No. 745,157. PATENTED NOV. 24, 1903.

C. J. COLEMAN.

MEANS FOR OPERATING MOTOR VEHICLES.

APPLICATION FILED FEB. 11, 1901.

NO MODEL. 2 SHEETS—SHEET 1.

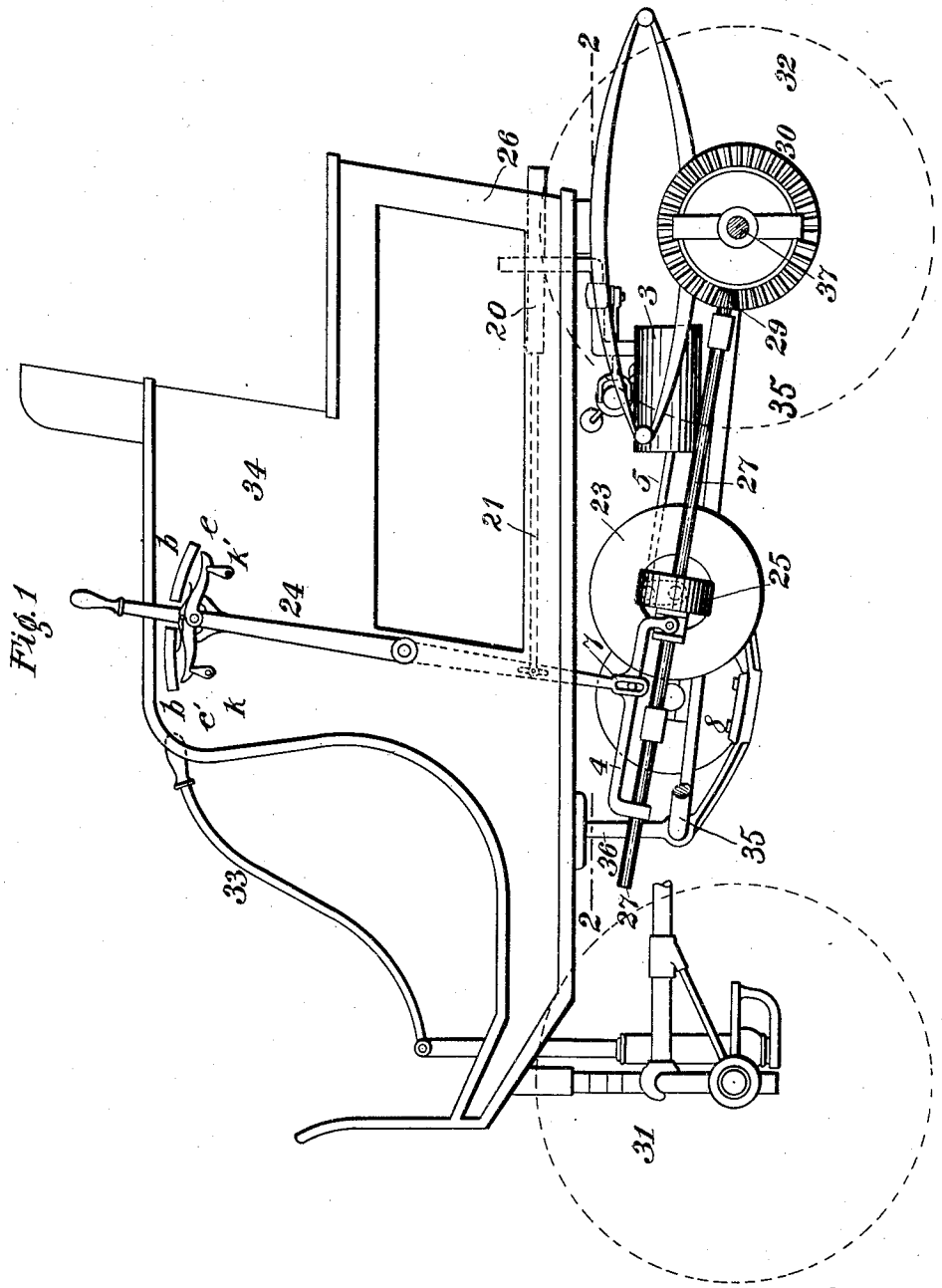

Fig. 1

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NO MODEL. 2 SHEETS—SHEET 2.

