J. W. CURRIE.

FEED WATER HEATER.

APPLICATION FILED AUG. 27, 1908. RENEWED JULY 30, 1909.

934,393.

Patented Sept. 14, 1909.

2 SHEETS—SHEET 1.

Fig. 1

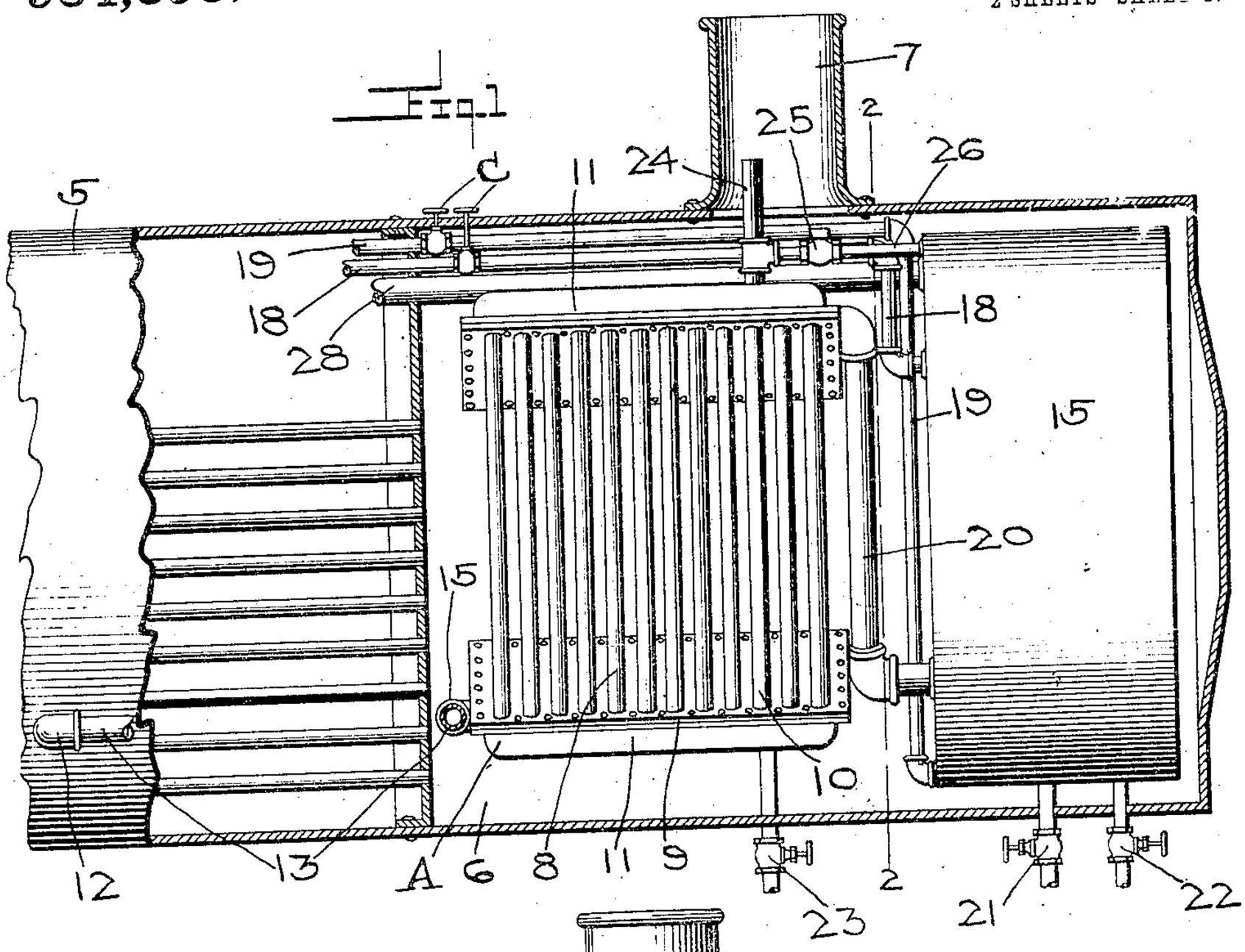
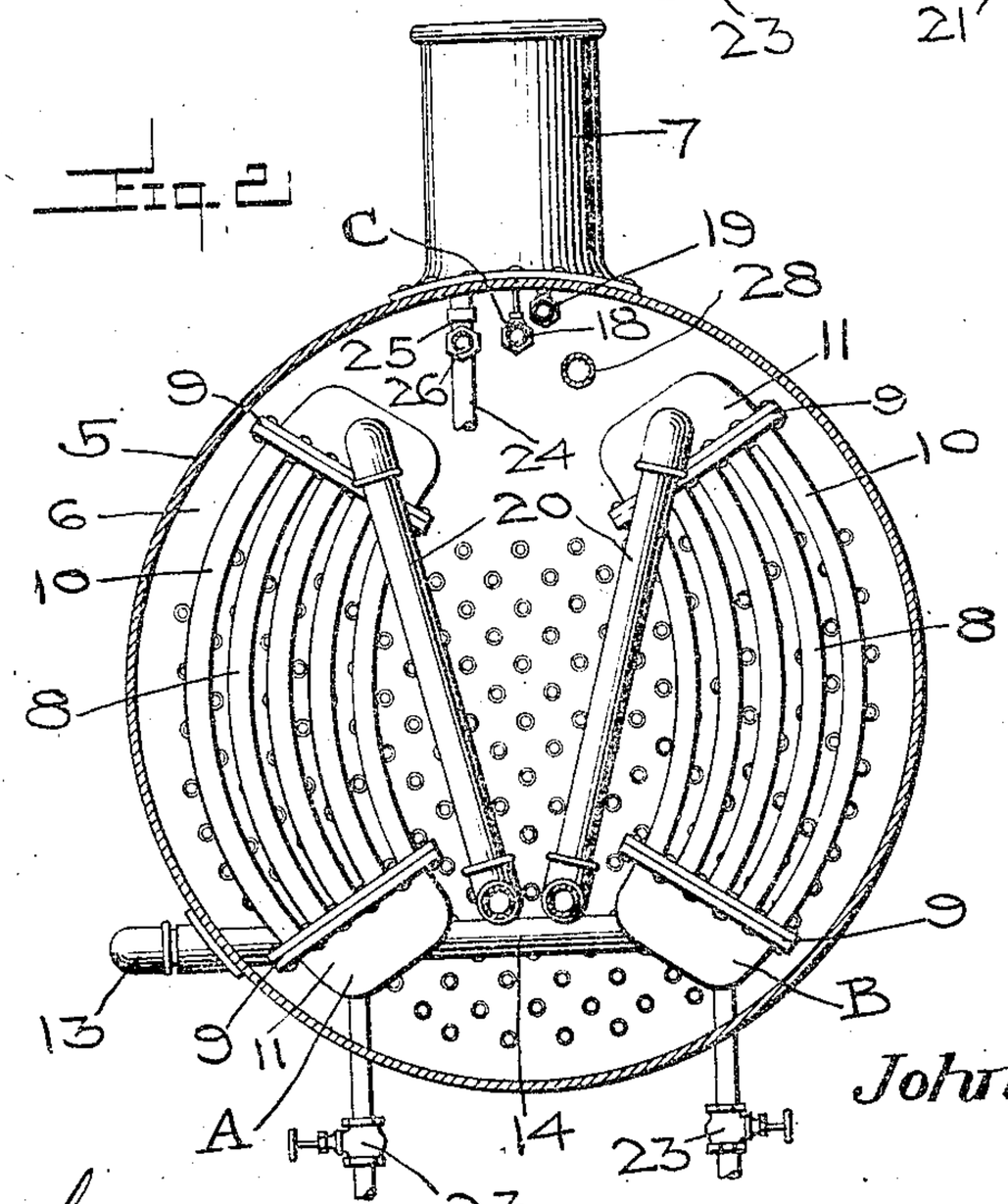


