P. W. HODGKINSON.

ENGINE STARTING DEVICE.

APPLICATION FILED MAR. 3, 1910.

969,162.

Patented Sept. 6, 1910.

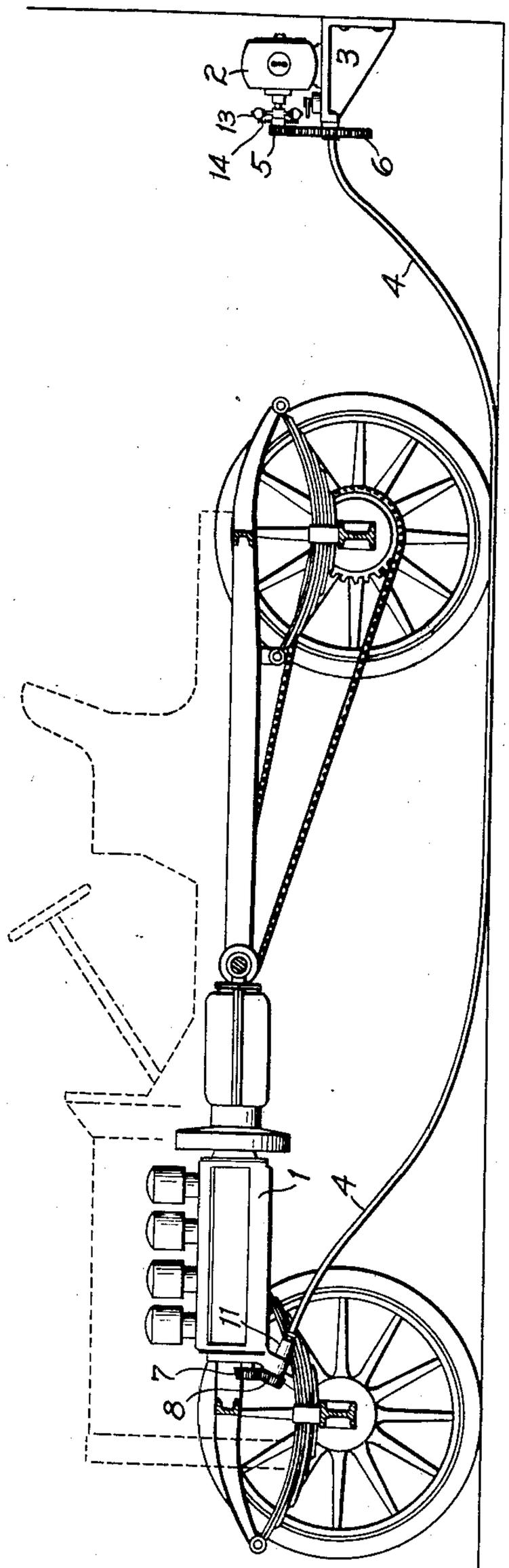

FIG. 1.

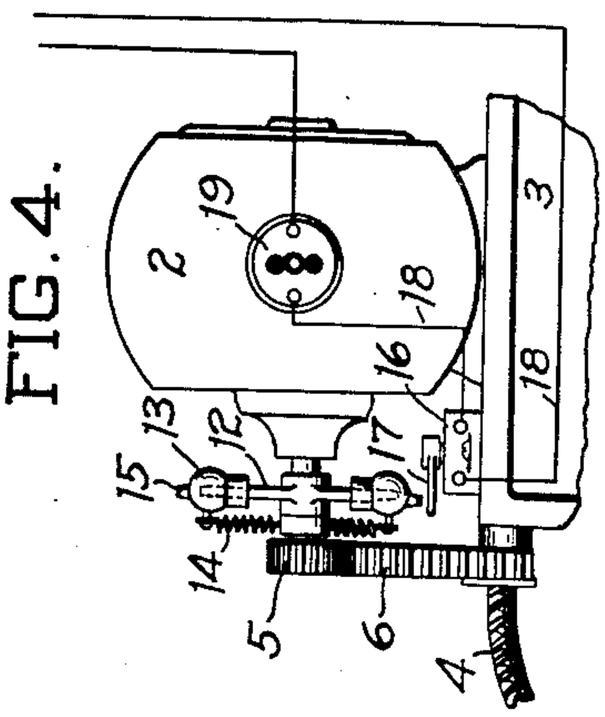

FIG. 4.

