

No. 732,908.

PATENTED JULY 7, 1903.

E. THOMSON.

DRIVING MECHANISM FOR AUTOMOBILES.

APPLICATION FILED NOV. 27, 1900.

NO MODEL.

3 SHEETS—SHEET 1.

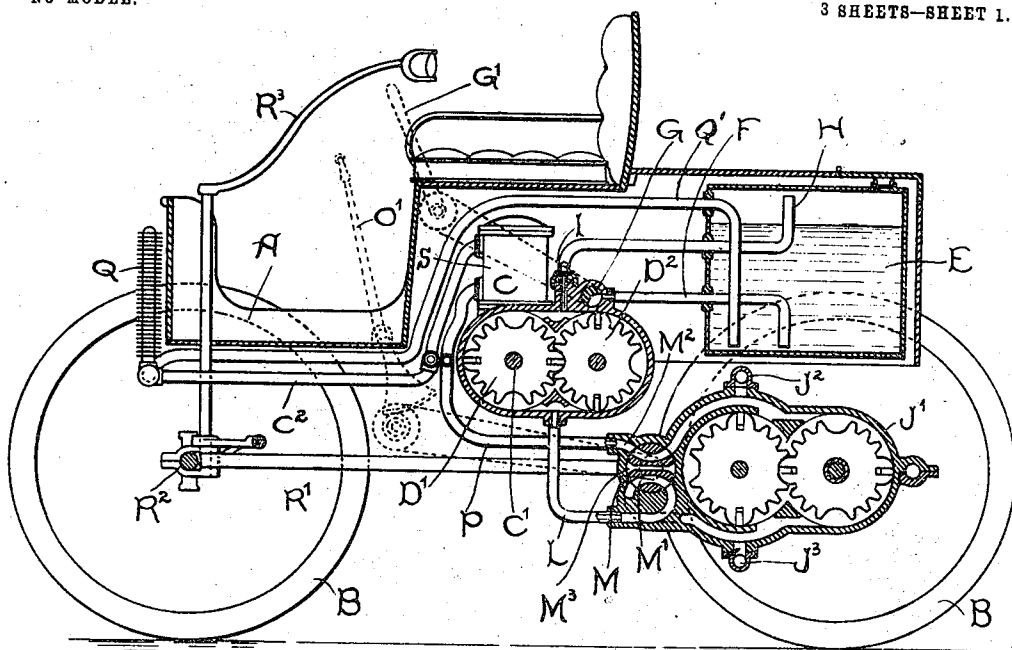


Fig.1.

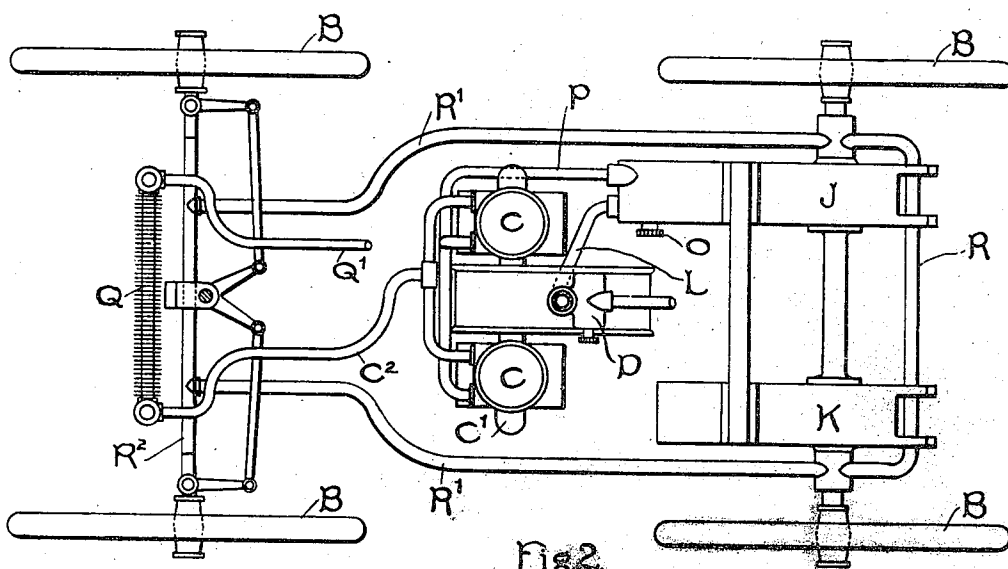


Fig.2.

