F. O. STANLEY.

STEAM BOILER.

APPLICATION FILED JAN. 18, 1919.

1,342,606.

Patented June 8, 1920.

2 SHEETS—SHEET 1.

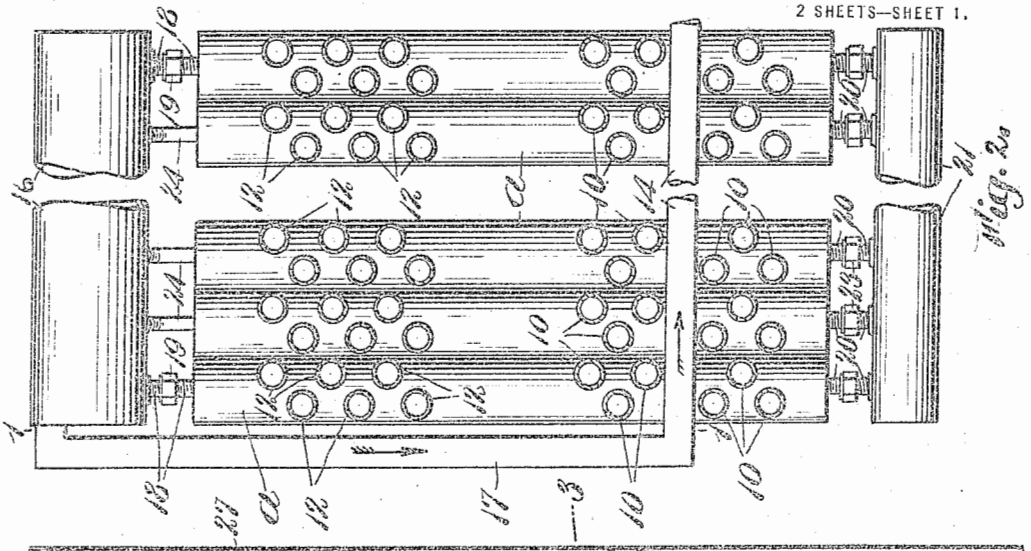

Fig. 2.

