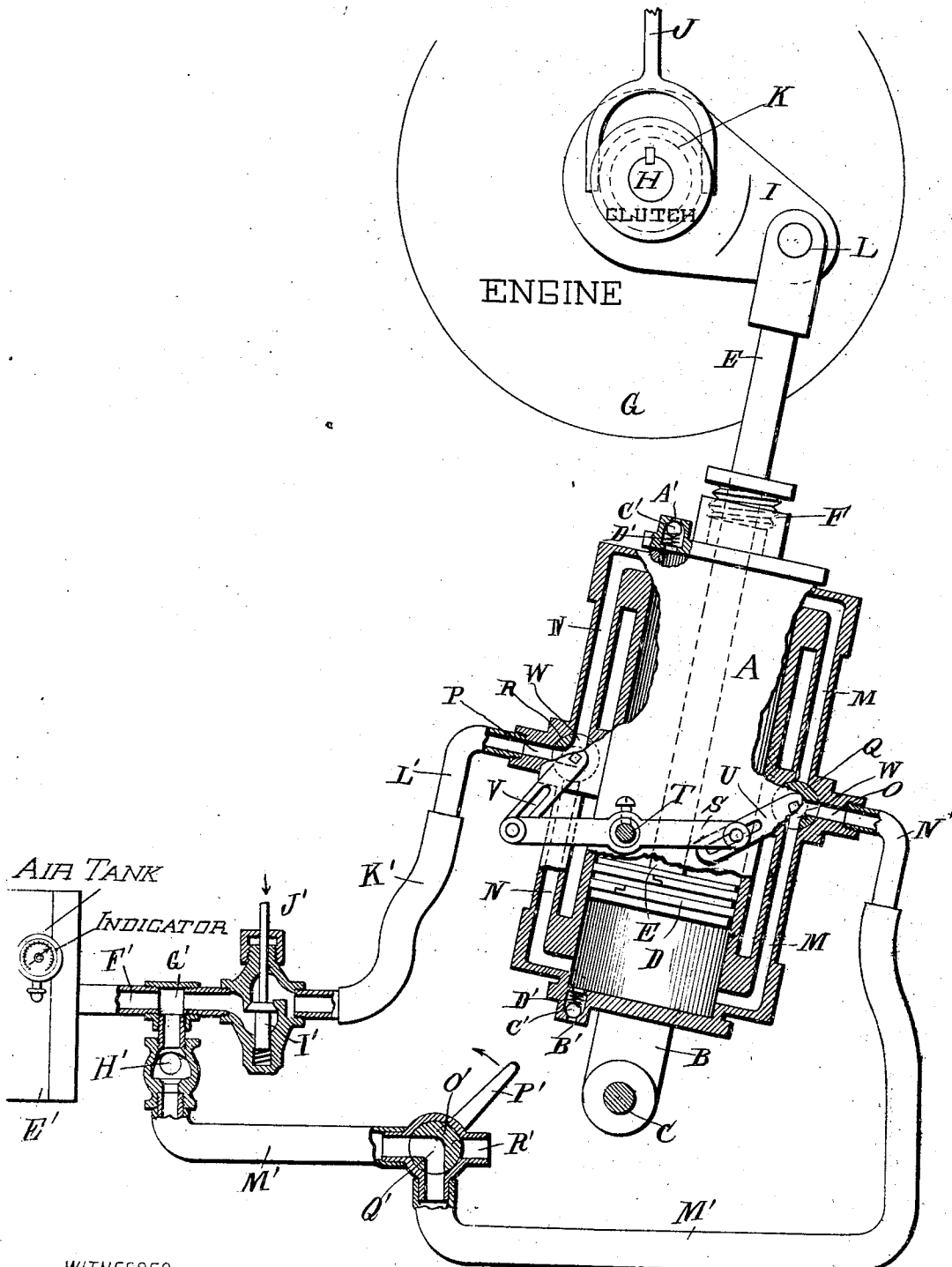


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PATENTED NOV. 12, 1907.

F. L. ORR.
ENGINE STARTER.
APPLICATION FILED FEB. 6, 1907.



WITNESSES.

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FRANCIS LEONARD ORR, OF THURMAN, IOWA, ASSIGNOR OF ONE-HALF TO MARK MORROW,
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ENGINE-STARTER

No. 870,580.

Specification of Letters Patent.

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To all whom it may concern:

Be it known that I, FRANCIS LEONARD ORR, a citizen of the United States, and a resident of Thurman, in the county of Fremont and State of Iowa, have invented a new and Improved Engine-Starter, of which the following is a specification.

The invention relates to means for starting gas or gasoline engines, and has for its object the provision of novel and improved power means adapted for cranking internal combustion engines in general, stationary or mobile, but more especially for starting engines of the general character stated, employed on gasoline automobiles.