WITNESSES.

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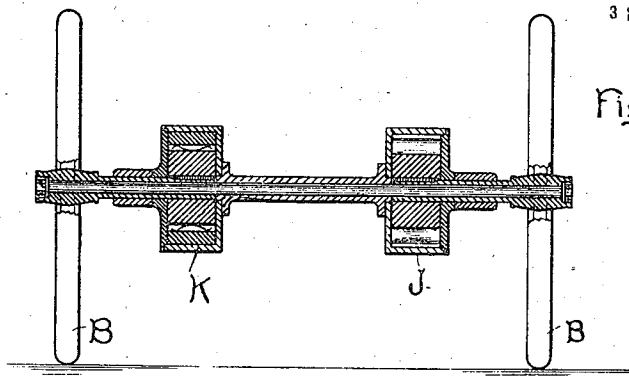


Fig. 3.

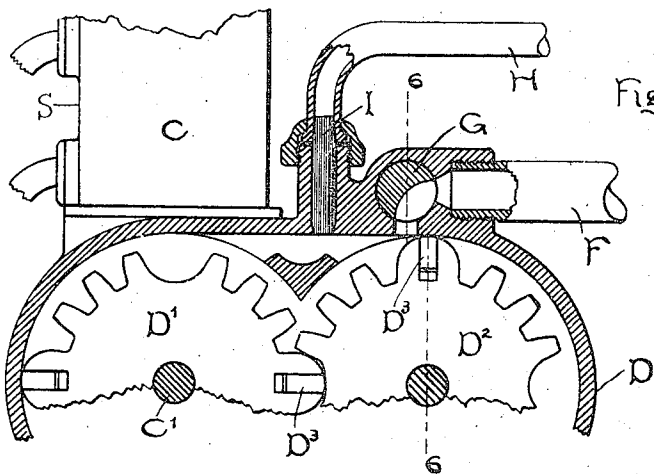


Fig. 4.

Fig. 5.

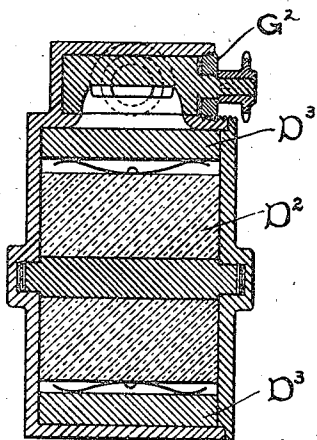
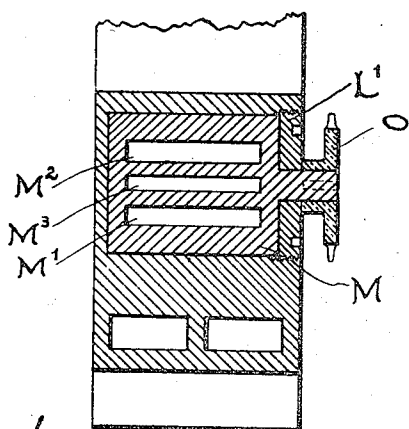


Fig. 6.

WITNESSES.

