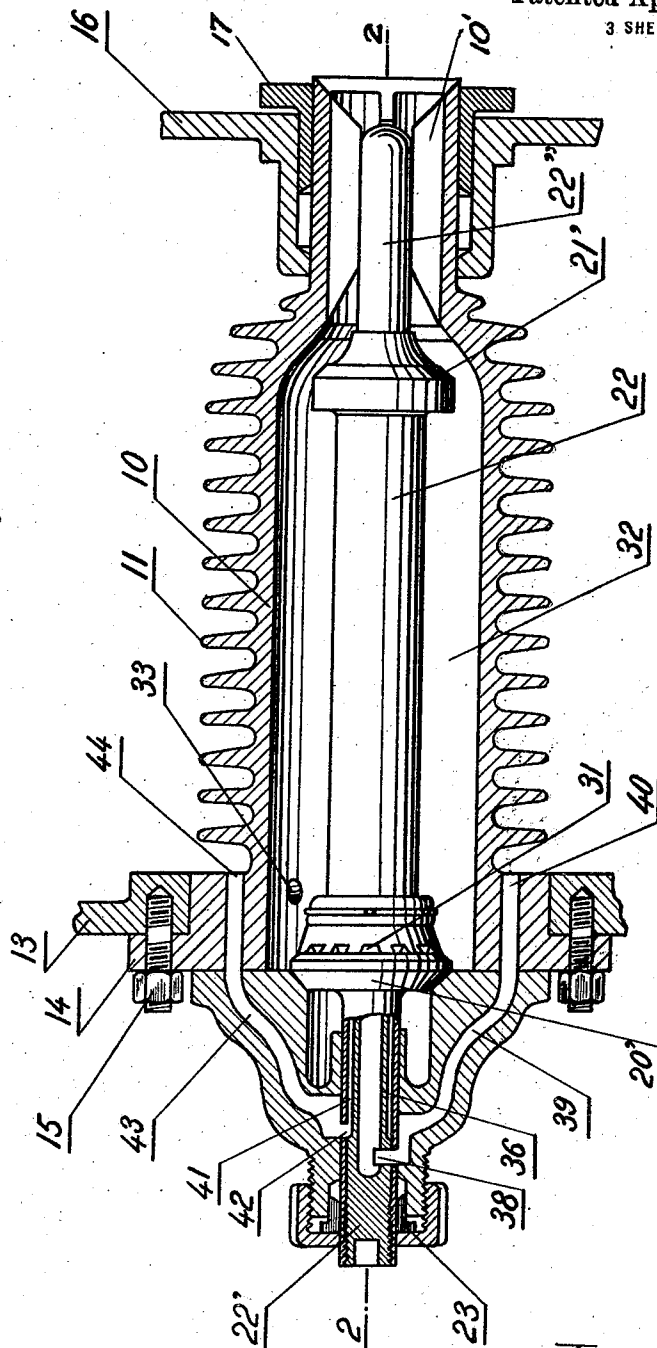


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 MAZOUT BURNER OF THE COMBUSTION UNDER PRESSURE TYPE FOR STEAM BOILERS.
 APPLICATION FILED FEB. 4, 1921.

1,414,099.

Patented Apr. 25, 1922.
 3 SHEETS—SHEET 1.

