

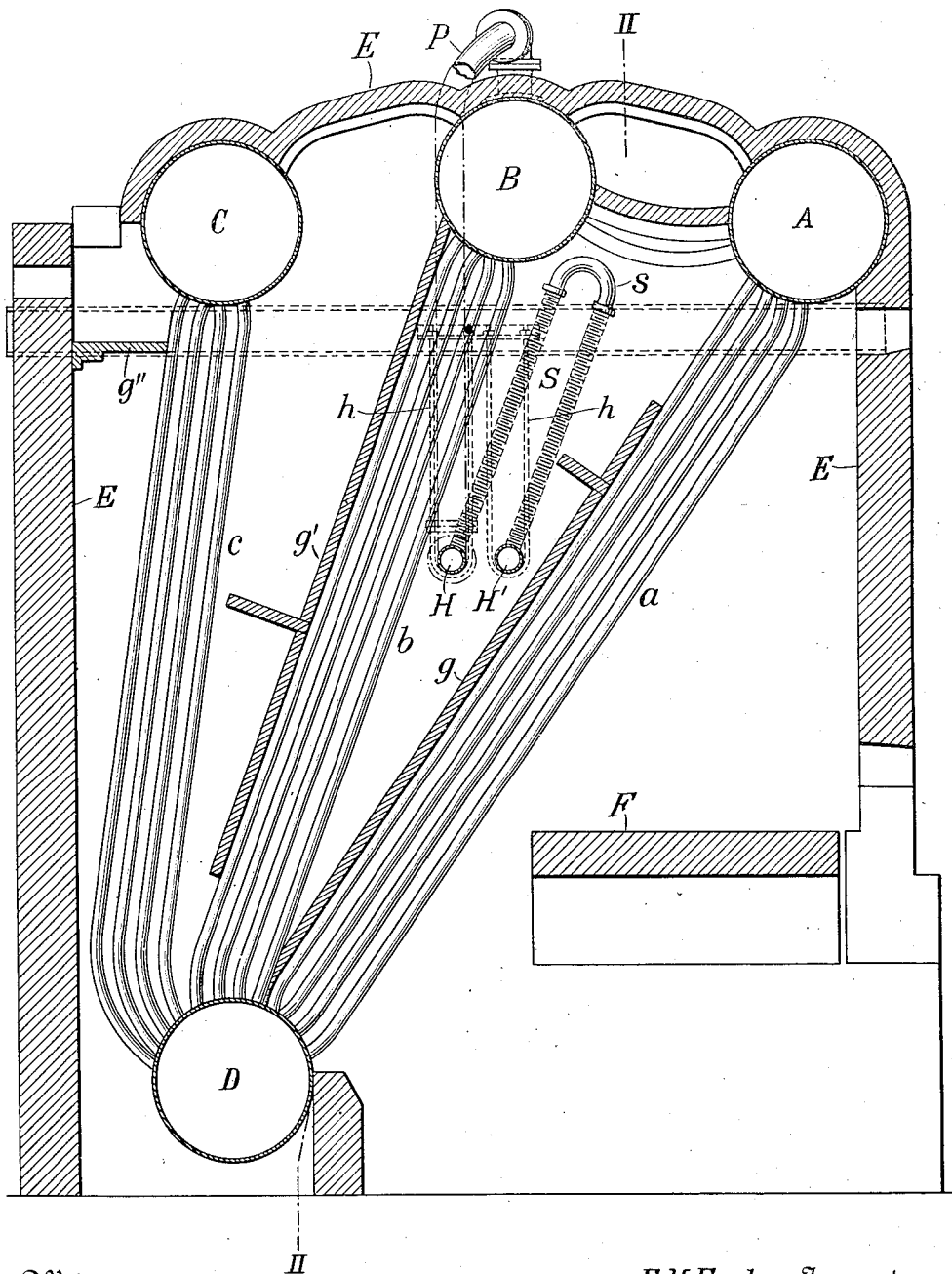
E. H. FOSTER.
STEAM SUPERHEATER.
APPLICATION FILED MAY 15, 1907.

