E. A. HALBLEIB.

ENGINE STARTING APPARATUS.

APPLICATION FILED DEC. 16, 1910.

1,005,541.

Patented Oct. 10, 1911.

2 SHEETS—SHEET 1.

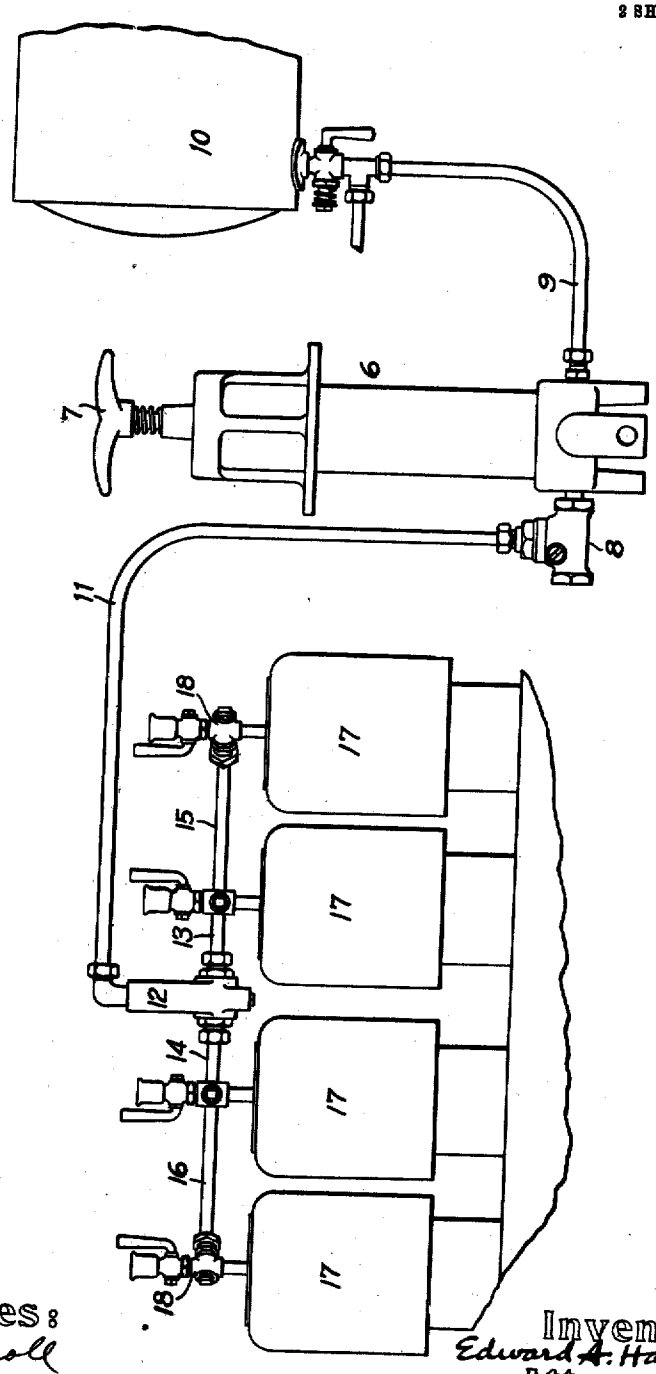

Fig. 1.

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2 SHEETS—SHEET 2.

Fig. 2.

