

Oct. 21, 1930.

E. B. ROBEY

1,779,077

FUEL BURNING MOTOR

Filed Aug. 26, 1929

2 Sheets-Sheet 1

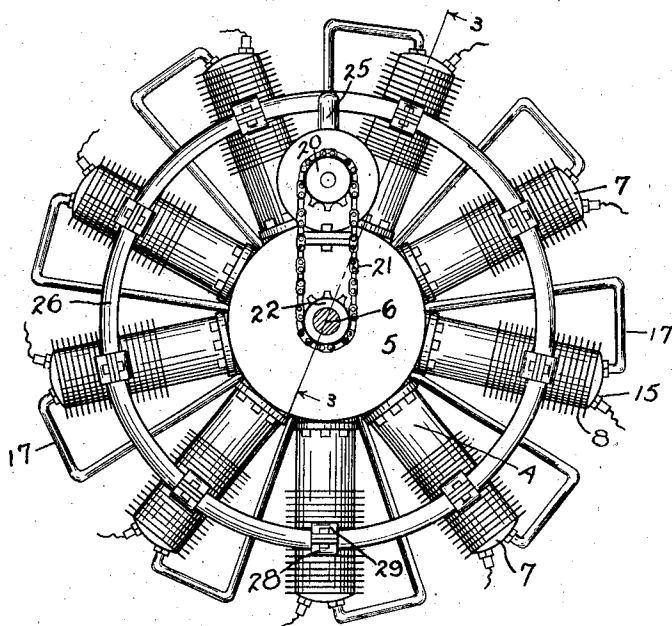


FIG. 1

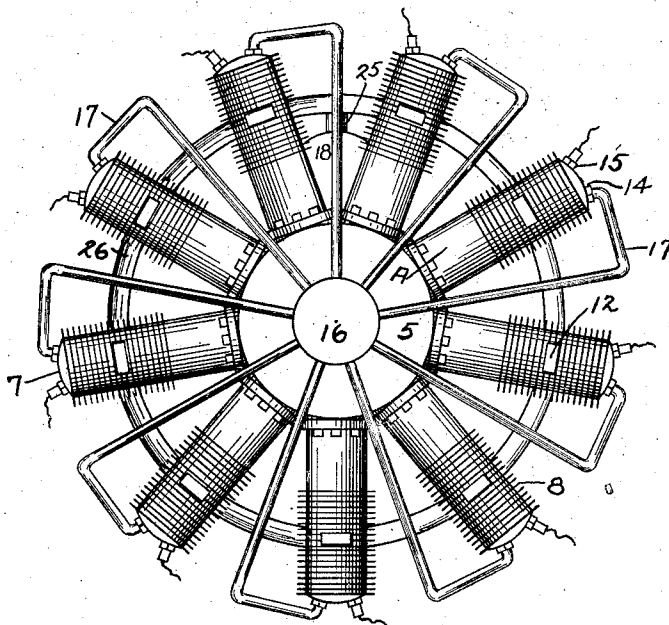


FIG. 2

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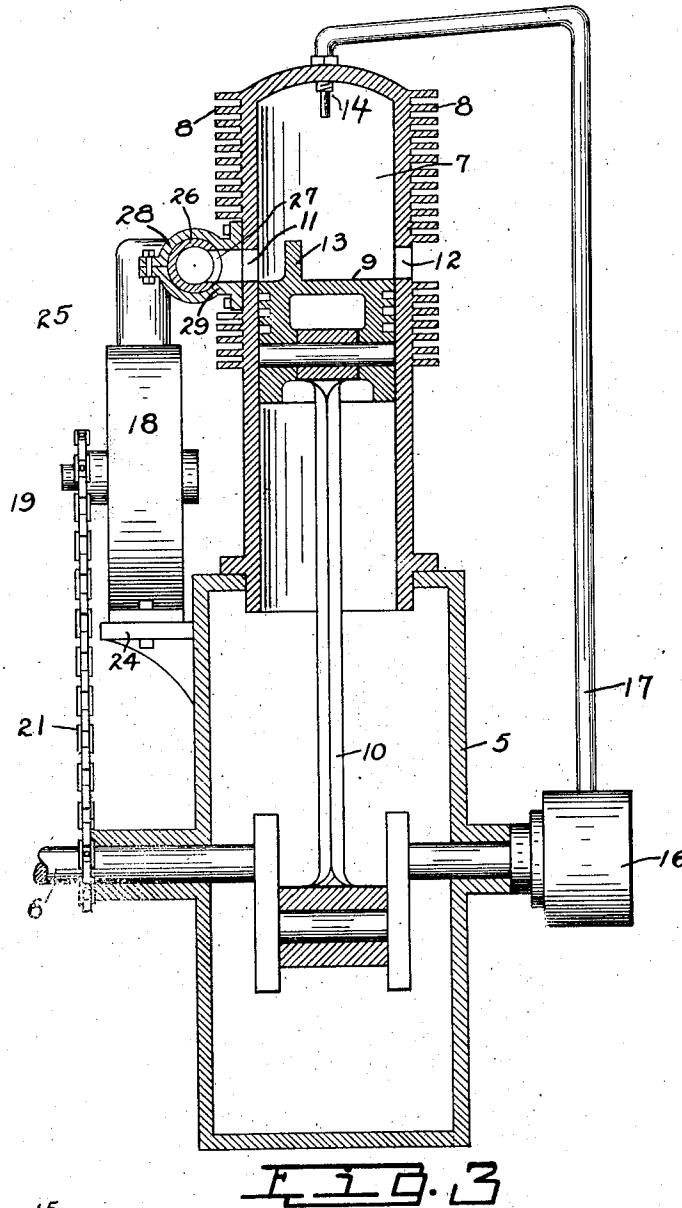
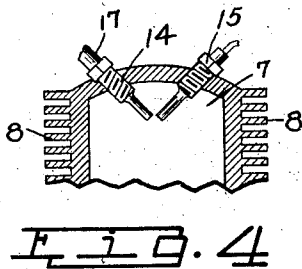
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FUEL BURNING MOTOR

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2 Sheets-Sheet 2



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UNITED STATES PATENT OFFICE

EDWARD BLANCHARD ROBEY, OF EGG HARBOR CITY, NEW JERSEY, ASSIGNOR OF FORTY PER CENT TO WASHINGTON FUEL BURNING ENGINE CORPORATION, OF WASHINGTON, DISTRICT OF COLUMBIA, A CORPORATION OF DELAWARE, AND THIRTY PER CENT TO GEORGE B. ROBEY, OF FAIRFAX, VIRGINIA

FUEL-BURNING MOTOR

Application filed August 26, 1929. Serial No. 388,395.

This invention appertains to internal combustion engines of the two cycle type and more particularly to a novel two cycle radial motor, it being understood however that the principles thereof are applicable to two cycle motors having the cylinders in line or in other arrangement.

One of the primary objects of my invention is to provide a two cycle motor of exceptionally simple and durable character eliminating the necessity of use of many working parts now considered necessary on motors of the two and four cycle oil burning type, and at the same time increasing the efficiency of the motor, both as to fuel consumption and power.

Another important object of my invention is the provision of novel means for introducing the fuel charge and air in the cylinders of the motor whereby the necessity of compressing the fuel charge in the crank case is rendered unnecessary, consequently eliminating the dangers incident to such practice and the reduction of working parts, by-passes and the like.