1,064,309.

Patented June 10, 1913.

2 SHEETS—SHEET 1.

Fig. 1



Witnesses:
Raphael Ketter
S. Dunham

E.H. Foster, Inventor
By his Attorneys
Kerr, Page & Cooper

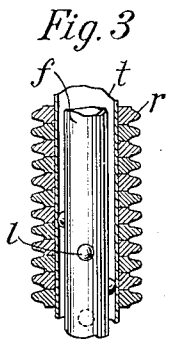
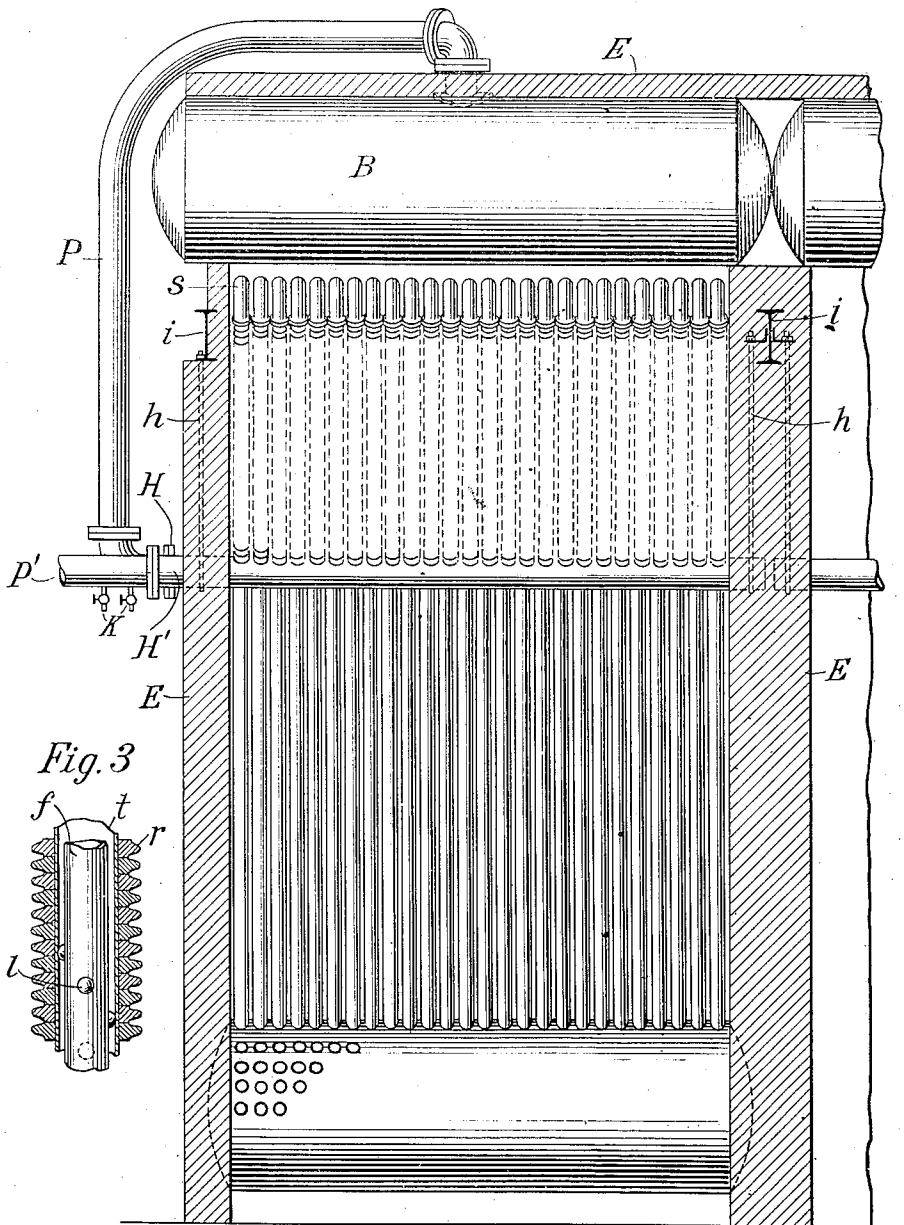
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2 SHEETS-SHEET 2.

