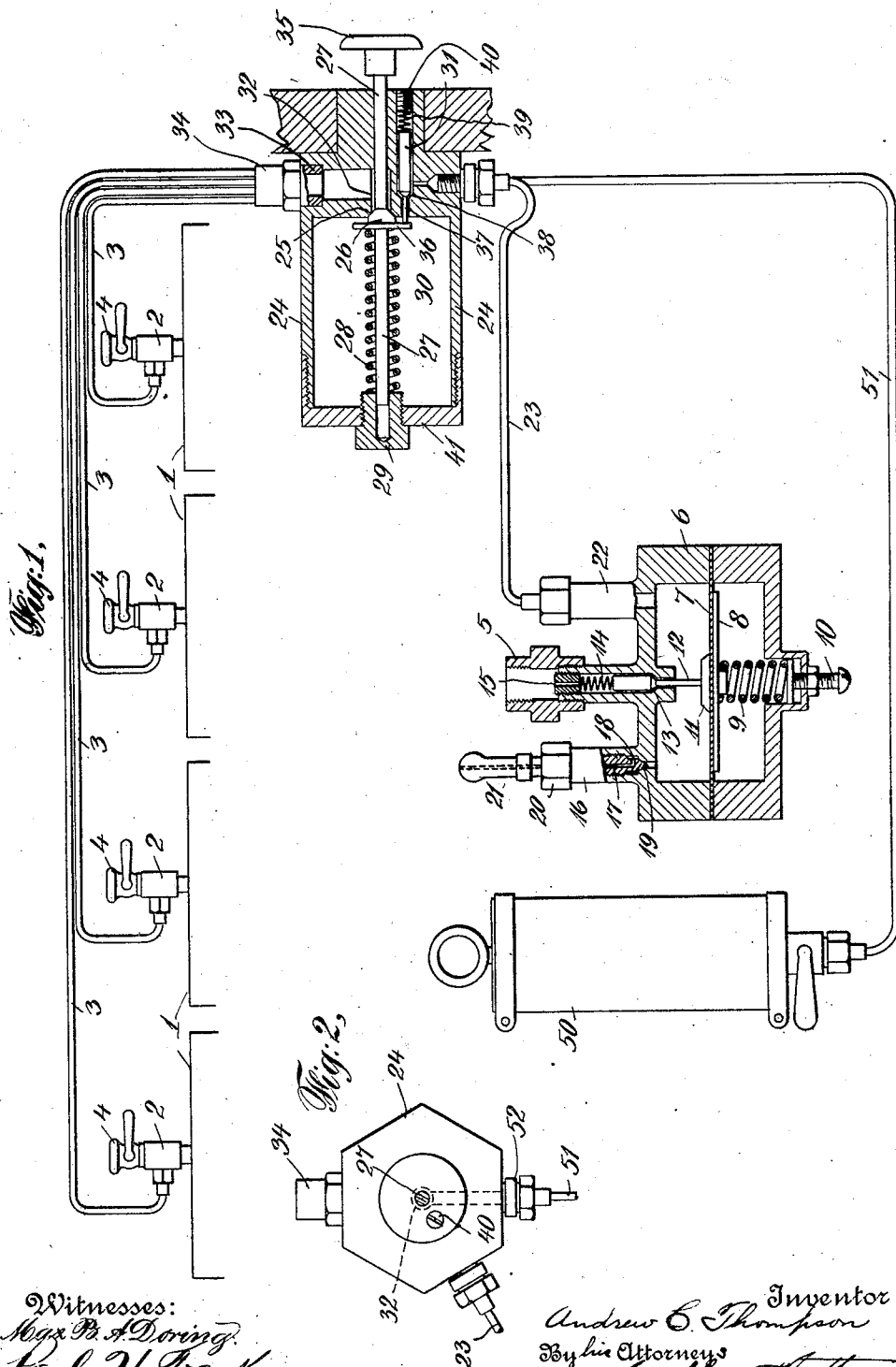


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 STARTING DEVICE FOR INTERNAL COMBUSTION ENGINES.
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UNITED STATES PATENT OFFICE.

ANDREW C. THOMPSON, OF PLAINFIELD, NEW JERSEY.

STARTING DEVICE FOR INTERNAL-COMBUSTION ENGINES

1,056,381.

Specification of Letters Patent.

Patented Mar. 18, 1913.

