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D. F. GRAHAM & F. A. FOX.

FOOT STARTER MECHANISM FOR AUTOMOBILE ENGINES.

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NO MODEL.

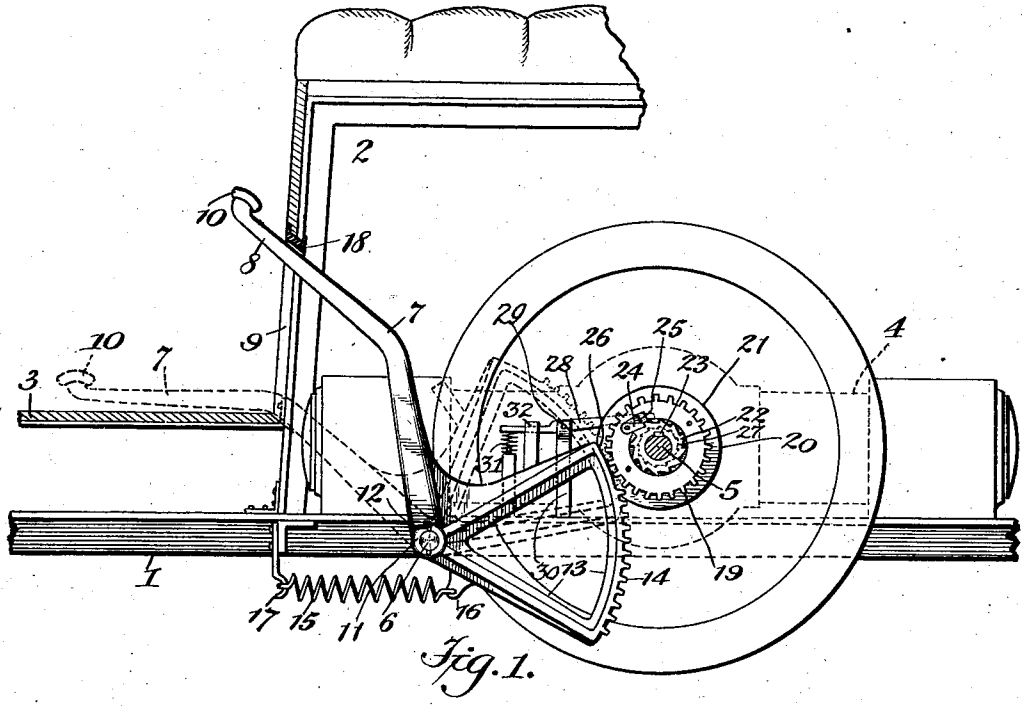


Fig. 1.

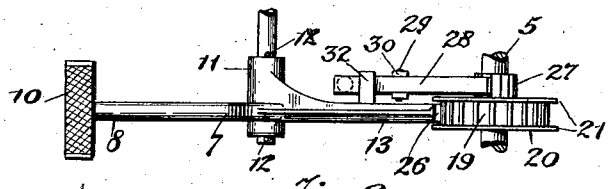


Fig. 2.

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UNITED STATES PATENT OFFICE.

DAVID F. GRAHAM, OF SPRINGFIELD, MASSACHUSETTS, AND FRANK A. FOX, OF NEW YORK, N. Y., ASSIGNORS, BY MESNE ASSIGNMENTS, TO THE GRAHAM-FOX MOTOR COMPANY, OF NEW YORK, N. Y., A CORPORATION OF NEW YORK.

FOOT STARTER MECHANISM FOR AUTOMOBILE-ENGINES.

SPECIFICATION forming part of Letters Patent No. 725,955, dated April 21, 1903.

Application filed September 21, 1901. Serial No. 76,005. (No model.)

To all whom it may concern:

Be it known that we, DAVID FERGUSON GRAHAM, residing at Springfield, in the county of Hampden and State of Massachusetts, and FRANK A. FOX, residing at New York, in the county and State of New York, citizens of the United States, have invented certain new and useful Improvements in Foot Starter Mechanisms Adapted for Automobile-Engines and Analogous Uses, of which the following is a specification.

This invention relates to foot starter mechanisms for engines or the like; and it has special relation to an improved starting mechanism which is designed to be operated by the foot and which is especially applicable in its adaptability of operation to automobile-engines and analogous uses.

The object of our invention is to provide a simple and improved starting mechanism for automobile-engines which can be conveniently and effectively operated by the driver or operator without leaving his seat upon the vehicle and which will be positive and safe and efficient in operation.

Heretofore in the ordinary starting of automobile-engines it has been customary to apply a crank or analogous device to the main shaft of the engine to start the same preliminary to the operation of the automobile; but this occasions considerable inconvenience and difficulty and virtually precludes the stoppage of the engine during short periods while the automobile is standing or at rest. Our invention is therefore designed to render the starting so convenient and effective that the disadvantages heretofore experienced will be entirely overcome and stopping of the engine during short periods while the automobile is standing or at rest will be rendered entirely feasible.

