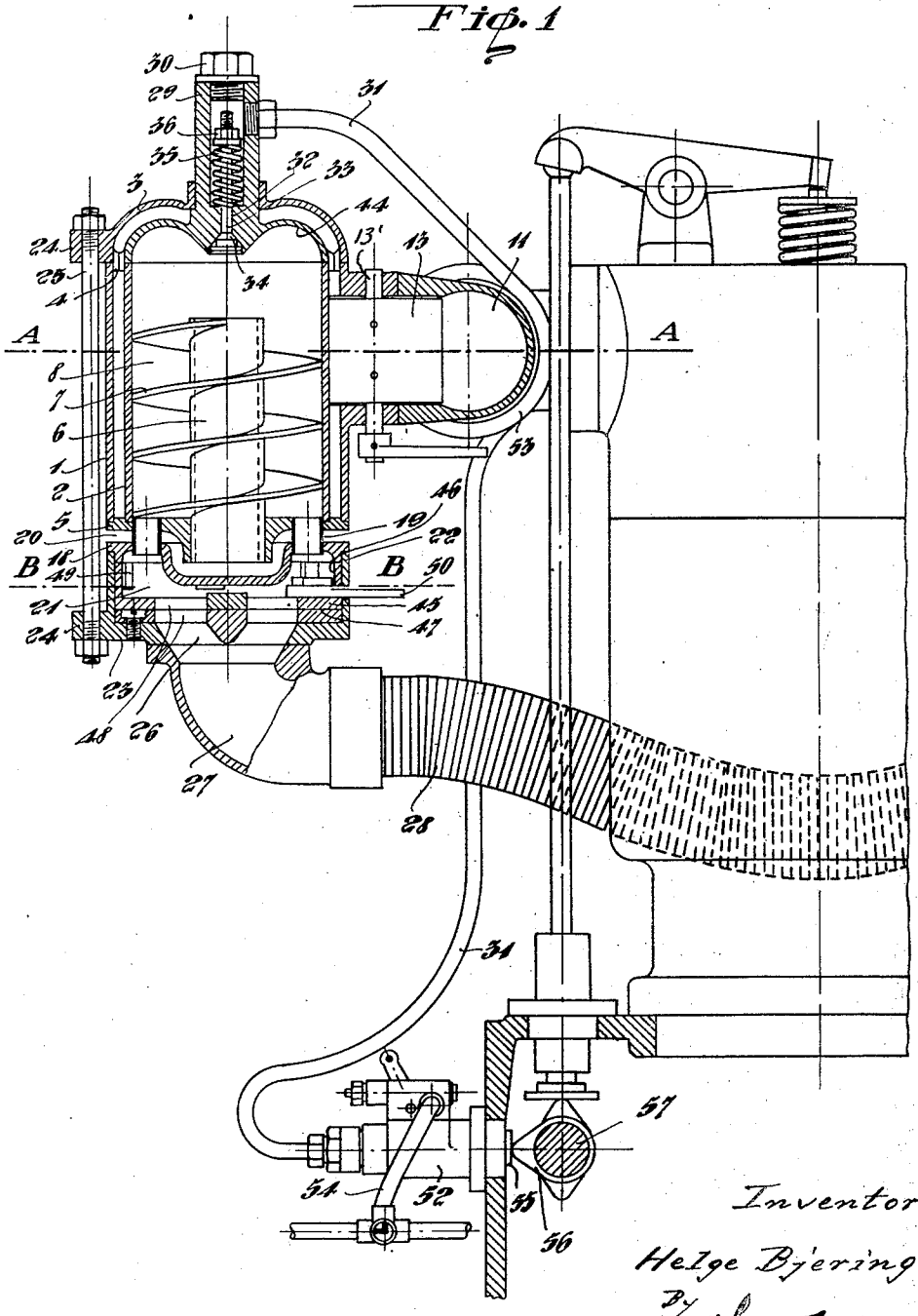
April 11, 1933. H. BJERING 1,903,433

CARBURETOR

Filed June 24, 1931 2 Sheets-Sheet 1

Fig. 1



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CARBURETOR

Filed June 24, 1931 2 Sheets-Sheet 2

Fig. 2

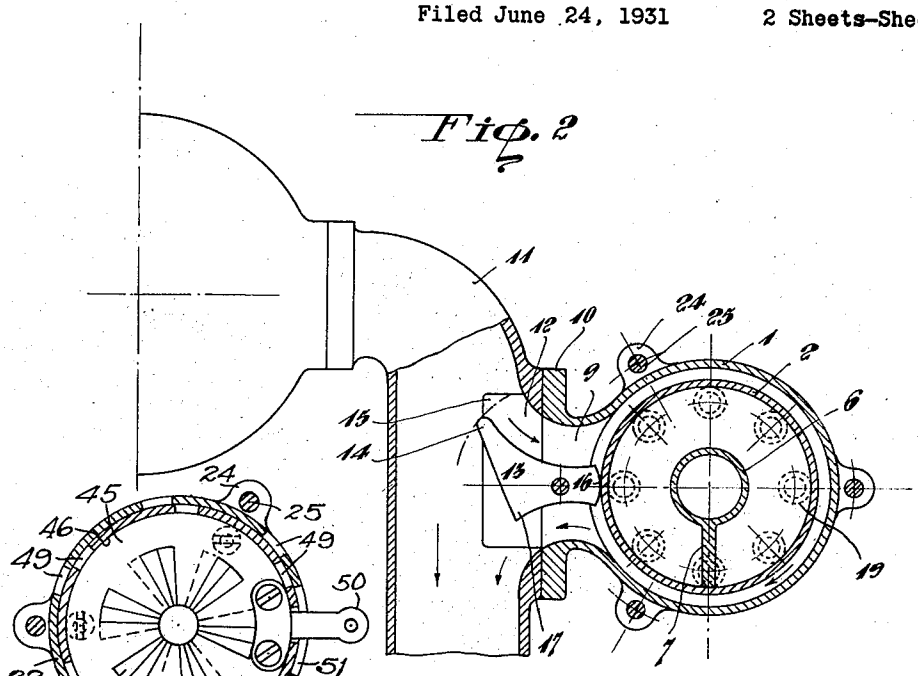


Fig. 6.

Fig. 3

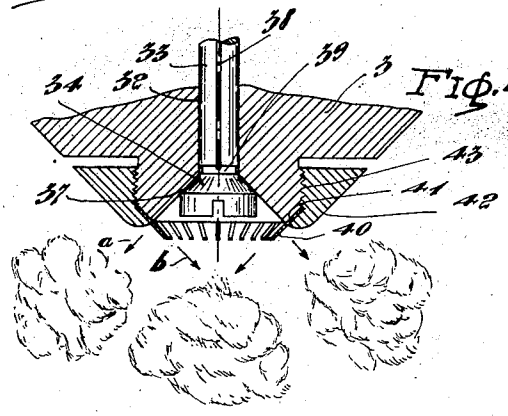


Fig. 4.

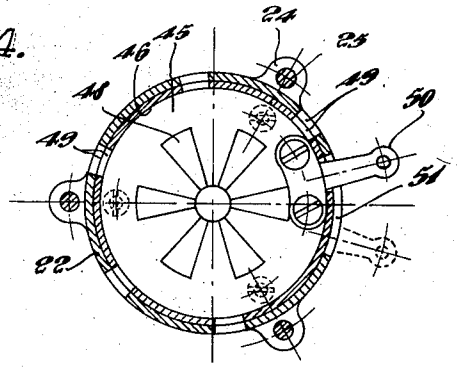
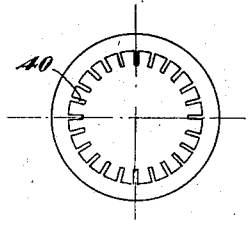


Fig. 5



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Patented Apr. 11, 1933 1,903,433

UNITED STATES PATENT OFFICE

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CARBURETOR

Application filed June 24, 1931. Serial No. 546,590.

This invention relates to a carburetor for heavy fuel, and has for its object to allow the feeding of internal combustion engines with heavy oils such as fuel oil, Diesel-oil, and those heavy oils whose density reaches up to 0.960.

The carburated gases produced by the carburetor according to the present invention can be utilized in internal combustion engines of well known type, being introduced by suction into the cylinder where they explode and expand in the same manner as the carburated gases produced in the common carburetors for naphtha.