Fig. 2

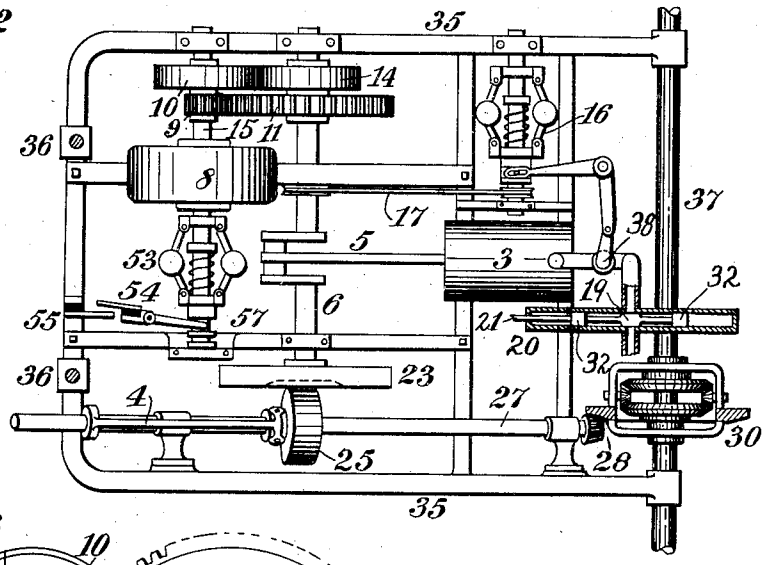


Fig. 3

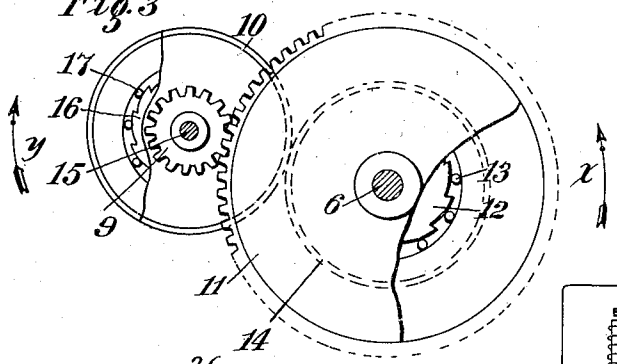
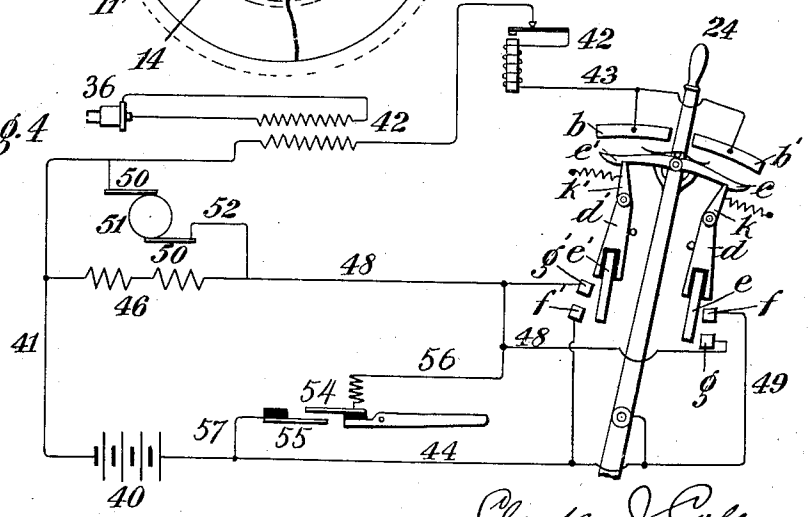


Fig. 4



Witnesses
Bert E. Jones.
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Clyde J. Coleman
Inventor

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No. 745,157. Patented November 24, 1903.

UNITED STATES PATENT OFFICE.

CLYDE J. COLEMAN, OF NEW YORK, N. Y., ASSIGNOR TO ROCKAWAY AUTOMOBILE COMPANY, OF ROCKAWAY, NEW JERSEY, A CORPORATION OF NEW JERSEY.

MEANS FOR OPERATING MOTOR-VEHICLES.

SPECIFICATION forming part of Letters Patent No. 745,157, dated November 24, 1903.

Application filed February 11, 1901. Serial No. 46,789. (No model.)