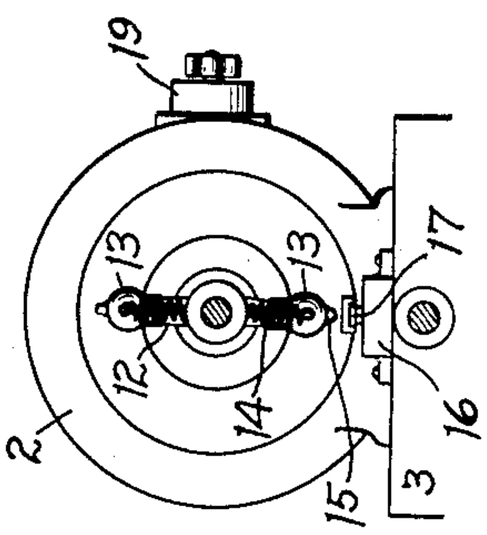

FIG. 3.

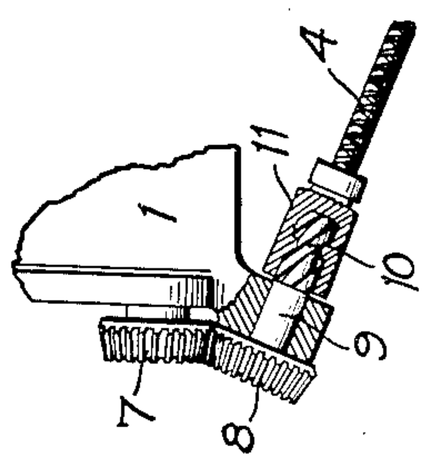

FIG. 2.

WITNESSES:

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UNITED STATES PATENT OFFICE.

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ENGINE-STARTING DEVICE.

969,162. Specification of Letters Patent. Patented Sept. 6, 1910.

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To all whom it may concern:

Be it known that I, PERCY W. HODGKINSON, a citizen of the United States, residing at Rochester, in the county of Monroe and State of New York, have invented certain new and useful Improvements in Engine-Starting Devices, of which the following is a specification.

This invention relates particularly to a device for starting an internal-combustion engine in a vehicle standing in a building.

In the use of vehicles such as ambulances and the apparatus of fire departments, it is desirable that such vehicles be started with the least possible delay when their use is necessary. Where such a vehicle is driven by an internal-combustion engine a certain amount of delay is necessary in starting the engine before the vehicle can be used. Automatic engine-starting devices have been heretofore proposed which are designed to be mounted upon, and carried by, the vehicle in connection with which they are used, but a device of this character is unsatisfactory for several reasons, and particularly on account of the permanent addition to the weight of the vehicle.

The object of the present invention is to produce an engine-starting device which shall operate to start an internal-combustion engine in a vehicle, but which may be disengaged from the vehicle after the engine has been started so that there is no substantial addition to the weight of the vehicle and its propelling mechanism.

To the above end, my invention consists in a device by which the engine on a vehicle may be connected with a stationary source of energy, by means of flexible connections having provision for disengagement from the vehicle after the engine thereon has been started, such disconnection being accomplished either automatically upon the starting of the engine, or through the motion of the vehicle itself.

Other features of my invention, relating more particularly to the details of construction and operation, will be set forth in connection with the following description of the illustrated embodiment of the invention.

In the accompanying drawings, which illustrate the preferred embodiment of my invention, Figure 1 is a side elevation of a complete engine-starting device, together with a diagrammatic representation of a vehicle in connection with which the device is used; Fig. 2 is a detail view, partly in section, illustrating particularly the construction and arrangement of the coupling device; Fig. 3 is a front elevation of the motor, showing particularly the automatic electric cut-out; and Fig. 4 is a side elevation of the motor and the cut-out.

