J. M. TAGGART.

FEED WATER HEATER.

APPLICATION FILED AUG. 12, 1914.

1,216,747.

Patented Feb. 20, 1917.

2 SHEETS—SHEET 1.

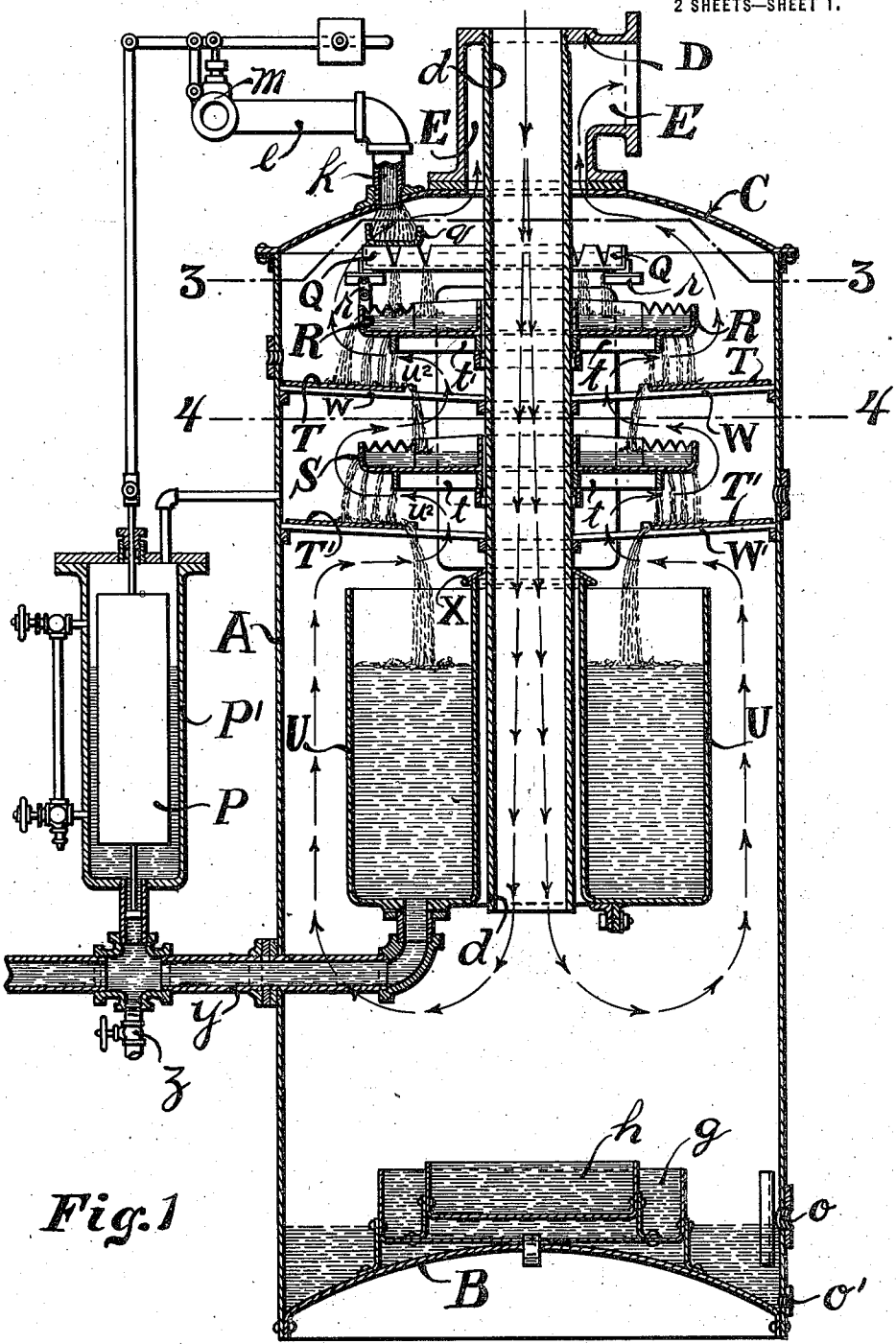


Fig. 1

Sect. A-A

Witnesses

Wm. J. Martin

Walter H. Harris

Inventor

James M. Taggart

by D. Walter Brown

his attorney

J. M. TAGGART.

FEED WATER HEATER.

