

No. 702,638.

Patented June 17, 1902.

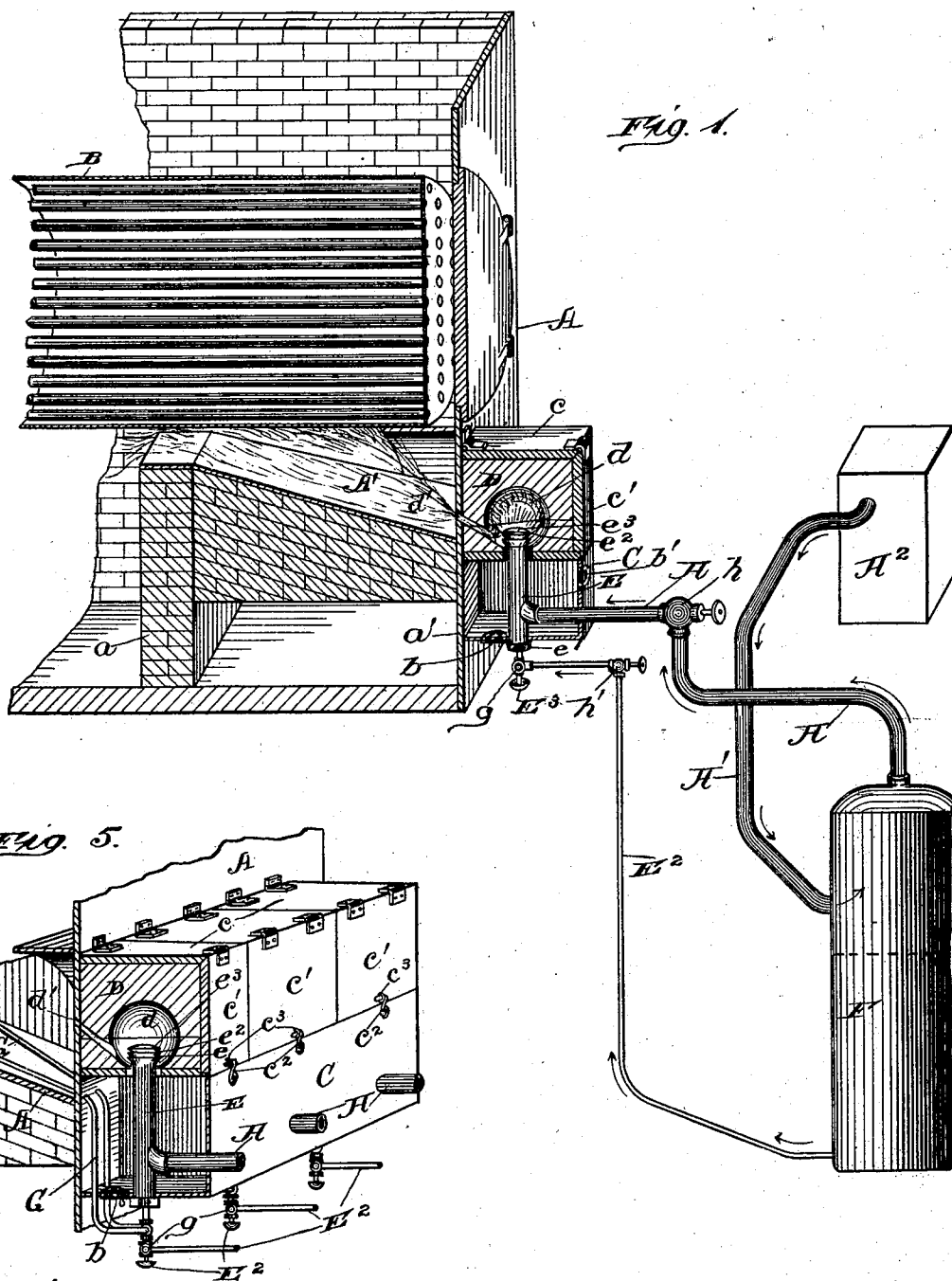
A. D. DUNCAN & W. H. WAFER.

RETORT HYDROCARBON BURNER.

(Application filed July 1, 1901.)

(No Model.)

2 Sheets—Sheet 1.



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Fig. 2.