To all whom it may concern:

Be it known that I, CLYDE J. COLEMAN, a citizen of the United States, and a resident of the borough of Manhattan, in the county of New York, city of New York, and State of New York, have invented new and useful Improvements in Means for Operating Motor-Vehicles, &c., of which the following is a specification, reference being had to the accompanying drawings, forming part thereof.

This invention relates to means for operating motor-vehicles, &c., and the means embodying my invention are particularly adapted for use in connection with explosive or internal-combustion engines, such engines being non-starting.

According to my invention means are provided for starting the engine by the application of power thereto and for utilizing the power of the engine when the engine is self-actuated for the purpose of storing energy, these means and the engine being connected by differential connecting devices, and according to my invention these means comprise a motor-dynamo so connected.

My invention also includes the provision of means constructed so as to be readily actuated by the operator and initially operating the starting-motor and by further movement connecting the running-gear of the vehicle with the engine, such means permitting the engine to be started by the starting-motor while relieved of its load.

My invention also includes provision for the discontinuance of the self-actuation of the starting-motor after the engine has been started, so that such starting-motor has only to perform the work of starting the engine.

My invention also includes improved connecting means between the engine and running-gear, whereby connection and disconnection may be readily effected and the ratio of speed may be varied, so as to control the speed of the vehicle, and various improvements in construction and combination of parts.

I will now describe the means embodying my invention illustrated in the accompanying drawings and will thereafter point out the novel features in claims.

Figure 1 is a side elevation of a motor-vehicle or automobile provided with means embodying my invention. Fig. 2 is a horizontal section of a portion of the same on the plane indicated by the line 2 2 of Fig. 1. Fig. 3 is an enlarged side elevation, partly in section, of a differential gearing connecting the engine and motor-dynamo. Fig. 4 is a diagram of the electrical connections.

The motor-vehicle comprises a body 26, having a seat 34, front steering-wheels 31, rear driving-wheels 32, a steering-lever 33, and a controlling-lever 24, both of these levers being located in proximity to the seat and within easy reach of the operator.

The engine and the motor-dynamo 8 are shown as carried in a frame 35, pivotally supported at its front end in brackets 36 36, extending downward from the vehicle-body and pivotally supported at its rear end on the axle 37 of the rear driving-wheels 32. The engine shown is an explosive-engine of the reciprocating type, and its piston is coupled by the connecting-rod 5 with the crank and shaft 6. The crank-shaft 6 of the engine has a differential connection with the motor-dynamo 8, so that the motor-dynamo drives the engine at one ratio of speed, and the engine when self-actuated drives the motor-dynamo at another and different ratio of speed, and the ratio of speed when the motor-dynamo is the driver is such that the motor-dynamo revolves at high speed and the engine is actuated at low speed, and when the engine is the driver the motor-dynamo has a much higher speed relatively to the engine. This differential connection is shown as effected by two different sets of gearing, the small spur gear or pinion 9 being secured upon the shaft 15 of the motor-dynamo and meshing with the large spur-gear 11, loosely fitted upon the engine-shaft 6 and connected thereto by a friction-clutch consisting of a ratchet-wheel 12, secured upon the engine-shaft and arranged within the spur-gear 11, and of gripping-balls 13, playing between the ratchet-wheel 12 and an internal cylindrical surface of the gear 11, these gripping-balls being thrown outwardly when the gear 11 is rotated by the pinion 9 in the direction indi-

cated by the arrow, and thus locking the gear 12 to the engine-shaft 6. When the motor-dynamo is energized and operates as a motor, it will drive the gear 11 and through the clutch 12 13 the engine-shaft 6, and, as will be seen, will drive the engine-shaft at a comparatively slow speed and with considerable advantage of leverage. These are the conditions under which the motor-dynamo starts the engine.

The friction-gear 14, secured upon the engine-shaft, engages with the friction-gear 10, loosely fitted upon the motor-dynamo shaft and connected thereto by a clutch comprising a ratchet-wheel 16 and gripping-balls 17, similar to that connecting the spur-gear 11 and the engine-shaft. When motor-dynamo is the driver, the friction-gear 10 is disconnected from the motor-dynamo shaft 15, and the friction-gear 10 is slowly rotated by the friction-gear 14 independently of the motor-dynamo shaft.

