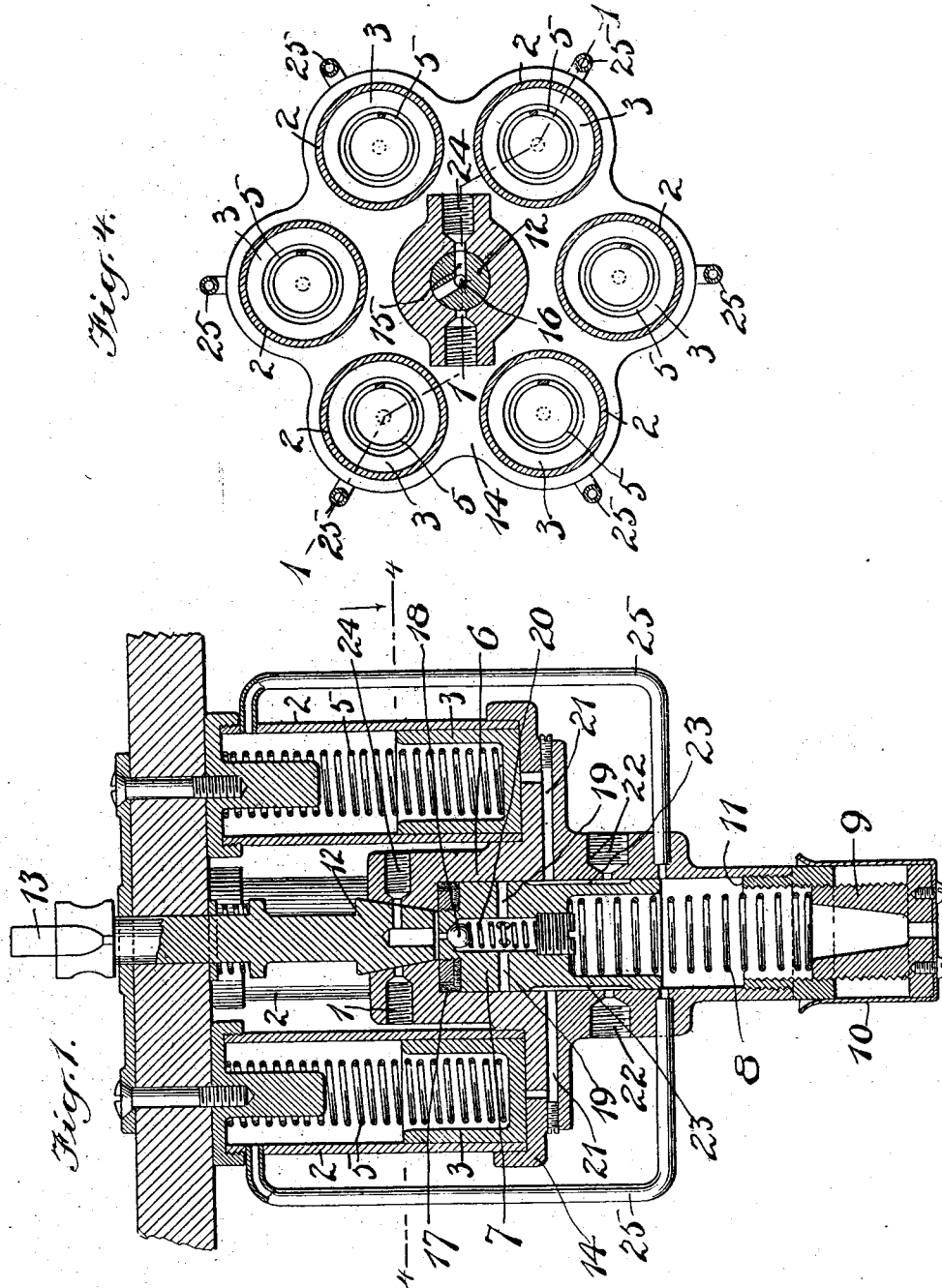


1,049,679.



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1,049,679.

