

May 10, 1927.

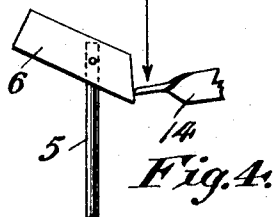
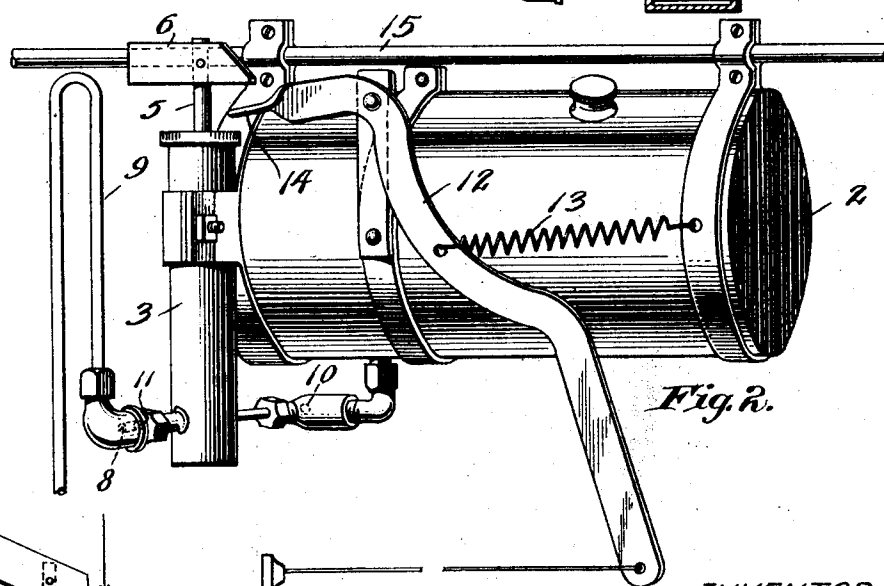
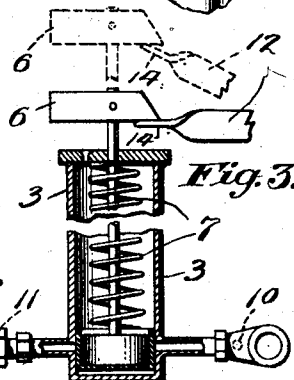
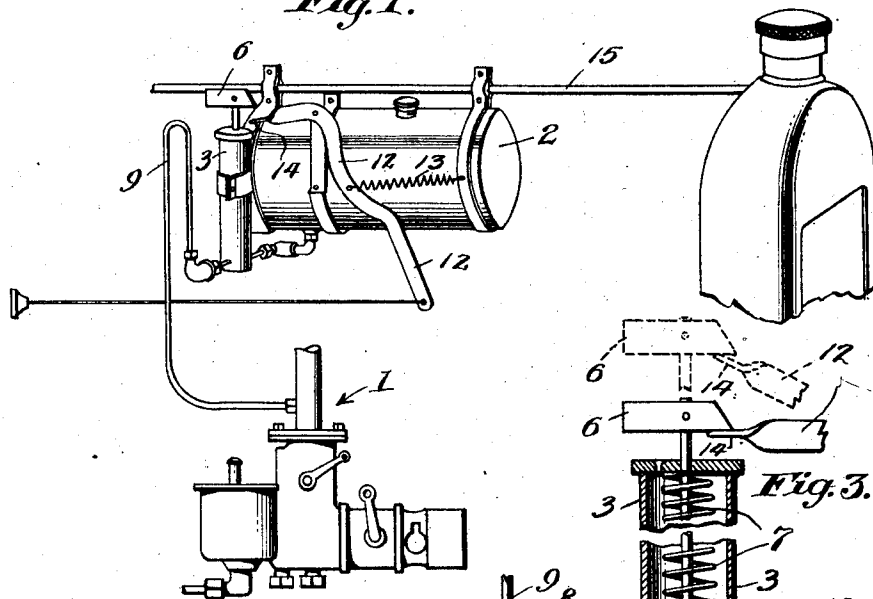
R. H. KNAPP

1,627,563

AUXILIARY FUEL DEVICE FOR INTERNAL COMBUSTION ENGINES

Filed March 18, 1925

Fig. 1.



INVENTOR.
Rudolph H. Knapp
By *George B. Waller*
Attorney.

UNITED STATES PATENT OFFICE.

RUDOLPH H. KNAPP, OF SAGINAW, MICHIGAN.

AUXILIARY-FUEL DEVICE FOR INTERNAL-COMBUSTION ENGINES.

Application filed March 18, 1925. Serial No. 16,405.

This invention relates to means for producing a small supply of combustible mixture as an auxiliary to the starting device of an internal combustion engine. In general, the objects of the invention are to supply an easily vaporized fluid to the engine when it is started, to more easily form initial combustible charges, the engine being afterwards operated by a less volatile fluid.

The device is separate and distinct from the elements constituting the engine and is not involved in the normal operation thereof.

More particularly my invention provides a means to start a cold engine promptly without unduly depleting the power of the usual electric starter and without liability of causing dilution of the lubricating oil in the crank case.

In the ordinary method of starting by the electric starter and choke, the following difficulties are experienced in very cold weather:

The operator first closes the carburetor choke. He then operates the electric starter. The engine acts as a pump to draw fuel from the carburetor, but ordinarily, especially if it is very cold, the piston speed produced by the starter is so slow that not sufficient air velocity is created through the carburetor to satisfactorily atomize the fuel. The result is that raw liquid fuel is drawn through the carburetor into the combustion chambers of the motor and a considerable quantity works past the piston rings into the crank case, causing dilution of the crank case lubricating oil.

