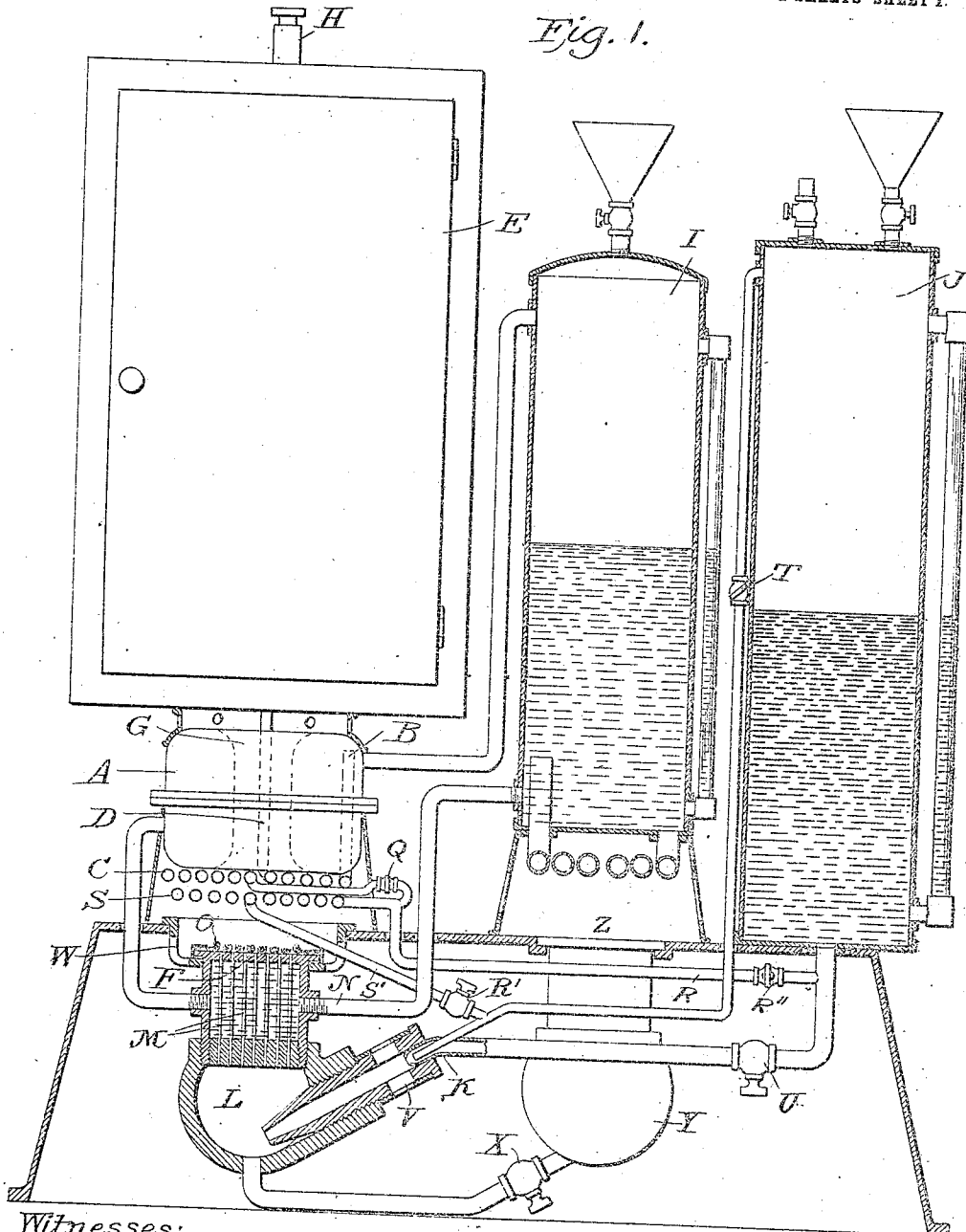


H. MAXIM.
METHOD OF COMBUSTION OF OIL AND GAS MIXTURES.
APPLICATION FILED APR. 19, 1902.

977,208.

Patented Nov. 29, 1910.

