W. D. LUTZ.

SELF STARTER FOR INTERNAL COMBUSTION ENGINES.

APPLICATION FILED OCT. 8, 1913.

1,147,956.

Patented July 27, 1915.

Fig. 1.

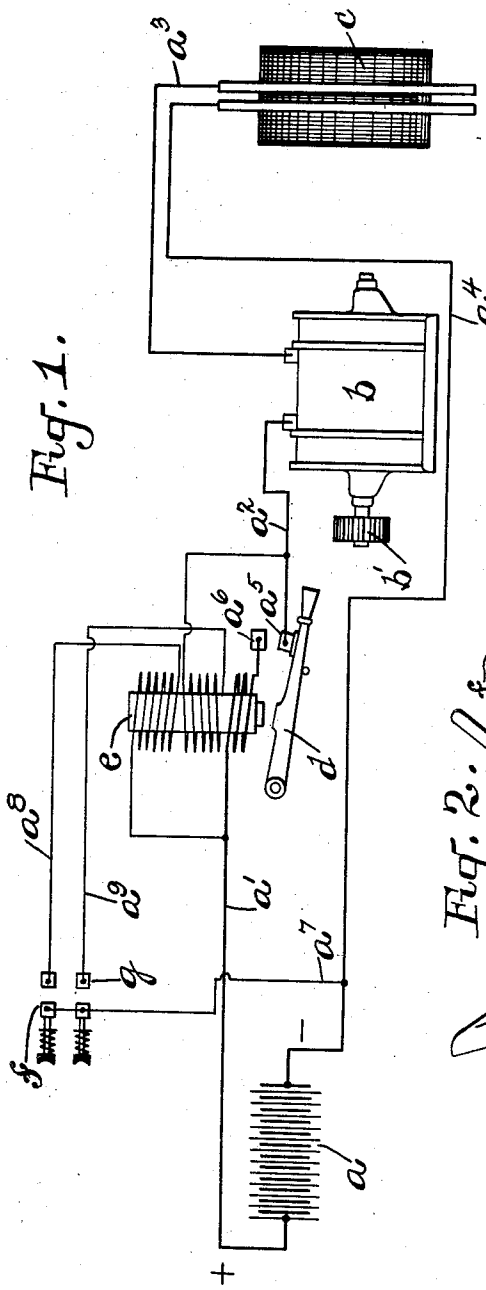
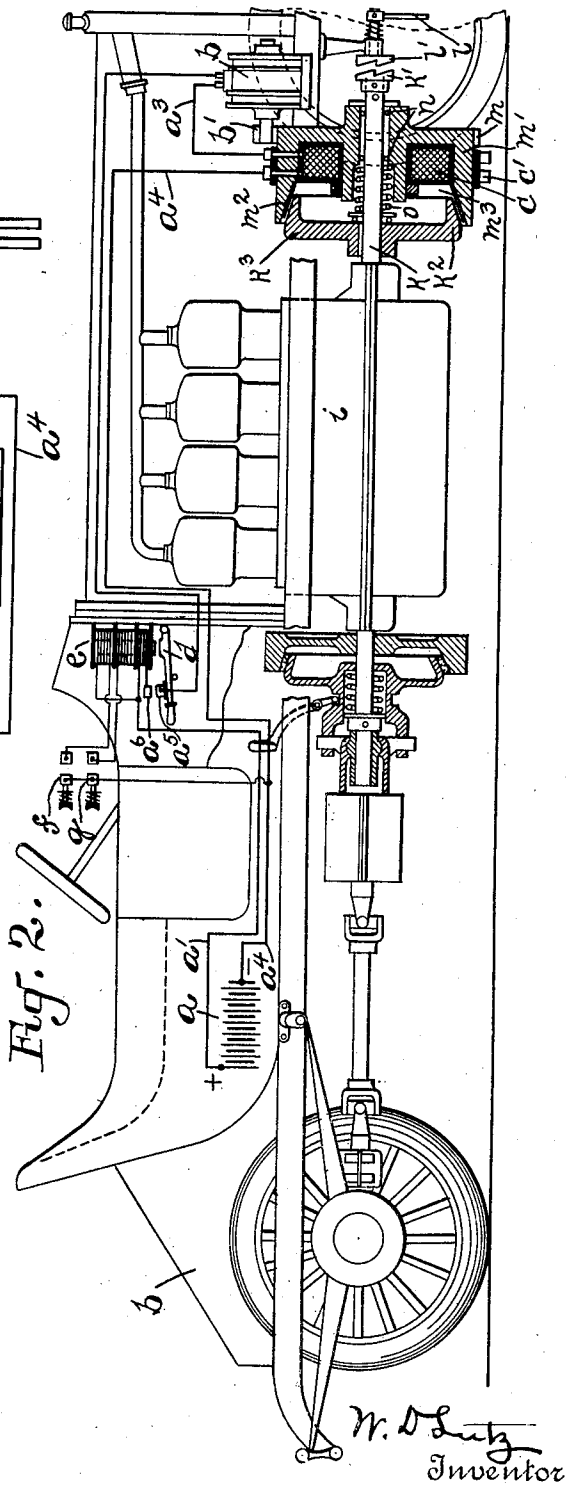


Fig. 2.



