

G. L. BOURNE.
OIL FUEL COMBUSTION PROCESS.
APPLICATION FILED JUNE 26, 1905.

933,953.

Patented Sept. 14, 1909.

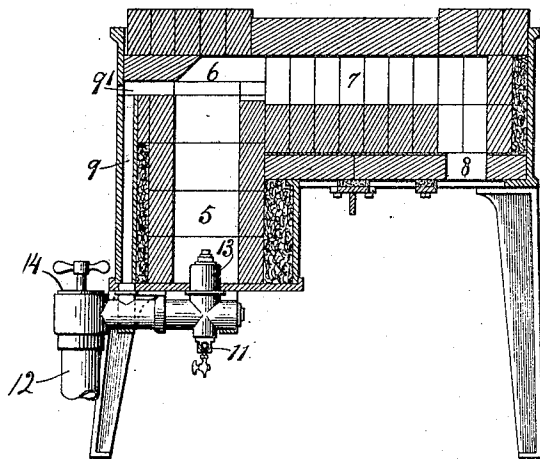


Fig. 1.

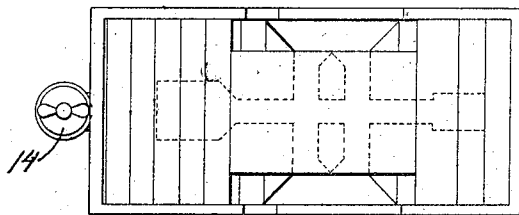


Fig. 2.

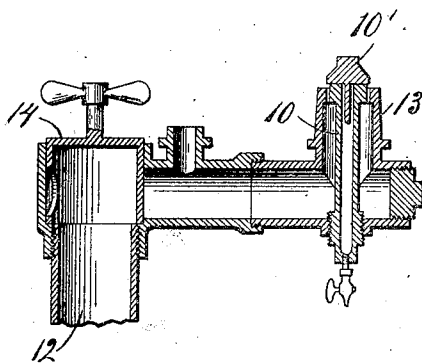


Fig. 3.

Witnesses:
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UNITED STATES PATENT OFFICE.

GEORGE L. BOURNE, OF NEW YORK, N. Y., ASSIGNOR TO THE RAILWAY MATERIALS COMPANY, OF CHICAGO, ILLINOIS, A CORPORATION OF ILLINOIS.

OIL-FUEL-COMBUSTION PROCESS.

933,953.

Specification of Letters Patent. Patented Sept. 14, 1909.

Application filed June 26, 1905, Serial No. 266,973.

To all whom it may concern:

Be it known that I, GEORGE L. BOURNE, a citizen of the United States, residing at New York city, in the county of New York and State of New York, have invented a new and novel Oil-Fuel-Combustion Process, of which the following is a specification.

The object of this invention is to provide a process for burning oil fuel whereby perfect combustion will be obtained and all of the heat units in the fuel made available for the work.

In the accompanying drawings I have shown a flue welding furnace in which the process can be practiced and referring thereto—

Figure 1 is a sectional elevation. Fig. 2 is a top plan view. Fig. 3 is a detail sectional view of the air valve and burner connections.

In the furnace disclosed in the drawings 5 is the primary combustion chamber, 6 the secondary combustion chamber and 7 the heating chamber, the latter being preferably closed at the top and provided with a slag opening 8. At one side of the primary combustion chamber is an air flue 9 which turns inward at the top, at 9', and discharges into the secondary combustion chamber. The burner comprises a tube 10 connected with an oil supply pipe 11 and provided at its top with a valve 10' of any suitable character. I have shown a gravity valve in the drawings which is adapted to be raised by the pressure of the oil. Air is supplied from a pipe 12 which communicates with the flue 9 and also with the extension 13 to discharge air around the upper end of the oil tube 10. The supply of air is regulated by a valve 14 of suitable construction.

