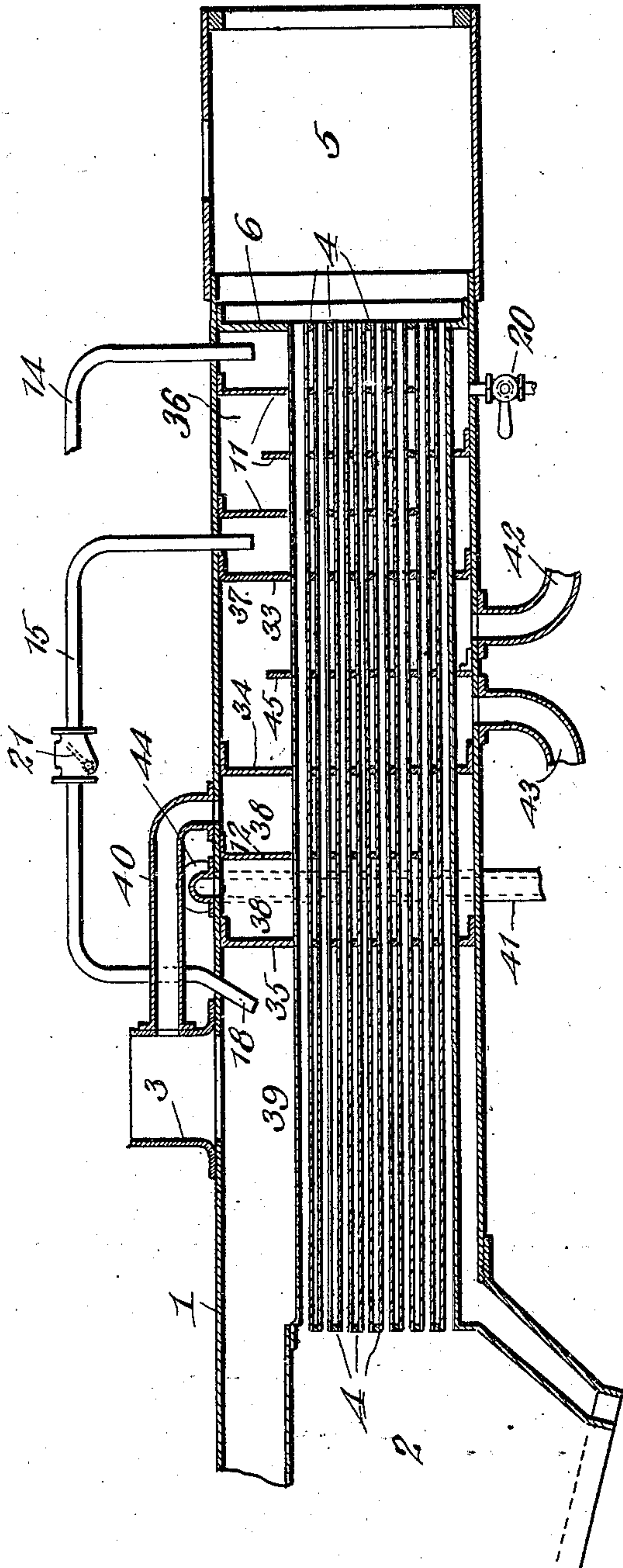


F. A. HAUGHTON.
STEAM GENERATOR AND REHEATER.
APPLICATION FILED DEC. 1, 1909.

989,781.

Patented Apr. 18, 1911.



WITNESSES:

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UNITED STATES PATENT OFFICE.

FRANK A. HAUGHTON, OF HIGH BRIDGE, NEW JERSEY.

STEAM GENERATOR AND REHEATER.

989,781.

Specification of Letters Patent.

Patented Apr. 18, 1911.

Original application filed March 13, 1909, Serial No. 483,146. Divided and this application filed December 1, 1909. Serial No. 530,799.

To all whom it may concern:

Be it known that I, FRANK A. HAUGHTON, a subject of the King of Great Britain, and a resident of High Bridge, county of Hunterdon, State of New Jersey, have invented certain new and useful Improvements in Steam Generators and Reheaters, of which the following is a specification.

My invention relates to an improvement in steam generators and reheaters for use in connection with compound or multiple expansion engines.

The principal object of the invention is to utilize the highest possible percentage of the heat from the gases of combustion in generating the steam for the high pressure engine, and in reheating it for the low pressure engines, so that the steam may be dry and highly superheated.

