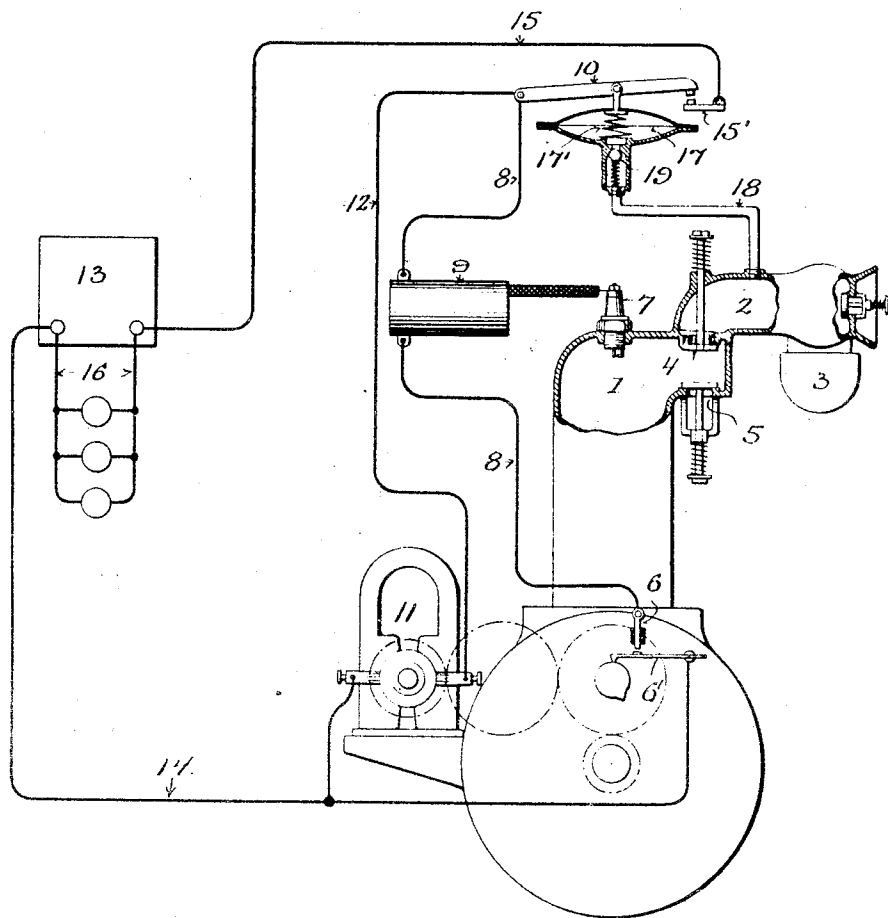


W. S. HARLEY.
CIRCUIT BREAKER.
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1,240,442.

Patented Sept. 18, 1917.



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UNITED STATES PATENT OFFICE.

WILLIAM S. HARLEY, OF MILWAUKEE, WISCONSIN, ASSIGNOR TO HARLEY-DAVIDSON MOTOR CO., OF MILWAUKEE, WISCONSIN.

CIRCUIT-BREAKER.

1,240,442.

Specification of Letters Patent.

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To all whom it may concern:

Be it known that I, WILLIAM S. HARLEY, a citizen of the United States, and resident of Milwaukee, in the county of Milwaukee and State of Wisconsin, have invented certain new and useful Improvements in Circuit-Breakers; and I do hereby declare that the following is a full, clear, and exact description thereof.

The object of my invention is to provide a simple, economical and effective engine-controlled pneumatic means for breaking an electric circuit, the invention being particularly designed for use in connection with igniting and lighting circuits having a storage battery and generator therein, the construction and arrangement being such that when the engine is stopped, the circuit is broken by differential air pressures under control of the engine to thus prevent reversal of the current from the battery whereby the generator is converted into a motor, resulting in depletion of the storage battery.

So far as I am aware means for breaking circuits of the above referred to character comprising manually controlled mechanical devices, electrically controlled circuit breakers and signals have been utilized, but practice has developed that such means only partially effect the desired result, for various reasons, and particularly that such devices are not positively and automatically controlled by movement of the engine. Hence it frequently occurs that when the engine of a self propelled vehicle is at rest, the storage battery in circuit with the generator, will cause back flow of current whereby the energy of the battery is wasted in driving the generator which is then idly rotating as a motor.

All of the above objectionable features are overcome with my device and with the above objects in view the invention consists in certain peculiarities of construction and combination of elements as set forth hereinafter with reference to the accompanying drawing and subsequently claimed.

The drawing illustrates a diagrammatic view of a gas engine provided with a sparking circuit and lighting circuit embodying the features of my invention.

Referring by characters to the drawings, 1

represents the firing end of an internal combustion engine provided with a manifold or intake tube 2, which tube carries a carbureter 3, said intake tube being provided with a check-valve 4 at its discharge mouth. The engine cylinder is also provided with a valve-controlled exhaust nozzle 5 and a cam-controlled circuit breaker comprising separated contact members 6, 6'. The firing end of the cylinder 1 is also provided with the usual spark-plug 7, which spark-plug is connected to the contact member 6 through a conductor 8, there being a high tension coil 9 interposed between the conductor 8 and said spark-plug. The opposite terminal of the conductor 8 is secured to a pivoted switch arm 10, which switch arm is also connected to a generator 11 through a conductor wire 12, the said generator being also connected to one terminal of a storage battery 13 through a conductor wire 14, which wire is also connected to the contact member 6' of the cam-controlled circuit breaker. The other terminal of the storage battery is connected by a wire 15 to a contact block 15', which contact block is arranged to engage the free end of the switch-arm 10. The storage battery is also connected to the feed-wires 16 of a lighting circuit as shown. The switch-arm 10, which constitutes a pneumatically controlled switch make and break mechanism, is connected to the flexible upper wall of a diaphragm 17 constituting an air chamber, said upper wall being normally distended by a coiled spring 17'. The chamber 17 of the diaphragm communicates with the intake tube 2 of the engine through a pipe 18 and the intake mouth of the chamber is controlled by a check-valve 19, which valve is in the form of a ball held to its seat by a delicate coiled spring.

