

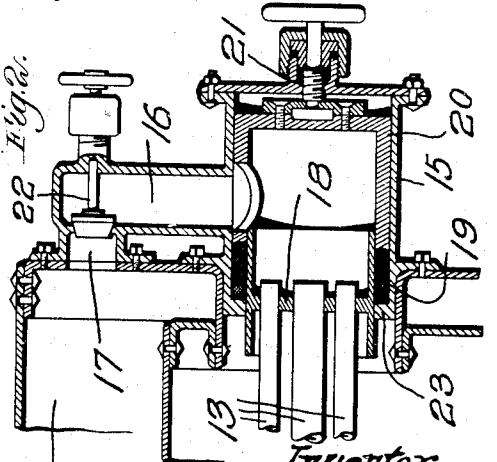
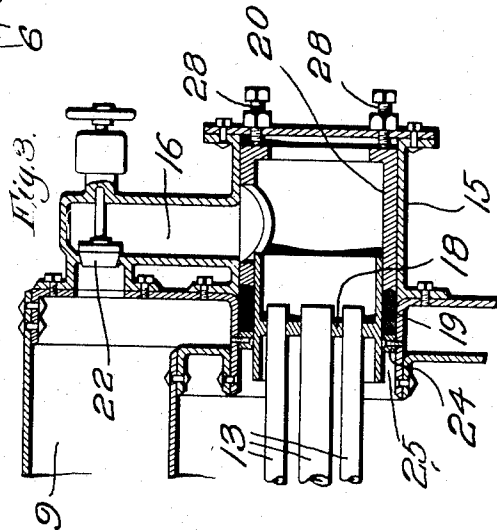
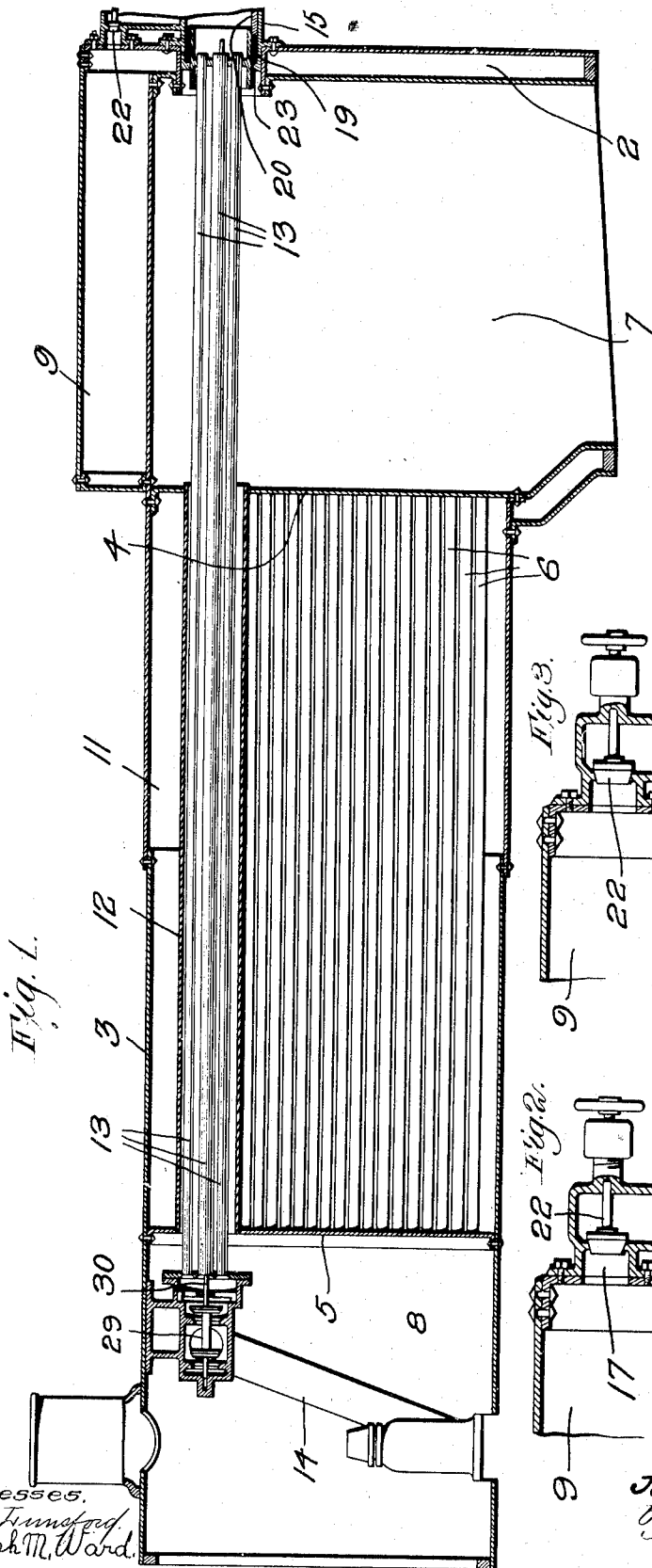
J. M. McCLELLON.  
SUPERHEATER.