In the drawings, Figure 1 is a side view, partly in section, illustrating our improved foot starting mechanism. Fig. 2 is a detail top or plan view of the mechanism.

Corresponding parts in both figures are denoted by the same reference characters.

Referring to the drawings, 1 designates the frame of the vehicle, comprising the seat portion 2 and a foot-rest 3, which parts may be of any suitable or ordinary construction and arrangement. The engine is indicated in dotted lines in Fig. 1 at 4, and 5 designates the main shaft of the engine. Upon the framework 1, preferably at a point beneath the seat-frame 2, is provided a shaft 6, upon which is journaled a foot-lever 7. Said foot-lever projects upwardly and forwardly from its fulcrum or bearing, so that its front end 8 projects in front of the seat-frame 2, and said front end preferably operates in a vertical slot, as at 9, provided at the front of the seat portion. The front end of the lever 7 carries a cross-piece 10, adapted to provide a foothold. The bearing of the lever upon the shaft 6 may be formed in any suitable or adapted manner; but it preferably consists of a sleeve 11, carried by the lever and surrounding said shaft and retained in position by pins or other devices, as at 12.

Rearwardly of its fulcrum the foot-lever 7 is extended in the form of a segmental frame, as at 13, carrying at its rear edge a segmental rack or toothed portion 14. The lever is retained in normal position by means of spring mechanism, preferably comprising a coiled spring 15, connected with the lever at a point in rear of and beneath its fulcrum, as at 16, and extending forwardly to a hook or other engagement device, as at 17, projecting from the framework 1. A cushion or buffer, of elastic or other suitable material, (represented at 18,) is provided to receive the impact of the return movement of the lever caused by action of the spring 15 when the operation of the lever in its starting function is finished. This cushion is preferably located at the top of the slot 9, as shown.

The segmental rack 14 engages a gear 19, mounted upon the engine-shaft 5, and preferably carrying at its opposite sides disks or plates 20, which form peripheral flanges, as at 21, between which the rack 14 is retained and operates. Upon the shaft 5 within the gear 19 is secured a ratchet 22 by means of a key, as at 23, or in any other suitable or

adapted manner, which ratchet is engaged by a pawl 24, carried by the gear 19 and actuated by a suitably-arranged spring, as at 25.

The relative construction and arrangement are such that the lever is normally in position at the upper limit of its play, with its foot-hold 10 projecting in position at the front of the seat portion, so that it can be readily and conveniently engaged by the foot, and with its rack 14 below and out of engagement with the gear 19. When it is desired to start the engine, it is only necessary to engage the lever with the foot and press the same downwardly, (this operative movement being indicated in dotted lines in Fig. 1,) when the rack 14 will engage the gear 19 and the latter will lock with the ratchet 22 by action of the pawl 24, and thus turn the engine-shaft. The return movement of the lever is automatically effected by the spring mechanism, during which movement the gear 19 will travel in a reverse turn while it is engaged by the rack 14, and its pawl 24 will slide over the ratchet 22, and no reverse movement of said ratchet or of the engine-shaft 5 will take place. The lever 7 is then in the operation of starting the engine again depressed and will return to its normal position, and this reciprocating operation of the lever is continued until the desired degree of revolution of the engine-shaft 5 is attained.

It is an important desideratum concerned in our invention and improvements that the foot-lever 7 be normally entirely out of operative connection with the engine-shaft, so that the normal operation of the latter will not be affected in any way, and it is also important that at the same time the foot-lever maintains a relative operative position for quick and positive engagement with the mechanism or devices which constitute its connection with the engine-shaft. In carrying out the purposes just stated we provide a relative construction and arrangement with respect to the rack 14 and the frame portion 13 of the lever 7 which carries said rack whereby the initial end of the rack will be entirely out of engagement or contact with the gear 19 when the foot-lever is at rest in its normal upper position, and at the same time the frame portion 13 of the foot-lever will maintain an operative relative position with respect to said gear. In the specific construction herein shown and described in connection with the relative operative arrangement just stated the segmental rack 14 does not extend the whole length of the rear segmental portion of the frame 13 of the lever 7, but terminates at a predetermined point below the top end of said segmental portion of the frame 13, as clearly shown in Fig. 1, while said segmental portion of the frame continues upwardly, as indicated at 26, between the said disks or plates 20 of the gear mechanism. With the construction and arrangement as just described when the foot-lever is at rest in normal position the upper portion of its frame which carries the rack is thus at all times maintained in an operative position or relationship with respect to the gear mechanism upon the engine-shaft; but the segmental rack is out of engagement with said gear, and yet at an initial point adapted for immediate engagement with the gear when the foot-lever is operated. This special feature of our invention and improvements is an important factor in respect to the precise and positive and effective operation of the mechanism in the purposes for which it is designed.

