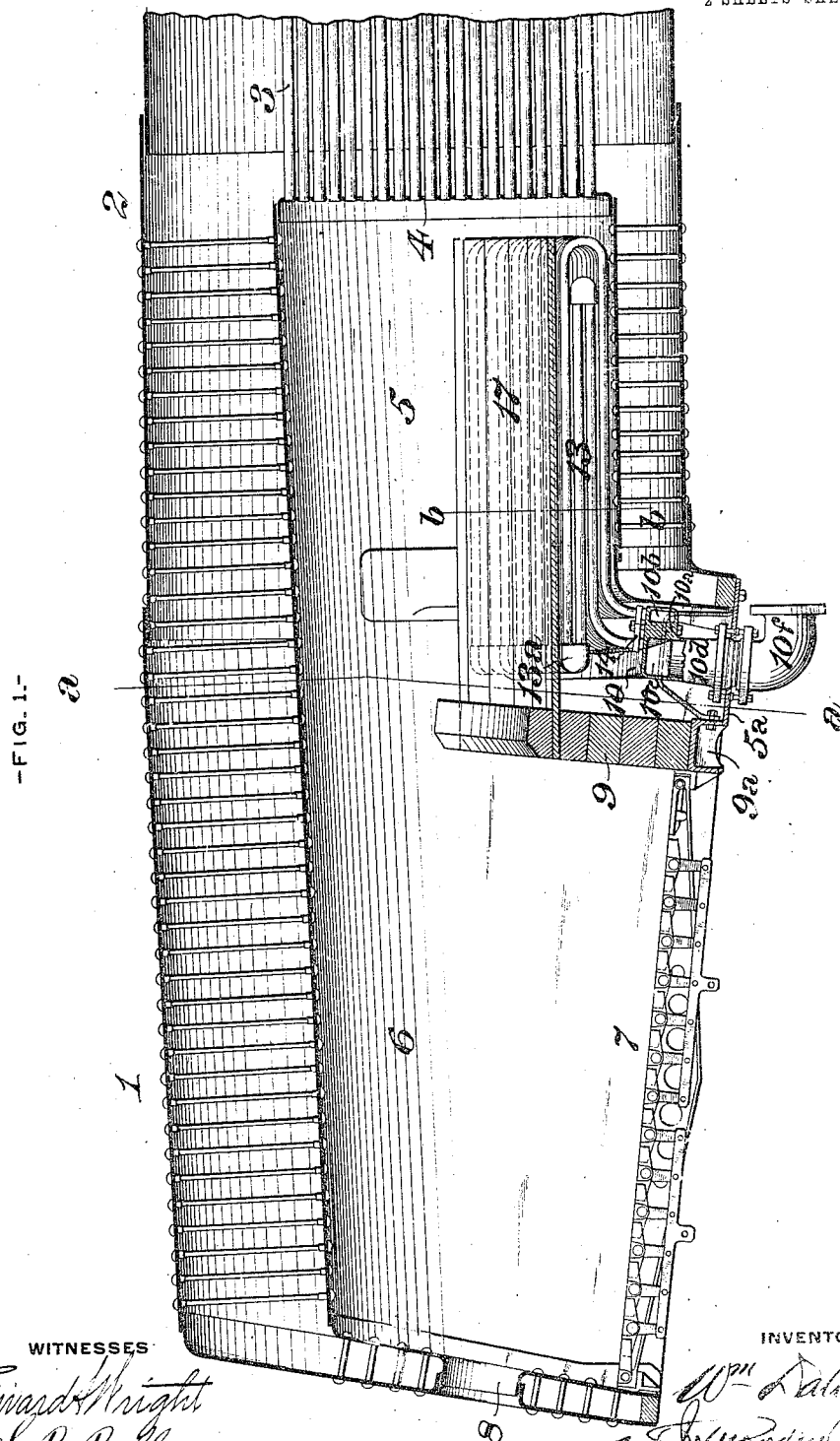


1,031,693.