APPLICATION FILED DEC. 5, 1906.

1,038,172.

Patented Sept. 10, 1912.

2 SHEETS—SHEET 1.



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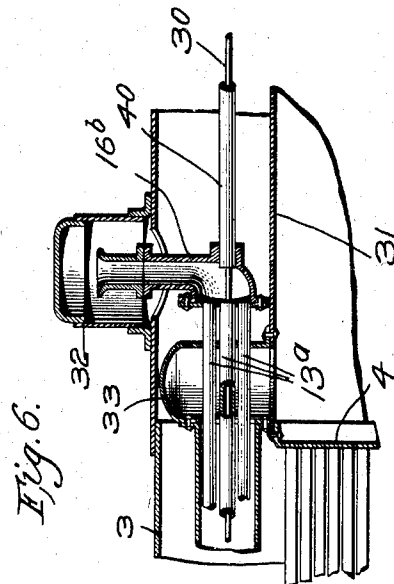
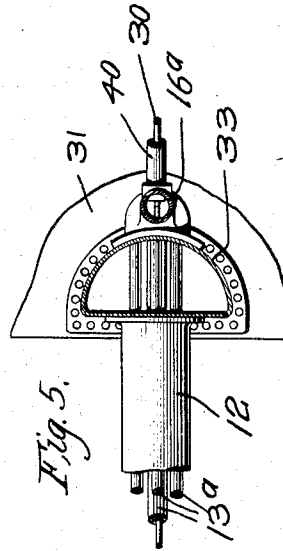
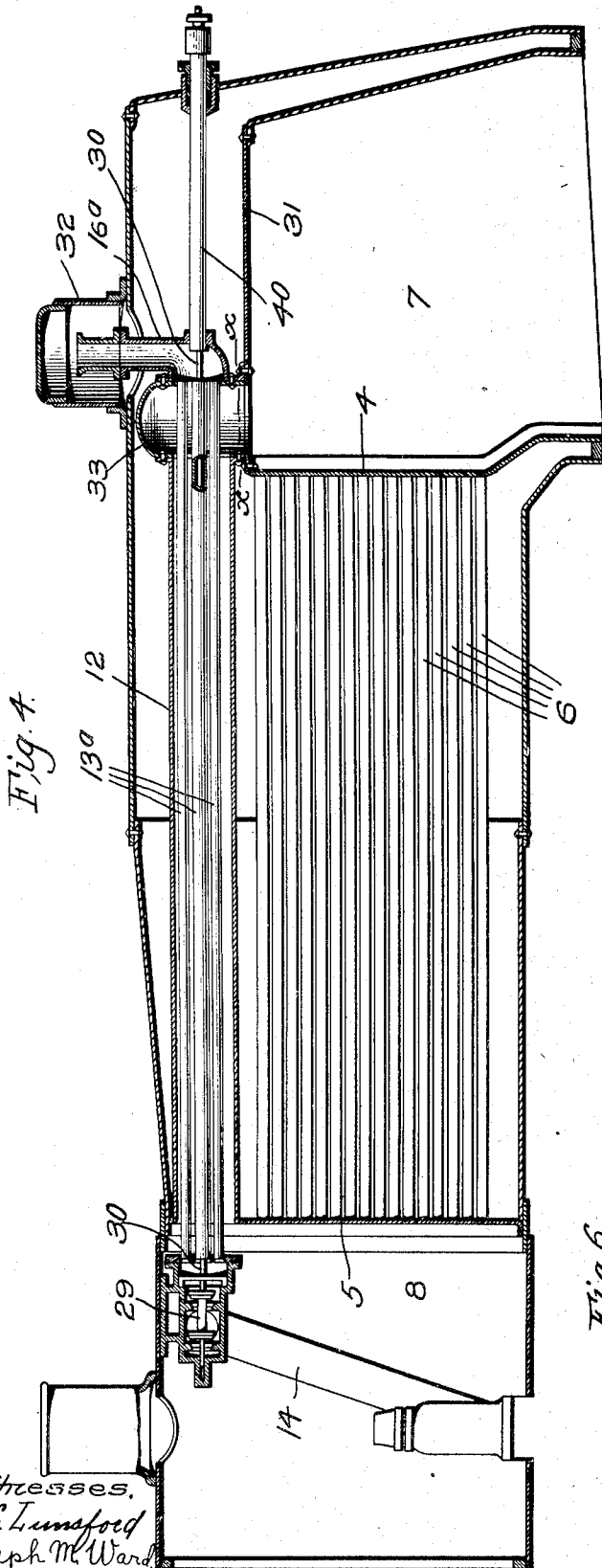
SUPERHEATER.

