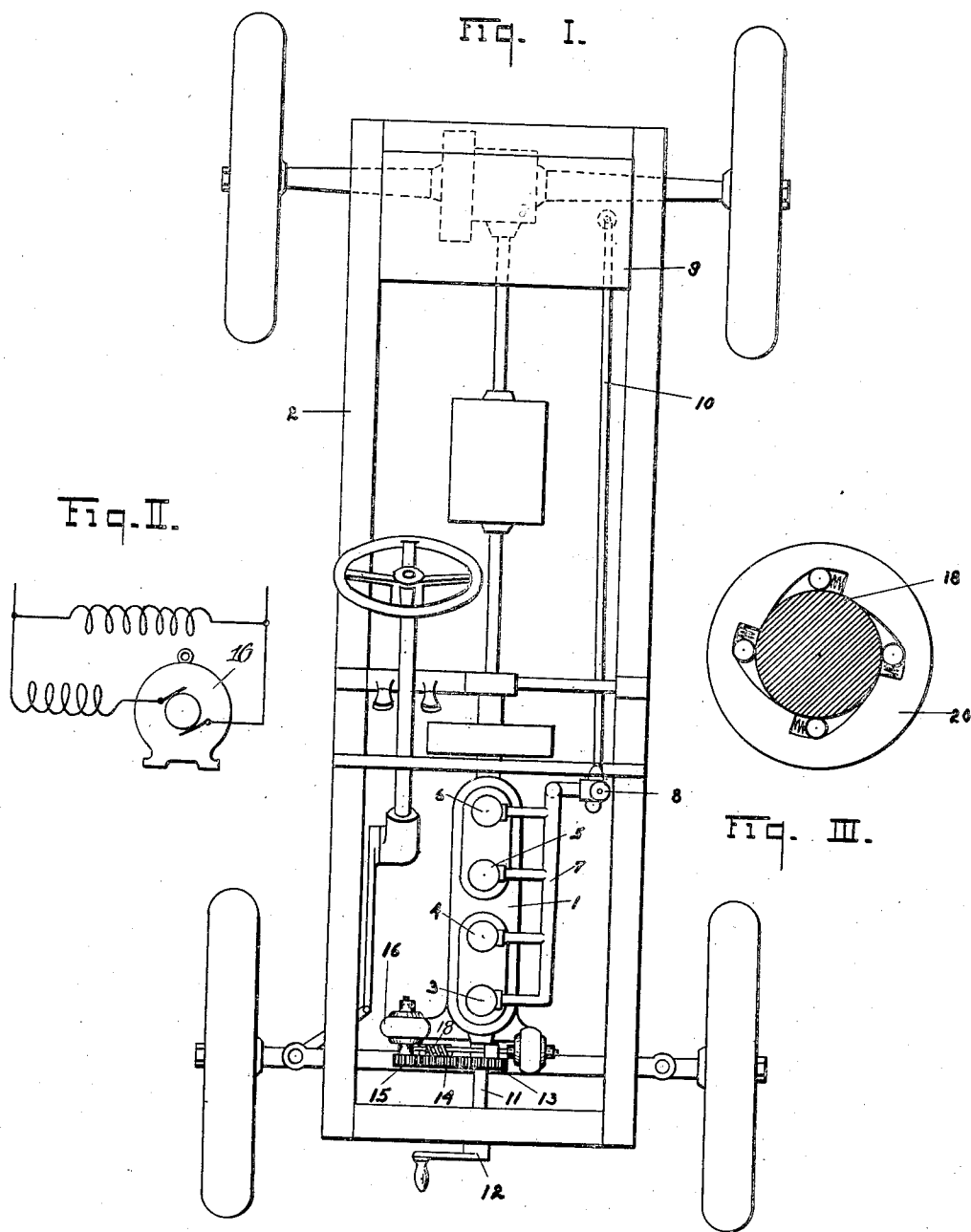


J. A. HEANY.
 DYNAMO ELECTRIC STARTING, LIGHTING, AND IGNITION MECHANISM FOR AUTOMOBILES.
 APPLICATION FILED NOV. 3, 1917.

1,328,873.

