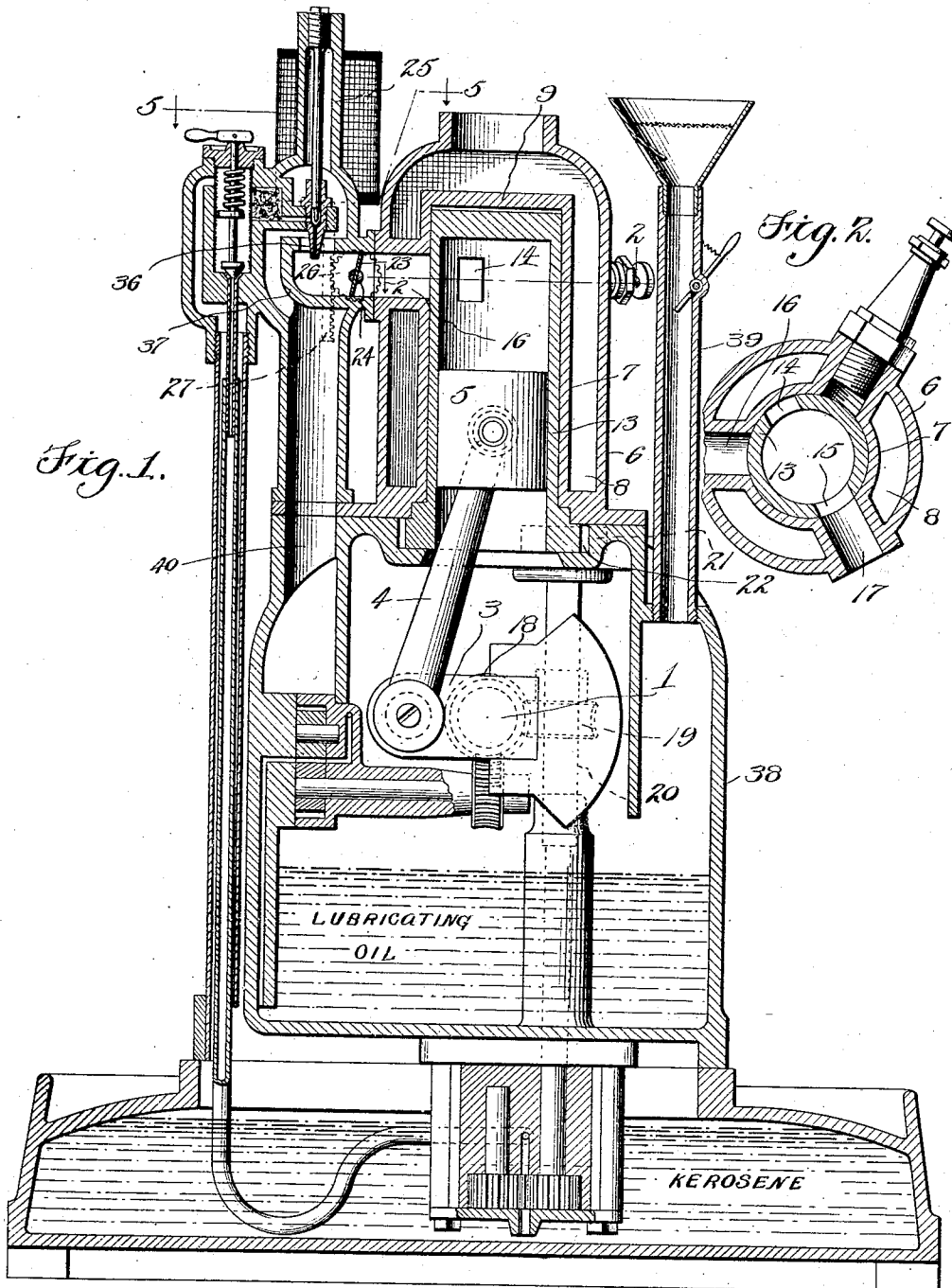


R. W. IDE.
INTERNAL COMBUSTION ENGINE.
APPLICATION FILED JUNE 21, 1917.

1,246,747.

Patented Nov. 13, 1917.

2 SHEETS—SHEET 1.



INVENTOR
Roy W. Ide
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Fig. 3.

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2 SHEETS—SHEET 2.

Fig. 4.