When the engine is self-actuated, the power will be applied at the engine-shaft, and the clutch 12 13 will be released and the gear 11 permitted to rotate independently of the engine-shaft. The motor-dynamo shaft will now be actuated through the clutch in the friction-gear 10 in the direction indicated by the arrow *y*. The friction-gears 14 and 10 are shown as both of the same diameter, and therefore the motor-dynamo when driven by the engine is driven at a higher speed relatively to the engine than when the motor-dynamo is the driver. With this differential connection between the engine and the motor-dynamo comparatively little power will be required to start the engine. I am therefore enabled to employ a motor-dynamo of small dimensions, while at the same time the utilization of the motor-dynamo as a dynamo will be under favorable high-speed conditions.

In order to effectively employ the motor-dynamo as a dynamo for storing electrical energy, it is desirable that the engine shall be actuated at a constant speed, as an excess of speed in the motor-dynamo above a predetermined point would result in the impairment or destruction of the storage batteries. I therefore provide a centrifugal governor 16, driven by a belt 17 from the shaft 6 of the engine and automatically controlling the supply of motive medium thereto through a governing-valve 38 in the supply-pipe 39.

The supply of the motive or explosive medium or fluid to the engine is opened and closed by a valve 20, having a sliding gate 19 and stoppers 32 on each side thereof and on the same stem, and actuated by a rod 21 from the controlling-lever 24. As will be seen, the supply-valve 20 is so constructed that the initial movement of the controlling-lever in either direction will open it wide, and its wide-open condition will not be altered by further movement of the controlling-lever.

The running-gear of the vehicle is disconnected from the engine and motor-dynamo when the vehicle is at rest, but is connected thereto by the actuation of the controlling-lever 24, although such connection is not effected by the initial movement of the controlling-lever. This connection is effected by means of the friction-disk 23, secured upon the engine-shaft 6, and by the friction-wheel 25, fitted to rotate with but to slide longitudinally upon the connecting-shaft 27, such connecting-shaft 27 having its axis at a right angle to the axis of the engine-shaft 6 and extending rearwardly and provided with a bevel-pinion 28, meshing with a bevel-gear 30, forming part of an equalizing-gearing of the usual construction, applying power to the divided shaft of the rear driving-wheels in the well-known manner.

The friction-wheel 25 is connected to the controlling-lever 24 so that the actuation of the controlling-lever causes this friction-wheel to be moved longitudinally on the connecting-shaft 27, this connection being shown as effected by a yoke 4, having a bearing upon the connecting-shaft 27 at its front end and engaging with a collar on the hub of the friction-wheel 25 at its rear end and having a slotted connection 7 with the lower end of the controlling-lever 24.

In the position shown, with the vehicle at rest, the friction-wheel 25 is opposite a recess at the central portion of the friction-disk 23, and therefore receives no motion from the engine-shaft. The engine is thus disconnected from the driving-gear of the vehicle and does not have to overcome this load in starting. The connections of the controlling-lever 24 are such that the initial movement thereof closes a circuit for actuating the motor-dynamo and opens the supply-valve 20 and closes the sparking-circuit, but does not in its initial movement carry the friction-wheel 25 a sufficient distance to connect the engine and the driving-gear of the vehicle. Thus the motor-dynamo is energized and starts the movement of the engine with a great advantage of leverage, and the engine receives its supply of motive medium and is placed in condition for actuation and will of course very quickly become self-actuating. The further movement of the controlling-lever after its initial movement continues the conditions for the actuation of the engine, breaks the actuating-circuit of the motor-dynamo, and connects the engine with the driving-gear of the vehicle, this latter operation being effected by carrying the friction-gear 25 beyond the recess in the friction-disk 23 and into contact with the gripping-face of the friction-disk. It will also be noted that the first contact of the friction-gear 25 with the friction-disk 23 is near the axis of the disk, and therefore the initial actuation of the driving-gear will be attained under such conditions that the engine has considerable advantage of leverage, and thus the vehicle will be started up slowly, and to attain greater speed it will only be

necessary to further continue the movement of the controlling-lever, thereby moving the friction-gear 25 farther away from the axis of the friction-disk 23 and giving a greater speed to the vehicle driving-gear relatively to the speed of the engine.

The movement of the handle of the controlling-lever 24 in the forward direction will cause the movement of the friction-gear 25 rearward to connect the engine and running-gear, so that the engine will cause a forward movement of the vehicle. A rearward movement of the handle of the controlling-lever will move the friction-gear 25 forward and cause it to be actuated in the reverse direction, driving the vehicle rearward. The supply-valve 20 will be opened by movement of the controlling-lever in either direction, and the electric connections are duplicated on each side of the lever, and thus the vehicle may be driven forward and rearward under practically the same conditions of control.