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2 SHEETS—SHEET 2.

1,038,172.



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# UNITED STATES PATENT OFFICE.

JAMES M. McCLELLON, OF EVERETT, MASSACHUSETTS.

## SUPERHEATER.

1,038,172.

Specification of Letters Patent. Patented Sept. 10, 1912.

Original application filed January 30, 1905, Serial No. 243,356. Divided and this application filed December 5, 1906. Serial No. 248,267.

### *To all whom it may concern:*

Be it known that I, JAMES M. McCLELLON, a citizen of the United States, and a resident of Everett, in the county of Middlesex and State of Massachusetts, have invented an Improvement in Superheaters, of which the following description, in connection with the accompanying drawing, is a specification, like letters on the drawing representing like parts.

This invention relates to superheaters for steam boilers, and in making the invention my aim has been to provide a novel superheater which is effective in operation, and so constructed that it will not become choked or clogged with soot or ashes.

My invention is particularly adapted for use in connection with locomotive boilers, but it may also be used with boilers of other types. I have, however, chosen to herein illustrate it in connection with a locomotive boiler, and in the drawings Figure 1 is a vertical section through a locomotive boiler showing one form of my invention; Fig. 2 is an enlarged vertical section at the end of the boiler showing the manner of connecting the steam dome with the superheating tubes; Fig. 3 is a similar view to Fig. 2 showing a slightly modified construction; Fig. 4 is a vertical section through a locomotive boiler of the ordinary type having a crown sheet showing my invention applied thereto; Fig. 5 is a horizontal section on the line  $x-x$ , Fig. 4; Fig. 6 is a sectional view showing a modified form of the invention.

The boiler shell 3 has at one end a fire-box or combustion chamber 7 and at the other end a smoke-chamber 8 and also has the two flue sheets 4 and 5 between which extend the flues 6. These parts are or may be all as usually found in locomotive boilers and form no part of my present invention.

I have herein illustrated my invention as embodied in two different types of locomotive boilers. In Fig. 1, I have illustrated a type of boiler such as is shown and described in my Patent No. 870,455 dated November 6, 1907, and in Fig. 4 I have illustrated a locomotive boiler of the type now in common use.

