Feb. 12, 1924. 1,483,577

J. GOOD

ENGINE PREHEATER

Original Filed May 24, 1917 2 Sheets-Sheet 1

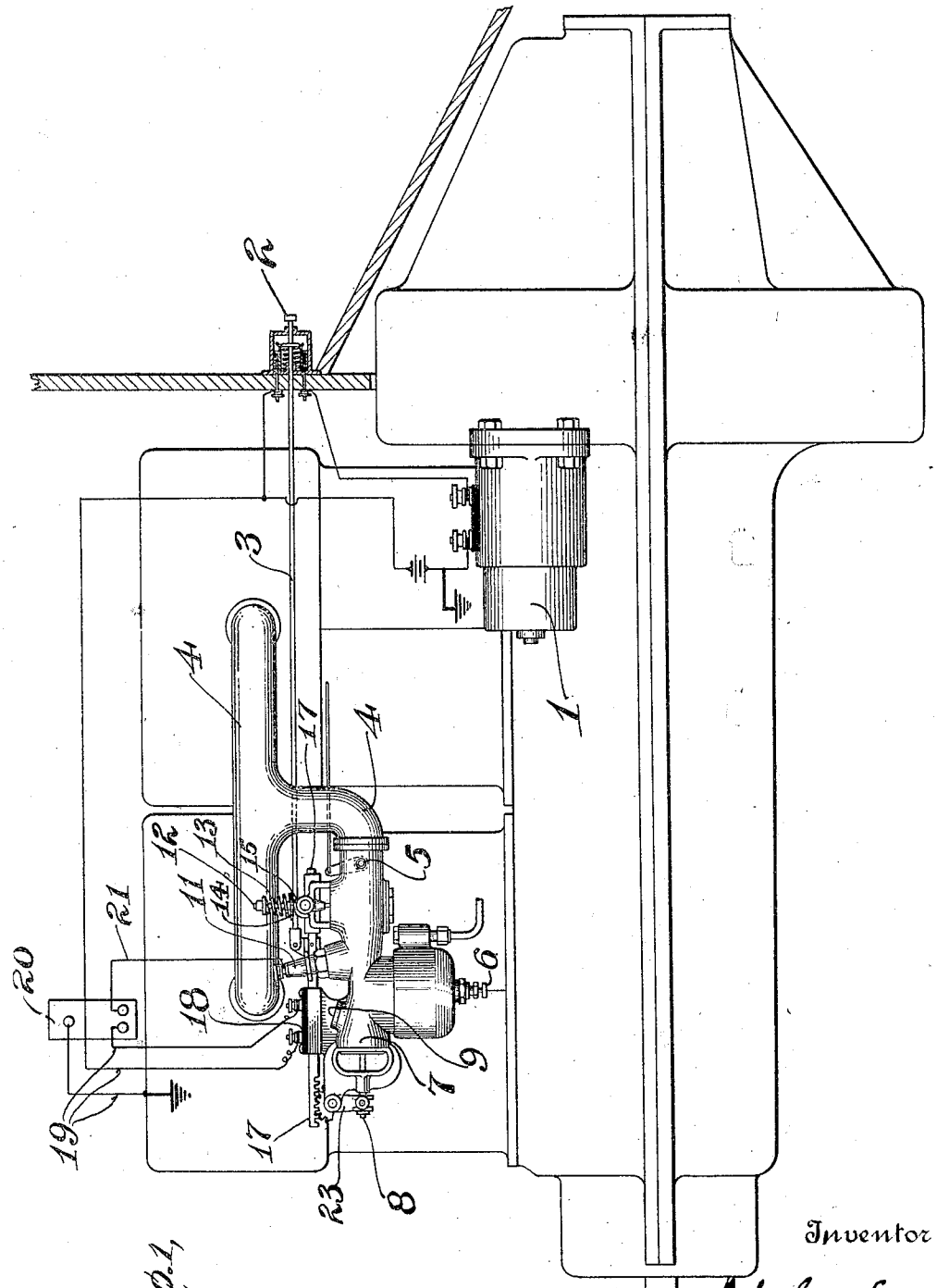


Fig. 1.

