J. A. RAY.

STEAM BOILER APPLIANCE.

APPLICATION FILED AUG. 20, 1907.

919,462.

Patented Apr. 27, 1909.

2 SHEETS—SHEET 1.

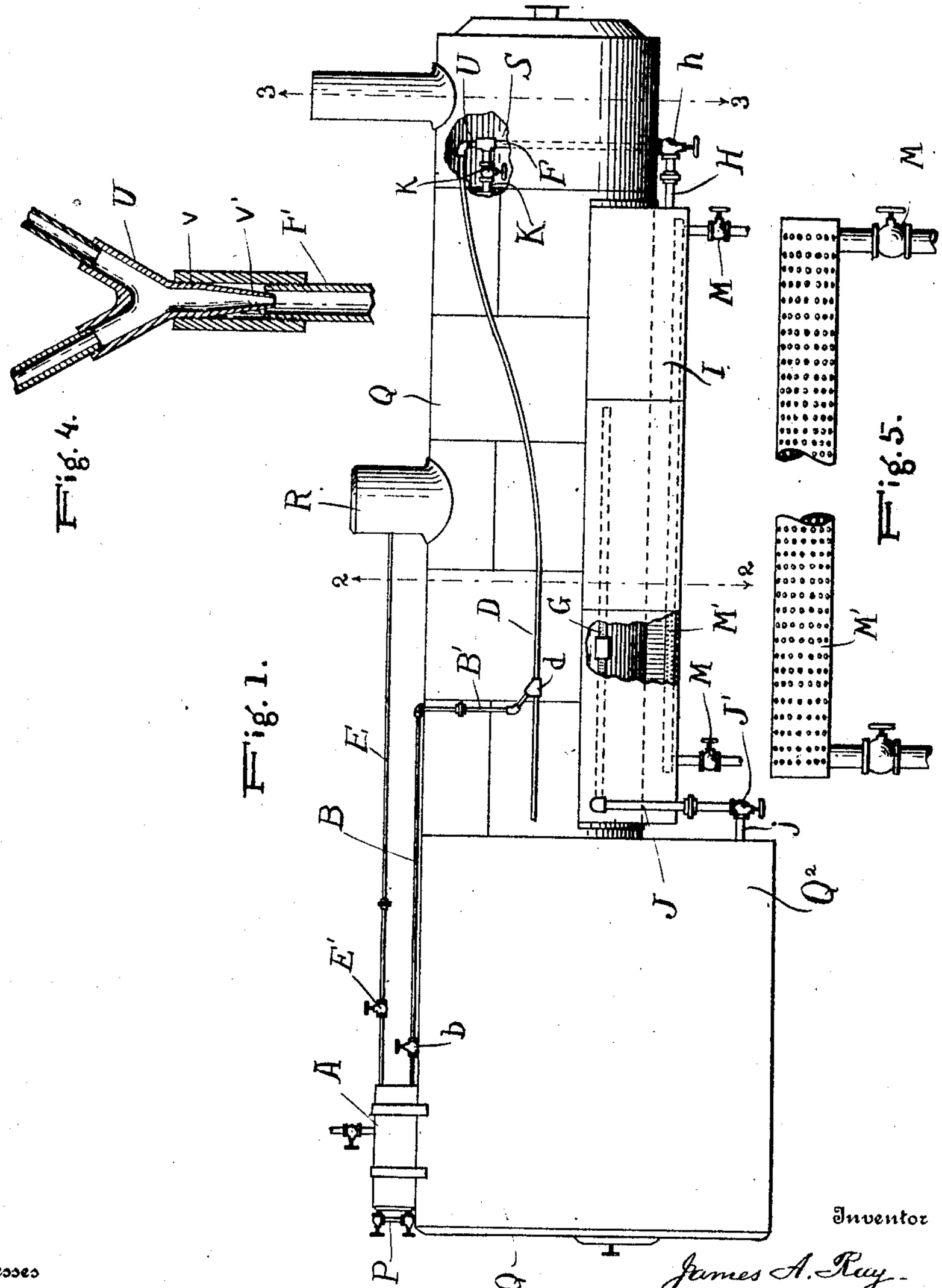

Fig. 1.

Witnesses

Stuart Hilder.

George M. Anderson.

Inventor

James A. Ray.

By E. W. Anderson

his Attorneys

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2 SHEETS—SHEET 2.

Fig. 3.

