

No. 676,063.

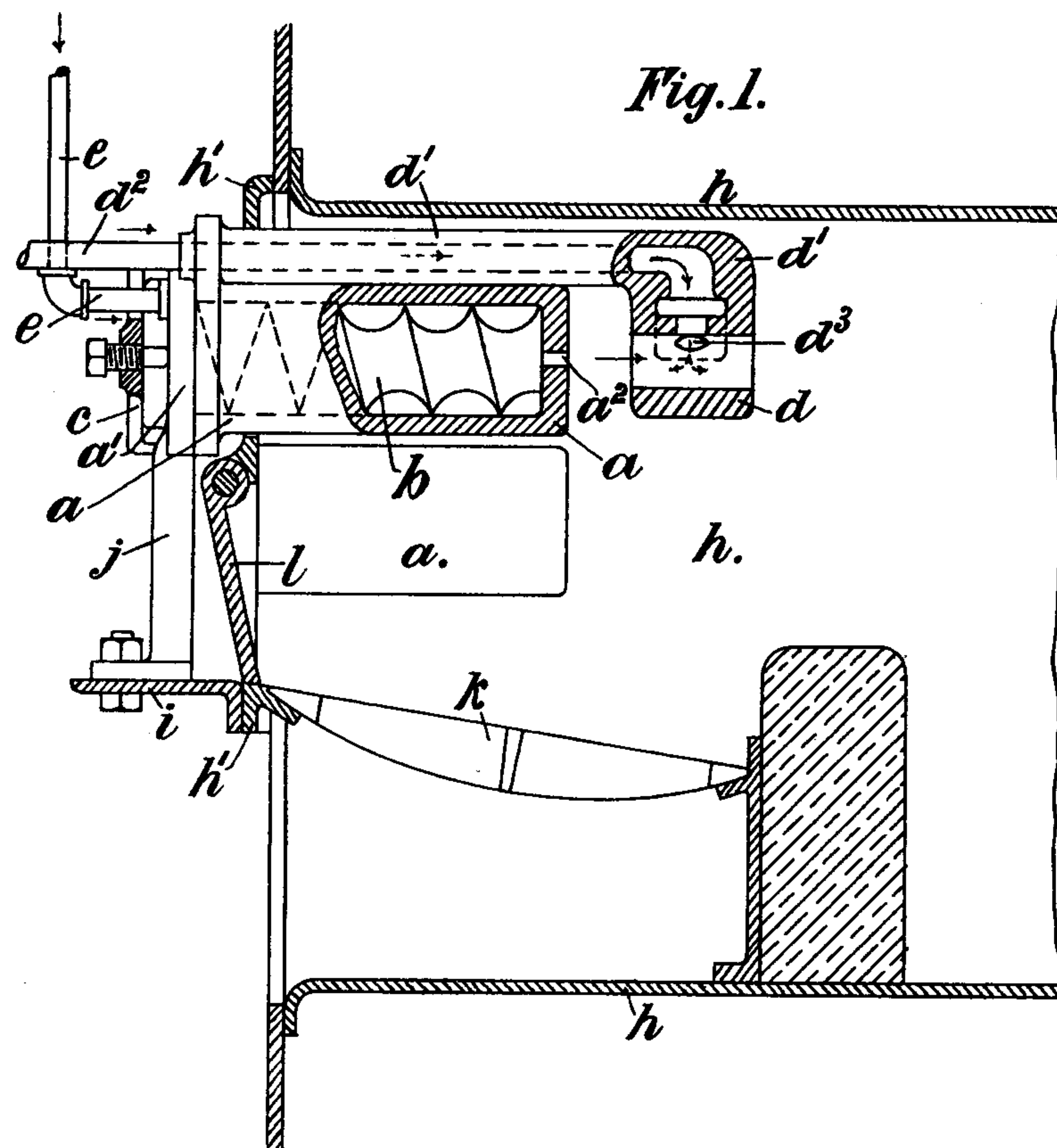
Patented June 11, 1901.

P. J. E. E. CHAMBOST.  
LIQUID FUEL HEATING APPARATUS.

(Application filed Oct. 31, 1898.)

(No Model.)

