J. E. DESMOND.

PNEUMATIC ENGINE STARTER.

APPLICATION FILED MAY 7, 1917.

1,284,614.

Patented Nov. 12, 1918.

3 SHEETS—SHEET 1.

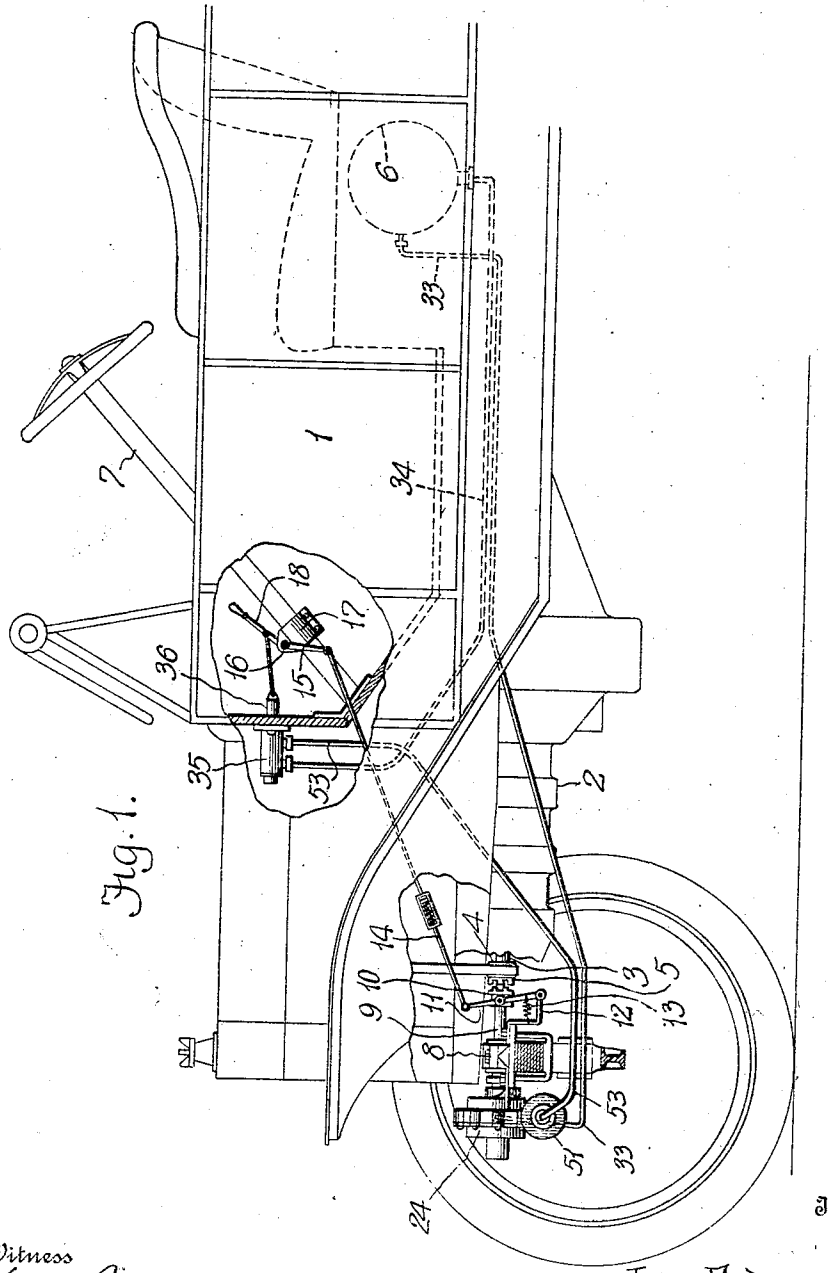


Fig. 1.

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3 SHEETS—SHEET 2.