In the boiler shown in Fig. 1, the steam dome 9 is in the form of a drum which extends longitudinally of the boiler above the fire-box, and the water spaces 2 around the fire-box are separate from the space or

chamber 11 within the body of the shell 3 between the flue sheets 4 and 5. The latter space is filled completely full of water and provision is made for delivering water from the top of this chamber into the bottom of the water spaces around the fire box. This may conveniently be done by a pipe arranged in the shell having its upper end near the top thereof and its lower end opening into the water space at the rear of the fire box, all as shown in said Patent No. 870,455, although as this construction of boiler forms no part of the present invention, I have not deemed it necessary to illustrate it herein. The steam passes to the steam dome. The combustion chamber of the fire box may have therein a plurality of water tubes which extend diagonally thereacross all as shown in said patent, but to avoid confusion in the drawings I have omitted to show such water tube herein. For a more complete description of this construction of boiler reference may be had to my aforesaid Patent No. 870,455.

In the embodiment of the invention illustrated in Fig. 1, the chamber 11 has extending therethrough an enlarged flue 12 which opens at one end into the smoke-chamber 8 and at the other end into the combustion-chamber 7 so that hot products of combustion may pass through said flue. Situated within the flue 12 are a plurality of superheating tubes 13 which communicate at one end with the steam dome 9 and at the other end with a pipe or pipes 14 leading to the engine cylinders. These superheating tubes 13 extend not only through the flue 12, but also into the combustion-chamber of the fire-box, and in the type of boiler shown in Fig. 1, it is possible to extend them through both the fire-box and the flue 12 without bending them at all or without providing them with elbows or bends. Any suitable means may be employed for establishing communication between them and the steam-dome, and in Figs. 2 and 3 I have shown two ways of doing this. In Fig. 2 the steam-dome has communication with a steam-chamber 15 through a suitable connection 16 and port 17, and the superheating tubes 13 are connected to the chamber 15 by means of an expansion joint. As herein shown, they are connected to the partition 18 of an expansion member which is slidably mounted in an aperture in one wall of the steam-

chamber 15, and in order to make a steam tight joint between this expansion member and the steam-chamber 15, I preferably employ suitable packing 19 which surrounds the expansion member and which is held in place by a clamping member 20, the position of which may be adjusted to clamp the packing firmly in place by means of an adjusting screw 21. 22 is a throttle-valve which may be employed to control communication between the steam-dome 9 and superheating tubes 13. This construction permits the superheating tubes to expand or contract independently of the other parts of the boiler.

The construction shown in Fig. 3 is substantially like that shown in Fig. 2 with this exception that in Fig. 2 the steam-chamber 15 is formed with an end 23 through the aperture in which the expansion member 18 is received, while in Fig. 3 said expansion member slides back and forth in a ring 24 which is secured within the opening 25 formed in the end of the fire-box, and the packing 19 is received between said ring and the clamping member 20. In this form of the invention also the clamping member 20 is held in position by a plurality of clamping screws 28 acting near the periphery thereof instead of a single clamping screw acting near the center thereof. In other respects, however, the two devices are alike. 29 designates a throttle-valve which is situated within the smoke-chamber 8. This valve may be operated by a suitable stem 30 which extends through one of the superheating tubes 13 and leads to an accessible point within the cab of the engine.

In the boiler constructed as above described the steam which is generated in the steam-generating spaces 2 passes to the drum 9, all as shown in my co-pending application, and from the drum the steam passes to the chamber 15, and from the latter through the superheating tubes 13 and thence to the cylinders. In passing through the superheating tubes the steam becomes superheated, as will be obvious.

With the construction above described each of the superheating tubes is straight and without any bends or turns, and consequently said tubes form no appreciable obstruction to the passage of the hot gases through the flue 12, and there is no danger of said flue becoming clogged.