Patented Jan. 27, 1920.
 3 SHEETS—SHEET 1.



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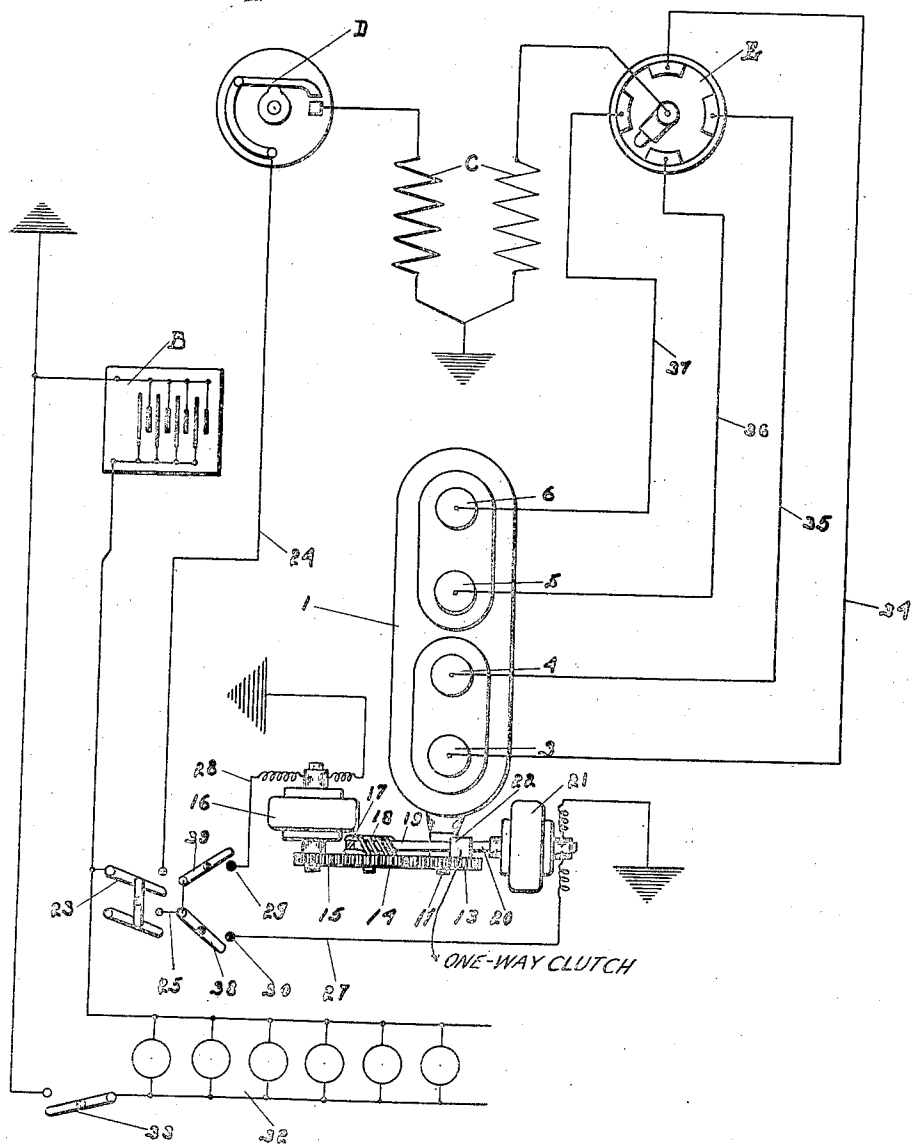


FIG. IV.

