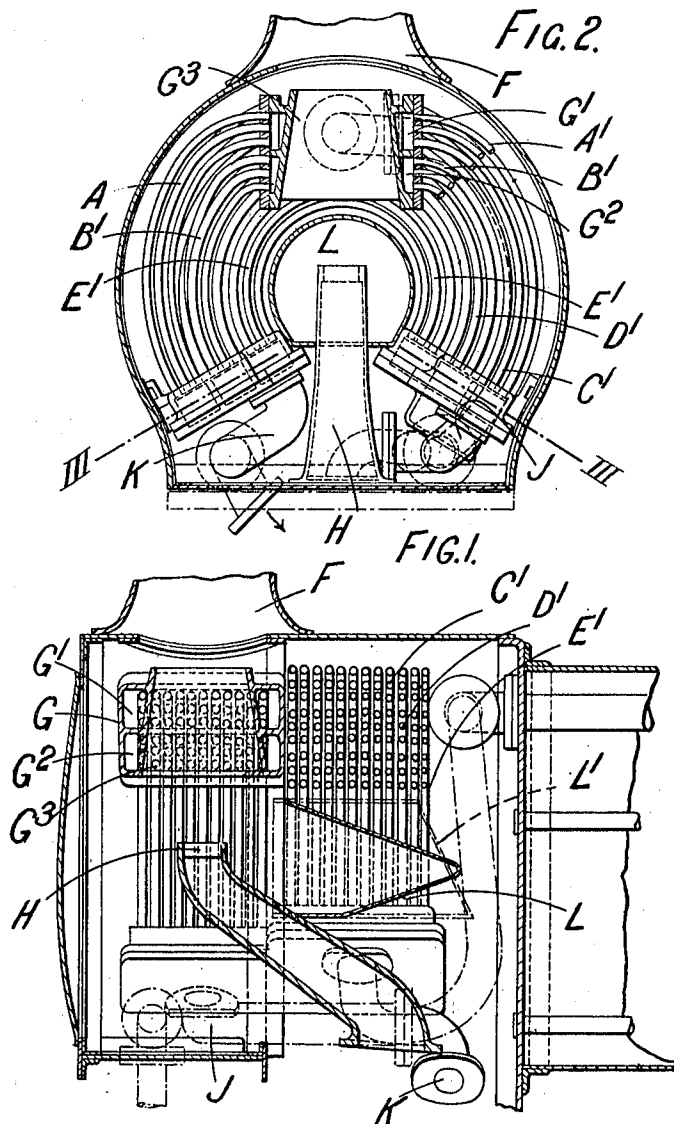


2 SHEETS--SHEET 1.



Witnesses
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SUPERHEATER.
APPLICATION FILED JULY 11, 1910.

984,294.

Patented Feb. 14, 1911.

2 SHEETS—SHEET 2.

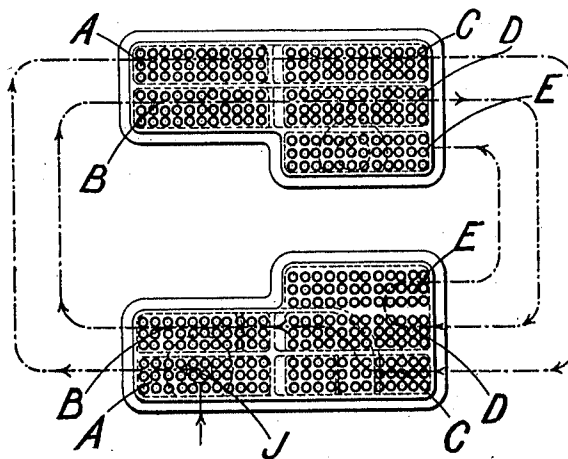


FIG. 3.

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UNITED STATES PATENT OFFICE.

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SUPERHEATER.

984,294.

Specification of Letters Patent.

Patented Feb. 14, 1911.

Application filed July 11, 1910. Serial No. 571,535.

To all whom it may concern:

Be it known that I, WILLIAM FRANK PETTIGREW, subject of the King of England, residing at Risedale, Abbey Road, Barrow-in-Furness, Lancashire, England, have invented certain new and useful Improvements in Superheaters, of which the following is a specification.

This invention relates to superheaters for locomotive and similar steam generators of the type wherein groups of tubes connect in series separate chambers or steam headers arranged within the smoke box on either side thereof.

The object of this invention is to provide an improved superheater of this type which will be of simple construction and capable of being applied to existing generators.

According to this invention the superheater tubes which communicate with the steam headers or chambers on either side of the smoke box are connected by an intermediate chamber disposed between the blast pipe and chimney and having a central passage, which is preferably conical, for the products of combustion, around which passage steam from one side steam header passes to the tubes connected to the steam header on the other side of the smoke box. The heat of the exhaust gases is thus utilized without the draft being in any way impaired. The groups of tubes, which are bent to the contour of the smoke box, are preferably arranged in such a manner that the steam enters the tubes in the coldest part of the smoke box first, and is only delivered to the cylinders after having been led through the whole series of tubes and steam headers or chambers, the last series of tubes being in the hottest part of the smoke box. In most cases baffles are provided within the smoke box which compel the products of combustion to circulate around all the superheater tubes.

A construction of superheater in accordance with this invention is hereafter described with reference to the accompanying drawings, in which—

Figure 1 is a vertical sectional side elevation, Fig. 2 a front elevation also in section, and Fig. 3 a section on the line 3—3 of Fig. 2.

