

J. H. MEISSNER.

SUPERHEATER.

APPLICATION FILED JUNE 14, 1907.

899,060.

Patented Sept. 22, 1908.

2 SHEETS-SHEET 1.

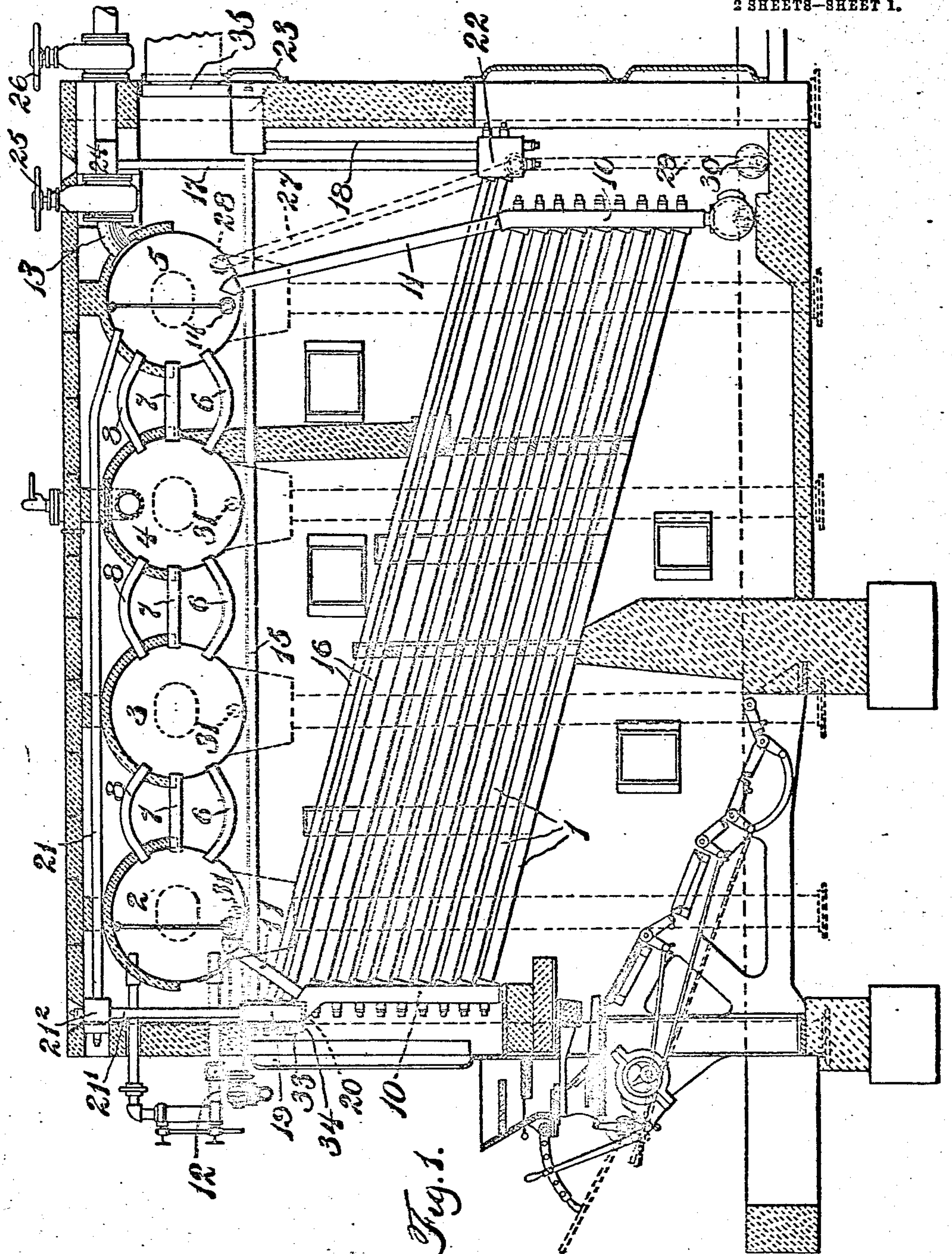


Fig. 1.