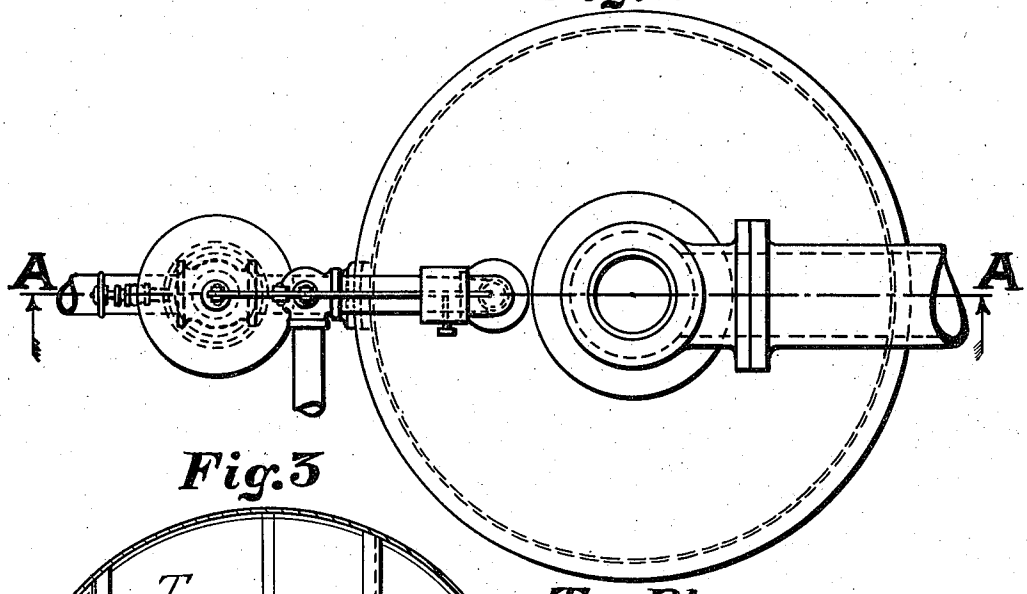
APPLICATION FILED AUG. 12, 1914.

1,216,747.

Patented Feb. 20, 1917.

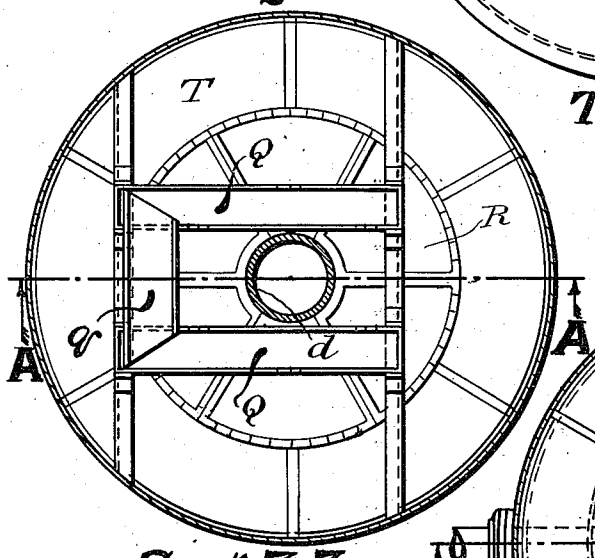
2 SHEETS—SHEET 2.

Fig. 2



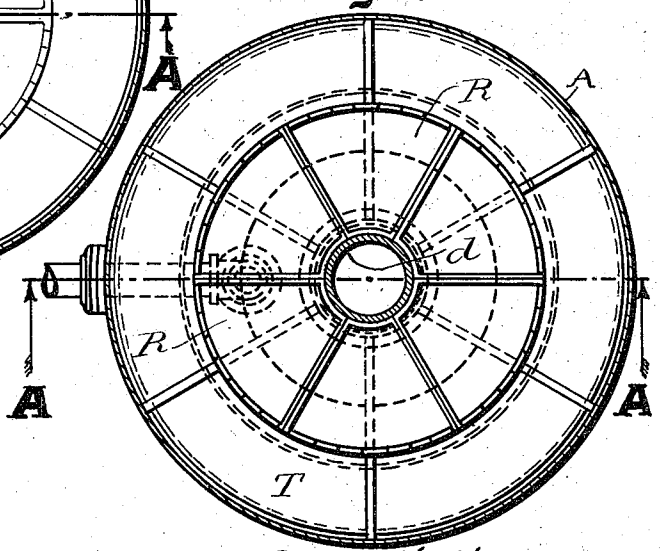
Top Plan

Fig. 3



Sect. 3-3

Fig. 4



Sect. 4-4

Witnesses

Hugh J. Martin

Walter H. Harris

Inventor

James M. Taggart

by D. Walter Brown

his attorney

UNITED STATES PATENT OFFICE.

JAMES M. TAGGART, OF PORT WASHINGTON, NEW YORK.

FEED-WATER HEATER.

1,216,747. Specification of Letters Patent. Patented Feb. 20, 1917.

