermore, such deposit is facilitated by the high degree of heat to which the water is subjected which will operate to precipitate lime or other substances carried in solution by the water. In order to clean the heater of such deposits I tap a blow-off pipe (16) thereto at or near the bottom of the shell, which pipe is normally closed by a blow-off cock (17). When it is desired to blow out the shell, all that is necessary is to open the valve (17) and the pressure within the boiler

will cause water to back up through the pipes (15), (11), (10) carrying with it any sediment within that pipe, taking it and the sediment within the shell (B) out through the blowoff pipe (16).

In mounting the feed water heater where it is exposed to the direct heat of combustion, it soon becomes incrustated with soot and other products of combustion, which tend to form a scale thereon. In order to remove this scale, which removal is necessary since, if left on, it greatly reduces the amount of heat communicated to the feed water, I could use a steam jet, but I prefer to use a scraper (18) which in the present instance is round, but in any case would conform to the shape of the heater shell. This scraper I mount on the shell so that it may slide back-and-forth on its exterior surface. In order to move the scraper, I have provided a rod (19), the outer end of which passes through an aperture in the breeching and is accessible to the boiler tender. The inner end of the rod is connected to the scraper in any suitable manner, as by means of a yoke (20) engaging pins (21) carried by the scraper. The reciprocation of the scraper will operate to remove the scale and soot deposited on the exterior of the shell. If the necessary length of rod is objectionable, two rings and rods of different length may be provided, each movable over half the length of the heater.

It is obvious that I have devised a very neat, simple and inexpensive feed water heater possessing many advantageous features not found in other heaters and that many changes might be made in the form and arrangement of the different parts described without departing from the spirit and scope of my invention, and hence I do not wish to limit myself to the exact construction herein set forth.

Having thus fully disclosed my invention, what I claim as new, is—

1. The combination with a boiler and its setting the setting provided with a seat, of a horizontally disposed cylindrical feed water heater and purifier removably cradled in the setting and exposed to direct contact with the hot furnace gases, means for supplying the feed water heater with water, means connecting the feed water heater and boiler and a bypass around the feed water heater connecting the supply with the boiler.

2. The combination with a boiler, of a feed water heater exposed to the direct heat of the furnace gases, an inlet and an outlet pipe for the feed water heater, a supply connected to the inlet pipe, a header pipe to which the outlet is detachably connected, a bypass directly connecting the supply and header pipes and valves controlling the supply, header and bypass pipes.

3. The combination with a boiler, of a horizontally disposed feed water heater ex-



posed to the direct heat of combustion, the feed water heater comprising an approximate cylinder closed at opposite ends, an inlet pipe extending through the outer end of the cylinder to a point adjacent the inner end, an outlet pipe leading from the outer end of the heater the outlet pipe adapted to receive the water lying at the outer end of the heater, a supply connected with the inlet and a header pipe connected with the outlet.

4. The combination with a boiler, of a horizontally disposed feed water heater exposed to the direct heat of combustion, the heater being approximately cylindrical, inlet and outlet pipes communicating with the heater at its outer end and at points above the bottom thereof and a blowoff pipe communicating with the heater at its outer end at a point approximately at the bottom thereof.

5. The combination with a boiler, of a

cylindrical horizontally disposed feed water heater located above the boiler and exposed to the direct heat of combustion after such heat has passed the boiler, means for supplying water to one end of the heater, an outlet pipe communicating with the opposite end of the heater, a header pipe connected to the outlet and forming a continuation thereof, the header pipe leading to the boiler, and a depending section on the discharge end of the header pipe, the depending section passing down into and having its mouth beneath the normal level of water in the boiler, to cause a signal when the water in the boiler drops below the mouth.

In testimony whereof, I affix my signature in presence of two witnesses.

ROBERT CLARK STEVENS.

Witnesses:

M. H. GREGG,

DORA O'KEEFE.