

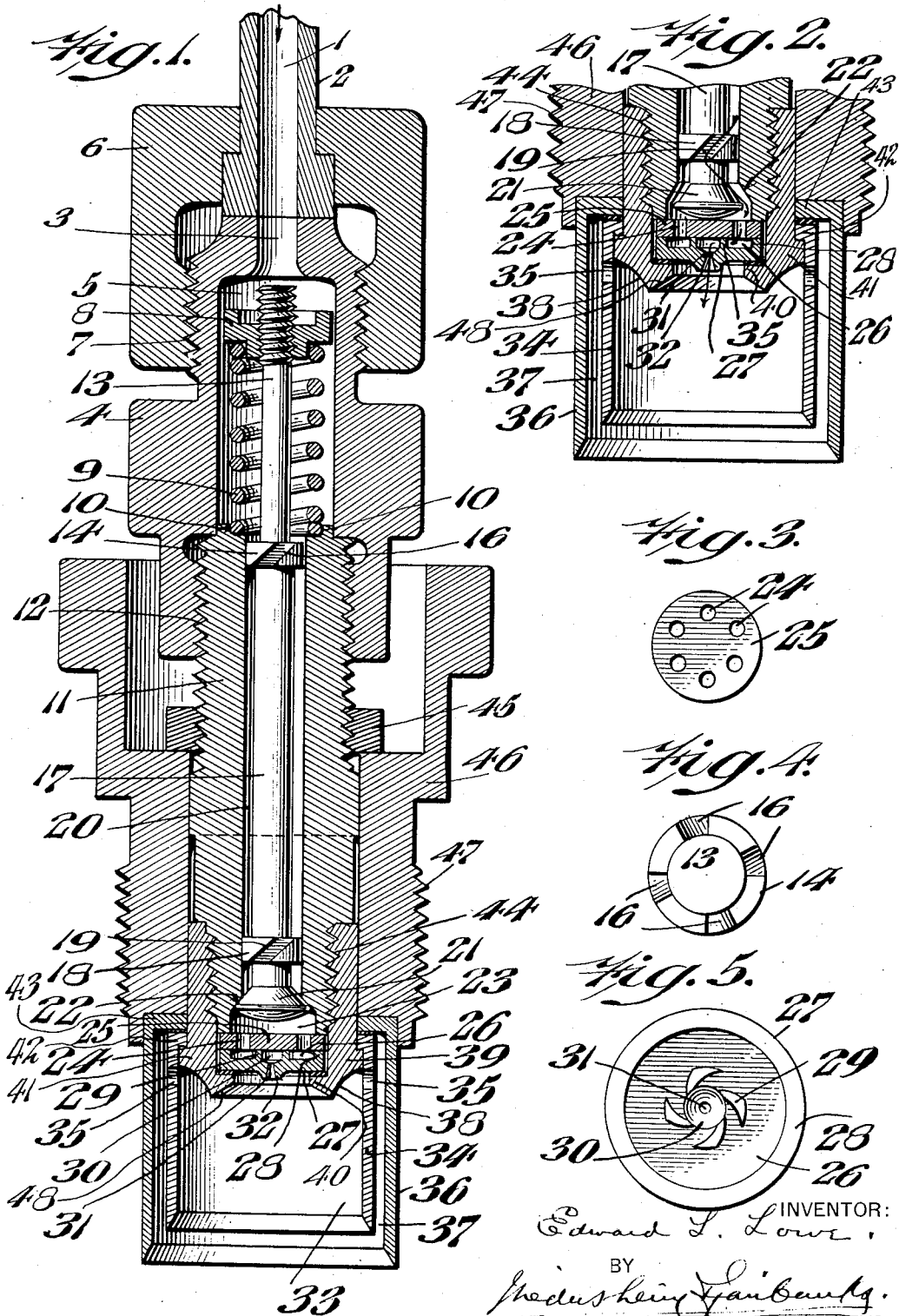
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BURNER AND VALVULAR CONTROL THEREFOR

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BURNER AND VALVULAR CONTROL THEREFOR.

