April 14, 1931. O. LIEBHERR 1,801,096

VAPORIZER FOR INTERNAL COMBUSTION ENGINES

Filed Feb. 28, 1930

Fig. 1.

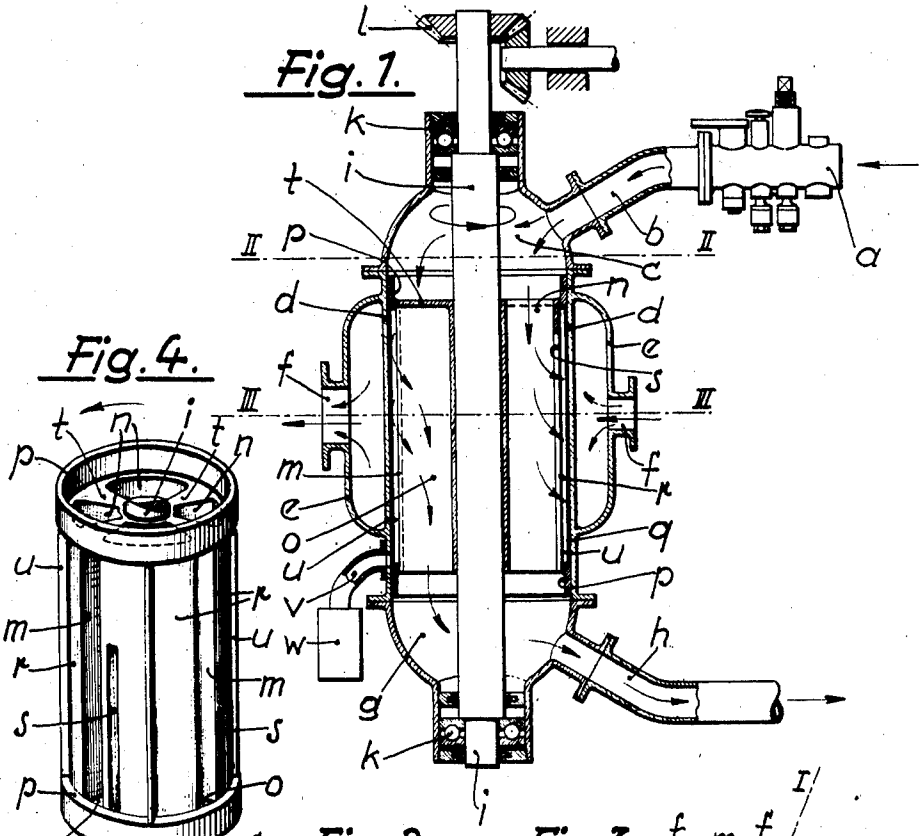


Fig. 4.

Fig. 2.

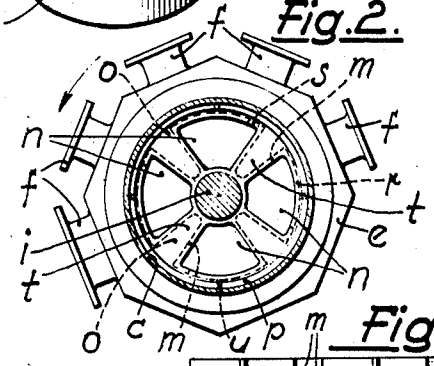


Fig. 3.

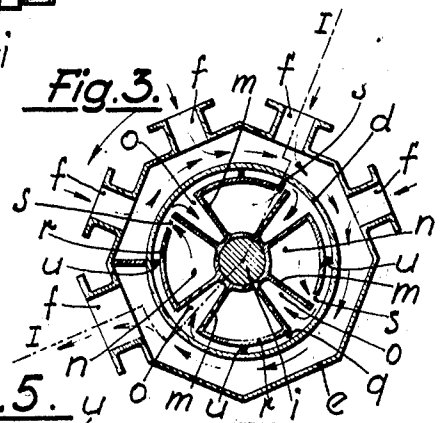
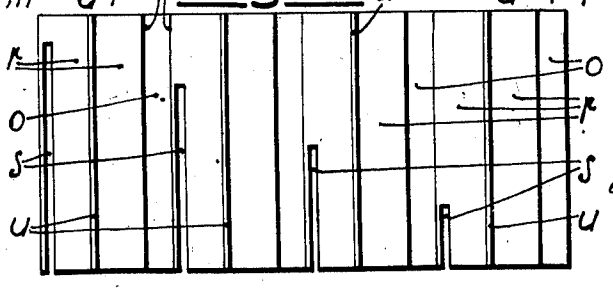


