No. 652,278. Patented June 26, 1900.

F. A. LA ROCHE.

MOTOR VEHICLE.

(Application filed Mar. 2, 1900.)

(No Model.) 4 Sheets—Sheet 1.

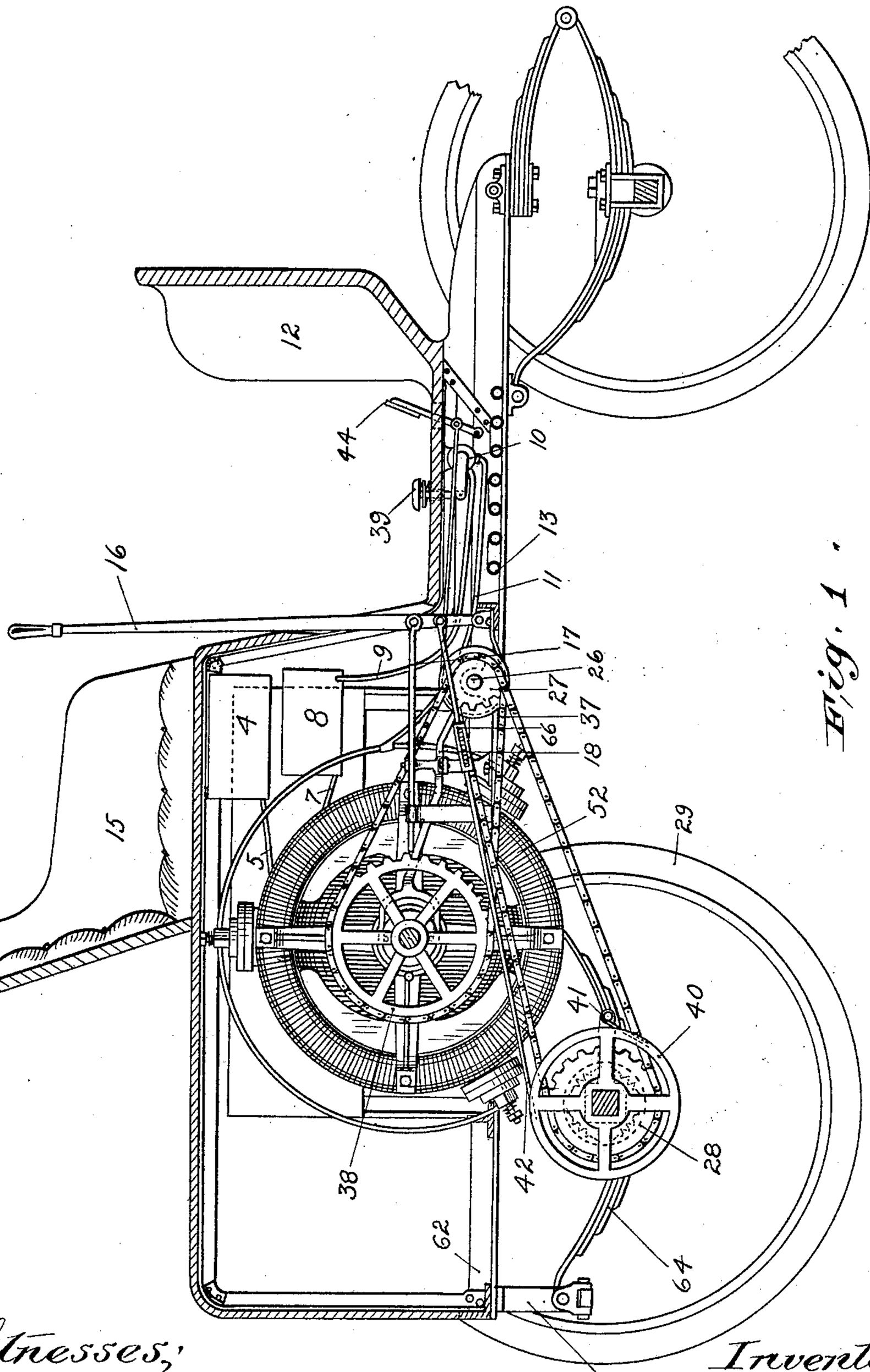

Fig. 1.

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(No Model.) 4 Sheets—Sheet 2.

