C. E. LIPMAN.

ENGINE STARTING MECHANISM.

APPLICATION FILED JAN. 15, 1912.

1,055,769. Patented Mar. 11, 1913

Fig. 1.

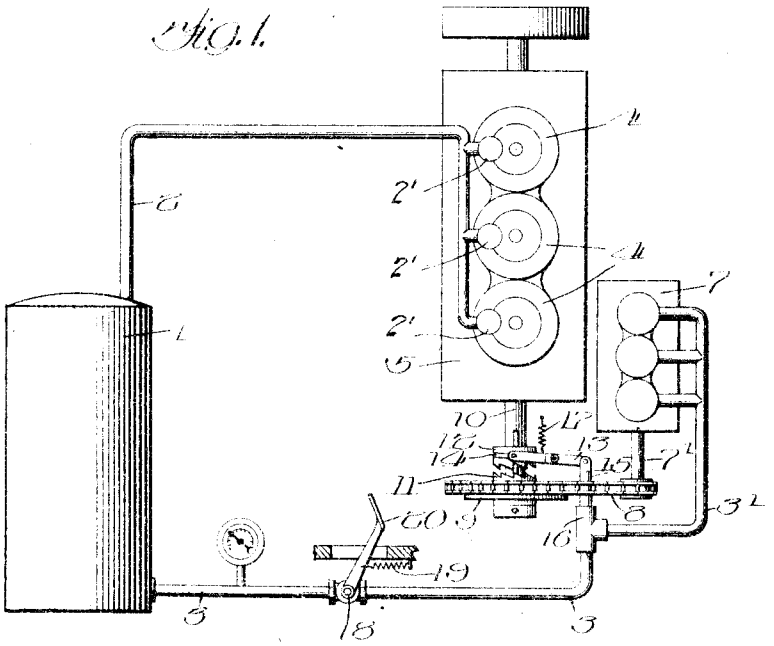


Fig. 2.

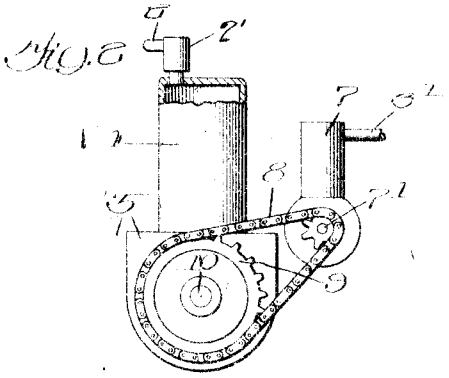
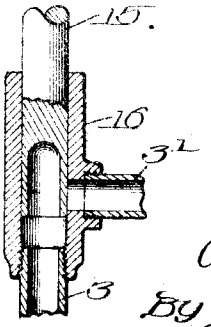


Fig. 3.



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UNITED STATES PATENT OFFICE.

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ENGINE-STARTING MECHANISM.

1,055,769. Specification of Letters Patent. Patented Mar. 11, 1913.

Application filed January 15, 1912. Serial No. 671,212.

To all whom it may concern:

Be it known that I, CARL E. LIPMAN, a citizen of the United States, residing at Beloit, in the county of Rock and State of Wisconsin, have invented a certain new and useful Improvement in Engine-Starting Mechanism, of which the following is a full, clear, concise, and exact description, reference being had to the accompanying drawings, forming a part of this specification.

My invention relates to power transmission systems and is of particular service in connection with those transmission systems in which non-self-starting engines are employed.

The invention is of particular service in connection with those power transmission systems that are used for the operation of automobiles or other traveling bodies, the invention being of service in starting the internal combustion engines that are usually employed.

In practising my invention I preferably cause the engine or prime mover to store gas, under pressure, in a suitable reservoir from which gas, under pressure, is taken to operate an engine starting motor. In the preferred embodiment of the invention the reservoir is in communication with the combustion chamber of the engine so that the reservoir is charged with spent gas under pressure which is to be used for the purpose stated. In order that the engine starting motor may normally be free of the engine I provide clutching mechanism which is interposed between the engine and its starting motor and which serves normally to permit the engine to run free of the starting motor but which clutching mechanism is operated when the engine is to be started. The clutching mechanism is provided with means for operating it that is preferably itself operated by the gas under pressure, and means are also employed for governing the passage of the operating gas to the clutch operating mechanism and the engine starting motor. The reservoir which I employ is preferably a single tank, though I do not limit myself to the number of tanks comprising the reservoir, and when a single tank is used for the reservoir a controlling valve is employed that permits the operating gas to flow to the clutch operating mechanism and the engine starting motor, the arrangement being preferably such that the clutch will be operated to couple the engine and its starting motor before the starting motor is operated, a result that can be well accomplished owing to the comparatively small load imposed upon the operating gas by the clutch operating mechanism, prior operation of the clutch being preferably further assured by means of mechanism that will cause the operating gas to be applied to the clutch operating mechanism before it is applied to the engine starting motor.