2 SHEETS-SHEET 1.



WITNESSES
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INVENTOR:

Wm. Sallou.
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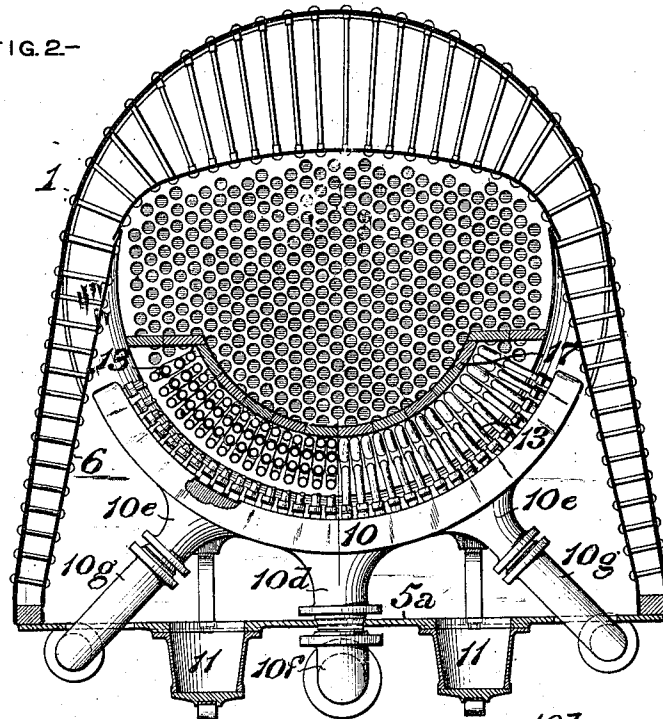
W. DALTON.
STEAM BOILER SUPERHEATER.
APPLICATION FILED FEB. 20, 1912.

1,031,693.

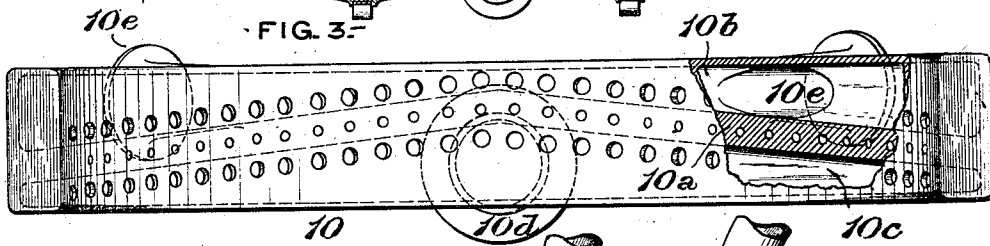
Patented July 9, 1912.

2 SHEETS-SHEET 2.

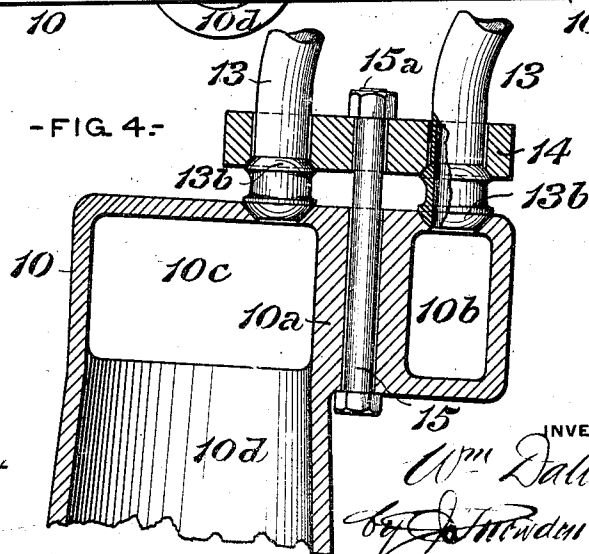
-FIG. 2-



-FIG. 3-



-FIG. 4-



WITNESSES

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STEAM-BOILER SUPERHEATER.