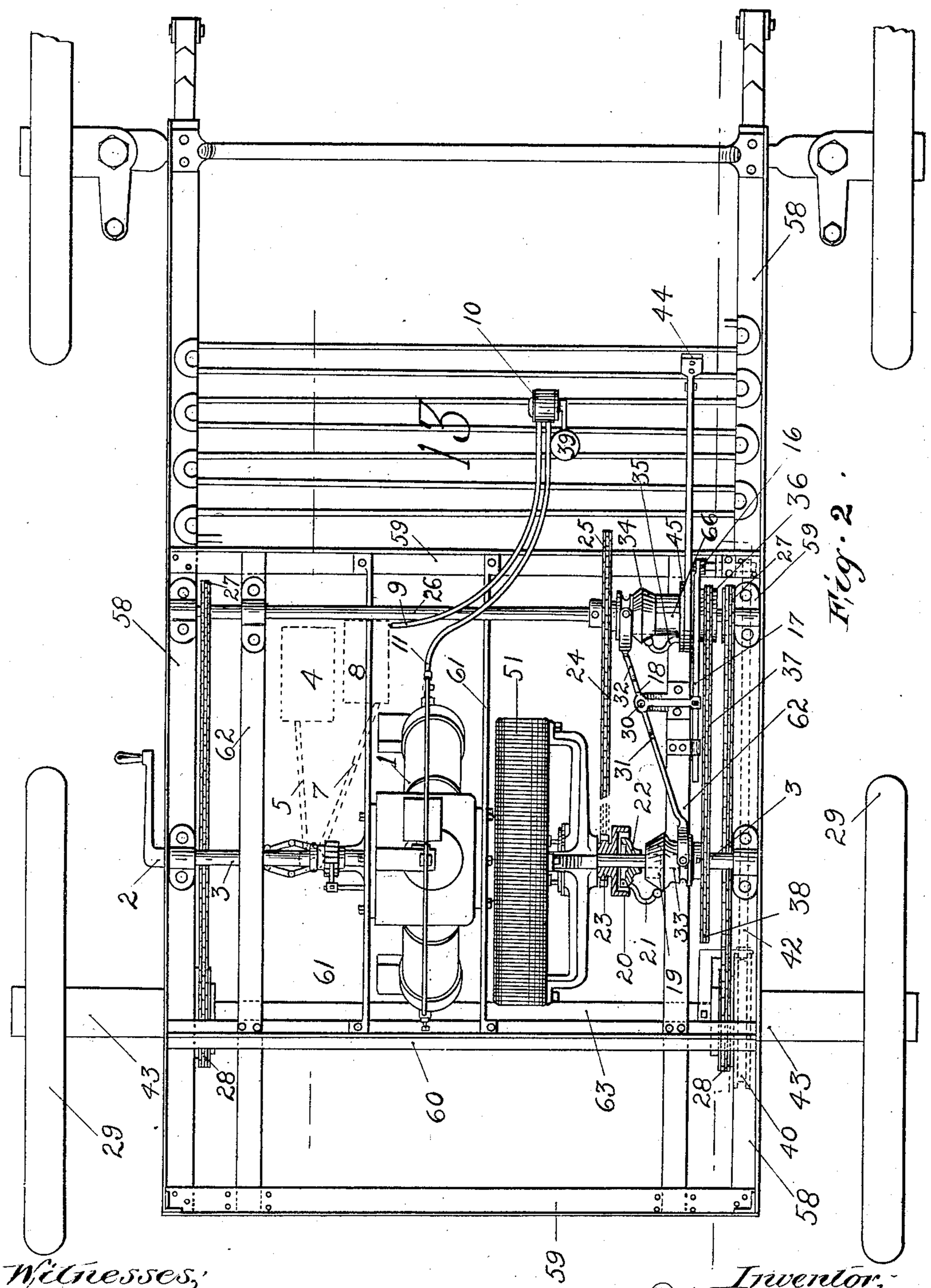

Fig. 2.

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(No Model.) 4 Sheets—Sheet 3.

