O. D. ORVIS.

LOCOMOTIVE BOILER.

APPLICATION FILED SEPT. 12, 1906. RENEWED DEC. 14, 1908.

928,880. Patented July 20, 1909.

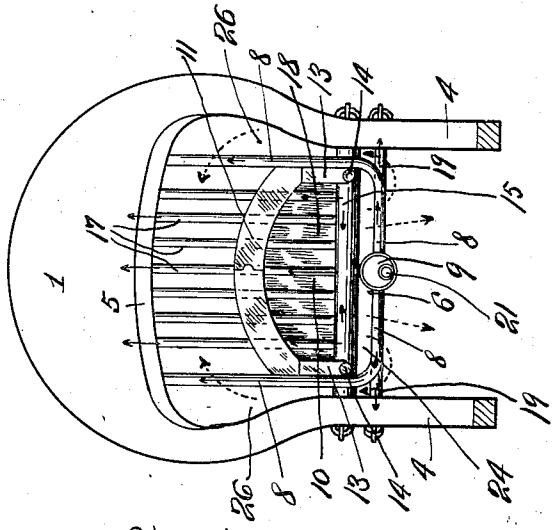

FIG. 2.

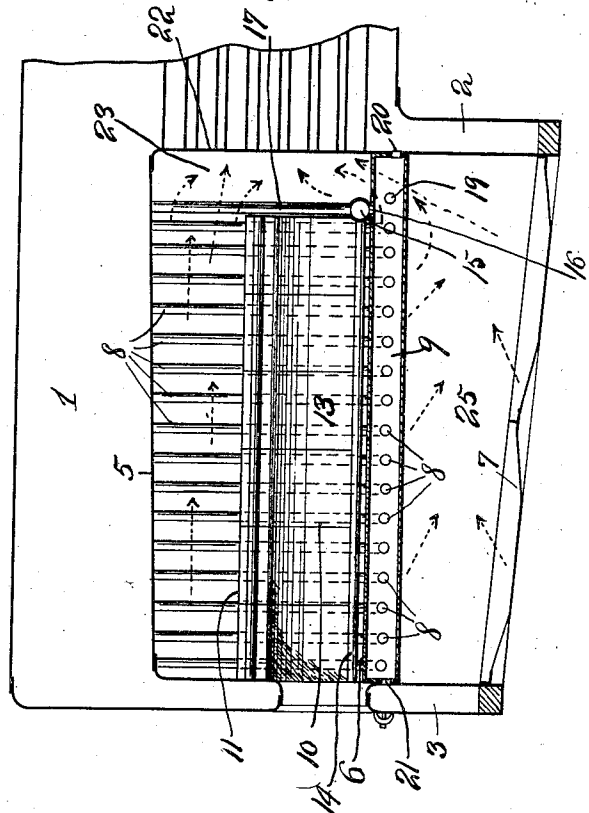

FIG. 1.

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UNITED STATES PATENT OFFICE

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LOCOMOTIVE-BOILER.

No. 928,880. Specification of Letters Patent. Patented July 20, 1909.

Application filed September 12, 1906, Serial No. 334,229. Renewed December 14, 1908. Serial No. 467,535.

To all whom it may concern:

Be it known that I, OREL D. ORVIS, a citizen of the United States, and a resident of Jersey City, in the county of Hudson and State of New Jersey, have invented certain new and useful Improvements in Locomotive-Boilers, of which the following is a specification.

This invention relates to improvements in locomotive boilers and has for its particular object the construction of a down draft furnace to be applied to such boilers; though it will be seen that my invention is applicable to other types of boilers as well.

My invention provides a down draft furnace within the fire box of a locomotive and constructed in such a manner as to obtain smokeless combustion, increased heating surface and improved water circulation, hence an increase in the efficiency of the boiler and economy in the consumption of fuel. These objects are attained without reducing the grate surface or necessitating the building of a new locomotive, my invention being applicable to any existing type of the same.

I provide my furnace with an upper down draft water grate onto which the fuel is fed, and a lower grate of any suitable form. On said lower grate the partly consumed fuel from the upper one falls and burns. Walls are formed around the upper fire box and the same is covered by means of an arch of fire proof material, thereby creating a chamber above and around the bed of fuel.

By admitting the air requisite for perfect combustion over and above the burning fuel, and causing it to pass downward through the same together with any smoke and gas retained in said chamber, a smokeless combustion and consequent fuel economy are made positive.

It will also be seen from the following description that my invention makes possible an equal distribution of heat on all parts of the heating surface, and further, that the cold air is prevented from coming into contact with the flue head or entering the flues, when stoking or cleaning the fire, thereby insuring greater durability and reducing the cost of maintenance.