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My invention relates to a novel construction of a burner and its adjuncts for internal combustion engines and a valvular control therefor, whereby in lieu of gasoline as a fuel, I am enabled by my novel construction to employ the cheapest and heavier grades of hydrocarbons or oils, whose cost approximates but a few cents per gallon as compared with the more expensive lighter hydrocarbons, such as gasoline and the like.

In order to set forth the advantages of my novel burner for oil burning internal combustion engines, I will first explain as to certain fundamental requirements for the effective combustion of fuel oil, which form the basis of this invention.

(1) Ordinary internal combustion engine fuel oil has generally a flash point between 150° F. and 200° F. and a fire test in the neighborhood of 250° F. or 300° F.

(2) Air when compressed to about 200 pounds per square inch gauge is raised in temperature to about 670° F. Lower as well as higher compressive pressures have corresponding temperature, and the temperature of 670° F. is far in excess of that actually required to burn ordinary fuel oil and one object of my invention is to utilize this temperature to ignite oil of combustion.

My novel burner and its valvular control comprises a device, which may be used on engines with compressive pressures lower than those used in engines of the Diesel type and is applicable to engines using a light fuel for starting only, as well as engines which have no such provision, depending in either case entirely upon the compressive pressures for which the engine is designed. I have found that with a compressive pressure of about 200 pounds per square inch, ordinary fuel oil may be ignited from a cold start and that an engine with much lower compressive pressure will operate satisfactorily on the same grade of oil, but ordinarily must be started on a light fuel with higher flash and fire test.

The advantages of my novel device reside in its extreme simplicity of construction, its freedom from carbon deposits and its satisfactory functioning with comparatively lower compressive pressure, the freedom from carbon deposits being accomplished by ignition and combustion taking place without contact of the fuel oil with parts at either extremely high temperatures or parts at low

temperatures. Extremely high temperatures as met with in the hot bulb engines have a tendency to decompose or "crack" the oil of combustion instead of vaporizing it, with a resultant deposition of carbon. When the oil of combustion deposits on cool surfaces it does not vaporize and a carbon deposit results.

To the above ends my invention consists of a novel valvular control for a burner for internal combustion engines, comprising a plurality of concentrically arranged metallic ferrules, thimbles or sleeve-like members which for convenience of manufacture are made separate so as to be readily assembled or disconnected if desired, said thimbles being clamped or positioned by novel mechanism within a pocket or passage in the engine cylinder communicating with the compression chamber, and said valvular control comprising an upwardly seating valve and a valve stem having thereon means for effecting an automatic intermittent rotation of said stem and valve, whereby the liability of wear on the valve seat is obviated or reduced to a minimum.

It further consists of a novel construction of a burner for an internal combustion engine composed of novel supporting means, a plurality of concentric metallic skirts, thimbles, ferrules or sleeve-like members, so collocated that a relatively large central combustion chamber is provided within the inner thimble, while the annular space between the two thimbles comprises a thin or restricted annular air heating and guiding channel, the fuel prior to its exit into said combustion chamber, passing through apertured disks collocated and functioning in a novel manner to be hereafter described.

It further consists of a novel construction of a burner composed of concentric skirts, thimbles or sleeve-like members, which may have upper inwardly deflected supporting flanges, the inner thimble being preferably shorter than the outer thimble and provided with upper ports therein and novel means being provided for positioning said burner in a passage in the engine cylinder head in communication with the compression chamber, the passage of fuel to said burner, being controlled by an upwardly seating valve, which is automatically and intermittently rotatable.

It further consists in combination with a burner of the general character above de-

scribed, of a novel construction of automatically operated valvular control mechanism, comprising an upwardly seating valve, and a spring pressed valve stem having upper and lower heads provided with spiral cuts, whereby the valve for admitting fuel to the burner is automatically controlled by said spring or its equivalent, so as properly to admit the fuel to the burner under all conditions and to be seated by back pressure.

