B. T. BABBITT.
Steam-Boiler.

No. 203,986. Patented May 21, 1878.

Fig. 1.

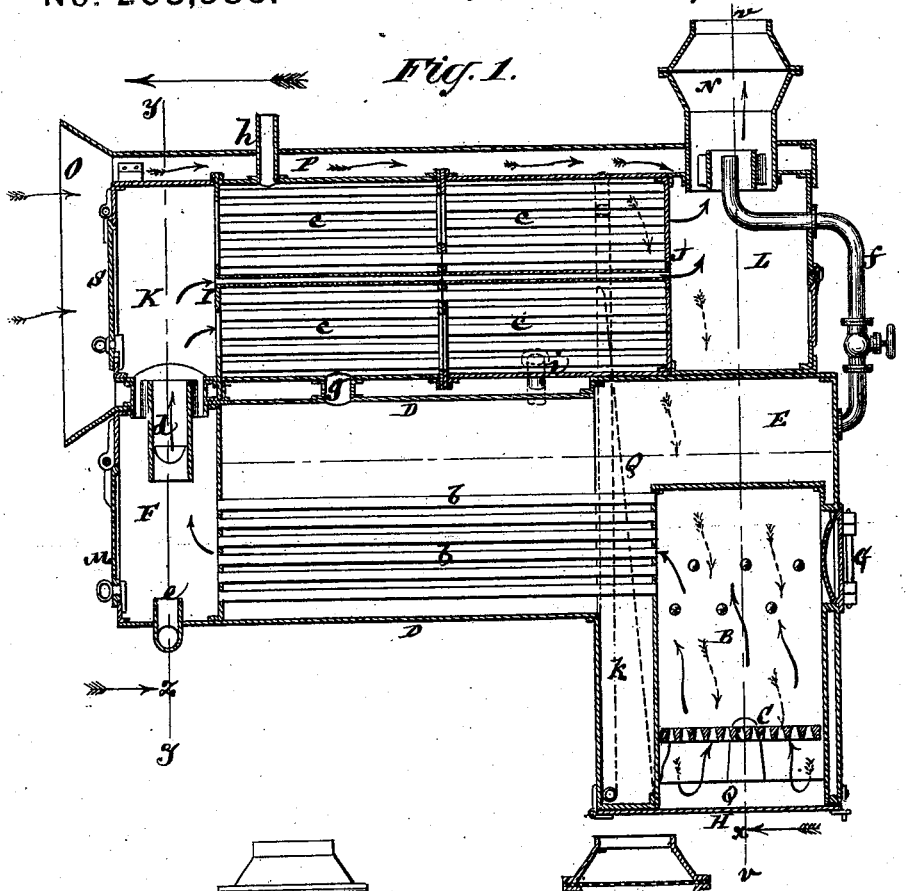


Fig. 3.

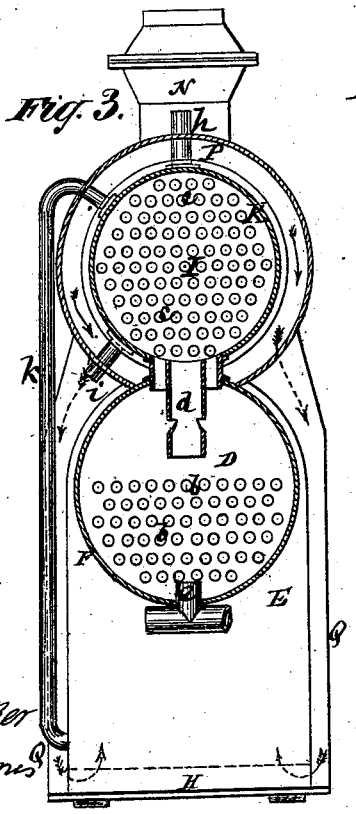
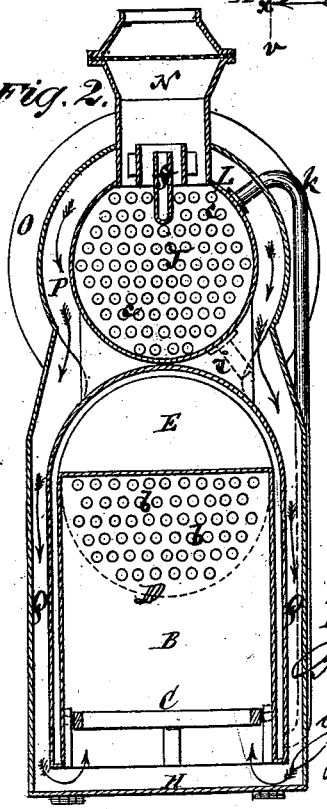


Fig. 2.



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UNITED STATES PATENT OFFICE.

BENJAMIN T. BABBITT, OF NEW YORK, N. Y.

IMPROVEMENT IN STEAM-BOILERS.

Specification forming part of Letters Patent No. **203,986**, dated May 21, 1878; application filed March 9, 1878.

To all whom it may concern:

Be it known that I, BENJAMIN T. BABBITT, of the city and State of New York, have invented certain new and useful Improvements in Steam-Boilers, of which the following is a description, reference being had to the accompanying drawing, forming part of this specification.

This invention relates to boilers of the locomotive type, to be used either for stationary or locomotive purposes, including its application, if desired, to engines of sea-going and other vessels.

The principal objects of the invention are to economize fuel by utilizing to an enlarged extent the heat derived from the escaping gaseous products of combustion; also, to superheat the steam and to produce a rapid generation thereof. Said invention may be readily applied to locomotive-boilers in present use, or as heretofore constructed, as well as to boilers of future and special construction.