Witnesses:

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SELF-STARTER FOR INTERNAL-COMBUSTION ENGINES.

1,147,956. Specification of Letters Patent. **Patented July 27, 1915.**

Application filed October 8, 1913. Serial No. 794,182.

To all whom it may concern:

Bt it known that I, WILLIAM D. LUTZ, a citizen of the United States, residing in the borough of Allendale, in the county of Essex and State of New Jersey, have invented a new and useful Improvement in Self-Starters for Internal-Combustion Engines, of which the following is a specification.

In a co-pending application filed by the present applicant on October 8, 1913, Serial No. 794,181 is shown and described a starting device for internal combustion engines in which, upon operation of an auxiliary electric starting motor suitable clutch elements are automatically brought into operative relation to each other by mechanical devices, to transmit the power of this auxiliary motor to the internal combustion engine to be started, to rotate the crank shaft of the latter until it is operated under the power of the internal combustion engine.

In the present invention, the clutch elements are brought into operative engagement with each other through the energization of an electromagnetic coil, whereupon the power of an auxiliary starting motor, similar in all respects to the starting motor shown in the application above referred to, is transmitted to the crank shaft of the internal combustion engine to be started to rotate the crank shaft thereof for the purpose pointed out above.

The principal object of the present invention is to provide in combination with an auxiliary starting motor and its control system, electromagnetic devices, operative automatically only after the starting motor has attained a predetermined speed, to bring suitable clutch members into operative engagement with each other, one of the clutch members being driven by the auxiliary motor and the other clutch member being fixed to the crank shaft of the internal combustion engine, whereby the rotary movement of the auxiliary motor is transmitted to said crank shaft.

A further object is to provide in combination with such electro-magnetic clutch controlling devices, means whereby upon operation of the internal combustion motor under its own power, the electromagnetic devices shall automatically release the clutch members to disengage the starting motor from the crank shaft of the internal combustion motor.

These and further objects will appear more fully hereinafter, reference now being had to the embodiment of the invention illustrated in the accompanying drawings, for a detailed description thereof.

In the drawings, Figure 1 is a diagrammatic view of the electrical control system showing the auxiliary starting motor and the electromagnetic coil; Fig. 2 is a view partly in section and partly in side elevation of a motor car equipped with the improved starting devices, the electrical connections being shown somewhat diagrammatically.

The control system shown in Fig. 1 is, as pointed out before, substantially similar to the system shown in the co-pending application above referred to, except in certain respects to be pointed out hereinafter, comprising a storage battery a, or other available source of power, connected through leads a^1, a^2, a^3, a^4, to the starting motor b and the electromagnetic coil c, the starting motor and the coil being connected in series and the circuit being controlled by a switch d carrying a contact a^5 to coöperate with a contact a^6 to which the leads a^2 and a^1 are secured, respectively. The lead a^1 is passed around a magnetizable core e mounted to control the position of the switch d whereby the latter may be moved to bring the contacts a^5 and a^6 in engagement to close the circuit of the starting motor b. Other leads a^7 and a^8 are connected to the battery and have their circuit controlled by a push button switch f mounted within convenient reach of the operator, so that the circuit may be closed and the core e energized through the lead a^8, which also passes around it, to move the switch d so as to bring the contacts a^5 and a^6 in engagement and close the circuit of the starting motor b.

In addition to the circuits described, a third circuit may be provided by which the core e may be demagnetized. This circuit comprises, in addition to the lead a^7, another lead a^9 which may be placed in electrical connection therewith, at the will of the operator, through a suitable push button switch g. The lead a^9, it is to be noted, is passed around the core e with windings reversed to the windings of the leads a^1 and a^8 so that its action is to demagnetize the core e and release the switch whereby the contacts a^6 and a^5 are moved out of engagement with each other and the circuit of the starting motor b is broken.

Reference is now to be had to Fig. 2 in

which the control system, the starting motor *b* and the magnetic coil *c*, illustrated in Fig. 1, are shown as applied to a motor car *h*. This motor car is adapted to be propelled by an internal combustion motor *i* having a crank shaft *k* extended forwardly therefrom, and arranged to be rotated manually by a hand crank *l* connectible therewith through coöperating ratchet teeth k^1 l^1. In accordance with the present invention provision is made for rotating the crank shaft *k* initially by the auxiliary starting motor *b*, which may rotate, through a pinion *b'* carried on its armature, and an intermeshing gear *m* formed on the outer periphery of a rotatable female clutch member *m'*, a coöperating male clutch member k^2 splined slidably onto the crank shaft *k* of the internal combustion engine *i*. The female clutch member *m'* rotates freely on the crank shaft *k* through a ball bearing support *n*. Further, it is recessed internally to support the annular electromagnetic coil *c* which may be in constant connection with the circuit of the storage battery *a*, through collector rings *c'*. The male clutch member k^2 is held normally with its conical flange k^3 out of engagement with the correspondingly tapered inner face m^2, which, as usual, may be faced with a suitable frictional strip m^3, by means of a spiral spring disposed operatively between the two clutch members.

