April 20, 1926. 1,581,223

J. M. MOORE

METHOD OF ATOMIZING LIQUID FUEL

Filed August 29, 1922

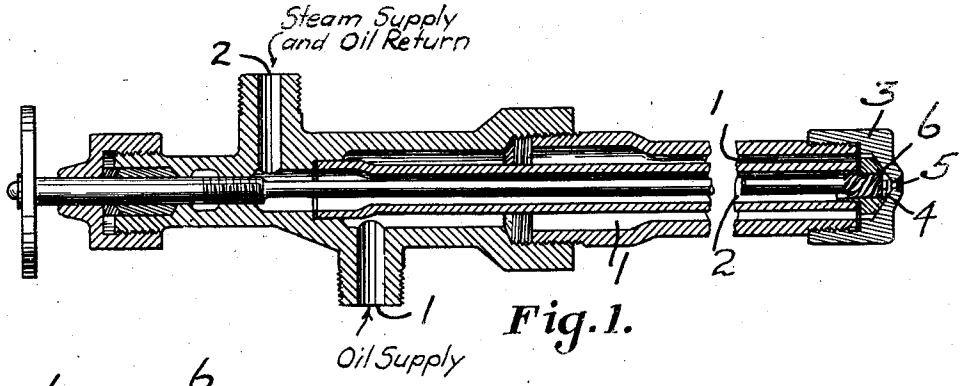



Fig. 1.

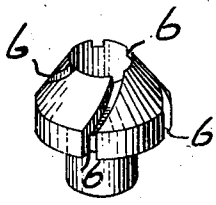



Fig. 2.

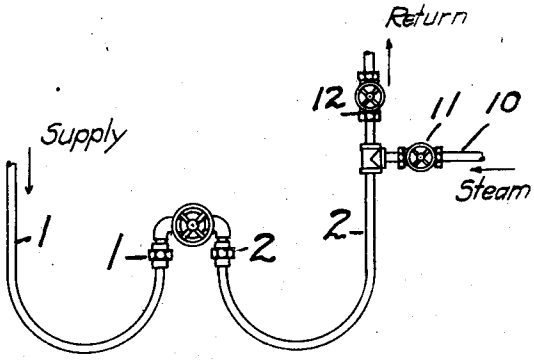



Fig. 3.

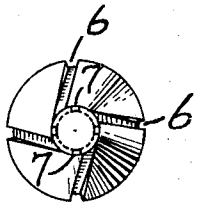



Fig. 4.

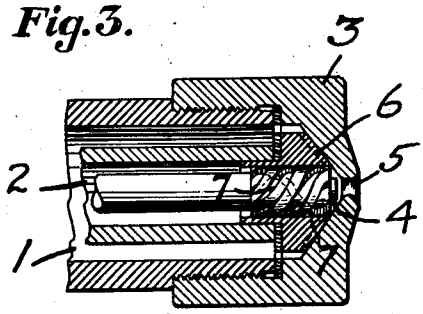



Fig. 5.

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# UNITED STATES PATENT OFFICE.

JULIAN MORGAN MOORE, OF PORTSMOUTH, VIRGINIA.

## METHOD OF ATOMIZING LIQUID FUEL.

Application filed August 29, 1922. Serial No. 585,001.

*To all whom it may concern:*

Be it known that I, JULIAN MORGAN MOORE, a citizen of the United States, and resident of Portsmouth, in the county of Norfolk and State of Virginia, have invented certain new and useful Methods of Atomizing Liquid Fuel, of which the following is a specification.

My invention relates to an improved method of atomizing liquid fuel especially hydrocarbon fuel and more particularly the utilization of steam in mechanical atomizers of the well known Fisher type as described in the following United States Patents granted to Joseph O. Fisher: 1,252,254, January 1, 1918; 1,326,488, December 30, 1919; 1,333,612, March 16, 1920; and has for its object the production of a method of control that will permit instantaneous and perfect atomization and combustion without smoke in starting.

A further object is to produce a method of operation where a burner may be utilized both as a mechanical and steam atomizer in which event the heat of the steam can be utilized to heat the fuel in starting the burner.

This and other objects of my invention will be evident from inspection of the following drawings.

Figure 1 is a cross sectional view of a mechanical atomizer.

Figure 2 is an isometric view of the plug showing the tangential slots through which streams of oil are delivered to the mixing chamber.

Figure 3 is a piping diagram showing the fuel and atomizing medium lines as connected to the burner.

Figure 4 is the end of the plug showing the tangential ports for entry of the fuel and the end of the helical ports for entry of the atomizing agent or oil discharge, alternately disposed around the periphery.

Figure 5 is an enlarged detail of the atomizer end, in section.

In the carrying out of my invention I employ a burner provided with a fuel supply 1 and oil return 2 terminating in a tip 3 provided with a mixing chamber 4 and a fuel port 5 which is an outlet port for the nozzle and an inlet port for the combustion chamber, not shown. The fuel supply 1 connects with the mixing chamber through tangential slots 6 of which I show four but any number of slots or passages may be employed. The fuel discharge 2 is connected to the mixing chamber through a series of circumferential or helical passages 7 which are arranged so that they may be alternately disposed around the periphery of the rear face of the mixing chamber 4 as readily understood by referring to Figure 4. While it is not essential that the number of tangential slots for the entry of fuel into the mixing chamber be the same as the number of helical slots for the admission of the atomizing agent it is desirable, for a better mixture will result if the slots alternate around the periphery of the mixing chamber. All of the foregoing is more fully described in the three United States patents referred to and therefore require no further description.

