Nov. 17, 1925. 1,561,820

D. J. BEDFORD

MEANS FOR STARTING INTERNAL COMBUSTION ENGINES

Filed Jan. 21, 1925

Fig. 1.

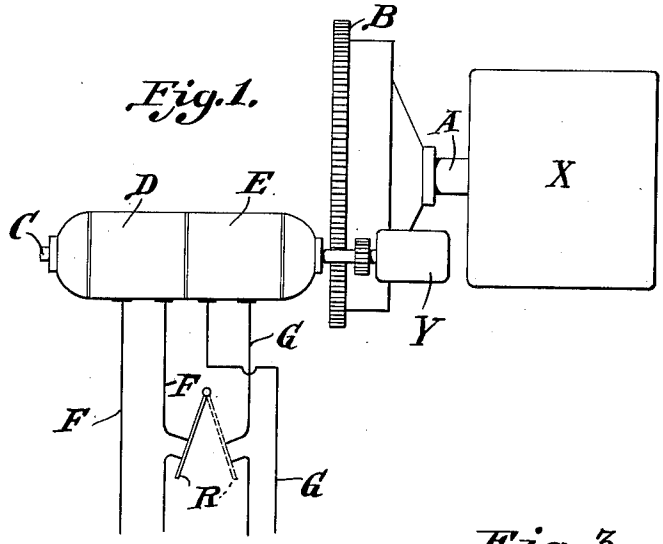


Fig. 2.

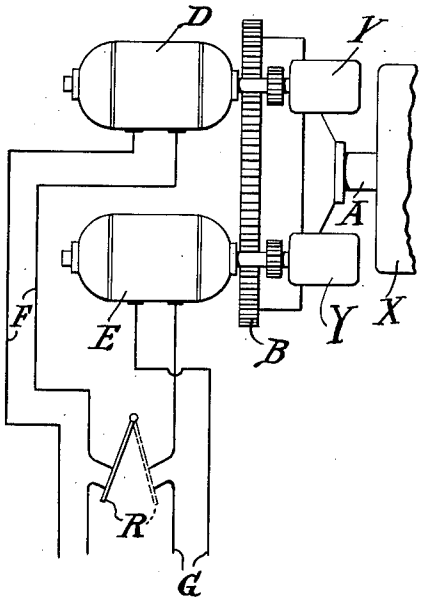
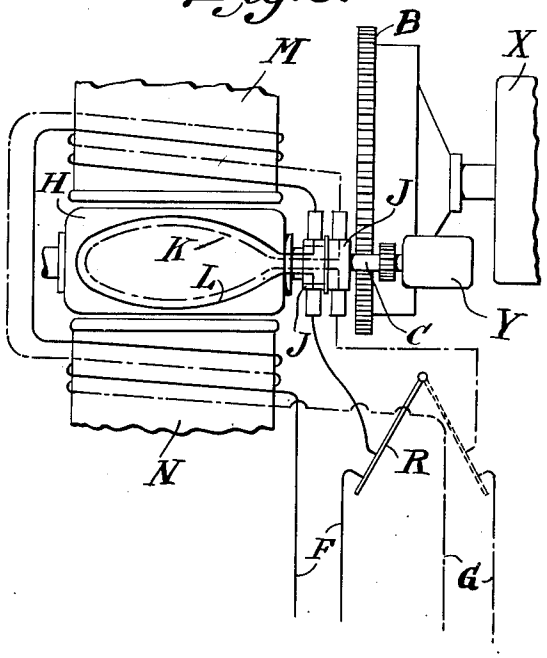


Fig. 3.



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UNITED STATES PATENT OFFICE.

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MEANS FOR STARTING INTERNAL-COMBUSTION ENGINES.

Application filed January 21, 1925. Serial No. 3,765.

To all whom it may concern:

Be it known that I, DOUGLAS JAMES BEDFORD, a subject of the King of Great Britain, residing at The Hermitage, Kegworth, Derby, England, have invented certain new and useful Improvements in Means for Starting Internal-Combustion Engines, of which the following is a specification.

This invention relates to means for starting internal combustion engines, and it is especially applicable to starting the engines of motor cars particularly when the engine is cold and difficult to start.

Self-starters on motor cars as commonly employed consist of an electro-motor driven from an accumulator carried on the car. It is well known that when the weather is cold it is difficult to start the engine, and the use of the self-starter for this purpose imposes a severe strain on the electro-motor and also on the accumulators, entailing danger of a break-down of the self-starting apparatus. It is general practice therefore when the engine is cold to start the engine by using the hand crank and thus save undue load and strain on the self-starter.

