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COMBINED ELECTRIC LIGHTING AND STARTING APPARATUS FOR MOTOR VEHICLES.

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1,194,607. Patented Aug. 15, 1916.

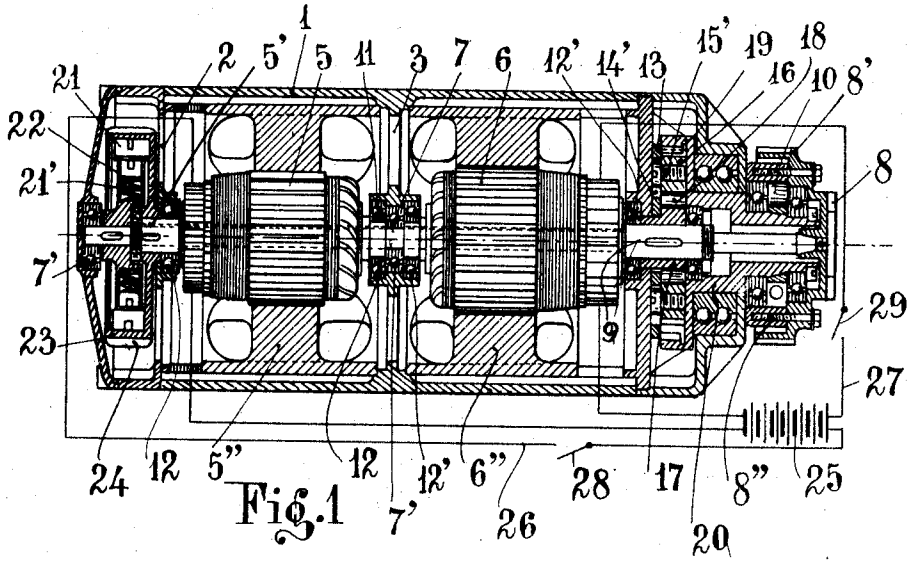


Fig. 1

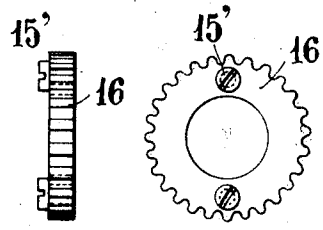


Fig. 3

Fig. 4

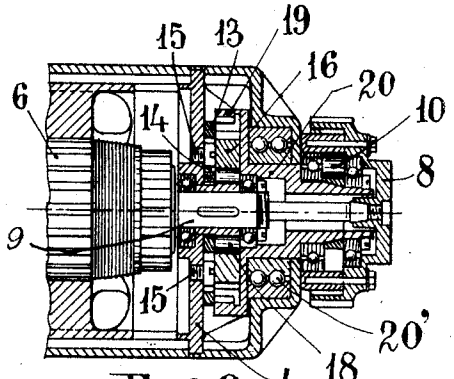


Fig. 2

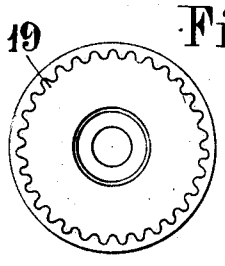


Fig. 5

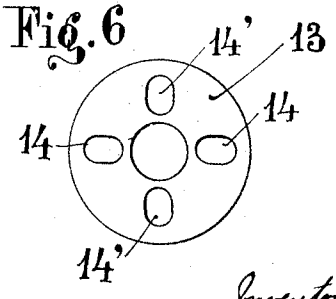


Fig. 6

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UNITED STATES PATENT OFFICE.

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COMBINED ELECTRIC LIGHTING AND STARTING APPARATUS FOR MOTOR-VEHICLES.

1,194,607. Specification of Letters Patent. Patented Aug. 15, 1916.

Application filed April 12, 1915. Serial No. 20,942.

To all whom it may concern:

Be it known that we, LUIGI DUCA and ERCOLE NALDINI, residing at Turin, Italy, have invented certain new and useful Improvements in Combined Electric Lighting and Starting Apparatus for Motor-Vehicles, of which the following is a specification.

This invention relates to an improved electric apparatus intended to be used in motor cars and generally in vehicles operated by explosive engines for effecting the starting of the engine and for generating the electric current used for the ignition in the engine as well as for lighting and heating the vehicle and for other purposes, a battery being used for storing the energy thus produced and supplying it to the starting motor and for other purposes.