It further consists of a novel construction of a burner of the character above described, combined with an automatically rotated valvular member, which is seated by spring pressure and by back pressure from the burner, said valve being positioned in proximity to said burner, and automatically operated, as will be hereafter explained.

It further consists of a novel valvular control, a novel burner having a central combustion chamber formed within a pendant skirt having ports in its upper portion, positioned in proximity to an annular concave wall in the nozzle body, and a thin outer, restricted, air heating chamber, and novel means for assembling these devices with respect to the valvular control.

It further consists of other novel features of advantage and construction, all as will be hereinafter fully set forth.

For the purpose of illustrating my invention, I have shown in the accompanying drawings, a form thereof which is at present preferred by me, since it will give in practice, satisfactory and reliable results, although it is to be understood that the various instrumentalities of which my invention consists can be variously arranged and organized and that my invention is not limited to the precise arrangement and organization of these instrumentalities as herein shown and described.

In the accompanying drawings,

Figure 1 represents a vertical sectional view of a burner and its adjuncts embodying my invention, certain of the parts being shown in elevation.

Figure 2 represents a vertical sectional view similar to the lower portion of Figure 2, but showing the fuel valve unseated.

Figure 3 represents, in detached position, a plan view of a perforated disc employed.

Figure 4 represents, on an enlarged scale, a plan view of the upper head of the valve stem, showing the inclined cuts therein.

Figure 5, represents, on an enlarged scale, a plan view of the top of the nozzle plate.

Referring to the drawings, in which similar reference characters indicate like parts:—

In carrying out my invention, the fuel, through the action of a pump plunger, (not shown) is caused to enter the passage 1, of the inlet pipe 2, and passes through the aligning passage 3 of the cap member 4 into the chamber 5 within the latter. The inlet pipe 2 is

secured in position by the nut 6, which is in threaded engagement with the cap member at the point 7. The incoming fuel passes around the outer periphery of the head 8 and along through the spring 9, whose upper end abuts against the bottom of said head and whose lower end rests upon the upper end 10 of the inner sleeve or valve stem guide 11, which latter is in threaded engagement at the point 12 with the lower end of the cap member 4. The head 8 is in threaded engagement with the upper end of the valve stem 13, which is surrounded by the spring 9, below which, is the head 14 having the spiral or inclined grooves 16 therein. The lower portion 17 of the valve stem forms a continuation of the upper portion 13 and is preferably of larger diameter than the latter. Near the lower end of the valve stem 17 is the head 18 having the spiral or inclined ports 19 therein. The heads 14 and 18 fit loosely and are guided in the bore 20, which serves as a fuel passage for incoming fuel. At the lower end of the valve stem 17 is located the valve 21, which is of conical form and seats upwardly against the valve seat 22, the valve being shown seated in Fig. 1, and unseated in Fig. 2. The fuel after passing through the upper chamber 5 passes through the inclined cuts 16 in the head 14 and thence through the chamber 20 and through the inclined cuts 19 of the head 18 to the top of the valve 21. The tension of the spring 9 against the bottom of the head 8 is such that the valve 21 is normally held against its seat 22, but at the proper intervals of the pulsations of the fuel pumping element (not shown) the pressure within the chambers 5 and 20 will overcome the forces holding the valve 21 on its seat and the valve will unseat, as seen in Fig. 2 and will at the same time be rotated by the passage of the fuel under pressure through the inclined cuts or ports 16 and 19 of the upper and lower heads 14 and 18, respectively.

