(No Model.) 2 Sheets—Sheet 1.

E. DE BEAUHARNAIS.

LIQUID FUEL BURNER.

No. 454,125. Patented June 16, 1891.

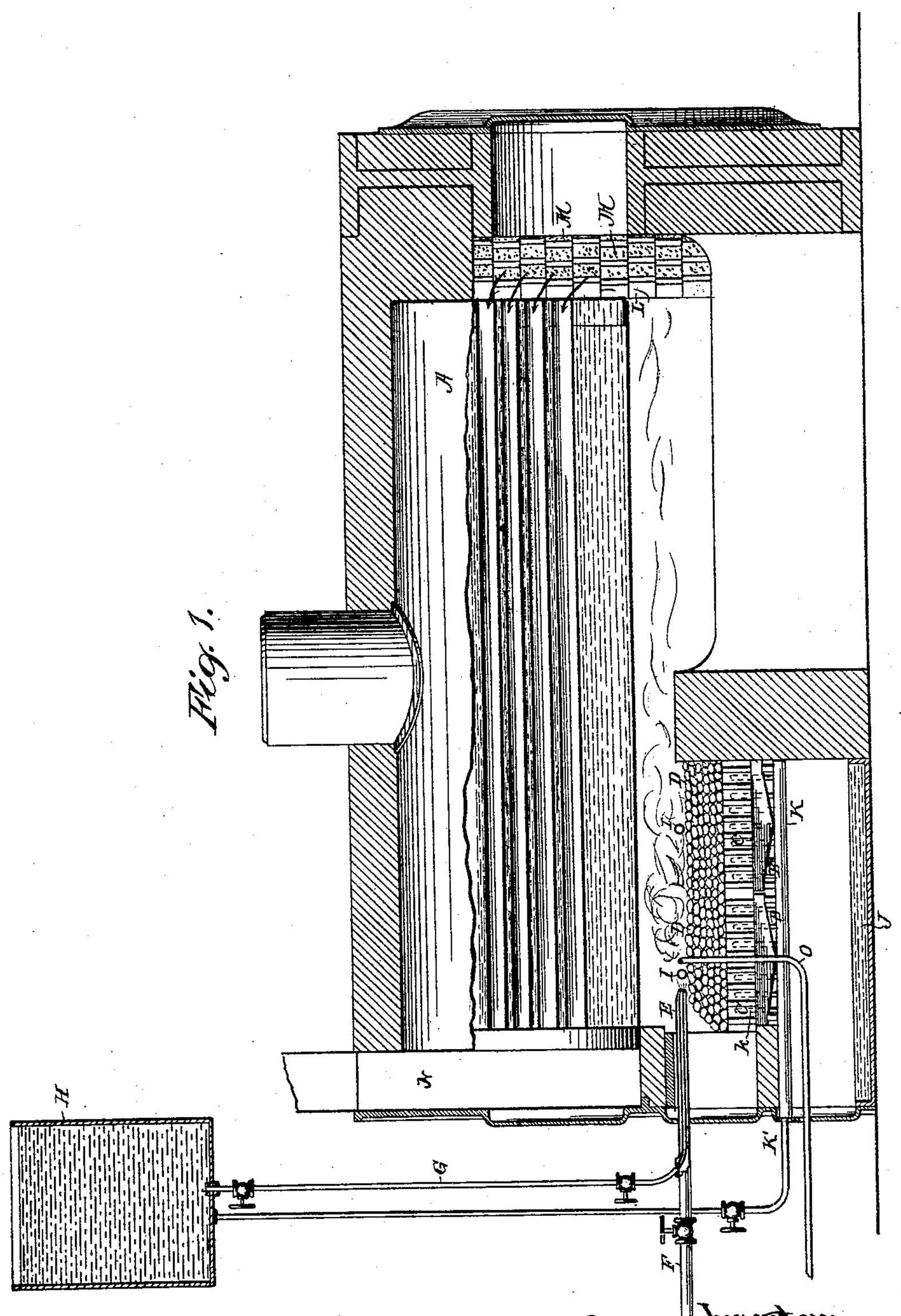

Fig. 1.

