

Feb. 28, 1950

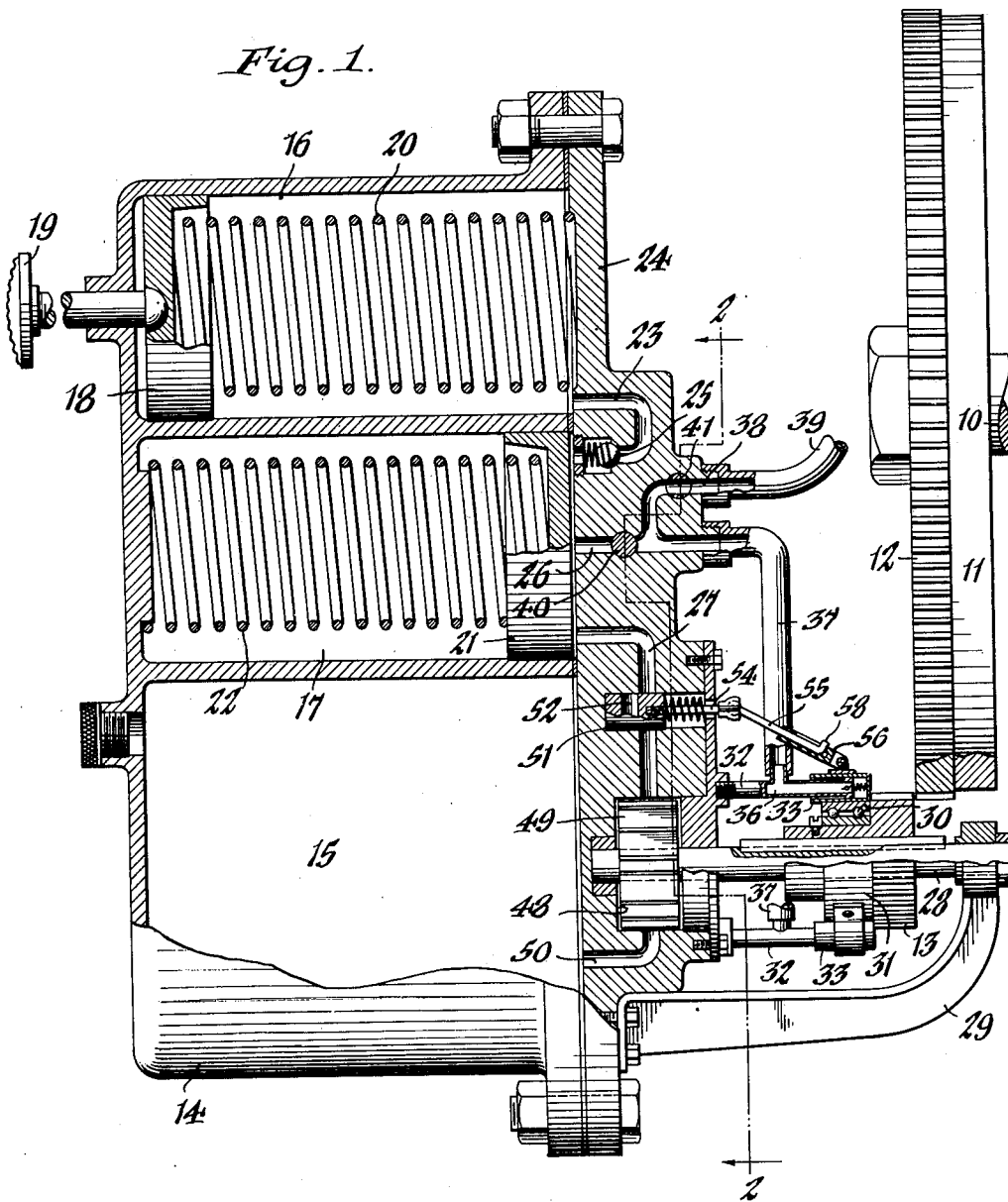
J. C. MOLYNEUX ET AL
HYDRAULIC STARTING MECHANISM

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3 Sheets-Sheet 1

Fig. 1.



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Fig. 2.