Another object of this invention is to so construct the boiler that the fire tubes may be readily and conveniently removed when necessary without destruction of the parts necessary for effecting the above purposes.

These and other objects of the invention will more fully and at large appear from the following description of an apparatus embodying the invention, in connection with the accompanying drawing which is a longitudinal cross-sectional view through a locomotive boiler embodying the invention.

The present application is a division of my Patent No. 943,189, dated December 14, 1909. The structure and operation of the apparatus shown in the drawings of the present application is in part like that of my aforesaid patent. The boiler in the present case is divided by diaphragms 6, 33, 34 and 35 into several parts, to wit: smoke box 5, water preheater 36, steam reheater 37, steam superheater 38, and steam generator 39. Fire tubes 4 are shown as continuous through all of these chambers from the fire box 2 to the smoke box 5. Instead of being single continuous tubes, there may be a set of tubes for each chamber as shown in Fig. 2 of my aforesaid patent, each tube registering with a tube in the next chamber to form continuous passages for the gases of combustion. In the latter instance there would be two diaphragms separating each chamber from the next, so that the boiler could be disjointed between such chambers as shown and described in my aforesaid application.

Water is admitted to the preheater chamber 36 through a supply pipe 14, and guided by diaphragms 11, passes down and up in a zigzag path through the preheater, finally passing by way of the pipe 15 to the generator 39. The pipe 15 projects down a slight distance into the preheater so that an air and steam cushion is formed in operation at the top of the preheater, thus relieving the latter from the action of the water hammer that might injure it. The pipe 15 terminates at 18 in the steam space of the generator so that the water may freely enter the latter chamber. A check valve 21 prevents flow of steam from the generator to the preheater. A drain valve 20 in the preheater provides for the withdrawal of sediment and deposits at the bottom of the latter.

Pipe 40 connects the generator to the superheater, and a diaphragm 12 in the latter causes the steam to pass therethrough in zigzag passage to the pipe 41 which leads to the high pressure cylinder of the engine to which the boiler furnishes steam. From the high pressure cylinder the exhausted steam passes by pipe 42 to the reheater 37, and guided by diaphragm 45, passes up and down through the latter to the outlet pipe 43 which leads to the low pressure cylinder.

It will be noted that the passage of fluid through each of the several chambers is always in a direction, from a point more remote, to a point nearer the fire box. The fluids thus first come into contact with colder, and then with hotter, portions of the fire tubes 4. In this manner the temperature of the fluid is gradually raised in each chamber. Furthermore, the colder fluids are heated at the end of the boiler remote from the fire box, where the tubes are relatively cool, and the hotter fluids at the end of the boiler near the fire box where the tubes are hottest. The effect of this arrangement is that the hottest parts of the tubes are used to heat those fluids which require the greater temperature, and the cooler parts of the tubes to heat the fluids which require less temperature. It is thus assured that the tubes will always be appreciably hotter at all points than the fluids in contact therewith at such points. If, on the contrary, the tubes first passed through the relatively cold feed water, the gases might be so cooled as to be of no use for superheating the steam,

or might even be cooled to a temperature below that of the steam. The importance of my arrangement of the chambers is thus apparent.

5 I have described one embodiment of the invention. It is obvious, however, that the invention is capable of embodiment in structures differing widely from that shown in the drawings.

10 What I claim is:

1. In a fire tube boiler, the steam generator, and in tandem therewith, a steam superheater, a steam reheater, and a feed water preheater, an inlet for water to the pre-
15 heater, connections from the preheater to the generator, and from the generator to the superheater, an inlet for steam to the reheater and an outlet therefor, and fire tubes extending through all of the said elements
20 forming continuous passages for the products of combustion.

2. In a fire tube boiler, the steam genera-

tor, and in tandem therewith, a steam superheater, a steam reheater, and a feed water preheater, an inlet for water to the pre- 25 heater, connections from the preheater to the generator, and from the generator to the superheater, an inlet for steam to the reheater and an outlet therefor, the said generator, superheater, reheater and preheater being 30 arranged in the order named from the fire box to the smoke box, and fire tubes extending through all of said elements forming passages substantially continuous through 35 all of the same for the products of combustion.

Signed by me at New York city, county and State of New York, this 27th day of November, 1909.

FRANK A. HAUGHTON.

Witnesses:

W. H. HEAGERTY,
CHAS. D. EDWARDS.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."