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(No Model.) 2 Sheets—Sheet 2.

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Fig. 2.

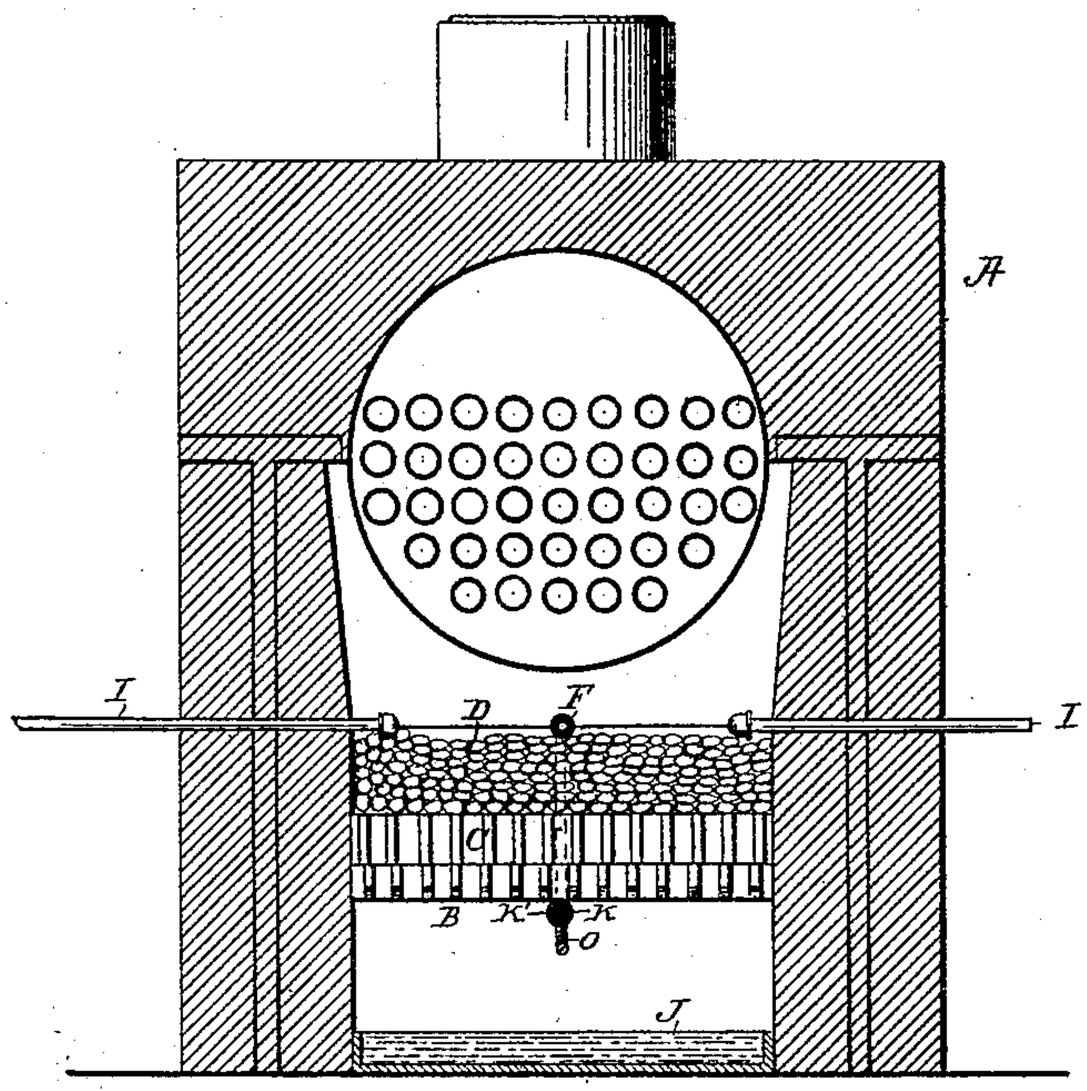
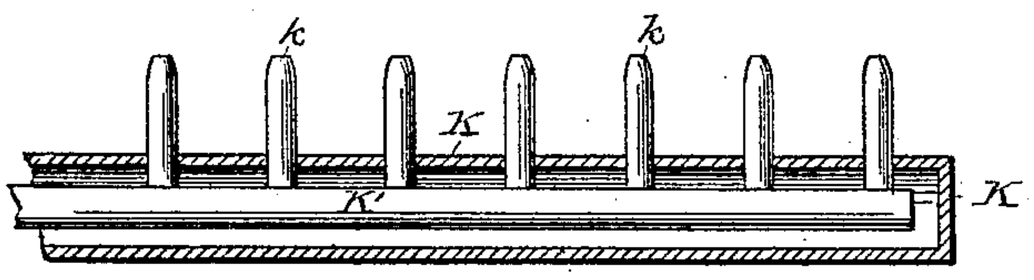