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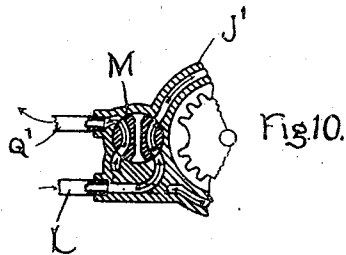
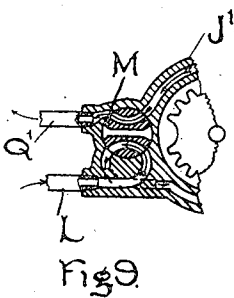
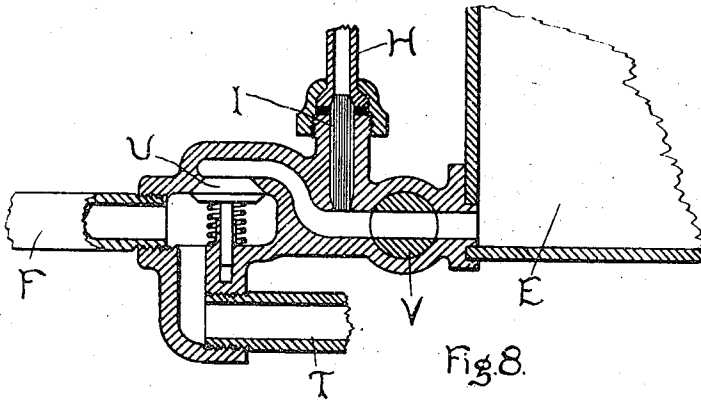
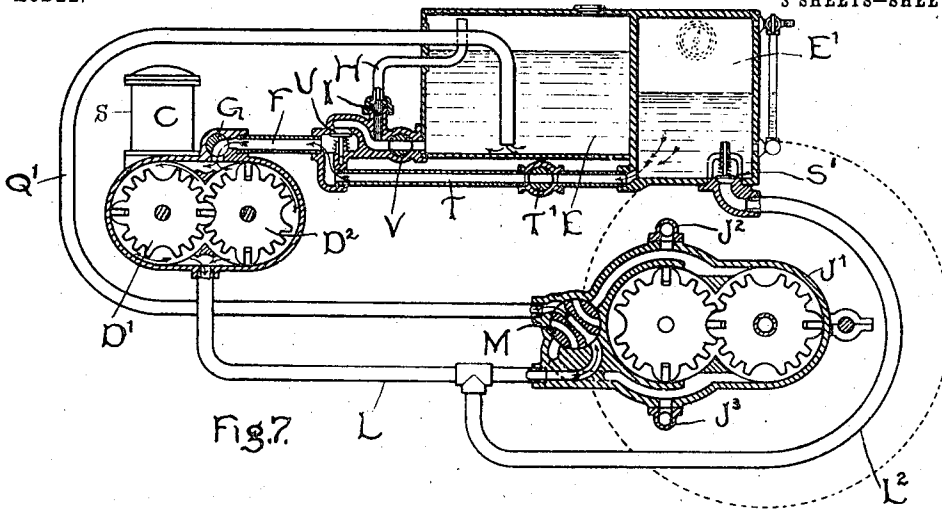
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WITNESSES.

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UNITED STATES PATENT OFFICE.

ELIHU THOMSON, OF SWAMPSCOTT, MASSACHUSETTS.

DRIVING MECHANISM FOR AUTOMOBILES.

SPECIFICATION forming part of Letters Patent No. 732,908, dated July 7, 1903.

Application filed November 27, 1900. Serial No. 37,890. (No model.)

To all whom it may concern:

Be it known that I, ELIHU THOMSON, a citizen of the United States, residing at Swampscott, county of Essex, State of Massachusetts, have invented certain new and useful Improvements in Driving Mechanism for Automobiles, of which the following is a specification.

In certain kinds of automobiles internal combustion engines are employed, using gas, gasolene, or petroleum for fuel. Engines of this class are capable of only a limited speed variation. Therefore it becomes necessary to provide some form of speed-changing agency between the engine and the driving-wheels of the vehicle.