I will explain my invention more fully by reference to the accompanying drawing showing two embodiments thereof, to which however I do not wish to be limited, and in which drawing—

Figure 1 is a plan view, somewhat diagrammatic in its nature, illustrating a transmission system as it is preferably equipped in accordance with my invention; Fig. 2 is a side view indicating the relationship of the engine and its starting motor; Fig. 3 is a detail view, mainly in section, showing the means by which the operating gas is caused to pass to the clutch operating mechanism before it passes to the engine starting motor.

Like parts are indicated by similar characters of reference throughout the different figures.

The reservoir in which the operating gas is to be stored is shown in the form of a single tank 1, a pipe 2 leading the gas to the tank while the pipe 3 enables the gas to be passed from the tank. In the form of the invention illustrated in Figs. 1 and 2 the pipe 2 is in connection with the combustion chamber of each of the cylinders 4 of the engine 5 which constitutes the prime mover of the power transmission system whereby the tank 1 may be supplied with spent gas under pressure, check valves 2^1 being included in the piping between the combustion chambers and the presser tank 1. I have not indicated a load for the engine nor means for operating the load as the presence of such will be understood. By the arrangement illustrated the engine operates automatically to keep the reservoir charged, gas when received under sufficient pressure within the reservoir operating to prevent the admission of further gas from

the engine while when the gas in the reservoir has its pressure sufficiently reduced the flow of gas from the engine to the reservoir is renewed.

The prime mover starting motor is preferably one in which is included a shaft which rotates in uniform direction for the purpose of starting the engine, but I do not limit myself to the type of starting motor which is employed in starting the engine. As the invention is preferably practised, the engine starting motor 7 includes a rotating shaft 7^1 carrying a sprocket wheel upon its outer end over which a sprocket chain 8 is passed, this sprocket chain 8 being in engagement with a sprocket wheel 9 which is normally loose upon the shaft 10 of the engine 5. The clutching mechanism which is employed for coupling the starting motor with the engine includes a clutch member 11 fixed with respect to the sprocket wheel 9 and a second clutch member 12 splined upon the shaft 10 of the engine 5 whereby the clutch member 12 rotates with the shaft 10 while it is movable longitudinally thereof. The mechanism that is employed to operate the clutch mechanism includes a centrally pivoted lever 13, having connection at one end with a groove 14 in the clutch member 12 whereby said clutch member may rotate with respect to the lever 13 while the lever 13 is adapted to move the said clutch member longitudinally of the shaft 10. The other end of the lever 13 is in linked connection with a piston 15 which works within a cylinder 16 and whose free end constitutes a valve. Some suitable agency, such as a spring 17 diagrammatically indicated in Fig. 1, serves normally to maintain the clutch lever 13 in a position in which the clutch member 12 will be disengaged from the clutch member 11. In the normal position of the lever 13 which is determined by the spring 17, the free end of the piston 15 operates to disconnect the pipe 3 from its branch or continuation 3^1. The main valve 18 in the main pipe portion 3 is normally held closed by any suitable means such as the spring 19. In the case of automobiles the valve is equipped with a foot lever 20 so that the operator may open the valve 18 against the force of the spring 19 and thereby permit gas, under pressure, to pass through the main pipe section 3 to the cylinder 16, the gas operating within the cylinder 16 to press the piston rod 15 against the force of the spring 17 so as to bring the clutch member 12 into engagement with its companion 11, the piston 15 preferably operating through an appreciable distance to start the clutch operating mechanism into action, before it permits the passage of operating gas to the pipe section 3^1, though I do not wish to be limited to this characteristic. The piston 15 constitutes a valve structure that performs the double function of mechanically operating the closure and, preferably, thereafter permitting the flow of operating gas to the engine starting motor. After the clutch operating mechanism has been started into action the engine starting motor 7 is brought in action to turn the sprocket chain 8, the sprocket wheel 9, and the shaft 10 which is now coupled with the sprocket wheel through the agency of the clutch members 11 and 12. Though the operating gas is admitted to the engine starting motor before the clutch operating mechanism has fully acted, yet, in the preferred arrangement, the motor will not start until the clutch members are fully engaged, a result which is due to the heavy load upon the operating gas furnished by the starting motor as compared with the load furnished by the clutch operating mechanism.