The oil is fed by gravity or under pressure and the air is supplied by a fan or other suitable means. The various steps of the process of consuming the oil have in view, first,—the vaporization of the oil, and secondly, the complete combustion of the hydrocarbons thus formed from their vaporized conditions. The ordinary processes of burning oil are wasteful in that too direct conversion of oil to burning gases is attempted with a resultant loss in fuel and oxidizing flame. This is due to the fact that a perfect mechanical mixture of oil and air is not possible in practice.

In this process combustion takes place at

the burner in the lower part of the primary combustion chamber which is lined from bottom to top with fire brick. The only air admitted to the primary combustion chamber enters through extension 13 around the upper end of the oil tube and supplies the oxygen necessary to support the primary combustion, the object being to so regulate this supply that oxygen is not present in sufficient quantity to completely consume the hydrocarbon vapors which result from this first step.

The air issuing from the extension 13 around the upper end of the oil tube greatly aids in an early vaporization of the oil, on account of the restricted orifice shown in Fig. 3, and through which said air passes; and also on account of the edge of the valve 10' projecting slightly over said orifice, as illustrated. That is to say, the construction is such that the oil is delivered in a thin film on the under surface of the projecting edge of the valve 10', and the air at a high velocity impinges against said film and projecting surface. This action not only causes the oil to be more finely divided or atomized than would be the case were no obstructing surface present; but owing to the fact that the edge projects as shown, the air and atomized oil is immediately deflected, and therefore scattered, or expanded, at the very base of the flame to a higher degree than would be the case were no obstructing surface present; and this increased expansion of oil and air at the base of the flame, of necessity, promotes the formation of carbon monoxid or CO gas in the early stages of combustion. In addition to this, after the burner is in operation the valve 10' and its edge become highly heated, so that this atomization or extreme sub-division of the oil takes place after the oil in a thin film has traversed a surface at a high temperature; and therefore an additional degree of sub-division, closely approaching, if not reaching the state of vaporization, is imparted to the oil just before it is ignited. This state of extreme sub-division is also very important in producing oil vapors at the very beginning of the flame; for such vapors more readily form relatively large quantities of carbon monoxid CO, which is afterward blown through the chambers 6 and 7 on to the object being heated, and there further oxidized to carbon dioxid CO₂.

This CO₂ gas is therefore formed in greater quantities and caused to deliver up relatively greater quantities of heat at the exact point needed, than would be the case if it were formed at some other point. Stated with more particularity as these CO and other vapors pass upward in the combustion chamber into the area highly heated from previous combustions their temperature rises, and before they enter the secondary combustion chamber said vapors have formed carbon monoxid, hydrogen, marsh gas and traces of other hydrocarbon gases. These gases having attained a high temperature and, not as yet having been supplied with the oxygen necessary for a complete combustion, now pass into the secondary combustion chamber where the additional oxygen to complete combustion is supplied by the air issuing from the flue, and the gases are burned to CO₂ and H₂O at the very point where the heat liberated is needed, thereby preventing losses of heat from radiation and other causes, which would result if this combustion took place at an earlier stage. A certain amount of free carbon is disengaged as the gases are admitted into this highly heated area, and this burns while floating in the inflammable gases.

The chemical action taking place throughout the process is as follows: The oil after ignition is vaporized and passing upward breaks up into free hydrogen, carbon mon-

oxid, marsh gas and traces of other hydrocarbon gases. Passing on now to the secondary combustion chamber the hydrogen is burned to water, the carbon monoxid to carbon dioxid and the marsh gas to carbon dioxid and water. The carbon which may be disengaged in the process burns to carbon dioxid.

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

The process of burning oil fuel which consists in supplying the oil to a burner at the bottom of a primary combustion chamber under pressure in a thin film in contact with a highly heated surface; supplying air under pressure and causing the same to impinge against said surface and film to highly subdivide the oil, said air and oil after leaving said heated surface being deflected to further aid in subdividing the heated oil at the base of the flame and thereby promoting the formation of inflammable gases in said chamber; and finally admitting a fresh supply of air to said gases at the top of said chamber and causing said gases to further oxidize and to deliver up their heat of combination at the point of use, substantially as described.

GEORGE L. BOURNE.

Witnesses:

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