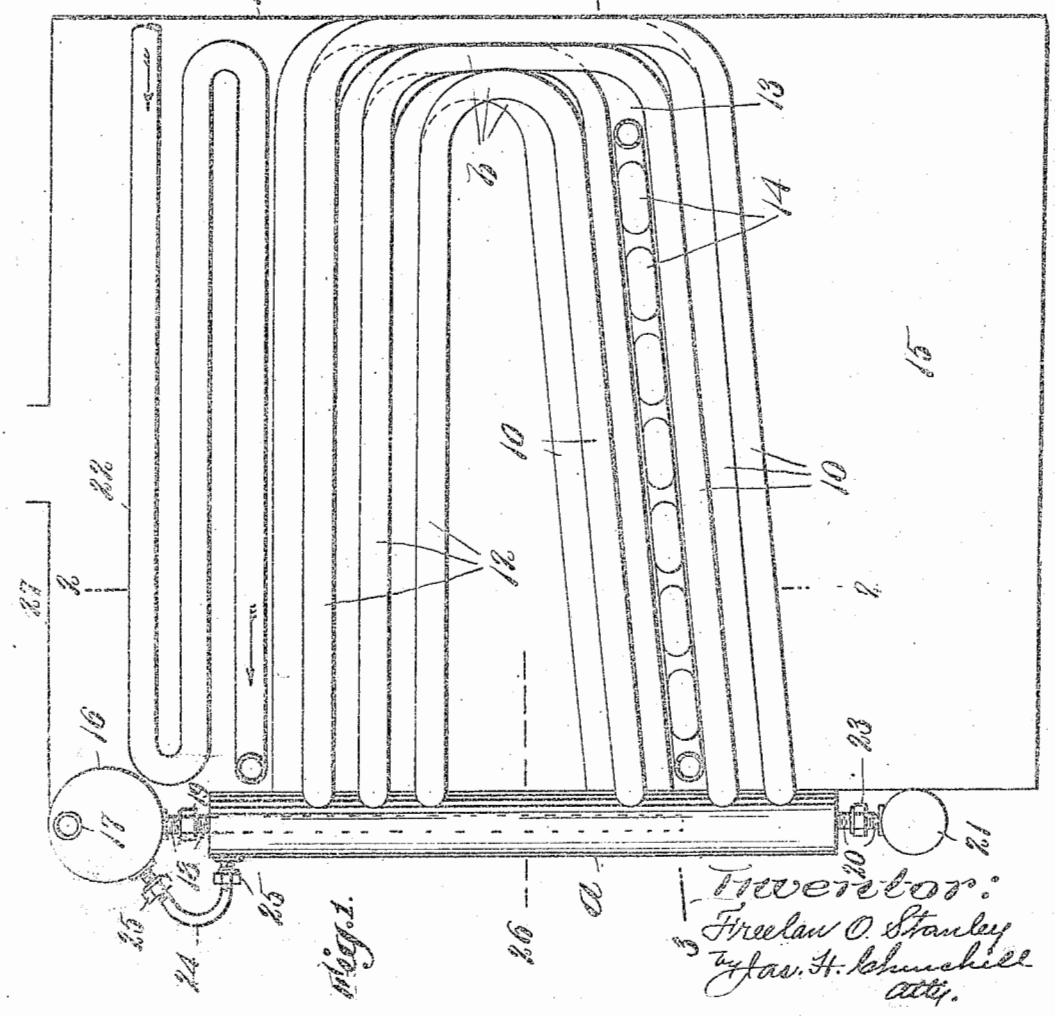

Fig. 1.

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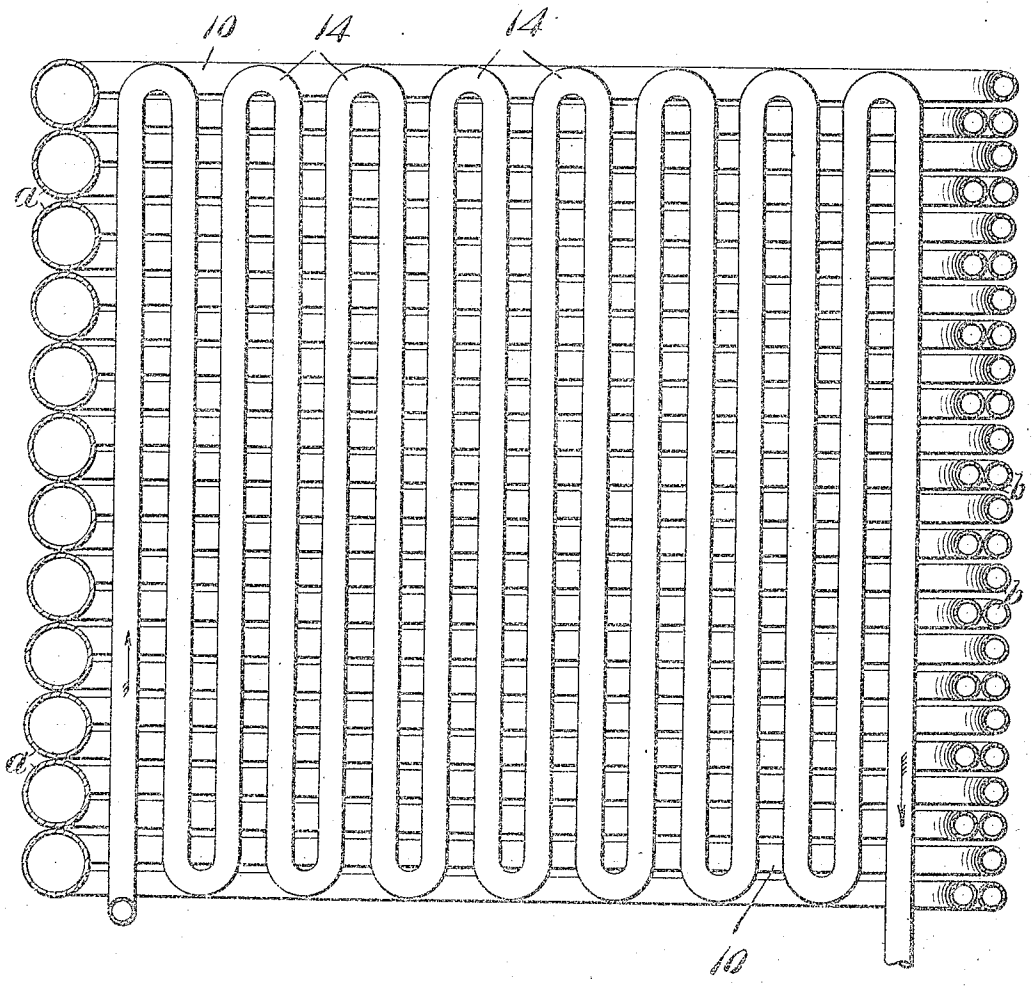
2 SHEETS—SHEET 2.

Fig. 3.



Inventor:
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UNITED STATES PATENT OFFICE.

FREELAN O. STANLEY, OF NEWTON, MASSACHUSETTS, ASSIGNOR TO UNIT RAILWAY CAR COMPANY, OF CAMBRIDGE, MASSACHUSETTS, A CORPORATION OF MASSACHUSETTS.