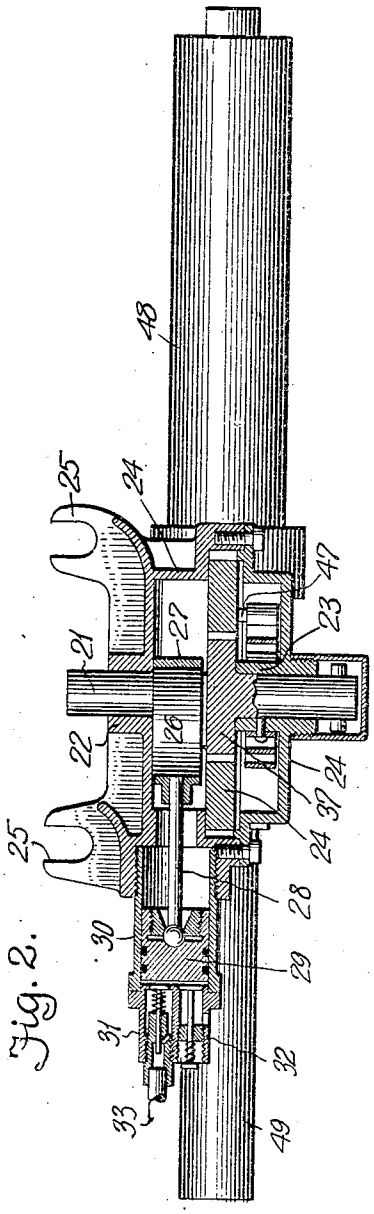


Fig. 2.

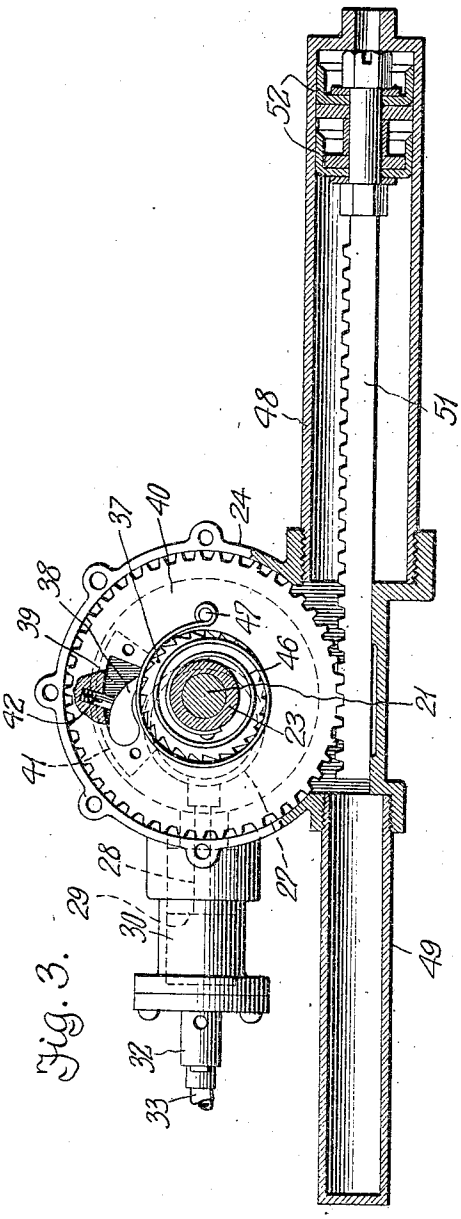


Fig. 3.

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3 SHEETS—SHEET 3.

Fig. 5.