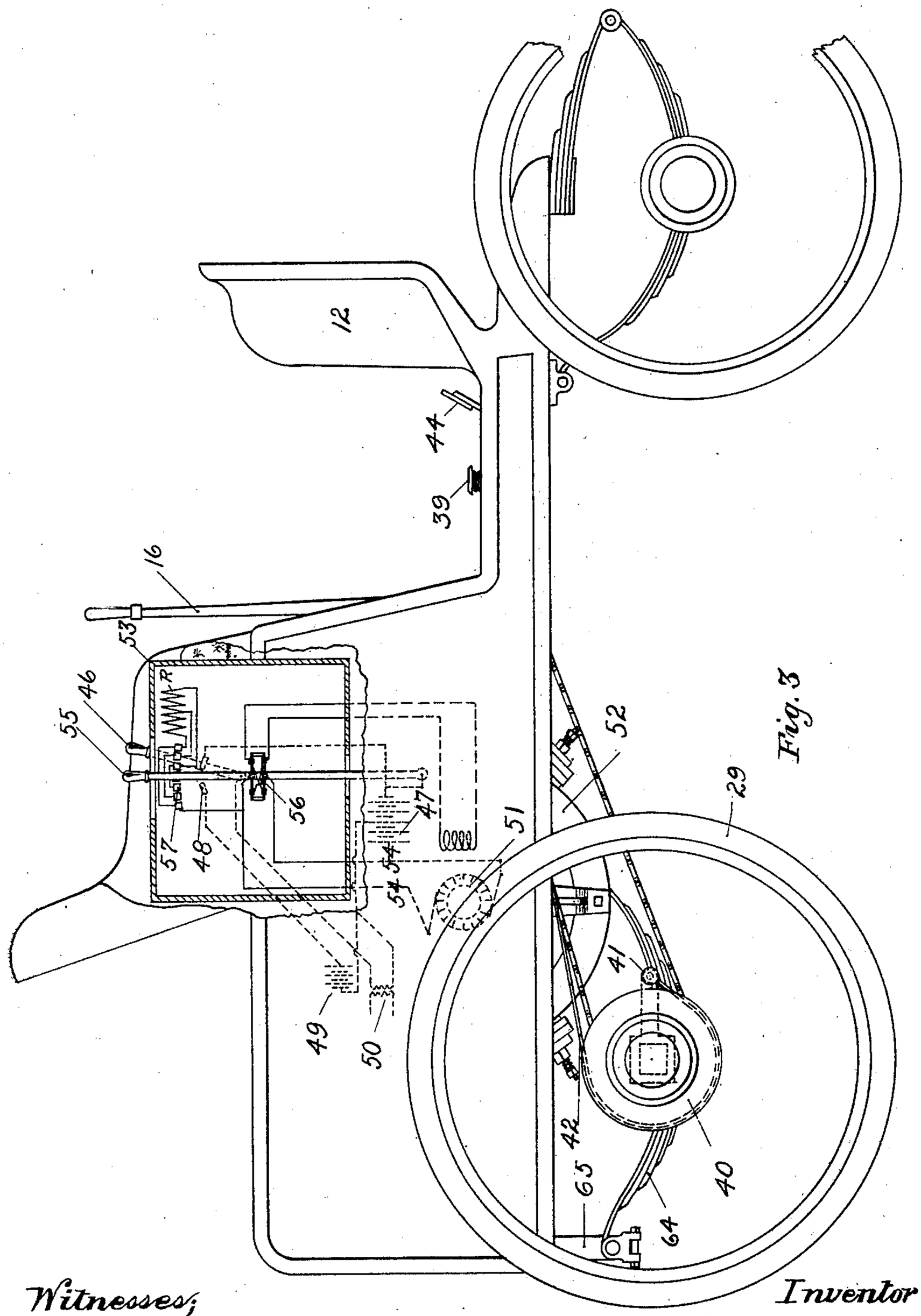

Fig. 3

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No. 652,278. Patented June 26, 1900.

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MOTOR VEHICLE.

(Application filed Mar. 2, 1900.)

(No Model.) 4 Sheets—Sheet 4.

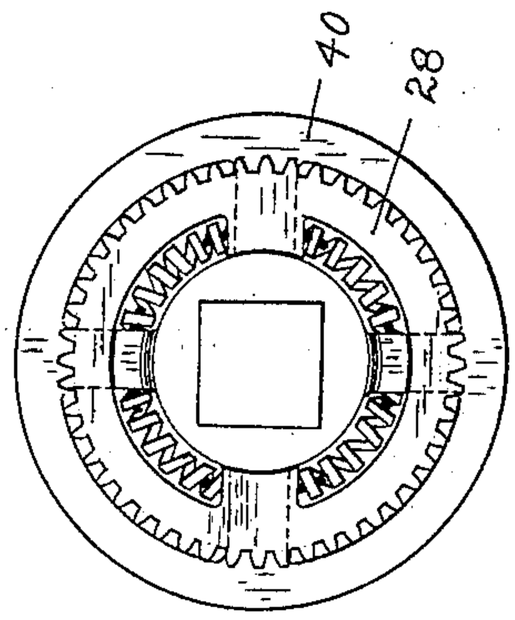

Fig. 5.

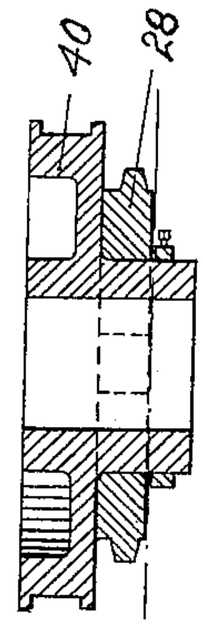

Fig. 7.

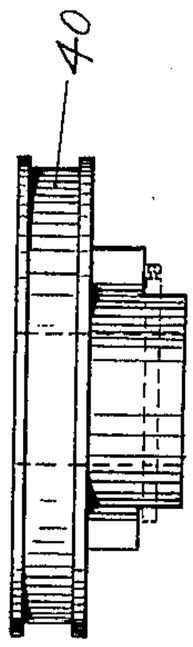

Fig. 6.