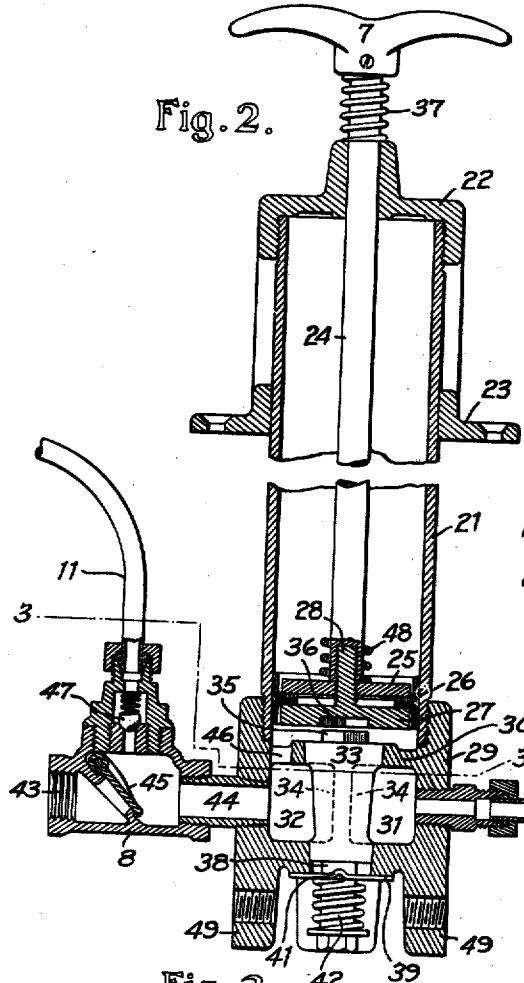


Fig. 3.

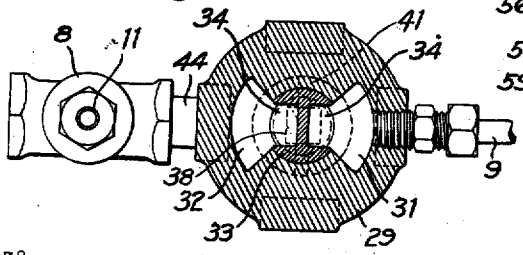


Fig. 5.

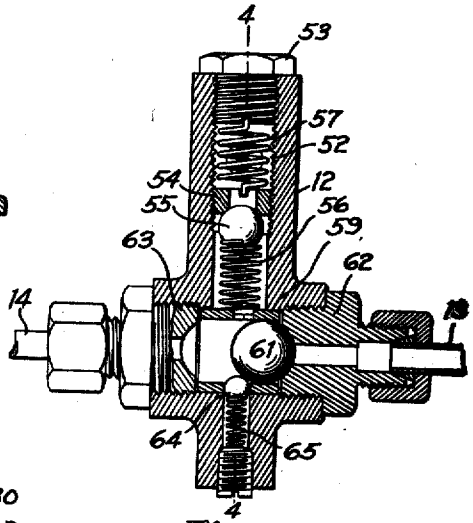
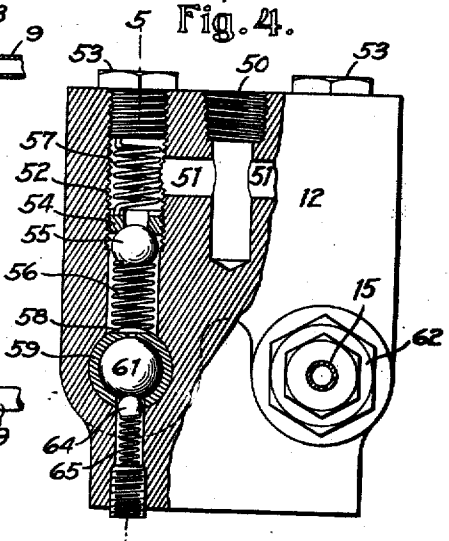


Fig. 4.



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UNITED STATES PATENT OFFICE.

EDWARD A. HALBLEIB, OF ROCHESTER, NEW YORK, ASSIGNOR TO NORTHEAST ELECTRIC COMPANY, OF ROCHESTER, NEW YORK, A CORPORATION.

ENGINE-STARTING APPARATUS.

1,005,541. Specification of Letters Patent. Patented Oct. 10, 1911.

Application filed December 16, 1910. Serial No. 597,732.

To all whom it may concern:

Be it known that I, EDWARD A. HALBLEIB, a citizen of the United States, and resident of Rochester, in the county of Monroe and State of New York, have invented certain new and useful Improvements in Engine-Starting Apparatus, of which the following is a specification.

