

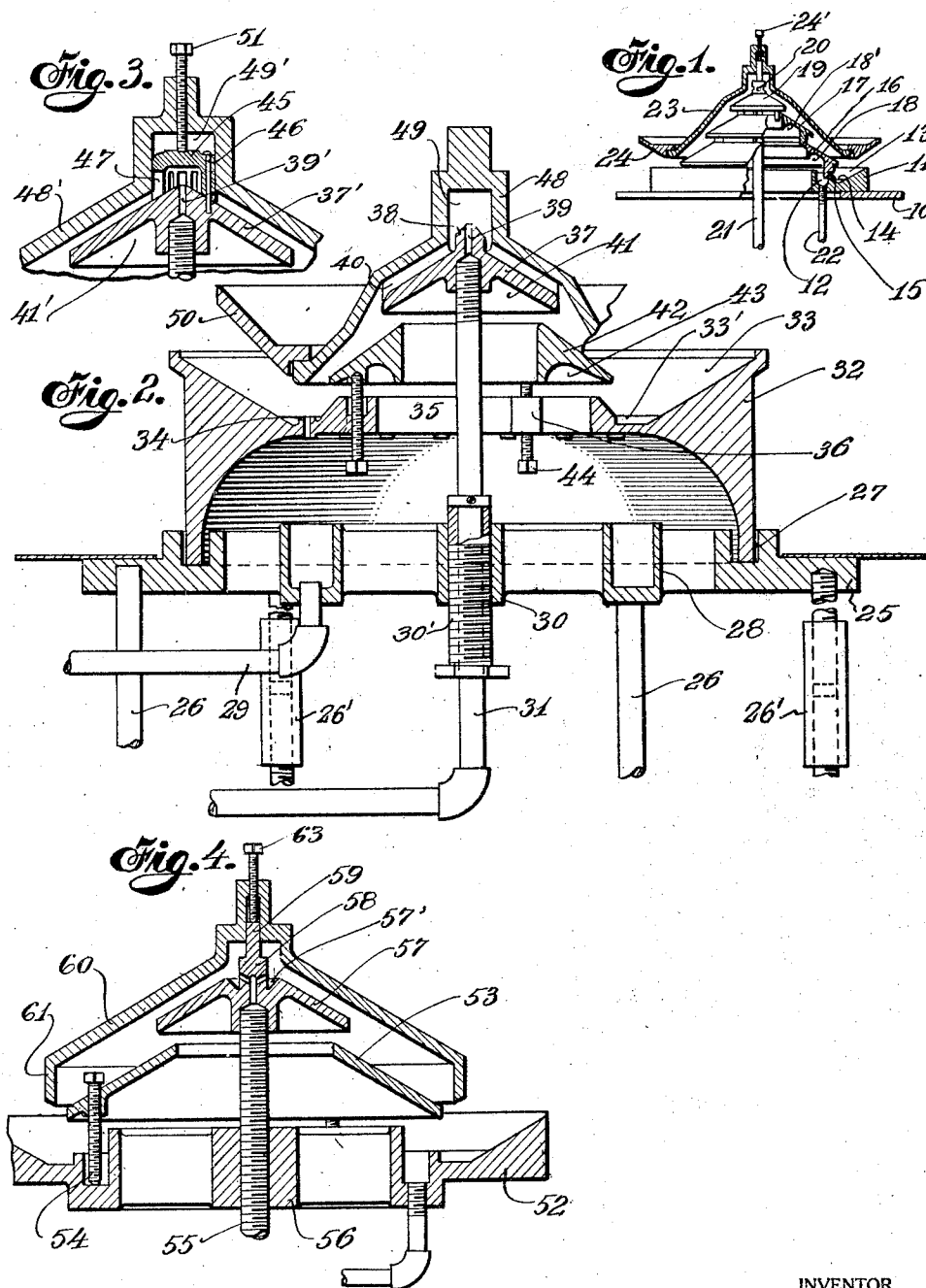
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OIL BURNER

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OIL BURNER.