Fig. 2



Witnesses

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2 SHEETS—SHEET 2.

Fig. 5

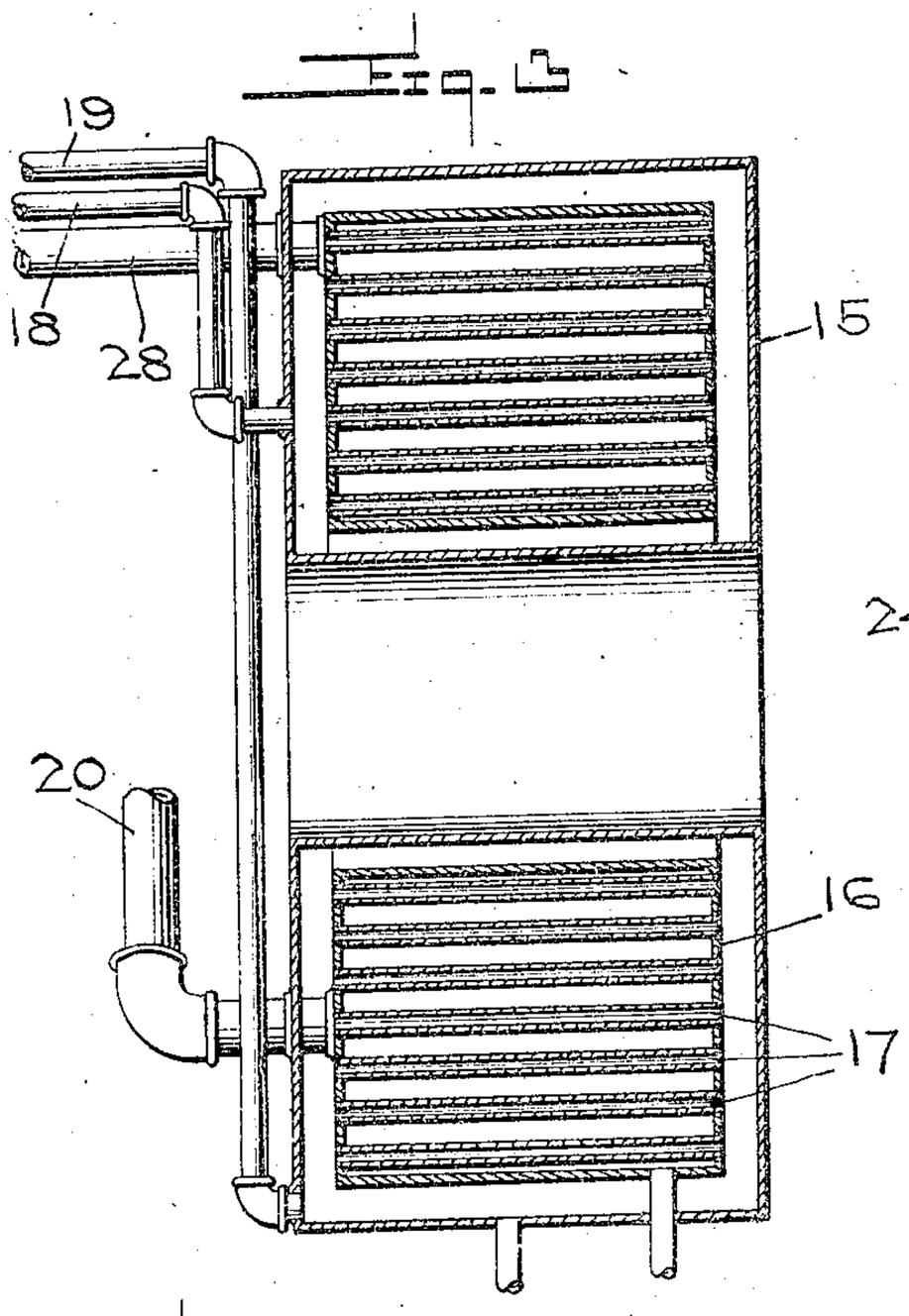
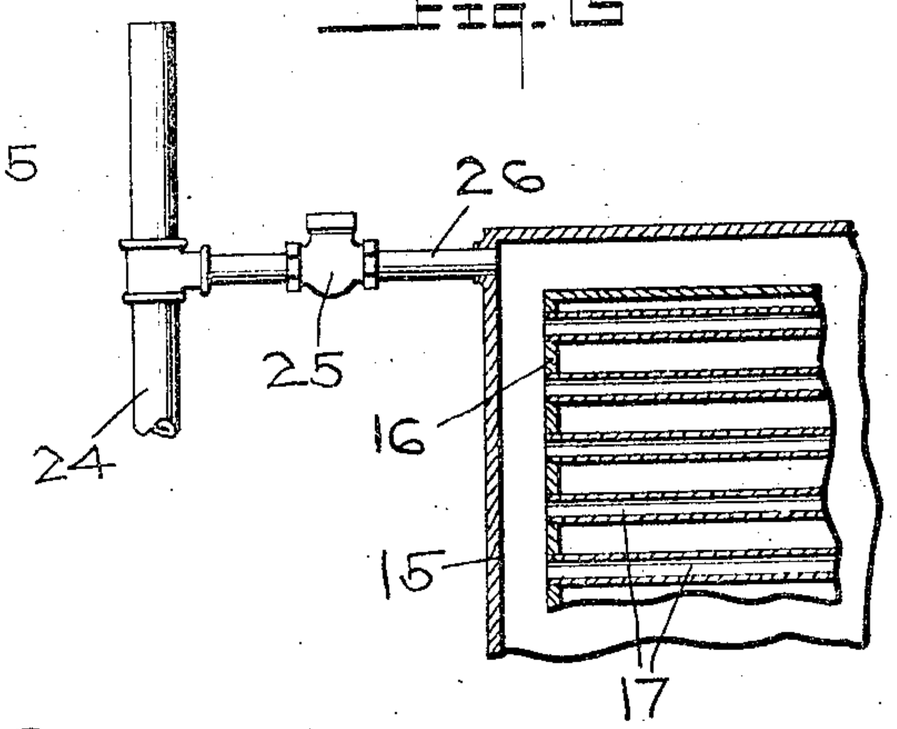
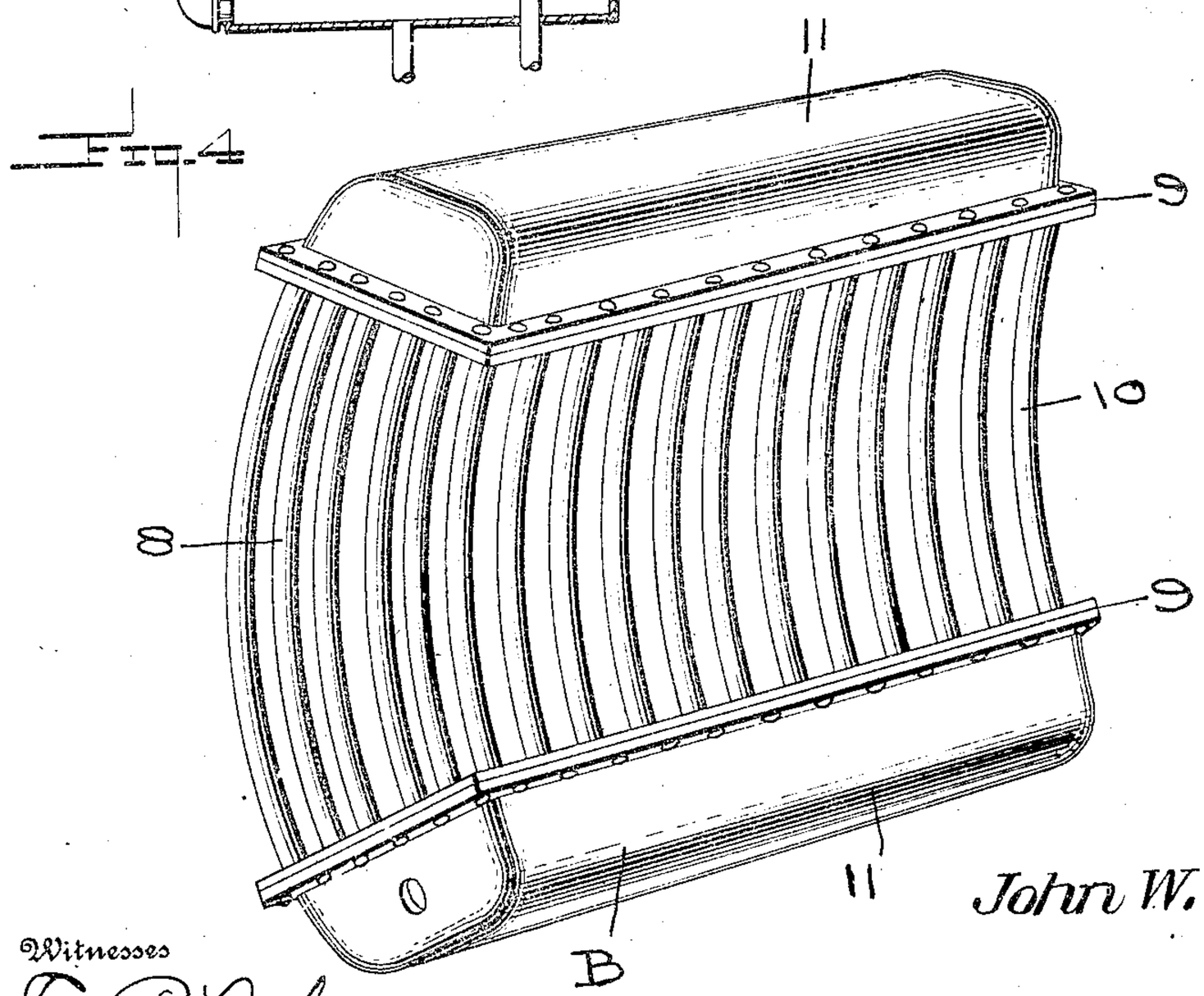