Application filed August 12, 1914. Serial No. 856,506.

To all whom it may concern:

Be it known that I, JAMES M. TAGGART, a citizen of the United States, and a resident of Port Washington, in the county of Nassau and State of New York, have invented certain new and useful Improvements in Feed-Water Heaters, of which the following is a specification.

This invention relates to improvements in feed water heaters.

It is the purpose of the invention to provide a feed water heater of such construction as will insure the heating of the feed water to the highest practicable temperature, and substantially to the temperature of the steam which is admitted to the apparatus. It is also a purpose of the invention to so arrange the circulation of the steam and of the water within the feed water heater, and to so construct and arrange the several parts thereof, that those parts with which the water comes into contact may be of relatively non-corrodible materials and not require great tensile strength, and that those parts which require great tensile strength shall be in contact only with the steam and oil emulsified water, which will not act corrosively on such parts.

Still another purpose of the invention is to combine in one apparatus both a grease separator and a feed water heater, so that the grease separator shall effectively remove the grease and deleterious ingredients from the exhaust steam, and thereby enable me to more effectively accomplish the arrangement and construction of the several parts hereinbefore referred to.

To attain the highest heating efficiency of the apparatus and bring the feed water substantially to the temperature of the steam, I combine with the body of the feed water heater a hot water container, the surfaces of which become heating surfaces instead of cooling surfaces, and thus facilitate the raising of the feed water to a high temperature and practically to the temperature of the exhaust steam.

Other advantages of the invention will be apparent from the description and explanation hereinafter contained.

Referring to the drawings which accompany the specification to aid the description, Figure 1 is a vertical section of apparatus embodying my invention on the line A—A of Figs. 2, 3, and 4; Fig. 2 is a plan of the same; Fig. 3 is a cross section on the irregular line 3—3 of Fig. 1; Fig. 4 is a cross section on the line 4—4 of Fig. 1.

A is the shell of the feed water heater constructed of suitable metal of high tensile strength, as sheet steel, and as has been hereinbefore stated, and will be hereinafter more fully explained, the construction and arrangement of my improved feed water heater is such that the shell will not be in contact with water which would corrode it. Said shell A is closed at the bottom B, has a cover C, and is provided with a manhole on the side. A compound fitting D secured to said cover C, has threaded in it the depending exhaust steam inlet pipe *d* and the steam outlet E, which is formed in said fitting around said pipe *d*.

Directly in the path of the exhaust steam entering the feed water heater from said pipe *d* is my improved grease separator consisting of a plurality of pans, as *g*, *h* concentrically arranged, and the outer pans being successively lower than the inner pans whereby there is produced a radial surge and flow of the water outwardly over the edges of the pans, and a water surface free from oil film is continually presented to the incoming steam, and the grease is effectively removed. The oil and grease and other impurities collect in the lower part of the feed water heater, and will be drawn out through a suitable discharge pipe located at *o*. A draw off and clean out pipe may be connected at *o'*. The construction and operation of the grease separator are clearly set forth in another application for patent, filed in the United States Patent Office on or about April 3rd, 1913, Serial Number 758,574. The grease and other impurities are separated from the steam by said grease separator, and the steam and vapor freed from said impurities rise up through the feed water heater past the baffles, containers and pans, and finally pass out through the said steam outlet E, and meantime the feed water is raised to a high temperature as will immediately be described.

The quantity of feed water entering the apparatus by pipe *k* is regulated by the valve *m* controlled by a float *p* in the well known manner; and the water preferably first flows into the open-ended distributing trough *q*, over the ends of which it spills into the troughs Q—Q', which are arranged at right angles to said trough *q*, and are provided with serrated sides to properly

distribute the water into the pans R, as it drips from said troughs Q—Q'. Said troughs Q—Q' are supported on a bracket *r* supported from the shell.

There are preferably a number of pans, as R, S, arranged at different levels and generally similar to each other in construction, as will hereinafter be more fully described. Between the pans of different levels are baffles, the construction of which will be hereinafter more particularly described, and which, together with said pans, cause the steam and water vapor to take a zig-zag course up through the feed water separator and give up the greatest practical part of its heat to the feed water. By the aforesaid arrangement of pans and baffles, together with the container U, I produce a feed water heater of great heating efficiency.