1,031,693.

Specification of Letters Patent.

Patented July 9, 1912.

Application filed February 20, 1912. Serial No. 678,835.

To all whom it may concern:

Be it known that I, WILLIAM DALTON, of Schenectady, in the county of Schenectady and State of New York, have invented a certain new and useful Improvement in Steam-Boiler Superheaters, of which improvement the following is a specification.

My invention relates to superheaters for steam boilers of the locomotive type, and more particularly to those having a combustion chamber in the waist of the boiler, and its object is to provide a superheating appliance which shall be readily applicable in boilers of such character, without modification of the standard form and dimensions of the boiler shell and tubes, and in which a sufficient area of heating surface to insure a high degree of superheat shall be provided, with a substantial reduction in the length of superheater pipes, as compared with prior constructions.

The improvement claimed is hereinafter fully set forth.

In the accompanying drawings: Figure 1 is a vertical longitudinal central section through the rear portion of a locomotive boiler, illustrating an embodiment of my invention; Fig. 2, a vertical transverse section through the same; on the line *a a* of Fig. 1, the left hand half thereof showing the superheating pipes in section on the line *b b* of Fig. 1; Fig. 3, a plan view, partly in section, and on an enlarged scale, of the header, detached; and, Fig. 4, a section, on a further enlarged scale, through the header and superheater pipe connections.

My invention is herein exemplified as applied in a locomotive boiler of one of the present standard types, having an outside firebox, 1, connected to a waist, 2, through which a plurality of fire tubes, 3, extend from a flue sheet, 4, at the front end of a combustion chamber, 5, formed in the waist of the boiler, to a smoke box (not shown) at the forward end of the waist. The inside fire box, 6, which adjoins, and communicates directly with, the combustion chamber, is provided, at bottom, with a grate, 7, of any suitable and preferred construction, and a firing opening, 8, (one or more) controlled by a door in the usual manner, is formed in its rear end.

Prior practice in locomotive boiler superheaters has, so far as my knowledge and information extend, embodied practically only two classes, known respectively, by reason

of the location of the superheating elements, as smoke box and fire tube superheaters. Each of these classes is necessarily open to certain practical objections, the smoke box type not being capable of developing a sufficiently high degree of superheat to be fully effective, and, further, involving a material extension and obstruction of the smoke box, and the fire tube type requiring the use of flues of materially greater than ordinary diameter, and superheating pipes of great length, and obstructing the passage of the gases through the superheating tubes. A comparatively small number of locomotives have also been fitted with superheaters which are located in a compartment interposed between the rear steam generating section, and the front water heating section of a boiler, said compartment constituting an intermediate combustion chamber in front of the tubes.

The special purpose of my invention is to construct a superheating appliance, which shall be exempt from the objections above stated, and in which the heat of the gases of combustion shall be utilized as fully as practicable by presenting the superheating elements to their action in their passage from the firebox to the tubes. A reduction of volume of the space occupied by the superheating elements is also designed to be effected.

In the practice of my invention, I locate the superheating appliance within the combustion chamber, at the front of the firebox, instead of in the smoke box or the fire tubes, or in front of the fire tubes, as in prior practice, thereby utilizing the higher heat of the products of combustion in their direct passage from the firebox to and through the combustion chamber, and correspondingly reducing the aggregate length of the pipes through which the steam traverses while being subjected to the superheating action of the products of combustion. In order to admit of the convenient connection of the steam supply and delivery conduits of the superheater, the volume of the combustion chamber, 5, is increased by the interposition of a transverse bridge wall, 9, of fire brick, between the front of the grate, 7, and the front water wall of the firebox, said bridge wall being supported on a bearer, 9^a, secured at its ends to the mud ring of the firebox. A transverse header, 10, which is a substantial metallic casing, of segmental