The present invention has for one of its objects to provide a suitable power-transmitting agency for vehicles having an engine of the above-mentioned type which shall be capable of varying the speed thereof from minimum to maximum, and vice versa, and this in a smooth and quiet manner. The means for accomplishing this, together with other points of novelty, will be more fully described and claimed hereinafter.

In the accompanying drawings I have shown an embodiment of my invention, in which—

Figure 1 is a longitudinal section of a vehicle. Fig. 2 is a plan view thereof with the body and certain of the other parts removed. Fig. 3 is a longitudinal section through the driving-axle. Fig. 4 is an enlarged sectional view of the hydraulic pump and controlling devices therefor. Fig. 5 is an enlarged sectional view of the valve controlling the hydraulic engine. Fig. 6 is a sectional detail of the valve for controlling the admission of fluid to the hydraulic pump, which section is taken on lines 6 6 of Fig. 4. Fig. 7 is a sectional view of a device for starting an engine of the internal-combustion type into operation. Fig. 8 is an enlarged sectional detail view of the valve mechanism for controlling the same, and Figs. 9 and 10 are sectional detail views showing the valve mechanism controlling the hydraulic engine in different positions.

In Fig. 1 I have illustrated my invention in connection with an automobile which may be of any well-known type, wherein A represents the body of the vehicle, which is supported in any suitable manner from the wheels

B. In order to simplify the illustration, the supporting-springs and certain of the other mechanism have been omitted. Mounted in any suitable position on the vehicle is an internal-combustion engine C, which engine may use gas, gasolene, or petroleum for fuel, as desired. I have not illustrated the fuel-tank and the various structures required for supplying fuel to the engine, since they are so well known. The engine as shown, Fig. 2, consists of two vertically-extending cylinders with pistons which are connected to a common shaft C'. Situated between the two cylinders of the engine is a casing D, containing a variable-capacity pump. This type of pump may be greatly varied; but it is preferable to employ a pump of the rotary type as distinguished from pumps having reciprocating parts and valves, which valves open and close as the pistons move to and fro. As illustrated in the drawings, the pump consists of two spur-gears D' and D², the former being mounted on the engine-shaft C', while the latter is mounted on a shaft that extends parallel with the shaft C' and is mounted in the bearings formed in the casing D. The teeth of these gears intermesh and are closely fitted to the casing. Situated in any convenient part of the vehicle is a tank E, containing some form of lubricating or other heavy oil. This tank communicates with the casing D through a pipe F, a valve G being placed between the pipe and the casing, so that the amount of oil entering the pump can be throttled as desired. The valve is controlled by means of a throttle-lever G'. The construction of this valve is well illustrated in Figs. 4 and 6, wherein D represents the pump-casing, D' and D² the revolving elements or gears. Certain of the teeth of the gears are enlarged, and mounted in slots formed therein are spring-pressed pieces D³, which engage with the casing of the pump as they are rotating. The valve G consists of a cylindrical piece having a cut-away portion of greater or less extent, which by its position determines the amount of fluid which passes from the tank to the pump. The valve is retained in place by a plug G², which is screw-threaded to the pump-casing. The stem of the valve is extended through the plug, and mounted on the end thereof is a sprocket by means of which motion is im-

parted from the throttle-lever G' by a chain. In operating a pump of this class—that is to say, one which is driven at approximately constant speed—more or less of a vacuum would be created if the throttle-valve G was moved to a point where it would restrict the admission of oil. To enable me to reduce the amount of fluid-supply to the pump and at the same time break the vacuum, means are provided for introducing a small amount of air into the pump which tends to froth the oil, and thereby give an elastic effect thereto. This arrangement prevents any hammering or noise due to the sudden checking of the power when the vehicle is in motion.