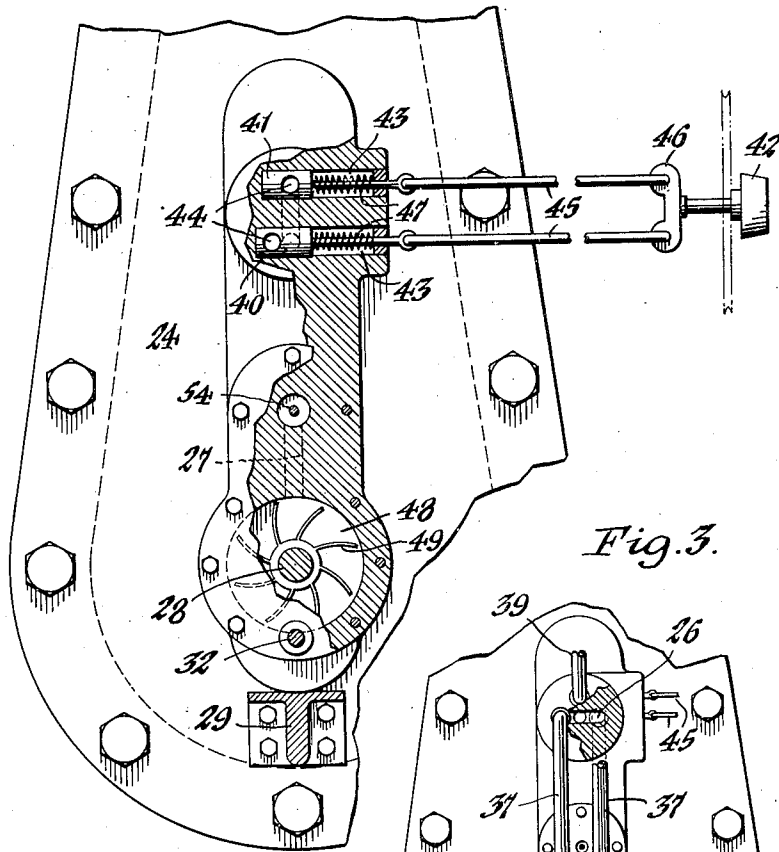


Fig. 3.

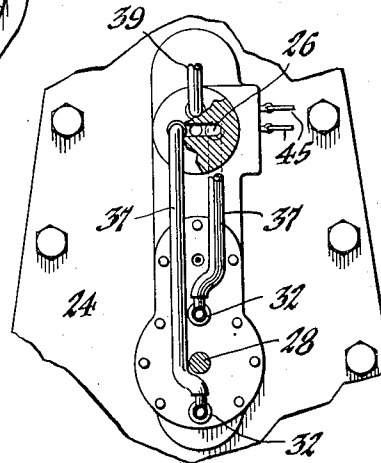
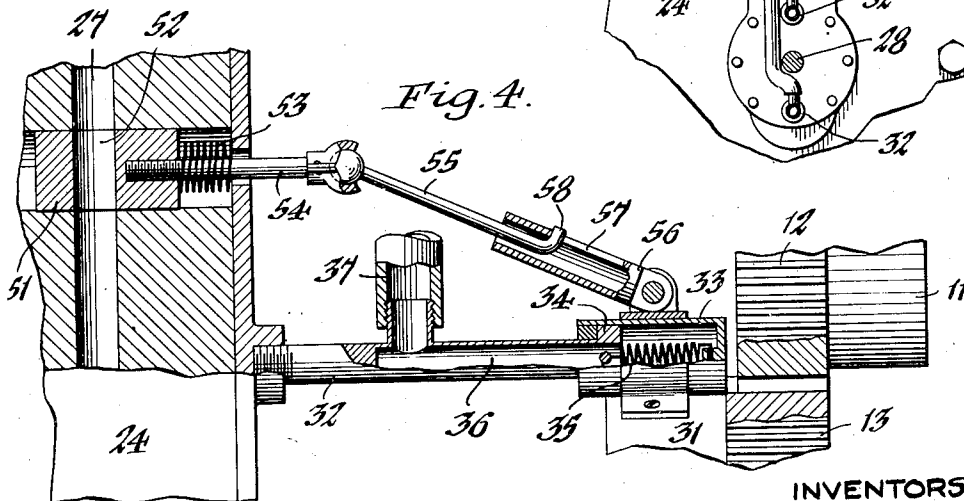


Fig. 4.