Fig. 1



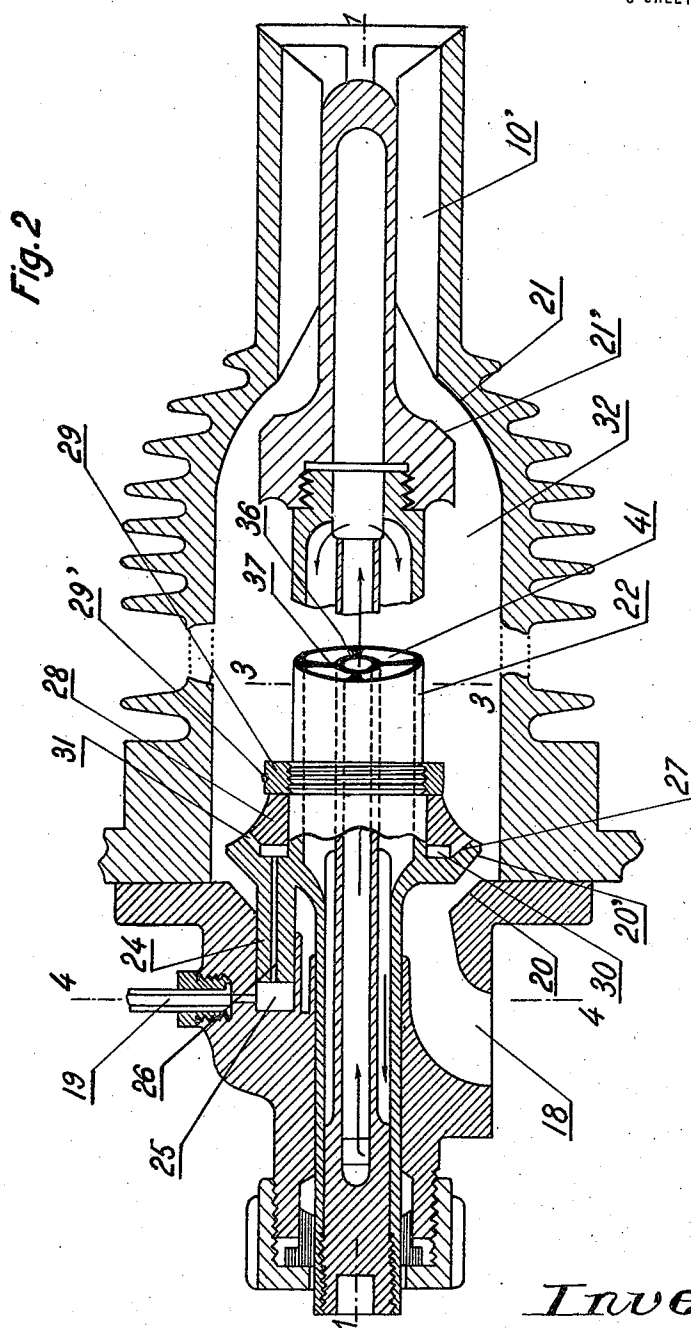
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Fig. 3

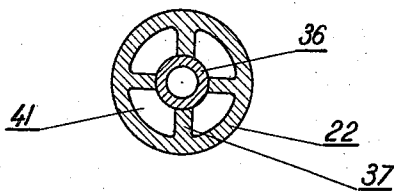


Fig. 5

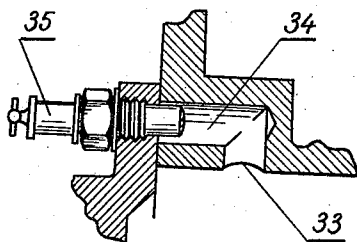
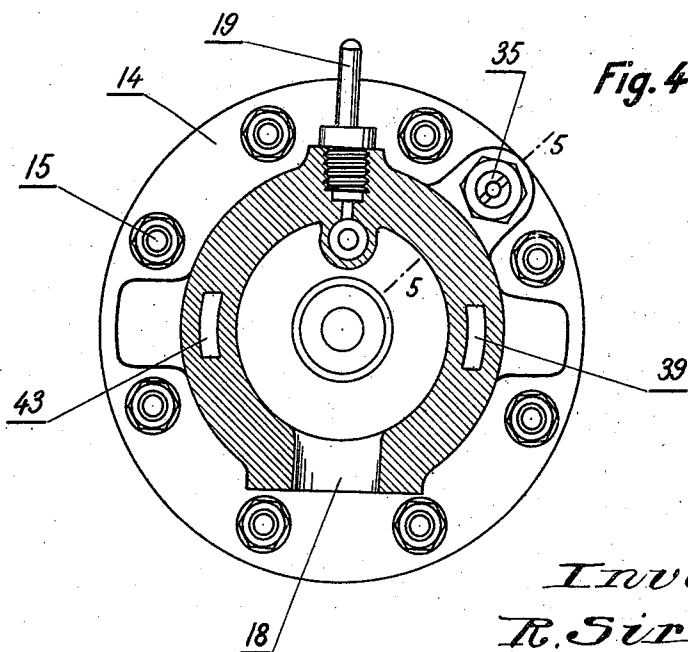


Fig. 4



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UNITED STATES PATENT OFFICE.

RENÉ SIROUET, OF ISSY LES MOULINEAUX, FRANCE.

MAZOUT BURNER OF THE COMBUSTION-UNDER-PRESSURE TYPE FOR STEAM BOILERS.