The invention consists of a peculiar form of combined pump and engine adapted for operative connection with the power shaft of the driving or propelling engine, or other rotatable shaft forming a part of the driving or propelling engine, a tank with tubing providing communicating passageways leading therefrom into the cylinder of the combined pump and engine, check and controller valves in the tubing, and automatically opening feed and exhaust valves on the combined pump and engine, the latter being oscillatory in character.

The invention may be more definitely stated as residing in the special construction and arrangement of parts hereinafter fully described, and with the novelty thereof pointed out in the claims.

In the following detail description, reference is had to the accompanying drawing illustrating my invention in preferred form, the drawing being shown part in section.

In the practice of my invention I employ a cylinder A, having oscillatory attachment at one end, by means of a suitable bearing B, having support on a fixedly located shaft or journal C.

In the cylinder A, I arrange a piston D, with its rod E made projecting through a suitable gland F on the swinging end of the cylinder A.

G denotes in diagram any form of gas or gasoline driving engine, on the power shaft H, of which, I arrange a crank-arm I.

It is intended that the crank-arm I shall be loosely arranged on the shaft H and be adapted for working connection therewith, by means of any well known form of clutch device, indicated in diagram by the reference characters J, K.

The projecting end L of the piston E is suitably connected with the outer or free end of the crank-arm I, substantially as shown by the figure of illustration.

M, N, indicate respectively, passageways, on opposite sides of the engine cylinder, having their ends providing open communication into the cylinder, at opposite ends thereof, as illustrated.

The passageways M, N, are provided respectively with branch passageways O, P, and at the juncture of the passageways M, O, and N, P, I locate valves Q, R, adapted to shift open communication of the passageways into the engine cylinder, at opposite sides of its piston D, through operation of means illustrated in its preferred form, and which may be described as follows.

In constructing the valve operating means just referred to, I employ a bar S and provide it with substantially central support, on a fixedly located journal, rod or shaft T, having support on the engine base, or other suitable location adapting its being held against movement.

U, V, indicate links respectively connecting opposite ends of the bar S, with projecting ends of the respective valves Q, R. The valves Q, R, are constructed with angularly disposed openings W therethrough, shown by the drawing.

At the ends of the cylinder A, I arrange suitable inlet ports A', B', provided with check valves C', held yieldingly seated by springs D'.

My invention further comprehends the use of a storage tank E', having a nipple or opening F', leading thereinto. At the outer end of the tank opening F', I locate a two-way union or L-shaped passageway G'. In one passageway of the union G' I locate an automatic, or puppet check valve H', adapted to seat closing passageway leading through the union and into the tank E, and in the other passageway of the union G', I locate a valve I', held yieldingly seated, closing passageway through the union G', leading from the tank E'. The valve I' is provided with a projecting stem J', whereby, through manual manipulation, the valve I', may be forced from its seat, thus opening up free passageway through the valve-casing.

K' indicates a flexible tube, having one end suitably connected with the casing of the valve I', and its other end extended to and affording communication leading into one end of a tube L', the other end of the tube L' being suitably connected with the branch passageway P, on the cylinder A.

M' indicates a flexible tube providing passageway from the check-valve H', into one end of a tube N', the other end of the tube N' being attached to the cylinder nipple or passageway O.

In the passageway formed by the tubes M', N', I locate an exterior exhaust valve O', and provide it with an operating handle P', whereby the angularly disposed passageway Q' through the valve may be adjusted from its illustrated position completing open passageway from the cylinder A into the storage tank E', to cutting off communication leading from the cylinder A into the storage tank E', and establishing

free exhaust from one or the other ends of the cylinder A, leading through the passageways M, tubes N', M', and to the outer air, through the valve opening R'.

The construction of my improved engine starter will be understood from the above description.

In describing the operation of invention, I would premise by saying that under ordinary operation of the driving or propelling engine G, the crank arm is designed to hang loosely on the engine shaft-H, by obvious adjustment of the clutch device J, K, hereinbefore briefly referred to. Now we will assume that the tank is stored with suitable pressure of air, and it is desired to boost or crank the engine G to start it in operation. To effect starting up of the driving or propelling engine as stated, it becomes necessary simply to unseat the valve I', by simple pressure on its stem J', thereby permitting pressure of air to flow from the tank E' into one or the other ends of the cylinder A. In the figure of illustration the cylinder A is shown near the end of its oscillation with the piston moving downwardly, and the valve R adjusted to feed the compressed air into the upper end of the cylinder A, above its piston and operating thereon with pressure designed to force the piston to completed down-stroke. During the down stroke of the piston just described obviously the crank arm I will be imparted turning action, indicated by the arrow thereon, through connection therewith of the piston rod E, and the crank arm being fixedly secured to the engine shaft H, by suitable adjustment of the clutch device J, K, it is apparent the engine shaft H will be turned thereby. During the action of parts just described it is further apparent the free or upper end of the cylinder A will be caused to swing to the left, indicated by the arrow marked 1. The bar S being held against endwise movement, as above described, obviously when the cylinder A has completed the swinging movement referred to, the valve R will be adjusted through connection of its link V with the bar S, to position, providing passageway for flow of compressed air from the tank E', into the cylinder A, to the under side of the piston D. Air pressure being fed into the cylinder, under its piston as stated, the piston will be forced upwardly toward the other end of the cylinder A, and by such operative movement, effect continued rotary movement of the engine shaft H.