In operation, with the internal combustion motor *i* at rest, the operator may initiate the starting devices from his seat by closing the push button switch *f*. The core *e* is then magnetized and the switch *d* drawn into contact therewith, thus bringing the contacts a^5 and a^6 into engagement and closing the circuit of the starting motor *b*. Immediately thereupon the magnetization of the core *e* is maintained by the winding of the lead a^1 so that the switch *f* may be released to open its circuit, the switch *d* and core *e* then forming a self holding switch. While the coil *c* is magnetized upon the starting of the motor *b*, its action is somewhat sluggish as regards the motor, so that the latter is permitted to reach an appreciable speed before the male clutch member k^2, under the action of the energized coil *c* is drawn against the spring *o* into snug frictional engagement with the female clutch member m^1 to transmit rotary movement thereof to the engine crank shaft *k*.

As soon as the crank shaft *k* is rotated under the power of the internal combustion engine *i*, the motor *b* is relieved of its load and the current in its circuit accordingly decreases appreciably. Indeed, if the speed of rotation of the crank shaft *k* is sufficiently high, the motor *b* may be driven momentarily thereby and thus neutralize entirely the voltage of the storage battery *a*. At all events, this decrease in current in the circuit of the motor *b*, and likewise in the coil *c*, is sufficient to permit the spring *o* to overcome the magnetic action of the coil and slide the clutch member k^2 out of engagement with the clutch member m^1. In addition, this decrease in current through the winding of the lead a^1 results in the switch *d* being released from the magnetic core *e* so that the contacts a^5 and a^6 are disengaged to break the circuit of the motor *b* and automatically stop the operation of the motor.

In case the internal combustion engine *i* does not operate under its own power, after rotation of the crank shaft *k*, in the manner described, the operator may break the circuit of the motor *b* by operating the push button switch *g*, thus deënergizing the core *e* by reason of the reverse windings of the lead *a*. Since this lead completes its circuit to the battery *a* through the contacts a^5 and a^6, not only will the operation of the motor *b* be stopped by closing the switch *g*, but the circuit in which is the lead a^9 will be broken automatically, thus guarding completely against the waste of electrical power from the battery *a*.

Modifications will suggest themselves to those skilled in the art, but all rearrangements of the controlling system and substitutions of mechanical equivalents are to be deemed within the spirit of this invention provided they fall within the scope of the appended claims.

I claim:

1. In an electric motor starter for internal combustion engines, the combination of a motor a shaft to transmit the power of the motor to the crank shaft of the engine, a magnetic clutch associated with the shaft to turn the same, an electric motor to drive one of the parts of the clutch, a source of current supply for the motor and the clutch, and a circuit therefor, a self holding switch in the said circuit and electromagnetic means in the same circuit automatically to operate the self holding switch.

2. In an electric motor starter for internal combustion engines, the combination of an electric motor, an electromagnetic clutch carrying a magnetizable coil and adapted to connect together the motor and engine, a source of current supply for the motor and coil, a circuit therefor, an automatically operable self holding switch in the circuit, and a magnet to close the switch.

3. In an electric motor starter for internal combustion engines, the combination of an electric motor, an electromagnetic clutch carrying a magnetizable coil and adapted to connect together the motor and engine, a source of current supply for the motor and coil, a circuit therefor, an auto-

matically operable self holding switch in the circuit, an electromagnet to close the switch and a self restoring switch to close the circuit of the electromagnet.

4. In an electric motor starter for internal combustion engines, the combination of an electric motor, an electro-magnetic clutch carrying a magnetizable coil and adapted to connect together the motor and engine, a source of current supply for the motor and coil, a circuit therefor, an automatically operable self-holding switch in the circuit, an electromagnet to close the switch, a self-restoring switch to close the circuit of the electromagnet, an additional circuit, a magnetizable coil therein, and a self restoring switch to close the said circuit to permit the self-holding switch to open.

5. In an electric motor starting apparatus, an electric motor, a source of current supply for the motor, a magnet winding having a core, a circuit including the winding, the motor and the source of current supply, a switch in the circuit held closed by the magnet, branch circuits from said circuit, windings oppositely wound to each other in the branch circuits, embracing the said core, switches in the branch circuits to close and open the same, one to supply current to magnetize the core to close the switch in the current supply motor circuit, the other to open the said switch.

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

WILLIAM D. LUTZ.

Witnesses:
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