

Nov. 22, 1932.

W. E. SHORE

1,888,939

METHOD AND APPARATUS FOR NEBULIZING AND BURNING FUEL OIL

Filed Jan. 20, 1930

2 Sheets-Sheet 1

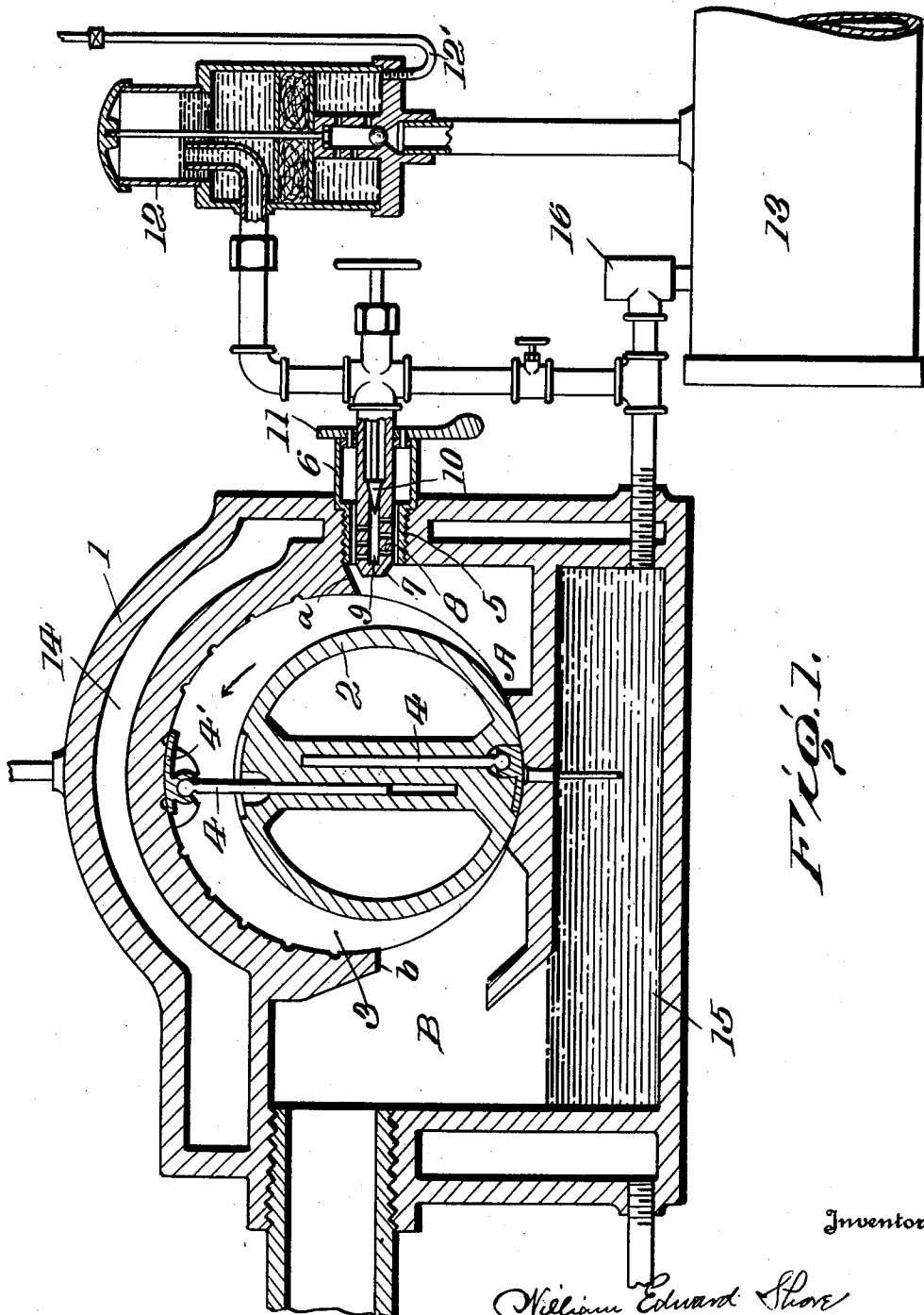


Fig. 1.

Inventor

William Edward Shore
By *Thordar & Thordar*

Attorney

Nov. 22, 1932.

W. E. SHORE

1,888,939

METHOD AND APPARATUS FOR NEBULIZING AND BURNING FUEL OIL

Filed Jan. 20, 1930

2 Sheets-Sheet 2

Fig. 2.