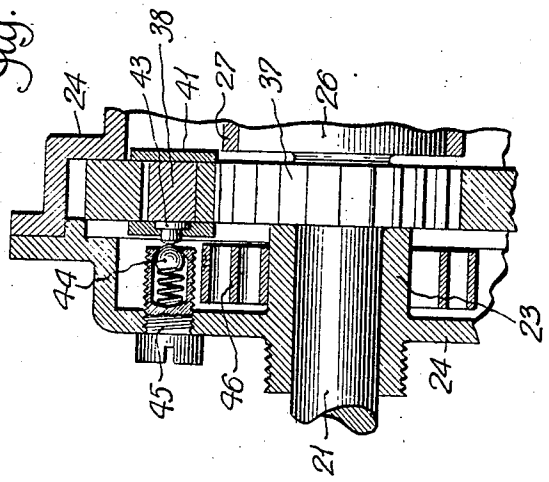
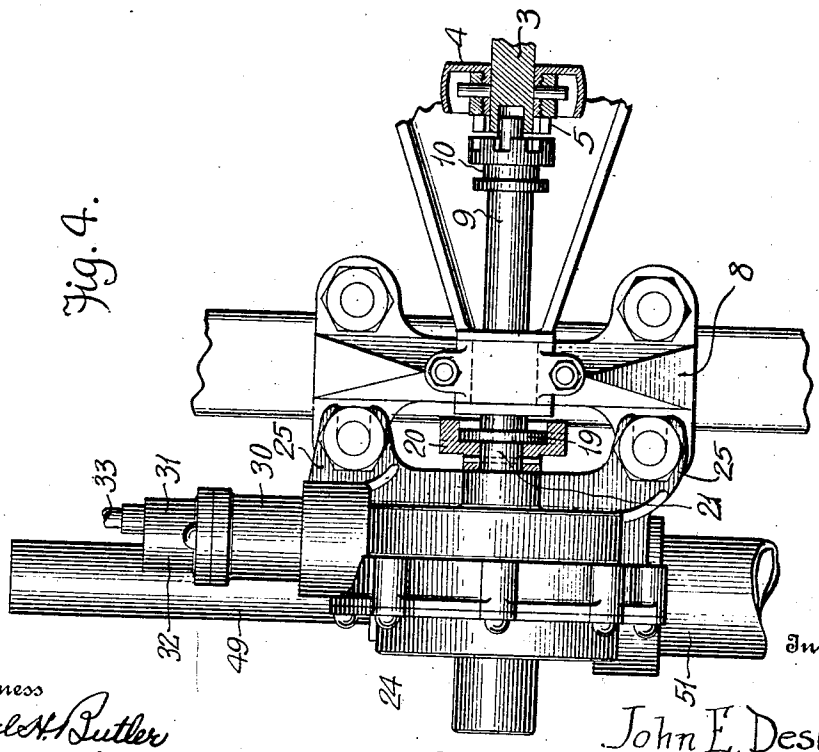


Fig. 4.



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UNITED STATES PATENT OFFICE.

JOHN E. DESMOND, OF DETROIT, MICHIGAN, ASSIGNOR TO DESMOND PNEUMATIC STARTER COMPANY, OF DETROIT, MICHIGAN, A CORPORATION OF MICHIGAN.

PNEUMATIC ENGINE-STARTER.

1,284,614. Specification of Letters Patent. Patented Nov. 12, 1918.

Application filed May 7, 1917. Serial No. 167,047.

To all whom it may concern:

Be it known that I, JOHN E. DESMOND, a citizen of the United States of America, residing at Detroit, in the county of Wayne and State of Michigan, have invented certain new and useful Improvements in Pneumatic Engine-Starters, of which the following is a specification, reference being had therein to the accompanying drawings.

This invention relates to a starting device, and has special reference to that class of starting devices used for turning over the crank shaft of an internal combustion engine, especially when forming part of the power plant of an automobile. The invention also has special reference to that class of starting devices wherein air, under pressure, is utilized as a motive fluid or power.

My invention aims to provide a device of the above type including an air pump that may be driven by an internal combustion engine to place air, under pressure, so that it may be utilized for various purposes in connection with an automobile. For instance by using suitable controlling devices, it may be stored for the inflation of tires or placed in a fuel tank to maintain a fuel feed supply system for an internal combustion engine. Provision is made for maintaining a predetermined pressure of air at all times, either during an operation of an internal combustion engine or during the cessation in the operation so that the reserve supply of air may be utilized for operating the device to turn over the crank shaft of the internal combustion engine and thereby start the engine.

My invention further aims to provide a pneumatic starting device for automobiles, wherein the parts are constructed with a view of reducing the expense of manufacture, and at the same time retain those features by which ease of installation, adaptability to various types of automobiles, reliability in time of need, and positive action as a cranking device, are secured.

With such ends in view, my invention resides in the novel construction to be hereinafter described and then claimed.

Reference will now be had to the drawings, wherein—

Figure 1 is a side elevation of a portion of an automobile, partly broken away and partly in section, showing the starting device in connection therewith;

Fig. 2 is a horizontal sectional view of a portion of the starter device;

Fig. 3 is a front elevation of a portion of the same, partly in section;

Fig. 4 is a plan of the starting device, partly in section, and

Fig. 5 is an enlarged detailed sectional view of a portion of the starting device.