Fig. 3.



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UNITED STATES PATENT OFFICE.

EUGÈNE DE BEAUHARNAIS, OF KINGSTON, CANADA.

LIQUID-FUEL BURNER.

SPECIFICATION forming part of Letters Patent No. 454,125, dated June 16, 1891.

Application filed April 10, 1890. Serial No. 347,316. (No model.)

To all whom it may concern:

Be it known that I, EUGÈNE DE BEAUHARNAIS, a citizen of the United States, residing in Kingston, in the Province of Ontario, Canada, have invented certain new and useful Improvements in Liquid-Fuel Burners, of which the following is a description.

My present invention consists in certain improved methods of producing heat and applying it to useful purposes, and also of certain novel parts and combinations of parts composing an apparatus or elements in an apparatus for the production and application of heat, as will be particularly pointed out in the claims concluding this specification.

The following is a description of the accompanying drawings, wherein is illustrated one of the many structures which may be employed in the practice of my invention, and this, in connection with the description hereinafter contained, will be sufficient to enable any one skilled in the art to which my invention appertains or with which it is most nearly connected to make and use the same in one of the forms which are at present preferred.

In said drawings, Figure 1 is a longitudinal section through a stationary boiler embodying my invention, and Fig. 2 is a cross-section through the same. Fig. 3 is a detail view of one of the parts of the device.

In the drawings I have shown an ordinary steam-boiler A to illustrate the application of my invention to a useful purpose. Any other apparatus to be heated would be equivalent of the boiler there shown. This boiler I prefer to inclose in a tight compartment for the purpose of confining therein the heat generated.

B B are grate-bars.

C C are fire-bricks or fire-blocks resting on the grate-bars.

D are lumps of an incombustible compound, hereinafter fully described, placed upon the fire-bricks C C.

K is one of a number of double conducting-pipes fitted throughout its length with burners *k*, made of lava or other material which is not liable to melt or suffer injury from the high degree of heat to which it is subjected. The inner pipe K′, fitted with said burners, may be made of metal, and is connected with any suitable source or reservoir of fluid fuel to conduct the same from its reservoir to the points where it is desired that combustion of the same shall take place. The outer pipe may be made of asbestus, fire-clay, or any other suitable material, or a compound of materials capable of resisting intense heat. I prefer to fill the space between said pipes and to keep it continuously supplied while the furnace is heated with a fluid, such as water, to protect the inner pipe from the effects of the high degree of heat-pressure, as without this protection it would be apt to melt. The burners projecting from the pipes are preferably to be placed immediately under the grate-bars or between them. Indeed, I may dispense with the grate-bars shown in Fig. 1 and rely altogether upon these double pipes K to act as grate-bars, the blocks C and lumps D being placed immediately upon and supported by them. In this case these pipes will perform the double function of ways to conduct the heated fluids and as grate-bars for sustaining the weight of the superincumbent infusible material.

