

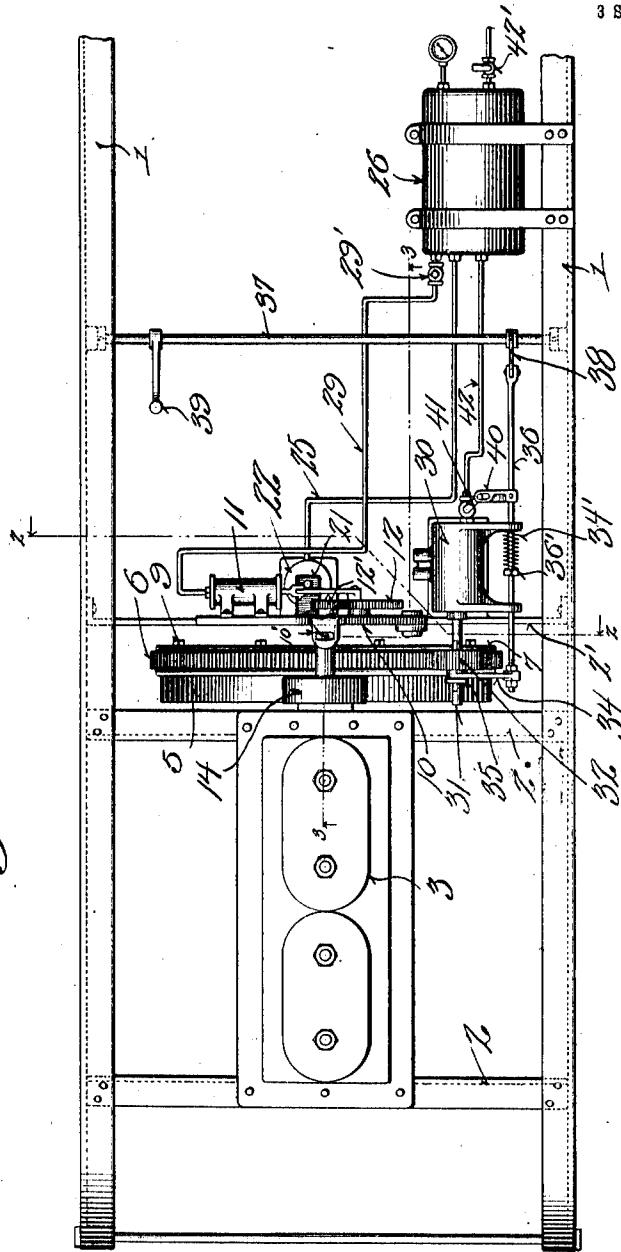
E. D. BANGS.
ENGINE STARTER.
APPLICATION FILED MAR. 5, 1912.

1,061,719.

Patented May 13, 1913.

3 SHEETS—SHEET 1.

Fig. 1.



Witnesses:
Charles Young
May Downey.