In the fuel discharge line 2, Figure 3, I provide a cut in 10 for steam or other atomizing agent controllable by a valve 11. The oil return is controllable by the valve 12. It will be obvious therefore that when the valve 12 is closed and the valve 11 is open that steam under pressure may be delivered to the mixing chamber 4 and that when the valve 11 is closed and the valve 12 is opened a regulable amount of oil will return from the mixing chamber.

In starting my burner the steam and fuel is permitted to enter the mixing chamber, the fuel passing in streams through the tangential passages 6 and the steam axially and circumferentially through the helical grooves 7 impinging upon the fuel making a perfect mixture and is forced out through the opening 5 into the combustion chamber in a perfect atomizing spray ensuring complete combustion, the heat of the steam passing through the center of the oil supply, warming up the oil so that the viscosity of the fuel is lowered. The burner is now operated as a steam atomizer. After the boiler is generating steam the valve 11 is closed and valve 12 is opened and a regulable amount of fuel is by-passed the port 5. From now on the burner is operated as a mechanical burner covered by patents mentioned in the early part of this specification.

It will be readily understood that in passing hot steam under pressure inside the fuel supply that the viscosity of the fuel is lowered and upon entering the combustion chamber atomizing action is greatly promoted.

The fuel enters the mixing chamber 4 in small streams, through the tangential slots 6 of which I have shown four but it is perfectly obvious that any number may be used. The steam enters the mixing chamber also in small streams through the helical passages 7 which are interposed between the tangential slots so that the streams of fuel and oil alternate around the periphery of the mixing chamber. The number of the passages 6 should be the same as the number of passages 7. This arrangement causes a perfect swirling motion of the oil and steam which results in perfect atomization of the fuel upon entering the combustion chamber, not shown.

It will be readily understood that inasmuch as the atomizing agent is delivered into the mixing chamber through helical passages, it will have a decided motion axially due to emerging from the ends of the helical grooves as well as a tangential movement.

It is to be understood that it is not necessary that there be exactly four helical passages 7. There may be two, three, or any desired number provided that they alternate with the passages for the admission of fuel. Furthermore, as illustrated, the fuel is delivered tangentially so that it has a whirl in one direction, while the atomizing medium is delivered tangentially so that it is given a whirl in the other direction. This produces a thorough atomization but is not an essential characteristic of the invention.

I wish it distinctly understood that my steam atomizer herein described and illustrated is in the form in which I desire to construct it and that changes or variations may be made as may be convenient or desirable without departing from the salient features of my invention and I therefore intend the following claims to cover such modifications as naturally fall within the lines of invention.

I claim:

1. A method of atomizing liquid fuel which comprises delivering fuel into a mixing chamber in streams substantially tangential to the walls of said mixing chamber, thereby imparting a whirling motion thereto, delivering an atomizing agent under pressure into said chambers in streams alternating with the streams of fuel and which tend to produce rotation in the opposite direction, and liberating the resulting mixture of fuel and atomizing agent through an orifice concentric with the axis of rotation.

2. A method of atomizing liquid fuel which comprises delivering fuel into a mixing chamber in tangential streams substantially tangential to the walls of the said mixing chamber, thereby imparting a whirling motion thereto, and delivering an atomizing agent under pressure into said chamber in tangential streams which alternate with the streams of fuel and tend to produce rotation in the opposite direction and liberating the resulting mixture of fuel and atomizing agent through an orifice concentric with the axis of rotation.

3. A method of atomizing liquid fuel which comprises delivering fuel into a mixing chamber in streams substantially tangential to the walls of said mixing chamber, thereby imparting a whirling motion thereto, delivering an atomizing agent under pressure into said chamber in tangential streams which alternate with the streams of fuel and impinge thereon at an angle and which tend to produce rotation in the opposite direction, and liberating the resulting mixture of fuel and atomizing agent through an orifice concentric with the axis of rotation.

4. A method of controlling the combustion of liquid fuel which comprises supplying the fuel and an atomizing agent under pressure to a mixing chamber, cutting off the supply of atomizing agent and by-passing a regulable amount of fuel back from the mixing chamber.

5. A method of controlling the combustion of liquid fuel which comprises supplying the fuel and an atomizing agent under pressure in alternate streams to a mixing chamber, cutting off the supply of atomizing agent, and returning a regulable amount of fuel from the mixing chamber.

6. A method of controlling the combustion of liquid fuel which comprises supplying the fuel and an atomizing agent under pressure in alternate tangential streams into a mixing chamber, cutting off the supply of atomizing agent, and returning a regulable amount of fuel from the mixing chamber.

Signed at 501 Fifth Ave., New York in the county of New York and State of New York this twenty-eighth day of August A. D. 1922.

JULIAN MORGAN MOORE.