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2 SHEETS—SHEET 2.

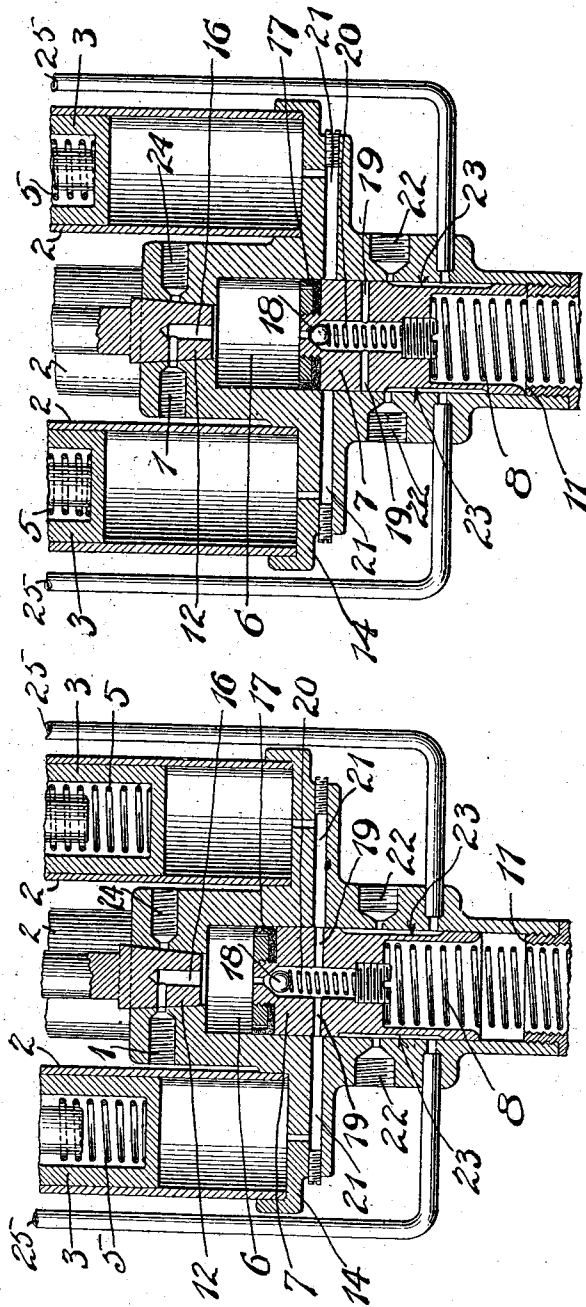


Fig. 3.

Fig. 2.

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UNITED STATES PATENT OFFICE.

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ENGINE-STARTER.

1,049,679.

Specification of Letters Patent.

Patented Jan. 7, 1913.

Application filed February 16, 1912. Serial No. 677,971.

To all whom it may concern:

Be it known that I, CHARLES H. CUNO, a citizen of the United States, residing at Meriden, New Haven county, State of Connecticut, have invented certain new and useful Improvements in Engine-Starters, of which the following is a full, clear, and exact description.

My invention relates to means for starting motors of the internal combustion variety, and relates to the employment with a multiple cylinder engine of a simple and effective means for charging the cylinders thereof while stationary with an explosive mixture, which mixture may be ignited for the purpose of starting the engine, thereby eliminating the necessity of the usual manual cranking thereof.

In the drawings, Figure 1 is a central sectional view of the complete apparatus, on the line 1—1 of Fig. 4. Fig. 2 is a similar view with parts broken away and showing certain parts in a different position. Fig. 3 is a view similar to Fig. 2, showing parts in still another position. Fig. 4 is a section of the apparatus on the plane of the line 4—4 Fig. 1.

I have shown my invention as applied to a six-cylinder engine, in which type of engine there is no so-called "dead center."

The invention relates particularly to the means for receiving from a suitable source of supply and measuring off certain predetermined amounts of gas which are transferred to the several cylinders of the engine whereby, when sparking occurs within one or more of the cylinders, a succession of initial impulses will be given essential to the starting of the motor.