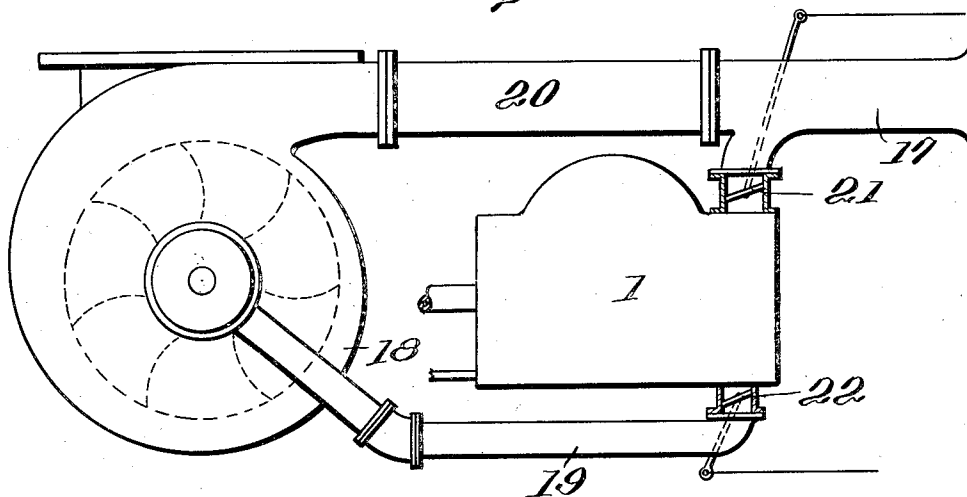
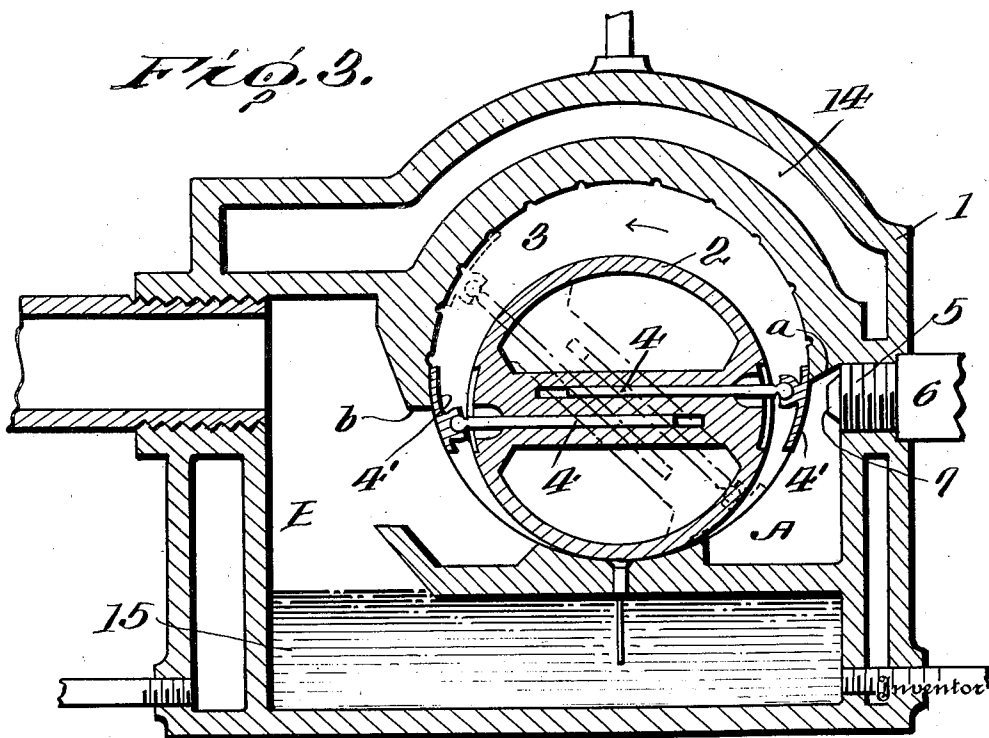


Fig. 3.



William Edward Shore

By *T. Gordon & T. Gordon*

Attorney

UNITED STATES PATENT OFFICE

WILLIAM EDWARD SHORE, OF WEST NEW BRIGHTON, NEW YORK

METHOD AND APPARATUS FOR NEBULIZING AND BURNING FUEL OIL

Application filed January 20, 1930, Serial No. 422,237, and in Great Britain December 21, 1923.

This invention relates to new and useful improvements in a method and apparatus for nebulizing and burning fuel oil and the objects of the invention are to facilitate the combustion of fuel oils by reducing them to such a fine state of division as to be readily supported in the atmosphere and consequently enabling a thorough mixture of air therewith to produce a more perfect combustion, thereby effecting a material reduction in the cost of oil fueling and eliminating the smoke nuisance.

A still further object is to enable a perfect control of the combustion.