It will of course be understood that the tension of the spring 9 is such as to serve to insure prompt and certain return of the valve 21 to its seat 22, as soon as the wave of excess pressure has passed. When the valve 21 is unseated the fuel passes into the chamber 23 below the valve, and thence through the ports 24 in the disc or diaphragm 25 into the shallow cup shaped chamber 26 in the disc or diaphragm 27, having the annular outer wall or flange 28. The fuel flows thence past the spiral walls or vanes 29, into the central chamber 30 of the disc 27 and thence outwardly in a whirling direction through the small nozzle orifice 31 and finally issues through the pendant expanding cone 32 of said nozzle as a whirling, spiral spray of finely atomized or pulverized fuel. While the creation of said spiral or whirling jet of the exact character above described is not absolutely essential, since any whirling jet

will meet practical requirements, I prefer to employ or create the whirling, spiral form of spray created by the construction above described. This conical, diverging, spiral, whirling jet of atomized fuel is discharged into the cylindrical combustion chamber 33 formed within the pendant cylinder, thimble or skirt 34, which is provided at its upper portion with the ports 35. 36 designates an outer cylindrical shell, thimble, or skirt, which is of slightly greater length than the inner skirt 34, whereby there is formed a concentric heating and guiding passage 37 which communicates at its upper portion with the port 35. There are a number of these ports 35 in the upper portion of the skirt 34 and it will be noted that said ports 35 are positioned in proximity to the curved or concaved annular surface or wall 38, which is located at the lower end of the nozzle body 39.

While I have shown one mode of assembling the various elements composing the burner body or casing, and their adjuncts, it will be apparent that these parts may be differently constructed and assembled. I preferably construct the nozzle body 39, so that its inner flange or shoulder 40 serves to retain in position the disks 25 and 27, while its outer flange 41, serves to support and lock in assembled position, the inturned upper flanges 42 and 43 of the inner and outer thimbles or skirts 34 and 36 respectively, said nozzle body being in threaded engagement at 44 with the lower end of the inner member 11. The nut 45 locks the member 11 to the outer casing 46, which is externally threaded at 47 for engagement with the engine cylinder.

I preferably bevel the nozzle body 39 as indicated at 48 and it will be apparent that any back pressure in the burner or combustion chamber 33 will tend to seat the valve 21 upwardly, this upward seating tendency being augmented by the spring 9 as is evident.

While I preferably proportion the length of the burner elements substantially as seen in Fig. 1, my device will function satisfactorily, if said burner elements are of substantially the same length. It will be obvious that a plurality of burners may be employed for a single cylinder and when a plurality of said burners are employed, it will be evident that they may be disposed around or in the cylinder head in any desired arrangement, which will produce the greatest efficiency.

It will be noted that the central combustion chamber 33 and the outer relatively thin annular passage 37 communicate at their upper and lower portions, the upper communication being at or by the ports 35.

The operation is as follows:—

The general mode of operation, in so far as the co-action of the combustion chamber 33 and the outer annular passage 37 and the ports 35 is concerned, in general, is substan-

tially the same as explained in my prior patents granted to me, Nos. 1,454,972; 1,443,187; 1,450,691 and 1,462,514, my present invention differing from the constructions shown therein, mainly in the employment of the disks 25 and 27 in conjunction with the curved wall 38 of the nozzle body and the valve positioned in proximity to said disks and provided with the two heads having spiral cuts therein, for the purposes already explained. There is, however, in my present device, a conical spreading jet created within the combustion chamber which is formed just as the engine piston (not shown) is at or near the top of its stroke and the engaged air thus compressed to about 225 or 250 pounds with corresponding temperature. As a result of the sudden formation of this jet, an eddying disturbance with relative lowering of pressure is formed in the combustion chamber 33 within the skirt 34 but outside and on the boundaries of the conical jet. Such lowering of pressure and such entraining action on the air in the skirt 34 will be effective in its upper portion and air will flow upwardly through the annular passage chamber 37 through the ports 35 and will then be deflected downwardly by the curved wall 38, thus meeting and surrounding the spreading jet of atomized fuel. Under these conditions and with the air temperature conditions as they now are, a fractional distillation or vaporization will result, parts of the lighter fractions of the fuel being vaporized out of the heavier body, and such lighter fractions will then find themselves in a temperature adequate for ignition with oxygen at hand for combustion as required. Ignition will then follow and with such initial ignition, the immediate combustion of the fuel charge will follow in regular course.