D are chunks or blocks of refractory and incombustible material for receiving, containing, and conducting the heat generated by the consumption of the fuel, as is hereinafter described. This material preferably consists of a compound of retort-cement, plumbago, asbestus, mica, fire-clay, and fire-brick or equivalent infusible substances in suitable proportions, so prepared that they will unite or combine and form an infusible mass. These materials are preferably mixed thoroughly together in a dry state, when a sufficient quantity of water is added, so that the mixture shall be made of molding consistency. It is then formed into suitable shapes, such as blocks or lumps, of about four inches in diameter, or of any other suitable size to suit the furnace capacity. Such a compound material may be conveniently made of the following ingredients and proportions: retort-cement, twenty per cent.; plumbago, twenty per cent.; fire-clay, twenty per cent.; asbestus, twenty-five per cent.; and mica, fifteen per cent. These proportions may be varied according to the use required. Pulverized fire-brick may be added to advantage to increase bulk. I do not, however, limit myself to the use of a refractory material made of the precise ma-

terials and proportions above described, as equivalent compounds may be used instead. After this compound has been molded into blocks or lumps of the desired size and shape they may be dried and hardened by exposing them to the sun and air, or by placing them in pans or plates in an oven. This material is a valuable medium for receiving, retaining, and communicating heat in the improved methods and with the improved apparatus herein described, even to a metal-melting temperature. They are capable of standing long-continued use without decomposition and with but little waste in communicating the heat produced by the consumption of fuel, especially liquid fuel, as herein described.

E is an injector consisting of an outside pipe F in communication with atmospheric air or steam, or both, and an interior pipe G, in communication with a suitable supply of liquid fuel, such as gasoline or naphtha. Both of these pipes are provided with suitable valves to regulate the flow of the material through them, so as to vary the mixture injected into the fire-box in the form of thin spray. By means of this injector an exceedingly fine spray of oil may be thrown on or into the body of the glowing blocks or lumps D. If desired, the pipe F may be attached to a suitable supply of steam, or steam and air, so that there will be discharged from the injector a spray of oil, steam, and air, or oil and steam, or oil and air, upon the top of the glowing mass.

I I are tubes entering the sides of the fire-box, through which, when desired, water or steam may be injected therein.

O is an air-tube, made of suitable material, carrying air up through the grate-bars to increase perfect combustion and to hasten the fire when needed. The bottom of the ash-pan I prefer to keep covered with water J, which is being constantly converted into steam, and is then forced with and by the air, introduced by any suitable means under the grate-bars, up between the grate-bars to promote perfect combustion.

L are dry fire-bricks placed so as to leave between them intervening spaces of, say, an inch, and M are blocks or lumps of partly-burned limestone behind the bricks L. The heat and products of combustion leaving the fire-box on their way to the boiler pass through these lumps of partly-burned limestone M, which, being heated, complete the combustion of the passing smoke, thereby increasing the heat in the tubular parts of the boiler, or in any other structure to be heated, by converting into heat all the combustible elements of the fuel and preventing any from escaping from the chimney unconsumed. This not only econimizes fuel and obtains the maximum degree of heat from a given quantity of fuel, but it entirely prevents smoke issuing unconsumed from the chimney. This part of my invention is adapted to use with all sorts of fuel and in any system of heat production.

N is a chimney, the upper part being broken away, through which the products of combustion unconsumed escape.