The invention consists in a combination, with the fire-box and horizontal or approximately horizontal multitubular barrel or cylindrical body of the boiler, of a horizontal or approximately horizontal multitubular steam-superheater and a multitubular feed-water heater, both arranged over the barrel of the boiler, and in such communication therewith that the products of combustion pass through said superheater and feed-water heater in a reverse direction to their circulation through the tubes in the barrel or body of the boiler.

The invention likewise consists in a combination of the fire-box, multitubular barrel of the boiler, smoke-boxes at the end of the latter farthest removed from the fire, a multitubular steam superheater, and a multitubular feed-water heater, both arranged over the barrel of the boiler, and a smoke-box at the fire-box end of the boiler.

The invention likewise consists in a multitubular steam-superheater and feed-water heater having corresponding tubes, and arranged with the tubes of the one in line with the tubes of the other, whereby increased facility is afforded for cleaning the tubes of both of said heaters.

Furthermore, the invention consists in a combination, with a boiler of the locomotive type, having a multitubular superheater and multitubular feed-water heater arranged above it, of an air-heating jacket surrounding both said superheater and feed-water heater, and extending down the sides of the fire-box end of the boiler, and communicating with the fire-box for supplying the fire with heated air to maintain combustion.

Figure 1 of the drawing represents a longitudinal sectional elevation of a steam-boiler constructed in accordance with the invention. Fig. 2 is a transverse vertical section of the same on the line *v v*, looking in direction of the arrow *x;* and Fig. 3, a transverse vertical section thereof on the line *y y*, looking in the direction of the arrow *z*.

D is the multitubular barrel or cylindrical body of the boiler, and B its fire-box. E is the external shell of the fire-box or water-jacket thereof, and constituting a portion of the ordinary steam and water space of the boiler, the same extending above the fire-box, and being in free communication with one end of the barrel D, as in other locomotive-boilers. C is the grate of the fire-box, and *b b* the tubes of the boiler, connecting the fire-box with the smoke-box F at the opposite end of the boiler. The water-level in said boiler may stand at any suitable height above the crown-sheet of the fire-box, but below the top of the barrel D.

G is the fire-door, through which the fuel is supplied, and H is a door at the base of the ash-pit, which is kept closed, except when it is necessary to discharge the ashes. Arranged longitudinally over the barrel or body D of the boiler are a cylindrical multitubular steam-superheater, I, and a cylindrical multitubular feed-water heater, J, lying end to end one against the other. These structures I and J have corresponding longitudinal tubes *c*, arranged so that the tubes of the one are in line with the tubes of the other, and there may be the same number of tubes in both structures, whereby the cleaning of both sets of tubes is facilitated on opening a door, S, of a smoke-box, K, arranged over the smoke-box F. A similar door, M, applied to the smoke-box F, provides for cleaning out the tubes *b*. These two smoke-boxes F K virtually form but one box, being connected bv a duct, *d*, and

the lower one of the two being fitted with the usual blast-pipe *e*, for promoting the draft by the exhaust-steam of the engine.

L is a smoke-box at the fire-box end of the boiler, into which the gaseous products of combustion pass on their way to the chimney N, and to enter which said products are made to pass first through the tubes *b* in one direction, and subsequently through the tubes *c* in a reverse direction.

The chimney N may be furnished with a steam blow-pipe, *f*, in communication with the steam-space of the boiler at its fire-box end, for promoting the draft by the escape of live steam when required, or for providing for the escape of steam up the chimney when there is an excessive pressure in the boiler.

A neck, *g*, serves to connect the steam-space of the barrel or cylindrical body D of the boiler with the superheater I, from which latter the steam is supplied by a pipe, *h*, to work the engine or for any other purpose.

The water is fed to the boiler by or through an inlet-pipe, *i*, connected with the feed-water heater J at or near its bottom, and from said feed-water heater, at or near its top, a pipe, *k*, descends to near the bottom of the external shell or water-jacket E of the fire-box.

The air to feed the fire is introduced through a funnel, O, at the smoke-box end K of the boiler, and, passing along or through an air-heating jacket, P, surrounding the steam-superheater I and feed-water heater J, is conducted by passages Q on opposite sides of the fire-box end of the boiler, and forming a continuation or part of the jacket P to the ash-pit of the fire-box, thus supplying the fire with heated air, and thereby promoting combustion.

A boiler constructed as described largely economizes the consumption of fuel and utilizes the escaping gaseous products of combustion, both to the heating of the feed-water and the air supplied to the furnace of the boiler.

I claim—

1. The combination of the fire-box B, the multitubular barrel or body D, the smoke-boxes F K, the multitubular steam-superheater I, the multitubular feed-water heater J, and the smoke-box L, all arranged essentially as shown and described.

2. The multitubular steam-superheater I and feed-water heater J, having corresponding tubes, and arranged with the tubes of the one in line with the tubes of the other to facilitate the operation of cleaning them, substantially as specified.

3. The combination, with the multitubular superheater I, the feed-water heater J, both arranged above the body of the boiler, and the fire-box B of the latter, of an air-heating jacket, having an inlet-opening for the admission of fresh air at the end of the boiler farthest removed from the fire, also constructed to surround both the said superheater and said feed-water heater, likewise provided with one or more extensions down the fire-box end of the boiler, and terminating in an outlet or outlets within the fire-box below the grate, essentially as and for the purpose herein set forth.

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