WITNESSES

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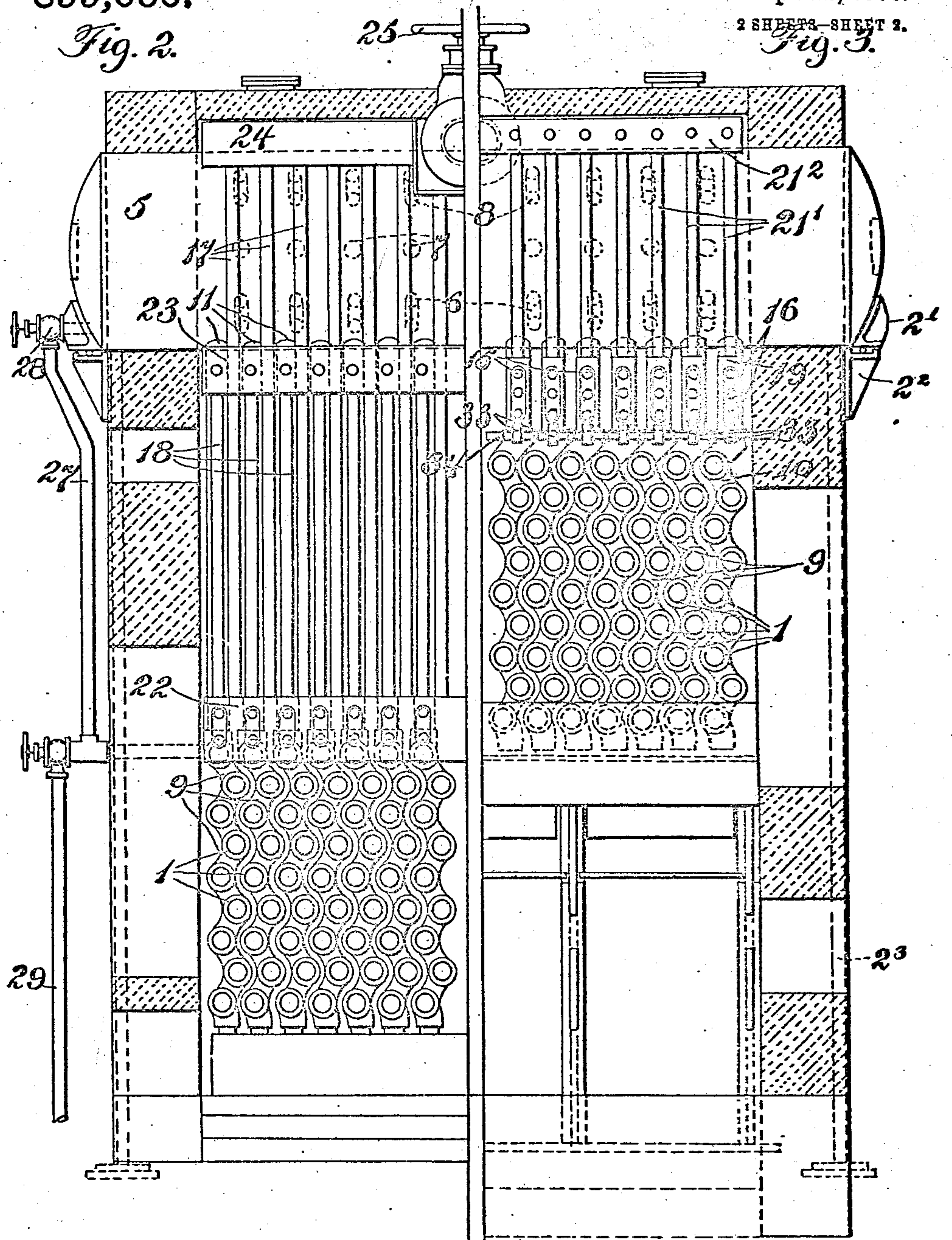
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Fig. 2.

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UNITED STATES PATENT OFFICE.

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SUPERHEATER.

No 899,060.