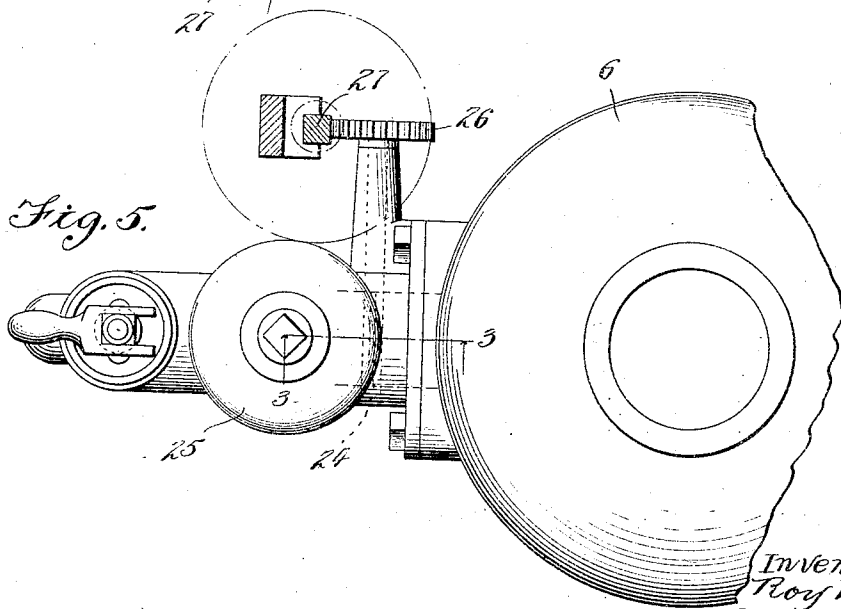
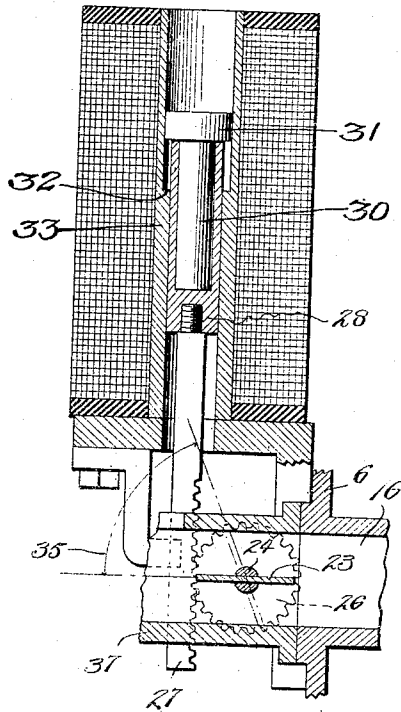
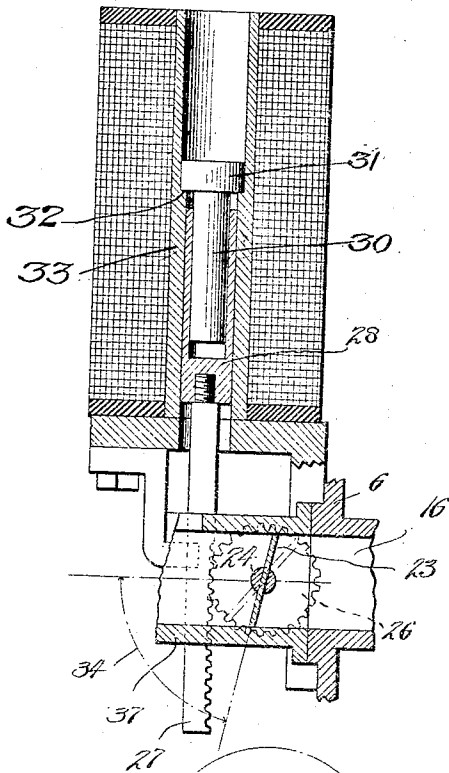


Fig. 5.

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UNITED STATES PATENT OFFICE.

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INTERNAL-COMBUSTION ENGINE.

1,246,747.

Specification of Letters Patent.

Patented Nov. 13, 1917.

Original application filed February 19 1917, Serial No. 149,572. Divided and this application filed June 21,
1917. Serial No. 175,988

To all whom it may concern:

Be it known that I, ROY W. IDE, citizen of the United States, residing at Springfield, in the county of Sangamon and State of Illinois, have invented a certain new and useful Improvement in Internal-Combustion Engines, of which the following is a full, clear, concise, and exact description.