To prevent back turning of the engine during the operation of the foot starter mechanism, we may provide a ratchet 27, keyed or otherwise secured to the engine-shaft 5 and adapted to be engaged by a pawl 28 when the rack 14 of the lever 7 is returning to normal position after its stroke, whereby the engine-shaft 5 is turned in its forward movement. The construction and arrangement are such that when the starting stroke of the rack 14 is operating to turn the engine-shaft 5 in its forward movement the pawl 28 will slide over said auxiliary ratchet 27; but during the reverse movement of the rack said pawl will operatively act against any back turning of the engine-shaft. The pawl 28 may be suitably fulcrumed, as at 29, in any adapted part, as at 30, of the general framework 1 and may be operatively actuated by a suitably-arranged spring 31.

To provide for the free operation of the engine in either direction under normal conditions during the travel of the vehicle when the foot-starter mechanism is not being operated, we preferably arrange in connection with the means for preventing back turning of the engine during the operation of the foot-starter mechanism means for throwing and retaining said anti-back-turning means entirely out of operation when the foot-starter mechanism is in normal position. The preferred construction for effecting the purpose just stated consists of a lug or projection, as at 32, upon the segmental rack portion 13 of the lever 7, which will engage the pawl 28 in rear of its fulcrum and bear upon the pawl against the tension of its actuating-spring 31 to withdraw the pawl 28 from engagement with the ratchet 27 when the lever 7 reaches the limit of its return stroke to normal position, and thus retain said pawl 28 out of engagement with the ratchet 27 so long as the lever 7 is in non-operative normal position. As soon as the lever 7 starts its operative stroke the pawl 28 will of course be released into automatic operative engagement with the ratchet 27.

The operation and advantages of our invention will be readily understood by those skilled in the art to which it appertains. It enables a quick and convenient starting of the engines in automobiles and analogous structures from the driver's seat and without dismounting by simple operation of the foot

and without the employment of any separate devices for special engagement with the engine-shaft. The device is exceedingly simple and compact and is designed to form a permanent component part of the governing mechanism of the vehicle.

It is manifest that modifications and variations in the detail features of construction and arrangement may be made in the adaptability of our invention and improvements to various conditions of use without departing from the spirit and scope of our improvements. We therefore reserve the right to all such variations and modifications as properly fall within the scope of our invention and the terms of the following claims.

In the variation and modification of our invention under specific circumstances it will be obvious that in lieu of a specific foot-lever the main arm of the lever may be extended into convenient position to form a hand-lever, or other hand-lever mechanisms or connections of any suitable or adapted construction may be employed.

Having thus described our invention, we claim and desire to secure by Letters Patent—

1. In a mechanism of the class set forth, the combination with the engine-shaft, of lever mechanism for operatively turning said shaft, such mechanism consisting of an operating-lever carrying a segmental gear, and a gear loosely mounted upon the engine-shaft adapted to be engaged by said segmental gear when the operating-lever is actuated, and thus serving to turn the shaft in one direction, means in connection with the gear for operatively engaging the shaft to prevent back turning of the same during the operation of said lever mechanism, and means carried by the segmental gear of the lever mechanism for retaining said non-back-turning means out of engagement with the shaft when said lever mechanism is in normal non-operative position, substantially as and for the purpose set forth.

2. In a mechanism of the class set forth, the combination, with the engine-shaft, and a starting mechanism operatively related to said shaft to turn the same, of means for preventing back turning of the shaft during the operation of the starting mechanism, and means comprised in the starting mechanism for holding said non-back-action means in inoperative position while the starting mechanism is in normal position.

3. In a mechanism of the class set forth, the combination with the engine-shaft, of a lever mechanism operatively related to said shaft to turn the same, and means controlled by said lever mechanism for preventing back turning of the shaft during the operation of the lever mechanism.

4. In a mechanism of the class set forth, the combination, with the engine-shaft, of a lever mechanism operatively related to said shaft to turn the same, a ratchet carried by said shaft, a pivoted spring-pressed pawl for engaging said ratchet to prevent back turning of the shaft during the operation of the lever mechanism, and means carried by the lever mechanism for disengaging said pawl from said ratchet as said lever mechanism returns to normal position and holding said pawl in inoperative position.

5. In a mechanism of the class set forth, the combination, with the engine-shaft and a ratchet carried thereby, of a gear mechanism loosely mounted upon said shaft around said ratchet and provided with a pawl for engaging said ratchet and with side guide-flanges projecting beyond the gear, a lever mechanism embodying a segmental portion moving between said guide-flanges and provided with an initial plain portion which normally rests between said flanges and a geared portion having an operative relationship to the gear upon the shaft to turn the same, means for preventing the back turning of the shaft during the operation of the lever mechanism, and means carried by the lever mechanism for returning the non-back-action means to inoperative position as the lever mechanism returns to normal position and for retaining the non-back-action means in such position as long as the lever mechanism remains in normal position.

In testimony whereof we have signed our names in the presence of the subscribing witnesses.

DAVID F. GRAHAM.
FRANK A. FOX.

Witnesses:
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HERBERT G. WHIPPLE.