In Fig. 4 I have illustrated my invention as applied to the type of boiler now commonly in use in which the fire-box is provided with a crown-sheet 31, and in which the spaces around the fire-box communicate with the space between the flue sheets within the body of the shell. In this type of boiler the space within the shell constitutes a steam and water space, and as the steam is generated it fills the upper part of said space

and the dome 32. In applying my invention to this type of boiler I provide the combustion-chamber with an extension 33 which is herein shown as situated above the crown-sheet 31. One end of the enlarged flue 12 communicates with this extension 33, the other end of said flue 12 communicating with said smoke-chamber, as shown in Fig. 1. The superheating tubes 13<sup>a</sup> are located within the enlarged flue 12 and they communicate at one end with the pipes 14 leading to the engine cylinder and at the other end they communicate with the steam-dome 32 through a suitable connection 16<sup>a</sup>. These superheating tubes extend not only through the flue 12 but also through a portion of the combustion-chamber, this portion being the extension 33 in the present embodiment. In this form of the invention the steam which accumulates in the steam-dome passes down the connection 16<sup>a</sup> into the superheating tubes, and in passing through the tubes it becomes superheated by the hot gases within said flue as will be obvious.

In both embodiments of my invention the superheating tubes are received partially within the enlarged flue 12, and partially within some portion of the combustion-chamber. In both forms of the invention too the superheating tubes are perfectly straight and without bends, and as a result they do not form such an obstruction in the flue 12 as to cause any danger of its being clogged up with soot or ashes.

In the form of the invention shown in Fig. 4 I have illustrated a throttle-valve 29 situated within the smoke-chamber which is controlled by a stem 30 which extends through one of the superheating tubes 13<sup>a</sup>, and if desired I may protect the portion of the stem which extends through the space above the crown-sheet by means of a tube or pipe 40.

In Fig. 6 I have shown a construction similar to that shown in Fig. 4 with the exception that the connection 16<sup>b</sup> through which the steam is taken from the steam dome to the superheating tubes is separated from the walls of the extension 33. This construction has the advantage that there is less danger of the wall of the extension 33 burning out at the point where the superheating tubes pass therethrough than there is in the construction shown in Fig. 4.

This application is a division of my co-pending application Se. No. 243,356, filed January 30, 1905.

Having fully described my invention what I claim as new and desire to secure by Letters Patent is:—

1. In a boiler, the combination with a boiler shell having a fire box at one end and a smoke chamber at the other, of an enlarged flue extending through said shell and communicating both with the smoke chamber

and fire box, superheating tubes extending through said flue and projecting at one end into the smoke chamber and at the other end into the combustion chamber, means to connect the latter ends of the tubes with the steam-generating compartment of the boiler, and a connection at the other end of the tubes leading to the cylinders of the engine to be operated.

2. In a boiler, the combination with a boiler shell having a fire box at one end and a smoke chamber at the other, of superheating tubes extending through said shell and projecting at one end into the combustion chamber of the fire box and at the other end into the smoke chamber, means to protect said tubes from contact with the water in the shell, means to connect the latter end of said tubes with the steam-generating space of the boiler, and a connection at the other end of said tubes for delivering superheated steam therefrom.

3. In a locomotive boiler, the combination with a boiler shell having a smoke chamber at one end and a fire box at the other, of an enlarged flue extending through the shell and communicating at one end with the combustion chamber of the fire box and at the other end with the smoke chamber, super-

heating tubes extending through said flue and projecting at one end into said combustion chamber and at the other end into the smoke chamber, means to connect the former end with the steam-generating spaces of the boiler, and a connection with the other end of said tubes within the smoke chamber for delivering superheated steam therefrom.

4. In a boiler, the combination with a boiler shell having a fire box at one end and a smoke chamber at the other, of an enlarged flue extending through said shell and communicating both with the smoke chamber and fire box, a superheating tube extending through said flue and projecting at one end into the combustion chamber, means to connect said end of the tube with the steam-generating compartment of the boiler, and a connection at the other end of said tube leading to the cylinder of the engine to be operated.

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

J. M. McCLELLON.

Witnesses:

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MARGARET A. DRUM.