The invention, broadly considered, consists in the transmission of energy in any form to the engine, through connections of the kind hereinbefore referred to, but in the illustrated embodiment of the invention I employ a flexible connection in the form of a rotary shaft adapted to actuate the vehicle engine mechanically, the shaft being rotated by a stationary electric motor.

In the drawings the engine 1 is illustrated diagrammatically as mounted upon a chassis which may constitute a part of a vehicle of any ordinary or suitable form. The source of energy in the present instance is an electric motor 2 of any suitable form, mounted upon a stationary support 3 at a convenient point in the building in which the vehicle stands when not in use. The flexible connection between the motor and the engine comprises a flexible shaft 4 of any ordinary or suitable form. This shaft is rotated by reduction gearing connecting it with the motor, this gearing comprising a pinion 5 on the motor shaft meshing with a gear 6 to which the end of the flexible shaft is connected. The flexible shaft may be connected with any rotating part of the engine, such as the main shaft or the half-speed shaft. It is illustrated as connected with the engine through gears 7 and 8, the gear 7 being connected with one of the engine shafts (not shown), while the gear 8 is fixed upon a short counter-shaft 9, journaled on the crank case of the engine. The rear end 10 of the counter-shaft is provided with several threads, of steep pitch, and the flexible shaft 4 is connected to the counter-shaft by means of a shell-coupling member 11. The coupling member 11 has a socket threaded to correspond with the threaded end 10 of the counter-shaft.

When the vehicle is placed in the building in which the above described device is used the coupling 11 may be engaged by hand with the threaded end of the counter-

shaft, and the device is then ready for use. When the motor is thrown into operation it rotates in a direction to cause the coupling member 11 to maintain itself in engagement with the counter-shaft 9, and thus to rotate the gears 7 and 8 and start the engine. After the engine is started, if the vehicle is immediately started forward the counter-shaft is readily disengaged from the coupling by the forward movement of the vehicle, since the threads on the counter-shaft and the coupling are sufficiently steep to permit these parts to be disengaged by a direct pull. This is a feature of great practical value, as it prevents the possibility of injury to the flexible shaft and obviates the necessity of attention on the part of the operator in starting the vehicle.

Another valuable feature of the form of connection illustrated in Fig. 2 resides in the fact that as soon as the engine has been started and has attained a sufficient speed of operation, whether the vehicle be started or not, the coupling is disconnected, for the engine tends to overrun the starting device, so that the counter-shaft 9 automatically unscrews itself from the coupling, thereby disengaging the flexible shaft from the engine, instead of transmitting rotative force through the flexible shaft to the motor.

In order that the electric motor may cease to operate as soon as the engine has been started, thereby economizing power and saving unnecessary wear in the mechanism, I provide an automatic cut-out device for breaking the motor circuit. To this end arms 12 are mounted upon the motor shaft, and two weights 13 are slidingly mounted upon these arms and held normally in the inward position by tension springs 14. Each weight carries a lug 15 adapted to cooperate with an arm 17 by which an electric switch 16 is operated. The switch 16 may be of any ordinary or suitable form, such as the ordinary snap-switch, the arm 17 being mounted upon the shaft of the switch in place of the ordinary finger-button. The switch 16 is shown diagrammatically in Fig. 4 as connected in the motor circuit through wires 18, together with an ordinary hand-switch 19 also controlling the motor circuit. When the motor attains a predetermined speed the weights 13 are moved outwardly upon the arms 12 by centrifugal force, sufficiently to enable one of the lugs 15 to engage the arm 17, whereby the arm is swung to operate the switch and break the motor circuit, thereby stopping the motor. While this device is directly controlled in accordance with the speed of the electric motor it is obviously controlled indirectly by the speed of the vehicle engine, owing to the mechanical connections between the engine and the motor.