Referring to Figs. 1 and 4, H represents a pipe leading from the air-space in the oil-tank E to the pump-casing. The pipe is connected to the casing by an ordinary screw-threaded coupling, and mounted somewhere in the pipe, preferably between the pipe and the interior of the casing, is a piece I of ratan or other material, which will admit a small amount of air to be sucked into the chamber when the admission of fluid to the pump is more or less restricted.

I have illustrated a simple form of variable-capacity pump; but it is to be understood that my invention is not limited to the structure shown, for any suitable form of pump capable of more or less variation in capacity may be substituted. Various forms of variable-capacity pumps would readily suggest themselves to one skilled in the art to which this invention relates, and they will not be here illustrated.

The driving mechanism for the vehicle consists of one or more hydraulic motors. As shown, two hydraulic motors J and K are provided, each motor being arranged to drive one of the driving-wheels. The two motors are arranged in multiple relation with respect to each other, meaning by "multiple relation" that the motors simultaneously receive motive fluid from a common source and deliver it to the same return-pipe. If desired, however, a single motor may be employed in connection with differential gearing in the ordinary manner. These hydraulic motors or engines may either be directly connected to the driving-axes or geared thereto in any desired manner. The type of motor or engine can be greatly varied, it being preferable, however, to select those types which are without reciprocating parts or valves for opening and closing the admission or exhaust ports. The type illustrated is a well-known form of gear-pump or gear-motor, and consists of two spur-gears, one of which is mounted on a sleeve connected to one of the driving-wheels, while the other is mounted on a shaft that is carried by the engine-inclosing casing J'. The structure of both of these motors is the same, so only one of them will be described. The casing of the pump is connected with the casing of the hydraulic motor by means of an inlet-pipe L, and between the pump and the mov-

ing parts of the motor is a three-way valve M. The structure of this valve is best illustrated in Figs. 1 and 5. The valve consists of a cylindrical piece having three openings therein and is retained in place by a plug L', which is screw-threaded to the casing of the motor. The stem of the valve is extended through the plug, and mounted thereon is a sprocket O, which is connected, by means of a chain, with the sprocket and controlling-lever O'. (Illustrated in dotted lines, Fig. 1.) Extending from the motor-casing to the jacket surrounding the engine C is a pipe P, which carries the oil or other fluid after it has passed through the motor to the jacket around the engine for the purpose of cooling the latter. As shown in Fig. 1, the passage M' coincides with the passage admitting fluid to the motor, while the passage M² coincides with the exhaust-passage of the motor, the intermediate passage M³ being inoperative in the position shown. By rotating the valve by any suitable means—as, for example, by the operating-lever O'—the amount of fluid permitted to pass from the pump to the motor is controlled. When the valve is rotated to a point where the central passage M² communicates with the passage leading to the pipe P and the passage leading to the pipe L, the admission of fluid to the motor is prevented and a local circuit is created, which circuit is as follows: the fluid-tank E, pipe F, motor D, pipe L, valve M, pipe P, the jacket around the engine, thence through the pipes C² to the radiator Q, which has an extended area, thence back to the tank E by the pipe Q'. With the parts arranged as described the engine may work at or about its normal speed, but the vehicle will remain stationary, since no fluid can pass through the motor, and the wheels will be locked.

Referring to Fig. 2, it will be seen that the exhaust-pipe P from the hydraulic motors is connected to the jackets surrounding both cylinders of the engine and that the pipe connecting the radiator Q is also connected to both jackets. In other words, two multiple paths are provided for the oil which is discharged from the hydraulic motors. The radiator Q is of a well-known construction and comprises a casing having an interior chamber that is connected to the pipes C² and Q' and covered externally by projections for radiating heat. The cooling device for the engine comprises an ordinary chamber which is formed between the outer casing S and the external wall of the cylinder. The chambers are connected at their lower ends with a pipe P from the motors and at their upper ends with a pipe C², leading to the radiator. From the foregoing it will be seen that the radiator is employed to cool not only the fluid which is employed to drive the motors, but also the fluid which passes through the cooling-jacket of the engine.