According to this invention, the ordinary accumulators hitherto employed for driving the electro-motor are maintained and carried on the car for use at ordinary times for starting up the engine, but instead of merely carrying the ordinary armature on the shaft, additional means are provided, whereby a service supply current, such for instance as the house supply used for lighting a garage, may be employed for turning the crank shaft with greater power than that usually available on the car. The additional and independent power received from the service current may be conveyed to the car by means of a flexible insulated twin cable having a plug on the end suitable for insertion in a double socket carried on the car, and from this double socket insulated cables are conveyed to an electric power motor, which is so arranged in association with any suitable transmission, such as a Bendix drive, as to gear when rotated with a spur wheel or with other gearing communicating with the crank shaft of the internal combustion engine. There is of course considerable reduction in the gear between the shaft of the motor and the shaft of the engine to be turned, in order to increase the mechanical advantage of the electro-motor and cause the engine to be rotated comparatively slowly but with considerable power.

Examples of construction illustrating the methods of carrying this invention into effect are given in the accompanying diagrammatic drawings, where Figure 1 illustrates a construction where the power motor using the service current is mounted on an extension of the shaft of the motor which receives the current from the accumulator; Figure 2 illustrates a similar view in which the motor receiving the service current is entirely independent of the motor receiving the accumulator current; and Figure 3 illustrates an arrangement where the motor receiving the service current is combined with the motor receiving the current from the accumulators, by the adaption of the winding and other alterations to suit this combined use of service current or accumulator current.

In the construction illustrated at Fig. 1, X is the engine, A is the engine shaft carrying a large spur wheel B, and C is the shaft carrying the armature of the electro-motor for starting the engine. The shaft C carries at one portion the armature of the ordinary accumulator motor, and the said shaft C is extended to carry the armature of another motor for receiving current from the service supply. The voltage of the motor comprising the second armature and second field magnets, not illustrated but contained within the left portion of the casing marked D, is considerably higher than the voltage of the first motor contained in the portion marked E, the said voltage being arranged to suit the lighting circuit of the electric power supply which is available at the garage where the car is maintained. The two wires F, F from the high voltage motor connect to a socket preferably arranged on the dashboard of the car, and suitable for receiving a plug connected to a flexible conductor communicating with the lighting circuit of the garage. The wires G, G connect with the accumulator (not shown). A suitable switch R is arranged so as to close either the circuit F or the circuit G as desired at the same time opening the other circuit, so that only one of the electric motor driving means can be operated at one time.

In the application of this invention to cars already constructed and already provided with self-starters, the arrangement illus-

trated at Fig. 2 may be employed, in which an independent high voltage electro-motor D is provided and arranged to gear with the flywheel of the engine, in similar manner to the application of the motor E driven by the accumulator. In such a case the axes of the high voltage and low voltage electro-motors are parallel to each other and equidistant from the axis of the engine to be driven. Both electro-motors D and E are also arranged for axial movement of the armatures and shafts for the purpose of disengaging with the teeth on the flywheel by means of any suitable transmission, such as a Bendix drive indicated at Y, when the operation of starting the engine has been effected and the electro-motor has been stopped.

Instead of employing two independent motors or two motors carried on the same shaft, as described with reference to Figs. 1 and 2, a single motor as illustrated at Fig. 3 may be constructed, having one shaft C and one armature H but with two separate commutators J, J, and the armature is in this instance wound in duplicate with two independent windings K and L, one communicating with each commutator. The field magnets M and N also are wound with two separate windings. In this manner there are two motors contained in one, yet with two independent circuits F, F and G, G available for use with the house current or for use with the current from the accumulators, whichever current it is desired to employ.

It will be noted, that in each of the three suggested embodiments of the invention, an internal combustion engine X is associated with a rotative member B adapted to be rotated by electric motor means for the purpose of starting the engine, and for the rotation of this member B two electric motor means are provided adapted to operate respectively on low voltage and high voltage current, which electric motor means may comprise either independent motors, independent fields and armatures on a common shaft or independent field and armature windings on common cores and a common shaft as may be desired, the gist of this invention being that independent electric means operative selectively as desired on low voltage or high voltage current be provided in combination with the engine and means for selectively applying the low voltage or high voltage current to the same.

A double switch or two switches should be employed in most instances, one switch R being used in order to prevent both currents being applied simultaneously, and the other switch (not shown) being merely a change-over switch which permits either one or the other of the windings to receive current.

What I claim as my invention and desire to secure by Letters Patent is:—

1. In combination, an internal combustion engine, rotative means associated with the engine, low voltage electric motor means adapted when operating to rotate said rotative means, high voltage electric motor means adapted when operating to rotate said rotative means and means for selectively applying low voltage current or high voltage current to said electric motor means respectively, as desired.

2. The combination of an internal combustion engine, a low voltage motor connecting when operating with the engine to start the same, a high voltage motor connecting when operating with the engine to start the same and means for selectively supplying low or high voltage current to the respective motors as desired.

In witness whereof I have hereunto set my hand.

DOUGLAS JAMES BEDFORD.