2 Sheets—Sheet 1.



WITNESSES:  
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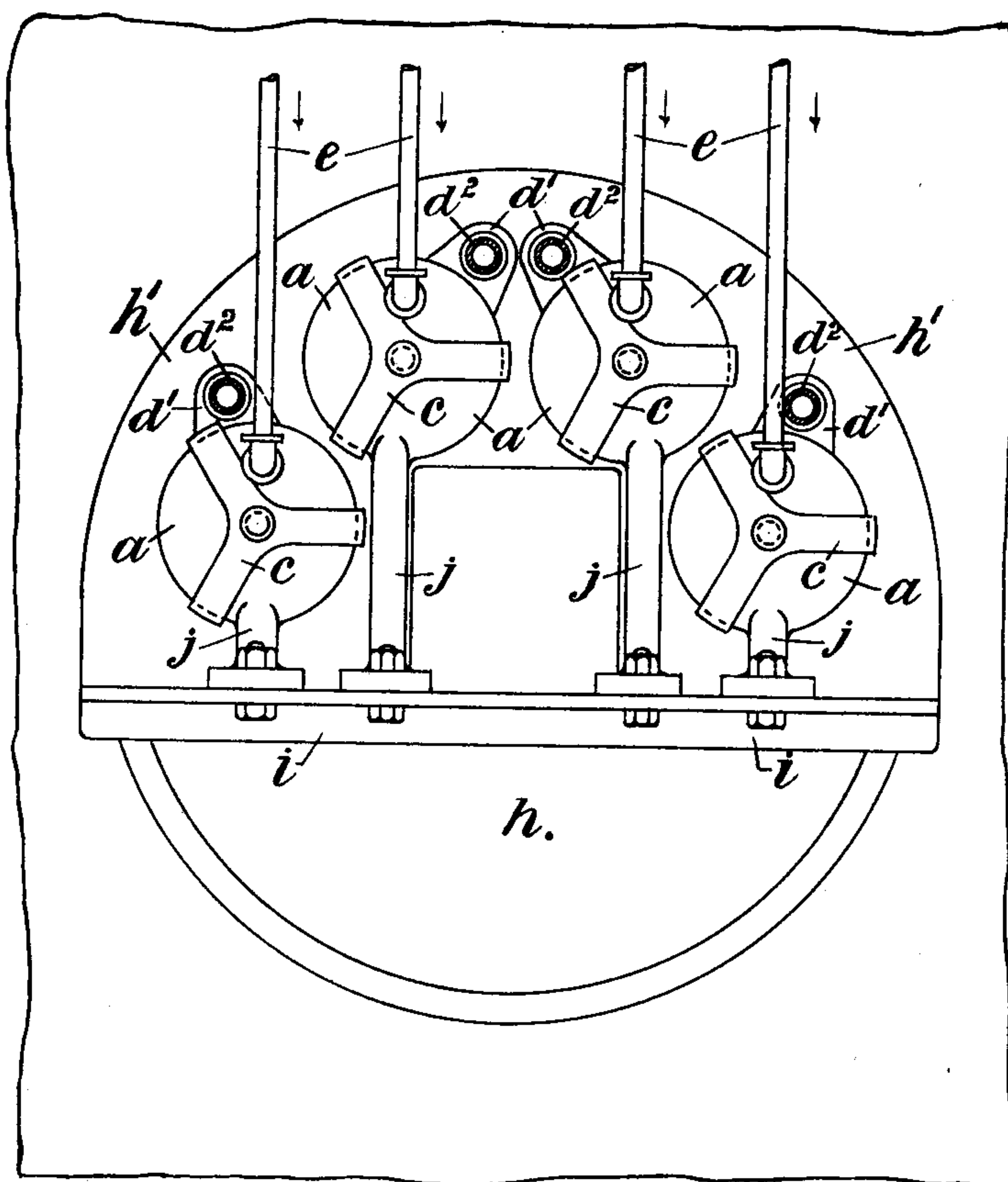
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2 Sheets—Sheet 2.

*Fig. 2.*



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# UNITED STATES PATENT OFFICE.

PIERRE JULES EUGÈNE EDOUARD CHAMBOST, OF LIVERPOOL, ENGLAND.

## LIQUID-FUEL HEATING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 676,063, dated June 11, 1901.

Application filed October 31, 1898. Serial No. 695,129. (No model.)

*To all whom it may concern:*

Be it known that I, PIERRE JULES EUGÈNE EDOUARD CHAMBOST, engineer, residing at Liverpool, England, have invented Improvements in Liquid-Fuel Heating Apparatus, of which the following is a specification.

My invention has reference to the heating of furnaces or apparatus by means of liquid fuel—namely, liquid hydrocarbon—it being applicable for use in steam-generators and other apparatus to be heated by fuel in connection with which it may be advantageously employed.

The invention will for convenience be described mainly as applied to the heating of steam-generators and with the aid of the accompanying drawings, which show such an application.

In the drawings, Figure 1 is a longitudinal section, and Fig. 2 an outside end view showing the invention applied to a circular-flue furnace of a steam-generator.

The method or mode of applying and burning liquid fuel under this invention is that in which the liquid hydrocarbon—say ordinary petroleum—is first converted to vapor by heat in a closed vessel and then subsequently when in the vaporous or gaseous state is discharged into and burns in the furnace. This mode, however, hitherto has only been capable of being accomplished with difficulty and with inconvenient apparatus, and my invention has mainly for its object to provide a simple and economical manner of accomplishing this mode of utilization of the fuel and without the necessity of employing a more or less complicated and costly apparatus and also without the formation and deposit of pitch or soot within the distilling apparatus or the formation and giving off of smoke from the furnace.