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This invention relates to fuel burners in general and particularly to the kind employed for burning liquid fuel oils.

The prime object of my invention is to provide a device of the character described which will facilitate preparing liquid fuel for burning, prior to its combustion, by converting such liquid fuel into a gaseous fuel, and mixing the thus produced gaseous fuel with air at either one or a multitude of places. By so doing a thoroughly intimate fuel and air mixture is produced before the actual combustion of the fuel takes place, at which point additional oxygen is supplied to the fuel mixture to support combustion.

Another object of my invention is to provide a construction based on the principle of ejectors and carburetors, whereby the air blast created by the draft, or by any artificial source, is directed by a series of air passages, which diminish in width towards their ends, first against the gasified fuel, and successively against the partially air-mixed fuel mixtures, thereby adding to the fuel additional oxygen at successive steps, while at the same time, increasing the velocity of the out-flowing combustibles, thus creating effects similar to that of a Bunsen burner.

Another object of my invention is to provide means for adjusting the various parts, comprising my burner, relative to each other and for leveling them, whereby the distances, and thus the size of the air passages created between the various parts, may be regulated.

Further objects of my invention will be more fully apparent from the following description and the accompanying drawings, forming part of this disclosure, illustrating however, the latter in only few preferred forms, which may be readily changed when necessity arises, without departing from the broad scope of my idea.

Referring to the drawings:

Figure 1 shows one form of my device, partially in section,

Figure 2 shows another form of my de-

vice, partially in section, taken on the vertical center plane therethru.

Figure 3 is a partially sectional view through a modified form of the top part of Figure 2.

Figure 4 shows a modification of my device, also in section.

The principle of my invention which I employ, is based, as aforesaid, upon the ejector or the Bunsen burner method, combined with the conversion of liquid into gaseous fuel under pressure and while excluding air, and mixing the gasified fuel with air at successive steps of its gasification. I accomplish the desired effects by a simple arrangement of various parts which are disposed in desired relation to each other and which are so designed that they will direct the air, passing through the air spaces, created between the parts, in downward and outward directions, while at the same time, precipitating a perfect air and fuel mixture before its combustion takes place, thereby assuring complete combustion of the fuel.

Referring to Figure 1, there will be seen a rest or base plate indicated at 10 which may be supported by the ordinary furnace grate or by standards placed upon the furnace floor, and upon which rests a primer 11, which takes the shape of a ring provided with an annular inner groove 12, serving as over-flow and an outer groove 13, preferably provided with a plurality of radial ribs indicated at 14.

Sitting upon the edge of the dividing wall 15, between the outer and inner groove of the primer 11, is a substantially cone-shaped member 16, provided with a plurality of legs. This member 16 is spaced by said legs from the primer member 11 and supports another intermediate member 17 of a similar shape as the former. It will be noted that these intermediate members are under-cut at 18 and 18', for the purpose of deflecting the air, entering the burner, and directing it downwards and outwards.

Similarly shaped as the previously mentioned intermediate members, there is a top

cone member 19, which serves as fuel generator or converter and distributor, being provided with a plurality of apertures 20 or any other similar means, indicated in the other figures, for permitting the fuel to pass therethrough. Leading to the distributor member 19 is a supply pipe 21 centrally located within my device.

It is obvious that while I have shown only two intermediate members, more or less of such plates may be employed.

Leading from the annular over-flow groove 12 is another pipe 22 serving as conveyer of the superfluous fuel.

Covering all the intermediate members and the distributing member is a hood 23 which reaches downward towards the primer member 11. This hood has a detachable deflector ring 24, but may be constructed in one piece if desired.

Bearing against the top of converter and distributing member 19 is a set screw 24', by means of which the hood may be adjusted relative to the various intermediate members and relative to the primer 11.