Specification of Letters Patent.

Patented Sept. 22, 1908.

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To all whom it may concern:

Be it known that I, JULIUS H. MEISSNER, a citizen of the United States, residing at Pittsburg, in the county of Allegheny and State of Pennsylvania, have invented certain new and useful Improvements in Superheaters, of which the following is a specification.

My invention relates to superheaters for water tube boilers, and has for its objects: the provision of a superheater having a free circulation of water and steam; the provision of a superheater wherein the tubes are straight and easily accessible and removable; and the provision of a superheating means adapted to be filled with water and serve as a generator, and in which an effective circulation of water is secured and in which the use of a system of directing valves is avoided. One embodiment of the invention is illustrated in the accompanying drawings, wherein:—

Figure 1 is a combined side elevation and longitudinal section through my improved water tube boiler,

Figure 2 is an enlarged rear elevation of one half of the boiler, the rear casing being broken away to more clearly disclose the parts, and

Figure 3 is an enlarged front elevation of one half of the boiler, the front casing being broken away to more clearly disclose the parts.

Briefly stated, the boiler comprises an upper portion composed of a series of cross shells, connected in series by water and steam tubes of less length than the diameter of the shells, which shells rest on upright stands free of the walls, and a lower portion composed of inclined tubes having headers connected to the cross shells by inclined rising tubes. The cross shells lie between the headers, thus permitting them to be arranged low down and close to the inclined tubes. Referring now to the drawing, 1 are the inclined tubes, and 2, 3, 4 and 5 are the cross shells or drums, which latter communicate with each other by means of the tubes 6, 7 and 8, the tubes 6 being below the water line, the tubes 8 being above the water line, and the tubes 7 being at the normal water line. Referring to Figures 2 and 3, it will be seen that the tubes 1 are arranged in the usual manner in a series of vertical sets, with the members of each of the sets staggered with relation to the adjacent tubes in the same sets. Each of the ver-

tical sets terminate in a separate casting 9, which castings taken together constitute the headers 10, which is a common construction in the art. Each of the sectional castings 9 is connected to one of the end drums by means of a pipe 11, it being understood that the front and rear headers are substantially the same, with the exception that the front header carries an additional receptacle at the top, to be more particularly described hereafter. The boiler is supplied with a feed water inlet 12 to the drum 2, and a main steam outlet 13 from the drum 5, together with the other usual boiler accessories, which need not be described. The ends of the drums 2, 3, 4 and 5 are provided with supporting lugs 2' which rest on saddles 2" secured to the vertical beams 2³ (Fig. 2). The water in the drum 5 from which the steam is taken is much quieter than in the longitudinal drums, as the water rising through the front tubes 11 and progressing rearwardly through the drums 3, 4, and 5 is retarded and loses its violent motion so that very dry steam is assured in the rear drum. The vertical beam 2³ in addition to supporting the drums free from the furnace walls constitutes side braces for such walls. As the supporting of the front header 10 from the drum 2 by means of the tubes 11 would throw undue strain on these tubes and tend to rotate the drum 2, additional means are provided for supporting the front header in the form of a heavy cross bar 34 having its ends secured to the vertical channel bars at the end of the furnace. This bar is engaged by the hooks 33 integral with the receptacle 19 at the upper end of each of the header sections 9. The boiler is illustrated as provided with a Meissner grate and automatic feeding mechanism, but it will be understood that any type of furnace may be employed. The tubes 6, 7 and 8 are of less length than the diameter of the drums whereby they may be removed through the drums and all of the tubes employed on the boiler are easily accessible for the expansion and removal.