1,414,099.

Specification of Letters Patent. Patented Apr. 25, 1922.

Application filed February 4, 1921. Serial No. 442,500.

To all whom it may concern:

Be it known that I, RENÉ SIROUET, a citizen of the French Republic, residing at Issy les Moulineaux, in the French Republic, have invented certain new and useful Improvements in Mazout Burners of the Combustion-Under-Pressure Type for Steam Boilers, of which the following is a specification.

The subject of the present application is a mazout burner designed to burn a mixture of air and mazout in certain easily regulated proportions under high pressure in a suitable combustion chamber. Combustion under pressure produces a much greater heat value than combustion in free air, and the system possesses the further advantage of dispensing with the necessity for injecting additional air which is not entirely utilized in the combustion and which is, moreover, of harmful effect in that it reduces the temperature of the gases.

According to the present invention the burner comprises a cylinder forming a combustion chamber inside which an axially movable stem is arranged while at one end it carries a valve for the admission of compressed air and at the other end a valve for the exhaust of the gases of combustion. This stem is attached to a piston for distributing the mazout and is subjected to vibrations on one side and the other of a mean position between the seats of the admission and outlet valves under the action of the constant pressure of the compressed air acting on the exterior face of the admission valve, and of the variable pressure of the mixture under combustion inside the cylinder acting on the inner face of the admission and exhaust valves, the surfaces of which are different.

This action is such that (1), the chamber is fed evenly and regularly with compressed air and oil, (2) combustion is effected under pressure, and (3) the burning gases are blown into the furnace of the boiler. The combustion of the mixture of carburetted gases under pressure is started by means of a sparking plug.

One method of constructing the apparatus is, for the purpose of example, described below and shown in the accompanying drawings.

Fig. 1 shows an elevation, consisting in part of a vertical section through the line 1—1 of Fig. 2, and in part of an outside view.

Fig. 2 shows a section, as seen from above, through the line 2—2 of Fig. 1, drawn to a larger scale.

Fig. 3 is a partial transverse section through the line 3—3 of Fig. 2.

Fig. 4 is a transverse section through the line 4—4 of Fig. 2.

Fig. 5 is a partial longitudinal section through the line 5—5 of Fig. 4.

The burner consists (Fig. 1) of a cylinder 10 provided with wings 11, contained in a water chamber which communicates with the boiler. The cylinder is secured to the front 13 of the water chamber by a flange 14 and gudgeon pins or bolts 15 and passes through the back 16 of said chamber into a stuffing box 17 whence it runs into the furnace. A conduit for air under pressure 18 and a conduit for mazout under pressure 19 run into the head of the cylinder (Fig. 2). In the interior of the cylinder 10 a stem 22 fitted with an inlet valve 20' and an escape valve 21' moves between an inlet valve seat 20 and an escape valve seat 21; the said stem 22 is guided as regards the front part 22' by passing into a stuffing box 23 and as regards the back part 22'' by passing between the wings 10' with which the back part of the cylinder 10 is provided.

The inlet valve 20' is joined (Fig. 2) to a mazout supply piston 24 contained in a chamber 25 bored in the head of the cylinder. A channel 26 runs through the centre of the said piston. The inlet valve carries a conical seat 27 on the right receiving the contact of a ring 28 part of which is shaped to coincide with it and which fits on to the stem 22 where it is held in position by a nut 29 secured by a locking nut 29'. Between these two parts a circular chamber 30 is contrived which communicates with the channel 26 bored through the centre of the oil supply piston 24. The contacting surface 27 is grooved in such a way as to provide passages 31 through which the oil sprays into the interior combustion chamber 32 of the cylinder 10. A chamber 34 (Fig. 5) containing a sparking plug 35 communicates through an opening 33 with the interior of the combustion chamber 32. Inside the valve stem 22 (Figs. 2 and 3) is placed a tube 36 supported on the outside by wings 37. The said tube 36 is provided at the anterior end (Fig. 1) with an orifice 38 which brings it into communication with a channel 39 opening at 40 into the water

chamber 12 below the burner 10, while the annular space 41 between the tube 36 and the valve stem 22 communicates through an orifice 42 with a channel 43 opening at 44 into the same water chamber 12 above the burner.