As shown, the two motors J and K are connected on the admission side by the equaliz-

ing-pipe J², extending between the upper parts thereof, and on the exhaust or under side by the equalizing-pipe J³. In order to prevent the motors from turning, a frame-piece R is provided, which is attached to sleeves on opposite sides of the vehicle, and the motor-casings are clamped to this frame-piece. Extending forward from the axle-sleeves are frame-pieces R', which are secured to the front stationary axle R² in any desired manner. The steering-wheels are provided with the usual form of double axle suspension, and their movements are controlled by the steering-handle R³.

Assuming that the parts are in an operative position—that is to say, the one illustrated in Fig. 1—and that it is desired to decrease the speed, the throttle-lever G' is moved in a direction to more or less close the valve G, thus throttling the supply of fluid to the pump, and consequently to the hydraulic motor. Under ordinary running condition only a little air will enter the pump through the porous piece I; but as soon as a vacuum is created, which is more or less great, the pump will begin to draw air through the piece I from the pipe H, and the oil will begin to be more frothy, thus forming a somewhat elastic transmitting medium between the engine and the driving-wheels.

Internal-combustion engines as ordinarily constructed must be started by some extraneous means or else be kept running at all times. The latter method is commonly employed when the vehicle is in continued use. In order to avoid maintaining the engine in operation when the vehicle is standing still, either for a short or for a long time, I provide a novel arrangement of parts which permits me to start and stop the engine at will. This is illustrated in Figs. 7 to 10, inclusive. The engine C is of the ordinary internal-combustion type and is arranged to drive the rotary pump D in the same manner as before described. The motors are also of the same construction and are controlled in the same manner as recited above. In addition to the oil or fluid tank E, I provide an auxiliary tank E', which is connected with the inlet-pipe L, at a point between the pump and the motor, by a pipe I². The passage of fluid from this pipe to the auxiliary tank is controlled by a check-valve S', arranged to permit the oil to enter the tank, but not to escape therefrom. Extending from the auxiliary tank to the inlet-pipe F of the pump is a pipe T, and located in this pipe is a manually-controlled valve T'. The admission of fluid from the main tank E to the pump is regulated by a check-valve U, arranged to permit fluid to pass from the tank to the pump, but prevent it from returning thereto, due to any cause. As the fluid passes from the pump D to the hydraulic motor two paths are provided—one directly to the motor and the other to the auxiliary fluid-tank E'—by means of the pipe I², it is being assumed that the valve T' is closed. Assuming that the pump has been

started into operation, the fluid will be pumped into the auxiliary tank, since this is the path of least resistance, and the pressure therein rises, due to the compression of air within the tank. After the pressure has risen to a predetermined amount the hydraulic motor will begin to drive the vehicle, and the start will be accomplished in a smooth and easy manner, the motor acquiring speed gradually as the pressure in the tank increases. After the pressure in the tank rises to a predetermined point no more fluid will enter, but will all pass through the motors. The speed of the motor may now be controlled by changing the position of the throttle-valve G in the way previously described, the porous piece I permitting a certain amount of air to mingle with the fluid from the tank. Located in the pipe connecting the fuel-tank with the pump is a valve V, whereby the admission of fluid to the pump may be cut off or varied, and this in addition to the throttle-valve G. Assuming that it is desired to stop the vehicle and also to stop the engine, the supply of combustible to the engine is cut off in the ordinary manner and the valve M is moved to the position shown in Fig. 7, the valve T' being in the closed position. If now it is desired to start the engine, the valve T' is opened, the valve M remaining closed, and the fluid in tank E' having been placed under pressure in a manner previously described is admitted to the pipes T and F and thence to the pump. After passing through the pump the fluid enters the casing of the hydraulic motor and passes through the central passage of the valve M and thence back to the main tank E through the pipe Q', which pipe may or may not include a radiator Q, as desired. The passage of fluid from the auxiliary tank E' through the pump causes the engine to make a few turns, which are sufficient to start it into operation, as is well understood, after which the valve T' is closed and further operation is the same as that previously described.