A further object of my invention is the provision of means for injecting the raw fuel at the proper time in the cylinder at the head thereof, with means for injecting air under pressure at the opposite cylinder end through an appropriate air inlet port, the cylinder having a diametrically opposite exhaust port, the ports being controlled by the piston during its travel, whereby at the end of the piston stroke, the air under pressure will effectively scavenge the cylinder and sweep the same clean, the exit of the air through the exhaust port creating a slight vacuum for withdrawing all burnt gases from the cylinder, without withdrawing any of the fresh fuel charge, thereby eliminating fuel wastage.

A further object of my invention is the provision of a deflector plate carried by the piston for deflecting the air under pressure toward the cylinder head or combustion chamber and fuel injector nozzle, the air under pressure and fuel under compression combining in such a manner as to permit the use of fuel oil and an electrically heated hot

point for firing the charge at the time of the proper compression of the charge, the resultant structure producing a radial engine of semi-Diesel type.

A further object of my invention is to provide novel means for synchronously operating the fuel oil pump and the air pump from the crank shaft of the engine whereby these parts will be operated in proper timed relation, and to deliver the proper amount of air according to engine speed to the cylinders.

A still further object of my invention is the provision of a novel annular intake air manifold and novel means for introducing air under pressure in said manifold for maintaining an even pressure therein.

With these and other objects in view, the invention consists in the novel construction, and arrangement of parts as will be hereinafter more fully described, claimed and illustrated in the accompanying drawings, in which,

Figure 1, is a front elevation of a radial internal combustion engine constructed in accordance with my invention.

Figure 2, is a rear elevation of same.