The electrical connections are diagrammatically shown in Fig. 4. The source of electric energy is a storage battery 40, and this storage battery is charged when the motor-dynamo is operating as a dynamo and supplies electric current to the motor-dynamo to energize and actuate the same when the motor-dynamo is used as a motor and also during the operation of the engine supplies an electric current to an electric igniting or sparking circuit for igniting the gases within the engine-cylinder. The igniting or sparking circuit is closed at the switch-plates b and b' through the controlling-lever 24, which is of conductive material or is conductively connected with its pivot, and the primary circuit flows from the battery 40 through the wire 41, a primary coil of an induction-coil 42 and through a make-and-break device 42 and wire 43 to the switch-plate b or b', and from either switch-plate through the controlling-lever and the wire 44 back to battery. The secondary coil of the induction-coil is thus inductively energized and energizes the sparking device or plug 36, which would be located within the cylinder of the engine 3. If the ignition of the engine were accomplished by other than electrical means, this circuit would of course be unnecessary.

The controlling-lever is provided with latches c and c', which engage, respectively, with pivoted switch-plates d and d', normally held by springs in the position shown. When the controlling-lever is moved in a forward direction, the latch c actuates the switch-block d during the initial movement of the lever, but will soon pass over and release the switch-block, and the switch-block will be returned to normal position. When the switch-block d is thus actuated, its brush e will move in contact with the blocks f and g and will close the motor-actuating circuit as follows: from the battery 40 through wire 41, motor-dynamo field-coils 46, wire 48, block g, brush e, block f, and wires 49 and 44 back to battery. The armature is in a shunt-circuit branching from the wire 41 through the commutator-brushes 50, a commutator 51 and armature, and wire 52 to the wire 48, where it rejoins the field-magnet circuit above described. With these connections the motor-dynamo will be energized and will act as a motor to start the engine. When the switch-plate d is released and returns to normal position, the brush e passes back clear of the blocks f and g and the circuits above described are broken and the motor-dynamo is not energized. It is desirable to so adjust these connections that the motor-actuating circuit is broken at about the time the running-gear of the vehicle is connected to the engine. The motor-dynamo remains out of circuit until the engine attains its normal speed. When its normal speed is attained, the centrifugal governor 53, shown as on the shaft of the motor-dynamo 8, actuates a switch-plate 54 and closes the dynamo-circuit at the spring 55. This dynamo-circuit may be traced as follows: from battery 40 through wire 41, field-magnet coils 46, wire 48, wire 56, switch-plate 54, spring 55, and wire 57 back to battery and with the branch through the armature-circuit, as above described. The motor-dynamo now recharges the storage batteries and as it is actuated at a constant speed may recharge these batteries to saturation, but cannot injure the batteries for the reason that the speed of the motor-dynamo will not exceed the predetermined and proper speed for such charging. Should the speed of the engine fall below a normal or predetermined point, the centrifugal governor 53 will break the dynamo-circuit above described and the motor-dynamo will become electrically inactive.

The operation of the switch-plate d', actuated by the rearward movement of the controlling-lever, is exactly as above described, the switch-blocks f' and g' being bridged by the block e' during the initial rearward movement of the controlling-lever.

It is obvious that various modifications may be made in the construction shown in the drawings and above particularly described within the spirit and scope of my invention.

What I claim, and desire to secure by Letters Patent, is—

1. The combination of an engine, means controlling the power-supply thereof, running-gear of a vehicle, an auxiliary self-starting motor connected with the engine, means for controlling the power-supply of the self-starting motor and a controller located within reach of the operator and connected with the controlling means of the self-starting motor and the engine so as to successively actuate the same.

2. The combination of an engine, a valve for controlling the power-supply thereof, running-gear of a vehicle connected therewith, an auxiliary self-starting motor connected with

the engine, means for controlling the power-supply of the self-starting motor, and a controller located within reach of the operator and connected with the controlling means of the self-starting motor, such controlling means of the self-starting motor being provided with successive opening and closing parts and connected with the controller so that the initial movement of the controller starts the motor and the further movement thereof discontinues the power-supply of the motor, and the controller being connected to the controlling-valve of the engine so as to open the same during the operation of an opening part of the motor-controlling means and to maintain the same open during the operation of a closing part of the motor-controlling means.