Fig. 4





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UNITED STATES PATENT OFFICE.

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FEED-WATER HEATER.

934,393. Specification of Letters Patent. Patented Sept. 14, 1909.

Application filed August 27, 1908, Serial No. 450,535. Renewed July 30, 1909. Serial No. 510,368.

To all whom it may concern:

Be it known that I, JOHN W. CURRIE, a citizen of the United States, residing at Minneapolis, in the county of Hennepin and State of Minnesota, have invented certain new and useful Improvements in Feed-Water Heaters, of which the following is a specification.

This invention relates to steam boilers, and more particularly to locomotive boilers, and has for its object to provide a feed water heating apparatus for locomotive boilers, which will be so constructed that it may be located within the smoke box of a locomotive, forward of the boiler itself, and which will be so arranged as to enhance the heating of the water before it enters into the boiler.

Another object is to provide a structure which may be easily inserted or removed and which will be relatively simple to regulate.

Other objects and advantages will be apparent from the following description, and it will be understood that changes in the specific structure shown and described may be made within the scope of the claims, without departing from the spirit of the invention.

In the drawings forming a portion of this specification, and in which like numerals of reference indicate similar parts in the several views, Figure 1 is a longitudinal section of a locomotive boiler, the present heating apparatus being shown in side elevation, Fig. 2 is a section on line 2--2 of Fig. 1, showing the arrangement of the tube banks, Fig. 3 is a vertical section through the heating tank, Fig. 4 is a perspective view of one of the tube banks, Fig. 5 is a detail section showing the connection of the exhaust with the heating tank.

Referring to the drawings, there is shown a locomotive boiler 5, forwardly of which there is located the usual smoke box 6 with which the smoke stack 7 of the locomotive communicates.

Within the smoke box, at each side thereof, there is located a bank of water tubes 8, these banks being curved vertically as shown, and each consisting of a pair of spaced head plates 9, in which are engaged the ends of curved water tubes 10, the convex faces of which are directed outwardly. Bolted to each head plate, there is a dome 11, hollow as will be understood, and with which the tubes 10 communicate.

An injector or other feeding apparatus is indicated at 12, and communicates with a pipe 13, which is connected with the rearward end of the lower dome A of one of the tube banks 8. A pipe 14 is connected with the pipe 13 by means of a tee 15, and communicates with the corresponding lower dome B of the other tube bank. Forwardly of the two banks 8 there is located within the smoke box 6, a circular, vertically extending steam receiving tank 15, having a second water tank 16 therewithin. A plurality of tubes 17 extend horizontally through the tank 16, communicating with the interior of the tank 15, and thus receiving steam which has been admitted to the tank 15.