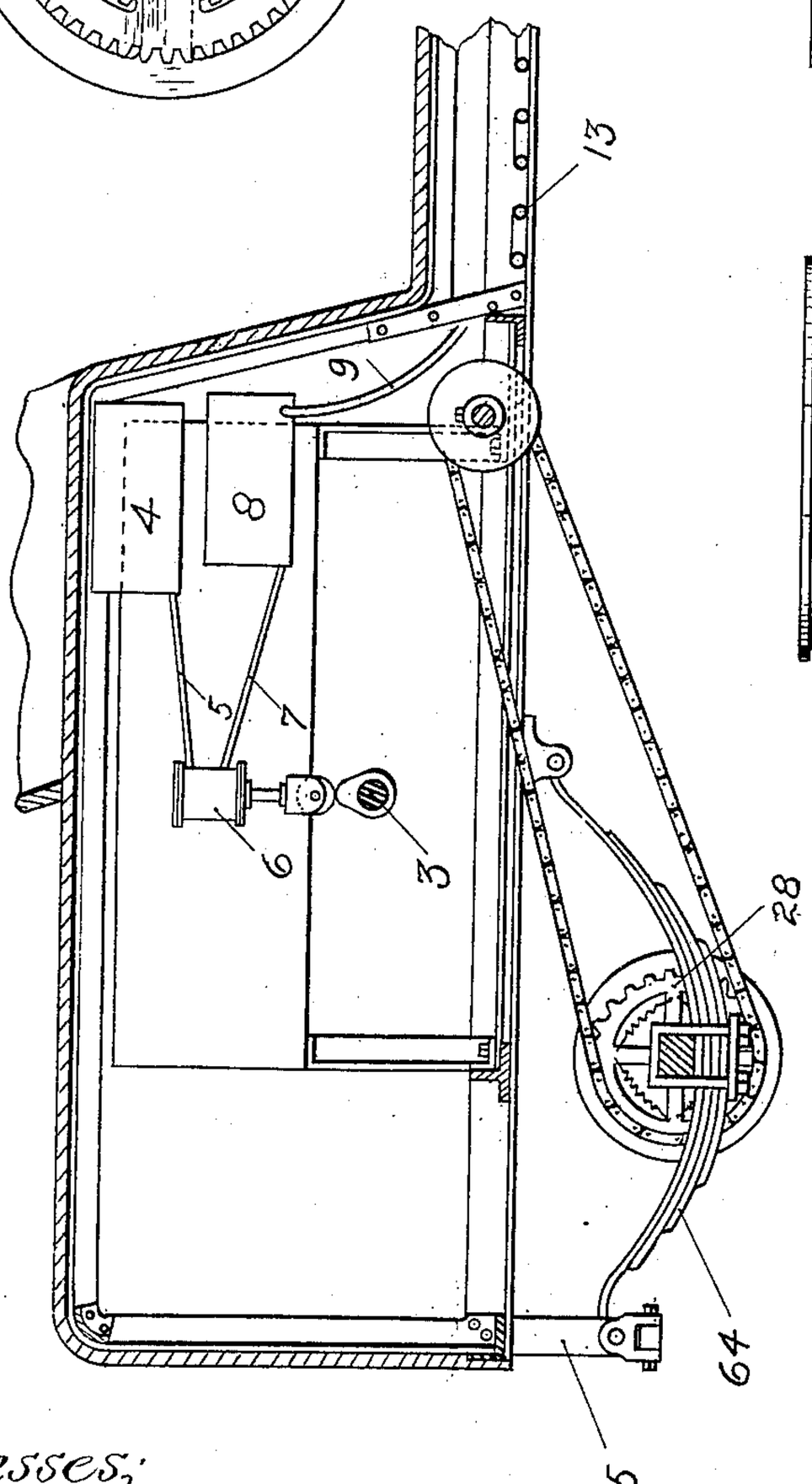

Fig. 4.

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UNITED STATES PATENT OFFICE.

FREDRICK A. LA ROCHE, OF NEW YORK, N. Y.

MOTOR-VEHICLE.

SPECIFICATION forming part of Letters Patent No. 652,278, dated June 26, 1900.

Application filed March 2, 1900. Serial No. 7,105. (No model.)

To all whom it may concern:

Be it known that I, FREDRICK A. LA ROCHE, a citizen of the United States, and a resident of New York, in the county of New York and State of New York, have invented certain new and useful Improvements in Motor-Vehicles, of which the following is a specification.

My invention in motor-vehicles relates to certain new and useful improvements in the construction of the vehicle proper and to the facilities for controlling and operating it and to the arrangement and distribution of the motive-power apparatus; and the objects of my invention are to produce a better and more effective means for operating motor-vehicles than that which has been to my knowledge in vogue previous to my invention and to improve the facilities for starting and stopping the motive-power apparatus and carriage and vary the speed of same at will, as well as to improve the construction of the vehicle throughout, and to provide a more comfortable and effective means of travel than with any other motor-carriage that I am at present aware of.

The chief feature of my invention lies in the peculiar arrangement of the different elements which compose the power apparatus for propelling the vehicle, which, as I have designed it to be ordinarily used, consists of a sectional combination of two elements—first, a thermodynamic primary motor element consisting, preferably, of a heat-engine of the internal-combustion type, and, second, an electrodynamic secondary element or accumulator for taking up the surplus of power or the inertia in stopping or descending grades (serving in such purpose a sort of brake) and holding it in reserve in accumulators to be used as an auxiliary for starting or supplying additional power to the driving-wheels of the vehicle when occasion may demand it. While carrying out this feature of my invention I have so planned and devised the primary and secondary elements of the power apparatus, as to independently supply the necessary power to the driving-axle of the vehicle, so that in the event of failure of one of the motor elements the other may be held in reserve to be applied at will, though while under normal conditions the secondary (a reactive element) is so arranged in its relation to the primary as to differentiate with it by either absorbing or developing power, which in turn may be transmitted to the driving-wheels while under control by a controlling apparatus, which may also be operated differentially, so as to effect either the absorbing of power or causing it to be communicated to the driving-wheels and with such relation to the primary that variations in load may be equalized by the secondary element taking up the surplus of power and giving back to the primary any power that exceeds its normal working load. By this ingenious arrangement I am enabled to attain the maximum of efficiency in the operation of my prime mover and at the same time provide for wide variations in power, which road traffic demands. In carrying out this feature of my invention I have given the preference to the internal-combustion gas-engine, using the potential energy of a mixture of carbureted gasolene and atmospheric air for the power-producing medium of the primary motor element. As an auxiliary I prefer to employ a secondary system comprising a dynamo-electrical generator and a suitable battery of electrical accumulators so ingeniously coupled up to the prime mover that the inertia element of the gas-generator or flywheel, which is ordinarily used to carry the revolving crank-shaft of the engine over its dead-point, forms the rotating inductive member of the dynamo (preferably the armature) in order that the armature-circuits may cut magnetic lines of force when the dynamo is in operation to develop sufficient electromotive force to charge (through a suitable electrical circuit and switching device) a series of accumulators or secondary cells, which I locate on a platform carried by the framework of the carriage, where the best disposition of their weight relative to traction may be found. With this disposition of the secondary system by simply reversing the magnetic polarity of the dynamo field-magnets the dynamo becomes an auxiliary to the prime mover (and as soon as the switch in the charging-circuit to the secondary battery is closed the dynamo becomes a motor, deriving its energy from the accumulators) and revolves in the same direction as the gas-engine. By employing any suitable clutch so