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Fig. 5.

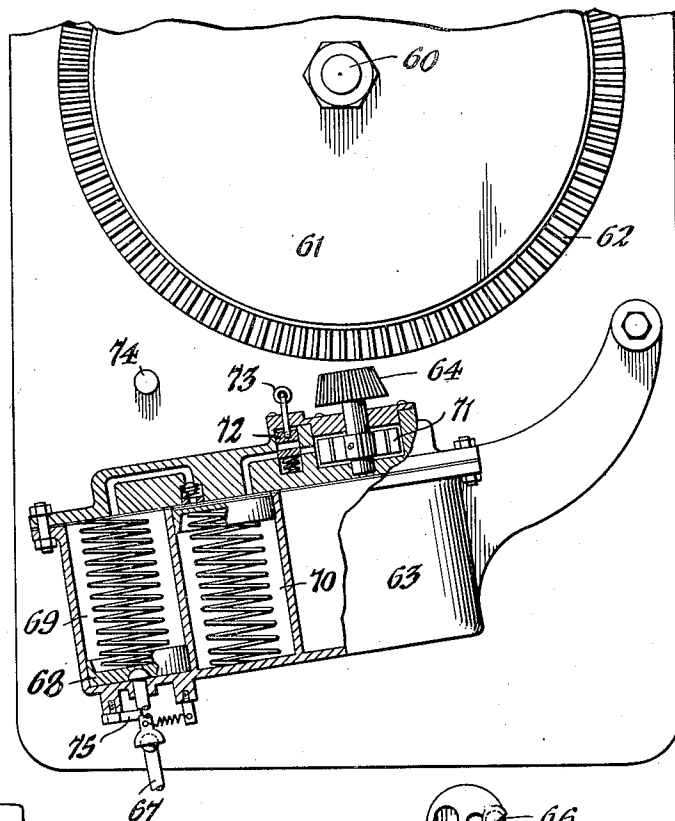


Fig. 7.

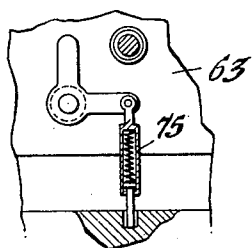
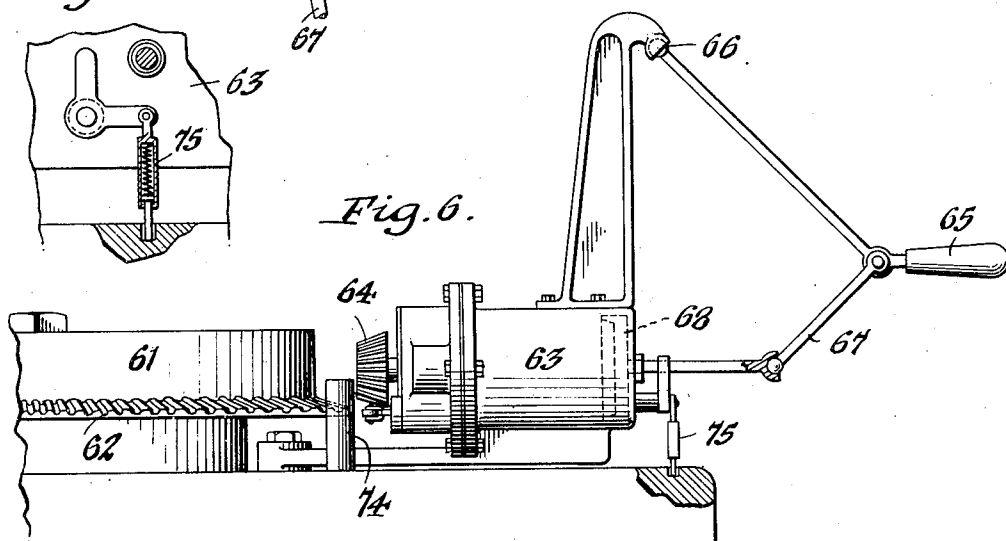


Fig. 6.