The burner operates in the following manner:

At first compressed air acting on the external face of the admission valve 20' displaces towards the right the whole of the valve connected with the rod 22 until the exhaust valve bears on its seat. During this movement air is introduced into the combustion chamber 32 at the same time as the piston 24 for admitting combustible causes the discharge from the mazout pump to flow into the grooves 31 by means of which the combustible enters the combustion chamber 32. The carburetted mixture thus formed ignites on contact with the spark caused by the plug 35 and causes an extremely rapid combustion in the chamber 32 where the temperature of the gases as well as their pressure rise very considerably. The inner faces of the admission valves 20' and of the exhaust valves 21' are unequal, the larger being that of the admission valve; the sudden pressure developed in the chamber 32 acting on the inner surface of the admission and exhaust valves, displaces the whole of these valves towards the left. In this movement towards the left the opening of the exhaust valve first occurs placing the chamber 32 in communication with the furnace in which there is a pressure practically equal to atmospheric pressure and considerably lower than that of the gases under combustion in the interior of the chamber 32; an extremely rapid flow of the gaseous mass results therefrom causing its elements to have a high speed in a given direction.

This flow of the gas which may expand in the furnace involves a rapid lowering of the pressure in the interior of the combustion chamber and consequently on the inner faces of the admission and exhaust valves. A point is therefore reached at which the pressure which tends to displace the whole of the rod 22 towards the left becomes neutralized and then immediately lower than that which tends to displace this rod in the opposite direction, which pressure is the resultant of the pressure of air injected on the outer face of the admission valve 20' and the pressure of the combustible on the end of the distributing piston 24, so that the rod 22 is again displaced towards the right before the admission valve 20' has come in contact with its seat. The rod 22 during operation is thus maintained reciprocating between the two admission and exhaust valve seats which movement as regards these two is very rapid, but is of a somewhat

small amplitude which tends to make the gaseous current practically continuous and makes its pressure, which varies continually inside the combustion chamber, of an average magnitude superior to that of the compressed air injected.

The combustion can only take place in the combustion chamber 32 it being evident that it is only at this point that the air and the combustible come in contact.

In view of the inertia of the rod 22 and the effect of the rapid escape of the gases under combustion it has been found necessary, in order to obtain satisfactory operation of the apparatus, to make the different surfaces in contact with the compressed air and the gases under combustion of such relative areas that the difference of the inner surfaces of the admission and exhaust valves added to the sectional area of the piston which distributes the combustible will be sufficient to move the stem 22 to the neutral position under the pressure acting on the surfaces.

In an experimental apparatus, for a given pressure of air the maximum working was obtained by giving the different parts of the rod 22 the following diameters.

1. Extreme cylindrical parts 22', 22''=13 mm.
2. Cylindrical part 22 situated between the valves=18 mm.
3. Admission valve 20'=35 mm.
4. Exhaust valve 21'=30 mm.
5. Distributing piston 24=4 mm.

The cooling of the valve rod or stem is effected by water circulation on the thermosiphon system the current is passed through the passage 39, the interior of the tube 36, the exterior of the tube 36 and the passage 43.

The sparking of the plug may be dispensed with as soon as the burner has started to operate.

What I claim is:—

1. Mazout burner for steam boiler comprising in combination, a combustion chamber, a stem in the interior of said chamber, an admission valve and an exhaust valve carried by said stem, a mazout supply piston together with said admission valve, a single inlet for entrance of air under pressure, means for igniting the mixture of air and mazout the combustion generating a pressure higher than the pressure under which the air is injected, and means actuated by the difference of pressure for maintaining the stem in equilibrium vibrating in a mean position corresponding to the opening of the two valves also when the pressure in the combustion chamber is higher than the pressure under which the air is injected.

2. Mazout burner for steam boiler comprising in combination, a combustion chamber, a stem in the interior of said chamber,

a conduit for circulation of water in the interior of the stem, an admission valve and an exhaust valve carried by said stem, a mazout supply piston, a channel in the said piston communicating by grooved apertures with the interior of the combustion chamber, a single inlet for entrance of air under pressure, means for igniting the mixture of air and mazout; the respective dimensions of the admission and exhaust valves and of the valve stem being so calculated that the differential effect of the pressures on the said valves results in maintaining the stem in equilibrium vibrating in a mean position corresponding to the opening of the two valves also when the pressure in the combustion chamber is higher than the pressure under which the air is injected.

In witness whereof I have hereunto set my hand.

RENÉ SIROUET.