Inventor

By Attorney John Good

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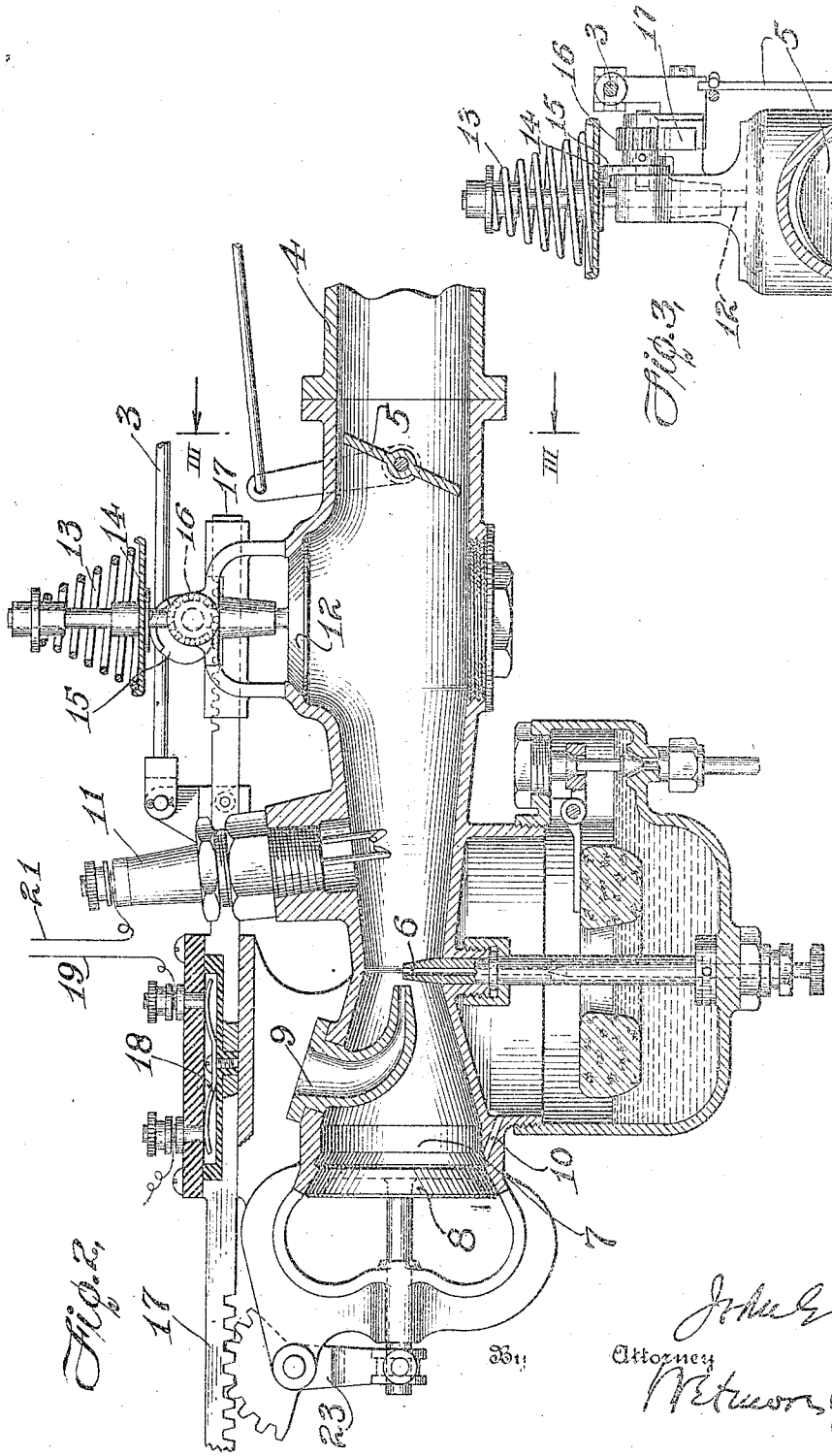


Fig. 2.

Fig. 3.

Inventor:
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By

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UNITED STATES PATENT OFFICE.

JOHN GOOD, OF GARDEN CITY, NEW YORK, ASSIGNOR TO GOOD INVENTIONS CO., OF BROOKLYN, NEW YORK, A CORPORATION OF NEW YORK.

ENGINE PREHEATER.

Application filed May 24, 1917, Serial No. 170,680. Renewed July 14, 1921. Serial No. 484,821.

To all whom it may concern:

Be it known that I, JOHN GOOD, United States citizen, residing in Garden City, Long Island, New York, have invented the following described Improvements in Engine Preheaters.

