Apr. 3, 1923. 1,450,229

J. G. ROBINSON

FURNACE OF LOCOMOTIVES

Filed June 9, 1920 3 sheets-sheet 1

Fig. 2.

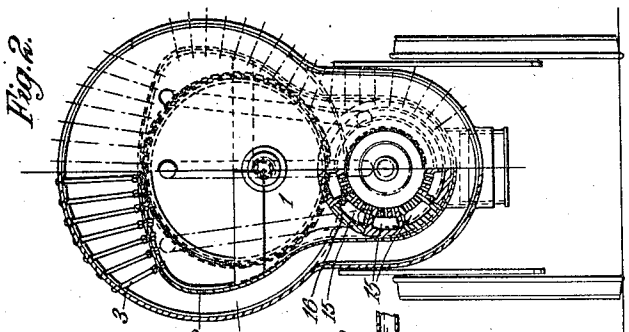
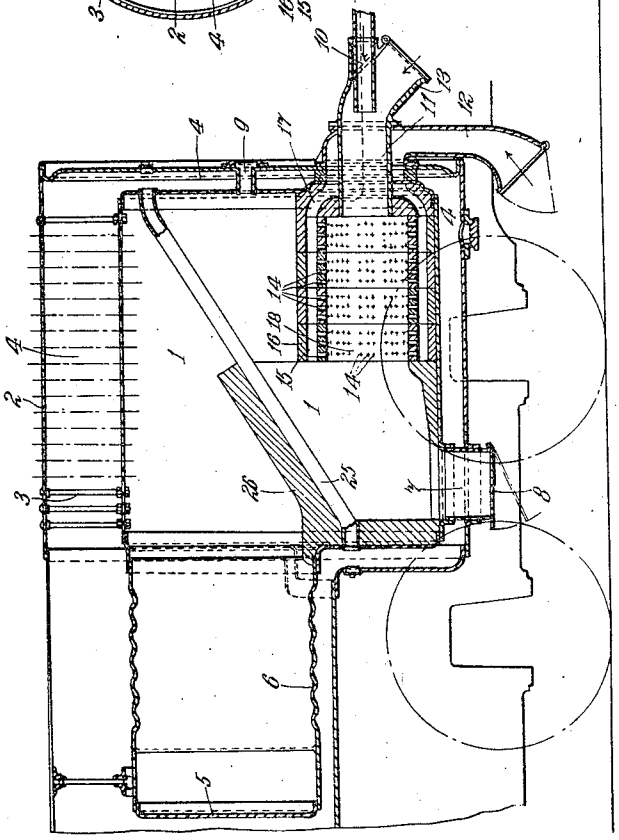


Fig. 1.



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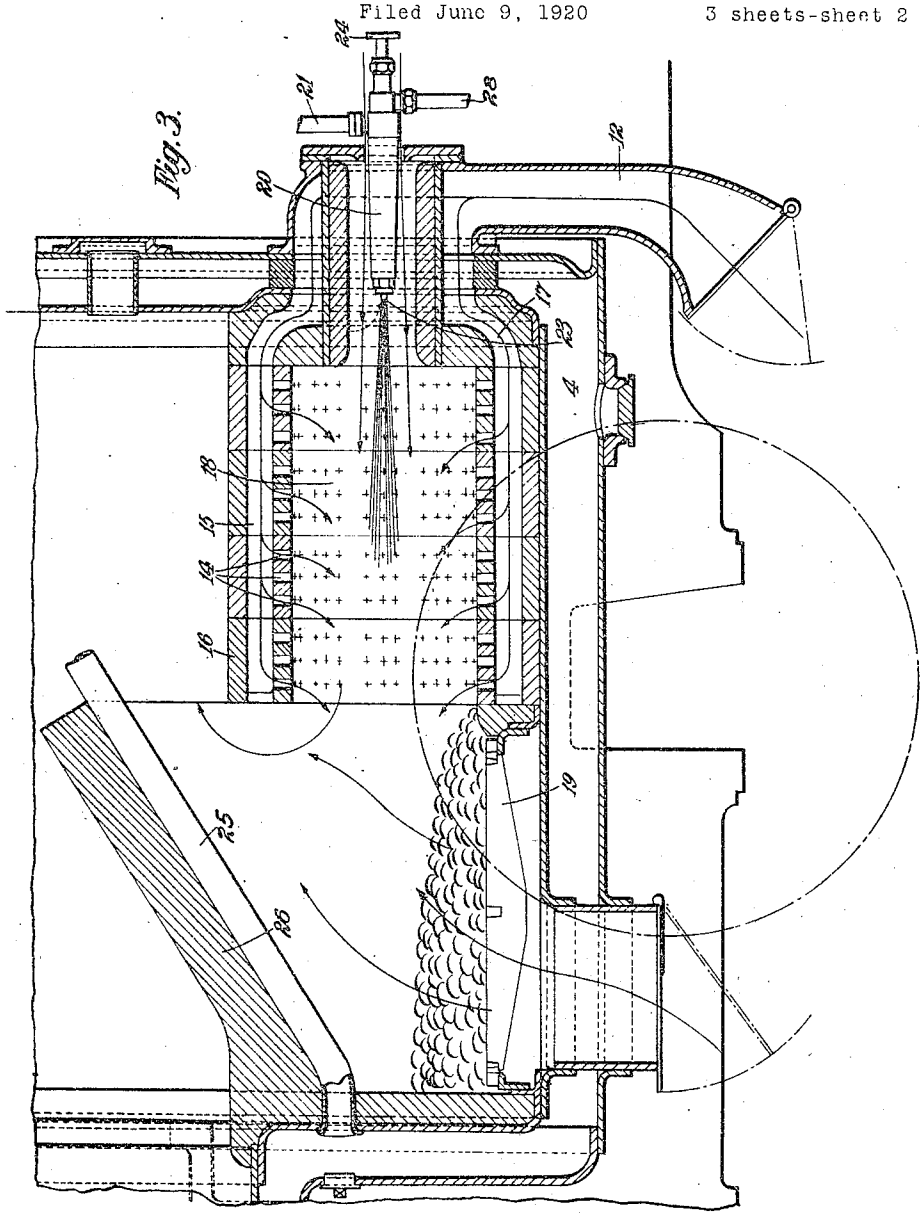
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Filed June 9, 1920 3 sheets-sheet 2