3. The combination of an engine, running-gear of a vehicle connected therewith, means for starting the engine and for utilizing the power of the engine to store energy, and differential connecting devices between the engine and the starting and power-storing means, such differential connecting devices being controlled by the speed of the engine.

4. The combination of an engine, running-gear of a vehicle, means for starting the engine and for utilizing the power of the engine to store energy when the engine is self-actuated, a controlling-lever located within reach of the operator, such lever controlling the engine and the means for applying power to start the engine, and the means connecting the running-gear of the vehicle with the engine, and differential connecting devices between the engine and the starting and power-storing means, and controlled by the speed of the engine.

5. The combination of an engine, running-gear of a vehicle connected therewith, means for starting the engine and for utilizing the power of the engine to store energy when the engine is self-actuated, a controlling-lever located within reach of the operator, such lever controlling the engine and the means for starting the engine and storing energy, and differential connecting devices between the engine and the starting and power-storing means and controlled by the speed of the engine.

6. The combination of an engine, running-gear of a vehicle, means for starting the engine and for utilizing the power of the engine to store energy when the engine is self-actuated, means for connecting the engine and running-gear of the vehicle, a controlling-lever located within reach of the operator, such lever controlling the engine and the starting and storing means and the means connecting the running-gear of the vehicle with the engine, and differential connecting devices between the engine and the starting and power-storing means and controlled by the speed of the engine.

7. The combination of an engine, running-gear of a vehicle connected therewith, an auxiliary self-starting motor and power-storing device, differential controlling means controlled by the speed of the engine and adapted to connect the self-starting motor and storing means to actuate the engine at one ratio of speed and the engine to actuate the self-starting motor and power-storing means at a different ratio of speed.

8. The combination of an engine, running-gear of a vehicle, an auxiliary self-starting motor and power device, such motor and the engine being connected together and each adapted to actuate the other, means for storing energy, a controlling-lever within reach of the operator and connected with the auxiliary motor and engine to start the engine and to connect the running-gear of the vehicle with the engine, and means independent of such lever for connecting the motor and power device as a power device with such storing means.

9. The combination of an engine, running-gear of a vehicle connected therewith, an auxiliary self-starting motor and power device, such motor and the engine being connected together and each adapted to actuate the other, means for storing energy, a controlling-lever located within reach of the operator and connected with and controlling the auxiliary motor to start the engine and to discontinue the self-actuation of the auxiliary motor, and means independent of such lever for connecting the motor and power device as a power device with such storing means.

10. The combination of an engine, running-gear of a vehicle, an auxiliary self-starting motor and power device, such motor and the engine being connected together and each adapted to actuate the other, means for storing energy, a controlling-lever located within reach of the operator and connected with and controlling the auxiliary motor and engine to start the engine, and to discontinue the self-actuation of the auxiliary motor and to connect the running-gear of the vehicle with the engine and means independent of such lever for connecting the motor and power device as a power device with such storing means.

11. The combination of an engine, running-gear of a vehicle, an auxiliary self-starting motor and power device, the motor and the engine being so connected that the motor actuates the engine at one ratio of speed and the engine actuates the motor as a power device at a different ratio of speed, means for storing energy, a controlling-lever located within reach of the operator and connected with and controlling the auxiliary motor and engine to start the engine and to connect the running-gear of the vehicle with the engine, and means independent of such lever for connecting the motor and power device as a power device with such storing means.

12. The combination of an engine, running-gear of a vehicle connected therewith, an auxiliary self-starting motor and power device, the motor and the engine being so con-

nected that the motor actuates the engine at one ratio of speed and the engine actuates the motor as a power device at a different ratio of speed, means for storing energy, a controlling-lever located within reach of the operator and connected with and controlling the auxiliary motor and engine to start the engine and to discontinue the self-actuation of the auxiliary motor, and means independent of such lever for connecting the motor and power device as a power device with such storing means.

13. The combination of an engine, running-gear of a vehicle, an auxiliary self-starting motor and power device, the motor and the engine being so connected that the motor actuates the engine at one ratio of speed and the engine actuates the motor as a power device at a different ratio of speed, means for storing energy, a controlling-lever located within reach of the operator and connected with and controlling the auxiliary motor and engine to start the engine, and to discontinue the self-actuation of the auxiliary motor and to connect the running-gear of the vehicle with the engine, and means independent of such lever for connecting the motor and power device as a power device with such storing means.