In the method employed under this invention the liquid hydrocarbon is first mixed with an elastic fluid or with elastic fluids—such as air, steam, or acetylene—and the compound fluid is introduced into an evaporating-retort, where it is forced to follow a long course, taking, for instance, a spiral course through the apparatus. To attain this, the retort will contain an internal spiral diaphragm or equivalent provisions. The petroleum is thus conveyed by and is vaporized in the elastic fluid

or fluids with which it is mixed, and the mixture being highly heated a pressure in the vaporizer is generated, and it issues from the vaporizer in a strong jet. Into this jet and by its action air is induced through and by a special device, the object being to insure perfect combustion and prevention of the formation of smoke.

Referring now to the drawings, *a* represents oil-vaporizing vessels disposed within the furnace *h* more or less and subjected externally to the temperature within it.

*b* is a spiral diaphragm within each vessel *a*, by which the fluid or fluids in passing through them is or are caused or subjected to a lengthened run and to be in contact with hot surface for a considerable time.

*a*<sup>2</sup> is a gaseous-fluid-discharge aperture in the back end of the vessel *a*, and *r* is a pipe conveying the liquid and a gaseous fluid—such as air, steam, or acetylene—which is previously mixed with it into the front end of each vessel *a*.

*a'* represents front covers on the vessels *a*, into which the pipes *r* are fitted, and *c* represents clamp fastening-bridges, by which these covers are held onto the end of the vaporizers.

*h'* is the front plate of the furnace, through which the vaporizers *a* pass, and *l* is the fire-door therein.

*j* represents legs on the covers *a'* of the vaporizers, which support these vaporizers upon a platform or plate *i* below and to which the legs are fastened. This plate may have longitudinally-disposed slots in it by which the vaporizers may be moved and adjusted farther into or out of the furnace through the plate *h'*, so as to expose more or less of their surfaces to the heat of the furnace.

*d* represents short tubes in front of the apertures *a*<sup>2</sup> of the vaporizing vessels, through which the flame-jet from *a*<sup>2</sup> of burning fluid passes, the said tubes having communication internally with the outside atmosphere by a conduit *d'*, which in the case shown is cast in one with the vessel *a*. Air is discharged into the interior of the tube *d* through apertures or openings *d*<sup>3</sup>. Air at atmospheric pressure may be admitted to the conduit *d'* from outside, or it may be supplied artificially to it.



$k$  is a small grate in the furnace below the vaporizing vessels  $a$ , on which solid fuel may be burned—say at the commencement of use of the apparatus—to heat up the vaporizers, and this small fire may be retained afterward, if desired.

The operation and effect of the apparatus are as follows: The oil and gaseous fluid—say air or steam—in an already-mixed state being supplied to the several vaporizers  $a$ , which it is assumed are hot—say at a read heat—the oil becomes vaporized in the inlet end of the vessel  $a$  in the spiral way formed by the internal spiral diaphragm  $b$ , and as vapor is formed it passes along the vessel  $a$  round and round the diaphragm under the influence of heat mixed with and carried by the air or steam. By this heating a pressure is created within the vaporizer, and the highly-heated mixed vapor and air or steam together under this pressure are discharged at a high velocity through the aperture  $a^2$  at the end of the vaporizers. At this aperture or nozzle the mixture burns and the flame passes through the short tube  $d$ , through which external atmospheric air is induced naturally by the difference of temperature and pressure and by the rush of the jet through it, and this air entering through the holes  $b^3$  pierces the stream of burning fluid and intermixes with it, producing complete combustion, and consequently without the formation of smoke.

The air supplied to the retorts with the oil

may be previously heated or not, or if steam be used and mixed with the petroleum alone or with air it is first preferably superheated.

What is claimed in respect of the herein-described invention is—

1. In liquid-fuel heating apparatus, the combination of a vaporizing-retort  $a$ , adapted to be heated externally, having an oil-feed tube  $e$  at one end, and a discharge-orifice  $a^2$  at the other; and an air-feeding device structurally separate from the retort and having an opening directly opposite the retort-orifice, the air-passage of said air-feeding device leading into said opening, substantially as set forth.

2. In apparatus heated by liquid fuel, the combination of a furnace  $h$ , a plurality of oil-vaporizing retorts  $a$  having their bodies mainly disposed within the furnace-space, and subjected to the heat thereof, fuel-supply pipe  $e$ , outside said furnace, and a discharge-orifice  $a^2$  in the inner end of said retorts, and air-feeding devices structurally separate from said retorts having openings axially in line and in front of the discharge-orifice  $a^2$ , and having conduits  $d'$  therein leading into said openings.

In witness whereof I have hereunto set my hand in presence of two witnesses.

PIERRE JULES EUGÈNE EDOUARD CHAMBOST.

Witnesses:

FREDERICK JOHN EDWARDS,  
JOHN HERBERT CHANDLER.