In the apparatus according to this invention the various parts are so combined as to reduce to a minimum the space required by the apparatus, the coupling of the starting motor and dynamo with the explosion engine being obtained by very simple means and further the transmitting ratio between the starting motor and explosion engine is reduced in such a way as to prevent the battery from being subjected to large discharges.

In the annexed drawing one construction of the apparatus according to this invention is shown, and Figure 1 is a central longitudinal section; Fig. 2 is a central longitudinal section on a plane perpendicular to that of Fig. 1; Fig. 3 is a side view of the toothed rim of the speed reducing gear inserted between the starting motor and the explosion engine; Fig. 4 is a front view of the same; Fig. 5 is a front view of the corresponding toothed sleeve and Fig. 6 is a front view of the disk arranged between the toothed rim and the stationary partition of the casing.

As shown in the drawing, the cylindrical casing 1 is provided with partitions 2, 3 and 4 forming chambers in which are arranged concentrically a dynamo and a starting electromotor. The rotor 5 of the dynamo is mounted on a hollow shaft 5′ pivoted on ball bearings 12 arranged in the partitions 2 and 3, and said hollow shaft is coupled by means of a suitable friction clutch hereinafter described with a central shaft 7 which in turn is connected by means of either an Oldham joint 8 or the pinion 8′ with the shaft of the explosion engine not shown. The rotor 6 of the starting electromotor is similarly mounted on a hollow shaft 9 pivoted on ball bearings 12′ arranged in the partitions 1 and 3, said hollow shaft being concentric with the shaft 7 and connected with one element of a speed reducing gear hereinafter described, the other element of which is connected with the engine shaft by means of a free wheel mechanism 10 secured on shaft 7. The shaft 7 is pivoted on ball bearings 7′ secured to the partitions of the casing.

The speed reducing gear inserted between the starting motor and the explosion engine shaft comprises a disk 13 (Fig. 6) provided with two sets of slots 14, 14′ arranged at 90° with regard to each other; the slots 14 are engaged by the pins 15 secured to the partition 4 and the slots 14′ are on the contrary engaged by pins 15′ projecting from one of the sides of a toothed rim 16 shown in Figs. 3 and 4. Said rim is mounted adjacent to the disk 13 and is provided with a central hole in which is engaged an eccentric 17 solid with the shaft 9. Antifriction members shown in form of rollers 18 are inserted between rim 16 and eccentric 17.

Owing to the arrangement described the rim 16 is eccentric with regard to the axis of casing and shaft 9 and meshes with an inner toothed sleeve 19 (Fig. 5). This sleeve has a larger diameter than rim 16 and is solid with a sleeve 20 pivoted on ball bearings 20′ and connected by means of a free wheel mechanism of any kind with an outer box 8″ provided with means for being coupled with the engine shaft.

The outer sleeve 8″ is intended to be coupled by any suitable means with the explosion engine shaft, and to that end is provided with a pinion 8′ and with one element 8 of a known Oldham joint, the pinion being intended to mesh either directly or by means of a chain with the engine shaft or with another shaft connected therewith. The Oldham joint is on the contrary used when the apparatus is arranged in alinement with the shaft by which it is driven. Obviously the preferred coupling is used according to the position of the apparatus with regard to the engine.

In order to maintain as constant as possible the speed of the rotor 5 of the dynamo a suitable friction coupling is inserted between the shaft 5′ of said rotor and the driving shaft 7. One construction is shown

by way of example in the drawing, and comprises friction blocks 21 sliding in guides 21′ solid with shaft 7 and pushed by springs 22 against the rim 23 which is solid with the shaft 5′ of the rotor of the dynamo. The springs 22 and the centrifugal force acting to push the blocks 21 against said rim 23 are counteracted by the centrifugal force acting on suitable weights connected to the blocks 21 by means of pivoted arms not shown, so that the friction between blocks 21 and rim 23 is reduced when the speed of the shaft 7 is increased and thereby the speed of the rotor of the dynamo is maintained constant as far as possible.

Preferably wings 24 are provided on the outer periphery of the rim 23, said wings being intended to create an air stream in order to ventilate the inner chambers of the casing 1 which communicate with each other by means of holes in the partitions of the casing.

The electric parts of the apparatus are completed by suitable windings arranged on the cores 5″ and 6″ and contacting brushes coöperating with the commutators of the dynamo and motor; these parts are not shown in the drawing for clearness.

A storage battery 25 is connected with the described apparatus by means of wires 26, 27 and the switches 28, 29 allow of inserting either the dynamo 5 or the electromotor 6 in the circuit of said battery.