Various means have been devised to prevent this dilution. It has even been suggested by automotive engineers that it may become necessary to design new types of motors to overcome this difficulty.

It is an object of my present invention to provide a simple and inexpensive device that will eliminate the liability of crank case dilution.

To this end I employ an auxiliary fuel supply, which may be the ordinary fuel used in the engine, or it may be a special high test fuel, or one mixed with one or more highly volatile or explosive ingredients.

From this auxiliary fuel supply the operator draws out, by appropriate means, a small approximately predetermined amount of the liquid, and thereupon instantaneously and automatically injects or shoots the measured supply into the usual intake channels that

conduct the mixture of vaporized fuel and air into the combustion chamber. The small charge is thorough atomized by the act of mechanically shooting it at high velocity into the intake. Both operations, that is, drawing the small charge from the auxiliary supply and shooting it into the intake are easily accomplished by one movement of the operator.

Crank case dilution is not liable to occur when my device is used because the operator, after closing the choke as usual, operates my charging device and thereby shoots only a small predetermined charge of thoroughly atomized fuel into the intake passages. He then operates the electric starter. Immediate explosion of the small measured charge of atomized fuel takes place in the cylinders and this initial explosion furnishes the powerful impulse that almost instantaneously gives the motor a speed sufficient to create high enough air velocity through the carburetor to split up and thorough vaporize the regular supply of fuel fed from the main tank.

Even in coldest weather, when the electric starter can only feebly turn the cold engine, this mechanical injection of a small, thoroughly atomized charge of highly explosive fuel, followed by ignition at the beginning of the next working stroke of the cylinder gives the required piston speed to start the engine immediately into normal operation.

The means for isolating the small charge and injecting it into the engine also includes devices for preventing leakage of fluid from the auxiliary supply when the engine is not operating.

With the foregoing and certain other objects in view which will appear later in the specifications, my invention comprises the devices described and claimed and the equivalent thereof.

In the drawings, Fig. 1 is a perspective view showing the device supported by the radiator stay rod of an automobile.

Fig. 2 is a side view to a larger scale.

Fig. 3 is a part sectional detail of a preferred form of device for isolating the small charge and for impelling it out through the atomizer nozzle.

Fig. 4 is a view showing the action of the trip and its operating lever on the return stroke.

Numeral 1 indicates the carburetor or any

other part of the usual channels or passages that conduct the explosive mixture to the engine intake.

2 is an auxiliary fuel supply chamber, which may be filled with readily combustible fluid.

A pull cord or other suitable means is provided, as shown, by means of which, with its associated parts, the operator may draw a small quantity of fluid from tank 2, and then by compression suddenly shoot it into the intake channel 1 in a thoroughly atomized condition.

In its preferred form the device for withdrawing the small quantity from tank 2 consists in a cylinder 3 having a plunger 4, Fig. 3, fitted with a plunger rod 5, to the upper end of which is pivoted a tripper 6. Between the plunger and the top of the cylinder is a compression spring 7. The plunger 4 is raised against the compression of spring 7 by lifting tripper 6 to the position shown in dotted lines, and thereby a small quantity of fluid is drawn from tank 2 into the bottom of cylinder 3.

When the tripper 6 is released, spring 7 drives the plunger 4 downward with force to suddenly expel the small quantity of fluid through a suitable atomizing nozzle 8 and pipe 9 into the intake channel 1.

To prevent back flow into tank 2 when the plunger 4 is driven downward, a check valve 10 is located in the pipe between the cylinder and tank 2. Likewise a check valve 11 is located in the delivery pipe from cylinder 3 to prevent the creation of back suction in pipe 9 when plunger 4 rises.

Any suitable devices may be employed for raising the plunger rod 5 and tripper 6, as for example, the pivoted lever 12 normally held inoperative by spring 13.

When the free end 14 of lever 12 rises, it lifts the tripper 6 until it slides off the edge of the tripper, as shown by the dotted lines in Fig. 3. After the plunger and tripper have descended, the lever end 14 is drawn downward by spring 13 and wipes past the beveled front end of tripper 6, as shown in Fig. 4.

It has been seen that when lever 12 is moved to the left, Fig. 2, by means of the pull cord, the plunger 4 is raised and draws in a small supply, and at the top of its travel the lever end 14 releases the plunger, which suddenly shoots the measured quantity out through the atomizing nozzle 8. The plunger 4 also tightly closes both the inlet and the outlet to cylinder 3, thereby preventing the suction of the engine, when in operation, from emptying auxiliary tank 2. This arrangement of plunger 4, together with check valves 10 and 11, practically insures that there can be no leakage through cylinder 3 under normal conditions, but as a further safeguard I extend the pipe 9 above the top of supply tank 2, as shown in Figs. 1 and 2, before connecting it with the intake channel 1. Hence when the engine is not operating there can be no gravity flow of fluid from auxiliary tank 2.

I have shown tank 2 suspended from a radiator tie-rod 15, this being the convenient location, but the tank may be mounted in any other suitable location if desired.

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

In combination, an internal combustion engine, an auxiliary fuel supply chamber located above said engine and adapted to contain a liquid other than the fuel normally supplied to the engine, a cylinder communicating with said auxiliary chamber and having a spring-pressed plunger, a tiltable tripper pivotally mounted on said plunger, a manually actuated lever adapted to raise said tripper by sliding engagement therewith and to slide off from and thereby suddenly release said tripper, a valve-controlled pipe connecting said auxiliary chamber and said cylinder, and a second valve-controlled pipe connecting said cylinder and the intake of said engine, a part of said second pipe formed with a loop extending higher than said chamber, for the purposes set forth. In testimony whereof, I affix my signature.

RUDOLPH H. KNAPP.