Fig. 3.



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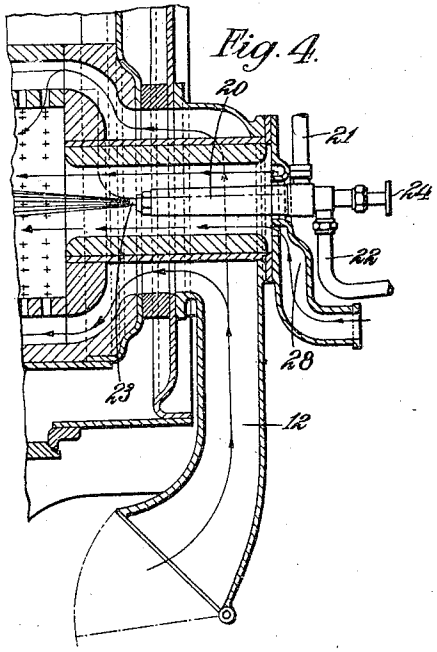
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FURNACE OF LOCOMOTIVES

Filed June 9, 1920 3 sheets-sheet 3

Fig. 4.



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Patented Apr. 3, 1923. 1,450,229

UNITED STATES PATENT OFFICE.

JOHN GEORGE ROBINSON, OF FAIRFIELD, ENGLAND.

FURNACE OF LOCOMOTIVES.

Application filed June 9, 1920. Serial No. 387,746.

To all whom it may concern:

Be it known that I, JOHN GEORGE ROBINSON, a subject of the King of Great Britain, and a resident of Fairfield, Manchester, England, have invented certain new and useful Improvements in the Furnaces of Locomotives, of which the following is a specification.

This invention relates to improvements in and connected with the furnaces of steam generators adapted for burning of pulverized fuel or liquid fuel and in particular to steam generators of the locomotive type. From experience it has been found that the ordinary type of locomotive boiler is not suitable for burning pulverized or liquid fuel. To economically burn such fuel it is desirable to provide a firebox of greater volume in relation to the water cooled surfaces than is usually available in the ordinary type of locomotive boiler burning solid fuel on a fire grate. It is also desirable in burning pulverized or liquid fuel in a locomotive type boiler to give ample accommodation for the long flame produced in the course of combustion.

The object of the present invention is to provide a furnace in which the desired conditions are attained and the invention consists broadly of a furnace comprising a shell containing the firebox and furnace surrounded by a continuous water space, a cylindrical combustion chamber or refractory material located in the lower part of said shell a cylindrical corrugated extension of said shell proceeding rearwardly from the brick arch of the furnace and terminating in a tube plate and means for introducing pulverized or liquid fuel and air into the fire box.

In a locomotive boiler it has previously been proposed to construct the fire box as a gas generator and to provide a combustion chamber extending therefrom into the barrel of the boiler, the end of the said chamber forming a tube plate. In the present invention such an extension is adapted to form only a portion of the combustion chamber or fire box proper.