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To all whom it may concern:

Be it known that I, ANDREW C. THOMPSON, a citizen of the United States of America, and a resident of Plainfield, in the county of Union and State of New Jersey, have invented certain new and useful Improvements in Starting Devices for Internal-Combustion Engines, of which the following is a specification.

My invention relates to improvements in starting devices for internal combustion engines and is particularly applicable to the engines of motor vehicles, motor boats, aeroplanes, etc., though also applicable to stationary and other types of internal combustion engines.

The starting device herein described is of that type which is arranged, upon the actuation of a suitable valve, to admit to the engine cylinders a combustible gas drawn from a pressure tank or other suitable source of supply; such gas being preferably one which forms an explosive mixture with air through a wider range than does gasoline vapor, and which may be ignited in the engine cylinder at a lower pressure than can a mixture of air and gasoline vapor. Acetylene is such a gas, and is the gas which I prefer to use in my starter; tanks of such gas being a common article of commerce.

The objects of my invention are to provide a simple and compact device of the type described, which may be applied easily to existing motor vehicles as well as to new vehicles, and which is relatively inexpensive; to insure equal charges of the gas to all cylinders of the engine; to provide for ready regulation of the pressure at which the gas is supplied to the engine; to so arrange the valve of the device that the pressure of the gas in the storage tank shall tend to keep the valve closed, when the valve is not in use, said valve being arranged to cut off the supply from the storage tank when the valve is in use; and to so construct the device that it may be easily operated and may be operated correctly by persons of little mechanical skill.

I will now proceed to describe my invention with reference to the accompanying drawings and will then point out the novel features in claims.

In the drawings: Figure 1 shows more or less diagrammatically a longitudinal vertical section of the valve of my starting device, attached to the dash-board of a motor ve-

hicle, in connection with the piping to connect such valve to a pressure tank reducing valve, to the cylinders of the engine, and to an air pump, said reducing valve being shown in vertical cross-section. Fig. 2 is an end view of the starting valve.

In said drawings, 1, 1 designate the cylinders of an internal combustion engine; and 2, 2 designate connecting plugs whereby small pipes 3, 3 may be connected to the engine cylinders; each cylinder having one such pipe connected thereto. As shown, the plugs 2 also comprise valved vents 4, 4 whereby by means of such valves the compression of the engine may be relieved.

5 designates a pipe fitting adapted to connect to a gas storage tank, not shown, or other suitable source of supply, the pipe fitting 5 being also connected to a pressure reducing valve 6.

In the present instance, the reducing valve 6 comprises a flexible diaphragm 7 which divides the reducing valve, the diaphragm being supported on one side by a metal plate 8 held in position by means of a spring 9, the tension of which is regulated by means of the screw 10 secured to the casing of the reducing valve. The other side of the diaphragm 7 is provided with a metal button 11 which is adapted to engage one end of the spindle of a valve plug 12, having a seat 13 in the wall of the valve casing, the other end of the valve plug being adapted to engage a spring 14, held in position by a gland screw 15, so as to press the valve plug 12 toward its seat 13. From the above it will be seen that the spring 9 can be adjusted, by means of the screw 10, to exert a pressure of say twenty pounds per square inch upon the diaphragm 7 and when the pressure above the diaphragm is less than this amount the diaphragm will be forced upward so as to raise the valve plug 12 from its seat whereby gas from the pressure tank, having gas under pressure in excess of twenty pounds per square inch, connected to the fitting 5 will enter the reducing valve until the pressure is raised slightly above twenty pounds per square inch, at which time the tension on the spring 9 will be overcome sufficiently to press the diaphragm 7 downward thereby relieving the pressure upon the valve plug 12 permitting it to seat itself on the seat 13, thereby preventing any more gas entering the reducing valve until the pressure therein has

been reduced by withdrawing the gas from the same.