Fig. 2



Witnesses:
Raphael better
A. S. Dunham

E. H. Foster, Inventor
By his Attorneys
Wm. B. & Cooper

UNITED STATES PATENT OFFICE.

ERNEST H. FOSTER, OF NEW YORK, N. Y.

STEAM-SUPERHEATER.

1,064,309.

Specification of Letters Patent.

Patented June 10, 1913.

Application filed May 15, 1907. Serial No. 373,755.

To all whom it may concern:

Be it known that I, ERNEST H. FOSTER, a citizen of the United States, residing at New York, in the county and State of New York, have invented certain new and useful Improvements in Steam-Superheaters, of which the following is a specification, reference being had to the drawings, which accompany and form a part of the same.

The invention which forms the subject of my present application for Letters Patent pertains to boilers of the so-called "vertical tube" class, of which the well known Stirling boiler may be regarded as typical, and consists in the combination with such a boiler of a U-tube superheater supported within the heating chamber in a novel manner.

In arranging a superheater of this kind in connection with a boiler, it is desirable to utilize the boiler heating chamber of the setting as the location of the superheater, the latter thereby receiving heat from the gases which also heat the boiler. In such cases, however, some means of support for the superheater must be, of course, provided, and this presents serious practical difficulties in connection with boilers of the Stirling type, mainly by reason of the width of the boiler setting.

It is obviously desirable that the superheater be maintained in fixed relation to the boiler itself, but the destructive effect of the hot gases on any ordinary supports for the purpose introduced into the path of the furnace gases, renders their employment objectionable. Furthermore, such supports would have nothing to rest on, but the heating surface of the boiler, an arrangement which is seriously inconvenient because of the increased difficulty of removing boiler tubes when necessary, and because of the need of strengthening parts which are not intended to carry weights. To avoid these and other objections incident to supporting the superheaters from the heating surface of the boiler, various expedients have been resorted to. In some instances the headers have been supported or embedded in the walls of the furnace chamber, the tubes projecting laterally from such headers into spaces between the banks of boiler tubes, as shown in the U. S. patent to Sneddon, No. 716,297; or vertically from the headers, as shown in British patent to McPhail, No. 20,057 of 1900. Another plan has been to arrange

the headers horizontally above the boiler and extend the tubes downwardly into the heating chamber. In these arrangements the headers are readily accessible for inspection, repairs, etc.,—a feature demanded by practical considerations,—but this advantage is more than offset by decrease of efficiency due to the fact that the headers are not utilized for heating purposes.

My present invention provides a plan whereby the entire superheater, while located, as in other types of boiler, entirely within the boiler heating chamber, is so supported therein in fixed relation to the boiler, as to overcome all of the objections noted above. According to this plan the headers themselves and to which the superheater tubes are connected, serve as the superheater supports, thus avoiding the employment of special supporting devices, which would be injured by the high temperature to which they must of necessity be subjected. Practically the entire space available within the boiler heating chamber thus be utilized for superheating purposes, and the superheater can be drained with the utmost facility.

The nature of the invention by which the above advantages, among others, are secured, will be more readily understood in connection with the accompanying drawings, in which is illustrated the preferred arrangement and construction of a superheater for a common type of vertical tube boiler.

Figure 1 is a central longitudinal section through the boiler and setting, showing the superheater in position. Fig. 2 is a transverse section, substantially on line II—II showing one section and part of another of a battery of boilers. Fig. 3 is a detail sectional view showing the preferred type of superheater element employed.

