

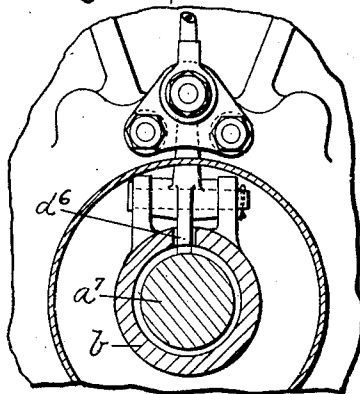
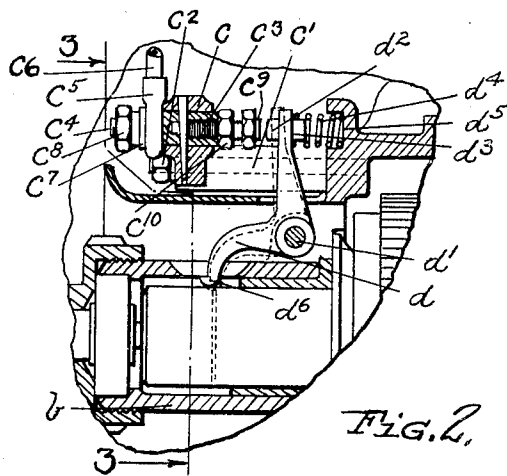
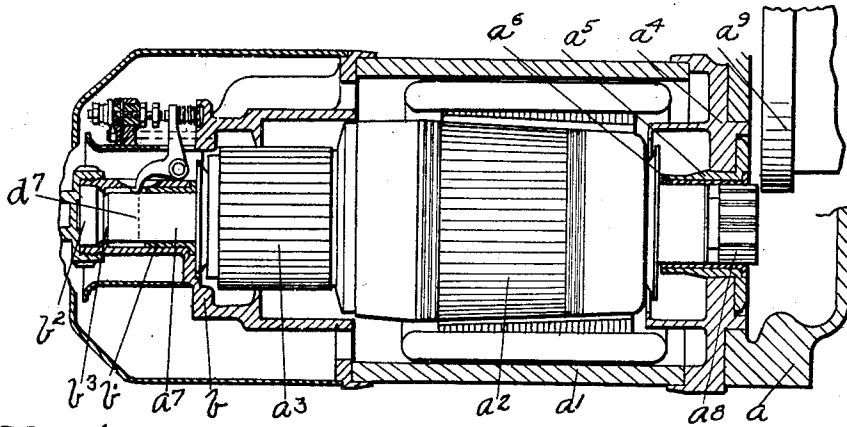
Feb. 25, 1930.

F. H. ROYCE

1,748,902.

ELECTRICAL TURNING GEAR FOR STARTING INTERNAL COMBUSTION ENGINES

Filed Jan. 16, 1929



INVENTOR.

Frederick H. Royce

BY

Annally Bro

ATTORNEY

UNITED STATES PATENT OFFICE

FREDERICK HENRY ROYCE, OF WEST WITTERING, NEAR CHICHESTER, ENGLAND, AS-
SIGNOR TO ROLLS ROYCE LIMITED, OF DERBY, ENGLAND

ELECTRICAL TURNING GEAR FOR STARTING INTERNAL-COMBUSTION ENGINES

Application filed January 16, 1929, Serial No. 332,938, and in Great Britain February 14, 1928.

This invention has reference to electrical turning gear for starting internal combustion engines of the type in which the axial movement of the shaft of the starting motor, under magnetic force and against the reaction of a spring carries a pinion into engagement with a toothed wheel geared to the engine and closes a switch of an electric circuit.

In such mechanisms there are generally two springs reacting against the movement of the shaft by the magnetic force, to wit: the spring which normally locates the shaft relative to the body of the motor and the spring which normally holds open the switch which the movement of the shaft closes: and as the magnetic end-pull causing the shaft to move axially, rapidly decreases as the shaft comes into its working position, while the tension of the springs reacting against the movement is augmenting, there is difficulty in ensuring that the axial movement of the shaft shall be completed, and any failure in that respect is inimical to proper functioning of the apparatus.