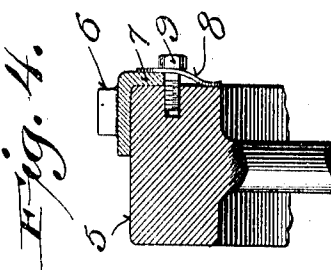
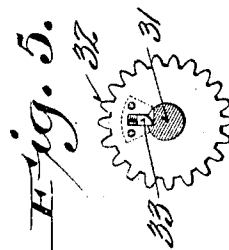
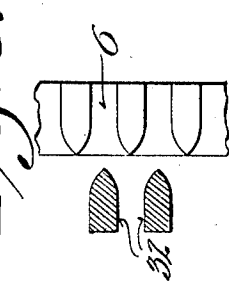
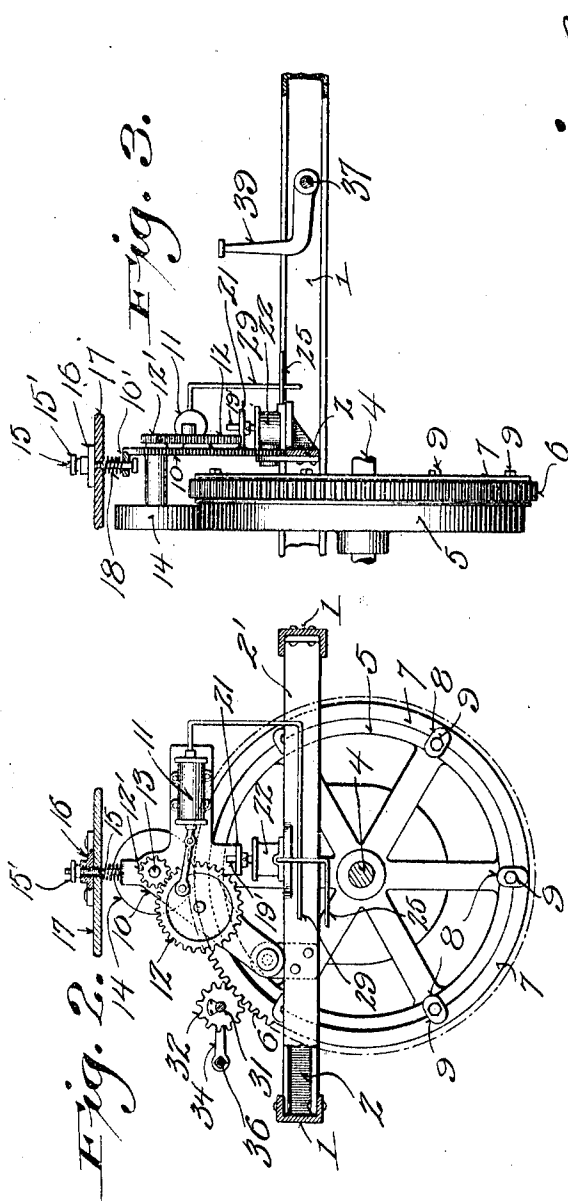
Inventor:
Edwin D. Bangs
By *Clifford Young*
Attorney.

E. D. BANGS.
ENGINE STARTER.
APPLICATION FILED MAR. 5, 1912.

1,061,719.

Patented May 13, 1913.