The invention as herein described in detail provides a simple means of preheating, by combustion, the vaporizer or internal passages of internal combustion engines, whereby the engine is quickly brought to condition for normal operation, and consists in a fuel and air mixing device adapted to serve alternately as a flame-producing device or burner delivering flame or hot combustion products to the engine intake passage and as a carburetor delivering thereto a correctly proportioned mixture of fuel and air for the working combustion in the engine, and being readily convertible from one condition to the other is suitable for the various purposes of burners in connection with the supply of fuel to combustion engines. The principle of the invention is illustrated in the accompanying drawings in a simple form and in such manner as to enable any person skilled in this art to embody the same principle in other forms which will naturally differ widely in design and appearance according to the character of the engine and the requirements of the fuel or the preference of the maker. In these drawings—

Fig. 1 is a side elevation of an automobile engine equipped with the said combined or convertible carburetor and burner illustrating also the control means thereof;

Fig. 2 is an enlarged longitudinal section of the carburetor structure; and

Fig. 3 is a cross-section on line III—III of Fig. 2.

As indicated in the drawings the engine is equipped with an engine-turning device in the form of a starting motor 1 of usual type operated by a storage battery under the control of a plunger or push button 2 mounted in some place convenient to the operator, as for instance on the dash of a motor vehicle. The push button actuates a rod 3 which extends to the carburetor structure and by its reciprocation converts it into a flame-producing burner, operated by the suction created by the engine when rotated by the starting motor. The convertible carburetor structure consists of a hollow body or casing connected to the suction intake 4 with the regular engine throttle 5 located at or near the junction, either in the intake passage or in the carburetor casing as desired. The casing is formed in part as a Venturi mixing tube, such as common in carburetors and the fuel spray nozzle 6 enters the casing so that its orifice is disposed at about the centre of the throat of such tube. In this position it is in the high velocity path of the air entering from the primary air inlet 7, which inlet is open when the structure functions as a carburetor. A valve 8, of any desired type, closes this primary inlet when the structure is to function as a burner. A constantly open, suction air jet nozzle 9 is arranged in the upper wall of the casing with its orifice in aspirating relation to the fuel orifice 6. This air jet becomes vigorously active only when the valve 8 is closed and operates to aspirate and discharge a finely atomized fuel spray from the orifice 6 through the casing and toward or into the intake passage. On such occasion the liquid fuel is lifted from the float chamber by the aspirating effect of the air jet, the liquid surface in the float chamber being equalized to the interior of the casing by the air passage or vent 10. When the structure functions as a carburetor the liquid is lifted by reason of the pressure reduction existing at the throat of the Venturi tube, the pressure on the liquid in the float chamber being substantially that of atmosphere when the valve 8 is open.

Immediately beyond the spray nozzles there is mounted an electric spark igniter 11 with hooked-shaped electrode terminals directly intercepting the spray and adapted to ignite it, and just beyond the ignited is arranged the auxiliary air inlet controlled by a check valve 12 loaded with a spring 13. One end of the spring thrusts against the collar at the upper end of the valve stem and the other against a sliding abutment collar 14 resting against a cam disc 15 by the rotation of which the spring pressure on the valve may be varied. The cam disc 15 rotated by its small pinion 16 journalled on the main casing or an extension thereof and engaged by the teeth of a rack bar 17 which rack bar is mounted to slide on the casing and is connected to the rod 3 above referred to for endwise reciprocation. The rack bar 17 also operates a circuit closer 18 of any suitable type for opening and

closing the primary circuit 19 of the spark coil 20. This circuit is from the same storage battery which operates the starting motor and the secondary circuit of the spark coil, marked 21, is connected to the electric igniter 11. The circuit closer 18 is closed and the igniter plug rendered active when the structure is converted into the condition of a burner—the position of the parts indicated in Fig. 2. The rack bar 17 still further operates the valve 8 of the primary air entrance 7 for which purpose the said valve is supported to slide in an extension bracket on the casing and moved by a segment lever 22 geared to the teeth 23 on the rack.