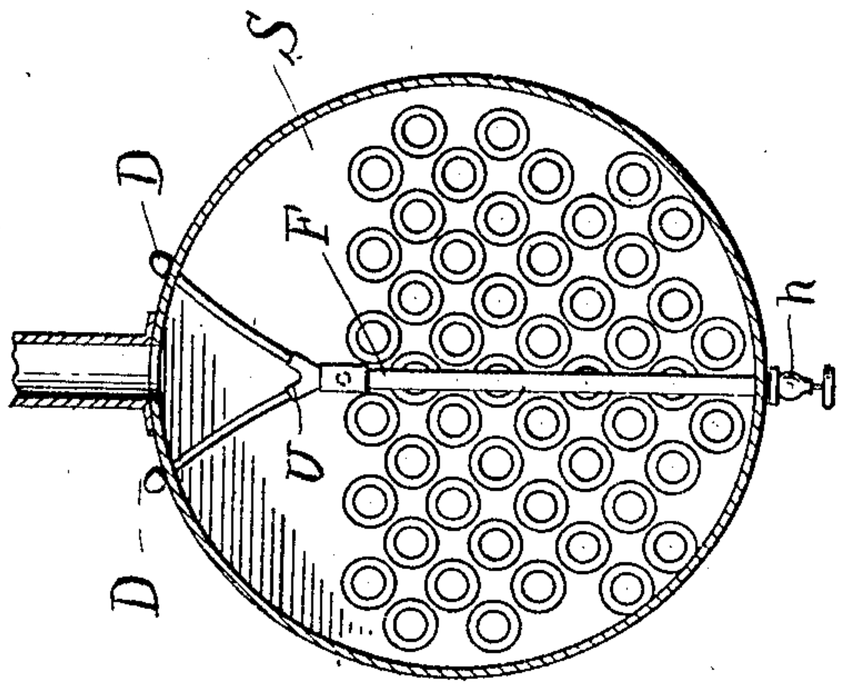
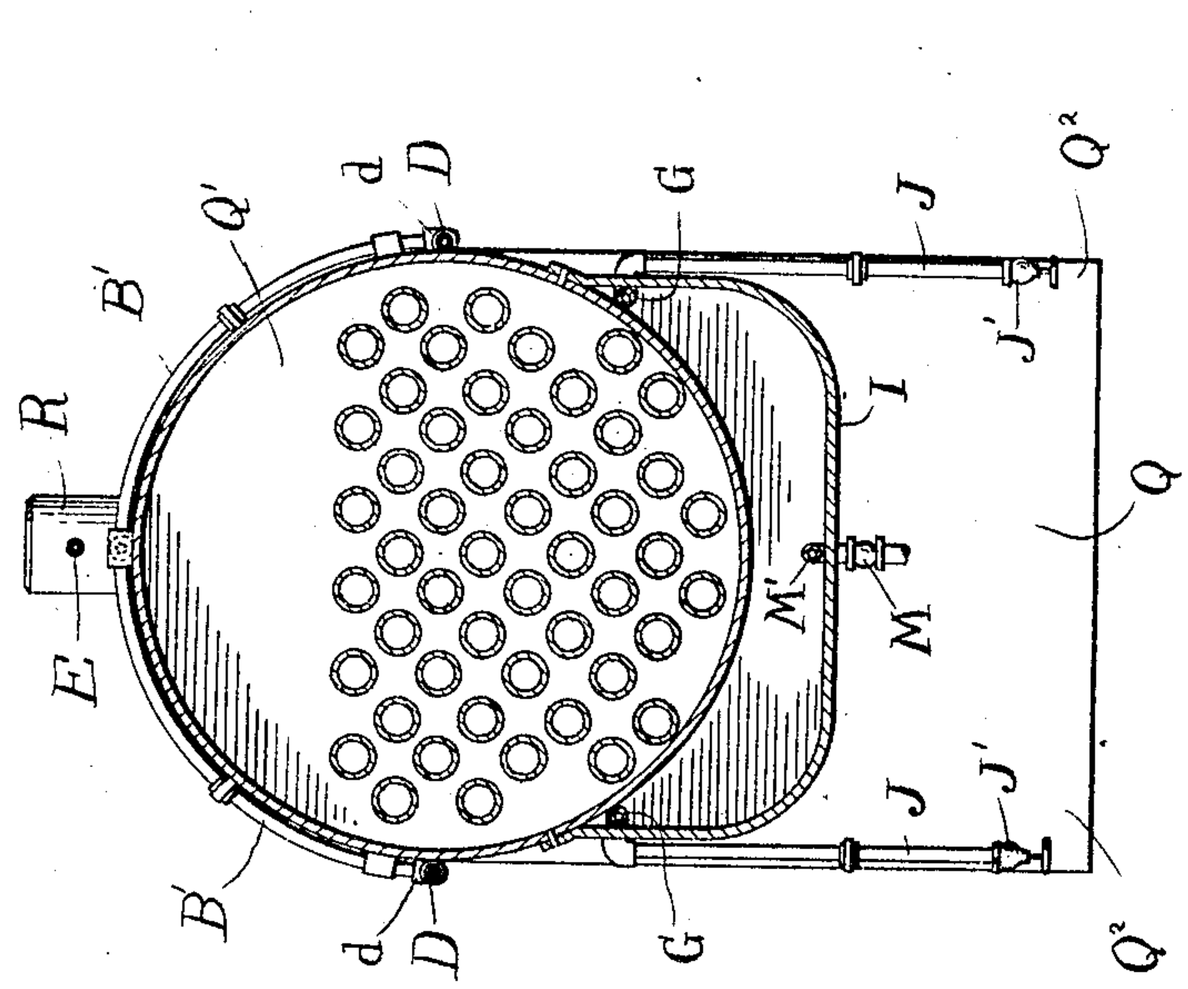