It will be apparent that the spiral or inclined ports 16 and 19 enable the fuel to impart to the valve stem and valve a slight rotary movement at each admission of fuel thus equalizing wear on the valve and its seat, as is evident.

It will be understood that while I have found in practice, very advantageous results to be attained by the employment of the spiral slots in the heads 14 and 18 for the purpose of rotating the valve and stem and thus equalizing wear in the valve and seat, it will be apparent that my burner will operate effectively without such means for automatic rotation of the valve.

It will be further apparent that while I have found the means herein described for producing a spiral or swirling jet of fuel to be desirable and very effective, my novel burner will function effectively without such means and with simply a diverging or conical spray, so that while the creation of the swirling or spiral jet described is a preferable and desirable construction, my device will be operable and efficient if the means shown in

Figure 5 for producing such spiral jet are omitted or modified.

Spécial attention is called to the provision of the curved or deflecting surface 38 which is located in proximity to the ports 35 which I have found to be a very important element in my present invention, since this curved surface 38 serves instantly to deflect the preheated air entering the combustion chamber 33 through the ports 35 from the thin annular preheating chamber 37. It will be understood that while I have described my invention as being especially adapted for internal combustion engines, the same is capable of being used and installed in other locations wherein an effective, quick and complete combustion of the hydrocarbon is desired at a given point.

It will now be apparent that I have devised a novel and useful construction of burner and valvular control therefor which embodies the features of advantage enumerated as desirable in the statement of the invention and the above description, and while I have in the present instance shown and described the preferred embodiment thereof which has been found in practice to give satisfactory and reliable results, it is to be understood that the same is susceptible of modification in various particulars without departing from the spirit or scope of the invention or sacrificing any of its advantages.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent, is:—

1. In a device of the character stated, the combination of a burner, a fuel passage leading thereto, an upwardly seating valve in said passage, a valve stem for said valve, means for holding said valve to its seat, and heads on said valve stem having inclined grooves therein whereby the passage of fuel to said burner past said heads tends to rotate said valve and its stem.

2. In a device of the character stated, the combination of a burner, a fuel passage leading thereto, a plurality of apertured discs located above said burner, the upper of said discs having outer ports therein and the lower of said discs having a central, conical discharge port therein, an upwardly seating fuel valve positioned above said discs, a valve stem therefor, tension devices for keeping said valve normally seated, and heads on said valve provided with inclined cuts for effecting rotation of said valve and stem at intervals during the passage of the fuel to said burner.

3. The combination of a burner, a fuel passage leading thereto, a plurality of discs in the lower portion of said fuel passage through which the fuel passes, the upper of said discs having outer ports therein and the lower of said discs being provided with means for giving a whirling action to the fuel, the lower of said discs having a central, conical exit

port, an upwardly seating valve located above said discs, a valve stem therefor, a head on the upper portion of said valve stem, a tension device bearing upwardly on said head, and lower heads on said valve stem below said tension device provided with inclined cuts for effecting the rotation of said valve and stem during the passage of fuel to said burner.

4. In a device of the character stated, a burner composed of concentric thimbles, the inner thimble having upper ports therein, a nozzle body for holding said thimbles in assembled position, a pair of apertured discs contained in said nozzle body, the latter being provided with a lower, outer annular concave wall located in proximity to said ports in said inner thimble, an upwardly seating valve positioned above said discs, a valve stem therefor, and means on said valve stem for enabling the latter and said valve to be intermittently rotated by the passage of fuel to said burner.

5. In a device of the character stated, a burner composed of concentric thimbles, the inner thimble having upper ports therein, a nozzle body for holding said thimbles in assembled position, and a pair of apertured discs contained in said nozzle body, the latter being provided with an outer annular concave wall located in proximity to said ports in said inner thimble.