Figure 3, is an enlarged fragmentary detail section through the engine illustrating one of the cylinders and its associate parts taken on line 3—3 of Figure 1, looking in the direction of the arrows.

Figure 4, is a detail fragmentary section through one of the cylinder heads illustrating the arrangement of the fuel injector nozzle and the electric hot point or plug.

Referring to the drawings in detail wherein similar reference characters designate corresponding parts throughout the several views, the letter A generally indicates my improved two cycle motor which comprises a crank case 5, having journaled therein a crank shaft 6. Bolted or otherwise secured to the crank case 5, and extending radially thereof are a plurality of cylinders 7. The cylinders 7, and other working parts of the engine may be water cooled or otherwise formed to take care of excess heat and in the present instance, the cylinders 7 are provided with heat dissipating fins 8.

Reciprocally mounted in each cylinder 7 is

a piston 9 operatively connected to the crank shaft 6 by means of the usual connecting rod 10. The construction so far may be considered as conventional and further description thereof is deemed unnecessary.

5 In accordance with my invention, I provide each cylinder 7 at a point slightly in advance of the lowermost stroke of the piston 9, with an air intake port 11, and a diametrically opposite burnt charge exhaust port 12. As
10 clearly shown in Figure 3 of the drawings the piston 9 controls these ports and when the piston is at the lower end of its stroke these ports are open. By this construction I eliminate the necessity of providing control valves
15 and their associate operating mechanism. The head of the piston 9 is provided with a deflector or baffle plate 13, which may be formed integral therewith, as shown. This
20 baffle plate or deflector 13 is located adjacent to the cylinder walls provided with the air inlet port 11, and is preferably of a greater height or width than the diameter of said port.

25 The cylinder head of each cylinder 7 is provided on one side thereof with a fuel injecting nozzle 14, and on the opposite side with an electrically heated hot point or plug 15. In the present instance, I have shown the nozzle
30 and the plugs threaded into the cylinder heads, but other means can be provided for holding the same in proper position. I prefer to extend the fuel nozzle and the hot point or plugs inwardly at an angle toward
35 one another so that the injected fuel will be substantially in the path of the hot point or plugs.

In order to supply the fuel to the fuel nozzles 14, of the various cylinders 7, I employ
40 a rotary fuel oil feed pump 16, which is connected directly with and operated by the crank shaft 6. This pump 16 is of the conventional type generally employed in supplying fuel oil to engines of the Diesel form.
45 Therefore I have not described this pump in detail and have simply shown same diagrammatically for the sake of simplicity in the present showing, but it is to be understood that this pump is so timed by the crank shaft
50 to deliver the raw fuel at the appropriate time to the desired cylinders. It is to be noted that a plurality of feed pipes 17 extend from the pump and that these pipes lead to their respective fuel nozzles 14.

55 Particular stress is laid on the means of supplying air to the air intake ports 11, and I have provided a rotary blower or air pump 18 for delivering the air under pressure to the cylinders. As this pump 18 is of
60 conventional construction the same has only been shown diagrammatically, but I provide the drive shaft 19 thereof with sprocket wheel 20 around which is trained the sprocket chain
65 sprocket wheel 22 keyed or otherwise secured

to the engine crank shaft 6. Any other conventional means can be provided for operating the air pump 18 from the crank shaft 6, but I lay stress on the fact that this pump is driven directly from the crank shaft.

70 The air pump 18 can be supported in any desired way on the engine, but in the present instance I prefer to bolt or otherwise secure the same to a supporting bracket or shelf 24 rigidly connected to the crank case 5. This
75 bracket can be in the nature of a ledge and integrally connected with the crank case.

The outlet pipe 25 of the pump 18 is connected with an annular air manifold pipe or header 26, which is arranged concentric relative to the crank case and at one side of the
80 cylinders 7. This air manifold pipe or header 26 is provided at spaced points on its inner face with outlet openings 27 which are in alignment with the air inlet ports 11 of the
85 cylinders. I prefer to connect the air manifold pipe or header 26 with each cylinder 7 by means of a split collar 28 which receives the header. The split collars 28 have formed
90 thereon short sleeve sections 29 which are secured to the cylinders around the air inlet ports 11. Thus it is to be noted that the air has free access from the air manifold pipe or header into the cylinders.

95 From the description so far it can be seen that the fuel is injected in its raw state adjacent to the cylinder heads and that the air is introduced into the cylinders adjacent to the lower ends of the cylinders and that the supply of air delivered to the cylinders will
100 be in proportion to the engine speed in view of the connection of the air pump with the crank shaft. Further in view of the constant operation of the air pump an even pressure of air will be maintained in the air manifold
105 pipe or header 26 at all times.