that the revolving member of the dynamo (or gas-engine fly-wheel) may be coupled or uncoupled at will the primary and secondary motor elements become independent, and either one or the other may be made to operate independently.

Another distinctive feature of my invention will be found in the process which I employ to facilitate and simplify the starting of my improved motor-vehicle. In motor-vehicles in which gas-engines have been employed heretofore as a means of propulsion the initial charge was given to the engine-cylinders usually by the operation of a system of levers or cranks which were somewhat laborious to operate and cumbersome in their construction. With my ingenious disposition of the power apparatus I devise a complete system of operation having its power elements so linked together that not only do I secure the greatest economy of fuel consumption by equalizing the working load of the power apparatus (due to the variations of load of the vehicle) as well as utilizing the energy wasted in applying brakes, but have (by virtue of the reactive power of the secondary system) at once a ready means of supplying an ample amount of power to the gas-motor cylinders, so as to give them their initial charge.

All of these and many other features of my invention are fully described herewith and are profusely illustrated by the several sheets of drawings which form part of this specification. I shall therefore reserve the various features of my invention in detail to be described by reference to the drawings, in which similar numerals of reference relate to similar parts throughout the various views, in which—

Figure 1 is a side elevation of my improved motor-vehicle with the front and rear wheel and side of body nearest observer removed, showing the mechanism. Fig. 2 is a top plan view of same with the seat and upper part of body removed, showing the propelling machinery and their supplementary parts. Fig. 3 is an elevational detailed view of same, showing the electrical apparatus and electrical controlling devices diagrammatically. Fig. 4 is a like view illustrating the disposition of the fuel-supply. Figs. 5, 6, and 7 are detailed views of my improved driving sprocket-wheel connection.

To operate my improved motor-carriage, I prefer to start the gas-engine by means of the usual detachable crank 2, which is adapted to rotate the crank-shaft 3 until the engine has received the initial starting charge sufficient, however, to start the shaft 3 rotating, after which the crank 2 is removed, as is customary with gas-motor carriages. The crank-shaft 3 of the motor 1, running free from the driving-gear of the carriage in starting up, enables the motor perfect freedom of operation when running without load other than the friction of its working parts as long as it is supplied with the carbureted gasolene which is obtained from the gasolene which passes from the gasolene-supply tank 4 through feed-pipe 5 to automatically-controlled valve 6, and through pipe 7 to carbureter 8, where it is carbureted, after which it passes via pipe 9 to foot-controlled valve 10 and supply-pipe 11 to the engine, (the ignition of the gases in the cylinders of the engine when taking place in their proper manner in the meanwhile.) The explosive mixture in the cylinders of the gas-engine 1 is ignited by a suitable electrical igniting device controlled by the switch-lever 46, which when thrown backward in an opposite direction to that position of the lever 46 shown in Fig. 3 opens the circuit for the igniting-current of the storage battery 47; but upon throwing it farther in the same direction, until it shall have made contact with the switch-point 48, it will close the circuit through the primary auxiliary battery 49 of induction-coil 50 to engine 1, which is adapted to pass the spark at a time suitable for ignition, as is customary with gas-engines using electrical ignition.

To start the carriage so as to run in a forward direction, (the driver being seated in the seat 15,) the starting-lever 16 is pulled back in the direction of the seat 15 and into the position as shown in Fig. 1. This will actuate a system of levers 16, 17, and 18, producing movement in a plane at right angles to the plane of the operating-lever 16, the effect being to throw the wedge 19 of the loose clutch-pulley 20 against the expanding-lever 21 of the tight expansible pulley 22, which is secure to the engine-shaft 3, sufficiently to expand 22 into 20, so as to make the clutch run tight and turn with the engine-shaft 3, as in Fig. 2, thus driving the reduction sprocket-wheel 23, sprocket-chain 24, reduction large sprocket-wheel 25, counter-shaft 26, and differential coupling 66, reduction sprocket-wheel 27, large yielding sprocket-wheels 28, and driving-wheels 29 of the carriage. To effect any further increase of speed of the driving-wheels 29, irrespective of the speed of rotation of the motor-shaft 3, I have devised an ingenious arrangement of the starting-lever 16 and aforesaid running-gear, levers, and friction-clutches, whereby upon pulling the lever 16 still farther in the same direction (the arm 18 being pivoted at 30, so that the portion 31 will be twice as long as the portion 32) will drive the wedge 19 of the clutch in beyond its operating-point, allowing the expanding-lever 21 to drop into the recess 33, which will release clutch 22 from the loose pulley 20 and sprocket-wheel 23, thus relaxing for an instant all the driving-gear, just as in the previous instance, prior to pulling the starting-lever 16 into its first position, and in the meanwhile, however, the short arm 32 of the lever 18 has just driven its wedge 34 against the clutch-lever 35 sufficiently to clutch small-speed sprocket-wheel 38, keyed to engine-shaft 3, so as to drive counter-shaft 26 and