Figs. 1 and 2 of the drawing will be seen to be the conventional illustration of the well known Stirling boiler constructed and supported in the usual and well known manner. The boiler comprises three upper or steam drums A, B and C connected with a lower water drum D by front, middle and rear groups or banks of water tubes designated by *a*, *b*, and *c*, respectively, all located within the boiler heating chamber formed by the usual setting E. These banks of tubes are in series, as regards the passage of the furnace gases, that is, the gases flow

over the banks in succession. The grate, not shown, is below the arched furnace top F. At the rear of the banks of tubes *a* and *b*, are baffles *z*, *z'*, *z''*, the first extending upward from drum D, the second downward from drum B, and the third rearwardly from bank *c* to the rear wall of the setting, so that the hot gases, issuing from the rear of the furnace will be directed against the boiler elements in the most effective manner for heating the latter.

The superheater is shown at S, and is located within the setting, near the top of the heating chamber and between the first and second banks of tubes *a* and *b*, and extends transversely across the space between said banks. The superheater is one of the kind well known in the art as a U-tube superheater, and consists of a plurality of U-shaped tubes or elements *s*, connected at their ends with inlet and outlet headers H and H', respectively, and extending upwardly from the same. The headers are, in turn, connected with the boiler and with the service steam pipe, respectively, in the ordinary way, that is to say, the headers project through the wall of the setting at one side of the boiler, as shown in Fig. 2, and are connected by a pipe P to the middle drum B, and to the service main, not shown, by a pipe P'. The headers are supported by U-shaped hangers *h*, preferably embedded in the brick-work of the setting and depending from the metal I-beams *i'*, which in the boiler settings of this kind extend transversely to and are supported immediately under the drums A and C, and are shown, in Fig. 1, one partially inclosed by a side wall of the setting and the other wholly inclosed by the partition wall between the two sets of the battery of boilers. These I-beams, as shown by the conventional illustration adopted and as is well known, constitute a rigid means upon which the boiler may be supported, so that the superheater may thus be maintained in fixed relation to the boiler, with the result that there is no relative movement between the two which would cause the joints of the steam supply pipe P to be impaired.

Any approved type of superheater tubes may be employed, but I prefer that shown in Fig. 3. In that form a steel foundation tube *t* is employed, covered with metal rings *r*, preferably tapered and of cast iron shrunk in place, forming a covering which effectively protects the foundation tube. The corrugations produced by the rings largely

increase the total heating surface, while the relatively large amount of metal, holding as it does, a large amount of heat, presents sudden cooling of the superheater and thus insures, within certain limits, a more or less constant degree of superheat. Inside the tube *t* is a filler *f*, maintained centrally in the tube by any suitable means, as for example, the lugs or bosses *l*, arranged spirally on the filler, the latter is closed at one or both sides (not shown), so that the steam is confined to the annular passage around the same. The surface of the steam exposed to the heat is thus made very large relative to its volume.

What I claim as my invention is:—

1. The combination with a water tube boiler of the vertical type, and the boiler setting including vertical walls, of metallic hangers embedded in said walls, oppositely disposed horizontal headers having end portions entering said walls and hung in said hangers, and vertically extending U-shaped superheater tubes connected to the respective headers and extending upwardly therefrom.

2. The combination with a water tube boiler of the vertical tube type, and the boiler setting including vertical walls, of metallic beams embedded in said walls, hangers depending from said beams, horizontal headers having end portions entering the walls and hung in said hangers, vertically extending U-shaped superheater tubes connected to the respective headers, and extending upwardly therefrom, said headers and tubes being directly in the path of the furnace gases.

3. The combination with a Stirling boiler as herein described, comprising upper drums A, B, and C, a lower drum D connected by water tubes arranged in a plurality of banks, and a setting E, of metal beams *i* in the walls of the setting and extending transversely to and immediately beneath the upper drums A and C of a superheater located within the boiler setting, comprising headers arranged horizontally and transversely in the path of the furnace gases, and upwardly extending superheating tubes connecting the headers, hangers depending from the said beams *i* and supporting the headers, and means for conveying steam from an upper drum to one of the headers.

ERNEST H. FOSTER.

Witnesses:

S. S. DUNHAM,
M. LAWSON DYER.