In describing my invention by aid of the views above referred to, I desire to point out that the same are intended as merely illustrative of an example whereby my invention may be put into practice, and I do not care to confine myself to the precise construction and arrangement of parts shown.

In the drawing, 1 denotes a conventional form of automobile having an engine 2, a driven crank shaft 3, a pulley 4 on the crank shaft, and a clutch member 5 at said pulley. The automobile also has a steering column 7, and a front end bearing 8. In the front end bearing 8 is a rotatable and slidable starter shaft 9, the inner end thereof provided with a clutch member 10 adapted for engagement with the clutch member 5 of the engine crank shaft 3. Loosely engaging the clutch member 10 is the usual form of collar and lever generally denoted 11, this lever being supported by a hanger 12 from the front end bearing 8. The lever 11 is connected to the hanger 12 by a coiled retractile spring 13, and this spring is adapted to hold the clutch members 10 and 5 normally separated. The upper end of the lever 11 is pivotally connected to an adjustable reach rod 14 that extends upwardly in proximity to the steering column 7 and is connected to the crank 15 of a rock shaft 16. The rock shaft 16 is journaled in a bearing 17 mounted on the steering column, and said rock shaft has an operating lever 18 that will be again referred to.

On the outer end of the starter shaft 9 is a fixed head 19 slidable in a socket member 20 mounted on the end of a shaft 21. The socket member 20 and the head 19 are adapted to establish a driving connection between the shaft and the starter shaft and yet permit of the starter shaft 9 being reciprocated in the front end bearing 8.

The shaft 21 is journaled in bearings 22 and 23 of a cylindrical pump casing 24 and this casing has slotted lugs or a bracket portion 25 so that it may be held stationary by the front end bearing 8, as best shown in Fig. 4.

On the shaft 21 within the casing 24 is an eccentric 26 and loose on this eccentric is a ring 27 having a connecting rod 28 articulated with a piston 29 reciprocable in a cylinder 30 carried by the casing 24 and communicating therewith. The piston 29 is of the conventional form and the outer end of the cylinder 30 has check valves 31 and 32 for the intake and exhaust of air to and from the cylinder 30. The exhaust valve 31 is connected by a pipe or tube 33 to an air reservoir or tank 6 preferably located below the front seat of the automobile, as best shown in Fig. 1. This reservoir or tank is in turn connected by a pipe or tube 34 to a controlling valve 35 attached to the dash of the autmobile. The valve 35 has a slidable plug 36 connected to the operating lever 18, so that said valve plug and the clutch member 10 may be adjusted in synchronism.

On the shaft 21 adjacent the eccentric 26, is a ratchet wheel 37, and adapted to engage said ratchet wheel is a pivoted pawl 38 located in an opening 39 in a pinion 40 that surrounds the ratchet wheel 37. The pawl 38 is pivotally supported between two plates 41 connected to the pinion 40 and said pawl is adapted to be pressed into engagement with the ratchet wheel 37 by a spring pressed member 42 disposed in a wall of the opening 39. The pawl 38 is also adapted to be held out of engagement with the ratchet wheel 37 by a friction member 43 in one of the plates 41, and said friction member is engaged by a spring pressed detent 44 in a housing 45 connected to the casing 24. The details of construction are best shown in Fig. 5.

Connected to the bearing 23 of the pump casing 24 is a spiral band spring 46 and the outer convolution of said spring is connected to the pinion 40, as at 47. The spiral band spring 46 is employed for restoring the pinion 40 to normal position.

The pump casing 24 is provided with a tangential cylinder 48 and a housing 49 alining therewith in opposed relation to the cylinder. In the cylinder 48 and meshing with the pinion 40 is a rack 51 with said housing 49 providing clearance for a reciprocable movement of the rack in order that said rack may impart a rotary movement of the pinion 40. The outer end of the rack 51 is provided with piston heads 52 and the outer end of the cylinder 48 is connected by a pipe or tube 53 to the controlling valve 35 and is adapted to conduct air, under pressure, to the cylinder 48, to move the rack 51 in one direction, while the rack is moved in the opposite direction by the spring 46 associated with the pinion 40.