The operation of the device shown in the drawings may be thus described: Blocks or lumps of the infusible material hereinbefore described, or their equivalent, are placed in the fire-box on top of the grate-bars in quantities proportioned to the amount of heat required and the quantity of fuel to be consumed per unit of time. Gasoline or other suitable fluid or material is placed in the reservoir H. The blower connected with the air-injecting pipes is then put into operation. By regulating the valve controlling the duct K′ a suitable quantity of oil is discharged from the burners *k* and is ignited in the fire-box. The temperature of the infusible blocks is then raised to a glowing heat. Atmospheric air is now forced into the space below the grate-bars, and this mingles with the steam rising from the surface of the water, with which the ash-pan has been previously filled, and carries the same up through the grate-bars into the glowing mass. The heat may be regulated and increased by injecting oil, air, steam, or water into the fire-box by means of the injectors E and ducts I. The furnace is now in full operation and may be made to generate a large quantity of heat at small cost of fuel and mechanically apply the same with perfect freedom from danger to those attending the apparatus. When a metal-melting heat is required, I prefer to inject through the tubes I I to the upper surface of the glowing medium a small quantity of atomized water.

As before stated, the burned lime, which I prefer to place in a flue should be placed midway between the point where the fire is ignited at the front of the furnace and the point where the heat passes into the chimney after having completed its useful services. The blocks of partly-burned limestone serve to consume the smoke and largely increase the heat created by burning wood, coal, coke, and other fuel as well as oil.

Having described an apparatus capable of working my invention, what I claim, and desire to secure by Letters Patent, is—

1. In a device for generating heat from liquid fuel, the combination of means for conveying the liquid fuel to and for discharging it at the point where combustion is to take place, and blocks of infusible material composed of a mixture of retort-carbon, plumbago, fire-clay, asbestus, and mica arranged in a pile, with interstices between them to receive, conserve, and conduct the heat generated by said fuel.

2. In a device for generating heat from liquid fuel, the combination of a plurality of burners or tubes for discharging said liquid fuel at the point where combustion is to take place, blocks of infusible material composed of a mixture of retort-carbon, plumbago, fire-clay, asbestus, and mica arranged above said burners in a pile, with interstices between

them, and a generator arranged above said blocks for supplying the fire-box with a supply of liquid fuel mixed with an element containing oxygen, such as steam or air.

3. In a device for generating heat from liquid fuel, the combination of a plurality of burners or tubes for discharging said fuel at the point where combustion is to take place, blocks of infusible material arranged above said burners in a pile, with interstices between them, means for conveying water to the fire-box above said blocks, and an injector, also arranged above said blocks for supplying the fire-box with a supply of liquid fuel mixed with an element containing oxygen, such as steam or air.

4. In a device for generating heat from liquid fuel, the combination of a reservoir containing said fuel, a duct provided with a plurality of burners or exit-tubes, said burners being made of an infusible material, such as lava, and an envelope, also made of an infusible material, surrounding said duct and forming a chamber for the reception of water or other non-conductors of heat.

5. In a device for generating heat from liquid fuel, the combination of means for conveying liquid fuel to and discharging it at the points where combustion is to take place, and blocks of infusible material made of a mixture of retort-cement, plumbago, fire-clay, asbestus, and mica, molded into the desired shape for receiving, conserving, and conducting the heat generated by the combustion of said fuel.

6. In a device for generating heat from liquid fuel, the combination of a reservoir containing said fuel, a duct provided with a plurality of exit-tubes or burners for discharging said liquid fuel at the points where combustion is to take place, an incasing tube made of an infusible material surrounding said duct, and blocks of infusible material arranged in a pile, with interstices between them, resting upon said conducting-tubes, which serve both as grate-bars and as ducts for conveying the liquid fuel.

7. In a device for generating heat from liquid fuel, the combination of means for conveying the liquid fuel to and for discharging it at the point where combustion is to take place, a reservoir of water placed below the point where the fuel is discharged vaporized by the heat of said liquid fuel, blocks of infusible material arranged in a pile, with interstices between them, the vapor of water passing up with said fuel through said blocks, and means for conveying water to the fire-box above said blocks.

EUGÈNE DE BEAUHARNAIS.

Witnesses:

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Of the city of Kingston, Ontario, law student.

JOHN MENDIES,

Of the city of Kingston, Ontario, notary public, &c.