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UNITED STATES PATENT OFFICE

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HYDRAULIC STARTING MECHANISM

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3 Claims. (Cl. 123-179)

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This invention relates generally to the art of engine starters but more particularly to an hydraulic starting mechanism for internal combustion engines.

It has for one of its objects to provide an hydraulic engine starting mechanism which is so designed and constructed as to operate in a closed or self-contained hydraulic system, which is positive and efficient in operation, and which requires but a minimum of manual effort by foot or hand pressure to initiate its operation to start the engine.

Another object of this invention is to provide a starting system of this character which will eliminate the type of storage batteries now required for starting the engines of motor-driven vehicles and materially simplify the electric system thereof, and wherein the hydraulic pressure-creating means will function over a maximum time period to induce mechanical motion at a near or distant point.

A further object is to provide an hydraulic starting mechanism for motor vehicles which is simple, compact and economical in construction and operation, and which can be readily installed.

Other features of the invention reside in the construction and arrangement of parts herein-after described and particularly pointed out in the appended claims.

In the accompanying drawings:

Figure 1 is a sectional elevation of the improved hydraulic starting mechanism, the cylinder arrangement being diagrammatical. Figure 2 is a fragmentary sectional end view thereof taken substantially in the plane of line 2-2, Figure 1. Figure 3 is a similar view, partly in section, showing certain of the fluid connections. Figure 4 is an enlarged, fragmentary sectional elevation showing the parts in their engine-engaging or starting position. Figure 5 is a top plan view, partly in section, of a modification of the invention for use on outboard motor-boat engines. Figure 6 is a side view thereof, partly in section. Figure 7 is a detail sectional elevation of the retaining latch for the starter assembly.

Similar characters of reference indicate corresponding parts throughout the several views.

By way of example, the invention has been shown in connection with an internal combustion engine wherein 10 indicates the crank shaft and 11 the flywheel having the customary ring gear 12 thereon with which the starting pinion 13 of the invention is adapted to releasably engage when it is desired to start the engine.

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The hydraulic starting mechanism includes a suitable cylinder-block or housing 14 suitably supported on the vehicle-frame adjacent the fly-wheel end of the engine and containing a reserve cylinder 15 for the fluid medium, an hydraulic piston or pumping cylinder 16 adapted for communication therewith and normally full of the fluid medium, and an operating or hydraulic pressure cylinder 17 communicating with the latter and in which the fluid pressure is built up for initiating the displacement of the starting pinion 13 into mesh with the flywheel gear 12 and then transmitting rotary motion to the pinion to start the engine. The reserve cylinder 15 has a filler-cap opening therein and through which any displaced air in the fluid system is vented. Operable in the pumping cylinder 16 for building up the pressure in the communicating cylinder 17 is a manually-actuated piston 18 having a foot or hand pedal 19 extending therefrom and guided in the end wall of the housing 14. A spring 20 interposed between this piston and the opposite end of the housing serves to normally urge the former to its retracted position, shown in Figure 1. Operable in the opposite end of the adjoining cylinder 17, and movable in a direction opposite to the piston 18 in response to a build-up pressure stroke by the pedal 19, is a piston 21 backed by a spring 22 which is of the proper size and tension to deliver the desired pressure of the hydraulic fluid required for actuating the starting pinion. Communication between the discharge end of the cylinder 16 and the intake end of the pressure cylinder 17 is effected by a passage 23 formed in the head 24 of the cylinder-housing and containing a spring-urged check valve 25 which opens inwardly and is normally closed outwardly. Also formed in this head and communicating with the pressure cylinder are valve-controlled discharge passages 26 and 27 for conducting the pressure-induced hydraulic medium to the means for shifting and transmitting motion to the pinion 13 to start the motor. The means for effecting the axial displacement of the starting pinion from its normally released position, shown in Figure 1, to its operative driving position shown in Figure 4, is preferably constructed as follows:

The pinion is splined for axial movement on a horizontal shaft 28 journaled at one end in a bearing formed in the housing-head 24 and at its other end in a bracket 29 projecting therefrom. Journaled on a bearing 30 applied to the hub of the pinion to move axially therewith but held against turning therewith is a collar or amulus