In the following specification and the accompanying sheet of drawings, I have shown my invention in its preferred form, but as this may vary, I claim all such changes as may come within the spirit and scope of my invention and claims. In the drawings, I have shown so much of the outline of a typical locomotive boiler in its conventional form as to enable those skilled in the art to understand and apply my invention.

In the said drawings, Figure 1 is a longitudinal section through a portion of a locomotive boiler having a down draft furnace embodying my invention and Fig. 2 is a front elevation of Fig. 1 with parts removed.

The reference numeral 1 denotes the boiler proper, 2 and 3 are the front and rear water legs respectively while 4 indicates the side water legs.

5 is the crown sheet. Below said crown sheet is located my down draft furnace having the down draft water grate 6 and the up draft grate 7 of any suitable construction.

The water grate is formed of a series of tubes 8, connected by the central header 9. The said tubes are bent at right angles and their upper ends communicate with the boiler through the crown sheet. The tubes are expanded into the header and the crown sheet, thus allowing of individual expansion and contraction. The fuel is fed onto the water tube grate, forming the bottom and sides of the upper fire box 10, and which is covered by the fire proof arch 11, preferably built in sections and supported on the side walls or linings 13, also of fire proof material and inside the water tubes. The linings are supported on one or more pipes 14 on either side.

The end wall of the fire box is built as follows: A transverse header 15 communicates with the side water legs and rests in the center on the header 9, with which it also communicates by means of the short pipe 16. This transverse header connects the lower ends of the water filled pipes 17, whose other upper ends are connected with the boiler through the crown sheet. The spaces between these pipes are filled in with fire proof material 18 to the height of the arch. Two transverse tubes 19 connect the central header with the side water legs of the boiler, and said header is also in communication with the front and rear water legs by means of apertures 20 and 21.

It will here be noted that between the end wall of the fire box and the flue head 22 is a chamber 23 with which the flues communicate and it will also be understood that the said wall and the arch prevent the cold air from reaching the flues.

In the drawing is indicated by arrows in dotted lines, the travel of the gases. It will be seen that a direct passage from the fire box to the chamber 23 is provided, the gases passing through the space 24 between the central and transverse header (see Fig. 2). Secondly, the gases pass downward into the lower fire box 25, where they meet and mix with the lesser up draft from the lower grate, and then into the chamber 23. Finally, a passage 26 on either side of the fire box is provided through which the gases, after having passed down through the upper grate, pass and mix above the arch and then pass into the chamber 23 in which all the gases commingle before entering the flues, thus the heat is applied equally to the increased heating surface, the circulation of water is very rapid and smokeless combustion is assured.

What I claim is:

1. In a locomotive, the combination with a boiler, a furnace, a fire box, a plurality of water tubes forming a water grate at the bottom of said fire box, side walls formed by a portion of said water tubes, a lining within said side walls, a wall closing said fire box, composed partly of water tubes and partly of fire proof material, an arch of fire proof material above said grate and connections between said water grate and said boiler.

2. In a locomotive, the combination with a boiler, a furnace, a down draft grate composed of water tubes, a central header into which the inner ends of said tubes are horizontally expanded, a portion of said tubes bent vertically, a lining inside said vertical tubes, a tubular support for said lining, a fire proof arch resting on said lining, vertical tubes forming a front wall of the fire box and a transverse header connecting said vertical tubes with said boiler.

3. In a locomotive, the combination with a boiler, a furnace, a fire box, a water grate at the bottom thereof, side walls formed by water tubes, a fire proof lining within said tubes, a fire proof arch between said tubes, an end wall, a draft passage at the bottom of said end wall and above said water grate and connections between the above mentioned tubes and said boiler.

4. In a locomotive, the combination with a boiler, a furnace, a down draft water grate composed of tubes, a central header connecting the inner ends of said tubes, connections between said central header and said boiler, side walls formed by said tubes bent at right angles, the outer ends of said tubes communicating with said boiler, an arch above said water grate, a transverse wall formed by vertical tubes and fire proof material, a transverse header connecting the lower ends of said tubes, a connection between said transverse header and said central header and transversely running connections between said central header and said boiler.

5. In a locomotive, the combination with a boiler, a furnace, a down draft water grate composed of a plurality of transversely running water tubes, a central longitudinal header connecting the said tubes, and communicating with said boiler, side walls formed by vertical continuations of said water tubes whose upper ends are expanded into the crown sheet of the boiler, a fire proof lining within said side walls, a fire proof arch resting on said lining and extending the length of the fire box, a transverse wall formed by vertical tubes, a transverse header connecting the lower ends of said vertical tubes, fire proof material between said tubes to the height of said arch, means communicating between said transverse and said central header and transverse connections between said central header and said boiler.

Signed at New York city in the county of New York and State of New York this 11th day of September A. D. 1906.

OREL D. ORVIS.

Witnesses:

GEO. A. MARSHALL,

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