3 SHEETS-SHEET 2.



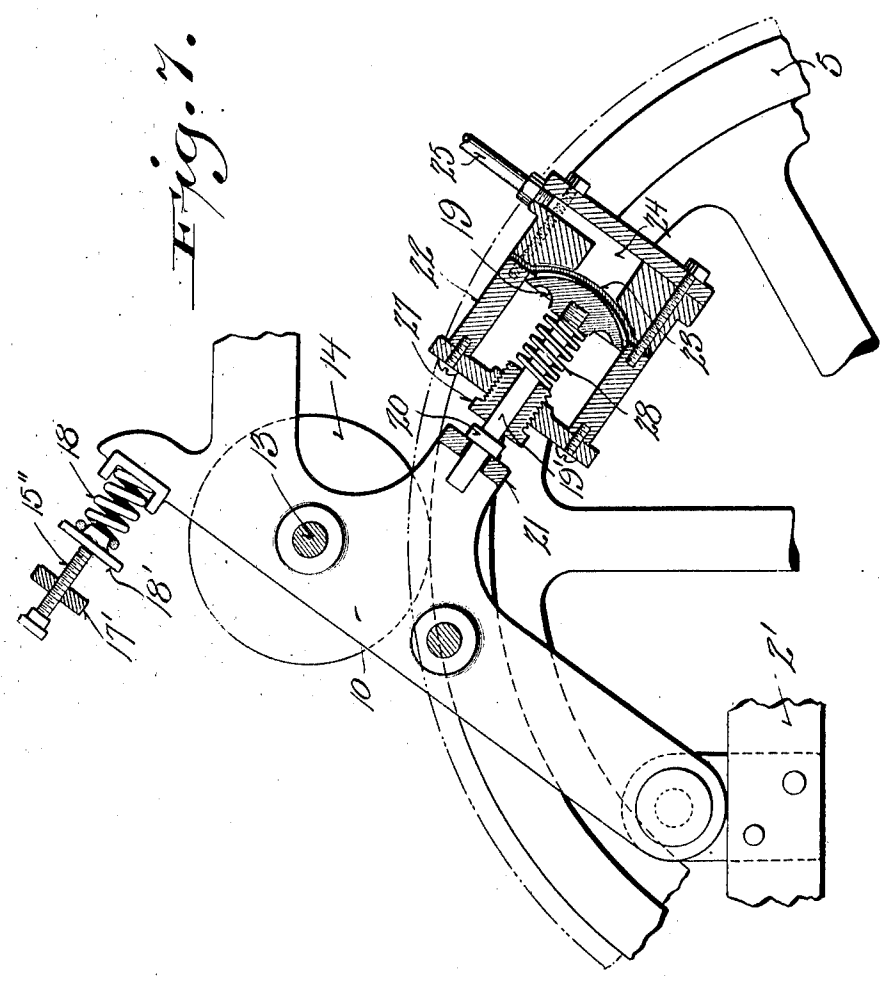
Witnessed:
Cammie Spring.
May Downey

Edwin D. Bangs.
By *Alfred Young*.
Attorneys.

E. D. BANGS.
ENGINE STARTER.
APPLICATION FILED MAR. 5, 1912.

1,061,719.

Patented May 13, 1913.
3 SHEETS—SHEET 3.



Witnessed:
Cassatt & Young,
May Downey.

Inventor:
Edwin D. Bangs.
By *Clifford Young*
Attorneys.

UNITED STATES PATENT OFFICE.

EDWIN D. BANGS, OF MILWAUKEE, WISCONSIN.

ENGINE-STARTER.

1,061,719.

Specification of Letters Patent.

Patented May 13, 1913.

Application filed March 5, 1912. Serial No. 681,723.

To all whom it may concern:

Be it known that I, EDWIN D. BANGS, a citizen of the United States, and resident of Milwaukee, in the county of Milwaukee and State of Wisconsin, have invented certain new and useful Improvements in Engine-Starters; and I do hereby declare that the following is a full, clear, and exact description thereof.

My invention has for its object to provide a simple, economical and positive starter mechanism for internal combustion engines, the invention consisting in certain peculiarities of construction and combination of parts as hereinafter set forth with reference to the accompanying drawings and subsequently claimed.

In the drawings Figure 1 represents a plan view of an engine embodying the features of my invention, the engine and starter mechanism being illustrated and shown mounted upon a truck-frame; Fig. 2, a cross-section of the same, the section being indicated by line 2—2 of Fig. 1; Fig. 3, a detail longitudinal section of the starter mechanism showing its relation to the fly-wheel of the engine; Fig. 4, a cross-section of said fly-wheel; Fig. 5, a detailed view of the clutch connection between a driving pinion and the motor-shaft; Fig. 6 illustrates a plan view of a portion of the fly-wheel rack enlarged with a pair of the motor shaft pinion wheels in section, said view showing the manner of tapering the teeth of the gears, whereby they will readily slide into mesh, and Fig. 7, a diagram view of the pump-carrying bracket, showing the air-controlled means for operating the same in section, the said air-control being in opposition to spring pressure.

Referring by characters to the drawings, 1, 1, represent the side beams of a truck-frame connected by cross-girders 2, upon which girders is mounted an engine 3 of the internal combustion type, the engine being provided with the usual crank-shaft 4 and fly-wheel 5, all of which mechanism forms no part of my invention. Mounted upon the rim of the fly-wheel 5 is a toothed angle-iron ring 6, the vertical flange 7 of which ring is securely clamped to the adjacent face of the fly-wheel rim by a plurality of frictional gripping spring tongues 8, the tongues being adjustable as to tension through their securing bolts 9, which bolts are in threaded union, as best shown in Fig. 4, with the fly-

wheel rim. By this construction it is apparent that the rim is frictionally held to the fly-wheel and will thus yield slightly in case of back-firing, the friction gripping being sufficient to cause rotation of the parts together under ordinary conditions whereby the engine crank-shaft may be rotated for the purpose of starting the same. The truck-frame is also provided with a cross-girder 2' to an ear of which is hinged a bracket 10. Mounted upon this bracket is an air pump 11, which pump is in crank connection with a gear-wheel 12 that is revolvable upon a stud carried by the bracket. The gear-wheel 12 in turn is meshed with a pinion 12' that is secured to a shaft 13, which shaft is journaled in the bracket, its opposite end being provided with a friction wheel 14, the same being adapted to be brought into and out of engagement with the periphery of the engine fly-wheel 5 incidental to oscillatory movement of the bracket.