Fig. 5.



Inventor:
Otto Liebherr
By
Attorney.

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UNITED STATES PATENT OFFICE

OTTO LIEBHERR, OF WEINGARTEN, GERMANY

VAPORIZER FOR INTERNAL-COMBUSTION ENGINES

Application filed February 28, 1930, Serial No. 432,183, and in Germany February 27, 1929.

The present invention relates to a device for gasifying and vaporizing liquid particles of fuel in the explosive mixture of internal combustion engines.

When heavy oil is gasified in one of the common spray carburetors, a mixture is formed which contains a large proportion of liquid fuel particles that have not been gasified. It is known to remove these particles from the mixture by guiding it from the carburetor through a rotary centrifugal wheel arranged in the suction pipe. During their passage through the centrifugal drum the liquid fuel particles are thrown towards the outside by centrifugal force, and the liquid can then be returned to the carburetor. It is further known to catch the liquid fuel particles thrown towards the outside on a wall heated by the hot exhaust gases in order to vaporize them by heat. The gas obtained during this vaporization flows outside the centrifugal drum and passes into the cylinders together with the other gaseous constituents of the mixture.

The feature of the present invention is that in order to remove the gases developed on the heated wall by vaporization special conduits rotating with the centrifugal drum are provided to prevent the suction air from entraining liquid fuel particles, which happens when the mixture can flow outside the centrifugal wheel.

The invention further consists in forming the inlet channels with a wall closing them in radial direction towards the heated wall and leaving only a small longitudinal slot, through which the fuel only may pass by means of the centrifugal force, whereas the air is retained within the channels to flow from the open inlet and directly to the open outlet end of said inlet channels.

One preferred form of the invention is illustrated in the accompanying drawing, in which Figure 1 is a vertical section of the device according to the invention; Fig. 2, a cross-section on line II—II of Fig. 1; Fig. 3, a further cross-section on line III—III of Fig. 1; Fig. 4 a perspective view of the centrifugal drum and Fig. 5 a development of the circumference of the drum.

Referring to the drawings, the charge of fuel and air produced in a carburetor *a* which may be of any desired construction flows through a suction pipe *b* into an antechamber *c* owing to the suction effect of the working cylinders (not shown). Connected with the antechamber *c* is a heating tube *d* surrounded by a case *e* to which the exhaust pipes *f* are connected, in order to pass the hot exhaust gases through the space between the heating tube *d* and the casing *e* for the purpose of heating the tube *d*.

At the opposite end of the heating tube *d* a collecting chamber *g* is provided from which the mixture passes through the suction pipe *h* into the cylinders. Within the heating tube *d* a shaft *i* is positioned in journals *k*. The shaft *i* is rotated by a pulley or by a bevel-wheel *l* and carries a rotary drum comprising radially arranged walls *m* forming channels *n* and *o* respectively between them. The walls *m* are connected to guide-rings *p* at their ends. The internal diameter of the heating tube *d* is larger than that of the drum in order to form an annular space *q* between the surface of the drum and the inner surface of the heating tube *d*. The channels *n* are open at both ends, so that there is a direct passage from the antechamber *c* to the delivery-chamber *g*. The inlet-channels *n* however are closed in radial direction by the drum walls *r*, each of said walls *r* being provided with a longitudinal slot *s* arranged adjacent to that wall *m* of each channel which regarding the direction of the rotation of the drum forms the rear wall of each channel *n*. The channels *o* are closed towards the antechamber *c* by end walls *t*, whereas they are open towards the delivery-chamber *g* and also towards the annular space *q* serving for vaporization.

