W. M. BURDON.

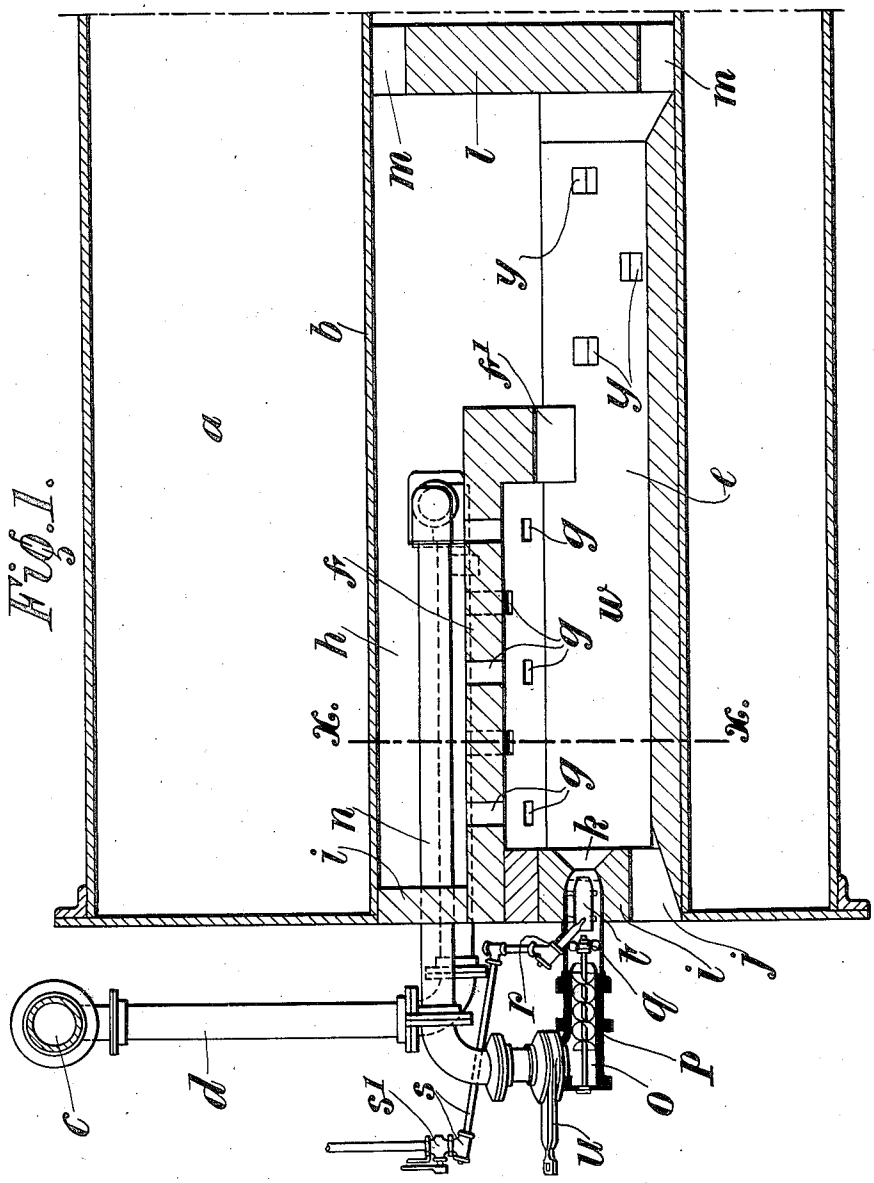
APPARATUS FOR THE LIQUID FUEL FIRING OF STEAM BOILERS.

APPLICATION FILED APR. 7, 1920.

1,423,183. Patented July 18, 1922.

2 SHEETS—SHEET 1.

Fig. 1.