gears 27 and 28, as before, but with considerable increase in speed to the driving-wheels 29. To increase the speed of the carriage more or less beyond that caused by change of gear, as just described, the engine-shaft 3 may be made to rotate more or less rapidly by various increases in the fuel-supply to the engine-cylinders, and to this end I have devised a spring foot-valve having a thread 39, which upon being depressed by the driver opens the gas-supply pipe 9 to the feed-pipe 11.

To stop the forward movement of the carriage and hold it in a state of rest, I propose to employ a hub-brake 40, having a strap 41 and tension-rod 42 and having an adjustable connection pivotally connected to lever 16, whereupon pushing lever 16 in a direction toward tank 12 or oppositely to that described for starting it is obvious that the speed of the driving-wheels 29 will be reduced (by changing from speed to reduction gearing) just in the reverse manner to that already described for starting and the engine-shaft 3 will run idle, and by pushing the lever 16 to its limit the brake 40 will be applied to the hub 43, and when sufficient friction shall have been applied to the brake 40 the carriage will stop, and by releasing the valve 10 the supply of fuel to the engine may be cut off, whereupon the engine will be shut down. When it is desired to effect a more positive and sudden rest of the vehicle than that which might be attained by the auxiliary hub-brake 40, I propose to arrange a foot hub-brake 44 to be applied by a suitable strap and rod to the hub 45 of the counter-shaft 26, which by virtue of the increase of leverage due to reduction-gear will increase materially the brake effectiveness.

As an auxiliary to the gas-engine I employ a secondary electrical system, consisting of the dynamo-electrical generator 51, having an external armature 52, carried around by the engine-shaft 3, which when the engine is running will charge the storage batteries 47 through the controlling devices 53 and circuits 54 and after the batteries have been sufficiently charged, the lever 55, being previously thrown back during the charging operation, is now thrown forward, which changes the polarity of the dynamo-field by the action of the pole-changer 56, (shown in Fig. 3,) causing the dynamo 51 to run as a motor in the same direction as the gas-engine shaft 3, thus assisting the gas-engine in propelling the carriage. By following the path of the current from the battery 47 through the controlling device 53, the circuits 54, and resistance contact-points 57 it will be readily understood how the carriage may be made to run as an electrically-driven carriage independently of the gas-engine, or by throwing the gas-engine out of gear with the driving mechanism by means of the starting-lever 16 the engine may be kept running without propelling the carriage; but the dynamo is put in motion, however, (being rigidly connected to the engine-shaft 3,) and may be employed to charge the storage batteries 47, and their having been charged may be held in reserve for future use.

When storage battery 47 is sufficiently charged, the gas-engine may be started up by the power derived from the storage battery 47 and dynamo 51, and by pushing the controlling-lever 55 forward, as already described, the dynamo 51 will run as a motor, carrying the engine crank-shaft 3 around and driving the gas-engine pistons in the same manner as already described when operated by the hand-crank 2 in order to give to the engine-cylinders their initial starting charge, whereby the auxiliary electric system serves the purpose of an automatic starting device.

To operate my improved motor-vehicle so as to obtain the highest efficiency from the fuel which is consumed in the operation of the engine, I propose to run the engine as near full load as may be found convenient and on a road of slight resistance. Where only a small fraction of the power of the engine is required, I propose to take up the surplus of the economic power-load of the engine by causing it to drive the dynamo to charge the series of accumulators 47 and in the manner as previously described. The controlling-lever in this instance is thrown forward to a degree which will throw in more or less resistance R, as may be desired.

In descending grades the gas-supply of the engine may be shut off by releasing the foot-valve 39, and the driving-wheels 29, transmitting motion to the running-gear, will turn the engine-shaft 3 and operate the dynamo 51, charging the storage batteries 47, thus acting as a sort of brake. I propose to employ the same method of operation in making stops prior to applying the hub-brakes.

When it is desirous to run the carriage in a backward direction, the gas-engine is stopped and the controlling-lever 55 is pulled back, which throws the battery 47 into the dynamo and reverses its direction, running it as a motor in the reverse direction to that given to it by the engine, thereby rotating the driving-wheels 29 backward and giving to the carriage a backward motion.

Having fully described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In a motor-vehicle the combination with a suitable frame and wheels of a primary motive-power apparatus to propel said vehicle, means for actuating said power apparatus from a suitable point located upon said carriage of a common lever, adapted to start and stop said vehicle independently of the power apparatus, a brake operated by said lever and a secondary power apparatus, adapted to operate in conjunction with said primary power apparatus substantially as described.