The extension proceeding rearwardly from the brick arch of the furnace and terminating in the boiler tube plate is preferably corrugated, and further features of the invention consist in the provision of ports in the lining of the fire box, said ports communicating with an air chamber, and the provision of an axially disposed fuel tube leading to a mixing chamber to which auxiliary air is supplied.

Other features will be apparent from the following description and appended claims read in conjunction with the accompanying drawings.

In these drawings Fig. 1 is a longitudinal section and Fig. 2 a transverse section through a furnace constructed in accordance with our invention.

Fig. 3 is a similar view to Fig. 1 of the lower part of a furnace illustrating a slight modification for use when liquid fuel is employed and Fig. 4 is a fragmentary view illustrating a further modification in detail of the furnace illustrated in Fig. 3.

Referring to these drawings the numeral 1 designates the firebox of a locomotive boiler. This firebox is supported in spaced relation to the shell 2 by stays 3 so that the water spaces 4 are continuous around the bottom sides and crown of the furnace. In the present example the bottom of the firebox 1 and of the shell 2 are semi-circular so as to more readily resist internal pressure.

The firebox tube plate 5 is extended a considerable distance into the boiler and is carried by a circular corrugated tube 6 the inner or open end of which communicates with the interior of the furnace.

In the bottom of the furnace there is provided a sump or extension 7 constituting an air cooled slag box the lower or open end of which is normally closed by a door 8 and is of such diameter as to permit of a man entering the furnace for examination or repairs. This construction enables the usual fire hole and door to be dispensed with and in its place is substituted a sight tube 9.

The pulverized fuel and primary air are delivered through a fuel tube 10 into a mixing or combining chamber 11 and induced auxiliary air enters the chamber 11 through the damper controlled conduits 12 and 13. The inner or open end of this mixing or combining chamber 11 communicates with the interior of a circular combustion chamber 18 composed of refractory material which chamber is provided with a plurality of ports 14 which establish communication between the interior of such chamber and a plurality of air chambers 15. These air chambers are constituted by employing hollow bricks or sections 16 of refractory material in the con-

struction of the walls of such combustion chamber.

The air chambers 15 communicate at their inner ends with an annular chamber 17 surrounding the mixing or combining chamber 11 which annular chamber is in communication with the auxiliary air conduit 12 the whole consisting preferably of a single casting of suitable design. The auxiliary air conduits 12 and 13 are controlled by adjustable dampers in the usual manner and the air admitted through these conduits combines with the injected fuel and primary air within the circular combustion chamber 18 as before indicated.

The above construction of furnaces is also adapted for the burning of liquid fuel in which case the front and the bottom of the furnace is preferably provided with a fire bar grate 19 upon which is spread small broken pieces of refractory material upon which the liquid fuel is sprayed as illustrated in Fig. 3, the pulverized fuel burner being replaced by a liquid fuel burner 20 which may be operated by either compressed air or steam. That is to say, a supply of steam or air entering through the pipe 21 may be used to induce an ejection of liquid fuel from the pipe 22 to the burner nozzle 23, a suitable control valve indicated at 24 being provided. Water tubes 25 may be provided with advantage beneath the brick arch 26. If desirable, additional air may be supplied from a fan or other source to a chamber 28 as illustrated in Fig. 4.

What I claim and desire to secure by Letters Patent is:—

1. A furnace for a steam generator, comprising in combination, a shell, a firebox disposed in spaced relation within said shell so as to form a continuous water space surrounding said firebox, a cylindrical combustion chamber of refractory material located in the lower part of said furnace, an annular space around said combustion chamber which space is open to the atmosphere at its outer end, a plurality of perforations in said combustion chamber effecting communication between the interior of the same and said annular space, means for projecting liquid fuel into the interior of said combustion chamber, and a cylindrical corrugated extension of said firebox which extends rearwardly from the usual brick arch of the furnace and terminates in a tube-plate which effects closure of the inner end of said corrugated extension.

2. A furnace for a steam generator comprising in combination, a shell, a firebox disposed in spaced relation within said shell so as to form a continuous water space surrounding said firebox, a cylindrical combustion chamber of refractory material located in the lower part of said furnace, an annular space around said combustion chamber which space is open to the atmosphere at its outer end, means for controlling the admission of air to said annular space, a plurality of perforations in said combustion chamber effecting communication between the interior of the same and said annular space, means for projecting liquid fuel into the interior of said combustion chamber, means for admitting air to the interior of the same with said fuel, means for controlling the admission of such air, and a cylindrical corrugated extension of said firebox which extends rearwardly from the usual brick arch of the furnace and terminates in a tube plate which effects closure at the inner end of said corrugated extension.

In testimony whereof I affix my signature in presence of two witnesses.

JOHN GEORGE ROBINSON.

Witnesses:
JAS. EDGE,
MABEL NORTH.