In Fig. 8 the puppet-valve U and the device for admitting air to the fluid as it passes from the tank to the pump is shown on a somewhat enlarged scale. In Fig. 9 the valve M is set in a position to cause fluid to pass from the pump through the hydraulic motor in the direction indicated by the arrows. In Fig. 10 the valve M is shown in a position to cause the motors J and K to revolve in a direction opposite to that shown in Fig. 9, and the passage of fluid is indicated by the arrows.

What I claim as new, and desire to secure by Letters Patent of the United States, is—

1. The combination of a constantly-driven pump, a hydraulic motor controlled thereby, a valve for varying the admission of fluid to the pump, and a body of porous material through which air passes for automatically reducing the vacuum created in the pump as the admission of fluid thereto is decreased.

2. The combination of a constantly-driven shaft, a second shaft arranged to be started, stopped, and run at speeds independent of the first-mentioned shaft, a fluid-actuated device for transmitting power between the shafts, a body of transmitting fluid, and a body of porous material arranged to admit air to the fluid system for giving a certain elasticity to the fluid.

3. In a self-propelled vehicle, the combination of an internal-combustion engine, a pump driven thereby, a pair of separate hydraulic motors in multiple relation each connected to a separate driving-wheel and adapted to receive fluid from the pump, equalizing-pipes between the motors, a throttle-valve for controlling the admission of fluid to the pump, and porous means for admitting enough air into the pump-casing to decrease the vacuum when the supply of fluid to the pump is reduced.

4. In combination, an internal-combustion engine, a fluid-containing tank, a hydraulic motor, a pump for the fluid which is driven by the engine, fluid-carrying connections between the pump and the hydraulic motor and also between the fluid-tank, engine, and motor, means for shunting the passage of fluid to the motor so that the latter may be stopped without interference with the action of the engine, and means for admitting air in limited amounts to the fluid system when the supply to the pump is more or less throttled.

5. The combination of a vehicle, an internal-combustion engine mounted thereon, a connection between the engine and the driving-wheel of the vehicle, and an energy storing or receiving device which receives energy from the engine when it is operating under normal conditions but which returns energy to the engine when it is desired to start the latter into operation.

6. In combination, a vehicle, an internal-combustion engine mounted thereon, a mov-

ing element constituting a load therefor, an energy storing or receiving device acted upon by the moving element, means arranged to hold or maintain the energy received from the moving element, and means arranged to release or deliver the energy in a manner to start the moving element into operation.

7. In combination, an engine, a pump driven thereby, a hydraulic motor, fluid-transmitting connections between the pump and the motor, a sealed fluid-tank, a connection shunting the motor which supplies fluid to the tank thereby creating a pressure, and means for subjecting the engine to the pressure developed in the tank for the purpose of starting.

8. In combination, an internal-combustion engine, a pump driven thereby, a hydraulic motor, fluid-transmitting connections between the pump and the motor, a sealed fluid-containing tank, a connection between the pump and the tank for supplying fluid to the latter thereby creating a pressure, a check-valve in the connection, a connection between the tank and the pump, and a valve in the last-mentioned connection for regulating the admission of fluid under pressure from the tank to the pump for the purpose of starting the engine.

9. In combination, a pair of hydraulic motors, a pump to which each motor is operatively connected, an equalizing connection between the inlet-ports of the motors, an equalizing connection between the exhaust-ports of the motors, a body of fluid, means for regulating the admission of fluid to the motors, and a pipe containing a piece of ratan for admitting air in limited amounts to the fluid system.

In witness whereof I have hereunto set my hand this 23d day of November, 1900.

ELIHU THOMSON.

Witnesses:

DUGALD MCK. MCKILLOP,
ROBERT SHAND.