It is well to note at this point that the hot points or plugs 15 are electrically heated, and that current therefore can be supplied there-
110 to from the ordinary 6 volt storage battery. After these plugs or points have been initially heated, the same will be maintained at the proper firing temperature by the firing of the charges and thus the current can be cut
115 off therefrom after the motor has been in operation a short time.

In operation of my improved two cycle engine, the fuel oil is admitted into the cylinder head at the appropriate time and when
120 the piston is in its lowered position the air under pressure will be admitted into the cylinder and will be deflected upwardly toward the combustion chamber by the deflector or baffle plate 13. On the up stroke of the piston the air will be compressed and when the
125 proper compression is reached the charge of raw fuel oil is injected and will be fired by the hot point or plug. It is to be noted that this charge will be under a relatively high state of compression when the piston has
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reached its extreme uppermost position thereby insuring the proper firing of the charge and the saving of fuel consumption. When the piston has again reached its lower-

most position the ports 11 and 12 will be opened, and the fresh air sweeping into the cylinder through its port 11 will again be deflected toward the cylinder head and will seek its outlet through the exhaust port 12.

This will effectively sweep the cylinder clean of all burnt gases, and the outrushing air through the port 12 will have a tendency to create a slight vacuum in the cylinder thereby further aiding in scavenging the cylinder.

At this time no fuel is supplied to the cylinder and thus there is no wastage of the fuel through the exhaust port 12 and immediately upon the upstroke of the piston the fuel oil is again admitted into the cylinder and the engine starts on its new cycle.

Due to the construction of these cylinders with the air inlet ports I am enabled to use fuel oil successfully and thus I have provided a radial engine of what I term a semi-Diesel type.

It is to be noted that I do not compress the charge in the crank case of the engine as is generally employed on two cycle engines and that I deliver the raw fuel and the air under pressure at spaced points in the cylinders by means of which I not only effectively scavenge the cylinder without waste of fuel but also aid in the compression of the fuel charge.

Changes in detail may be made without departing from the scope of this invention.

What I claim is:—

1. In a two cycle combustion engine, a crank case, a cylinder including a wall and a head, a fuel injector nozzle carried by the head, a heated hot point carried by the head adjacent the nozzle, a fuel pump connected with the nozzle, the cylinder having air inlet and burnt charge exhaust ports on opposite sides, an air pump communicating with the air inlet port, and a piston controlling said ports.

2. In a two cycle combustion engine, a crank case, a cylinder including a wall and a head, a fuel injector nozzle carried by the cylinder, a fuel pump connected with the nozzle, the cylinder having diametrically opposite air inlet and burnt charge exhaust ports, an air pump communicating with the air inlet port, and a piston controlling said ports, a crank shaft, and means for synchronously operating the fuel pump and the air pump from the crank shaft, as and for the purpose specified.

3. In a two cycle combustion engine, a crank case, a plurality of cylinders radiating from the crank case, a fuel injector nozzle carried by each cylinder, a crank shaft, a fuel pump operated by said crank shaft for supplying fuel in proper timed relation to the fuel nozzles, the cylinders having formed

in the walls thereof opposed air inlet and burnt charge exhaust ports, an annular air manifold secured to the cylinders and having communication with the air inlet ports, an air pump operated from the crank shaft for continuously supplying air under pressure to the manifold, and pistons in the cylinders for controlling said ports.

4. In a two cycle engine, a cylinder having oppositely disposed air inlet and burnt charge exhaust ports, a crank shaft, a piston operatively connected to the crank shaft and controlling said ports, a fuel injector nozzle carried by the head of the cylinder, a pump for supplying fuel oil to the nozzle, a pump for supplying air to the air intake port, and means for synchronously operating the fuel oil pump and the air pump from the crank shaft, as and for the purpose specified.

5. In a two cycle engine, a cylinder having diametrically disposed air inlet and burnt charge exhaust ports, a crank shaft, a piston operatively connected to the crank shaft and controlling said ports, a fuel injector nozzle carried by the head of the cylinder, a pump for supplying fuel oil to the nozzle, a pump for supplying air to the air intake port, and means for synchronously operating the fuel oil pump and the air pump from the crank shaft and an electrically heated hot point carried by the head of the cylinder, the fuel nozzle and the hot point extending inwardly at an angle toward one another and terminating in the same plane.

In testimony whereof I affix my signature.
EDWARD BLANCHARD ROBEY.

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