1 is the main gas inlet connected with a suitable gas supply. The measuring and distributing device comprises a plurality of distributing cylinders 2—2, in this instance six, since in this instance I have shown the device adapted to a six-cylinder engine. The cylinders 2—2 each contain a piston 3, which is preferably spring-pressed, as by a spring 5, so as to move to one end of the cylinder. The cylinders 2—2 are preferably arranged in a circle for compactness.

6 is a receiving cylinder arranged in this instance between the cylinders 2—2 and carrying a piston valve 7, which valve is capable of moving to and fro in the cylinder 6;

but is held in any suitable way against rotation therein.

8 is a spring for normally holding the piston valve 7 at one end of the cylinder 6.

9 is an adjusting device for the spring 8, whereby its pressure against the piston 7 may be varied. This adjusting device may be made in any suitable way, as, for example, by a threaded plug, as shown, which screws into the end of the cylinder 6 and bears against the spring 8, so that by turning said plug, it may be moved in and out to vary the effective tension of said spring.

10 is a lock for the plug 9, the same being in the form of a U-shaped spring, the ends of which press into notches arranged around the end of the cylinder 6, so that when said springs are lifted out of said notches, the plug may be freely turned for adjustment. At other times, the plug is held against rotation.

11 is a stop shoulder in the cylinder 6 to limit the excursion of the piston valve 7 toward the plug 9. The plug has a central air passage or vent.

12 is a gas cock of any suitable form, in this instance rotatable by a manually controllable thumb-turn 13.

The various parts may be assembled on any suitable frame work 14, and may be provided with any suitable means for attachment to any convenient part of the vehicle with which the engine is associated, for example, the dashboard of an automobile or the bulkhead of a motor boat. The particular form of the main frame may be varied as exigencies require.

The feed inlet 1 leads into the frame 14 adjacent the gas cock 12. The gas cock has an angular transverse bore 15 and a longitudinal bore 16, which latter leads to the space within the cylinder 6 above the piston valve 7.

17 is a packing at the upper end of the piston valve 7.

18 is a downwardly opening check valve which controls a central bore extending partially through the piston valve 7 and communicates with lateral passages 19—19 which correspond to the number of cylinders employed.

20 is a spring for the check valve 18.

Projecting laterally from the cylinder 6 are passages 21—21 which lead to the sev-

eral cylinders 2—2 and enter the same at points below the pistons 3 therein.

22—22 are distributing outlets in the walls of the cylinders 6, which outlets lead to the several engine cylinders.

In the side wall of the piston valve 7 are longitudinal grooves 23—23, which are of sufficient length to connect the passages 19 with the outlets 22 when the piston stands in the position shown in Fig. 1, that is, in its uppermost position. In this position the ends of the passages 19—19 are closed by the side walls of the cylinder 6 above the lateral passages 21—21. These passages 19 are arranged, however, to register with the passages 21 when the piston valve 7 has been moved to the position shown in Fig. 2.

The operation of the parts thus far described is as follows: When the gas cock 12 is turned so as to open the gas inlet 1, gas under pressure will be forced into cylinder 6 and will force the piston valve 7 downwardly until the lateral passages 19 therein will register with the lateral passages 21 which communicate with the cylinders 2—2, at which instant the gas will be forced through said passages into said cylinders 2—2, in turn forcing the pistons 3—3 therein back against the tension of the springs 5—5 until said cylinders 2—2 are filled with gas at the desired pressure, which pressure is determined by the tension of the spring 8, which controls the piston valve 7. When the cylinders 2—2 are filled with gas at the desired pressure, any excess pressure above this will cause the piston valve 7 to be depressed still more, to the position shown in Fig. 3, thereby cutting off a further supply to the cylinders 2—2. The gas cock 12 may then be turned so as to shut off the inlet 1 and at the same time vent the space above the piston valve 7 through the outlet 24, so as to allow the piston to be forced back to its original position under the influence of the spring 8. This outlet vent 24 should preferably lead to the intake manifold, with which internal combustion engines are usually provided, so that said gas will not be wasted. In a broad sense, this is immaterial and unnecessary to the working of the parts previously described. When the piston valve 7 has fully ascended, it will stand in the position indicated in Fig. 1, in which position the interior of the cylinders 2 are in direct open communication with the several engine cylinders as before described, whereupon the gas contained in the several cylinders 2—2 will be forced by the pistons 3 and springs 5 through the various distributing outlets 22—22 to the respective engine cylinders to provide in each of said cylinders an initial charge of gas, which, of course, should be suitably proportioned to the air contained therein to provide the necessary explosive mixture. The engine is