14. The combination of an engine, running-gear of a vehicle, an auxiliary self-starting motor connected with the engine, a friction-disk and axially-movable friction-wheel, the friction-wheel being adapted to engage with the face of the friction-disk and such disk and wheel being normally disengaged but constructed to be engaged to connect the engine and running-gear by the axial movement of the friction-wheel, and a lever located within reach of the operator and controlling the axial movement of the friction-wheel and also controlling the auxiliary motor and engine to start the engine.

15. The combination of an engine, running-gear of a vehicle, an auxiliary self-starting motor connected with the engine, a friction-disk and axially-movable friction-wheel, the friction-wheel being adapted to engage with the face of the friction-disk and such disk and wheel being constructed to connect the engine and running-gear, a lever located within reach of the operator and controlling the axial movement of the friction-wheel and also controlling the auxiliary motor and engine to start the engine.

16. The combination of an engine, running-gear of a vehicle, an auxiliary self-starting motor connected with the engine, a friction-disk and axially-movable friction-wheel, the friction-wheel being adapted to engage with the face of the friction-disk and such disk and wheel being normally disengaged but constructed to be engaged to connect the engine and running-gear by the axial movement of the friction-wheel, and a lever located within the reach of the operator and controlling the axial movement of the friction-wheel and also controlling the auxiliary motor and engine to start the engine and to discontinue the self-actuation of the auxiliary motor.

17. The combination of an engine, running-gear of a vehicle connected therewith, a motor-dynamo and differential connecting devices between the engine and motor-dynamo.

18. The combination of an engine, running-gear of a vehicle, a motor-dynamo, and means for connecting the engine with the motor-dynamo so that the motor-dynamo actuates the engine at one ratio of speed and the engine actuates the motor-dynamo at another ratio of speed.

19. The combination of an engine, running-gear of a vehicle, intermediate connecting mechanism between the engine and running-gear, a motor-dynamo and differential connecting devices between the engine and motor-dynamo, and means located within reach of the operator and connected with the motor-dynamo to start the engine and connected with the intermediate connecting mechanism to connect the running-gear of the vehicle with the engine.

20. The combination of an engine, running-gear of a vehicle connected therewith, a motor-dynamo and differential connecting devices between the engine and motor-dynamo, and means located within reach of the operator and connected with the motor-dynamo to start the engine, and discontinuing the self-actuation of the motor-dynamo.

21. The combination of an engine, running-gear of a vehicle, a motor-dynamo and differential connecting devices between the engine and motor-dynamo, a friction-disk and axially-movable friction-wheel, the friction-wheel being adapted to engage with the face of the friction-disk and such disk and wheel being normally disengaged but constructed to be engaged to connect the engine and running-gear by the axial movement of the friction-wheel, and a lever located within reach of the operator, and controlling the axial movement of the friction-wheel and connected with and also controlling the motor-dynamo and engine to start the engine.

22. The combination of an engine, running-gear of a vehicle, a motor-dynamo and differential connecting devices between the engine and motor-dynamo, a friction-disk and auxiliary movable friction-wheel, the friction-wheel being adapted to engage with the face of the friction-disk and the disk and wheel being constructed to connect the engine and running-gear, a lever located within reach of the operator and controlling the axial movement of the friction-wheel and connected with and controlling the motor-dynamo and engine to start the engine.

23. The combination of an engine, running-gear of a vehicle, a motor-dynamo and differential connecting devices between the engine and motor-dynamo, a friction-disk and axially-movable friction-wheel, the friction-wheel being adapted to engage with the face of the

friction-disk and such disk and wheel being normally disengaged but constructed to be engaged to connect the running-gear by the axial movement of the friction-wheel, and a lever located within reach of the operator and controlling the axial movement of the friction-wheel and connected with and controlling the motor-dynamo and engine to start the engine and to discontinue the self-actuation of the motor-dynamo.

24. The combination of an engine, running-gear of a vehicle connected therewith, means for starting the engine by the application of power thereto and for utilizing the power of the engine, when the engine is self-actuated, to store energy, differential connecting devices between the engine and the starting-engine and the starting and power-storing means, and means for connecting and disconnecting the engine and running-gear of the vehicle and varying the ratio of speed between the engine and running-gear.

Signed at New York, N. Y., this 8th day of February, 1901.

CLYDE J. COLEMAN.

Witnesses:
HERBERT H. GIBBS,
HENRY D. WILLIAMS.