Fig. 2.



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UNITED STATES PATENT OFFICE.

JAMES ARCHER RAY, OF WICHITA, KANSAS.

STEAM-BOILER APPLIANCE.

No. 919,462. Specification of Letters Patent. Patented April 27, 1909.

Application filed August 20, 1907. Serial No. 389,406.

To all whom it may concern:

Be it known that I, JAMES A. RAY, a citizen of the United States, resident of Wichita, in the county of Sedgwick and State of Kansas, have made a certain new and useful Invention in Steam-Boiler Appliances; and I declare the following to be a full, clear, and exact description of the same, such as will enable others skilled in the art to which it appertains to make and use the invention, reference being had to the accompanying drawings, and to letters or figures of reference marked thereon, which form a part of this specification.

Figure 1 is a side elevation of the invention, as applied and partly broken away. Fig. 2 is a section on the line 2—2, Fig. 1. Fig. 3 is a section on the line 3—3, Fig. 1. Fig. 4 is a detail sectional view of the Y-form joint. Fig. 5 is a detail side view partly broken away of the pipe connecting the blow-off valves.

The invention has relation to steam boiler appliances, and is designed to provide means for automatically purifying the boiler feed water before and after it enters the boiler, thus preventing the formation of scale upon the boiler shell and tubes and deposit of sediment in the bottom of the boiler. The use of the invention is also designed to remove such scale after the formation thereof. The impurities so removed from the feed water are deposited in a separate compartment of the boiler provided by the use of this invention, and from whence they are removed when required as hereinafter stated.

There is little pure water to be had, most water being contaminated with impurities, which upon evaporation of the water are precipitated upon the flues or tubes, and shell of a steam boiler, causing the formation of scale upon the same, and a deposit of sediment in the bottom of the boiler. This scale is a bad conductor of heat and greatly retards the heating of the water, requiring an extra amount of fuel on account of the incrusted condition of the flues or tubes and boiler shell, besides corroding the same and causing expense in the way of boiler repairs. The sediment deposit in the boiler bottom also excludes the water from the steel. In this way the boiler shell and tubes become overheated and are liable to blister or pocket, causing accidents and loss of life. A careful estimate of the damage done by hard water to locomotive boilers alone, is given at fifteen million dollars per annum.

The invention consists in the novel construction and combinations of parts, as hereinafter set forth.

In the accompanying drawings illustrating the invention, Q designates the fire box of an ordinary locomotive boiler, marked Q′.

I is a steel shell riveted to the sides of the boiler proper below the same, and extending from the fire box to the smoke flue S, such shell forming a water purifying compartment for the boiler feed water, and in which the impurities removed from such water are deposited, as hereinafter explained.

J, J, are vertical pipes located at each side of the boiler adjacent to the fire box, having communication at their lower ends with the bottom portion of the water legs Q^2 at the sides of the fire box (although such pipes may be connected with the water jacket of the fire box at some other point), and at their upper ends having connection with a horizontal strainer or filter pipe G, formed of perforated galvanized sheet metal covered with wire gauze, the outer end of such strainer pipe being open. A valve J′ is provided in each pipe J, at the junction of the same with a short pipe *j* forming the connection therewith with the water leg at each side. Any other suitable form of strainer pipe may of course be substituted.

E is a steam pipe connection for the steam dome R of the boiler, with the reagent tank A, located upon the upper forward portion of the fire box, such pipe being provided with a valve E′.

B represents a horizontal pipe communicating at one end thereof with the reagent tank, and at its opposite end having vertical branches B′, B′, having communication at each side of the boiler with the feed water pipes D, D, at *d*, *d*.

The feed water pipes D, D, have connection at their outer ends with a Y-form joint U, the lower branch of such joint having a threaded connection *v* with a vertical pipe F located in the smoke flue, such threaded portion *v* of the joint having a nozzle extension *v*′. A short horizontal pipe K has connection at one end thereof with the boiler, preferably just above the flues and below the water level, and at its opposite end has a T-joint connection with the pipe F, the head of such T-joint surrounding the tapered nozzle extension of the Y-joint aforesaid and

permitting the entrance of hot water into the pipe F without interference with the flow of the feed water. The pipe F has connection at its lower end with a short horizontal pipe H communicating at its inner end with the lower portion of the water purifying compartment, a valve *h* being provided at the junction of the pipes F and H.