In the use of the engine-starting device above described, when notice is received that the vehicle is to be used, as, for example, through an electric fire-alarm in the case of a vehicle used in connection with a fire-protection system, an attendant operates the hand-switch 19, thereby starting the electric motor. The vehicle engine is preferably left with its valves and connections in condition to permit the operation of the engine. As soon, therefore, as the electric motor, through the mechanical connections described, starts the engine in motion, the engine begins to run by its own power. Upon the attainment of a predetermined speed in the engine, corresponding to the predetermined speed in the electric motor, the automatic centrifugal cut-out breaks the motor circuit. The resulting cessation of rotation in the flexible shaft causes the coupling to be disconnected from the counter-shaft, and the flexible shaft then falls to the floor, leaving the vehicle entirely disconnected from the starting device with its engine running and ready to actuate the vehicle. The apparatus is reset, ready for the next operation, by opening the hand-switch and manually closing the automatic switch.

The engine-starting device hereinbefore described not only obviates the necessity of any substantial increase in weight in the vehicle, but it also permits the use of a source of energy of any required capacity, so that the starting of the vehicle may be insured under the most adverse conditions.

It will be apparent that energy from the stationary source may be transmitted in various forms to the vehicle engine, through flexible connections of appropriate character, and my invention is not, therefore, limited to the use of flexible mechanical connections, or to any particular source of energy.

In general, my invention is not limited to the embodiment thereof hereinbefore described and illustrated in the accompanying drawings, but may be embodied in various forms within the nature of the invention as it is defined in the following claims.

What I claim is:

1. An engine-starting device having, in combination with a stationary source of energy and a vehicle provided with a non-self-starting engine, flexible means for connecting the source of energy with said engine to supply energy for starting the engine, said means comprising a coupling separable by the movement of the vehicle away from the source of energy.

2. An engine-starting device having, in combination with a stationary source of power and a vehicle provided with a non-self-starting engine, flexible mechanical connections for connecting the source of power with said engine to actuate the engine, said means comprising a coupling separable by

the movement of the vehicle away from the source of power.

3. An engine-starting device having, in combination with a stationary source of power, flexible means for connecting the source of power mechanically with the engine of a motor-vehicle to actuate the engine, said means comprising a coupling automatically separable upon a tendency in the engine to run faster than it is driven by said source of power.

4. An engine-starting device having, in combination with a stationary source of energy, flexible means for connecting the source of energy with the engine of a motor-vehicle to supply energy for starting the engine, and means operating automatically to deënergize said connecting means upon the attainment of a predetermined speed by the engine.

5. An engine-starting device having, in combination with a stationary source of energy, flexible means for connecting the source of energy with an engine of a motor-vehicle to supply energy for starting the engine, said means comprising a coupling separable by the movement of the vehicle away from the source of energy, and means operating automatically to deënergize said connecting means upon the attainment of a predetermined speed by the engine.

6. An engine-starting device having, in combination with a stationary source of power, flexible means for connecting the source of power mechanically with the engine of a motor-vehicle to actuate the engine, said means comprising a coupling automatically separable upon a tendency in the engine to operate faster than it is actuated by the source of power, and means operating automatically to interrupt the transmission of power to said connecting means upon the attainment of a predetermined speed in the engine.

7. An engine-starting device having, in combination with a stationary electric motor, a flexible shaft connected with and actuated by the motor, connections between said shaft and the engine of a motor vehicle comprising a coupling separable automatically by movement of the vehicle away from the motor, and means operating automatically to deënergize the motor upon the attainment of a predetermined speed of rotation in the motor.

8. An engine-starting device having, in combination with a stationary source of power and a vehicle provided with a non-self-starting engine, a coupling-member permanently connected with the engine and directed toward the rear of the vehicle, a flexible shaft connected with said source of power, and a coupling-member connected with said shaft, the latter coupling-member being adapted to coöperate with the first-mentioned coupling-member, and to be disengaged therefrom by axial motion.

9. An engine-starting device having, in combination with a stationary source of power and a vehicle provided with a non-self-starting engine, a flexible shaft and a coupling for connecting the engine and the source of power, the coupling being adapted to maintain itself in operative engagement during rotation of the engine by the flexible shaft but being disengageable by a pull transmitted through the shaft.

In testimony whereof, I affix my signature in presence of two witnesses.

PERCY W. HODGKINSON.

Witnesses:

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