This invention relates to apparatus by means of which an internal-combustion engine may be started without the usual cranking operation, and it is adapted particularly for use upon motor-vehicles, though applicable to engines used in other connections.

The invention relates particularly to devices, of the kind above referred to, of the type in which the engine is started by forcing a combustible mixture of air and vaporized gasolene, or other fuel, into one or more of the cylinders of the engine under pressure, and then igniting the mixture so introduced.

The object of the invention, broadly stated, is to produce apparatus of this kind which shall be simple in construction and operation, the combustible mixture being produced by a manually-operable device comprising an air-pump and a fuel-measuring device.

A feature of the invention resides in the arrangement of the air-pump and the fuel-measuring device, by which a single manually-operable member is employed to operate both of these parts by movements in different directions.

Another feature of the invention resides in certain improvements in the construction of the automatic distributing device by which the combustible mixture is directed to those cylinders of the engine in which the pistons and the valve mechanism are in proper position to produce the starting impulses, and in this respect the present invention is an improvement upon the invention disclosed in my pending application Serial No. 580,785, filed September 6, 1910.

In the drawings: Figure 1 is a side elevation of an apparatus embodying the present invention, as employed in connection with a four-cylinder engine; Fig. 2 is a vertical section of the air-pump and the fuel-measuring and vaporizing devices; Fig. 3 is a plan-view of the parts illustrated in Fig. 2, taken partly in section on the line 3—3 in the latter figure; Fig. 4 is a right-hand side-elevation of the distributer, shown partly in section on the line 4—4 in Fig. 5; and Fig. 5 is a vertical section on the line 5—5 in Fig. 4, looking from left to right in the latter figure.

The illustrated embodiment of the invention comprises, as shown in Fig. 1, an air-pump, indicated generally by the reference number 6, which is operated by means of a handle 7. At the base of the air-pump the air is admitted through a check-valve 8, while liquid fuel is admitted through a pipe 9 connected with a fuel-tank 10. The fuel and air are mixed in a chamber at the base of the pump, and are then forced under pressure, through a pipe 11, to the distributer 12. From the latter the mixture is conducted, by pipes 13, 14, 15 and 16, to the respective cylinders 17 of the engine. As shown in Fig. 1, the mixture is introduced through valve-bodies 18 which embody also the usual priming-valves.

The construction of the air-pump and the fuel-measuring device is illustrated particularly in Figs. 2 and 3. The pump has a cylinder 21 which is screwed into a cap 22. The cap has depending legs integral with a ring 23, by which the pump may be secured in place in an opening in the floor of a motor-vehicle, or wherever the device is to be used. Within the pump-cylinder is a plunger 24 which slides through the cap 22 and carries the handle 7 fixed at its upper end. The pump-piston comprises a disk 25 at the lower end of the plunger, and two oppositely-arranged cup-leathers 26. The cup-leathers are held against the piston by a disk 27 provided with a threaded stem 28 screwed into the lower end of the plunger.

The lower end of the pump-cylinder is closed by a casing 29 which is provided with a horizontal partition 30. Beneath this partition are two chambers 31 and 32 which are separated by a rotary valve-member 33 of generally-conical form. The chamber 31 is supplied with liquid fuel through the pipe 9, and the valve-member 33 is provided with two lateral recesses 34, either of which is adapted to communicate with the chambers 31 and 32. The valve-member is provided with a squared projection 35 at its upper end, which is adapted to coöperate with a squared recess 36 in the disk 27 at the lower end of the plunger. These latter parts are

normally kept out of engagement by means of a spring 37 coiled about the upper end of the plunger.