The reducing valve 6 is connected to a needle valve 16 having a screw threaded spindle 20 provided with a central passageway 17, the lower end of which terminates, at right angles to the spindle, into a recess 18 below which the end of the spindle is adapted to engage a valve seat 19. It will be seen that when the valve spindle 20 is raised by unscrewing the same, gas from the reducing valve 6 will be admitted to the recess 18 from which it will pass up through the passageway 17, the gas passing through the valve 16 being connected to the lights of the automobile by means of a tube 21. The reducing valve 6 is also provided with a fitting 22 connected to a tube 23 which leads to the starting valve 24. This starting valve comprises a casing having within it a valve seat 25 and a valve plug 26; such valve plug being mounted upon a spindle 27 and being normally pressed toward its seat by a spring 28. The spindle 27 is mounted to slide in a suitable bearing in the casing of the valve, and also in the plug 29 which fits into one end of the valve casing. Within said valve casing, and in rear of the valve plug 26, a charging chamber 30 is provided which is of sufficient size to contain enough gas at a suitable pressure to charge the engine cylinders; gas being admitted to the chamber 30, from the reducing valve 6 through a needle valve 31 connected to the tube 23. On the other side of the valve plug 26 in the rear of chamber 30 is a smaller outlet chamber 32 into one end of which is fitted a plug 33 held in place by a gland screw 34; and into this plug are brazed or soldered the ends of the pipes 3. A handle or pedal 35 is provided for moving the valve spindle 27 axially so as to open the valve. The valve spindle 27 is also provided with a collar or flange 36 which is adapted to come in contact with the spindle 37 of the valve 31 so as to raise the valve 31 off its seat 38, so as to admit gas to the chamber 30, when the valve plug 26 is in closed position; the collar 27 being arranged to disengage the spindle 37 to close the valve 31 when the valve plug 26 is raised off its seat to admit gas to the engine cylinders. The valve 31 is pressed against its seat, when not engaged by the flange 36, by means of a spring 39 held in place by a plug 40.

Most motor vehicle internal combustion engines, and many other internal combustion engines, are provided with ignition devices whereby a spark may be produced in one of the cylinders of the engine, when the engine is standing still, whereby the engine may sometimes be started upon a charge remaining in such cylinders from the previous operating of the engine. The starting de-

vice herein described is intended to be applied to such engines. In starting such an engine by means of my improved starting device the operator pushes the handle 35 so as to raise the valve plug 26 from its seat, thereby permitting gas contained in the chamber 30 to pass to the engine cylinders through the tubes 3, the handle 35 being pushed inward until the chamber 30 is exhausted, it being noted that as long as the handle 35 is pushed inward the valve 31 is closed, thereby preventing any gas, from the source of supply or the reducing valve, from entering the chamber 30 while the charge of gas in this chamber is being admitted to the engine cylinders. The operator then operates the ordinary ignition device of the engine to produce a spark in that cylinder which is in condition for an explosion; whereby the gas admitted through the pipe 3 of that cylinder and which has already mixed with air of that cylinder, is ignited and an impulse is given to the piston of that cylinder.

From the above it will be seen that a certain volume of gas at a certain pressure can be admitted to the engine cylinders at all times, it being only necessary to regulate the reducing valve 6 for a definite pressure and the chamber 30 for a definite volume of gas. It is to be noted that the starting valve 24 is provided with an adjustable cap 41 for varying the size of the chamber 30.

It sometimes happens that the explosive mixture, forced into the cylinders of the engine by the actuating of the handle 35, as before described, will not explode, for the reason that insufficient air is present in the cylinders of the engine to form an explosive mixture. When the explosion fails to take place to start the engine as just described, I have provided an air pump 50 or other suitable source of air supply connected to the valve 24 by means of a pipe 51 so that air can be forced into the cylinders of the engine through the pipes 3. In order to prevent the air or gas being forced back, a check valve 52 is provided to accomplish this purpose.

What I claim is:—

1. An internal combustion engine starting device, such as described, comprising a valve casing having a charging chamber, said chamber having an inlet valve and an outlet valve, said outlet valve provided with means for opening the inlet valve upon closure of said outlet valve and for permitting closing of the inlet valve upon opening of said outlet valve.

2. An internal combustion engine starting device such as described comprising a starting valve, a charging chamber in said starting valve, an inlet valve and an outlet valve connected to said charging chamber, and a spring tending to close said outlet

valve, said outlet valve provided with means for opening the inlet valve when said outlet valve closes.

3. An internal combustion engine starting device such as described, having within it a charging chamber and an outlet chamber and a spring-pressed lift valve controlling passage from said charging chamber to said outlet chamber, means for operating said valve and means for supplying gas to said charging chamber comprising an auto-

matic reducing valve controlling the pressure at which gas is supplied to said charging chamber.

In testimony whereof I have signed this specification in the presence of two subscribing witnesses.

ANDREW C. THOMPSON.

Witnesses:

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Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."