STEAM-BOILER.

1,342,606. Specification of Letters Patent. Patented June 8, 1920.

Application filed January 18, 1919. Serial No. 271,802.

To all whom it may concern:

Be it known that I, FREELAN O. STANLEY, a citizen of the United States, residing in Newton, in the county of Middlesex and State of Massachusetts, have invented an Improvement in Steam-Boilers, of which the following description, in connection with the accompanying drawings, is a specification, like characters on the drawings representing like parts.

This invention relates to a steam generator or boiler and has for its object to provide a boiler of increased efficiency and durability and one which can be constructed and maintained at a minimum expense.

To this end, the boiler is provided with a steam generating section, a steam drying section located above the steam generating section and communicating therewith, and a superheating section located below the steam drying section and above a portion of the steam generating section to be protected by the latter from the intense heat of the fire while being subjected to sufficient heat to superheat the steam therein.

The steam generating and drying sections may and preferably will be made as the legs of U-tubes, which are arranged in substantially vertical rows with the steam drying legs in each row above the steam generating legs, and with the ends of said U-tubes connected with a vertical header so as to form a detachable unit or section of the boiler. The steam generating legs of the units or sections of the boiler are connected with the vertical header so as to leave a space between predetermined legs for the reception of the superheating section of the boiler, which latter section may and preferably will be made in the form of a coil, whereby a predetermined area or amount of the steam generating section is interposed between the superheater and the fire in the fire box of the boiler, to protect the superheater from the intense heat of the fire and yet subject it to a sufficient heat to enable it to function in the proper or desired manner.

The vertical headers of the units or sections are detachably connected with a steam drum located above them and with a water leg or drum located below them, and the boiler may and preferably will be provided with an economizing section which is located above the steam drying sections of the units and is connected with the water leg.

These and other features of this invention will be pointed out in the claims at the end of this specification.

Figure 1 is a vertical section of one form of boiler embodying this invention, the section being taken on the line 1—1, Fig. 2.

Fig. 2, a vertical section of the boiler shown in Fig. 1, taken on the line 2—2, with the economizing coil omitted, and

Fig. 3, a horizontal section on the line 3—3, Fig. 1, to show the superheater.

The boiler herein shown as embodying the invention is composed of a plurality of units or sections, arranged side by side and each comprising a vertically arranged header *a* and a plurality of bent tubes *b*, which are vertically arranged in rows and are welded or otherwise connected at their opposite ends to the header *a*.

The tubes *b* are bent substantially into the form of U-tubes, and the lower legs 10 are filled with water and constitute the steam generating section of the boiler, while the upper legs 12 contain steam and some water and constitute the steam drying section of the boiler.

In the present instance, each vertical header *a* has connected with it two rows of tubes *b*, with the tubes in one vertical row staggered with relation to the tubes in the other vertical row, and with some of the steam generating legs 10 arranged to form a space 13 between corresponding legs of all the sections or units of the boiler, for the reception of a superheater preferably in the form *a* of a coil 14, which is arranged transversely with relation to the tubes *b*.

In the present instance, the tubes *b* have the steam generating legs arranged so that the superheater 14 is located above two water legs of the tubes in one vertical row and above one water leg of the tubes in the other vertical row attached to each header, and as a result the superheater 14 is protected from the fierce heat of the fire in the fire box 15, while leaving the same exposed to sufficient heat to properly superheat the steam without danger of burning out the superheater with a high temperature in the fire box.

It will be understood that the superheater may be located with relation to the steam

generating section of the boiler so as to have a greater or less number of the water legs 10 between it and the fire box, according to the temperature it is desired to carry in the steam. By thus protecting the superheater, the latter can be positioned in proximity to the fire in the fire box so as to obtain a superheater of maximum efficiency, while providing for long life of the same.

The superheater 14 is supplied with steam from a steam drum 16 by the pipe 17, and the said drum is located above the headers *a* into which extend pipes 18 leading from the steam drum. The pipes 18 extend to near the bottom of the headers of the end sections and serve to return thereto any water which may accumulate in the steam drum, and said pipes are provided with unions or couplings 19 by which the headers may be detached from the steam drum.

The headers *a* are detachably connected by pipes 20 with a water leg or mud drum 21 located below them, and with which may and preferably will be connected the outlet end of a coil of pipes 22 located above the water drying section 12 of the boiler.

The pipes 20 are provided with couplings 23. The headers *a* between the end headers are detachably connected with the steam drum 16 by pipes 24 through which the steam passes from the upper part of the headers into the steam drum. The pipes 24 are also provided with unions or couplings 25.