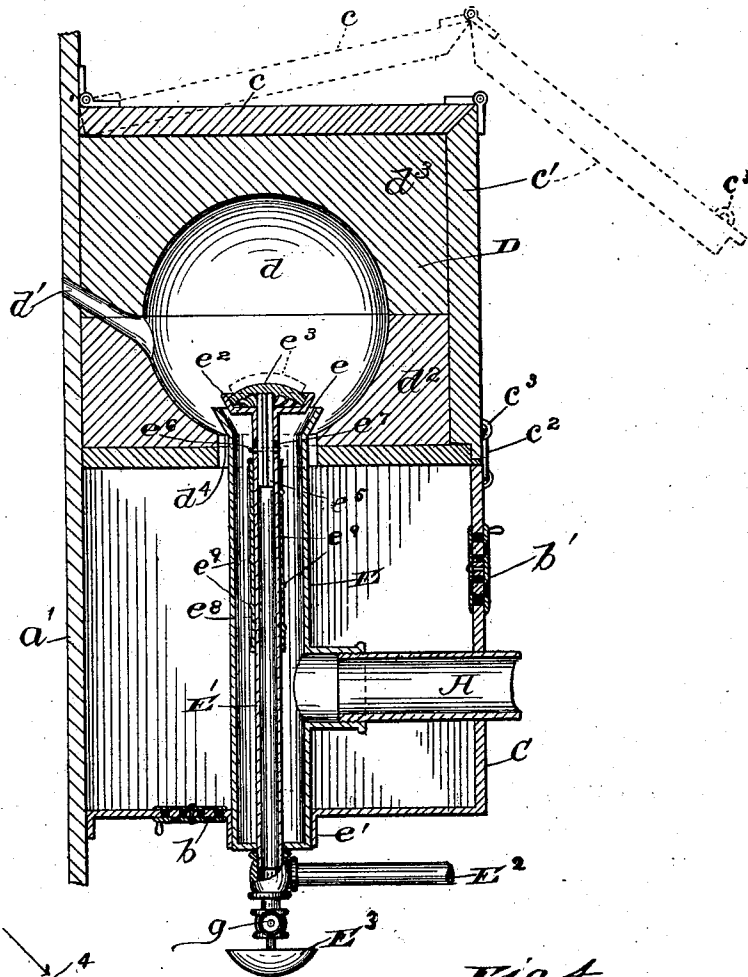


Fig. 3.

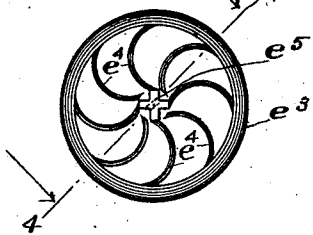


Fig. 6.

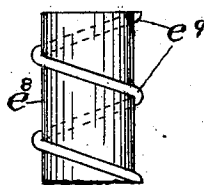
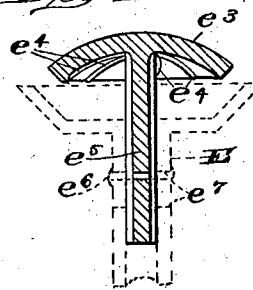


Fig. 4.



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# UNITED STATES PATENT OFFICE.

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## RETORT HYDROCARBON-BURNER.

SPECIFICATION forming part of Letters Patent No. 702,638, dated June 17, 1902.

Application filed July 1, 1901. Serial No. 66,691. (No model.)

*To all whom it may concern:*

Be it known that we, ALFRED D. DUNCAN, residing at Galveston, in the county of Galveston and State of Texas, and WILLIAM H. WAFER, residing at Chicago, in the county of Cook and State of Illinois, citizens of the United States, have invented certain new and useful Improvements in Retort Hydrocarbon-Burners, of which the following is a specification.

This invention relates to improvements in retort-burners, to be used for any suitable and desired purpose and for any kind of oils; and it consists in certain peculiarities of the construction, novel arrangement, and operation of the various parts thereof, as will be hereinafter more fully set forth and specifically claimed.

The objects of our invention are to provide a direct-combustion retort-burner for any and all of the various kinds of hydrocarbon oils; to furnish a burner of the above-named character which shall be of such construction that the combustion will be perfect and complete and the oil and air may be supplied thereto under a uniform pressure of high or low degree.

Another object is to provide a burner which can be constructed of parts which are mainly carried in stock by merchants, thus enabling them to be readily assembled without the necessity of having special machinery for their manufacture or skilled workmen to put them together.

