W. K. READ.

PUMP SYSTEM.

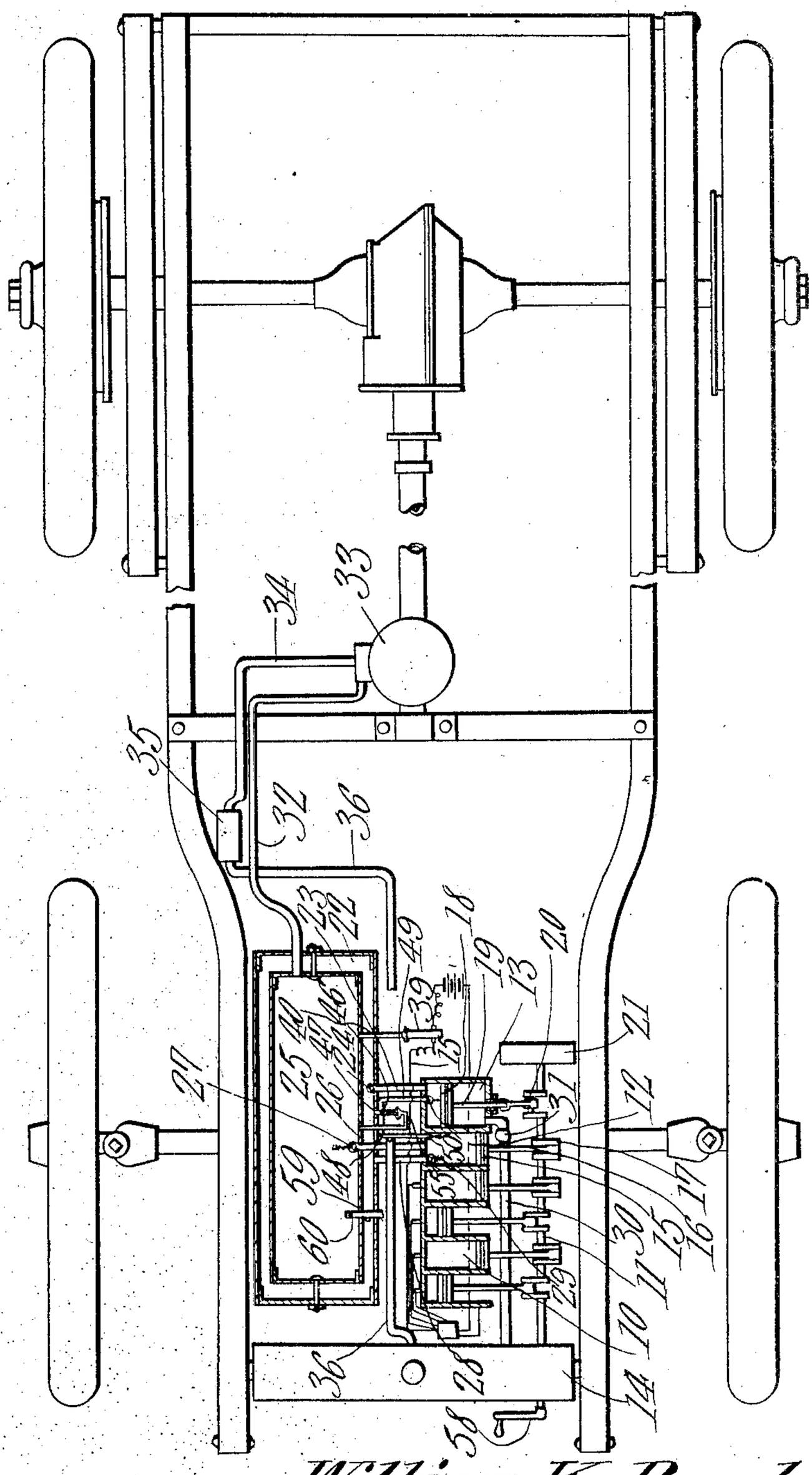
APPLICATION FILED AUG. 1, 1910.

998,717.

Patented July 25, 1911.

2 SHEETS—SHEET 1.

Fig. 1.



Witnesses

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2 SHEETS—SHEET 2.

Fig. 2.