As best shown in Fig. 3 the bracket is provided with an apertured arm 10' that is adapted to receive the head end of a threaded stud 15, which stud passes through an apertured cap 16 that is secured to the floor 17 of the truck body, the floor being illustrated in Figs. 2 and 3. The threaded stud is engaged by a cap-screw 15' that is seated upon the apertured cap 16 and interposed between the bottom face of the truck floor 17 and arm 10' of the bracket is a coiled spring 18, which coiled spring surrounds the stud and is adapted to force the bracket 10 downwardly, whereby the friction gear-wheel 14 is caused to engage the periphery of the engine fly-wheel. It will be observed by this construction that the cap-screw 15' of the threaded stud is accessible to the operator and when it is desired to permanently throw the bracket gearing out of commission that said cap-screw may be manipulated to lift the bracket 10 whereby its friction-wheel will remain in suspension, the coiled spring 18 serving to force said friction wheel into its working position. The action of the coiled spring 18 is opposed by a piston 19, which piston, as best shown in Fig. 7, is provided with a piston-rod 19' having a shoulder 20 that is adapted to engage a foot 21 of the bracket 10, the foot being provided with an aperture through which the piston-rod projects. The piston is mounted in a cylinder 22, the bottom portion of which cylinder is provided with a flexible dia-

phragm 23 that is adapted to oppose the piston, the bottom of the cylinder being provided with a closed air-channel 24 that communicates with an air-supply pipe 25, which pipe is connected to an air-tank 26 that is suitably secured to the truck-frame as best shown in Fig. 1. The head of the cylinder 22 is threaded for the reception of an adjustable gland 27, which gland surrounds the piston-rod and between its lower face and the face of the piston there is interposed a light coiled spring 28. The tension of this coiled spring is arranged to be adjusted by the gland, whereby the movement of the piston is predeterminedly regulated with relation to the air pressure admitted to the under side of the diaphragm from the air storage tank 26.

From the foregoing description with relation to the air-controlled piston it will be apparent that when the air pressure below the diaphragm overcomes the combined pressure of springs 28 and 18 that the bracket 10 will be forced upwardly, causing disengagement of the friction wheel 14 with the rim of the fly-wheel, this disengagement of the parts being maintained until such time as the pressure in the tank is lowered, whereby the springs will act to again connect the friction wheel 14 with said fly-wheel. The pump 11 is connected to the air-tank 26 by a pipe 29, there being a check-valve 29' interposed between the pump and tank to prevent back flow of air which is supplied to the tank by said pump.

From the foregoing description it will be seen that when the air pressure in the storage tank has been reduced to a predetermined volume that the coiled springs 18 and 28 will co-act to force the friction wheel 14 into gear connection with the engine fly-wheel and through the actuating gears 12 and 12' of the pump, said pump will be put into motion whereby a fresh supply of air will be admitted to the tank until the pressure reaches a predetermined point to overcome the coiled springs 18 and 28, said pressure being exerted directly upon the diaphragm 23 whereby the pump will be thrown out of action. Thus a predetermined pressure can be automatically maintained in said pump by adjustment of the gland 27 that is in threaded connection with the cap portion of the cylinder 22.

In some instances, as shown in Fig. 7 of the drawings, if desired I may provide means for also adjusting the tension of the coiled spring 18, in which case, as shown, the upper end of the coiled spring is fitted about a washer 18', which washer is engaged by a set-screw 15'' that corresponds to the set-screw 15' shown in Figs. 2 and 3, the set-screw 15'' being in threaded engagement with the bottom 17' of the truck body. In this instance where both of the coiled

springs are adjusted it is apparent that any manual connection to the frame 10 may be utilized permanently lifting the friction wheel 14 from its engaging position with the fly-wheel.