form, is supported in the space between the bridge wall and the front water wall of the firebox, said header being divided by a longitudinal partition, 10^a, which is perforated by a plurality of bolt holes, into a saturated steam compartment, 10^b, and a superheated steam compartment, 10^c. The partition, 10^a, is rearwardly inclined from the middle to the ends of the header, so that the saturated steam compartment is of gradually increasing transverse sectional area from its middle to its ends, and the superheated steam compartment is of gradually diminishing transverse sectional area from its middle to each of its ends, as clearly shown in Fig. 3. Saturated steam supply nozzles or connecting members, 10^d, extend downwardly from the header, 10, adjacent to its ends, said nozzles communicating with the saturated steam supply compartment, 10^b, and a superheated steam delivery nozzle or connecting member, 10^e, extends downwardly from the middle of the header, said nozzle communicating with the superheated steam compartment, 10^c. Elbows, 10^f and 10^g, are connected to the nozzles, 10^d and 10^e, respectively, for the attachment of saturated steam supply pipes, leading from the dome or other suitable portion of the steam space of the boiler, and of a superheated steam delivery pipe leading to the cylinders of the locomotive, respectively. Said delivery pipe is controlled by an outside throttle valve of any suitable and preferred construction, located in any convenient position adjacent to the cylinders. The lower end of the combustion chamber space containing the header is closed by a bottom plate 5^a, which may be fitted with a discharge hopper, 11 (one or more) for the removal of any cinders that may accumulate on the bottom plate. It will be obvious that if preferred the compartment, 10^b, of the header may be used as the saturated steam compartment, and the compartment 10^c, as the superheated steam compartment, the supply and delivery pipes being connected accordingly.

A plurality of horizontally extending loops or return bends of superheater pipes, 13, disposed side by side in substantially radial planes of the boiler, is located in the combustion chamber 5, adjacent to the shell thereof, the members composing each of said loops, which are preferably, as shown, in the form of double returns, extending alternately forwardly and rearwardly, and the opposite ends of each loop being connected to the saturated steam compartment and the superheated steam compartment, respectively, of the header, 10. The attachment of the superheater pipes to the header is preferably, as shown, effected by means of yokes, 14, which are drawn to a tight bearing on the superheater pipes, and connected to the header by bolts 15, passing through

holes in the partition, 10^a, and nuts, 15^a. Tight joints are insured by ball or spherical faced joint rings, 13^b, formed or fixed on the ends of the superheater pipes, and fitting in correspondingly shaped recesses in the yokes and the header. In order to protect the rear return bend elbows, 13^a, and the connections of the superheater pipes to the header, from the direct action of the high heat of the gases passing over the top of the bridge wall, a segmental shield plate, 17, of fire clay or other suitable refractory material, is connected to the bridge wall, a short distance below its top, and projects forwardly therefrom, above the superheater pipes, 13.

The high efficiency and value in the generation of steam, of the heating surface presented in a combustion chamber which adjoins and directly communicates with the firebox of a locomotive boiler, as compared with the heating surface of the tubes, is well and universally recognized by those familiar with the operation of boilers of this type, and these combustion chambers are now being applied to a considerable extent in railroad service.

I believe myself to be the first who has rendered the advantage of the combustion chamber available for the superheating of steam, by locating within it a superheating appliance of such construction as does not involve the perforation of the water space or the use of tubes of larger diameter than those of boilers working saturated steam, and in which a substantial reduction of the length of the pipes within which the steam is superheated, is effected, without impairment of the capacity of the appliance to afford as high a degree of superheat as experience has demonstrated to be advisable. I do not therefore consider my invention to be limited to the specific embodiment herein selected for illustration, and desire to include within it such structural modifications as embody its spirit and essential characteristic features, and as may be within the ordinary skill of a mechanic familiar with locomotive construction and operation.

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

1. The combination, with a locomotive boiler having a combustion chamber adjoining the fire box, of a superheater located in said combustion chamber and having downwardly extending steam supply and delivery connections leading to the exterior of the firebox, forward of the grate thereof.