Interposed between the series of drums 2, 3, 4 and 5 and the inclined tubes 1, is my superheater which constitutes an important feature of the invention. The effective heating surface of this superheater is comprised by the horizontal tubes 15, the inclined tubes 16 paralleling the tubes 1 and the vertical tubes 17 and 18, all of which tubes, it

will be observed, are exposed to the products of combustion as they pass from the furnace to the outlet flue 35, in the usual manner. The forward ends of the tubes 15 and 16 terminate in a series of receptacles or boxes 19, which are in fact continuations of the sections 9, which constitute the header 10, the interior of such receptacles being separated from the interior of the header sections 9 by means of the walls 20. The upper ends of the receptacles 19 are connected by means of the pipes 21 and 21' with the drum 5 above the steam line thereof, as indicated in the drawing, and a box 21² is provided at the juncture of such pipes. The rear ends of the tubes 16 are carried by a cross-box 22, while the rear ends of the tubes 15 are carried by a cross box 23. A box 24 is provided in the main steam outlet pipe 13, and the tubes 17 and 18 communicate with such box 24 and the boxes 22 and 23 respectively as shown. Valves 25 and 26 are provided on either side of the cross box 24 for a purpose to be hereinafter explained. In order that the superheater system may be filled with water, to act as a generator and to prevent injury to the tubes while steam is being raised, a pipe 27 is provided extending from the bottom of the drum 5 to the box 22 and provided with a controlling valve 28. Provision is made for draining the water from the system by means of the pipe 29 extending downwardly from the box 22 and terminating in a mud drum 30 provided with the usual blow-off means. The members 27, 22, 29 and 30 in addition to providing a means for filling the superheater with water and afterwards draining it, also constitute a blow-off means for the drum 5. The other drums 2, 3 and 4 are also provided with suitable blow-off pipes 31.

The operation is as follows. The furnace being ready to start, water is admitted to the superheating system by means of the valve 28 in the pipe 27, which arrangement provides for the protection of the tubes exposed to a high temperature while steam is being raised. At this time the valve 25 in the outlet pipe 13 is open, and the valve 26 is closed, thus providing for the escape into the drum 5 of any steam generated in the boxes 22 and 23, and the pipes 17 and 18, and to prevent geysering or back pressure and secure a proper circulation of water. The superheater at this stage constitutes a generator, and the arrangement of the tubes 15, 16 and 18 in the triangular form shown, provides for a vigorous circulation of water in a clock-wise direction, and permits a passage of the steam upward through the pipes 16, 21' and 21 to the drum 5, thus materially augmenting the main boiler in the generation of steam. After steam has been raised in the boiler to the desired pressure, the valve 28 is closed and the water in the superheater is allowed to evaporate, or the superheater is emptied by means

of the blow-off connection in the drum 30, and the valve 25 closed and the valve 26 opened. The steam now generated in the system finds its way to the drum 5, and passes out through the tubes 21, box 21² and tubes 21' to the receptacle 19, and then passes through the tubes 15 and 16 to the boxes 22 and 23. That portion of the steam passing to the box 22, then passes up through the pipes 17 to the box 24, while the steam passing to the box 23 first passes down to the box 22, through the tubes 18 and then up through the pipes 17 to the box 24, from which it is discharged through the main outlet pipe 13. The steam in its passage through the pipes 15, 16, 17 and 18 is exposed to the products of combustion and thoroughly superheated. It will be seen that the steam passing through the tubes 15 and 17 is heated to approximately the same extent as the steam passing through the tubes 16, as the greater length of the combined tubes 15 and 17 compensates for the lower degree of heat to which they are exposed. The circulation of water in the boiler itself, is, commencing with the drum 5, down through the rear tubes 11, thence upwards through the inclined tubes 1 to the header 10, then through the pipes 11 to the drum 2, and from there successively to the drums 3, 4 and 5 by means of the tubes 6 and 7, thus completing the circuit. It will be seen that by this circulation, very little agitation in the drum 5 is produced, because of the passage of the water through the successive drums 2, 3 and 4, and that steam of a drier quality is secured from the rear drum 5, than is the case where the old style drums extending longitudinally of the boiler were used, and in which the violent inflow of water from the front head through the tubes 11 occurred in the same drum from which the steam was taken.