2. In a motor-vehicle, the combination of a primary power apparatus consisting of a gas-engine, a dynamo and a secondary system,

consisting of secondary batteries and a translating device and of suitable propelling-gear; said gas-engine adapted to drive said dynamo and said dynamo being adapted to charge said secondary batteries, said translating device being adapted to reverse said dynamo, whereby same shall run as a motor, of a suitable igniting device and igniting-circuit for said gas-engine, deriving its energy from said secondary battery, and means for throwing said propelling-gear off from said power apparatus substantially as described.

3. In a motor-vehicle, the combination of a power apparatus adapted to propel said vehicle and a system of variable-speed gear, through which said power apparatus is adapted to transmit the power for propelling said vehicle, of a pivoted lever adapted to swing in a plane lying in the same direction as that of the axis of said vehicle and adapted to control said variable-speed gearing, whereby upon a suitable movement being given to said lever, a portion of said gear shall have been thrown into operative connection with said power apparatus and upon an increase in the said movement, said gear shall have been thrown out of operative connection with said power apparatus, whereupon a higher-speed gear shall have been thrown into operative connection with said power apparatus substantially as described.

4. In a motor-vehicle, the combination of a power apparatus adapted to propel said vehicle and a system of variable-speed gear, a lever pivoted so as to operate in a plane along the axis of said vehicle and adapted to control said variable-speed gear, whereby upon a suitable movement being given to said lever, a portion of said gear, shall have been thrown into operative connection with said power apparatus and upon a suitable increase of movement in the same direction, said gear shall become released, whereupon a reduction-gear shall be thrown into operative connection with said power apparatus, and upon a further movement of said lever in the same direction, said reduction-gear shall be thrown out of operative connection with said motive-power apparatus, of a hub-brake operated thereby substantially as described.

5. In a motor-vehicle, having a variable-speed gear and a power apparatus adapted to drive said motor-vehicle through said variable-speed gear, the combination of a lever adapted to operate in connection with said variable-speed gear, whereby upon moving said lever in one direction a positive acceleration in speed shall be given to said vehicle and upon moving said lever in the opposite direction a negative acceleration in speed shall be given to said motor-vehicle, and a brake adapted to be applied to the hub of said driving-wheels of said motor-vehicle substantially as described.

6. In a motor-vehicle having a variable-speed gear and a power apparatus adapted to drive said motor-vehicle through said variable-speed gear, the combination of an engine-shaft having sprocket-wheels adapted to run tight or loose with said shaft and a counter-shaft having a sprocket-wheel connected by a sprocket-chain to aforesaid sprocket-wheel, a second sprocket-wheel to run tight or loose on said counter-shaft, a third sprocket-wheel 27, rigidly secured to said crank-shaft and a driving sprocket-wheel 28 adapted to be connected by a sprocket-chain to aforesaid sprocket-wheel 27 substantially as described.

7. In a motor-vehicle having a suitable propelling mechanism and a heat-engine, the combination of a carbureter and a foot-valve 39 for controlling the supply of fuel to said carbureter of said engine, said foot-valve being situated between said carbureter and said engine, substantially as described.

8. In a motor-vehicle having a suitable propelling mechanism and a heat-engine, the combination of a fuel-supply tank 4, having a fuel-control valve 6 for controlling the fuel to be carbureted in a carbureter 8, said valve being actuated by said engine and a valve 39 for controlling the supply of carbureted fuel to said engine substantially as described.

9. In a motor-vehicle, an engine 1, having a fly-wheel and a dynamo-electrical generator, said engine fly-wheel forming the rotating member of said dynamo-electrical generator, a storage battery 47 and a differential controlling device 53 embodying a single operating-lever 55, substantially as described and shown.

10. In a motor-vehicle the system of electrical distribution consisting of an accumulator 48, controlling device 53, consisting in the pole-changer 56 and resistance R, operated by a single lever 55, circuits 54 substantially as shown and for the purpose set forth.

11. In a motor-vehicle, a prime mover, a system of electrical distribution, consisting of an electrical accumulator 47, controlling device 53, circuits 54, pole-changer 56 and dynamo-electrical machine 51 and a lever 55 adapted to engage aforesaid pole-changer, whereby upon the operation of said lever 55, said pole-changer shall be operated so as to cause the electrical current to flow in one direction through circuits 54 and upon an opposite movement being given to said lever 55, said electrical current shall be caused to flow through said circuits 54 in an opposite direction, a resistance R being adapted to be thrown into said circuits 54 by the operation of said lever 55 substantially as described.

12. In the herein-described system of electrical distribution, consisting of a dynamo-electrical generator, a secondary battery, a resistance, a suitable pole-changing device and electrical circuits connecting the aforesaid devices, of a lever adapted to actuate said pole-changing device, whereby upon a movement being given to said lever in one direction, said pole-changing device shall establish electrical communication through the aforesaid electrical circuit in one direction,

and upon an opposite movement being given to the said lever, the aforesaid pole-changer shall be thrown into an opposite direction, establishing in the aforesaid electrical circuit, a current running in the opposite direction and a variable resistance operated by said lever substantially as described.

13. A controlling device, having suitable electrical circuits, a variable resistance R and a lever 55 and resistance contact-points 57; said lever being adapted to move pivotally over said contact-points in opposite directions, said resistance R being adapted to be wholly or partially included in said circuits by the operation of said lever 55 in either direction substantially as described and shown.