The carburetor according to the present invention consists essentially in a fuel pulverizer and in a chamber or conduit in which the air and pulverized fuel penetrate and mix. This chamber is heated by the exhaust gases of the engine or other source of heat, which causes the vaporization of the fuel, the mixture of which with additional fresh air penetrates into the cylinder in an adequate state for its perfect combustion.

In order that the invention may be clearly comprehensible and easily carried out in practice, it has been represented, by way of example, in the accompanying illustrative drawings, in which:

Fig. 1 is a vertical cross sectional view of the carburetor applied to an internal combustion engine.

Fig. 2 is a horizontal cross sectional view on line A—A of Fig. 1.

Fig. 3 is a horizontal cross sectional view on line B—B of Fig. 1.

Fig. 4 is a vertical cross sectional view of a detail of the pulverizer.

Fig. 5 is a plan view of the crown of the pulverizer.

Fig. 6 is a view similar to Fig. 3 showing the regulator valve in a "hot mixture" position.

In all the aforementioned figures, the same reference characters indicate similar or corresponding parts.

The body of the carburetor is formed by two concentric cylinders 1 and 2, outer and inner respectively, between which is formed a space in which the exhaust gases which serve to heat the inner cylinder 2 circulate. A double bottomed cover 3, with openings 4, closes the upper part of these cylinders, and causes said double bottom to communicate with the space between the cylinders in such manner that the hot exhaust gases also circulate in said cover. The lower part of the cylinders is closed by a disc 5 which carries in its centre a tube 6 which penetrates in an axial manner in the inner cylinder to the proximity of the upper part of same. This tube is provided externally with an helix 7 which engages with the inner wall of said cylinder and forms a helicoid channel 8 which runs from the upper end of said tube 6 to the disc 5. The outer body 1 is provided with a lateral opening 9 near its upper part, which opening is surrounded by a flange 10 by which means the apparatus is fixed, with the aid of screws, on the exhaust tube 11 of the engine opposite an opening 12 of said tube. In the centre of the opening is mounted a deflector 13 of similar form to that of a butterfly valve, which revolves on a vertical shaft 13′, which allows it to be given various directions. Seen on a plan view said deflector presents three points: the point 14 which is projected in the exhaust tube and forms between said point and the tube a channel 15 which leads a part of the exhaust gases in the space between the cylinders, the point 16 that forms the separation between the entrance and exit of the gases in said space, and the point 17 which directs the gases that leave said space in the exhaust tube 11 in a direction parallel to that of the gases which travel through said tube. According to the position of the deflector it is possible to direct a greater or lesser amount of gases towards the space between the cylinders and in the double bottom of the cover and to even completely close the entrance of same, by which means it is possible to vary at will the temperature of the carburetor.

The disc 5 is fixed upon a disc 18 by means of short tubes 19 which, at the same time that they make a solidary body of said discs, maintaining between them a space 20, form a communication between the cylinder 2 and the fresh air mixing chamber 21 situated beneath

the disc 18. The space 20 communicates with the lower opening of tube 6 in such a manner that the air entering said space continues along this tube and reaches the upper part of cylinder 2. The disc 18 is mounted in turn upon the cylindrical flange 22 of the bottom disc 23 which forms with the former the aforementioned cold air mixing chamber. The bottom 23 and the cover 3 are provided with lugs 24 through which are passed bolts 25 serving to join in one sole body the cover 3, the cylinders 1 and 2, and the discs 5, 18 and 23. The latter possesses a central opening 26 that communicates with a bend 27 secured to said bottom, and to which is fixed the tube 28 that conducts the carburated mixture to the cylinder of the engine.