The principal feature of this invention consists in nebulizing the oil by introducing it into a chamber which through a mechanical movement is being rapidly increased in its volumetric capacity and subjecting the oil together with an elastic suspending medium such as air to a rapid and progressive expansion continuing to the moment of opening the chamber to discharge and utilizing the heat energy created through the discharge conditions, thus effecting a further transformation of the nebulized oil, by subjecting it suddenly to the pressure of previous discharge which is preferably below the saturation pressure of part or all of the constituents of the oil.

For a more complete disclosure of the method principle involved reference may be made to my Patent No. 1,744,059, granted January 21st, 1930.

In the drawings, Figure 1 is a sectional diagrammatic view of a form of apparatus for putting this invention into effect.

Figure 2 is a diagrammatic illustration of a means for handling the nebulized oil.

Figure 3 is a diagram illustrating the relative position of the rotor vanes as effecting the steps in the method.

This invention contemplates a departure from all previous methods in reducing the oil to fine particles and the accomplishment is very simple, the oil being introduced into a high speed vacuum machine and rapidly expanded therein, as hereinafter more fully described.

In the structure illustrated in Figure 1, 1

is a vacuum pump of high speed rotary type having the rotor 2 eccentrically arranged in the chamber 3 and carrying the vanes 4. In the inlet 5 arranged at one side of the chamber 3 is secured a cylindrical casing 6 and in the centre of this casing is supported the oil nozzle 7. The nozzle which is spaced from the wall of the casing 6 is preferably provided with radial holes 8 leading from a central passage 9 which is controlled by the needle valve 10. A perforated rotary disc valve 11 controls the flow of air to the casing 6.

The oil is fed to the body of the valve 10 from a filter 12 arranged above a suitable tank supply 13, being drawn through the nozzle by the vacuum created in the pump. The oil discharging through the radial holes 8 is partly broken up by the flow of air or gas through the casing 6 but the principal change in the condition of the oil occurs through the extremely rapid rarification of the elastic suspending medium in the suction side of the pump.

In the rotation of the rotor 2 the vanes 4 which are here shown provided with suitable contact shoes 4' engaging the inner wall of the chamber 3 are moved in the direction of the arrow past the upper wall *a* of the chamber A connected with the inlet 5 and as the vane continues to swing through the rotation of rotor, the volumetric capacity of the inlet chamber A is rapidly increased. This rapid increase in volumetric capacity is greater than can be supplied by the inflowing air and oil through the nozzle member 7, the result being that the air or other elastic suspending medium for the oil is rapidly expanded and the oil sprayed through the nozzle is by reason of such expansion broken into very fine particles,

On reference to Figure 3 it will be seen that when the vanes move into such a position through the rotation of the rotor then an opening is created between the discharge chamber B in the pump and the interior of the chamber 3, the opposite vane will have moved past the wall *a* and the inlet chamber is closed.

Upon the moving of the vanes past the wall *b*, the pressure of the previous discharge,

which is much greater than the rarified pressure in the chamber 3, is allowed to enter the chamber 3, thereby subjecting the rarified air and the particles of the oil carried thereby, to a pressure shock and agitation which is preferably below the saturation pressure of part or all of the constituents of the liquid.

The continued movement of the rotor vane which is following the one which has thus opened the discharge to communicate with the chamber 3, than expels the nebulized oil from the chamber 3 forcing it against the higher pressure of the previous discharge.

It is found in practice that this rapid raising of pressure within the chamber 3 of the pump containing the rarified suspending medium and oil not only produces a very effective vaporizing of the oil particles, but it effects a very material increase in temperature.

The increase in temperature due to compression is undoubtedly an important factor in effecting the gasification of the nebulized oil particles and the ultimate result is that the extremely fine particles produced remain in suspension and are not easily subject to condensation.

In the treatment of extremely heavy oils, such as ordinary fuel oil there may be a certain amount of condensation or lack of vaporization and such particles will fall to the chamber 15 arranged below the pump chamber. This oil will be heated by the heat of the pump and may be further heated by a steam jacket 14 and it is preferably carried back to the inlet oil nozzle where it mixes with the stiffer and heavier oil and helps it to reduce. Any excess is conducted back to the supply tank 13 through a check valve 16. Some oils may be handled to better advantage by emulsifying them and a tube 12' is connected to the filter to conduct a suitable emulsifying agent thereto.

The nebulized oil discharged from this pump is of an extraordinarily fine nature and readily supports combustion. It floats well and has the effect of carrying a flame a long distance in a furnace, thus producing the very best conditions of combustion as well as of heating.

In order to assist the distribution of the nebulized oil it is found advisable under certain conditions to boost the flow of the nebulized oil emanating from the vacuum pump. This may be accomplished by attaching a blower to the discharge through a T connection such as illustrated in the pipe 17, Figure 2 or it may be desirable to take the nebulized oil from the pump discharge to the centre of a centrifugal blower and have it blown direct with the full force of the pump. It may be found desirable to use an installation which is capable of being operated either way and in the diagrammatic illustration of Figure 2 the blower 18 has a conduit 19 leading from the centre to the discharge end of the

pump and its conduit 20 leading from the discharge of a blower is projected into the T pipe 17. Suitable valves 21 and 22 are provided to regulate the discharge openings.