By pushing on the button 2 and thereby thrusting the rack bar 17 to the left of Fig. 2, the air valve 8 is closed, the igniter circuit is also closed, the spring 13 is put under extra tension and the starting motor 1 is energized and rotates the engine. The resulting suction acting on the air nozzle 9 establishes a fuel spray which is immediately ignited by the spark at the igniter, the mixture being over-rich at this point, and the air necessary for continued and complete combustion of the igniter spray enters into contact with it and around it through the auxiliary valve opening, opened by the suction effect. The tension of the spring 13 determines the proportions of fuel spray and combustion-supporting air so that there is produced in the carburetor structure a steady, intense and clean-burning flame which enters the engine intake and circulates through the engine passages, warming the interior and raising the temperature to such point as may be desired, the throttle 5, for this particular mode of operation being understood to be open or set so far from the carburetor-burner structure as not to extinguish the flame if partially closed. The action of this burner structure is substantially identical with the suction burner disclosed in my co-pending application, filed June 6, 1916, Serial No. 101,889, to which reference may be had for further explanation of the non-explosive character of combustion produced. When the combustion has been continued for a sufficient period pressure on the push button 2 is released or it is pulled outwardly, to open the valve 8 and restore the normal, weaker, spring tension on the valve 12 and break the igniter circuit but still retaining the motor circuit closed. The opening of valve 8 immediately destroys the spraying effect of the air nozzle 9 and stops the combustion. Mere cessation of the igniter circuit will not stop combustion which, when once started, is continuous for as long as the proper proportions of fuel and air are supplied. The burner, with its air passages thus modified is thereby re-converted into a carburetor and as such supplies the engine with normal fuel mixture, well heated by reason of its contact with the hot casing and engine passages and in the best condition to be ignited in the engine cylinders by the regular engine ignition (not shown) whereupon the engine will pick up its normal cycle.

The operator's control 2 may then be fully released or pulled outward to open the motor circuit. Fig. 1 illustrates the operator's control as a simple push button restored by a spring, but obviously the design of this part of the system may be greatly varied according to preference and convenience and according as to whether the same control is to perform other functions. It could, for example, be used as a so-called "choker" for the carburetor and it is adapted to control all kinds of starting motors such as ordinarily used on automobiles and boats. It should be so designed as to effect conversion and operation of the carburetor structure as a burner simultaneously or coincidently with the cranking of the engine and also to continue the cranking after the re-conversion back to carburetor condition. Operating a carburetor the air valve 12 supplies the so-called secondary air under its weaker spring pressure and for this purpose it may be designed and controlled according to any preferred method of carburation and various means of preserving uniformity of proportions in the fuel mixture, for high and low speeds, may be supplied. For convenience of description I have herein shown the carburetor as of simplest form and in what might be called a conventional type. It will be understood however, that it may have all of the usual appurtenances and adjustments common in carburetors and not necessary to be described. It will be also understood that while in the present case the intake passage of the engine is assumed to be the normal vaporizer for the fuel, various special forms of intake vaporizers may be substituted for it, exhaust-heated or water-jacketed as preferred. All such vaporizing instrumentalities will of course be adequately heated during the preliminary operation of the carburetor structure as a flame-producing burner.

My copending application Serial No. 314,061, filed July 29, 1919, describes my combined carburetor and burner structure arranged to include enough unconsumed cracked or vaporized fuel in its hot combustion products to ignite in a cold engine and run the latter until it becomes hot enough to operate directly on the unignited carburetted fuel.

Claims:

1. A means of starting combustion engines comprising a device connected to the intake and provided with air and fuel inlets normally functioning to automatically deliver

explosive fuel mixture thereto and with an electric igniter, a switch controlling the circuit of the igniter, and means for operating said device first to pass flame into said intake and then to deliver said fuel mixture through the same to the engine.

2. A carburetor structure for internal combustion engines comprising a fuel nozzle and air inlet normally producing a fuel mixture of explosive proportions for combustion in the engine cylinders and also comprising an electric igniter and means for modifying the fuel mixture encountering said igniter to convert the structure into a suction-operated flame-producing device.

3. A means for starting combustion engines comprising a device connected to the engine intake and provided with air and fuel inlets normally functioning to automatically deliver an explosive mixture to said intake, means for turning the engine and changing the air flow during such turning and an electric igniter in said device producing ignition and steady combustion therein to internally pre-heat said intake during the engine turning period.

4. In an internal combustion engine the combination with an engine turning mechanism, an operator's control therefor and a carburetor structure for the engine convertible by said control into a burner for preheating the engine.

5. The combination with an internal combustion engine of an engine-turning motor therefor, a carburetor therefor including an igniter and convertible into a flame-producing burner and an operator's control adapted for conjointly operating said motor and converting said carburetor into a burner and vice versa.

6. The combination with an internal combustion engine of a storage battery, an engine-turning motor to be operated thereby, a carburetor for the engine including an electric igniter adapted to ignite the fuel in said carburetor and an operator's control arranged to coincidently connect said battery to the motor and igniter.

7. In an internal combustion engine, an intake passage and a carburetor normally delivering an explosive mixture of liquid fuel and air to said passage and containing a fuel nozzle in aspirating relation to the air flow to said passage, means for rotating the engine and at the same time temporarily augmenting the velocity of said aspirating flow, an electric igniter in said carburetor and a circuit therefor automatically energized during said augmented flow, said parts being mutually organized and adapted to establish ignition and steady burning within said intake passage to preheat the same.