31 coupled to the housing-head by guide rods or members 32 and having cylinders 33 applied thereto in axial alinement with such guide rods. The latter terminate at their outer ends in heads or pistons 34 which engage and operate within the companion cylinders 33, the latter being movable on the pistons and a spring 35 between each piston and cylinder constantly urging the latter together with the pinion to seek the position shown in Figure 1. The outer portions of the guide rods are hollow, as indicated at 36, and open into the companion cylinders, each being connected by a tube or conduit 37 to the companion fluid pressure discharged passage 26, so that when the mechanism is rendered operative, the fluid pressure is directed against the heads of the cylinders to shift the pinion 13 toward and into mesh with the ring gear 12, this movement being limited by the pinion abutting the opposing end of the bearing-bracket 29. Upon the return stroke of the pinion-shifting cylinders, the fluid medium is adapted to be expelled through the same conduits 37 and thence through a valve-controlled passage 38 branching or by-passing from the passage 26 and connected by a tube or conduit 39 leading to the reserve cylinder 15.

The control of the fluid from the pressure cylinder 17 and its return to the pump-cylinder 16 is effected by alternately opened and closed feed and release valves 40 and 41, respectively, governed jointly by a manually actuated knob 42 conveniently positioned on the dash board of the vehicle. These valves are preferably in the form of slide valves guided in companion openings 43 formed in the housing-head 24 at right angles or in intersecting relation to the respective passages 26, 38 and each has a transverse port 44 therein for registering with such respective passages. Each valve is connected by a rod 45 to a common tie-bar 46 joined to the knob 42 and springs 47 normally urge the valves 40, 41 to their respective closed and opened positions, as shown in Figures 1 and 2. When the knob is pulled outwardly to its operative engine-starting position, the fluid pressure release valve 41 is moved from its open to its closed position and the fluid pressure feed control valve 40 is moved from its closed to its open position to deliver the fluid under pressure to the piston-cylinder assembly 33, 34 for causing the shifting of the pinion 13 into driving engagement with the engine gear 12, preparatory to transmitting rotary motion to such gear by hydraulic pressure.

Immediately following the shifting of the starting pinion into operative driving engagement with the flywheel gear, fluid pressure is diverted from the pressure cylinder 17 through the passage 27 to a rotor chamber 48 formed in the housing-head 24 axially of the pinion-shaft 23, the latter having a rotor or impeller wheel 49 fixed thereon. Leading from this rotor-chamber is a passage 50 through which the spent fluid medium is discharged into the reserve cylinder 15. Interposed in the rotor intake passage 27 is a slide valve 51 having a transverse port 52 therein and having a spring 53 acting thereon for normally urging it to its closed position shown in Figure 1. For effecting the automatic opening of this valve in proper sequence to the meshing of the starting pinion with the flywheel gear, an operative connection is employed between the stem 54 of the valve and the shiftable pinion assembly. This connection preferably consists of a linkage or telescopic members 55, 56 pivoted at their outer ends to the valve-stem and pinion assembly, re-

spectively, one of the members having a longitudinal slot 57 therein for receiving a stop lug 58 on the companion member. By this construction, a certain lost motion is provided during the shifting of the pinion toward and from its operative position, after which the telescopic connection is rigid to cause the movement of the valve 51 to its open or closed position jointly with the final or initial stroke of the pinion assembly and thereupon cause the rotation of the shaft 23 to start the engine or arrest such rotation after the engine is started.

After the starting of the engine, the knob 42 is restored to its initial position shown in the drawings, thereby closing the fluid pressure feed control valve 40 and opening the pressure release valve 41, and causing the springs 35 to release the pinion assembly 13, 31 from the ring gear 12 and the contained fluid medium to be discharged through the conduits 37, 38 and 39 to the reserve cylinder 15. During this return or release stroke of the pinion assembly, the rotor control valve 51 is closed and the rotation of the pinion-shaft 28 arrested.

If desired, the hydraulic pressure cylinder 17 may be dispensed with and the pressure built up in cylinder 16 and directly connected to the pinion and rotor assemblies for actuating them in sequence for starting the engine.