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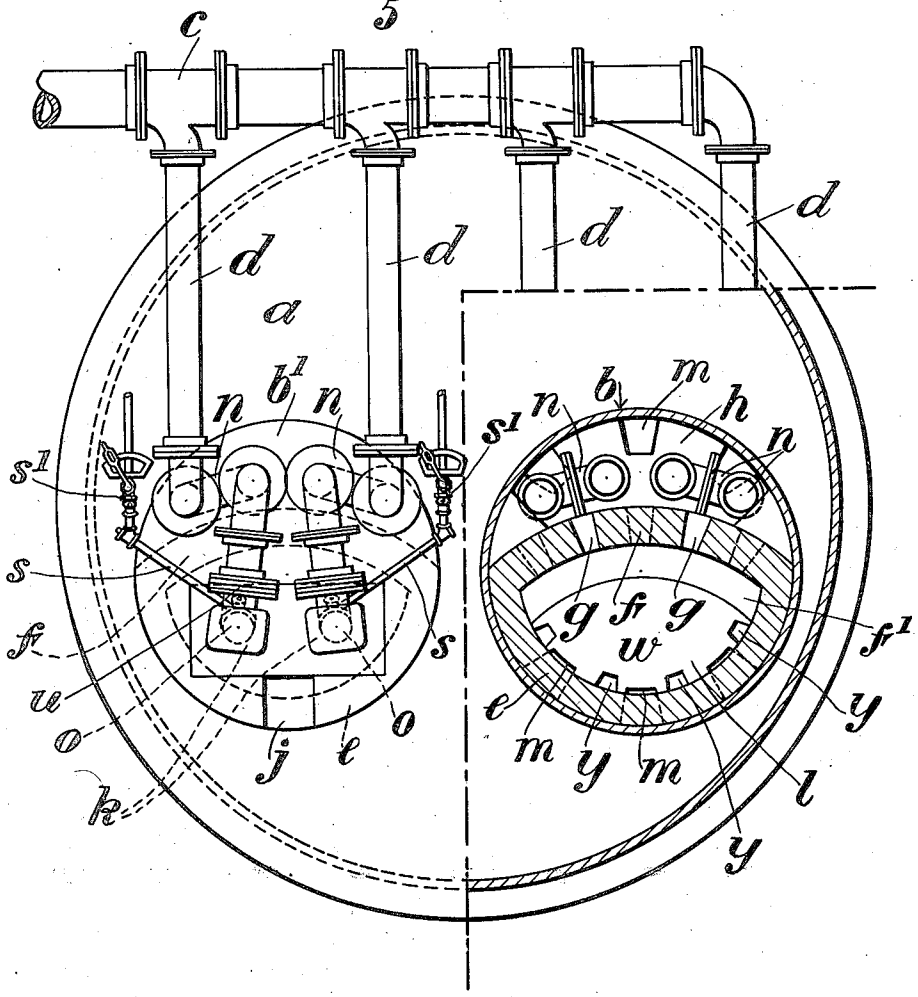
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2 SHEETS—SHEET 2.

Fig. 2.



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UNITED STATES PATENT OFFICE.

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APPARATUS FOR THE LIQUID-FUEL FIRING OF STEAM BOILERS.

1,423,183. Specification of Letters Patent. Patented July 18, 1922.

Application filed April 7, 1920. Serial No. 372,004.

(GRANTED UNDER THE PROVISIONS OF THE ACT OF MARCH 3, 1921, 41 STAT. L., 1313.)

To all whom it may concern:

Be it known that I, WILLIAM MURRAY BURDON, a subject of the King of Great Britain, residing at Bellshill, Lanarkshire, Scotland, have invented a certain new and useful Improved Apparatus for the Liquid-Fuel Firing of Steam Boilers (for which I have filed applications in England March 29, 1919; in France June 6, 1919; in Belgium June 18, 1919, and in Holland June 12, 1919), of which the following is a specification.