6. In a device of the character stated, a burner composed of concentric thimbles, the inner thimble having upper ports therein, a nozzle body for holding said thimbles in assembled position, and a pair of apertured discs contained in said nozzle body, the latter being provided with an outer annular concave wall located in proximity to said ports in said inner thimble, in combination with means on said lower disc for imparting a whirling movement to the fuel particles.

7. In a device of the character stated, a burner composed of an outer sleeve, and an inner sleeve positioned within said outer sleeve, both of said sleeves being open and unobstructed at their lower ends, whereby an outer channel or passage is formed between said sleeves open at its bottom, and a relatively large combustion chamber is formed within said inner sleeve, said chambers being in communication at their upper and lower ends, and a plurality of discs through which the fuel passes, located above said combustion chamber the upper of said discs having outer ports therein and the lower of said discs having a central exit port therein.

8. In a device of the character stated, a burner composed of an outer sleeve, and an inner sleeve of less length than said outer sleeve positioned within said outer sleeve, whereby a relatively thin outer annular channel or passage open at its bottom is formed between said sleeves, and a relatively large central combustion chamber is formed with-

in said inner sleeve, the latter having ports at its upper portion forming a communication between the upper portions of said chamber and said passage, and both of said sleeves being open and unobstructed throughout the entire area of their lower ends, a plurality of discs through which the fuel passes located above said combustion chamber, the upper of said discs having outer ports therein, and the lower of said discs having spiral vanes on its upper surface and a central conical discharge port.

9. In a device of the character stated, a burner composed of an outer sleeve, and an inner sleeve positioned within said outer sleeve, and having its lower end terminating above the bottom of said outer sleeve, whereby a relatively thin, annular, chamber open at its bottom is formed between said sleeve, and a relatively large central combustion chamber is formed within said inner sleeve, the latter having ports at its upper portion forming a communication between the upper portions of said chambers, said outer sleeve being open and unobstructed throughout its entire area at its lower end, a conical fuel exit port discharging fuel into said combustion chamber, at a point in proximity to said ports, and a perforated disc above said fuel exit port.

10. An insertible burner for internal combustion engines having an elongated central combustion chamber and an elongated surrounding, relatively thin chamber communicating therewith through ports near its upper end, the remaining portion of said elongated chamber being cut off from said combustion chamber, but communicating therewith at its lower end, said chambers being open and unobstructed throughout their entire lower area opening into the compression space, an upwardly seating fuel valve located in proximity to said burner and means for rotating said valve by the passage of fuel to said burner.

11. A burner for engines of the slow combustion type, comprising a plurality of approximately concentric cylindrical sleeves separated from each other by an outer air space forming a chamber opening into the compression space of the engine and a central combustion chamber formed within the inner sleeve and opening into said compression space and having restricted communication with said chamber near one end, the opposite ends of said chambers communicating, and the outer sleeve being open and unobstructed throughout its entire lower area opening into said compression space, an upwardly seating fuel valve located in proximity to said burner, and means for intermittently rotating said valve during the passage of fuel to said burner.

12. An insertible burner for internal combustion engines, comprising a plurality of

interfitted sleeves, one within the other, and separated from each other by an outer, elongated, air space forming a relatively thin channel or passage, the inner sleeve containing the combustion chamber and having small ports near its upper end, said burner being adapted to be mounted in the wall of an engine cylinder, and said combustion chamber and said channel or passage communicating at their lower ends and opening into the compression space of said cylinder, said chambers being noncommunicating throughout their length and open and unobstructed at their lower ends, a support for said sleeves adapted to be secured to said cylinder, and a plurality of apertured discs through which the fuel passes to said burner, the lower of said discs having a conical exit port and means for imparting a whirling motion to the fuel.

13. In a device of the character stated, a burner composed of an outer sleeve and an inner sleeve positioned within said outer sleeve, both of said sleeves being open and unobstructed at their lower ends, whereby an outer chamber is formed between said sleeves open at its bottom, and a relatively large combustion chamber is formed within said inner sleeve, said chambers being in communication at their upper and lower ends, an upwardly seating spring pressed fuel valve, means for intermittently rotating said valve during the passage of fuel to the burner, and a pair of apertured discs located between said valve and burner.