Other objects and advantages of the invention will appear in the subjoined description.

In order to enable others skilled in the art to which our invention pertains to make and use the same, we will now proceed to describe it, referring to the accompanying drawings, in which—

Figure 1 is a fragmental perspective view, partly in section and partly in elevation, of a boiler and its furnace, showing our improved burner applied thereto and in operation. Fig. 2 is a vertical sectional view through the retort and burner, showing a portion of the oil and air pipes. Fig. 3 is a bottom plan view of the burner-valve. Fig. 4 is a sectional view thereof, taken on line 4 4, Fig. 3. Fig. 5 is a perspective view, partly

in section and partly in elevation, of a portion of a furnace with our burner applied thereto and illustrating a modification in its construction; and Fig. 6 is an enlarged detail view.

Similar letters refer to like parts throughout the different views of the drawings.

A represents the furnace of a boiler B, which furnace may be of the ordinary or any preferred construction; but in the present instance we have shown the fire-box thereof as having a floor A', inclined from the bridge-wall *a* toward the front plate *a'* of the furnace. Secured to the outer surface of the front plate *a'* is a box-like casing C, which is provided in its bottom with a damper-opening *b* and in its front portion with another damper-opening *b'*, the purposes of which will be presently explained. On the top of the casing C is located the retort D, which is preferably formed of fire-clay so shaped as to provide a spherical chamber *d*, from which a suitable channel or opening *d'* leads through the front plate *a'* of the furnace to the fire-box. The retort D is shown in the present instance as being made of two pieces *d*<sup>2</sup> and *d*<sup>3</sup> of fire-clay, each having substantially a hemispherical cavity or hollow which when said pieces are united together form the spherical chamber *d* or retort proper. However, we do not desire to be limited to any number of pieces or any specific material in the construction of the retort, as we may make it of other material than fire-clay and of more than two pieces or of pieces having different-shaped cavities.

Hinged to the outer surface of the front plate *a'* of the furnace is a piece *c*, to the outer edge of which is hinged at its upper end a piece *c'*, which is provided at its lower portion with a hook *c*<sup>2</sup> to engage an eye *c*<sup>3</sup> on the front portion of the casing C. The pieces *c* and *c'*, together with the top of the casing C, form a casing or protection for the retort, and said pieces may be raised to the position shown by dotted lines in Fig. 2 of the drawings, so that the retort may be repaired or a new one readily placed in position.

The lower portion of the retort is formed with an opening *d*<sup>4</sup>, through which passes a tube E, the upper end of which is open and

flared, as at *e*. (See Fig. 2 of the drawings.) The tube E is located in the box or casing C and has its lower end extending through the bottom thereof and secured in place by means of a collar *e'*, which surrounds it. Passing through the tube E from its bottom to its top is a pipe E', which has on its upper outer surface a sleeve *e''*, provided with spiral ribs *e'''*, and at its upper end within the chamber *d* of the retort and in the flaring portion *e* of the tube E a cup-shaped and flaring valve-seat *e''* for the reception and operation of the burner-valve *e'''* and escape of the hydrocarbon. The valve *e'''* is concavo-convex and has on its lower or concave surface a series of curved ribs or corrugations *e''''* to give to the oil a circling movement as it is forced through the pipe E' and burner into the retort-chamber. The valve *e'''* carries a stem *e''''*, which is preferably in the form of a cross in cross-section, and has a pin *e'''''*, extending into vertical slots *e''''''* in the upper portion of the pipe E', thus permitting the valve to be raised by pressure and lowered by gravity.

Communicating with the lower portion of the pipe E' is another pipe E'', which communicates at its other end with the lower portion of a tank or reservoir which contains oil under pressure and may be located at any suitable or desired distance from the furnace and burner. The lower portion of the pipe E' is provided with a drip-cup E<sup>3</sup> and a valve *g*, which valve is employed to allow oil to pass from the pipe E' into the cup E<sup>3</sup>, where it may be ignited in setting the burner in operation. Communicating at one of its ends with the upper portion of the tank or reservoir F is a pipe H, which passes through the casing C and communicates at its other end with the tube or pipe E, as is clearly shown in Figs. 1 and 2 of the drawings. The pipe H is provided with a valve *h* to regulate the flow of air therethrough. Communicating at one of its ends with the upper portion of the tank F and above the oil-line therein is a pipe H', which communicates at its other end with an air-compressor H<sup>2</sup> of the ordinary or any desired construction, and which compressor may be located at any desired point.