According to this invention in lieu of closing a switch by the movement of the shaft the closing of such switch is effected by a spring seeking at all times to close it, and means are provided inhibiting the action of the spring in all axial positions of the shaft except its working position, when the lever is released.

In the accompanying drawings is shown an example of my invention.

Fig. 1 is a section of the starter motor case with the armature and commutator in elevation. Fig. 2 is a repetition of a portion of Fig. 1 showing the parts constituting the subject of this invention to an enlarged scale, and Fig. 3 is a section of Fig. 2 on the line 3-3.

a is a bracket forming part of the engine crankshaft case. a^1 is the case of the starter, a^2 the armature, a^3 the commutator, a^4 a cover enclosing the end of the case and carrying a flanged sleeve a^5 , which carries the bearing bush a^6 , a^7 is the motor shaft and a^8 the pinion to be engaged with the fly wheel a^9 . b is a housing for the end of the shaft and members now to be described, b^1 a bearing bush,

b^2 the outer race of ball bearings of a rod b^3 extending down a tunnel in the shaft a^7 fixed for rotation, but axially slidable, in relation to the shaft all for purposes not pertinent to this invention. c is a bracket made of insulating material secured to the housing by means of studs c^1 and nuts c^2 , c^3 is a metal plug located in a hole through the bracket c , provided with a threaded terminal c^4 , c^5 is a flat annular terminal of the cable c^6 (being part of one of the controlling circuits of the starter) connected to the metal plug by means of the washer c^7 and nut c^8 , and c^9 is a fixed contact having formed integral therewith a hexagon for adjusting purposes, and a threaded shank which is screwed into a tapped hole in the metal plug c^3 and secured by the lock nut c^{10} . d is a lever rocking on the fulcrum d^1 carrying on one arm a contact d^2 and having formed thereon a projection d^3 to locate and secure one end of a spring d^4 , the other end of which is anchored in a recess d^5 formed in the housing. The extreme end d^6 of the other arm of the lever d protrudes through an aperture in the said housing and rests on the end of the shaft. The action of the described mechanism is such that the contact d^2 is normally out of engagement with the contact c^9 but when the shaft has been moved axially so that the pinion a^8 is in engagement with the wheel a^9 and hence the other end of the shaft in the position indicated by the dotted line d^7 , the end d^6 of one arm of the lever will pass behind the end of the shaft under the influence of the spring d^4 , and the contact d^2 will come into engagement with the contact c^9 , thus completing a circuit of which the cable c^6 forms part, and bringing about the functioning of the apparatus.

What I claim is:—

1. In electric turning gear for starting internal combustion engines of the type in which the axial movement of the shaft of the starting motor under magnetic force carries a pinion into engagement with a toothed wheel geared to the engine, and causes the closing of an electric circuit, the combination of a switch in the said circuit adapted normally open, a spring adapted to close such

switch and means inhibiting the action of such spring except when the pinion is in engagement.

2. In electric turning gear for starting internal combustion engines of the type in which the axial movement of the shaft of a starting motor carries a pinion into engagement with a toothed wheel geared to the engine, and causes the closing of an electric circuit, the combination of a switch adapted normally open, a spring adapted to close such switch, and means inhibiting the action of such spring except when the pinion is in engagement, consisting of a two arm right angle lever, one arm of which is engaged by the motor shaft at all times except when the pinion is engaged, and the other arm of which carries a seating of the spring.

3. In electric turning gear for starting internal combustion engines of the said type, the combination claimed in claim No. 2, the said other arm of the lever carrying the moving terminal of the switch.

In testimony whereof I have hereunto affixed my signature.

FREDERICK HENRY ROYCE.

30

35

40

45

50

55

60

65