A similar design is shown in Figure 2, where a base member 25 is provided, supported by means of upright 26, which are preferably adjustable as to height by means of members 26'. The base member 25 is shown to have an annular groove 27. Concentric with the base member is formed an overflow ring indicated at 28. Leading from the over-flow ring 28 is a pipe connection 29. The hub of the base member indicated at 30 is provided with adjusting means 30', whereby the central supply pipe 31 may be raised or lowered at will.

Sitting in groove 27 is a primer member 32, having a substantially cone-shaped upper depression 33, also provided with a plurality of radial ribs 33', and between each two ribs, a boss 34 is provided with an opening for permitting superfluous fuel to drip into over-flow rim 28.

The annular cone-shaped depression of the primer 32 serves for the purpose of temporarily retaining a small quantity of fuel which serves, when lit, to preheat the upper structure of my device. The inner portion of the primer is provided with a central aperture 35 and also with a plurality of lugs 36.

Secured to supply pipe 31 is a generating, converting and distributing member 37, preferably provided with a cone-shaped nozzle 38 which is centrally drilled, as indicated at 39.

Through this opening 39, fuel is delivered to the distributor, which latter has the shape of a hollow cone. Numeral 40 indicates a plurality of radial spacers intended to separate the one from the hood, which latter will be described presently.

The distributor is shown to be under-cut

at 41 for the purpose of directing the air entering from below in downward and outward directions.

Between the primer 32 and the generator-distributor 37, there is an intermediate member 42, also of frusto conical construction and having an under-cut, indicated at 43, serving also for the purpose of deflecting the air in downward and outward directions. This intermediate member 42 is shown resting on a plurality of set screws, indicated at 44. By this means, member 42 may be readily adjusted or leveled and by doing so, the size of the air passages between the distributor and the generator may be varied.

The construction of the generator-distributor 37 may be altered, one modification being shown in Figure 3, where a plain cone 37' is used, provided with a central bore 39', and having an under-cut 41'.

Arranged above the opening 39', sits a cap 45, attached to cone 37', as shown at 46. This cap is provided with a plurality of vertical slots 47 to permit the fuel to pass therethrough and to spread over the entire upper surface of the cone, where its conversion into gas takes place.

Substantially entirely covering both the distributor-generator and the intermediate member 42, and extending towards the primer 32, is a hood 48 (Fig. 2), which is provided with a depression 49 to accommodate extension 38 of the distributor, and incidentally forming a gasification chamber above it. The shape of the hood is such as to provide air passages between the distributor and the intermediate member 42 in such a way that these passages diminish in width towards their outer peripheries.

I preferably provide with this hood a deflector ring indicated at 50 so as to further direct the gases issuing from the passages.

Referring to Figure 3, a similar hood 48' is shown, which also has a depression 49' which, however, serves not only as gas chamber and to accommodate cap 45, but provides also a guide for the hood. The upward extension of the hood in this case, is provided with a tapped hole accommodating a set screw, indicated at 51, by means of which adjustments between the distributor and the hood may be readily made.

In the modified form shown in Figure 4 a base 52 is seen, upon which rests an intermediate member 53, being supported by adjustable means 54. Adjustable supply pipe 55 is shown to be held in threaded hub 56, forming a part of base 52. At its upper end supply pipe 55 supports a distributor 57, provided with an annular groove 57', adapted to retain a small quantity of fuel oil in its liquid state. The drilled extension 58, serving for distributing the oil, is reduced at 59 into a stem which serves as a guide for overhanging hood or member 60. The latter is

provided with a downwardly extending rim 61. A set screw 63 facilitates the adjustment of the hood.

Operation.