When the device is to be operated the handle 7 is first depressed, against the resistance of the spring 37, so as to engage the recess 36 and the projection 35, and a half-turn is then given to the handle, thereby imparting a half-rotation to the valve-member 33. By this movement the one of the recesses 34 which is, at the time, in communication with the fuel chamber 31, and is full of fuel, is brought into communication with the mixing chamber 32 and discharges its contents therein. To provide for arresting the measuring-valve at the end of the half-rotation, the valve has a downwardly-projecting squared stem 38 upon which is mounted a washer 39 having upward projections 41 adapted to engage corresponding recesses in the bottom of the casing 29. This washer is pressed upward into engagement with the casing by a spring 42. This spring serves also to maintain the valve-member firmly against its seat in the casing.

After the fuel has been measured as above described and delivered to the mixing-chamber 32, the handle 7 is raised to draw air into the mixing-chamber and the pump-cylinder. The air enters through an opening 43 in the casing of the check-valve 8 and passes into the mixing-chamber 32 through a nipple 44 connecting the check-valve with the casing 29. From the mixing-chamber the air passes through a passage 46 in the partition 30, and thus into the pump-cylinder. The handle 7 is then depressed, thus compressing the air and forcing it from the pump-cylinder through the mixing-chamber and the casing of the check-valve. By its passage through the mixing-chamber the fuel is vaporized and mixed with the air, and the air is prevented from escaping through the inlet 43 by means of a pivoted valve-member 45 in the check-valve casing. The mixture of air and vapor passes upwardly through a spring-pressed check-valve 47 of ordinary form, and thus into the pipe 11, through which it is transmitted to the distributer 12, as shown in Fig. 1. The strokes of the air-pump are separated until the necessary amount of air has been introduced into the engine-cylinders, and the engine may then be started by a suitable operation of the ignition-devices.

The casing 29 is provided with four downwardly-projecting lugs 49 having threaded openings which are adapted to receive the ends of brace-rods, or other fastening devices, when necessary to steady the pump upon the vehicle in connection with which it is used.

The arrangement of the air-pump and the fuel-measuring and mixing devices, as just described, produces a compact and simple construction in which a single manually-operable member is employed in the performance of all the functions of the device.

A valuable feature of the form and arrangement of the fuel-valve 33 resides in the fact that while this device, when rotated, permits the necessary amount of fuel to pass into the mixing-chamber, there is no position of the valve-member in which a free passage is afforded for the fuel, and consequently danger of escape of fuel, owing to careless operation of the device, is entirely eliminated.

The construction of the distributer 12 is shown particularly in Figs. 4 and 5. This device has a casing which is centrally drilled to provide an inlet 50, which is connected with the pipe 11 as shown in Fig. 1. From the inlet 50 two horizontal passages 51 lead to two similar vertical passages 52, each of which is closed, at the upper end, by a screw-plug 53. Within each passage 52 is screwed a valve-seat ring 54 coöperating with a check-valve in the form of a ball 55 pressed upwardly by a spring 56. Each valve-seat ring is notched to receive the lower end of a coiled spring 57, of which the upper end is seated in a notch in the corresponding plug 53, and this arrangement prevents the valve-seat ring from rotating out of adjusted position.

The combustible mixture, after passing through the passage 52, emerges at the lower end, through an opening 58, into a hardened steel sleeve 59 in which a hardened steel valve-ball 61 moves horizontally. This ball coöperates with seats at either end of the sleeve formed in plugs 62 and 63 screwed into the casing of the distributer. These plugs are perforated, and are connected with the pipes 13, 14, 15 and 16 by which the combustible mixture is communicated to the engine-cylinders.

The valve-ball 61 is maintained normally in engagement with one or the other of its seats by means of a detent in the form of a hardened steel ball 64 which is pressed upwardly, by means of a spring 65, into engagement with the valve-ball. When the latter moves from one end to the other of the sleeve 59 the detent-ball is momentarily depressed, but springs upwardly again into engagement with the rear of the valve-ball, as shown in Fig. 5, thereby preventing accidental movements of the latter.