The valve preferably does not establish full communication between the receiver and the engine starting motor until the clutch members have been engaged by the mechanical operation of the valve.

It will be observed that the valve 15 is operated by the fluid passing from the reservoir to the starting motor for the purpose of admitting fluid to the starting motor and I consider this feature to be broadly new.

While I have herein shown and particularly described the preferred arrangement it is obvious that changes may readily be made without departing from the spirit of my invention and I do not therefore wish to be limited to the precise details of construction shown, but

Having thus described my invention, I claim as new and desire to secure by Letters Patent the following:—

1. A power transmission system including a prime mover; a compression reservoir for holding driving fluid under pressure; a motor for starting the prime mover; a valve serving to establish and intercept communication between the reservoir and said motor; and a clutch mechanically operated by said valve to couple the motor and prime mover when the motor is supplied with operating fluid, said valve being subject to the pressure of fluid flowing between the reservoir and motor and operable by the flowing fluid to establish communication between the reservoir and motor.

2. A power transmission system including a prime mover; a compression reservoir for holding driving fluid under pressure; a motor for starting the prime mover; a valve serving to establish and intercept communication between the reservoir and said motor; and a clutch mechanically operated by said valve to couple the motor and prime mover when the motor is supplied with operating fluid, said valve in its movement serving to couple the clutch members before fully es-

tablishing communication between the motor and reservoir, said valve being subject to the pressure of fluid flowing between the reservoir and motor and operable by the flowing fluid to establish communication between the reservoir and motor.

3. A power transmission system including a prime mover; a compression reservoir for holding driving fluid under pressure; a motor for starting the prime mover; a valve serving to establish and intercept communication between the reservoir and said motor; a clutch mechanically operated by said valve to couple the motor and prime mover when the motor is supplied with operating fluid; and a controlling valve interposed between the aforesaid valve and the reservoir for preventing and permitting the flow of fluid from the reservoir to the first aforesaid valve, said first aforesaid valve being subject to the pressure of fluid flowing between the reservoir and motor and operable by the flowing fluid to establish communication between the reservoir and motor.

4. A power transmission system including a prime mover; a compression reservoir for holding driving fluid under pressure; a motor for starting the prime mover; a valve serving to establish and intercept communication between the reservoir and said motor; a clutch mechanically operated by said valve to couple the motor and prime mover when the motor is supplied with operating fluid, said valve in its movement serving to couple the clutch members before fully establishing communication between the motor and reservoir; and a controlling valve interposed between the aforesaid valve and the reservoir for preventing and permitting the flow of fluid from the reservoir to the first aforesaid valve, said first aforesaid valve being subject to the pressure of fluid flowing between the reservoir and motor and operable by the flowing fluid to establish communication between the reservoir and motor.

5. A power transmission system including a prime mover; a compression reservoir for holding driving fluid under pressure; a motor for starting the prime mover; a valve serving to establish and intercept communication between the reservoir and said motor; and a clutch mechanically operated by said valve to couple the motor and prime mover when the motor is supplied with operating fluid.

6. A power transmission system including a prime mover; a compression reservoir for holding driving fluid under pressure; a motor for starting the prime mover; a valve serving to establish and intercept communication between the reservoir and said motor; and a clutch mechanically operated by said valve to couple the motor and prime mover when the motor is supplied with operating fluid, said valve in its movement serving to couple the clutch members before fully establishing communication between the motor and reservoir.

7. A power transmission system including a prime mover; a compression reservoir for holding driving fluid under pressure; a motor for starting the prime mover; a valve serving to establish and intercept communication between the reservoir and said motor; a clutch mechanically operated by said valve to couple the motor and prime mover when the motor is supplied with operating fluid; and a controlling valve interposed between the first aforesaid valve and the reservoir for preventing and permitting the flow of fluid from the reservoir to the first aforesaid valve.

8. A power transmission system including a prime mover; a compression reservoir for holding driving fluid under pressure; a motor for starting the prime mover; a valve serving to establish and intercept communication between the reservoir and said motor; a clutch mechanically operated by said valve to couple the motor and prime mover when the motor is supplied with operating fluid, said valve in its movement serving to couple the clutch members before fully establishing communication between the motor and reservoir; and a controlling valve interposed between the aforesaid valve and the reservoir for preventing and permitting the flow of fluid from the reservoir to the first aforesaid valve.

In witness whereof, I hereunto subscribe my name this 13th day of November A. D., 1911.

CARL E. LIPMAN.

Witnesses:
G. L. CRAGG,
E. L. WHITE.