Considering the operation of the starting device, I will assume that the reservoir or tank 6 has been previously charged by the starting device and contains sufficient air, under pressure, to operate the device for starting purposes. It is only necessary to swing the operating lever 18 toward the dash of the automobile to throw the clutch member 10 into engagement with the clutch member 5, thereby coupling the shaft 21 and the starter shaft 9 relative to the crank shaft 3 of the engine. Simultaneously with this operation the valve plug 36 is shifted to establish communication between the pipe 34 and 53 through the valve 35. Air entering the outer end of the cylinder 48 forces the piston head 52 to the inner end of the cylinder causing the rack 51 to rotate the pinion 40. An initial movement of this pinion causes the pawl 38, frictionally held by the member 43, to be released, so that the spring pressed member 42 can force the pawl into engagement with the ratchet wheel 37. The pawl 34 causes the ratchet wheel 37 to be carried with the pinion 40 and as said ratchet wheel is mounted upon the shaft 21, the engine shaft 3 will be turned over sufficiently for starting purposes.

During this operation the piston 29 is reciprocated within the cylinder 30 and air is drawn into said cylinder and forced, under pressure, into the reservoir or tank 6.

As the pinion 40 and the ratchet wheel 37 move in synchronism, the spring 46 is placed under compression and immediately upon the engine 2 having been started and the operating lever 18 restored to normal position, the supply of air to the cylinder 41 is shut off, allowing the expansive force of the spring 46 to restore the pinion 40 and the rack 51 to normal position.

It is apparent that when the engine 2 is started that the ratchet wheel 36 may revolve independent of the pinion 40, as the ratchet wheel 38 may recede over the teeth of the ratchet wheel. In restoring the pinion 40 and the rack 51 to normal position, the pawl 38, while held elevated by the ratchet wheel 37 again engages the friction member 43 and is held in an elevated position thereby, so that the engine may operate without the pawl dragging on the ratchet wheel. In the interim of opening and closing the valve 35, the air pump supplies the reservoir or tank 6 with air, so that there is always a sufficient quantity of air under a compression, within the reservoir or tank, for starting purposes.

By reference to Fig. 2, it will be noted that the shaft 21 protrudes from the pump casing 24 and is inclosed by a detachable

cap, which when removed, permits of the usual hand crank being used for starting the engine in emergency cases.

What I claim is:—

1. In an engine starting device, the combination with a shaft, of a ratchet wheel fast upon said shaft, a gear co-axial with said ratchet wheel, a pawl carried by said gear for engaging said ratchet wheel to establish the gear in a driving relation to the starter shaft, a rack engaging said gear, means for pneumatically actuating the rack in one direction to drive the gear, means for returning the rack and gear to starting position, and a member mounted to yieldably act upon said pawl in the starting position of the gear to hold the same disengaged from the ratchet wheel.

2. In an engine starting device, the combination with a shaft, a ratchet wheel fast upon said shaft, a gear co-axial with said ratchet wheel, a pawl carried by said gear for engaging said ratchet wheel to establish the gear in a driving relation to the starter shaft, a rack engaging said gear, means for pneumatically actuating the rack in one direction to drive the gear, means for returning the rack and gear to starting position, a member carried by the gear laterally adjacent said pawl, and a non-rotative means for exerting yielding pressure upon the pawl through said member in the starting position of the gear to hold said pawl disengaged from the ratchet wheel.

3. In an engine starting device, the combination with a shaft, of a ratchet wheel fast upon said shaft, a gear co-axial with said ratchet wheel, a pawl carried by said gear and recessed therein for engaging said ratchet wheel to establish the gear in a driving relation to the starter shaft, a rack engaging said gear, means for pneumatically actuating the rack in one direction to drive the gear, means for returning the rack and gear to starting position, plates at each side of the gear retaining the pawl in its recess, a thrust member carried by one of said plates, and non-rotative means for exerting yielding pressure upon the pawl through said thrust member in the starting position of the gear to hold said pawl disengaged from the ratchet wheel.

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

JOHN E. DESMOND.

Witnesses:

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ANNA M. DORR.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents. Washington, D. C."