In order to start the device, it is necessary to preheat the parts above the primer, for which purpose a small quantity of fuel is permitted to accumulate in the outer primer or groove and is ignited. When these are sufficiently heated, a small quantity of fuel is permitted to flow down the generator-distributor. Passing down in near proximity to the heated top of the hood, the fuel is preheated and gasified before it reaches the lower edge of the distributor. In the meantime, a sufficient draft has been created by the flame in the primer and the preheated and gasified fuel, issuing from the distributor, is vigorously mixed with air, which is deflected by the lower surface of the distributor into the passage between the latter and the intermediate member. The incoming air is relatively cool and causes a partial condensation of the gasified fuel. In entering the preheated and gasified fuel the air not only pre-mixes it but also and simultaneously atomizes its partially condensed particles into a fine mist.

I refer now to Figure 2, in which the intermediate part 42 is employed. The fuel having been premixed with air while issuing from the distributor into the confined space, between the intermediate member 42 and the lower portion of hood 48, is superheated to such a temperature as to ignite when reaching the lower edge of the intermediate member 42. At this point another blast of fresh air is directed into the already premixed air and fuel mixture, through the air passage between the intermediate member 42 and the primer, thereby increasing the oxygen content of the mixture and assuring complete combustion.

During the process of passing from the lower edge of the distributor to the lower edge of the intermediate member, the premixed air and fuel mixture, having been cooled off somewhat through the admission of air, is subjected to the heat radiating from both the hood and the intermediate member. In this manner the mixture is vaporized and its combustible qualities enhanced. By adding additional oxygen to the premixed and now vaporized mixture, an admixture of extremely high oxygen content is created.

The process of evaporation and premixing of the fuel with air, and the subsequent repetition of the process with additional superheating of the air mixed fuel mixture, may be repeated, depending upon the number of intermediate members employed. Due to the fact that the hood is hottest at its lowermost edge and its heat diminishes towards

its apex, the heating or evaporating process is gradual and makes it particularly suited for burning heavy fuel, or fuel in large quantities.

Particular attention is called to the fact, that the conversion of the fuel, from its liquid into gaseous form, takes place under complete exclusion of air and under a certain pressure, created by the formation of gases, and that air is not allowed to mix with the fuel while in its liquid state.

As said before, the passages diminish in widths in the direction from the center towards their peripheries, thus increasing the velocity of the air, thereby causing a rapid ejection of the combustible mixture from under the edge of the hood. This feature is important as it facilitates a rapid feeding of the device, without causing carbonization.

The deflectors shown in Figures 1 and 2, and indicated at 24 and 50, respectively, serve as spreaders of the flame and obviously may be changed in shape and design, depending upon the desire, whether a spread or a more concentrated flame is required.

While the arrangement of parts, which comprise a substantially closed air excluding generating or gasifying chamber and substantially hollow cone-shaped plates, and while their relative disposition in pyramid or cascade fashion brings the desired results of excellent fuel-air mixture and complete combustion, other designs may be employed with equally good effects.

It will be evident, therefore, that while I have shown specific constructions and only few modifications, that the principle employed may be applied to various other structures and designs, and I therefore reserve for myself the right to make changes and improvements in my device, as such changes become necessary, due to the employment of my device for the burning of various fuels.

I claim:—

1. In a fuel burner, means for preparing fuel for combustion by heating and gasifying it in the absence of air, said means comprising a chamber formed by two members, detachable from each other, means for premixing the prepared fuel with air, means for heating and vaporizing the thus premixed fuel, and means for introducing additional oxygen to the now premixed fuel before or upon reaching the point of combustion.

2. In a fuel burner, means for preparing fuel for combustion by heating and gasifying the fuel while excluding air, said means comprising a chamber formed by two members normally in intimate contact with each other, one movable relative to the other, means for premixing the prepared fuel with air, means for heating and thereby enhancing the combustible quality of the premixed

fuel mixture, and means for admixing the combustible mixture with additional oxygen before or at the point of combustion.

3. In a fuel burner, means for heating and gasifying liquid fuel under exclusion of air, said means comprising a substantially closed chamber formed by two members normally in heat conducting contact with each other, one member being stationary the other removable relative to the former, means for premixing the gasified fuel with air, means for reheating the thus produced fuel mixture, and means for introducing to the reheated fuel mixture additional air before or at the point of combustion.