Said pans, baffles and containers and troughs are of non-corrodible metal, such as cast iron, or copper, brass or other non-corrosive metals, since none of such parts are subjected to any considerable strains, and therefore do not require to be constructed of metals having great tensile strength. Said pans R, S are preferably made in the shape of segments concentric to said exhaust steam inlet pipe *d*, as is clearly indicated in Fig. 4, the several segments fitting around said pipe *d*, and being supported on a spider *t'*, which is supported in any suitable manner on said pipe E. Thus the segments of the pans can be easily removed through the manhole for cleaning and repairs. The peripheries of said segments are preferably serrated as shown to facilitate the equal drip of the water over all parts of said periphery, and there may be as many rows of pans as are necessary.

Below each said row of pans is arranged a baffle, as T and T', said baffles being each preferably composed of segmental plates, respectively supported on radial bars W, W', which are secured in said separator in any suitable manner, and said baffles are preferably arranged with a slight downward inclination inwardly to produce a drip of water from the inner ends of said baffles.

The consequence of the drip of the water over the serrated edges of the pans and the baffles, is that streams or films of dripping water come into contact with the ascending steam, and thereby the most effective absorption of the heat of the steam into the water is effected.

The efficiency of the apparatus is still further greatly increased by the container U. Said container is supported in any suitable manner, is an open topped annular vessel of non-corrodible metal and preferably arranged concentrically around said inlet pipe *d*, and in a position to receive the water as it drips down from said pans and baffles. Said container may be formed either as a single annular vessel, or as a plurality of communicating vessels, discharging through pipe *y* provided with a draw off valve *z*, and said pipe *y* communicates in the ordinary manner with float chamber *p'*. Said container is preferably arranged in the lower half of said feed water heater, but at a suitable distance above the grease separator, and so that the ascending steam will impart its heat to said container. In Fig. 1 said container is shown arranged quite near to said pipe *d* and so that the steam passes up around the outside of said container. But said container might be arranged near to the shell of the feed water heater, and so that the steam would ascend in contact with the inner side of said container.

The operation of my apparatus is as follows: The water entering by pipe *k* at the top of the feed water heater, and the exhaust steam entering the feed water heater from the lower end of pipe *d*, and the outlet for the steam being at the top of the feed water heater while the outlet for the water is much lower down, it follows that the water drips and flows, by reason of the baffles and pans, in a zig-zag course through all parts of the interior of the feed water heater and through steam which is rising through all parts of said feed water heater in a zig-zag course against the drip of the water. Thus a most intimate contact of the steam with the streams and films of water is effected, and a very high heating efficiency is attained. Moreover the heated dripping water is finally collected in said container U, which is in contact with the most highly heated steam, and the water in said container again absorbs much heat from the steam. The sides and bottom of said container therefore become heating, not cooling, surfaces in their effect on the temperature of the feed water, the steam is freed from its oil and other impurities by the action of the grease separator combined, as aforesaid, in the same apparatus with the feed water heating devices; and the final result is not only more efficient heating but purity of the feed water much beyond what can be obtained without the combination of my grease separating devices with my said feed water heating devices.

Now having described my improvements I claim as my invention:—

1. A feed water heater adapted to produce a balanced flow of steam and water in opposite directions throughout the interior of said feed water heater, the said feed water heater comprising an outer shell provided with a water supply and with a steam inlet extending substantially concentrically within said shell to a point substantially below the top of said shell, an outlet for steam at the top of said shell substantially concentric to said steam inlet, and a plurality of

alternating water pans and baffles concentric to said vessel and arranged with steam passages each of which are of uniform area around within said shell whereby there is produced a balanced flow of steam and water in opposite directions through all parts of said shell.

2. The combination in a feed water heater of a closed shell provided with an inlet for water at the top thereof and with an outlet for steam at the top of said shell, a steam inlet pipe entering into said shell to a point considerably below the top of said shell, a container for water at the lower end of said pipe, a plurality of trays at different levels along the course of said pipe and a plurality of baffles between said trays, said trays and baffles being adapted to direct the water into said container, whereby the steam ascends from the lower end of said pipe to said steam outlet around said trays and baffles through falling water.

3. A feed water heater comprising in combination; a closed shell adapted to resist high pressures and provided with a water inlet at the upper part and with a steam outlet at the upper part of said shell, a steam inlet pipe descending through the interior of said shell to a point considerably below the top of said shell and said steam outlet, a water container around the lower part of said pipe, having a discharge out through said shell, a distributing trough adapted to receive the water from said water inlet, a plurality of pans below said trough, and a plurality of baffles between the said pans, said baffles being staggered with respect to said pans, said pans and baffles being adapted to impart a zig-zag course to the steam ascending from the lower end of said steam inlet pipe to said steam outlet through streams of descending water.

Signed at New York city, in the county of New York and State of New York, this 27th day of July, A. D. 1914.

JAMES M. TAGGART.

Witnesses:
HERMAN J. RUBENSTEIN,
WALTER W. HARRIS.