It will be apparent that my superheater construction is an advantageous one from a constructive standpoint as all of the tubes used for superheating are straight and hence easily handled and replaced, and further that the ends of these tubes are readily accessible in the boxes 21', 22 and 23, and the receptacle 19, so that such tubes may be removed and replaced in the same manner that the tubes 1 in the boiler are removed and replaced. It will also be seen that my superheater requires no system of directing valves for securing the proper circulation of water and steam therethrough, and that the blow-off members 27, 29 and 30 also provide for the filling of the system with water, thus giving a simple and effective means for securing desired results. It will also be seen that the triangular arrangement of the tubes 15, 16 and 17 provides for a proper circulation of water when the device is used as a generator which result it is believed has never before been accomplished, and that the boxes em-

played are positioned at points removed from the area of the highest temperature, thus materially increasing their life. The making of the receptacle integral with the header sections also simplifies and cheapens the construction of the superheater, avoiding a multiplication of parts, and giving a means for the attachment of the supporting hooks 23, whereby the weight of the front header and the tubes carried thereby may be supported in the most effective manner. It will also be apparent that the superheating tubes 15 and 16 occupy space otherwise unused, and that the use of this superheater does not necessitate any substantial increase in total height of the boiler. Other advantages incident to my construction will be apparent to those skilled in the art.

Having thus described my invention and illustrated its use, what I claim as new and desire to secure by Letters Patent is the following:—

1. The combination with a boiler, of a tubular superheater having the tubes thereof arranged in a vertical plane in the form of a triangle, and means communicating with the boiler above and below the water line thereof.

2. The combination with a boiler, of a tubular superheater comprising a set of horizontal tubes and a set of inclined tubes communicating at both ends, together with means whereby the steam from the boiler is passed through the superheater and means for filling the superheater with water from the boiler whereby the superheater may be used as a generator.

3. The combination with a boiler, of a tubular superheater comprising a set of horizontal tubes and a set of inclined tubes communicating at both ends and having such ends adjacent to and accessible from the ends of the boiler, together with means whereby the steam from the boiler is passed through the superheater and means for filling the superheater with water from the boiler whereby the superheater may be used as a generator.

4. The combination with a boiler having a steam drum and water tubes, of a superheater intermediate the drum and water tubes comprising a pair of rear boxes arranged one above the other, a set of tubes between the said boxes, an outlet therefor, a front box, inclined and substantially horizontal tubes from the front box to the rear lower and rear upper boxes respectively, and

an inlet to the front box from the steam drum.

5. The combination with a boiler having a steam drum and water tubes, of a superheater intermediate the drum and water tubes comprising a pair of rear boxes arranged one above the other, a set of tubes between the said boxes, an outlet for the lower box, a front box, inclined and substantially horizontal tubes from the front box to the rear lower and rear upper boxes respectively, and an inlet to the front box from the steam drum.

6. The combination with a boiler having a steam drum and water tubes, of a superheater intermediate the drum and water tubes comprising a pair of rear boxes arranged one above the other, a set of tubes between the said boxes, an outlet therefor, a front box, a set of tubes from the front box to one of the rear boxes, another set of tubes from the front box to the other rear box and an inlet to the front box from the steam drum.

7. In a boiler having inclined water tubes and a plurality of transverse drums, the combination of a superheater intermediate the drums and the water tubes, comprising a pair of rear boxes arranged one above the other, a set of tubes between the two boxes, an outlet therefor, a front box, a set of tubes from the front box to one of the rear boxes, another set of tubes from the front box to the other rear box and a set of tubes extending forwardly from the rear drum over the tops of the other drums and then down to the front box.

8. The combination with a boiler having a steam drum and water tubes, of a superheater comprising the outlet box 24 located above the outlet flue of the furnace, the boxes 22 and 23 located one above the other, the tubes 17 connecting the boxes 22 and 24 and extending across the outlet flue, the tubes 18 connecting the boxes 22 and 23, a front box, the tubes 15 and 16 connecting such box to the boxes 22 and 23, and connecting tubes from the steam space in the drum to the front box.

In testimony whereof I have hereunto signed my name in the presence of the two subscribed witnesses.

JULIUS H. MEISSNER.

Witnesses:

DOERING BELLINGER,
ARCHWORTH MARTIN.