A steam pipe 18 communicates with the tank 15 and with the boiler for the passage of steam to the tank, and a circulating pipe 19 also communicates with the boiler and with the bottom of the tank 15.

Pipes 20 communicate with the forward ends of the upper domes 11 of the two tube banks 8, and extend downwardly to communicate with the lower portion of the tank 16. This tank is provided with a washout valve 21 and the steam tank 15 is provided with a drain cock 22. The lower domes A and B of the tube bank are also provided with washout cocks, indicated at 23.

The exhaust pipe from the cylinders of the engine is indicated at 24, and a pipe 26 communicates with the exhaust pipe and with the steam tank 15, this pipe having a check valve 25 opening toward the steam tank, so that when live steam has been cut off from the boiler, by means of valves C located in the pipes 18 and 19, the exhaust from the cylinder will pass through the check 25, and by means of the pipe 26 through the steam tank, thus acting to heat the water in the tank 15.

The water pipe 28 communicates with the upper portion of the tank 16 and with the boiler.

It will be observed, water being fed to the lower domes A and B of the banks 8, will, as the water is heated, rise through the tubes 10 to the upper domes, and will then, by thermal circulation pass downwardly through the pipes 20 to the lower portion of the tank 16 where it will be further heated

and will rise to the pipe 28 from which it will pass into the boiler 5.

What is claimed is:

1. The combination with a locomotive, of a pair of tube banks located within the smoke box, forwardly of the boiler, said tube banks each consisting of a pair of vertically spaced head plates, a plurality of longitudinally curved pipes engaged at their ends in the head plates, and hollow domes secured upon the head plates, said pipes communicating with the interiors of the domes, a water feeding mechanism, branch pipes communicating with the feeding mechanism and with the lower domes of the two tube banks, a steam tank located within the smoke box forwardly of the banks, steam circulating pipes communicating with the steam tank and with the boiler, a water tank located within the steam tank, a plurality of tubes extending horizontally through the water tank and communicating with the steam tank, and a water pipe communicating with the water tank and with the boiler.

2. The combination with a locomotive, of a pair of tube banks located within the smoke box forwardly of the boiler, said tube banks each consisting of a plurality of longitudinally curved pipes, domes connected with the ends of the pipes of each bank, a water feeding mechanism, branch pipes communicating with the feeding mechanism and with the lower domes of the tube banks, a steam tank located within the smoke box forwardly of the banks, steam circulating pipes communicating with the tank and with the boiler, a water tank located within the steam tank, a plurality of tubes extending horizontally through the water tank and communicating with the steam tank, pipes communicating with the upper dome and with the water tank, and a water pipe communicating with the water tank and with the boiler.

3. The combination with a locomotive, of a pair of tube banks located within the smoke box forwardly of the boiler, said tube banks each consisting of a plurality of longitudinally curved pipes, domes connected with the ends of the pipes of each bank, a water feeding mechanism, branch pipes communicating with the feeding mechanism and with the lower domes of the tube banks, a tank located within the smoke box forwardly of the banks, a tank located within the first named tank, a plurality of tubes extending through the second named tank and communicating with the first named tank, steam circulating pipes communicating with one of said tanks and with the boiler, water pipes communicating with the other of said tanks and with the tube banks, and a water pipe communication with the just mentioned tank and with the boiler.

4. The combination with a locomotive, of a pair of tube banks located within the smoke box forwardly of the boiler, said tube banks each consisting of a plurality of longitudinally curved pipes, domes connected with the ends of the longitudinally curved pipes of each bank, a water feeding mechanism, branch pipes communicating with the feeding mechanism and with the lower domes of the tube banks, a tank located within the smoke box forwardly of the banks, a tank located within the first named tank, a plurality of tubes extending through the second named tank and communicating with the first named tank, steam circulating pipes communicating with one of the said tanks and with the boiler, a valve in each of said steam circulating pipes operable to cut off the circulation of steam therethrough, water circulating pipes communicating with the other of said tanks, certain of said water circulating pipes communicating with the tube banks, and certain of said water circulating pipes communicating with the boiler, an engine exhaust pipe, and check valve connections between the exhaust pipe and the tank with which the steam circulating pipes communicate.

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

JOHN WILLIAM CURRIE.

Witnesses:

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