14. In a device of the character stated, a burner composed of an outer sleeve and an inner sleeve positioned within said outer sleeve, both of said sleeves being open and unobstructed at their lower ends, whereby an outer air heating chamber is formed between said sleeves open at its bottom, and a relatively large combustion chamber is formed within said inner sleeve, said chambers being in communication at their upper and lower ends, an upwardly seating valve in proximity to said burner, and a pair of apertured discs intermediate said valve and burner, the lower of said discs having a conical exit port and means thereon for imparting a swirling motion to the fuel.

15. The combination of an engine cylinder, a casing secured thereto and having a fuel passage therethrough, a burner comprising a plurality of flanges in metallic contact with said casing and secured to said cylinder thereby, an outer thimble carried by one of said flanges and positioned in a passage within said cylinder, said outer thimble being open and unobstructed at its lower end, an inner thimble secured to the other of said flanges, and positioned within said outer thimble, whereby there is formed a central combustion chamber, and an outer chamber, said chambers being in communication at their

opposite ends, and both of said chambers having an uninterrupted communication at their lower ends with the compression space of the cylinder, a pair of apertured discs for said burner, the lower of said discs having a conical exit port and means on said lower disc for imparting a whirling motion to the fuel.

16. The combination of an engine cylinder, a relatively thick casing secured thereto and having a fuel passage therethrough, a burner comprising an outer flange in metallic contact with said casing and having a thimble secured thereto open and unobstructed at its lower end, an inner flange seated within said outer flange, an inner thimble carried by said inner flange and positioned within said outer thimble, and ports near the upper end of said inner thimble, there being a combustion chamber formed within said inner thimble and a channel or passage formed between said thimbles, said chamber and channel communicating at their bottoms, a pair of apertured discs through which the fuel passes to said burner, and a rotatable fuel valve located in proximity to said discs.

17. A burner for an internal combustion engine formed of an inwardly deflected outer flange, an outer thimble secured at one end thereto and open and unobstructed at its opposite end, an inner inwardly deflected flange seated within said outer flange, an inner thimble having ports near its flanged end, secured to said inner flange and positioned within said outer thimble, an upwardly seating fuel valve, means for rotating said valve by the passage of fuel to the burner, and a pair of apertured discs between said valve and burner.

18. A burner for an internal combustion engine, formed of an outer flange, an outer thimble secured at one end thereto and open and unobstructed at its opposite end, an in-

ner flange seated in said outer flange and an inner thimble secured to said inner flange and positioned within said outer thimble, and having restricted ports near its flanged end, said inner thimble being shorter than said outer thimble, an upwardly seating fuel valve, a valve stem therefor, heads on said valve stem having inclined cuts therein, and a plurality of apertured discs between said valve and burner.

19. A burner for an internal combustion engine, formed of an outer flange, an outer thimble secured at one end thereto and open and unobstructed at its opposite end, an inner flange seated in said outer flange, an inner thimble secured to said inner flange and positioned within said outer thimble, and having restricted ports near its flanged end, said inner thimble being shorter than said outer thimble, a fuel valve above said burner, a plurality of apertured discs between said valve and burner and a nozzle head having on its outer portion means for securing the flanges of said thimbles in position and on its inner portion means for retaining said discs in assembled position.

20. In a device of the character stated, a burner composed of an outer sleeve and an inner sleeve positioned within said outer sleeve, both of said sleeves being open and unobstructed at their lower ends, whereby an outer thin, annular, air preheating chamber is formed between said sleeves open at its bottom, and a relatively large combustion chamber is formed in the inner sleeve, the latter having ports in its upper portion, and a curved annular deflecting wall in proximity to said ports in the upper portion of said combustion chamber for deflecting the preheated air entering from said ports in the jet of fuel.

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