The upper cover 3 carries the fuel pulverizer, disposed in an axial manner. To this end the cover is provided with an upper tubular extension 29 closed by a plug 30, on one side of which is connected the fuel feed tube 31. By a central opening 32 of this cover the stem 33 of the pulverizing valve 34 passes to free adjustment, said stem leading into the tubular extension 29 and receives a compression spring 35 held by a nut 36 screwed on the end of the stem. The head 34 of the valve is conical and is seated beneath a conical seat 37 formed in the lower part of the cover 3. To allow the passage of the fuel from the chamber of the tubular extension 29 to the head of the valve 34, longitudinal grooves 38 are provided in the periphery of the stem 33 which terminates in an annular groove 39 formed in the root of the conical part 34. On the valve separating from its seat by effect of the pressure of the fuel, the latter encounters a passage in the conical space that exists between the valve and its seat and is projected in a divergent conical form. At the lower border of the conical opening of the seat, or in other words the major base of the cone, a conical crown is provided in the form of a comb 40 formed by a sheet of steel carrying teeth at its inner periphery, as can be seen in Figure 5. This crown is arranged with its conical surface perpendicular to that of the seat in such a manner that its teeth form an obstacle that directs towards the centre a part of the fuel projected by the valve, while the grooves between the teeth allow another part of the fuel to follow its course towards the outside, in the manner indicated by the arrows in Figure 4. The solid outer part of this crown serves to fix same by pressure between a corresponding conical part 41 of the outer cover 3 to the valve seat and a nut 42 screwed at a filletted part 43 also formed in the cover in continuation of part 41. The outer surface of this nut is conical in order to form the continuation of the conical part of the lower face of the cover 3, which as a whole is circularly channelled as indicated at 44 in order that the pulverizer be placed on a projection in the upper part of the cylinder 2. This regulating valve device will be adjusted preferentially as shown in Fig. 6, so that the openings 48 will open before the cold air ports 49, in order to obtain as quickly as possible a maximum velocity through the helical conduit.

In the chamber 21 where cold air is added to the mixture, is arranged a regulator formed by a revolving disc 45 provided with a cylindrical flange 46 which adjusts freely in the interior of the flange 22 of disc 23. This disc rests upon a fixed disc 47 fixed by means of screws upon the disc 23. These movable and fixed discs 45 and 47 respectively, are provided with openings in the form of sectors 48 which may or not coincide, according to the position given to the movable disc 45, which allows the passage of the gaseous mixture admitted to the intake pipe 28 to be varied. Simultaneously with this regulation, the disc 45 allows the entrance of cold air to the chamber 21 to be regulated. To this end the fixed flange 22 and the flange 46 of the disc 45 are provided with windows 49 which may or not coincide, according to the position given to said disc 45, and give access to the outside air to chamber 21. This disc 45 has a limited oscillating movement governed by means of an arm 50 solidary with same, which may be worked in any convenient manner, and which passes through the opening 51 of flange 22.

The canalization of the fuel 31 which comes from the pump 52 travels various times round the exhaust tube, as indicated at 53 in order to heat somewhat the fuel before its pulverization. This pump is not described in detail because it does not form part of the invention. In order that it may be clearly understood, however, the suction tube of the pump is indicated at 54, the piston of same at 55, and at 56 the lever that works said piston and which is mounted on the usual cam shaft 57 of the engine.

The working of this carburetor is as follows: The suction of the engine creates a vacuum in the body 2 as in the case of the usual carburetor for gasolene. This vacuum provokes the entrance of air by the space 20 and the windows 49. The air that enters by 20 ascends by the tube 6 and encounters in the upper part of body 2 the particles of fuel finely divided by the atomizer. The rich mixture thus created travels at a high revolving speed along the helicoid conduit, where particles, not sufficiently atomized, are flung against the hot cylinder wall and vaporized. When this heated and rich mixture enters the mixing chamber 21 a maximum proportion of cold air is added. The principle of this arrangement is to cool off and densify the hot gases after their passage through the carburetor, and thereby admitting to the charge

a maximum percentage of oxygen for perfect combustion.

From the helicoid channel 8, the first mixture passes therefore to the chamber 21, through the tubes 19, in which chamber, as has been stated, the addition of fresh air takes place, the definite mixture passing through the openings 48 of the regulating device 45—47 towards the intake pipe 28 of the engine.

The object of the helicoid form of the channel 8 is to develop a centrifugal force in the mixture which travels through it, which tends to project against the wall of the body 2 the less pulverized or heavier particles of the fuel, which in this manner receive more heat and vaporize more easily. As will readily be understood, it would be possible to obtain the contact of said particles with the heating walls by means of another arrangement, for example, by means of a zig-zag path formed by partitions so that in the change of direction the projection of said particles against the heating walls is produced. A coil could also be employed for the circulation of the mixture, and around which the exhaust gases would circulate or vice-versa, or any other superficial heat changer.