4. In a fuel burner, means for preheating and gasifying the fuel under exclusion of free oxygen, said means comprising a substantially closed chamber, formed by two members normally in heat conducting contact with each other, one member being stationary the other movable relative to the former, said stationary member serving as support for said movable member, means for simultaneously atomizing and premixing the preheated or gasified fuel with a small amount of air, means for reheating and thus vaporizing the atomized and premixed fuel, and means for remixing the vaporized mixture with a large supply of air before or when ignition takes place.

5. A fuel burner comprising means for preheating and gasifying fuel under pressure and under the exclusion of air, said means comprising a substantially closed chamber formed by two members normally in heat conducting contact with each other, one member being stationary the other movable relative to the former, said stationary member serving as support for said movable member, means for atomizing and premixing the gasified fuel with a small amount of air, means for reheating the premixed fuel, and means for admitting fresh air to the reheated fuel for supporting its combustion.

6. A fuel burner comprising a fuel distributing element, a cover member disposed in close proximity to said element and forming with the latter a substantially confined space in which fuel may be preheated and gasified without the admission of air, an intermediate member arranged below said element, an air passage formed between said element and said intermediate member for admitting a small amount of air so as to atomize and premix the gasified fuel with a small amount of air without permitting it to ignite, said cover member extending over said intermediate member, a passage formed between these two members in which the atomized and premixed fuel is superheated, and thus vaporized, a base member arranged beneath said intermediate member, a passage formed between these two members for

admitting fresh air to mix with the superheated and vaporized fuel mixture.

7. A fuel burner comprising a fuel distributing element adapted to retard the flow of the fuel, a cover member disposed in close proximity to said element and forming with the latter a substantially closed chamber in which fuel may be preheated and gasified in the absence of air, at least one intermediate member arranged below said element, an air passage formed between said element and the intermediate member for admitting a relatively small amount of air for the purpose of atomizing and premixing the preheated and gasified fuel with air, means for adjusting said intermediate member relative to said distributing element, said cover member extending over said intermediate member, a passage formed between these two members in which the atomized and premixed fuel is superheated and thus vaporized, a base member arranged beneath said intermediate member and provided with a groove and an air inlet, a passage formed between said intermediate member and said base member for admitting fresh air to mix with the superheated and vaporized fuel mixture issuing from the passage formed between said cover member and said intermediate member.

8. A fuel burner comprising a fuel distributor adapted to retard the flow of the fuel so as to allow for preheating and conversion of the fuel into gas, a cover member disposed in close proximity to said element and forming with the latter a substantially closed chamber in which fuel may be preheated and gasified in the absence of air, prior to leaving the chamber, at least one intermediate member arranged below said element, a passage formed between said element and the intermediate member for admitting a relatively small amount of air for the purpose of atomizing and premixing the preheated and gasified fuel, said cover member extending over said intermediate member, a passage formed between these two members, diminishing in cross-section in outward direction and in which the atomized and premixed fuel is superheated and thus vaporized and brought under slight pressure to the ends of said members, a base member arranged beneath said intermediate member and provided with an air inlet, a passage formed between the base member and the intermediate member for admitting fresh air to the superheated and vaporized fuel mixture issuing from between said intermediate and cover members for supporting the combustion of the fuel.

9. A fuel burner comprising a fuel distributor adapted to retard the flow of the fuel so as to allow for its preheating and gasification, a cover member disposed in

close proximity to and having intimate contact with said element, and being supported thereby but capable of free movement relative to said element, said cover member and
 5 said distributing element forming a substantially closed chamber with each other in which chamber fuel may be preheated and gasified under pressure in the absence of air, prior to leaving the chamber, means for admitting
 10 a relatively small amount of air to the gasified fuel for the purpose of atomizing and premixing it with air, means for superheating the premixed fuel to its flash point temperature and means for admitting
 15 fresh air to the superheated fuel mixture for supporting the combustion.