2 SHEETS—SHEET 1.



Witnesses:

James P. Duhamel.
[Signature]

Inventor:

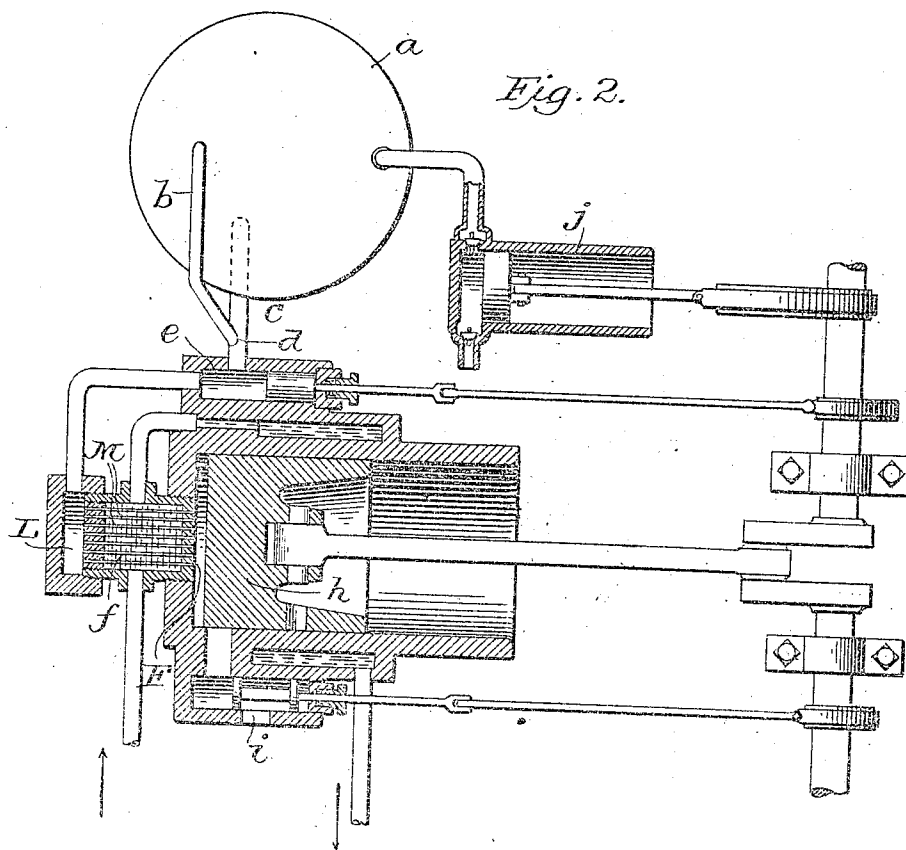
Hudson Maxim
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Witnesses:

Daniel F. Duhamel

[Signature]

Inventor:

Hudson Maxim

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Atty.

UNITED STATES PATENT OFFICE.

HUDSON MAXIM, OF NEW YORK, N. Y.

METHOD OF COMBUSTION OF OIL AND GAS MIXTURES.

977,208.

Specification of Letters Patent.

Patented Nov. 29, 1910.

Application filed April 19, 1902. Serial No. 103,726.

To all whom it may concern:

Be it known that I, HUDSON MAXIM, of 891 Sterling Place, Brooklyn, county of Kings, city and State of New York, have invented new and useful Improvements in Methods of Combustion of Oil and Gas Mixtures, which invention is fully set forth in the following specification.

The present invention relates to improvements in methods of combustion of gas or oils or oil vapors, and is especially applicable in heating boilers and in supplying heated products of combustion under pressure for actuating a motor.

In carrying out the invention, a chamber is provided, normally filled with water, the chamber being preferably interposed in the path of the water supply to the boiler or other vessel to be heated, forming a part of the said water conduit, whereby is maintained a comparatively low temperature of the water in the said burner. Passing through the burner chamber are provided small tubes or vapor conduits of such number as may be sufficient to supply the necessary vapor or mixed vapor or gases and air to the flame, all as hereinafter explained, and the size of the tubes must be sufficiently small, and their length sufficiently great to effectually prevent the passage of the flame through them to ignite the gas and air mixture, at the inlet end of the burner.

Referring to the drawings, Figure 1 is a sectional elevation of the burner and an elevation partly in section of appurtenant apparatus in combination with which it may be employed for heating a boiler. Fig. 2 is a plan view of an engine, air pump and air and oil reservoir, showing the said burner in section as an inlet port for mixed air and vapor to an engine cylinder.

Referring to Fig. 1, A is a steam boiler, used for producing steam for cooking purposes, the steam produced within the boiler escaping through a pipe B, shown in dotted lines, and through a superheating coil C, under the boiler, where the steam is superheated, thence passing upward in a highly superheated state through the vertical extension D, of the pipe C, shown in dotted lines, to the point of use here shown as a steam oven E of any suitable construction, superimposed upon the boiler, while the products of combustion from the burner F pass upward through a tube G, shown in dotted lines, to any suitable place where heat

is to be used such as around an oven through a channel not shown in the drawings, the steam and the products of combustion both escaping at the valve H at the top of the oven.

