

E. RECTOR.
BURNER CLEANER.

APPLICATION FILED JULY 15, 1918. RENEWED APR. 30, 1921.

1,399,655.

Patented Dec. 6, 1921.

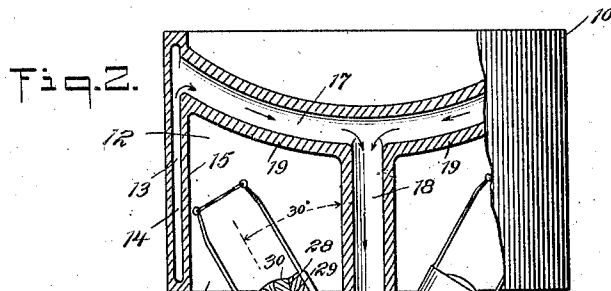
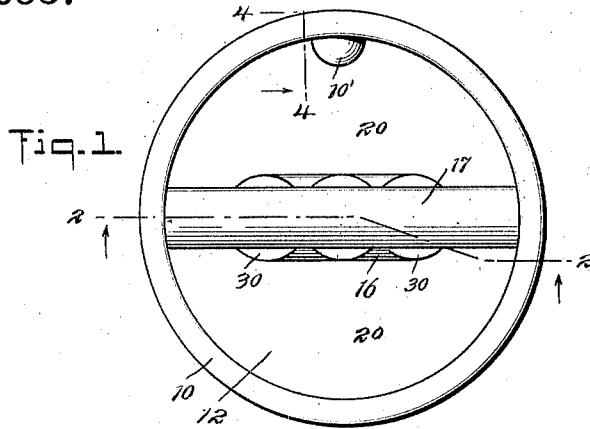


Fig. 4.

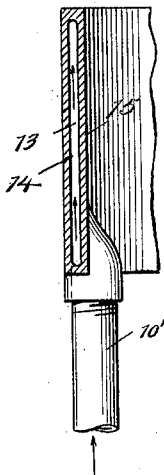
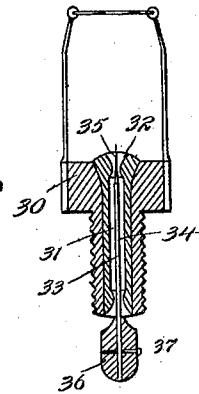


Fig. 3.



WITNESS

[Signature]

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BURNER-CLEANER.

1,399,655.

Specification of Letters Patent.

Patented Dec. 6, 1921.

Application filed July 15, 1918, Serial No. 244,904. Renewed April 30, 1921. Serial No. 465,925.

To all whom it may concern:

Be it known that I, ENOCH RECTOR, a citizen of the United States, residing in the city, county, and State of New York, have
5 invented certain new and useful Improvements in Burner-Cleaners, of which the following is a specification.

The invention relates in general to a combined hydrocarbon fuel preheater and
10 burner and specifically relates to a self-cleaning vapor discharging vent and combined cleaner and regulator therefor, forming a replaceable attachment for a vapor
burning heater of general application.

15 Primarily the invention relates in its complete physical embodiment to a part of an organization which includes a form of heater of the type in which a hydrocarbon fuel, either in liquid or gaseous form, is fed to a
20 preheater, there to be subjected to a high heat treatment, and from the preheater discharged through vents arranged to direct the flame partially onto the preheater and partially past the preheater to the part of
25 the organization heated by the device.

The basic object of the invention is to design such a burner with a higher efficiency and with a more complete combustion of the fuel ejected therefrom when under both
30 high and low pressures, than is possible with present known similar devices.

In its refinement of construction, the invention relates to a burner designed to insure at all times a free flow of fuel into the
35 combustion zone of the organization. In some plants, such as steam generators, laboratory heat apparatus and the like, it is necessary to use a type of heater which will give a definite supply of heat per unit of
40 time, and which will maintain this definite supply constant over a long period of time when in active operation under high pressure and which will be capable of supplying a pilot light when under relatively low pressure.
45 One means for insuring this constancy of heat supply under high pressure is to utilize a form of hydro-carbon burner in which the fuel is projected forcefully through one or more fine, small-diametered
50 fuel discharging vents. In the active operation of such burners, the small vents quickly become clogged with deposits of carbon which soon interfere with the rate of discharge fixed initially by the size of the vents,

and which deposit eventually intercepts the
flow of the gaseous fuel from the vents.