14. A controlling device having suitable electrical circuits, a variable resistance R and a lever 55 and resistance contact-points 57, said lever being adapted to move pivotally over said contact-points in opposite directions and a pole-changing device, also operated by said lever, said pole-changing device changing poles upon the aforesaid lever being moved in either direction substantially as described and shown.

15. In a motor-vehicle the combination with the seat thereof, of a controlling device located at one of the sides of said vehicle having a lever 55 pivotally connected to the aforesaid controlling device and adapted to oscillate in a backward and forward direction with respect to the axis of the vehicle, said lever to control the movement of the said vehicle by engaging a system of electrical circuits substantially as described.

16. In a motor-vehicle, the combination with the seat thereof, of a controlling device located at one of the sides of said vehicle having a lever 55 pivotally connected to the aforesaid controlling device adapted to oscillate in a backward and forward direction with respect to the axis of the vehicle, said lever to control the movement of said vehicle by engaging a system of electrical circuits and an igniting-circuit of a switching-lever 46, similarly located within the side of the seat of said vehicle, and adapted to open or close the aforesaid igniting-circuit substantially as described.

17. In a motor-vehicle, the combination with the seat thereof, of a controlling device located at one of the sides of said vehicle having a lever 55 pivotally connected to the aforesaid controlling device and adapted to oscillate in a backward and forward direction with respect to the axis of the vehicle, said lever to control the movement of the said vehicle by engaging a system of electrical circuits and an igniting-circuit of a switching-lever 46, similarly located within the side of the seat of said vehicle, adapted to open or close the aforesaid igniting-circuit and of an auxiliary igniting battery and circuit, whereby upon throwing said lever in an opposite direction, the said auxiliary battery may be thrown into circuit with the aforesaid igniting-circuit substantially as described.

18. The herein-described motor-vehicle, consisting in the combination of the framework and parts shown, the engine 1, dynamo-electrical generator 51, storage battery 47, controlling device 53, distribution-circuits 54, pole-changing device 56, igniting-circuits, and igniting-switch 46, operating-lever 16, connecting-levers 17 and 18, clutches 22 and 34, counter-shaft 26, sprocket-wheels 36 and 38, 27 and 28, driving-hubs 43, sprocket-chains 24 and 37 substantially as described.

19. In a motor-vehicle the combination of an engine, and a suitable propelling-gear, through which power is transmitted from said engine to said vehicle, a lever 16 for varying said variable-speed gear, throwing the same into operative connection with the driving-wheels or out of operative connection with the driving-wheels of said vehicle of a secondary power system, comprising an electrical engine and a storage battery, adapted to receive power from the said electrical engine, a system of electrical distribution and controlling devices and a lever for operating said controlling devices, whereby upon a suitable movement being given to said lever, the aforesaid engine may be adapted to furnish power to said electrical accumulators and upon another suitable movement of said lever, said electrical accumulators may be caused to discharge electric current into the aforesaid electrical engine, and transmit power through the aforesaid driving-gear to the driving-wheels of the aforesaid vehicle substantially as described.

20. In a motor-vehicle, the combination of an engine, having a suitable variable propelling speed gear, through which power is transmitted from said engine to said vehicle, of a secondary power system, comprising an electrical engine and a storage battery, adapted to receive power from the said electrical engine, a system of electrical distribution and controlling devices and a lever for operating said controlling devices, whereby upon a suitable movement being given to said lever, the aforesaid engine may be adapted to furnish power to said electrical accumulators and upon another suitable movement of said lever, said electrical accumulators may be caused to discharge electric current into the aforesaid electrical engine, transmitting power through the aforesaid driving-gear to the driving-wheels of the aforesaid vehicle; substantially as described.

21. In a motor-vehicle having a sectional differential power apparatus, consisting of a thermodynamic section and a differential electrodynamic section, a differential controlling device having a pivoted lever adapted to differentiate said electrodynamic section upon differentiating the movement of said lever, substantially as described.

22. In a motor-vehicle, the combination of

a sectional differential power apparatus, consisting of a thermodynamic section and a differential electrodynamic section, having an electrical accumulator, a differential controller, having a lever for said electrodynamic system; whereby upon moving the said lever in different directions, said differential electrodynamic system shall operate either as an absorber of dynamic energy or a producer of dynamic energy and of a controller, located at said differential controller for controlling the said thermodynamic section of said power apparatus substantially as described.

23. In a motor-vehicle, a sectional differential power apparatus, having a thermodynamic section and a differential electrodynamic section, a system of power transmission, adapted to transmit the energy developed by the power apparatus to the driving-wheels of said vehicle and a differential controller, adapted to control both the said electrodynamic and the said thermodynamic sections of said motive-power apparatus, substantially as described.

24. In a motor-vehicle, a sectional differential power apparatus, having a thermodynamic section and a differential electrodynamic section, a system of power transmission adapted to transmit energy, developed by the aforesaid power apparatus to the driving-wheels of said carriage, a differential controller adapted to control either one or both of the aforesaid sections of the power apparatus and means within the said controller for varying the speed of the motor-vehicle, substantially as described.

Signed at New York, in the county of New York and State of New York, this 1st day of March, A. D. 1900.

FREDRICK A. LA ROCHE.

Witnesses:
GEO. M. MACWILLIAM,
P. J. SHELLEY.