In the modified form of the invention shown in Figures 5-7 inclusive, the starting mechanism is adapted for use on smaller engines, for example, an outboard, internal combustion engine, wherein 60 indicates the motor-shaft, 61 the flywheel and 62 the ring gear. Pivoted on the motor-frame at one side of the flywheel for horizontal swinging movement relative thereto is a starter housing 63 having a cylinder-block structure similar to that previously described and having a starter pinion 64 journaled thereon and projecting from the inner side thereof for releasable engagement with the ring gear in response to the manual movement of the housing toward and from the flywheel. The actuation of the starter housing to and from operating position is effected by a handle 65 pivoted at 66 to swing toward and from as well as laterally of the housing and having a link 67 pivoted at one end thereto and at its other end to the operating piston 68 of the pumping cylinder 69, this handle also functioning as the means for building up the pressure in the adjoining pressure cylinder 70. As in the previous construction, the starting pinion is rotated by a rotor or impeller wheel 71 driven by hydraulic pressure, a normally-closed valve 72 being provided for governing the flow of the fluid medium from the pressure cylinder to the chamber of the impeller. This valve has an actuating stem thereon terminating at its end in a roller 73 for abutting engagement with the periphery of the flywheel, so that when the housing 63 is swung to its operative gear meshing position the valve will be automatically moved to its open position and cause the admission of the hydraulic pressure to operate the impeller wheel and accordingly start the engine. A stop 74 is disposed in the path of the inward movement of the housing to predetermine the meshing of the gears as well as the opening position of the valve 72. Also, a suitable latch 75 pivotally mounted on the housing may be provided for releasably retaining the starter housing in its normal outwardly swung position and when operating the handle 65 as a pump. If desired, this latch may be in the lateral folding path of the handle assembly, so that when the latter

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is so moved the latch will be tripped thereby and released to free the housing for movement toward the flywheel.

We claim as our invention:

1. An hydraulic engine starting mechanism, comprising a driven shaft, a pinion mounted thereon for axial movement relative thereto into and out of driving engagement with the engine-gear, means in operative engagement with said pinion for axially-displacing it hydraulically into engagement with the engine-gear, hydraulically rotatable means operatively connected to said pinion-shaft for driving it, valve means for governing the admission of the hydraulic pressure medium to and its discharge from said pinion-displacing means, one of said valve means being normally closed and the other being normally open, and control means for initiating the operation of said shaft-rotating means when the pinion is in operative engagement with the engine-gear.

2. An hydraulic engine starting mechanism, comprising a driven shaft, a pinion mounted thereon for axial movement relative thereto into and out of driving engagement with the engine-gear, means in operative engagement with said pinion for axially displacing it hydraulically into engagement with the engine-gear, hydraulically rotatable means operatively connected to said pinion-shaft for driving it, valve means for governing the admission of the hydraulic pressure medium to and its discharge from said pinion-displacing means, one of said valve means being normally closed and the other being normally open, manual means operatively connected to said valve means for jointly actuating them to their respective open and closed positions, and control means governed by said hydraulic pinion-displacing means for automatically initiating the operation of said shaft-rotating means when the pinion is in operative engagement with the engine-gear.

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3. An hydraulic engine starting mechanism, comprising a driven shaft, a pinion mounted thereon for axial movement relative thereto into and out of driving engagement with the engine-gear, an annulus journaled on said pinion to move axially therewith and held against turning relatively thereto, hydraulically-actuated means correlated with said annulus for projecting it in a direction to bring the pinion into driving registration with the engine gear, hydraulically-actuated means for driving said shaft, valve means for governing the admission of the hydraulic pressure medium to and its discharge from said annulus-actuating means, one of said valve means being normally closed and the other open, manual means operatively connected to said valve means for jointly actuating them to their respective open and closed positions, a normally-closed valve for governing the admission of the pressure medium to said shaft-driving means, and an operative connection between said annulus and said last-named valve for actuating the latter to its open position at a predetermined time in the registration of the pinion with the engine-gear.

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REFERENCES CITED

30 The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
35 1,055,769	Lipman	Mar. 11, 1913
1,104,058	Marr	July 21, 1914
1,974,870	Lansing	Sept. 25, 1934
2,446,691	Clyde et al.	Aug. 10, 1948

FOREIGN PATENTS

Number	Country	Date
40 20,202	Great Britain	Sept. 25, 1914