Accordingly, another object of the invention is to provide, in connection with such a vent, a simple form of cleaning device
60 which will be automatic in its operation, which will act upon accumulations of carbon and other deposits to grind and finally remove the same through the small diametered vents without materially influencing the prefixed rate of flow through the vent.
65 Incidental to this object it is a further desideratum to provide a form of vent which will feature the air entraining advantages characterizing small-diametered vents and which will at all times have the same dis-
70 charging capacity under like pressure conditions irrespective of the presence of the cleaning device.

Broadly, this object is attained by providing the vent in the form of a relatively long
75 and small-diametered Venturi tube and arranging within this tube a pendulum-like cleaner, free at all times to wobble in the tube, and of such light weight that it is raised by the relatively high pressures of
80 fuel passing through the tube so as to impose thereon longitudinal reciprocatory movement supplemental to the lateral wobbling movement.

Still another object of the invention is to
85 provide a device of the class described, the detachable parts of which may be readily inspected, cleaned and replaced.

Various other objects and advantages of the invention will be in part obvious from
90 an inspection of the accompanying drawings and in part will be more fully set forth in the following particular description of one form of mechanism embodying my invention, and the invention also consists in cer-
95 tain new and novel features of construction and combination of parts hereinafter set forth and claimed.

In the accompanying drawings:—

Figure 1 is a plan view looking down
100 upon a preferred embodiment of my invention;

Fig. 2 is a vertical sectional view taken on the line 2—2 of Fig. 1 with the cleaner in its lowered position;

Fig. 3 is an enlarged sectional view taken axially through the insert plug detached from the burner and showing the position
105

of the cleaner therein when raised into floating position by the normal working fuel pressure; and

Fig. 4 is a vertical sectional view taken on the line 4—4 of Fig. 1.

In the drawings there is shown a heater comprising in general a heating compartment for preheating the fuel before it is led to the burner and a burner for supplying heat to the preheater and for supplying heat to the other portions of the complete organization not illustrated.

The preheater includes an upstanding cylindrical drum 10 entirely opened at the bottom to provide an air inlet 11 for permitting a free flow of air to the combustion chamber 12 of the burner inclosed by the drum 10. The drum is formed of a double walled shell 13 with the walls positioned relatively close together to form a fuel chamber 14 of relatively small capacity but the inner wall 15 outlining the chamber 12 is of relatively large heat receiving area. A multiple jet burner 16 is centered within the lower part of the chamber 12 adjacent the inlet 11 and positioned to direct flames upwardly and outwardly onto the wall 15. A T-shaped conduit 17 is positioned within the outline of the cylinder for supplying the burner with gaseous fuel heated in its passage through the fuel chamber 14. The conduit includes a centrally disposed depending fuel conducting pipe 18 constituting the stem of the T-shaped conduit and disposed concentrically of the axis of the wall 15. The head portions 19 of the T-shaped conduit extend diametrically from the upper end of the pipe 18 and are opened at their outer ends to the upper portion of the interior of the chamber 14, as shown in Fig. 2.

The upper end of the drum 10 on opposite sides of the head portions 19 provides discharge openings 20. These openings collectively have an area (shown in Fig. 1) substantially equal to the interior cross-section of the drum 10 within the wall 15 thereby to permit a free discharge of the heat and products of combustion from the combustion zone. The burner illustrated is shown to be of the two-jet type designed to discharge two streams of fuel into the combustion zone. The burner is formed of a block 21 preferably of high grade steel drilled inwardly from opposite sides to form a V-shaped gas chamber 22 and a centrally positioned bore 23 opening through the top of the block into the chamber 22. The upper end of the bore 23 is counter-drilled and screw-threaded so as to demountably fit the lower end of the pipe 18 which is threaded externally. The block is drilled in forming the V-shaped gas chamber so that the outlet bores 24 are disposed at an angle of approximately 30° to the vertical. This angle appears to give the proper slippage to the gas

and is regarded as a critical angle in determining the proper directional discharge of the gases. The bores 24 are so disposed with reference to the shell 13 that the fuel streams projected from the burner are directed upwardly and outwardly onto the inner wall 15 and against that portion of the wall just below the connection of the head portions therewith. This causes an intense heating of the fuel just before it is passed down the pipe 18 to the burner.