now ready to start and will start upon causing the usual spark to occur within the engine cylinders. Obviously any suitable sparking apparatus may be employed and constitutes no essential part of this particular invention. When sparking occurs in the engine cylinders, they will be successively fired and the engine will be started. Danger of explosion in the foregoing apparatus is eliminated by reason of the fact that all gas has been discharged therefrom and the source of supply has been effectively cut off. As a further safeguarding means, however, it is preferable to provide a check valve (not shown) at the several pipe lines which lead to the several cylinders of the motor. The several distributing pipes which lead from the distributing outlets 22 will, of course, be connected with the several engine cylinders at a suitable point above the uppermost position of the pistons therein, the particular method and means for connecting said distributing pipes thereto being variable at will.

I have also shown, in the present drawings, a further detail of improvement which it may be desirable in certain forms of apparatus to employ, namely, means for guaranteeing the introduction into the several engine cylinders of at least some fresh uncontaminated air. This I provide as follows: Each of the cylinders 2 is provided with an air pipe 25 leading from its rear end into the cylinder 6 at a point below the piston valve 7 therein when the latter is in its uppermost position (see Fig. 1). As the piston in each of the cylinders 2 advances, it will be seen that fresh air will be drawn through the pipe 25 into each cylinder 2 so as to fill the same. When the piston valve 7 is advanced by the introduction of gas, the longitudinal grooves 23—23 in the piston valve 7 will connect the ends of the air pipes 25 with the distributing outlets 22 (see Figs. 2 and 3), so that while gas is entering one end of the cylinders 3 and forcing the pistons back therein, fresh air in the other ends of said cylinders will be forced through the pipes 25 and distributing outlets 22 into the several engine cylinders preparatory to receiving the charge of gas.

What I claim is:

1. In an engine starter of the character described, a gas receiving cylinder having a valved inlet, a gas distributing cylinder, a spring-pressed piston therein, a duct leading from the first mentioned cylinder to the second mentioned cylinder, a distributing outlet leading from the first mentioned cylinder, and a movable means in the first mentioned cylinder for putting the second mentioned cylinder in communication with said distributing outlet when said movable means is in one position and for putting said first mentioned cylinder in communication with

said second mentioned cylinder when said movable means is in another position.

2. In an engine starter of the character described, a gas receiving cylinder having a
5 valved inlet, a gas distributing cylinder, a spring-pressed piston therein, a duct leading from the first mentioned cylinder to the second mentioned cylinder, a distributing outlet leading from the first mentioned cylinder,
10 and a movable means in the first mentioned cylinder for putting the second mentioned cylinder in communication with said distributing outlet when said movable means is in one position and for putting said first
15 mentioned cylinder in communication with said second mentioned cylinder when said movable means is in another position, said movable means comprising a piston valve.

3. In an engine starter of the character described, a gas receiving cylinder having a
20 valved inlet, a gas distributing cylinder, a spring-pressed piston therein, a duct leading from the first mentioned cylinder to the second mentioned cylinder, a distributing outlet leading from the first mentioned cylinder,
25 a movable means in the first mentioned cylinder for putting the second mentioned cylinder in communication with said distributing outlet when said movable means is in one position and for putting said first mentioned
30 cylinder in communication with said second mentioned cylinder when said movable means is in another position, said movable means comprising a piston valve, and
35 a spring operating against said valve at one end to move it into position to put the second mentioned cylinder in communication with said distributing outlet.