It will be noticed that connection of the valves R, Q, with the bar S is such, that when the former is adjusted to feed into one or the other ends of the cylinder A, the latter valve Q, is adjusted cutting off exhaust from the feed end of the cylinder, and the other end of the cylinder opened up adapted for free exhaust in advance of the piston D, the exhaust passageway leading through the tube N', M', the valve O', and the outlet R' from the valve O'.

It will be understood that during the operation of parts above described, in boosting or cranking the driving or propelling engine above described, the valve O' is adjusted to position with its opening Q' completing passageway through the cylinder end of the tube M', and the valve outlet R' to the outer air. Now so long as the valve I' is held pressed down permitting flow of compressed air into the cylinder A, the piston D will be made to travel from end to end of the cylinder

A, and through its connection with the power shaft H, effect continued boosting or cranking of the shaft H, until the driving or propelling engine is effectively started up and set running under its own power. During boosting or cranking of the engine shaft H, it is apparent that the cylinder A will be imparted oscillatory movement, and that through the linked connection of the valves Q, R, with the bar S, the latter being held against lateral movement, the valves Q, R, will be adjusted, the former permitting feed of air into the cylinder A, and the latter permitting exhaust of air from the cylinder A, in advance of its piston D. When the driving or propelling engine is effectively started in operation, pressure is removed from the valve stem J'. At the same time the valve I' in feed passageway leading from the tank E' into the cylinder A, will be forced to its seat or closing adjustment. In the figure of illustration, all the valves are shown in position with the piston forcing air, drawn into the cylinder through its check valve openings A', B'. Now it being assumed that the driving or propelling engine has been given operative boosting or cranking action, with all the valves in the conveying passageways adjusted as illustrated, working operation of the driving or propelling engine will effect restoring of air into the tank E', thereby maintaining required air pressure therein, which air pressure may be ascertained by an indicating device on the storage tank.

It will be apparent from the above description that my invention involves means, in one apparatus or device, serving as an engine to crank the power shaft of the driving or propelling engine, whereby to start it in operation, through force of stored up air, and at the same time is adapted for operation as a pump whereby to restore pressure of air, thus at all times insuring adequate motive power in the storage tank for effective re-cranking or starting of the driving or propelling engine, as occasion may require.

I claim—

1. An engine starter comprising an oscillatory cylinder, a piston in the cylinder, the piston being provided with a rod projecting outside of the cylinder, a crank-arm loosely arranged on a rotatable shaft of the engine, clutch devices on the engine shaft adapted to fixedly connect the crank-arm therewith, an air storage tank, passageways providing open communication between the cylinder and storage tank, the passageways being constructed with branch passageways, leading into opposite ends of the cylinder, valves in said branch passageways, means adapted to operate the valves in said branch passageways, providing respectively feed and exhaust into, and from the cylinder, a manually operated valve in one passageway leading from the storage-tank, a check-valve and an outlet valve in a separate passageway leading from the storage tank, and vent valves in the end of the oscillatory cylinder.
2. The combination with a driven shaft of an engine, of a crank-arm loosely arranged on said shaft, clutch devices adapted to fixedly connect the crank-arm and said driven-shaft, a cylinder provided with oscillatory support at one end thereof, a piston in the cylinder, the piston being provided with a rod constructed and adapted to extend through the free, or swinging end of the cylinder, and for attachment to the outer or free end of the crank-arm, vent valves in the cylinder ends, a storage-tank, passageways with branch passageways at one end thereof, the branch passageways being arranged leading into opposite ends of the oscillatory cylinder, and the main passageways affording communication, leading from the stor-

age tank, valves in the branch passageways, a fixedly held device with means operatively connected to the valves in the branch passageways, and a manually operated, check, and outlet valve in the tank end of the passageways.

- 5 3. In combination, an engine shaft, a crank-arm loosely arranged on the engine shaft, means to secure the crank-arm against movement on said shaft, an oscillatory cylinder and piston therein, the piston being operatively connected with the outer end of the crank-arm, and the cylinder provided with venting valves leading to the outer air,
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a storage tank, and means connecting said tank and cylinder, comprising passageways with controller, check, outlet and cylinder valves, the combined apparatus or devices being adapted for operation to effect boosting or cranking action to the engine shaft by pressure of air stored in the tank, and also, for operation, to restore air into the tank. 15

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Witnesses:

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