As each of these bores and the plugs 25 mounted therein are similar in construction, a detail description of either one will be sufficient for the other. The plug is bolt-shaped and is provided with a barrel portion 26 threaded into the bore 24 and a head 27 constituting a means for rotating the plug and adapted to engage the adjacent side of the block 21. The plug is drilled axially therethrough to provide a cylindrical socket, the outer end of which is counter-drilled to provide a frusto-conical seat 28 in the head of the plug.

A Venturi tube 29 constitutes a removable insert fitted in the cylindrical portion of the socket and including an enlarged head 30 at one end. The head is fitted to said conical seat 28 and constitutes a flame forming tip.

The tube is provided with a passageway 31 of relatively small diameter constricted adjacent its outer end to form a fuel discharging vent 32. From the vent the passageway is enlarged in both directions in order to form the vent as the constricted portion of a Venturi tube passageway. Due to the high temperature conditions generated by a device of this character, it is necessary that the inserted Venturi tube be formed of lava or other noncarbonizing substance.

Each of the plugs is provided with a cleaner 33 which includes thin wire 34, preferably a nicrome wire, with the upper end drawn out to a fine point 35 and designed to be reciprocated back and forth in the vent to clear the same of any carbon deposits accumulated therein. The lower end of the cleaner projects into the chamber 22 and is defined by a weighted head 36 presenting a relatively large area exposed to the pressure of the gases passing through the passageway in the Venturi tube. This head is preferably formed separate from the wire so as to facilitate the replacement of the wire should it become burned or otherwise damaged. The wire is demountably held in position in the head by a set screw 37. The cleaner is so arranged that normally the head will fall by gravity to the bottom wall 38 of the chamber 22, causing the pointed end 35 to fall below the vent 32 or rather to cause the pointed end to fall until but a small length of the pointed end remains in the vent, thus permitting

a less restricted passage to the fuel passing out through the vent when under relatively low pressure such as is employed when feeding a pilot light.

5 The cleaner is so weighted that any working pressure greater than the pilot-light-supplying pressure will be sufficient to raise the same from the position shown in Fig. 2 into the position shown in Fig. 3 to constitute a floating pendulum.

The device thus described is demountably positioned on a support 43 and fastened thereto by a bolt 44 passed upwardly through the support and into the block 21.

15 In operation, fuel, either liquid or gaseous is admitted through the inlet 10' shown in Fig. 2 and is subjected to an intense heating while in the fuel chamber 14. From the fuel chamber the gas usually in a highly attenuated state is passed through the conduit 17 and into the gas chamber 22.

Let it be assumed, first, that the gaseous fuel is under relative low pressure just sufficient, for instance, to supply a pilot light flame at the tip end of the Venturi tube. Under this light pressure condition, the weight of the cleaner will be sufficient to hold the same in the lowered position shown in Fig. 2 and against the tendency of the flowing fuel to raise the head 37 off the bottom 38. Due to the weighted end provided by the head, the cleaner will be held to the bottom 38 and the gases passing about the light needle-like part will tend to rock the free upper end back and forth laterally across the length of the passageway 31. This wobbling action will be insured by the vibration of the engine or other machine part forming a part of the complete organization.

40 The gas normally passes through the Venturi tube and has its maximum velocity in the most constricted portion of the vent, thus tending to maintain the vent free of small particles of carbon which might otherwise tend to collect in the restricted passage. In the active operation of the device, the relatively high pressure of the fuel acts on the portion of the cleaner positioned in the Venturi tube to raise the head off the bottom 38 and to project the thin pointed end of the wire 34 more fully into the vent 32. At this time the cleaner acts as a pendulum supported adjacent its upper end by the dense ring of gaseous fuel compressed at the vent by the Venturi tube effect of the passageway 31.

When in this position the cleaner has freedom of motion in all directions; it will reciprocate back and forth longitudinally due to small variations in the gas pressure; it will wobble laterally due to unbalanced pressure conditions and due to vibrations of attached parts, and it will also possess a tendency to rotate about its own axis by the action of the gas current on the flat head 37.

As the entire wire wears bright after the burner has been in operation for a time, it is assumed that the cleaner acts not only to eject carbon accumulations by pushing the same out through the vent, but that the wire has a scouring action on the gas during the passage of the gas through the passageway 31 and that the wire breaks up the carbon particles before they are passed out through the vent.