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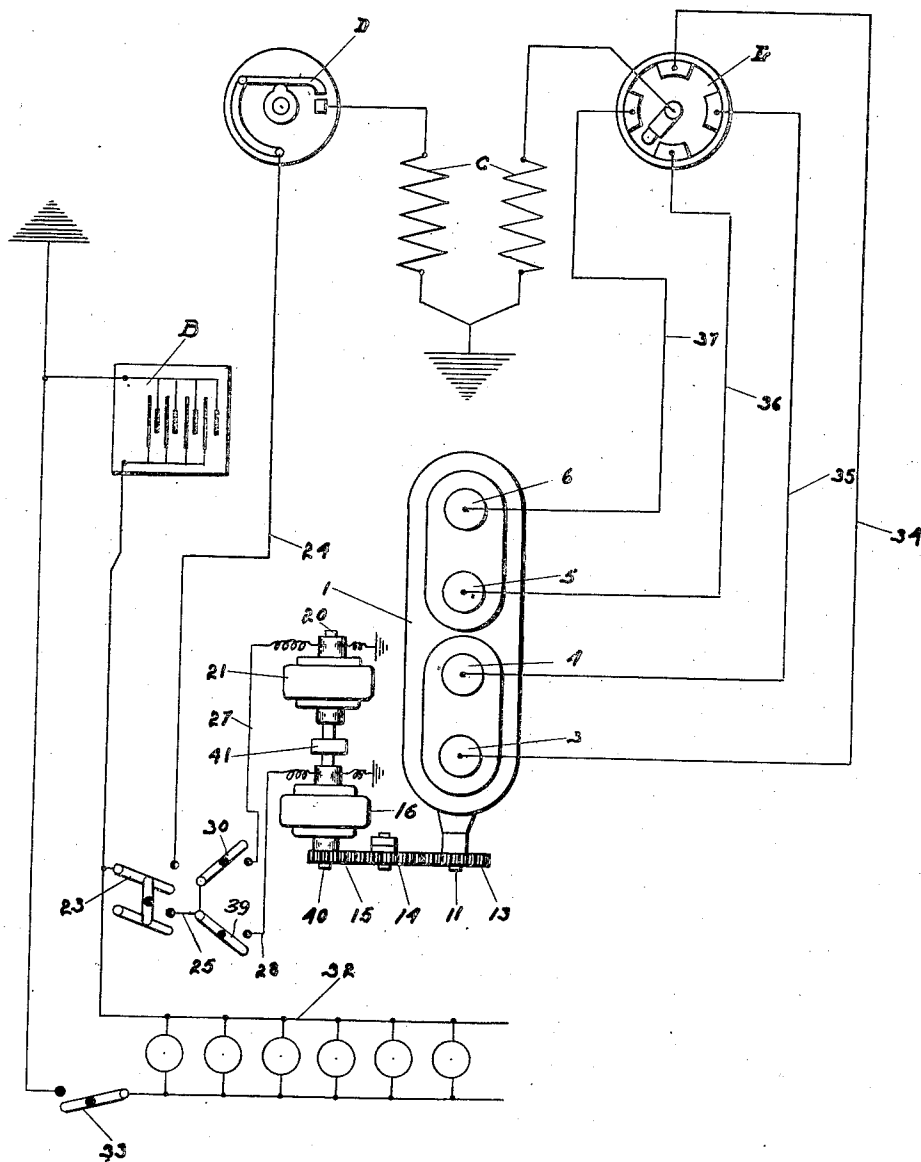


Fig. V.

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UNITED STATES PATENT OFFICE.

JOHN ALLEN HEANY, OF JERSEY CITY, NEW JERSEY, ASSIGNOR, BY MESNE ASSIGNMENTS, TO INDUSTRIAL RESEARCH CORPORATION, A CORPORATION OF DELAWARE.

DYNAMO-ELECTRIC STARTING, LIGHTING, AND IGNITION MECHANISM FOR AUTOMOBILES.

1,328,873.

Specification of Letters Patent.

Patented Jan. 27, 1920.

Original application filed August 1, 1910, Serial No. 574,774. Divided and this application filed November 3, 1917. Serial No. 200,092.

To all whom it may concern:

Be it known that I, JOHN ALLEN HEANY, a citizen of the United States, and a resident of Jersey City, in the county of Hudson and State of New Jersey, have invented certain new and useful Improvements in Dynamo-Electric Starting, Lighting, and Ignition Mechanism for Automobiles, of which the following is a full, clear, and exact description, whereby any one skilled in the art may make and use the same.

This invention relates to means for translating electrical energy into motive power for starting an engine and means for translating the motive power of the engine into electrical energy for the starting mechanism and the lighting and ignition system to be used in conjunction with an automobile. This application is a division of my co-pending application, Serial No. 574,774, filed August 1st, 1910.