The water fed to the boiler passes through the economizing coil 22 into the water leg 21 and then into the headers *a*, rising therein to about the line 26 so as to fill the lower legs of the tubes *b*. The water in the water legs 10 is converted into steam by the fire in the fire box, and the steam thus generated passes through the upper legs 12 of the tubes *b* into the headers above the level of the water therein, and thence passes through the pipes 24 into the steam drum, from which it passes by pipe 17 into and through the superheater 14 to the place where it is to be used.

Each unit or section of the boiler may be cut out of service in case of accident, without interfering with the service of the remaining units of the boiler, as it is only necessary to uncouple the header from the steam drum and water leg and plug up the ends of the pipe 18 leading from the steam drum 16 and of the pipe 20 leading from the water leg.

The fire box 15 may be formed by a suitable casing 27 within which the sectional boiler is located.

In the present instance I have shown one form of boiler embodying the invention, but it is not desired to limit the invention to the particular embodiment shown.

Claims:

1. In a steam generator or boiler, in combination, a plurality of sections arranged side by side and comprising upright headers and a plurality of substantially vertically arranged rows of U-shaped tubes having their ends connected with said headers, with the tubes in adjacent rows in staggered relation and having the lower legs of some of said tubes spaced apart to form a substantially horizontal space, a steam drum located above said vertical headers and extended transversely with relation to said sections, pipe connections between said headers and the steam drum for the passage of steam from the headers into said steam drum, water outlet pipes detachably connected with said steam drum and extended into some of said headers to near the lower ends thereof, a superheating coil extended transversely with relation to said sections in said substantially horizontal space and connected with the steam drum to receive steam therefrom, a water drum located below said headers and extended transversely with relation to said sections, pipe connections for detachably connecting said headers with said water drum, and an economizer coil located above the tubes of said sections and connected with said water drum to feed water thereto

2. In a steam generator or boiler, in combination, a plurality of sections arranged side by side and comprising upright headers and a plurality of bent tubes vertically arranged and having their ends connected with said headers, with the lower legs of some of said tubes spaced apart to form a substantially horizontal space extended transversely with relation to said sections, a steam drum located above said vertical headers and extended transversely with relation to said sections, pipe connections between the said headers and the steam drum for the passage of steam from the headers into said steam drum, a water outlet pipe detachably connected with said steam drum and extended into one of said headers to return water from the steam drum to said headers, a superheater extended transversely with relation to said sections in said substantially horizontal space and connected with said steam drum to receive steam therefrom, a water drum located below said headers and extended transversely with relation to said sections, and pipe connections for detachably connecting said headers with said water drum.

3. In a steam generator or boiler, in combination, a plurality of sections arranged side by side and comprising upright headers and a plurality of bent tubes vertically arranged and having their ends connected with said headers, with the lower legs of

some of said tubes spaced apart to form a substantially horizontal space extended transversely with relation to said sections, a steam drum located above said vertical headers and extended transversely with relation to said sections, pipe connections between the said headers and the steam drum for the passage of steam from the headers into said steam drum, a water outlet pipe detachably connected with said steam drum and extended into one of said headers to return water from the steam drum to said headers, a superheater extended transversely with relation to said sections in said substantially horizontal space and connected with said steam drum to receive steam therefrom, a water drum located below said headers and extended transversely with relation to said sections, pipe connections for detachably connecting said headers with said water drum, and an economizer coil located above said bent tubes and connected with said water drum to feed water thereto.

4. In a steam generator or boiler, in combination, a plurality of sections arranged side by side and comprising upright headers and a plurality of bent tubes vertically arranged and having their ends connected with said headers, with the lower legs of some of said tubes spaced apart to form a substantially horizontal space extended transversely with relation to said sections, a steam drum located above said vertical headers and extended transversely with relation to said sections, pipe connections between the said headers and the steam drum for the passage of steam from the headers into said steam drum, a water outlet pipe detachably connected with said steam drum and extended into one of said headers to return water from the steam drum to said headers, a superheater extended transversely with relation to said sections in said substantially horizontal space and connected with said steam drum to receive steam therefrom, and means detachably connected with said headers for supplying water thereto.

5. In a steam generator or boiler, in combination, a plurality of sections arranged side by side and comprising upright headers and a plurality of substantially vertical rows of tubes connected with said headers and comprising upper and lower communicating tubes, a steam drum located above the level of the uppermost of said tubes and extended transversely with relation to said sections, pipe connections between said headers and said steam drum for the passage of steam from the headers into said steam drum, a water outlet pipe connecting said steam drum with one of said headers to return water from the steam drum to said headers, a superheater extended transversely with relation to said sections between predetermined tubes of said vertical rows, and a water drum detachably connected with the lower end of said headers.

In testimony whereof I have signed my name to this specification.

FREELAN O. STANLEY.