For starting the engine, I provide an air actuated motor 30, which motor as shown is rigidly secured to the cross-girder 2' of the truck-frame. The motor is provided with a shaft 31, which shaft is splined for the reception of a pinion 32, the same being provided with a spring-plug 33 that is adapted to engage the spline, this construction being shown in Fig. 5 of the drawings. The spline is cut away to one side whereby rotation of the motor-shaft in the direction as indicated will cause the pinion to revolve therewith and when so revolved the pinion being in meshed engagement with the toothed ring 6 that is carried by the fly-wheel, said fly-wheel will be rotated one or more turns to thus start the engine. Through spline connection between the pinion and motor-shaft when the engine has started, drive will be reversed and the toothed ring will thus become the driver whereby the pinion 32 will be idly rotated about the motor axle until such time as the said toothed pinion will be disengaged from the ring. Engagement and disengagement of the pinion 32 from the toothed ring is effected by a spanner arm 34 which arm engages a grooved collar 35 of the pinion. The arm is carried by a reciprocative rod 36 that is supported in ears extending from the air motor 30, there being a coiled spring 34' surrounding said rod and interposed between one of the ears and a collar 36' that is rigidly secured to the rod, the said coiled spring serving to force the rod in one direction, whereby the air motor pinion 32 is slidably disengaged from its mesh with the teeth of ring 6. The rod 36 is connected to a rock-shaft 37 by a lever-arm 38 that is rigidly secured to said rock-shaft, the rock-shaft being also provided with an actuating lever 39 that is manually operated in opposition to the coiled spring 34' whereby the motor pinion is slipped into engagement with the engine fly-wheel toothed ring. The rod 36 also carries a slotted finger 40, into the slot of which is fitted a valve-lever 41 that controls the supply of air to the motor, which supply is admitted to said motor through a pipe 42 that is connected to the air tank 26. It is understood that the air tank is supplied with a suitable pressure gage as shown, and that said tank may also be provided with a valve-controlled pipe connection 42' for supplying air through a suitable hose connection for inflating the tires of the vehicle or any other purpose.

From the foregoing description it will be understood that when it is desired to start the motor the operator, by manipulating le-

ber 39 will cause a gear connection to be effected between the air motor and engine fly-wheel and incidental to this movement the finger 40 that is carried by rod 36 will
 5 manipulate valve-lever 41 whereby a supply of air is admitted to said motor. Thus the motor will impart one or more turns to the fly-wheel of the engine whereby the latter is started and as soon as the operator releases
 10 lever 39 spring 34' will automatically disengage the motor pinion from the fly-wheel by sliding said pinion outwardly. It is also understood that the tank is supplied with air at a predetermined pressure. Now, as
 15 this air pressure is depleted by use, either in starting the engine or otherwise, when it is reduced to a predetermined volume the coiled springs 18 and 28 will act in opposition thereto and thus throw the pump-gear connection into mesh with the engine fly-wheel
 20 whereby the supply of air is automatically renewed up to a predetermined pressure at which time the air will act upon the diaphragm to throw the pump gear out of action. Thus this finely adjusted mechanism
 25 will automatically be thrown into and out of engagement with the fly-wheel of the engine to maintain a predetermined pressure of air in the supply tank.
 30 Attention is called to the fact that this starting mechanism eliminates all supplementary gas charges and sparking mechanism usually employed for the purpose of obtaining an initial start of the engine, the
 35 herein described mechanism being purely mechanical and arranged to act directly upon the crank-shaft of the engine in the same manner as heretofore employed in connection with hand cranking with the ex-

ception that in this instance a wheel of the engine is gripped for turning said crank-shaft over to obtain the desired spark.

I claim:

1. In an engine starter having a toothed gear-wheel, an air motor and its shaft; the
 45 combination of a pinion in splined engagement with the motor-shaft, the same being adapted to be slidably moved into and out of engagement with the toothed gear-wheel, a reciprocative rod, a spanner-arm carried
 50 by the rod engageable with the pinion, a manually controlled rock-shaft having an arm connected to the rod, an air-supply pipe in communication with the motor, a valve therefor, and a finger carried by the
 55 reciprocative rod engageable with the valve whereby the same is actuated co-incidental with a shift of the pinion.

2. In an engine starter having a toothed gear-wheel, and an air motor having a
 60 splined shaft; the combination of a pinion loosely mounted upon the shaft engageable with the gear-wheel, a spring-plug carried by the pinion engageable with the shaft spline, a reciprocative rod having a spanner
 65 arm engageable with the pinion, an air-supply pipe in communication with the motor, a valve therefor, and a finger carried by the rod engageable with the valve.

In testimony that I claim the foregoing I
 70 have hereunto set my hand at Milwaukee in the county of Milwaukee and State of Wisconsin in the presence of two witnesses.

EDWIN D. BANGS.

Witnesses:

G. W. YOUNG,
 M. E. DOWNEY.