The smoke box is somewhat larger than usual and has a steam header or chamber provided in the lower part thereof on either side, these steam headers being arranged in a direction parallel to the length of the boiler. Each steam header is divided by longitudinal and transverse partitions or otherwise formed into a series of distinct chambers or headers, and in the present instance each steam header comprises two fore chambers A, B arranged in front of and adjacent to three rear chambers C, D, E. Each individual chamber or header is provided with a series or group of superheater tubes A', B', C', D', E', the ends of which are expanded into the heads of the chambers and which are bent to the contour of the smoke box. Since the tubes A', B', from the fore chambers or headers A and B would interfere with the escape of the exhaust gases through the chimney F, an intermediate chamber G divided into two superimposed chambers G', G², and having a central conical passage G³ is provided below the chimney F and above the blast pipe H. The superheater tubes A', B', are expanded into the outer wall of the chamber G, the two halves G' and G² of which serve to connect the tubes A' and B' from the chambers or headers A and B, on one side of the smoke box, with the tubes A', B' from the chambers on the other side thereof, since the steam in the tubes A' and B' passes through the chambers G' and G² respectively around the conical passage G³ through which the exhaust steam escapes.

Steam from the generator enters the lowest part of the chamber A through an inlet J and passes through the tubes A', chamber G' to the other chamber A on the opposite side of the smoke box. From this chamber it flows through a suitable conduit into the adjacent chamber C, thence through the tubes C' to the opposite chamber C and therefrom through a conduit to the adjoining inner fore chamber B. From the chamber B this steam, which has now been superheated to a certain extent, flows through the tubes B' and chamber G² into the opposite chamber B, and from this chamber into the adjoining intermediate rear chamber D. From the last said chamber D steam passes by the

tubes D' to the chamber D on the opposite side of the smoke box, then through the adjacent innermost, rear chamber E and, after flowing through the tubes E' and the innermost rear chamber E on the opposite side of the fire box, is admitted to the cylinder through a discharge pipe K. It will thus be seen that the steam enters the superheater at the coldest part thereof, and, after passing successively around the first or outer groups of tubes, enters the intermediate groups and finally the innermost groups which are situated in the hottest part of the smoke box. It is therefore only after it has passed through the whole series of tubes that the steam is finally admitted through the last chamber E to the cylinders.

In the construction shown a conical baffle L is arranged within the smoke box concentric with the group of tubes E', this baffle compelling the waste gases from the fire box to circulate around and between all the superheater tubes which are sufficiently spaced to enable the products of combustion to pass between them. If desired, however, other forms of baffles—such as that shown in dotted lines at L'—producing the desired effect may be used.

It will be understood that though described and illustrated as applied to the steam generator of a locomotive, the superheater according to this invention may be employed with other generators of the locomotive type, *i. e.*, to generators of the kind wherein fire tubes terminate in a smoke box into which the exhaust steam is also discharged from a blast pipe. Moreover the particular type of steam headers, the number of chambers and groups of tubes may vary to suit particular requirements without departing from this invention. Further, the manner in which the compartments of each steam drum or the other distinct chambers are connected may be varied as found convenient.

What I claim as my invention and desire to secure by Letters Patent is:—

1. In a steam generator of the locomotive type the combination of steam headers mounted within the smoke-box on opposite sides thereof, a chamber intermediate of the steam headers disposed between the blast pipe and chimney and having a central passage for the products of combustion, and superheater tubes bent to the inner contour of the smoke box connecting the intermediate chamber with the steam headers in such a manner that steam can flow from one steam header through said intermediate chamber to the other header as set forth.

2. In a steam generator of the locomotive type the combination of a plurality of steam headers mounted within the smoke box on

either side thereof, a chamber intermediate of the said steam headers disposed between the blast pipe and chimney and surrounding a central passage for the products of combustion such chamber being divided into separate compartments, and superheater tubes, arranged in groups bent to the inner contour of the smoke box, connecting said compartments with steam headers on opposite sides of the fire box and connecting the said headers in series with one another as set forth.

3. In a steam generator of the locomotive type the combination with steam headers mounted within the smoke box on opposite sides thereof, a chamber intermediate of said headers disposed between the blast pipe and chimney and having a central passage for the products of combustion, concentric superheater tubes bent to the inner contour of the smoke box connecting the intermediate chamber with the headers in such a manner that steam is caused to flow from one of said headers through said chamber to the other of said headers and a cylindrical baffle having a closed end concentric with the tubes compelling the products of combustion to flow between and around said tubes as set forth.

4. In a steam generator of the locomotive type, the combination of two steam headers arranged on opposite sides of a smoke box and each comprising a plurality of sections, a chamber arranged in the space between said headers and provided with a central passage for products of combustion, superheater tubes, bent to conform to the inner contour of the smoke box, connecting the forward sections of both the steam headers with said chamber, superheater tubes connecting a rear section of one of said headers with a corresponding section of the other said header, and connections independent of the superheater tubes between the front and rear sections of each steam header, for the purpose described.

5. In a steam generator of the locomotive type, the combination of two steam headers arranged on opposite sides of a smoke box and each comprising a plurality of sections, a chamber arranged in the space between said headers and provided with a central passage for products of combustion, a partition dividing said chamber into two compartments, superheater tubes connecting one of said compartments with a forward section of each of said headers, whereby steam will be caused to pass from a header at one side of the smoke box through said compartment to the opposite header, superheater tubes connecting a rear section of each steam header with a corresponding section of the other said header, additional superheater

tubes connecting the other compartment of said chamber with other sections of each steam header, and direct connections between the sections of each steam header which are
5 connected respectively with different groups of superheater tubes, for the purpose described.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

WILLIAM FRANK PETTIGREW.

Witnesses:

EDWARD SYLVESTER FINNESEY,
WILLIAM JAMES DREW.