The operation of the distributer just described is, in general, the same as that described in my copending application hereinbefore referred to. During the normal operation of the engine, at each compression stroke of the piston in one of the engine-cylinders, the pressure of the gases in the cylinder is communicated, through one of the pipes 13, 14, 15 or 16, to the correspond-

ing valve-ball 61, and the latter is thereby forced from one end to the other of its path of movement. Through this action an open passage is left into the distributing pipe in question, so that in whatever position the engine may come to rest when its operation is discontinued, the valve-balls 61 in the distributer are left in such position that when the starting apparatus is thrown into operation the combustible mixture may be forced into the cylinders in which the pistons are on the compression or the expansion strokes, and when these cylinders have been so charged with combustible mixture it is obvious that, by throwing the igniting devices into operation in these cylinders, one or more impulses may be produced sufficient to initiate the normal operation of the engine.

My invention is not limited to the details of construction and operation of the embodiment thereof hereinbefore described and illustrated in the accompanying drawings, but may be embodied in various forms within the nature of the invention as it is defined in the following claims.

I claim:

1. An engine-starting device having, in combination, a manually-operable member movable both longitudinally and rotatively, an air-pump operated by the longitudinal movement of said member, a fuel-controlling device operated by the rotative movement of said member, and a mixing-chamber into which the air-pump and the fuel-controlling device discharge.

2. An engine-starting device having, in combination, a manually-operable member movable both longitudinally and rotatively, an air-pump having a piston connected with said member and movable longitudinally thereby, a fuel-controlling device operable by the rotative movement of said member, and a mixing-chamber into which the air-pump and the fuel-controlling device discharge.

3. An engine-starting device having, in combination, an air-pump comprising a cylinder and a piston, a fuel-controlling valve comprising a rotary plug and a casing fixed to the pump-cylinder, and a manually-operable plunger connected with the piston and adapted to engage and turn the valve-plug.

4. An engine-starting device having, in combination, an air-pump comprising a cylinder and a piston, a rotary fuel-measuring valve, and a manually-operable plunger connected with said piston, the plunger and the valve having abutments adapted to cooperate when the plunger is in its inward position so that the valve may be turned by the plunger.

5. An engine-starting device having, in combination with an internal-combustion engine and a source of supply of liquid fuel, an air-pump connected with the engine, a fuel-measuring device connected with the source of supply of the fuel and adapted to discharge into the connections between the pump and the engine, and a single manually-operable member adapted to operate both the pump and the fuel-measuring device.

6. Engine-starting apparatus having, in combination with a multi-cylinder internal-combustion engine, means for forcing combustible mixture into the engine-cylinders, and a distributer for directing the combustible mixture to the proper cylinders, the distributer comprising a valve-casing having two oppositely-disposed valve-seats therein provided with outlets, a valve-ball movable in the valve-casing and adapted to coöperate with either of said seats and control said outlets, a spring-pressed detent engaging the valve-ball and adapted to retain it normally in engagement with one of the valve-seats, and connections between said outlets, respectively, and two of the cylinders of the engine.

7. An engine-starting device having, in combination, an air-pump, a fuel-chamber and a mixing-chamber located at the bottom of the pump, a rotatable measuring-valve controlling communication between said chambers and provided with a recess adapted to receive fuel from the fuel-chamber and transfer it to the mixing-chamber when the valve-plug is rotated, and a manually-operable member connected with the pump-piston, said member and said valve-plug having abutments adapted to coöperate when the manually-operable member is in depressed position, whereby the valve-plug may be turned to discharge fuel into the mixing-chamber.

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Witnesses:
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Correction In Letters Patent No. 1,005,541.

It is hereby certified that in Letters Patent No. 1,005,541, granted October 10, 1911, upon the application of Edward A. Halbleib, of Rochester, New York, for an improvement in "Engine-Starting Apparatus," an error appears in the printed specification requiring correction as follows: Page 2, line 52, for the word "separated" read *repeated;* and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 7th day of November, A. D., 1911.

[SEAL.]

E. B. MOORE,
Commissioner of Patents.