In the utilization of electrical devices for starting and generating purposes in connection with automobiles, it is essentially desirable that all unnecessary parts be eliminated; and that parts capable of use in more than one relation should preferably be employed. It is further highly desirable that when necessary, the whole effective power of the system may be employed.

The principal object, therefore, of my invention is to provide electrical mechanism, including a plurality of dynamo-electric machines, all of which may be utilized for the purpose of starting the engine; and a part of which may be employed for generating electrical energy for the lighting, charging and ignition system.

A further object is to accomplish the aforesaid object and at the same time maintain the necessary electrical and mechanical efficiency of the system.

Further objects, and objects relating to economies of manufacture and details of construction, will definitely appear from the detailed description to follow.

I accomplish the objects of my invention by the devices described in the following specification; my invention is clearly defined and pointed out in the appended claims.

A structure constituting a preferred em-

bodiment of my invention is illustrated in the accompanying drawing, forming a part of this specification, in which:

Figure I illustrates my invention embodied in an automobile, the storage battery not being shown.

Fig. II is a diagrammatic view illustrating the differentially wound dynamotor.

Fig. III illustrates a form of clutch which may be used to connect the motor shaft to the dynamotor shaft.

Fig. IV and Fig. V illustrate various ways of connecting the dynamo electric machines with their circuits.

In the drawings, similar reference numerals refer to similar parts throughout the several views.

As illustrated in the drawings, the engine 1 is shown as mounted upon the chassis frame 2, and provided with cylinders, 3, 4, 5 and 6, which receive their fuel supply in any well-known manner as through the manifold 7 and carbureter 8, the fuel being supplied from the main tank 9 through a connecting tube 10.

The engine shaft 11 is shown as projecting forward and terminating in a starting crank 12, which, of course, may be used for initially starting the engine to charge the battery hereinafter described.

Upon the shaft of the engine is a gear 13 meshing with an intermediate gear 14, which in turn is in mesh with the generator gear 15, these gears being so arranged as to drive the motor dynamo 16, as the engine shaft is rotated.

On the rear face of the gear 14, is shown a worm gear 17, in mesh with a worm 18, upon the worm or secondary shaft 19. This worm shaft 19 has a direct connection with the shaft 20 of the motor 21 through the one-way clutch device 22. Any known form of one-way clutch may be utilized, the form here shown in Fig. IV being the friction ball over-running clutch.

The function of the clutch 20 is to provide a connection between the generator shaft 17 and the motor shaft 18 which will transmit torque from the motor to the engine and will not transmit torque from the engine to the motor.

B denotes a storage battery which,

through a switch 23 connects said battery to the ignition line circuits 24 and to a motor and motor dynamo line circuit 25, which latter is controlled by switch blades 38, 39, so that the motor and motor dynamo circuits 27 and 28 may be both connected at the same time to the battery B.

A load circuit, shown herein as the lighting circuit 32 is controlled by a switch 33.

Any desired form of ignition may be employed, as for instance, the induction coil, high tension or low tension types in common use. A diagrammatic showing of the ignition system is illustrated in Fig. IV, where the make and break D is connected in the circuit 24 to the coil C and thence to a distributor E, the stationary contacts of which are connected to the insulated terminals of the spark plugs of the engine cylinders through circuit wires 34, 35, 36 and 37.

In operation the switch 23 is closed, connecting the line 25 and the ignition line 24. Thereupon, the switch 26 is thrown to connect the terminals 29 and 30 with the motor line 27 and generator line 28. The motor and motor dynamo then start up under full battery voltage; the motor dynamo adding its torque to that of the motor, and transmit the initial motive impulse to the engine. As soon as the engine has been started and the worm shaft speed exceeds that of the motor 21, the clutch device 22 will slip and torque will not be transmitted to the motor shaft from the engine. The switch 26 is then thrown so as to disconnect the motor 21, the motor dynamo 16 acting as a generator, remaining in closed connection with the storage battery so that the battery B is re-charged.