A supply reservoir of oil, J, is connected with a spraying device K, compressed air contained in the chamber J over the oil being utilized for spraying the oil, thereby producing in the chamber L a mixture of oil spray and air, which is forced upward through the small tubes M. of the burner chamber about which water is made to circulate through the pipe N. from the reservoir I. to the boiler A, the water supply to the boiler A being maintained at the proper altitude by a float valve not shown. The air and oil mixture is ignited at the burner F, which consists of the openings of the pipes M, about which openings asbestos O is provided, to facilitate in the ignition of the oil and air mixture, and maintain the stream of the same alight. After the boiler A has become heated by the burner supplied with oil and air from reservoir J, the valves T and U are turned to cut off this supply of fuel and valves R', Q and R'' opened. A portion of the escaping superheated steam now enters the coil S where it mixes with the oil delivered to the coil through oil supply pipe R. The oil is forced rapidly through the heated coil S by the superheated steam assisted by the pressure in reservoir J, and is vaporized and partially decomposed, forming a small percentage of water gas, the formation of soot being thus prevented within the coil S. The mixture of steam and oil flow together with great velocity through pipe S', valve R' and spraying device K, which now becomes an injector, sucking air in at the openings V, producing in the chamber L a mixture of hot steam, oil vapor and air, but not at a temperature so high as to reach the ignition point. The air, steam and oil vapor mixture, is now forced up through the pipes M to the burner F, and any additional air which may be desired to produce a perfectly blue hot flame may be admitted through openings W. A portion of the air, oil and steam mixture may be taken from the chamber L. through the valve X to the chamber Y, where it is supplied in the same manner as already described to the burner Z, for heating the water in the reservoir I.

Referring to Fig. 2, a, designates a com-

5 bined air and oil reservoir similar to that of
 Fig. 1. Air is admitted from the chamber
a, through a pipe *b*, and oil is simultane-
 10 ously admitted through a pipe *c*, to an in-
 jector and spraying device *d*, not shown in
 detail, to and through a port *e*, to the cham-
 ber *L*, and through the burner chamber *f*
 to the burner proper *F*, within the cylinder
 of the engine.
 15 - The small size of the pipes *M*, and the
 fact that they are surrounded by water, pre-
 vents the flame at *F* from passing backward
 to the chamber *L*, even though an explosive
 20 mixture of air and oil vapor be maintained
 at *L*, and supplied under great pressure to
 the burner *F*, and at a pressure necessarily
 in excess of the pressure generated by the
 combustion at the burner *F* in the engine
 25 cylinder. By means of a proper ignition
 device, or sparking device, of any usual and
 desirable form, the air and oil vapor in
 proper proportions for complete combus-
 tion, which are forced from the chamber *L*,
 30 through the pipes *M*, to the burner *F*, may
 be ignited at the burner *F*, and continuously
 as fast as the stream of the same enters into
 the engine cylinder to the burner *F*, where-
 by, due to the increased volume of the heated
 products of combustion, the piston of the
 35 engine *h*, will be forced violently forward
 until the inlet port *e* is closed, and the sup-
 ply of compressed air and oil vapor is shut
 off and the port *i* is opened for the escape
 of the products of combustion. An air
 pump *j*, is provided for compressing the air

for the reservoir *a*. It is obvious that the
 available power of this engine will be
 equivalent to the excess above that consumed
 in the friction of the parts and in the com-
 40 pression of the air necessary for the combus-
 tion of the oil or gas vapor.

The engine cylinder may be water jacketed
 and the water to the said water jacket may
 be supplied by passing it through the burner
 chamber and around the pipes *M*.

What is claimed is:—

1. A process of the character described,
 consisting in superheating a moving body of
 commingled steam and oil, introducing air
 into said moving body, subdividing the fluid
 50 mixture into a plurality of streams and cool-
 ing the latter in proximity to the zone of
 combustion.

2. A process of the character described,
 the steps consisting in superheating a rap-
 55 idly moving body of commingled oil and
 steam, mixing air with the resulting prod-
 uct on its way to the zone of combustion,
 subdividing the last-named mixture into a
 plurality of streams, cooling the same, and
 60 maintaining said streams lighted in the zone
 of combustion by means of refractory fibrous
 material.

In testimony whereof I, HUDSON MAXIM,
 have signed this specification in the presence
 65 of two subscribing witnesses.

HUDSON MAXIM.

Witnesses:

REEVE LEWIS,

WM. B. KERKAM.