The pulverization is produced, in the example illustrated, at each stroke of the pump, so that the pressure of the liquid in the chamber in part 29 pushes the valve 34, giving passage to said liquid by the conical space between said valve and its seat. The thin film of fuel thus projected in divergent conical form encounters in its passage the comb 40 which is placed perpendicularly to same. A part of the liquid passes between the teeth of the comb and forms an annular cloud in the direction of the arrows *a*; another part is deviated by said teeth towards the centre in the direction of the arrows *b* forming a central cloud. The collision of the liquid at high speed against this comb favours in high degree the nebulization which allows the obtaining of an intimate mixture with the air arriving in opposite direction by the tube 6. This pulverizer works with a high fuel pressure, round about 3,000 lbs., which is one of the necessary factors to obtain said nebulization.

The object of the synchronous pumping with the working of the motor is in order to obtain exactly the necessary dosis of fuel. But it is evident that it is possible to employ a continuous feed of the pulverizer, for example, utilizing the suction of the engine or a current of air forced through a fuel injector.

It is evident that it is possible to introduce certain modifications in the construction and in the details without departing from the scope of the invention, which is clearly disclosed in the following claims:

Having now particularly described and ascertained the nature of my said invention and in what manner the same is to be performed, I declare that what I claim is:

1. A carburetor for heavy oils comprising essentially a fuel pulverizer, a chamber connected to the intake tube of the engine and provided with an air entrance, in which chamber the fuel is pulverized and mixed with the air proceeding from said entrance, means for heating said chamber and consequently the mixture circulating therein, and an entrance for additional fresh air that adds the necessary air to the mixture leaving the chamber and entering the intake tube of the engine, said pulverizer being adapted to work at high pressure (approximately 3000 lbs.), and consisting in a conical headed valve which opens towards the mixing chamber by the pressure of the liquid, overcoming an opposing spring, so that the liquid enters the chamber by the space between the valve and its seat, thus forming a divergent conical jet, a crown being provided in the form of a conical comb placed in the passage of this jet in such a manner that a part of same is diverted towards the center of the chamber by the teeth of the comb, the origin of the pulverization being situated in a somewhat projecting position in the chamber with respect to that part of the bottom surrounding the pulverizer.

2. A carburetor for heavy oils comprising essentially a fuel pulverizer, a chamber connected to the intake tube of the engine and provided with an air entrance, in which chamber the fuel is pulverized and mixed with the air proceeding from said entrance, said chamber comprising a double walled cylinder, the exhaust gases of the engine circulating in said double walls, a cover closing the upper part of the cylinder, carrying in its center the pulverizer and having also a double wall for the circulation of the exhaust gases, a bottom closing the lower part of the cylinder, a tube mounted in this bottom which penetrates in an axial manner in the cylinder to a certain distance from the pulverizer, an helix between this tube and the wall of the cylinder, to form a helicoid channel, a chamber arranged beneath the bottom leaving a space between said chamber and said bottom by means of which the air enters said tube, said chamber communicating with the cylinder by means of tubes, the bottom of the chamber being connected with the admission tube, said chamber having air entrances and means for regulating the entrance of air through said air entrance and the exit of the definite mixture to the admission tube.

3. A carburetor for heavy oils comprising essentially a fuel pulverizer, a chamber connected to the intake tube of the engine and provided with an air entrance, in which

chamber the fuel is pulverized and mixed with the air proceeding from said entrance, said chamber comprising a double walled cylinder, the exhaust gases of the engine circulating in said double walls, a cover closing the upper part of the cylinder, carrying in its center the pulverizer and having also a double wall for the circulation of the exhaust gases, a bottom closing the lower part of the cylinder, a tube mounted in this bottom which penetrates in an axial manner in the cylinder to a certain distance from the pulverizer, an helix between this tube and the wall of the cylinder, to form a helicoid channel, a chamber arranged beneath the bottom leaving a space between said chamber and said bottom by means of which the air enters said tube, said chamber communicating with the cylinder by means of tubes, the bottom of the chamber being connected with the admission tube, said chamber being circular and provided with side openings for the admission of cold air and openings in its bottom for the exit of the mixture towards the intake pipe, and in said chamber is found, rotatably mounted, a concentric disc having a flange provided with side windows, the bottom of said disc having openings, and means for working same, all for the purpose of controlling the admission of the cold air and the passage of the mixture, a margin of movement of the disc being provided in which the windows for the cold air are closed and the openings for the passage of the hot mixture leave a certain pass therefor.

In testimony whereof I affix my signature.

HELGE BJERING.