4. In an engine starter of the character described, a gas receiving cylinder having a
40 valved inlet, a spring-pressed piston valve in said cylinder, a valved passage from one end of said piston to one side wall thereof, a distributing cylinder having a spring-
45 pressed piston therein, a duct leading from the first cylinder to the second cylinder and arranged to register with the passage in said piston valve when the latter stands in one position, a distributing outlet in the wall of
50 the first mentioned cylinder, and a passage in said valve arranged to connect said duct with said distributing outlet when said piston valve stands in another position.

5. In an engine starter of the character described, a gas receiving cylinder having a
55 valved inlet, a spring-pressed piston valve in said cylinder, a valved passage from one end of said piston to one side wall thereof, a distributing cylinder having a spring-
60 pressed piston therein, a duct leading from the first cylinder to the second cylinder and arranged to register with the passage in said piston valve when the latter stands in one position, a distributing outlet in the wall of
65 the first mentioned cylinder, a passage in

said valve arranged to connect said duct with said distributing outlet when said piston valve stands in another position, and an
70 air pipe leading from the open end of the first mentioned cylinder to the second mentioned cylinder and communicating with the latter at the end remote from the first mentioned cylinder, said air pipe being in communication with the distributing outlet when
75 said piston valve is in said second position.

6. In a gas engine starter of the character described, means for measuring a predetermined volume of gas and a predetermined
80 volume of air, and for discharging both of the same through a distributing outlet arranged to lead to the cylinder of a gas engine, said predetermined volume of air being discharged in advance of said predetermined volume of gas.

7. In a gas engine starter of the character described, means for measuring a predetermined
85 volume of gas and a predetermined volume of air, and for discharging both of the same through a distributing outlet arranged to lead to the cylinder of a gas engine, and an adjustable means for
90 varying said predetermined volume of gas.

8. In a gas engine starter of the character described, means for measuring a predetermined volume of gas including a receiving
95 cylinder and a distributing cylinder, means for putting the latter in communication with a distributing outlet arranged to lead to the cylinder of a gas engine, means for putting the first mentioned
100 cylinder in communication with a supply of gas under pressure, and means for cutting off said communication and for putting the interior of said first mentioned cylinder in communication with the regular gas supply
105 pipe of a gas engine.

9. In an engine starter of the character described, a gas receiving cylinder having a
110 valved inlet, a gas distributing cylinder, a piston therein, a duct leading from the first mentioned cylinder to the second mentioned cylinder, a distributing outlet leading from the first mentioned cylinder, and a movable means in the first mentioned cylinder for putting the second mentioned cylinder
115 in communication with said distributing outlet when said movable means is in one position, and for putting said first mentioned cylinder in communication with said second mentioned cylinder when said
120 movable means is in another position.

10. In an engine starter of the character described, a gas receiving cylinder having a
125 valved inlet, a gas distributing cylinder, a piston therein, a duct leading from the first mentioned cylinder to the second mentioned cylinder, a distributing outlet leading from the first mentioned cylinder, and a movable means in the first mentioned cylinder for
130 putting the second mentioned cylinder in

communication with said distributing outlet when said movable means is in one position, and for putting said first mentioned cylinder in communication with said second mentioned cylinder when said movable means is in another position, said movable means comprising a piston valve.

11. In an engine starter of the character described, a gas receiving cylinder having a valved inlet, a gas distributing cylinder, a piston therein, a duct leading from the first mentioned cylinder to the second mentioned cylinder, a distributing outlet leading from the first mentioned cylinder, a movable means in the first mentioned cylinder for putting the second mentioned cylinder in

communication with said distributing outlet when said movable means is in one position and for putting said first mentioned cylinder in communication with said second mentioned cylinder when said movable means is in another position, said movable means comprising a piston valve and means operating against said valve to move it into position to put the second mentioned cylinder in communication with said distributing outlet.

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