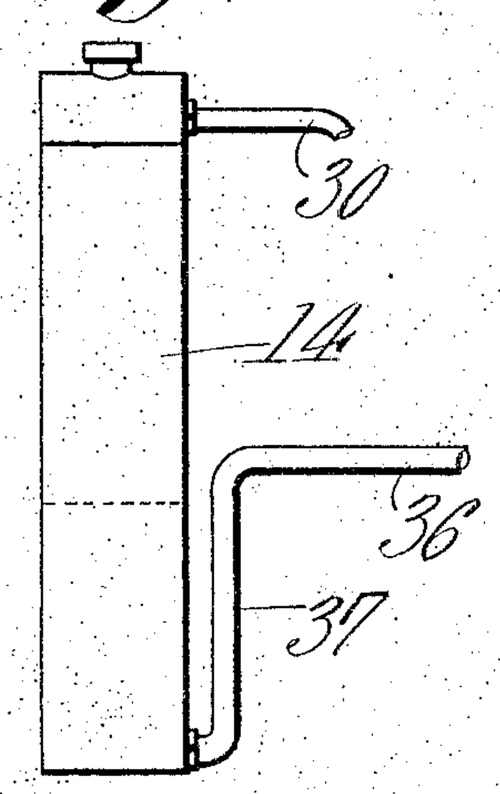


Fig. 3.

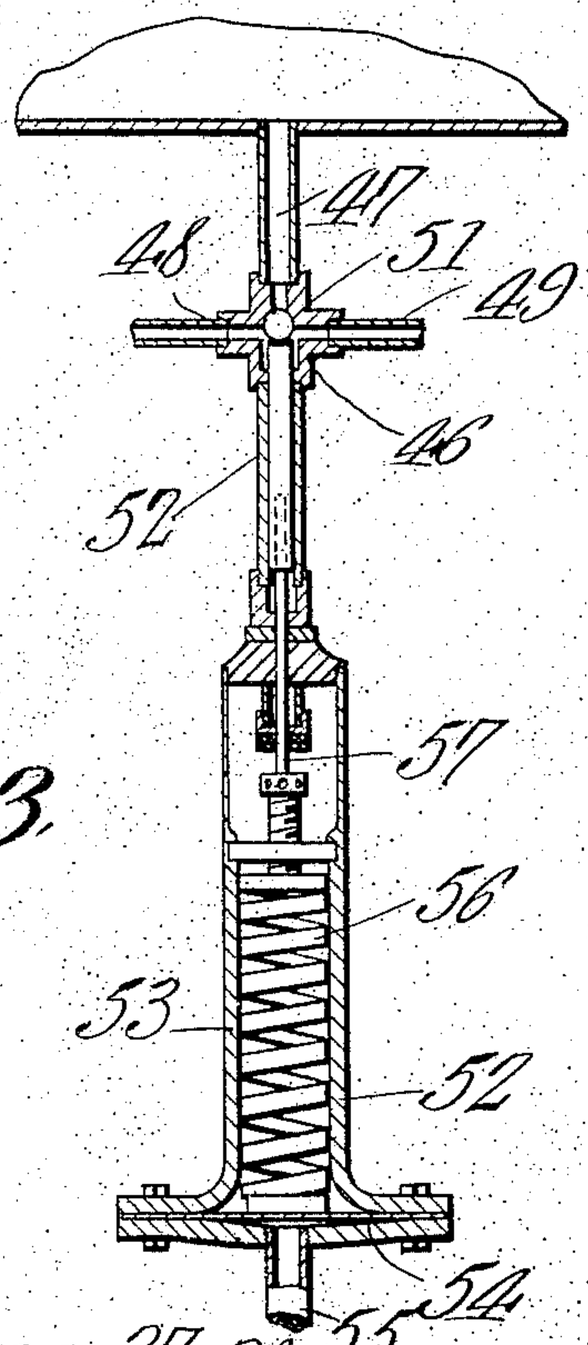


Fig. 4.