This invention relates to improvements in the liquid fuel firing of steam boilers wherein the boiler furnace is made or constructed with an air heating chamber arranged above the combustion chamber, and wherein the liquid fuel is directed into the combustion chamber in conjunction with air which is heated in the heating chamber.

Under this invention a portion of the hot gases generated in the combustion chamber is allowed to pass upwards into the heating chamber (above the combustion chamber) in order to heat pipes or passages located therein and through which the air supply for the burner is passed.

In the case of a "Lancashire", "Galloway", "marine" boiler, or the like, the furnace is built with a bottom lining of fire brick and a low arched crown having openings therein through which hot gases from the combustion chamber can pass upwards to an air heating chamber or space above the crown. The crown does not extend the full length of the furnace but only over the front portion thereof, which constitutes the combustion chamber, and, at its inner end, it is lowered and forms an arch. The bottom lining extends beyond the crown and, at its end, is a cross wall or a baffle which is preferably built of fire brick with passages above, below or all around, for the hot gases to pass to the flue which may have one or more similar baffles therein.

The liquid fuel is or may be supplied, under control of an indicator valve from a tank, or elsewhere, by means of a pipe to an inclined nozzle which projects into a tubular open ended carburettor which latter is located within a burner nozzle fitted into an opening in brick-work or an iron plate or the like, covering up the front of the furnace. The carburettor is arranged concentrically within the nozzle with an annular space between it and the nozzle and heated air, at low pressure, is supplied by piping from a fan or blower the air passing both inside and outside of the carburettor and blanketing the liquid fuel. The air is caused to gyrate by means of spiral blades, or other devices, arranged within the air pipe and may also be agitated by means of a small rotary fan.

It is of great importance that the oil be acted upon by air which is heated considerably above the temperature necessary for vaporization, and, in order to heat the air sufficiently, the air supply pipe is conducted to the hot chamber above the crown of the furnace and is looped or bent therein in such manner as to cause the air to travel forwards and backwards in the chamber. The air is preferably supplied to the air pipe from an air main aranged above, or below, the boiler as may be found most advantageous and is suitably controlled by means of dampers or otherwise.

Preferably each furnace has two burners with their air supply pipes each arranged to pass forwards and backwards through the hot chamber in order to heat the air.

The gyrating highly heated air acts upon the liquid fuel and not only atomizes but vaporizes or gasifies it and the gasified fuel issues from the burner between the inner and outer streams of air and burns with most effective results in the interior of the furnace.

The invention is generally applicable to the furnaces of both land and marine boilers.

In order that the invention may be clearly understood I have hereunto appended an explanatory sheet of drawings whereon I have shown, by way of example, a construction suitable for a Lancashire boiler.

Fig. 1 is a longitudinal section of the front end of the boiler and its furnace.

Fig. 2 is a partial front view and partial vertical cross section the cross section being taken on the line *x*, *x*, Fig. 1.

On the drawings:—

a is the boiler, *b*, b^1 the furnaces thereof, *c* the air main, and *d* the air supply pipes to the two furnaces.

As will be seen each furnace is provided with a bottom lining of fire brick *e* and with

a low arched crown f having a series of openings g therein through which hot gases can pass upwards into the heating chamber or space h at top. The front of the furnace is closed by fire brick i with the exception of a kindling hole j and the burner passages k. w is the combustion chamber. At the inner end of the crown is a lowered arch portion f^1. At the back of the furnace is a baffle or cross wall l having openings m for the passage of the hot gases to the flue. y are brick projections serving to retard and break up the gases.

As will be seen, the air supply for each burner passes from a pipe d through a bent pipe n located in the heating chamber h and thence to the burner (one of which is shown in section at Fig. 1) and, as will be seen, in the burner o is a fixed spiral p around which the air can pass and, in its passage, be caused to gyrate. At the end of the spiral is an agitating fan q automatically revolved by the air. r is the liquid fuel nozzle to which fuel is supplied from the pipe s provided with an indicator cock s^1. Located within the burner p is a carburettor t consisting of a small open ended tube or cylinder held concentrically in position within the burner and arranged, as shown, so that the air can pass both inside and outside of the carburettor and, in doing so, blanket the liquid fuel introduced into the carburettor by the inclined nozzle r. u are dampers for regulating the air supply to the burners.