By means of a device of this character a uniform and constant stream of fuel is discharged from each of the vents, which contributes to the uniformity of heat given out by the burner. As the discharging vents are promptly and automatically cleared of any accumulated deposit, the device can be operated without any particular attention and when it is desired to replace or clean the burner the plugs can be readily unscrewed from the block 21. The removal of these plugs provides ready access both to the interior of the gas chamber 22 and to the parts of the plugs and cleaner. The burnt out portions of the cleaner and plugs can readily be replaced and the parts remounted in position for continued operation.

Having thus described my invention, I claim:

1. A burner including a block provided with a gas containing chamber having an opening through a side thereof, a metallic plug demountably positioned in said opening and provided with a bore extending therethrough, a Venturi tube of a heat resisting substance demountably fitted in said bore and having a gas conducting passageway extending axially therethrough, an outer portion of said passageway being constricted to form a vent of relatively small clearance designed to act as a Venturi tube, a cleaner in the form of a wire mounted in said passageway, free to fall by gravity into normal position substantially clear of the vent, said cleaner provided with an enlarged head at its lower end positioned in said chamber, presenting a relatively large area to the action of the gas flowing through the passageway and adapted to be raised by the pressure of gas flowing through the passageway thereby to move the wire longitudinally of the same and to reciprocate the upper end thereof in the vent to clear the same of any accumulated deposits.

2. A burner provided with an upwardly inclined, normally open fuel conducting passageway adapted to have fuel at both a relatively low pressure and a relatively high pressure passed therethrough, a pressure controlled cleaner mounted in said passageway, every point along the length of said cleaner when floating having three degrees of freedom of movement, one of which is longitudinally of the passageway and said cleaner being weighted so as to be floated

in said passageway by any pressure greater than said relatively low pressure.

3. A burner provided with a fuel conducting passageway constricted adjacent its outer end to form a Venturi tube effect, a cleaner including a pointed end mounted in said constricted portion, said cleaner being free normally to fall into position to provide a maximum clearance for the fuel through the constricted portion when under relatively low pressure and adapted to be floated by relatively high pressure to bring the portion of greater cross-section of the pointed end into the restricted part and to cause said part to vacillate in the restricted part.

4. A burner provided with a fuel conducting passageway having a portion thereof constricted to form a Venturi tube effect, a cleaner constituting a floating pendulum, mounted in said passageway and adapted to be raised and supported in suspended position by the pressure of the fuel passing through said Venturi-tube passageway, said cleaner capable of having reciprocity as well as pendulous movement under the action of the fuel passing through the passageway.

5. A burner subject to vibratory movement and having a fuel conducting passageway therein, a floating cleaner mounted in said passageway free to move longitudinally therein, means below the cleaner for supporting the same in normal position, said cleaner in all positions adapted to be acted upon by the vibration of the burner to cause the cleaner to vacillate transversely of the passageway.

6. A burner provided with an upwardly inclined fuel-conducting-passageway, a floating member having its upper end mounted in said passageway for free reciprocity movement longitudinally thereof to constitute a cleaner, said cleaner having a cross-section less than the cross-section of the passageway whereby the cleaner is capable of moving laterally of the passageway, as well as longitudinally thereof and said mem-

ber having a mass so balanced relative to the pressure of the fuel that a relatively low pressure is insufficient to lift the cleaner and a relatively high pressure is sufficient to float the same in said passageway.

7. In a burner, a gas chamber provided with a gas discharging vent in the form of a Venturi tube, a freely floating cleaner including a wire provided with a pointed end free to fall by gravity through said vent and adapted to be moved longitudinally by the pressure on the gas passing through the vent into the vent to clear the same of any carbon deposits collected therein.

8. In a device of the class described, the combination with a normally open tube adapted to conduct a gas, and pressure controlled means free to float in said tube physically disconnected therefrom and adapted to clear the same of accumulations, said tube being free to conduct the gas there-through in all positions of the pressure controlled means.

9. A hydrocarbon conduit provided with a discharge vent of relatively small diameter designed to have a free flow of gas there-through and means free to move in all directions with a universal articulation and controlled by the gas moving through said vent for acting upon any accumulation of carbon collecting in said vent to work the same through the small diametered vent.

10. A hydrocarbon burner provided with a discharge vent designed to have a free flow of gas therethrough during the active operation of the burner, a carbon grinder provided with means capable of movement both longitudinally of the gas flow and transverse thereto and actuated by the gases moving through the vent for feeding through the vent any carbon accumulation which may tend to collect in said vent.

Signed at New York city, in the county of New York and State of New York, this third day of July, A. D. 1918.

ENOCH RECTOR.