The reagent tank A is strongly formed to withstand the steam pressure, and is designed to contain the reagent or chemical used for purifying the feed water, the proper reagent and the quantity to be used being determined beforehand by analysis of the water to be used. A gage glass P is provided for the reagent tank.

M, M, are blow off valves for the water purifying compartment having connection with a perforated pipe M, located in the bottom portion of such compartment. The pipe K is provided with a suitable valve *k*, and the pipe B with a valve *b*. The pipe J has communication with the bottom portion of the water jacket of the fire box, as shown, the hot water in such jacket continually rising and causing continuation of the flow, thus facilitating the water circulation.

The strainer pipe in the water purifying compartment serves the purpose of filtering the water and prevents any current being formed in such compartment, which would be likely to cause agitation of the impurities deposited therein, and retard the settling of such impurities. This strainer pipe being located at the highest point of the pipes J, J, connected thereto, makes it impossible for any foreign matters of greater specific gravity than hot water to rise to the strainer pipe and pass out of the purifying compartment. The steam supply to the reagent tank heats this tank and the reagent therein, and causes the reagent to be rapidly taken up and supplied to the feed water. The suction caused by the flow of the feed water causes a flow of the reagent. This reagent may however be supplied to the feed water by any other suitable means. The water purifying compartment I will be located at the side of an ordinary tubular boiler and not at the bottom thereof, as in the present case.

It is designed by the use of this invention to raise the temperature of the feed water to such a point that the impurities thereof will be deposited in the water purifying compartment without the use of a reagent, except in such cases where the reagent may be needed. The reagent tank A and its connecting pipes with the steam space of the boiler and with the feed water pipes may therefore be omitted, without affecting the operation of the other parts of the apparatus.

The impurities deposited in the water purifying compartment may be pumped out therefrom by connection with the blow off valves, which communicate with the perforated pipe in such compartment. Or such impurities may be flushed out by supplying water to the purifying compartment.

Having thus described my invention, what I claim and desire to secure by Letters Patent is:—

1. The combination with a steam boiler having a smoke flue, a feed water pipe, and a fire box provided with a water jacket, of a water purifying compartment located above the lower portion of said water jacket, a strainer and filter pipe at the upper portion of said purifying compartment, a pipe having connection at its lower end with said water jacket and at its upper end with said strainer and filter pipe, and a vertical pipe in said smoke flue having at its upper end connection with said feed water pipe and at its lower end connection with said water purifying compartment, said vertical pipe having a hot water pipe connection with the boiler.

2. The combination with a steam boiler having a smoke flue, feed water pipes, and a fire box provided with a water jacket, of a water purifying compartment located above the lower portion of the water jacket, a strainer and filter pipe at the upper portion of said purifying compartment, a pipe having connection at its lower end with said water jacket and at its upper end with said strainer and filter pipe, and a vertical pipe in said smoke flue having at its upper end a Y-form joint connection with said feed water pipes, provided with a tapered nozzle extension, said vertical pipe having a hot water pipe connection with the boiler, having a T-joint surrounding said nozzle extension.

3. The combination with a boiler of the locomotive type having a horizontal shell, a smoke flue, feed water pipes, and a fire box having water legs, of a horizontal water purifying compartment in close relation to said horizontal shell and above the lower portions of the water legs, strainer and filter pipes at the upper portion of said purifying compartment, vertical pipes having connections at their lower ends with said water legs and at their upper ends with said strainer and filter pipes, and a vertical pipe in said smoke flue having at its upper end connection with said feed water pipes, and at its lower end connection with said water purifying compartment, said vertical pipe having a hot water pipe connection with the boiler.

4. The combination with a boiler of the locomotive type having a horizontal shell, a smoke flue, feed water pipes, and a fire box having water legs, of a horizontal water purifying compartment in close relation to the horizontal shell, and above the lower por-

tions of the water legs, strainer and filter pipes at the upper portion of said purifying compartment, vertical pipes having connections at their lower ends with said water legs and at their upper ends with said strainer and filter pipes, a vertical pipe in said smoke flue, having at its upper end a Y-form joint connection with said feed water pipes provided with a tapered nozzle extension, said vertical pipe having a hot water pipe connection with the boiler having a T-joint surrounding said nozzle extension, and a perforated cleaning pipe for said purifying compartment located at the lower portion thereof and having a valved pipe connection.

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

JAMES ARCHER RAY.

Witnesses:

NANNIE E. RAY,

ANNA W. RAY.