2. The combination, with a locomotive boiler having a combustion chamber adjoining the firebox, of a superheater located in said combustion chamber and having downwardly extending steam supply and delivery connections leading to the exterior of the firebox, forward of the grate thereof, 130

and means for protecting joints of the superheater from the direct action of the heat of the products of combustion passing from the firebox.

- 5 3. The combination, with a locomotive boiler having a combustion chamber adjoining the firebox, of a bridge wall interposed between the front of the grate and the front water wall of the firebox, and a super-
10 heater located in the combustion chamber and having steam supply and delivery connections leading to the exterior thereof, between the bridge wall and the front water wall of the firebox.
- 15 4. The combination, with a locomotive boiler having a combustion chamber adjoining the firebox, of a bridge wall interposed between the front of the grate and the front water wall of the firebox, a super-
20 heater located in the combustion chamber and having steam supply and delivery connections leading to the exterior thereof, in front of said bridge wall, and a bottom plate closing the space between the bridge wall
25 and the front water wall of the firebox.
- 30 5. The combination, with a locomotive boiler having a combustion chamber adjoining the firebox, of a bridge wall interposed between the front of the grate and the front
35 water wall of the firebox, a superheater located in the combustion chamber, and having steam supply and delivery connections leading to the exterior thereof, in front of said bridge wall, and a shield of refractory
40 material, connected to and projecting forwardly from the bridge wall above the superheater.
- 45 6. The combination, with a locomotive boiler having a combustion chamber adjoining the firebox, of a superheater comprising a plurality of loops or return bends of pipe extending longitudinally in the combustion chamber and a header located in
50 rear of said loops of pipe, and having saturated and superheating compartments communicating with the ends thereof and downwardly extending steam supply and delivery connections leading to the exterior of the combustion chamber, forward of the grate
55 of the firebox.
7. The combination, with a locomotive boiler having a combustion chamber adjoining the firebox, of a bridge wall interposed between the front of the grate and the front water wall of the firebox, and a super-
heater comprising a plurality of loops or return bends of pipe extending longitudinally in the combustion chamber and a seg-
mental header located between the bridge

wall and the front water wall of the fire- 60
box and having saturated and superheated steam compartments communicating with the ends of the loops of pipe and downwardly extending steam supply and delivery connections leading to the exterior of 65
the combustion chamber, forward of the grate of the firebox.

8. The combination, with a locomotive boiler having a combustion chamber adjoining the firebox, of a bridge wall inter- 70
posed between the front of the grate and the front water wall of the firebox, a superheater comprising a plurality of loops or return bends of pipe extending longitudinally in the combustion chamber and a seg- 75
mental header located between the bridge wall and the front water wall of the firebox, and having saturated and superheated steam compartments communicating with the ends of the loops of pipe and downwardly extending steam supply and delivery connections leading to the exterior of the combustion chamber, forward of the grate of the firebox, and a shield of refractory material projecting forwardly from the 85
bridge wall above the loops of pipe.

9. The combination, with a locomotive boiler having a combustion chamber adjoining the firebox, of a superheater comprising a plurality of loops or return bends of pipe, 90
extending longitudinally side by side in the combustion chamber, in substantially radial planes of the boiler, and a transverse header, of segmental form, having compartments connected to the rear ends of said 95
loops of pipe and downwardly extending steam supply and delivery connections leading to the exterior of the combustion chamber, forward of the firebox grate.

10. A header for a locomotive boiler 100
superheater, consisting of a casing of segmental form, divided by a double inclined longitudinal partition, which is perforated in a longitudinal plane by a plurality of bolt holes, into a saturated steam compart- 105
ment of gradually increasing transverse sectional area from its middle to its ends, and a superheated steam compartment of gradually diminishing transverse sectional area from its middle to its ends, said header hav- 110
ing, on its convex side, nozzles or connecting members communicating with said steam compartments for the connection of pipes extending below the header.

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Witnesses:

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