

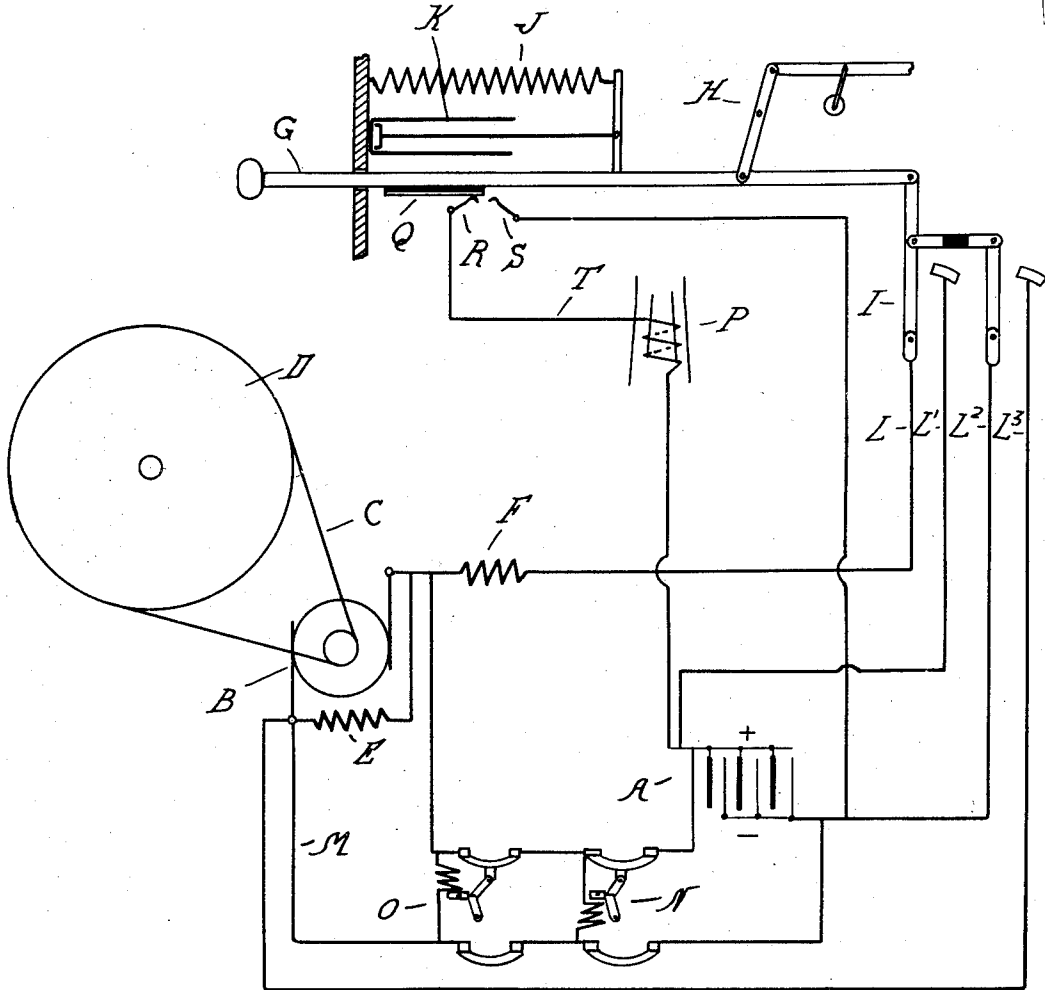
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SYSTEM OF STARTING INTERNAL COMBUSTION ENGINE DRIVEN MOTOR VEHICLES.

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Patented Dec. 10, 1912.



Witnesses

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UNITED STATES PATENT OFFICE.

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SYSTEM OF STARTING INTERNAL-COMBUSTION-ENGINE-DRIVEN MOTOR-VEHICLES.

1,047,114.

Specification of Letters Patent.

Patented Dec. 10, 1912.

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To all whom it may concern:

Be it known that I, HENRY GIBSON O'NEILL, a citizen of the United States of America, residing at Detroit, in the county of Wayne and State of Michigan, have invented certain new and useful Improvements in Systems of Starting Internal-Combustion-Engine-Driven Motor-Vehicles, of which the following is a specification, reference being had therein to the accompanying drawings.