It has been demonstrated in practice that the heaviest kind of fuel oils as low as between 12 and 14 Baumé can be nebulized without artificial heat to such a fine state that they will remain in suspension for an extraordinarily long period and as the velocity of discharge is not high, the speed of flow of the fuel will be relatively low. The fuel therefore does not need to be carried through the combustion chamber at an excessive speed and these combined conditions ensure the remarkable result in combustion. Moreover the compressor may be located a considerable distance from the burner itself.

Though in the specification and claims I have termed my device a pump or compressor, it will be understood that its use does not necessarily involve the building up of any particular degree of pressure. In the expanding chamber a degree of vacuum is ordinarily present. The pressure at the outlet end of the device obviously depends upon the conditions and may be greater than or equal to or less than atmospheric pressure. The words pump and compressor as herein used are to be so understood.

Having described my invention what I wish to claim and secure by Letters Patent is:

1. An oil burning apparatus comprising a vacuum pump, means for admitting a mixture of oil and air to said pump, means for rotating said pump whereby said mixture is expanded, a burner, means for conducting said mixture to said burner, and a means to accelerate the mixture in its movement toward said burner.

2. An oil burning apparatus comprising a vacuum pump, means for admitting a mixture of oil and air to said pump, means for rotating said pump whereby said mixture is expanded, a burner, a blower, means for conducting said mixture to said blower from said vacuum pump, and means connecting said blower to said burner.

3. In an oil burning apparatus having an oil supply and a burner connected thereto and wherein the oil is nebulized to produce a combustible vapor the combination with a vacuum pump for nebulizing the oil, means for admitting a mixture of the oil, and air, to said pump, means for rotating said pump whereby the oil air mixture is expanded, a high pressure chamber into which said expanded mixture exhausts, means for conducting said mixture to the burner, and a means including a blower to accelerate the mixture in its movement toward the burner.

4. In an oil burning apparatus having an oil supply and a burner connected thereto and wherein the oil is nebulized to produce a

combustible vapor, the combination with a vacuum pump for nebulizing the oil, means for admitting a mixture of the oil, and air, to said pump, means for rotating said pump whereby the oil air mixture is expanded, a

admitting a mixture of the oil, and air, to said pump, means for rotating said pump whereby the oil air mixture is expanded, means for conducting said expanded mixture to the burner from the vacuum pump, comprising a blower having its inlet side connected to the discharge of said pump and its outlet side connected to the discharge of said pump and to the burner and a valve in each connection to the discharge side of the vacuum pump.

WILLIAM EDWARD SHORE.

5. In an oil burning apparatus having an oil supply and a burner connected thereto and wherein the oil is nebulized to produce a combustible vapor, the combination with a vacuum pump for nebulizing oil, means for admitting a mixture of the oil, and air, to said pump, means for rotating said pump whereby the oil air mixture is expanded, a blower, a conduit connecting the discharge of the vacuum pump to the intake of said blower, a valve in said connection, and a conduit connecting the discharge of said blower to the burner, whereby the mixture may be drawn by suction from the vacuum pump and forced under pressure to the burner.

6. In an oil burning apparatus having an oil supply and a burner connected thereto and wherein the oil is nebulized to produce a combustible vapor, the combination with a vacuum pump for nebulizing the oil, means for admitting a mixture of the oil, and air, to said pump, means for rotating said pump whereby the oil air mixture is expanded, a blower, a conduit connecting the blower to the burner, a conduit connecting the discharge of the pump in the conduit between the blower and the burner, a valve in said second conduit whereby the mixture may be drawn by ejection from the vacuum pump under the influence of air passing to the burner.

7. In an oil burning apparatus having an oil supply and a burner connected thereto and wherein the oil is nebulized to produce a combustible vapor, the combination with a vacuum pump for nebulizing the oil, means for admitting a mixture of the oil, and air, to said pump, means for rotating said pump whereby the oil air mixture is expanded, a blower, a conduit connecting the discharge of the vacuum pump to the intake of said blower, a valve in said connection, and a conduit connecting the discharge of said blower to the burner, a conduit connecting the discharge of the pump to the conduit between the blower and burner, and a valve in said last named conduit whereby the mixture may be drawn optionally by suction from the vacuum pump and forced under pressure to the burner or by ejection from the vacuum pump under the influence of air passing to the burner.

8. In an oil burning apparatus having an oil supply and a burner connected thereto and wherein the oil is nebulized to produce a combustible vapor the combination with a vacuum pump for nebulizing oil, means for

80

85

90

95

100

105

110

115

120

125

130