8. In an engine carburetor, an electric igniter, an operating circuit therefor and a member for controlling the same adapted by its operation to modify the carburetor mixture to permit ignition and continuous enclosed combustion of the fuel within the carburetor.

9. The combination with an electrically-started internal combustion engine having a carburetor arranged to function as an enclosed burner, of an operator's control having two positions, in one of which it coincidently rotates the engine and causes the carburetor to function as a burner and in the other of which it restores the carburetor function and rotates the engine.

10. The combination with a structure adapted for connection to an engine intake having admission means for fuel and air and containing an electric igniter arranged to produce ignition and combustion in said structure whereby flame is delivered to the engine intake and an air valve for said structure adapted to extinguish the combustion.

11. In internal combustion apparatus, a closed flame passage, a fuel nozzle therein and means for directing air alternately at different velocities and through different paths into admixture with the fuel from said nozzle, one of said paths providing a mixture region suitably rich in fuel to permit ignition and non-explosive combustion in the passage and an electric igniter occupying said region and the other path furnishing a combustion-extinguishing air flow.

12. In internal combustion apparatus, a closed flame passage, a fuel nozzle therein and means for directing air through different paths into admixture with the fuel from said nozzle, one of said paths providing a mixture region suitably rich in fuel to permit ignition and non-explosive combustion in the passage and the other of said paths being adapted when opened to extinguish the combustion, in combination with an electric igniter occupying the location of said rich mixture.

13. The combination of an internal combustion engine, a charge-forming device associated therewith for supplying a charge mixture of fuel and air thereto, said charge-forming device being arranged to provide on starting an over-rich mixture of fuel spray and air within itself, an igniter located in said over-rich mixture to ignite said spray, and means for extinguishing the flame at will and permitting the charge-forming device to supply unignited charge mixture to the engine.

14. The combination of an internal combustion engine, a charge-forming device associated therewith for supplying a charge mixture of fuel and air thereto, said charge-forming device being arranged to provide on starting an over-rich mixture of fuel spray and air within itself, an igniter located in said over-rich mixture to ignite

said spray, means directing combustion-supporting air to the ignited over rich mixture, and means for extinguishing the flame at will and permitting the charge-forming device to supply unignited charge mixture to the engine.

15. The combination of an internal combustion engine, a charge-forming device associated therewith for supplying an engine-running charge-mixture of fuel and air thereto, said charge-forming device having means for causing the mixture to have different degrees of richness at different points therein, an igniter located at a point in said charge-forming device where the mixture is relatively rich to ignite the same, and means for extinguishing the flame at will and permitting the charge-forming device to supply unignited charge mixture to the engine.

16. The combination with an internal combustion engine, a spray carburetor for supplying an engine-running charge-mixture thereto, an electric spark igniter in said carburetor directly intercepting the spray from the fuel orifice to ignite the same, and means for extinguishing the flame at will and permitting the carburetor to supply unignited charge mixture to the engine.

17. The combination of an internal combustion engine, a fuel intake therefor including vaporizing means for the fuel and a spray carburetor for supplying a charge-mixture of fuel and air, an igniter located in said intake between said vaporizing means and the fuel orifice of the carburetor to ignite fuel therefrom, a member to control the operation of the igniter, and means for extinguishing the flame at will and permitting the carburetor to supply unignited charge mixture to the engine for operation thereon.

18. The combination with an internal combustion engine, its fuel intake, and a spray type carburetor for supplying a mixture of fuel and air thereto, of an igniter for said spray, a member to control the operation of the igniter, a change-over member associated with the carburetor, and means for operating said member to convert said carburetor into a combustion device.

19. In an internal combustion engine, an intake passage having a carburetor, an igniter therein, a member to control the operation of the igniter, and means whereby said carburetor optionally delivers ignited or unignited fuel to the engine.

20. The combination of an internal combustion engine, a charge-forming device associated therewith for supplying a charge mixture of fuel and air thereto, an igniter for the fuel from said charge-forming device, and means for extinguishing the flame thereof at will and permitting the charge-forming device to supply unignited charge mixture to the engine, provisions being made for an over-rich mixture of fuel spray and air, at the igniter, when said means permits the ignition of the mixture from the charge-forming device whereby said igniter may ignite the mixture from said charge-forming device.

In testimony whereof, I have signed this specification.

JOHN GOOD.