The invention relates to engine starters more particularly designed for use upon motor vehicles, and it is one of the objects of the invention to effect the starting by the utilization of agencies having also a function in the normal operation of the machine. Thus the dynamo generator and storage battery which forms a part of the ignition system and lighting system normally used on the car are, with my improvement, adapted to constitute the main elements of the starting system.

A further object of the invention is to obtain the necessary starting torque with a motor and battery of minimum size and capacity, thereby reducing weight and conserving the space on the car.

Still further it is an object to render the starting positive by insuring the presence of explosive gases upon the initial suction stroke of the engine.

With these objects in view the invention consists in the construction as hereinafter set forth.

In the drawing, my apparatus is represented diagrammatically.

A is a storage battery and B is a dynamo-motor for combined torque and current generation, C is a drive connection between the generator B and the motor which is diagrammatically represented as a belt or chain engaging the engine fly-wheel D. By utilizing the fly-wheel in this transmission I am enabled to obtain a relatively large speed reduction such for instance as six to one from the motor to the engine shaft and at the same time to obtain a compact arrangement of parts.

As has been stated it is one of the objects of the invention to obtain the requisite starting torque with as small a motor and battery as possible. For this purpose the organization of the motor is such as to obtain the

maximum torque, being preferably a compound winding having a shunt and series field. The shunt field E remains constantly in service but the series coil F is adapted to be cut out when the generator is used for current generation. The motor is also constructed to have a relatively low ohmic resistance so as to be capable of carrying a large current volume with a relatively low electro-motive force. This will produce the high power for starting, but with such a drain upon the battery continuation for more than a brief interval would have a destructive action. Thus special provision must be made for avoiding such a result which I obtain primarily by the use of a self-opening circuit closing switch. In addition to this a dash-pot or other timing mechanism is employed for regulating the time interval during which the switch remains closed. This being sufficient to insure the starting but limited to avoid destructive action.

As diagrammatically illustrated, G is the element for manual operation shown in the form of a push-rod. This rod is mechanically connected by levers H with the relief valves for the various engine cylinders so as to relieve the compression during starting, and the rod is further connected with an electric switch I for controlling the motor circuit.

J is a spring for automatically returning the rod when the operating pressure is relieved, and K is a dash-pot forming a retarder for determining the time interval in which the starting operation is effected.

The switch I is normally open but is closed by the inward movement of the rod G remaining closed during the greater portion of the time interval. Before however, the closing of this switch is effected, the rod through the lever connections H will operate the relief valves to reduce the resistance of turning the engine crank. The switch I is connected by leads L, L¹, L² and L³ with the battery and the generator B, the arrangement being such as to completely connect these devices when the switch is open and to include them in series when the switch is closed. This circuit also includes the series coil F of the motor to increase the starting torque. In addition to the circuit just described, the generator B and battery A are adapted to be

connected by an independent circuit M, which circuit cuts out the series coil F and includes an automatic switch preferably above the under load and the over load switch as indicated by N and O in the diagram. These switches are so set that the circuit M will not be closed until the generator B acting as a current generator, attains a certain electro-motive force, while an abnormal rise in potential will operate the over load switch to open the circuit.

One of the general causes of failure in starting is the lack of an explosive mixture for the initial suction stroke. This I have guarded against by providing an electric heating unit P arranged to vaporize a sufficient quantity of the liquid fuel to produce the explosive gas. Preferably this heating unit is arranged in the carbureter and either directly immersed in the liquid fuel or closely associated with the fuel discharge nozzle. The circuit for the heater is closed upon the initial movement of the rod G by suitable means such as the bridge contact Q on said rod for coupling the circuit terminal contacts R and S, and when the circuit is closed the heater P is in series with the battery.