My invention relates to internal combustion engines and has for its general object the provision of an improved operation of the butterfly or throttle valve that controls the admission of engine operating gas to the engine, this application being a division of my original application Serial No. 149,572, filed February 19, 1917. I employ mechanism whereby this valve has one range of operation while the engine is being started and is run below engine speed and another range of operation when the engine is operating above starting speed. This mechanism desirably includes an electro-magnet whose energizing source of current is regulated by the engine.

I will explain my invention more fully by reference to the accompanying drawings showing the preferred embodiment thereof and in which Figure 1 is a view in sectional elevation of an engine and a carbureter constructed in accordance with my invention; Fig. 2 is a view on line 2—2 of Fig. 1; Fig. 3 is a sectional elevation of the electro-magnetic throttle valve governing mechanism which I prefer to employ; Fig. 4 is a view similar to Fig. 3 with parts in a different relation; and Fig. 5 is a sectional plan view on line 5—5 of Fig. 1.

Like parts are indicated by similar characters of reference throughout the different figures.

The engine illustrated, but to the employment of which the invention is not to be limited, is inclusive of an engine shaft 1 that carries a fly wheel, not illustrated, and which shaft is provided with a crank structure 3 for turning it. This crank structure is connected with the inner end of a pitman 4 whose outer end is swingingly connected with a piston 5, all in accordance with well known practice.

The outer portion 6 of the engine casing is desirably made cylindrical and is co-axial with an inner cylinder 7, spacing 8 intervening between the inner cylinder 7 and the

outer cylinder 6 for the reception of engine cooling fluid that may be circulated through said spacing, as will be understood by those skilled in the art. The cylinder 7 has an end wall 9 to constitute such cylinder an explosion cylinder, there being a suitable spark plug (not shown) as will be understood. The working cylinder 13 of the engine receives the piston 5 and, as here shown, functions as a valving cylinder, to which end it is provided with ports 14 and 15 each adapted to serve, first, as an intake port and, second, as an exhaust port, the valving cylinder shown being arranged to operate in a counter-clockwise direction as it is viewed from above. Each of the ports 14 and 15 is in turn brought into alinement with the admission or intake port 16 and the exhaust port 17 and inasmuch as there are two ports 14 and 15 in the form of engine shown the valving cylinder is caused to turn a half revolution (during which one or the other of the ports 14 or 15 operates through a complete cycle that embraces the intake, compression, expansion and exhaust periods) during two revolutions of the engine shaft. The gearing by which the valving cylinder is thus driven at quarter engine speed includes the worm wheel 18 co-axial with and driven by the shaft 1, the worm 19 upon the vertical shaft 20, meshing with the worm wheel 18, the pinion 21 upon the upper end of the shaft 20 and the circular rack 22 carried upon the lower end of the cylinder 13 meshing with the pinion 21. The gas, produced by the carbureter of my invention, is governed in its passage through the admission port 16 by a butterfly valve 23. This butterfly valve is fixedly mounted upon a shaft 24 that extends through the carbureter casing wall 25. A pinion 26 is fixed upon the outer end of the shaft 24 and meshes with a vertically reciprocable rack 27 whose upper end is united with the core or armature 28 of a solenoid 28¹. The electromagnetic responsive device, the solenoid 28¹, is in circuit with the source of current that is regulated by the speed of the engine. This source of current, as illustrated, is in the form of a generator 29 which is driven by the engine, the solenoid responding to the voltage output of the generator. As the voltage decreases in response to the lowered engine speed the valve 23 opens to supply

additional gas to the engine to increase the engine speed and vice versa. When the engine is being cranked to start it the response of the solenoid to the voltage then generated should be quicker relatively to the response of the solenoid to changes in voltage that arise when the engine is in operation. To this end the core of the solenoid is provided with a load which is removed therefrom during cranking or starting speed and is added thereto when the speed is in excess of cranking or starting speed. This load is shown as being in the form of a plunger 30 that operates in the bore of the solenoid core and has a head 31 which rests upon a shoulder 32 in the bore of the solenoid spool 33 when the engine is operating at starting or cranking speed. When the engine is in excess of such speed the increased voltage is sufficient to energize the solenoid sufficiently to enable it to draw up its core 28 against the weight of the load 30, the load then being lifted from its seat 32 and moving in the space above the shoulder 32 according to the generated voltage. The effective weight of the solenoid core is thus increased to normal when the engine is operated at running speed but is reduced below normal when the engine is being started so that the operation of the valve 23 is more sensitive under the latter condition. The position of the rack 27 is thus governed by the voltage impressed upon the solenoid and therefore by the speed of the engine and as this rack moves it turns the pinion 26 to turn the throttle valve 23. The range or arc of travel of the throttle valve 23 during starting speed is indicated by the arc 34 in Fig. 3. A throttling or governing range is indicated by the arc 35 in Fig. 4, this arc succeeding the arc 34. When the speed (and consequent voltage) rises above normal or running speed the rack 27 is correspondingly lifted and the throttle valve 23 is turned in a clockwise direction from the full open position shown by full lines in Fig. 4 correspondingly to reduce the flow of gas into the engine and when such speed and voltage are reduced the rack 27 will be lowered correspondingly to turn the throttle valve in a counter-clockwise direction correspondingly to permit an increase in the flow of gas to the engine. It will be observed that the range through which the valve 23 operates for governing or regulating the running speed of the engine is not coincident with the range of operation of this valve when the engine is being brought to running speed with the advantage that there is increased vacuum for pulling upon the incoming gas during starting whereby a richer gas mixture is produced during starting than would otherwise be the case.