In the operation of my device, it is obvious that, when the engine is at rest, the spring controlled arm of the diaphragm will break the electrical connections between the storage battery and generator, whereby current from the battery is prevented from establishing a circuit through the generator. When the engine is started, a partial vacuum is created within the manifold or intake tube 2, whereby the valve 19 of the diaphragm will be retracted from its seat to thus par-

tially exhaust the air from the diaphragm chamber, thereby creating a vacuum which will cause the switch arm to be drawn downward, closing the contact between the switch arm and block 15. Thus the circuits are closed while the engine is running and the said circuits will be held closed due to the vacuum produced in the chamber 17, whereby said igniting and lighting circuits are normally maintained.

It is obvious that when the engine comes to rest, there being no longer a means for maintaining the vacuum in the chamber 17, the diaphragm will act to break the igniting and generating circuit so as to thus prevent the battery from creating a circuit through said generator.

It is obvious that the check valve 19, which controls the mouth of the diaphragm chamber, is employed to prevent the initial pulsations of the engine piston being transmitted to the chamber, whereby a vibratory movement would be imparted to the switch-arm 10. Thus it will be seen that by differential air pressures controlled by the engine, the circuit is automatically and positively broken.

While I have shown and described the valve-controlled chamber comprising the actuating element of the make and break switch connected to the intake pipe tube of the engine, it is obvious that I may, without departing from the spirit of my invention, connect this chamber to any portion of the engine, whereby when said engine is put into motion variation in air pressure will cause the make and break mechanism to operate.

I claim:

1. In an electric supply system, the combination of an internal combustion engine, a vacuum responsive device associated with the intake pipe thereof adapted to respond relatively quickly to a partial vacuum in said intake pipe and relatively slowly to the absence of vacuum in said intake pipe, and an electric circuit controlled by said vacuum responsive device.

2. In an electric supply system, the combination of an internal combustion engine, a vacuum responsive circuit controlling device associated with the intake pipe thereof adapted to respond relatively quickly to a partial vacuum in said intake pipe and relatively slowly to the absence of vacuum in said intake pipe, an electric generator driven by said internal combustion engine, a storage battery adapted to be charged by said generator and an electric circuit including said battery, generator and vacuum responsive circuit controlling device.

3. In an electric supply system, the combination of an internal combustion engine, a vacuum responsive circuit controlling device associated with the intake pipe of said

internal combustion engine, said device being relatively quickly displaced from its normal position by the presence of a partial vacuum in said intake pipe, and returning to its normal position relatively slowly during the absence of a partial vacuum in said intake pipe, a source of electricity, ignition apparatus for said internal combustion engine, and an electric circuit including said source of electricity, said ignition circuit and said vacuum responsive circuit controlling device.

4. In an electric supply system, the combination of an internal combustion engine, a vacuum responsive circuit controlling device associated with the intake pipe of said internal combustion engine, said device being relatively quickly displaced from its normal position by the presence of a partial vacuum in said intake pipe and returning to its normal position relatively slowly during the absence of such vacuum in said intake pipe, a source of electric energy, a load for said source, and a circuit including said source of electric energy, said load and said vacuum responsive circuit controlling device.

5. In an electric supply system, the combination of an internal combustion engine, a chamber communicating with the intake pipe thereof, a check valve in the passage between said chamber and said intake pipe, permitting a rapid flow of air from said chamber to said intake pipe, and but a slow flow of air in the opposite direction, a flexible piece forming a portion of the wall of said chamber, and an electric circuit controlled by said flexible piece.

6. In an electric supply system, the combination of an internal combustion engine, an electric circuit controlling means relatively quickly responsive to a difference of pressure resulting from the action of said engine and relatively slowly responsive to the absence of such pressure, and an electric circuit controlled thereby.

7. In combination with an internal combustion engine and an electric supply system employed therewith, of an electric controlling means responsive to a change of pressure resulting from the action of the engine, and an electric circuit controlled thereby, said responsive means comprising a chamber in which pressure differing from the atmospheric pressure is produced, and means whereby pressure in said chamber is permitted to change relatively quickly in one direction and relatively slowly in the other direction.

8. In combination with an internal combustion engine and an electric supply system employed therewith, of an electric controlling means responsive to a change of pressure resulting from the action of the engine, and an electric circuit controlled thereby, said responsive means comprising

a chamber in which a pressure differing from atmospheric pressure is produced, and means comprising a valve permitting a more rapid change of pressure in said chamber in one direction than in the other direction.
5 In testimony that I claim the foregoing I have hereunto set my hand at Milwaukee,

in the county of Milwaukee and State of Wisconsin, in the presence of two witnesses.

WILLIAM S. HARLEY.

Witnesses:

E. J. MUELLER,

J. B. KAMERLING.