In Fig. 5 of the drawings we have illustrated a modified form of our invention, which consists in employing, besides the parts above described, a coil or loop of pipe G, which extends up through the casing C and into the fire-box and communicates with the lower portion of the pipe E' and is for the purpose of superheating the oil as it passes therethrough. In this figure is shown a casing in which may be located a series of our burners, all or any of which may be equipped with the loop or coil G of pipe.

The operation is as follows: The tank or reservoir F is partially filled with oil and air under pressure admitted thereto, when by opening the valves *h* and *h'* in the pipes H and E'', respectively, oil and air will be caused to flow into and through the tube E and pipe E' un-

der uniform pressure, which may be regulated as desired. In starting the burner the valve *g* is opened, so as to allow oil to escape from the pipe E' into the drip-cup E<sup>3</sup>, where it may be ignited, when by opening the damper *b* the blaze from the burning oil will ascend into the chamber C and ignite the oil or gas therefrom in the retort-chamber, after which the valve *g* may be closed and the oil in the drip-cup extinguished. The damper *b'* in the casing C may be opened for the purpose of observation and also to furnish a draft. As the oil escapes from the pipe E' under pressure it will raise the valve *e'''* and by reason of the curved grooves or corrugations *e''''* on the lower surface thereof will give to the oil a rotary or whirling movement, in which operation the escaping air or steam from the tube E by reason of the spiral ribs on the pipe E' will be caused to whirl in the opposite direction and to thoroughly mingle therewith. Instead of using compressed air we may employ steam and admit it to the tank F under pressure, when the same operation will be carried out. By employing the loop or coil G it is apparent that the oil will be heated therein and vaporized, thus causing it to flow from the burner on the upper end of the pipe E' in the form of gas, where it will be ignited and discharged from the retort through the opening *d'* therein into the fire-box of the furnace.

From the foregoing it will be understood that the valve-seat *e''* and valve *e'''* comprise the burner and principal generator, for it is evident that as the mixture of oil, air, or steam escapes therefrom and is ignited the said parts will become heated and will generate gas or vapor.

Having thus fully described our invention, what we claim as new, and desire to secure by Letters Patent, is—

1. The combination with a retort having a discharge-opening and another opening in its lower portion, of a tube extending into the retort and having communication with a supply of steam or air, a pipe extending through said tube into the retort and communicating with a supply of oil, a valve seated on the end of said pipe in the retort and having on its lower surface a series of curved corrugations, and means to control the flow of oil, air or steam, substantially as described.

2. The combination with a retort having a discharge-opening and another opening in its lower portion, of a tube extending at one of its ends through said lower opening into the retort and having a communication with a supply of steam or air under pressure, a pipe extending through said tube into the retort and communicating with a supply of oil under pressure, a flaring valve-seat on the end of the pipe in the retort, a gravity-valve located in said seat and having on its lower surface a series of curved corrugations, substantially as described.

3. The combination with a furnace, of a casing secured to the front plate thereof and

having a dampered opening in its bottom and front, a retort on said casing and having a discharge-opening communicating with the fire-box and another opening communicating with the casing, a tube extending through the casing and into the retort and connected to a supply of steam or air, a pipe extending through said tube into the retort and connected to a supply of oil, a drip-cup on the lower portion of said pipe, a valve seated on the end of said pipe in the retort, means to control the flow of oil, and means to control the flow of air and steam, substantially as described.

4. The combination with a furnace, of a retort supported on the front plate thereof and having a discharge-opening communicating with the fire-box and another opening in its lower portion, hinged pieces secured to the furnace to protect the top and front of the retort, a burner located in the retort and having communication through the opening in the lower portion thereof with a reservoir

containing oil and air, or oil and steam under pressure, substantially as described.

5. The combination with a retort having a discharge-opening and another opening in its lower portion, of a tube extending at one of its ends through said lower opening into the retort and having a communication with a supply of steam or air under pressure, a pipe having on its upper outer surface spiral ribs and extending through said tube into the retort and communicating with a supply of oil under pressure, a flaring valve-seat on the end of the pipe in the retort, a gravity-valve located in said seat and having on its lower surface a series of corrugations curved in the opposite direction from the curve of the ribs on the pipe, substantially as described.

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