The motor dynamo 16 is preferably a machine adapted to give a practically constant voltage when connected with the battery, throughout the varying speeds characteristic of the internal combustion engine. The particular type of motor dynamo here employed is shown in Fig. II as a differentially wound compound machine, the reversed series winding compensating for variation of voltage due to speed variations, when charging, and adding its flux to that of the shunt field winding when operating as a motor in starting, according to the characteristics of a cumulatively compounded machine.

It is preferred to use a series-wound motor 21, with a low resistance winding, which is adapted to give a large starting torque with high wattage, and as it is geared to the engine shaft through a reducing speed-gear train, it will readily give, in conjunction with the motor dynamo, the initial movement to said shaft for securing the compression and firing of the cylinders to start the engine. When the motor 21 is

thus driving, the clutch device 22, illustrated more in detail in Fig. III, will connect the motor shaft for positively driving the train of gears.

In Fig. IV is shown a modified form of switch connection intermediate the motor 21, the motor dynamo 16 and the battery B, whereby the motor and dynamo may be connected independently or simultaneously with the storage battery by means of the switches 38 and 39 constantly in closed position employing the motor switch 38 and ignition switch 23 only. This form of connection is further exemplified in Fig. V where the generator switch is dispensed with, a permanent connection being made between circuits 25 and 28.

In Fig. V a modified disposition of the electrical units is disclosed in which the motor shaft 20 and dynamo shaft 40 are axially disposed with reference to each other, an operative interconnection being maintained between the two shafts in a one-way clutch 41. This particular arrangement permits of the employment of a single gear train 13, 14, and 15 between the electrical motive axis and the engine crank shaft; it further lends itself to the attainment of great economy in space,—a feature very desirable in automobile construction.

It is, of course, apparent that the switch devices might be automatically controlled from the motor and motor dynamo shafts so that the switching of the battery circuit from the motor to the motor dynamo circuit could be accomplished automatically. Similarly, the details of connections intermediate the motor dynamo, the motor and the engine shaft as well as those of the controlling switches or devices may be varied to suit the exigencies of any particular case, it being most desirable to provide connections which will give a proper ratio for starting the engine from the motor and a suitable ratio between the engine and the motor dynamo shaft with manually operated or automatically operated switching devices for giving the proper circuit connections between said devices and the source of power.

I am aware that this particular embodiment of my invention is susceptible of considerable variations without departing from the spirit of my invention, and, therefore, I desire to claim the same broadly, as well as specifically, as indicated by the appended claims.

Having thus described my invention, what I claim as new and desire to secure by Letter Patent, is:

1. The combination with an engine, of a starting and generating system therefor, comprising a storage battery; a motor dynamo normally functioning as a generator to

charge said battery, and having constant operative connection with the engine; a motor independent of the dynamotor, and adapted in conjunction with the motor dynamo operating as a motor to start the engine; means connecting the motor and engine operative for transmitting torque in a direction from the motor to the engine only; and circuits and switches for connecting the battery to the motor and motor dynamo.

2. The combination with an engine, of a starting, lighting and ignition system therefor, comprising a storage battery, dynamo-electric machines operatively connected with the engine; circuits and switches connecting the storage battery with the dynamo-electric machines, all of said dynamo-electric machines being effective to start the engine, and a portion of said dynamo-electric machines being adapted to generate current for charging said storage battery, lighting and ignition purposes when the engine is operating under its own power.

3. The combination with an engine, of a starting, lighting and ignition system therefor, comprising a storage battery; electrical transmitting devices, including a motor and motor dynamo, operatively connected to the engine; and circuits and switches connecting the storage battery with the electrical devices, the motor being rendered inoperative, and the motor dynamo functioning as a generator to charge said battery, when the engine starts up under its own power.

4. The combination with an engine having ignition means including a timer and distributor, of an electrical system therefor, comprising a storage battery; a motor dynamo normally functioning as a generator to charge said battery and having constant operative connection with the engine; a motor, independent of the motor dynamo and adapted in conjunction with the motor dynamo to start the engine; means connecting the motor and engine operative for transmitting torque in a direction only from the motor to the engine; and circuits and switches for connecting the battery to the motor, motor dynamo, and ignition means.