In the embodiment of the invention here shown, gasoline or other liquid fuel is

passed through the bore of the nozzle 36 into a receptacle (constituting a mixing chamber where the air is carbureted) 37 whose receiving space is merged with the intake port 16 and whose walls rise above the bottom of the receptacle for the purpose of trapping the liquid fuel in the composite space afforded by the receiving space of the receptacle and the port 16 during the starting operation of the engine, this fuel being vaporized and carbureted without materially descending into the receptacle as liquid during running speed. The air being carbureted is drawn into the crank case 38 through the pipe or breather 39 and is drawn upwardly through the intake air pipe 40 from which the air finds access to the receptacle 37 and the intake port 16. Other features herein shown are set forth more particularly in my aforesaid original application of which this is a division.

While I have herein shown and particularly described the preferred embodiment of my invention I do not wish to be limited to the precise details of construction shown as changes may readily be made without departing from the spirit of my invention, but having thus described my invention I claim as new and desire to secure by Letters Patent the following:—

1. An internal combustion engine including a cylinder having a port for the admission of engine operating gas to the engine; throttle valve mechanism in the path of gas being supplied to the engine; and mechanism governed by the engine and operating said valve mechanism in one range when the engine is turning below running speed and in another range when the engine is operating above starting speed.

2. An internal combustion engine including a cylinder having a port for the admission of engine operating gas to the engine; a rotatably mounted throttle valve in the path of gas being supplied to the engine; and mechanism governed by the engine for turning this valve in one arc when the engine is turning below running speed and in a succeeding arc when the engine is operating above starting speed.

3. An internal combustion engine including a cylinder having a port for the admission of engine operating gas to the engine; a rotatably mounted throttle valve in the path of gas being supplied to the engine; a pinion connected with the valve for enabling it to be turned; a rack in actuating relation to the pinion; and mechanism governed by the engine for moving the rack and operating to move the valve in one arc when the engine is turning below running speed and in a succeeding arc when the engine is operating above starting speed.

4. An internal combustion engine including a cylinder having a port for the admis-

- sion of engine operating gas to the engine; throttle valve mechanism in the path of gas being supplied to the engine; electro-magnetic mechanism for operating said valve mechanism in one range when the engine is turning below running speed and in another range when the engine is operating above starting speed; and a source of current for energizing said electro-magnetic mechanism and regulated by the engine to regulate the action of said electro-magnetic mechanism.
5. An internal combustion engine including a cylinder having a port for the admission of engine operating gas to the engine; a rotatably mounted throttle valve in the path of gas being supplied to the engine: electro-magnetic mechanism for turning this valve in one arc when the engine is turning below running speed and in a succeeding arc when the engine is operating above starting speed; and a source of current for energizing said electro-magnetic mechanism and regulated by the engine to regulate the action of said electro-magnetic mechanism.
6. An internal combustion engine including a cylinder having a port for the admission of engine operating gas to the engine; a rotatably mounted throttle valve in the path of gas being supplied to the engine; a pinion connected with the valve for enabling it to be turned; a rack in actuating relation to the pinion; electro-magnetic mechanism for moving the rack and operating to move the valve in one arc when the engine is turning below running speed and in a succeeding arc when the engine is operating above starting speed; and a source of current for energizing said electro-magnetic mechanism and regulated by the engine to regulate the action of said electro-magnetic mechanism.
- In witness whereof, I hereunto subscribe my name this first day of June A. D., 1917.
- ROY W. IDE.