When the explosion motor of the vehicle is running the shaft 7 connected therewith operates the dynamo rotor by means of the speed regulating coupling 21—23, and the storage battery is charged, said battery being inserted in the circuit of the dynamo by means of the switch 28. On the contrary when the explosion engine is at rest and it is desired to start it, the switch 29 is operated so as to connect the battery with the electromotor 6. Then the hollow shaft 9 is put in rotation together with the eccentric 17 which drives the rim 16. This latter does not rotate as it is connected by means of pins 15′ with the disk 13 which in turn is connected with the stationary partition 4 by means of the pins 15 but it is able to be displaced circularly around the axis of the shaft 7, this motion resulting from the combination of the rectilinear movement of the rim 16 with regard to the disk 13 allowed by the slots 14′ engaging the pins 15′ and the rectilinear movement of the disk 13 with regard to the partition 4, this latter movement being obtained by the slots 14 engaged by the pins 15 and being perpendicular to the other one. In this way the rim 16 meshing with a portion of the rim 19 rolls on this latter and transmits to it a continuous rotation at very reduced speed, said rim 19 being rotated a number of teeth equal to the difference between teeth of rims 16 and 19 when the shaft 9 and eccentric 17 are making one turn. By means of this arrangement the rotation of the rotor of the electromotor is imparted to the rim 19 and to the shaft of the explosion engine with a very reduced gear ratio, the explosion engine being thus easily started.

The current supplied by the dynamo and battery connected therewith is utilized in any known manner for lighting and heating the vehicle and for other purposes.

According to this invention a combined electric lighting and starting device is obtained requiring a very reduced space and in which both the dynamo and starting electromotor are connected with the explosion engine shaft by means of a single transmitting member, each of them being further capable of operating at its proper speed.

Owing to its construction and to the reduced space required the improved apparatus may be mounted in very easy manner in any kind of motor cars, boats and vehicles propelled by explosion engines by securing it by any suitable means to the bars of the frame or to the motor itself. Further it may be arranged either in alinement with one of the shafts of the engine (camshaft, water circulating pump shaft or the like) being driven by the same by means of an Oldham joint or parallel with the engine shaft being coupled to it by means of pinion 8′ either directly or by a chain; in any case it is not required of cutting teeth in the fly wheel of the engine thus saving considerable expense and trouble.

What we claim as our invention and desire to secure by United States Letters Patent is:—

1. In a combined electric lighting and starting apparatus for vehicles driven by explosion engines, a casing, a dynamo and a starting electromotor in alinement with each other in said casing, hollow shafts for the rotors of the dynamo and electromotor, an inner concentric shaft connected by one end with the dynamo shaft and by the other end with the electromotor shaft, means for coupling the electromotor shaft with the explosion engine shaft in a single direction and with reduced ratio.

2. In a combined electric lighting and starting apparatus for vehicles driven by explosion engines, a casing, a dynamo and a starting electromotor in alinement with each other in said casing, hollow shafts for the rotors of the dynamo and electromotor, an inner concentric shaft passing through said hollow shafts, a speed regulating coupling connecting the inner shaft with the dynamo shaft, a speed reducing gear between the starting electromotor shaft and a concentric sleeve, a free wheel mechanism on said sleeve, a member operated by the free wheel mechanism and connected with

said inner shaft, and means for coupling said member with the engine shaft.

3. In a combined electric lighting and starting apparatus for vehicles driven by explosion engines, a casing, partitions forming chambers in said casing, a dynamo and a starting electromotor, each arranged in one of said chambers and in alinement with each other, hollow shafts for the rotors of the dynamo and electromotor, an inner concentric shaft, bearings in said partitions for said shafts, means for connecting the inner shaft with the dynamo shaft, means for coupling the inner shaft with the explosion engine shaft, and a reduction gearing between the motor and the engine shaft.

4. In a combined electric lighting and starting apparatus for vehicles driven by explosion engines, a casing, holed partitions forming communicating chambers in said casing, a dynamo and a starting electromotor each arranged in one of said chambers and in alinement with each other, hollow shafts for the rotors of the dynamo and electromotor, an inner concentric shaft, bearings in said partitions for said shafts, means for coupling the inner shaft with the dynamo shaft, said means comprising a rim having blades on the outer periphery for ventilating the casing, and means for connecting the electromotor shaft with the engine shaft in a single direction and with reduced ratio.

In testimony whereof we have signed our names to this specification in the presence of two subscribing witnesses.

LUIGI DUCA.
ERCOLE NALDINI.

Witnesses:
CARLO TORTA,
HELEN PERRY.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."