The pipe connections and arrangements for each burner are similar so that a description of the action of one will suffice for all.

In the arrangement shown the liquid fuel supplied by a pipe s and nozzle r flows, by gravity into the carburettor t where it is acted upon by the air supplied under comparatively low pressure from a fan or blower to the main c and the air, owing to its passage through the bent pipe n located in the heating chamber h, is highly heated and acts upon the liquid fuel as it flows from the nozzle r and atomizes and vaporizes the same the gyratory action of the air and the agitation thereof by the fan q being important in this connection. The liquid fuel and air issues from the interior of the carburettor t as a jet or stream whilst hot air from the annular space between the carburettor and the burner blankets or envelopes the same and the jet, thus enveloped, enters the combustion chamber w where combustion takes place the main volume of hot gases passing, under the arch f^1, directly towards the outlets m whilst a comparatively small portion passes upwards through the passages g to the heating chamber h and heats the air pipes n.

The baffle l and other baffles, if they are employed, serve to retain the highly heated gases as long as possible in contact with the wall of the furnace.

Of course the construction may be varied more or less to suit different types of boiler. What I have shown is suitable for a "Lancashire" boiler and similar arrangements may be adopted for "Galloway" and "Scotch" marine boilers, but the structure would require to be altered for "Babcock & Wilcox" and other water tube boilers whilst, of course, maintaining the same principle of heating the air for the burners by a portion of the gases from the combustion chamber of the furnace and by having baffles for retarding the flow of the hot gases and retaining them within the furnace and furnace flue as long as possible.

This arrangement can be applied, if desired, to other types of heating furnaces as well as to boiler furnaces.

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

1. A steam boiler furnace adapted to be fired by liquid fuel having two chambers therein a heating chamber and a combustion chamber, a wall separating the chambers and having openings therethrough, a device for delivering liquid fuel in admixture with air into the combustion chamber, a main air supply pipe, and branch pipes passing into the heating chamber and then to the device.

2. A steam boiler furnace adapted to be fired by liquid fuel having two chambers therein a heating chamber and a combustion chamber, a wall separating the chambers and having openings therethrough, a device for delivering liquid fuel in admixture with air into the combustion chamber, a main air supply pipe, and branch pipes passing into and bent within the heating chamber and then passing to the device.

3. A steam boiler furnace adapted to be fired by liquid fuel having two chambers therein a heating chamber and a combustion chamber, a wall separating the chambers and having openings therethrough, a device for delivering liquid fuel in admixture with air into the combustion chamber, a main air supply pipe, branch pipes passing into the heating chamber and then to the device, and valves for controlling the air supply through said branch pipes.

4. A steam boiler furnace adapted to be fired by liquid fuel having two chambers therein a heating chamber and a combustion chamber, a low arched crown separating the chambers, means whereby hot products of combustion from the combustion chamber enter and heat up the heating chamber, a burner for delivering liquid fuel in admixture with air into the combustion chamber and means whereby the air for the burner is heated in the heating chamber.

5. A steam boiler furnace adapted to be

fired by liquid fuel having two chambers therein a heating chamber and a combustion chamber, a low arched crown separating the chambers, means whereby hot products of combustion from the combustion chamber enter and heat up the heating chamber, a burner for delivering liquid fuel in admixture with air into the combustion chamber, means whereby the air for the burner is heated in the heating chamber, a bottom lining of fire brick extending beyond the arched crown, projections extending inwardly from the lining, and a cross wall at the back of the lining with openings at intervals therein.

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

WILLIAM MURRAY BURDON.

Witnesses:
WM. B. VERITY,
HELEN A. FAIRFOWL.