Radially arranged ledges *u* are secured to the drum-walls *r* and extend to the inner surface of the heating tube *d* in order to sweep off any carbon produced inside the heating-tube *d* during the vaporization of the fuel. The carbon-scrapings fall down within the space *q*, from where they are carried out through an outlet *v* into a vessel *w* or other container.

The apparatus works as follows:

The charge of fuel and air sucked out of the carburetor *a* enters the antechamber *c* and passes into the inlet-channels *n*, wherein it is caused to rotate with the speed of the centrifugal drum. The drum-walls *r* by closing the channels *n* in the radial direction prevent the air from being thrown outwardly against the heating tube *d* and force the air to pass directly to the delivery-chamber *g*. The heavy drop-like or misty constituents of the charge are separated by centrifugal force from the air and forced to pass through the slots *s*. The liquid fuel thus is thrown against the heating tube *d*. In order to prevent all fuel from being thrown on the same spot of the heating tube *d*, the slots *s* are of different increasing lengths so as to form steps as shown in Fig. 5. The slots *s* may also be of equal lengths but arranged so as to cover adjacent annular areas during rotation of the drum. The liquid fuel thus is spread out over the whole surface of the heating tube *d* to form a thin layer which is instantly vaporized on account of its fine distribution.

The gases produced by vaporization are not permitted, however, to stay for a long time near the heating tube *d* and to become superheated, but are constantly whirled about by the ledges *u*, which at the same time assist to distribute the fuel on the heating tube *d*. The gases escape through the delivery channels *o* into the delivery chamber *g* where they are mixed with the air and gaseous part of the charge which were previously sucked off through the inlet-channels *n*. The entire mixture then passes through the suction pipe *h* into the working cylinders of the motor.

I claim:—

1. A device for the separation and secondary vaporization of the liquid particles of fuel in a carbureter charge for internal combustion engines comprising a casing; a centrifugal drum; guide rings provided at the ends of the said drum inlet channels for the mixture and rotary drawing-off conduits for the vaporized fuel arranged in said drum; a heated wall surrounding the drum; a vaporizing space adjacent to the heated wall; a collecting chamber at the outlet end of the casing, the said inlet and outlet conduits opening into the said revaporizing space and the collecting chamber.

2. A device for the separation and secondary vaporization of the liquid particles of fuel in a carbureter charge for internal combustion engines comprising a centrifugal drum serving as passage for the mixture; a heating jacket; a wall heated thereby and surrounding said drum, said drum comprising rotary inlet conduits which open at both ends into chambers, said conduits serving to draw off the gases formed on the heated wall by the vaporization of the separated fuel, and said drum having a slotted cover on the side facing the heated wall.

3. In a device according to claim 2 a centrifugal drum surrounded by a heating jacket, inlet channels with a cover on their sides facing the heating tube and longitudinal slots within the channel-covers arranged adjacent to the radial wall of the channels which forms the rear wall during the rotation of the drum.

4. In a device according to claim 2 a centrifugal drum, inlet channels in said drum, a cover on each inlet channel and slots in said covers having different, increasing lengths so as to form a stage.

5. In a device according to claim 1 a centrifugal drum, inlet channels forming said drum and outlet channels arranged between said inlet channels and being closed at the inlet side of the drum, but open in radial direction and at the outlet end.

6. In a device according to claim 1 ledges secured to the outside of the drum and adapted to touch the heating jacket.

7. In a device according to claim 1 a centrifugal drum, a heating jacket, ledges serving as scraping means secured to the drum and adapted to touch the heating jacket, guide rings for the drum device, an annular revaporizing space closed on both sides by the said guide rings, and an outlet for coal-scrapings provided at the end of the re-vaporizing space betwen the drum and heating jacket.

In testimony whereof I affix my signature.

OTTO LIEBHERR.