5. The combination with a variable speed engine, of a starting, lighting and ignition system therefor, comprising a storage battery; a motor dynamo, normally functioning as an approximately constant voltage generator when connected to said storage battery to charge the same and having permanent operative connection with the engine; a motor, independent of the motor dynamo, and adapted in conjunction with the motor dynamo to start the engine; means connecting the motor and engine operative for transmitting torque in a direction from the motor to the engine only; lighting and ignition means adapted to receive constant

pressure current from the motor dynamo when functioning as a generator; and circuits and switches for connecting the battery to the motor and motor dynamo.

6. The combination with a variable speed engine, of a starting and generating system therefor, comprising a storage battery; a motor dynamo normally functioning as a generator when connected to the storage battery to charge the same; a motor independent of the motor dynamo; gearing between the motor and engine; gearing between the motor dynamo and engine; the gearing between the motor and the engine giving a greater leverage than the gearing between the motor dynamo and the engine; both said motor and motor dynamo operating as a motor being adapted for cranking the engine through the gearing; means connecting the motor and engine operative for transmitting torque in a direction only from the motor to the engine; and circuits and switches for connecting the battery to the motor and motor dynamo.

7. The combination with a variable speed engine, of a starting and generating system therefor, comprising a storage battery; a motor dynamo normally functioning as a generator to charge said battery, and having constant operative connection with the engine; a motor independent of the motor dynamo and adapted to function concurrently with the motor dynamo operating as a motor to start the engine through said generator connections; means connecting the motor and engine operative for transmitting torque from the motor to the engine only; and circuits and switches for connecting the battery to the motor and motor dynamo.

8. The combination with a variable speed engine, of a starting and generating system therefor, comprising a storage battery; a motor dynamo normally functioning as a generator to charge said battery; a motor independent of the motor dynamo; driving connections intermediate the motor dynamo and engine and the motor and engine, said connections being in part common, said motor and motor dynamo operating as a motor being adapted to exert torque conjointly through the connections to start the engine; means intermediate the motor and motor dynamo for transmitting torque operative in a direction from the motor to the engine, and inoperative in a direction from the engine to the motor; and circuits and switches for connecting the battery to the motor and motor dynamo.

9. The combination with an internal combustion engine, of a starting and generating system therefor, comprising a storage battery; a motor dynamo capable of functioning either as a generator to charge said battery or as a motor and having an operative

connection with the engine; a motor independent of the motor dynamo and having an operative connection with the engine; a circuit including the battery; and means for
 5 permitting concurrent connecting of both the motor and the motor dynamo in the battery circuit at the same time.

10 10. The combination with an internal combustion engine, of a starting and generating system therefor, comprising a storage battery; a motor dynamo capable of functioning either as a generator to charge said battery or as a motor and having an operative connection with the engine; a motor independent of the motor dynamo and having an
 15 operative connection with the engine; a circuit including the battery; and means for permitting the connection of the motor dynamo in the battery circuit or the connection
 20 of both the motor and motor dynamo in the battery circuit.

11. The combination with an internal combustion engine, of a starting and generating system therefor, comprising a
 25 storage battery; a motor dynamo capable of functioning either as a motor or a generator for charging said battery and having a permanent driving connection with the engine; a motor independent of the motor dynamo
 30 and having a driving connection with the

engine transmitting torque only in the direction from the motor to the engine; a circuit including the battery; and means for permitting the connection of the motor dynamo in the battery circuit or the connection
 35 of both the motor and motor dynamo in the battery circuit.

12. The combination with an internal combustion engine, of a storage battery; a starting motor; a motor dynamo normally
 40 functioning as a generator for charging said battery; a driving connection between the motor dynamo and the engine; a driving connection between the motor and the engine; circuits and switches connecting the
 45 battery with the motor and motor dynamo; and means permitting the functioning of the motor dynamo as a motor to assist the starting motor during the starting operation.

13. The method of operating a combination comprising an internal combustion engine, a storage battery, and a plurality of
 50 dynamo electric machines, which comprises concurrently supplying energy from the battery to operate all of said machines as motors to exert starting torque on the engine
 55 and then operating less than all of said machines as generators to charge the battery.

In witness whereof I affix my signature.
 JOHN ALLEN HEANY.