With the parts constructed and arranged as described the operation is as follows: Whenever the rod G (which may be mounted on the dash-board or any other convenient location on the vehicle) is pushed inward, the initial movement will close the circuit T for the heater P. This will cause the instantaneous vaporizing of a portion of the liquid fuel so that before mechanical motion is imparted to the engine an explosive gas will be produced. The further movement of the rod G operates the levers H for opening the relief valves after which the switch I is closed, throwing the battery and motor B with the series coil F included in circuit. All of these operations are performed during the inward movement of the rod G against the tension of the spring J and upon the release of said rod the spring will return it to its initial position. On account however, of the dash-pot K a definite time interval is required to completely return the rod, this being sufficient to insure the starting of the engine but not long enough to have a detrimental effect on the battery. During the return movement the levers H will gradually close the relief valves on the completion of the operation (which need not require more than one or two seconds) and the engine is then in normal working condition.

As soon as the engine is started, the generator B is mechanically driven and the electro-motive force developed will rise until the under load switch is operated to close the circuit M. The current will then be utilized for recharging the battery A and

may also be employed for operating the ignition system and the lighting system which however, are not shown in the diagram.

What I claim as my invention is:

1. An engine starter comprising a motor organized for high starting torque efficiency, a battery sufficient to operate said motor for a brief interval, a circuit closing switch for said battery and motor, and means automatically operating to limit the interval in which the circuit is closed to that within the operating capacity of the battery.

2. An engine starter comprising an electric motor organized for high starting torque efficiency and having a mechanical transmission with the engine, a battery sufficient to supply said motor with current for the brief interval in which the circuit is closed, and means operating automatically upon the attainment of the requisite electromotive force for converting said motor into an efficient current generator to recharge the battery.

3. An engine starter comprising a dynamo motor having a mechanical transmission with the engine, a battery having a capacity sufficient to supply current to said motor for a brief interval, a switch for coupling said battery to said motor, means acting automatically to open the circuit within a predetermined limit, a circuit for connecting said motor as a current generator with said battery for re-charging the same, and a switch automatically operating upon the attainment of the requisite electromotive force in the generator to close said re-charging circuit.

4. An engine starter comprising a dynamo motor, a storage battery having a capacity sufficient to supply said motor for a brief interval, a circuit closing switch for said motor and battery, means for automatically opening said switch after a predetermined interval, and mechanical connections to said switch for initially relieving and subsequently restoring the compression of the engine.

5. An engine starter comprising a dynamo motor having a mechanical transmission with the engine, a storage battery having a capacity sufficient to supply current to said motor for a brief interval, manually operable means for closing the circuit of said battery and motor, means for automatically opening said circuit after a predetermined interval, and associated instrumentalities for facilitating the starting of the engine simultaneously operated by said manually operated means.

6. In an engine starter, the combination with means for mechanically actuating the engine, of an electric fuel vaporizer for generating the explosive gas for the initial operation, and a common controlling means for said mechanical starter and electric vaporizer.

7. In an engine starter, the combination with means for mechanically actuating the engine, of an electric fuel vaporizer for supplying the explosive gas for the initial operation of the engine, a compression relief mechanism and a common controlling means for said mechanical starter, compression relief mechanism and electric vaporizer.

8. In an engine starter, the combination with means for mechanically actuating the engine, of an electric fuel vaporizer for generating the explosive gas for the initial operation, and means for controlling said mechanical starter and the electric vaporizer.

9. An engine starter comprising a motor organized for high starting torque efficiency, said motor having a relatively low ohmic resistance whereby it is adapted to carry a large current volume, a battery sufficient to operate said motor for a brief interval, a circuit closing switch for said battery and motor, and means for automatically opening said circuit within a predetermined time limited to an interval within the operating capacity of the battery.

10. In an engine starter, the combination with a motor, of a circuit for the motor, an

electric fuel vaporizer for supplying the explosive gas for the initial operation of the engine, a circuit for said electrical vaporizer, a compression relief mechanism, and mechanism acting upon the operation thereof to first close the vaporizer circuit, to then open the relief valve and to then close the motor circuit.

11. In an engine starter, the combination with a motor, of a circuit for the motor, an electric fuel vaporizer for supplying the explosive gas for the initial operation of the engine, a circuit for said electrical vaporizer, a compression relief mechanism, mechanism acting upon the operation thereof to first close the vaporizer circuit, to then open the relief valve and to then close the motor circuit, and means acting automatically to operate said mechanism after a predetermined period to return said mechanism to its normal position.

In testimony whereof I affix my signature in presence of two witnesses.

HENRY GIBSON O'NEILL.

Witnesses:

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