10. A fuel burner comprising a fuel distributor having a ribbed surface for retarding the flow of the fuel so as to allow for
 20 its preheating and gasification under exclusion of air, a cover disposed above and being in intimate contact with said distributor and forming with the latter a substantially closed chamber in which the fuel gasification under
 25 pressure takes place, in the absence of air, an intermediate member arranged below said distributor, means for adjusting said intermediate member relative to said distributor, said cover over hanging said intermediate
 30 member and forming with the latter a passage diminishing in cross-section in outward direction, a base member arranged below said intermediate member and forming with the latter an air passage for delivering fresh
 35 air for supporting combustion, and means for adjusting said distributor, said intermediate member and said cover relative to said base member.

11. A fuel burner comprising a fuel distributor adapted to retard the flow of fuel
 40 so as to allow for its preheating and gasification, a cover having a depression for retaining gasified fuel under pressure, disposed above and being in intimate contact with and supported by said fuel distributor and forming
 45 with the latter a substantially closed chamber adapted to exclude air from said distributor, an intermediate member arranged below said distributor, said cover overhanging said intermediate member and forming a passage with the latter, the cross-section of which diminishes in outward direction, and a base member spaced from and arranged below said intermediate member and forming a passage with the latter through which passage fresh air is delivered for supporting combustion.

12. In a fuel burner, a generating or gasifying chamber formed by the fuel distributor and a cover member movably associated with the latter and being normally in intimate contact or in heat conducting relation therewith, means disposed in near proximity to said distributor for admitting an initial
 60 supply of air, other means in near proximity

to said first mentioned means for admitting additional air to support combustion, and adjusting means associated with said distributor and adapted to change the position of the latter relative to both of said air admitting means, thereby regulating the
 70 amount of air supplied.

13. In a fuel burner including a fuel distributor and a cover member, a substantially closed generating or gasifying chamber
 75 formed between said distributor and said cover member, the latter intimately associated with the former and movable relative thereto, means disposed in near proximity to said distributor for admitting an initial supply of air, other means in near proximity to said first mentioned means for admitting additional air to support combustion, and adjusting means associated with said distributor and adapted to change the position of the latter relative to both of said air admitting means, thereby regulating the amount of air supplied.

14. In a fuel burner including a fuel distributing member and a removable cover member intimately associated with and movable relative to the former, a substantially closed generating or gasifying chamber formed between said members and spacing means so arranged as to assure a heat conducting and intimate contact of the two members, while providing passages for the escape of gasified fuel, means disposed in near proximity to said distributor for admitting an initial supply of air, other means in near proximity to said first mentioned means for admitting additional air to support combustion, and adjusting means associated with said distributor and adapted to change the position of the latter relative to both of said air admitting means, thereby regulating the amount of air supplied.

15. In a fuel burner, a generating or gasifying chamber formed by the fuel distributor and a cover member removably associated with and supported by the latter and being normally in intimate contact therewith, means disposed in near proximity to said distributor for admitting an initial supply of air, other means in near proximity to said first mentioned means for admitting additional air to support combustion, and adjusting means associated with said distributor and adapted to change the position of the latter relative to both of said air admitting means, thereby regulating the amount of air supplied.

16. In a fuel burner, including a fuel distributing member and a removable cover member supported by the former and normally in intimate contact therewith and capable of moving relative to said distributing member, a substantially closed generating or gasifying chamber formed between said members, one of which has spacing means
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assuring an intimate contact of the two members while providing passages for the escape of gasified fuel, means disposed in near proximity to said distributor for admitting an
5 initial supply of air, other means in near proximity to said first mentioned means for admitting additional air to support combustion, and adjusting means associated with

said distributor and adapted to change the position of the latter relative to both of said 10 air admitting means, thereby regulating the amount of air supplied.

Signed at New York in the county of New York and State of New York this 7th day of November, A. D. 1923.

PAUL M. KLEIN.