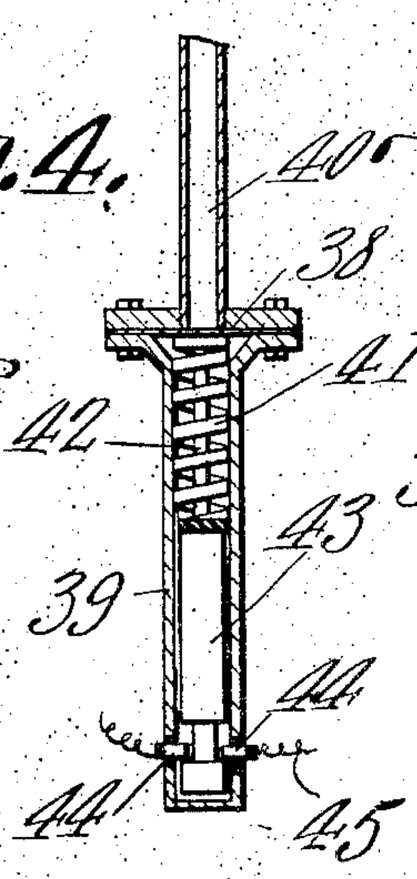
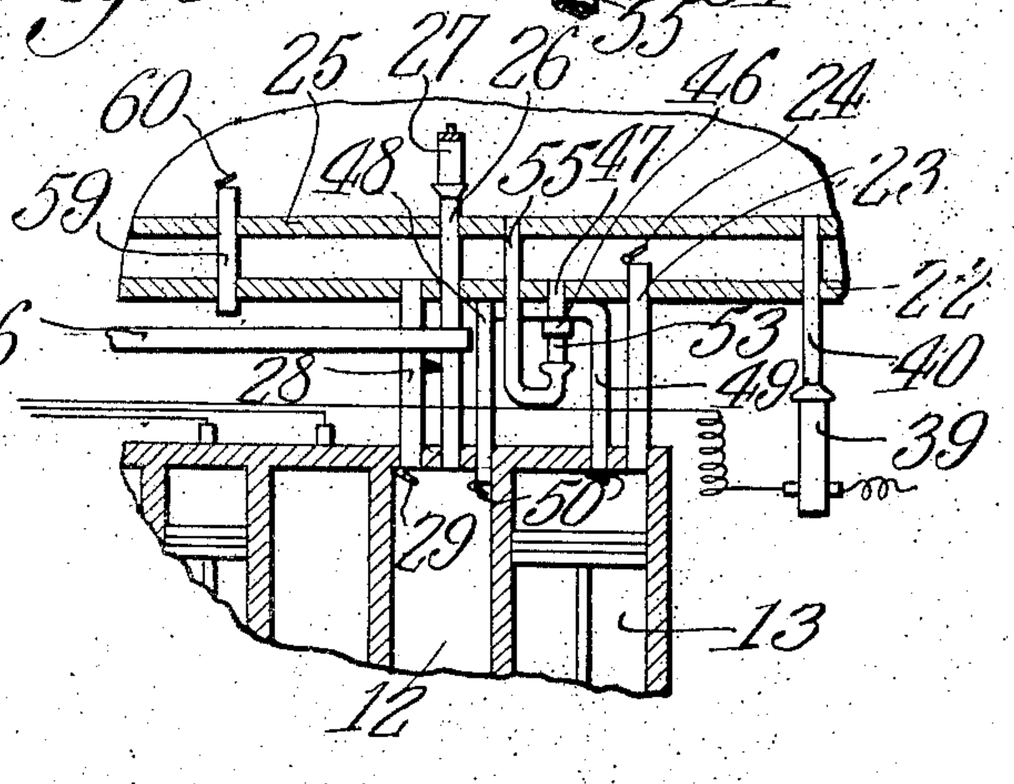


Fig. 5.



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UNITED STATES PATENT OFFICE.

WILLIAM K. READ, OF TEXARKANA, TEXAS.

PUMP SYSTEM.

998,717. Specification of Letters Patent. Patented July 25, 1911.

Application filed August 1, 1910. Serial No. 574,755.

To all whom it may concern:

Be it known that I, WILLIAM K. READ, a citizen of the United States, residing at Texarkana, in the county of Bowie and State of Texas, have invented a new and useful Pump System, of which the following is a specification.

This invention has relation to pump systems and consists in the novel arrangement of its parts hereinafter described and claimed.

The invention also has for its object to provide a novel and improved air compressor, the same being driven by an internal combustion engine which is automatically stopped when the pressure in the storage reservoir reaches a predetermined point, and started when the pressure drops below this point, whereby the operation of the compressor is controlled, and a predetermined pressure retained in the storage reservoir at all times.

Another object of the invention is to provide an arrangement whereby the radiator of the engine is utilized to cool and to wash the air free of all grit.

Other objects and advantages of the invention will be made manifest when the same is better understood, it consisting in a novel construction and arrangement of parts to be hereinafter described and claimed.

In the accompanying drawings forming a part of this specification, Figure 1 is a plan view of the invention largely diagrammatic and partly in section. Fig. 2 is an end view of the radiator hereinafter referred to. Figs. 3 and 4 are sectional views of the pressure controlling devices. Fig. 5 is an enlarged detail sectional view of portions of the members of the pump system.

Referring specifically to the drawings, 10 denotes a four-cylinder internal combustion engine, and 11 the crank shaft thereof. The engine is mounted on the frame of the car or vehicle in a suitable manner, preferably at the front end thereof. The construction of the engine is immaterial to the present invention, and a detailed description thereof is therefore deemed unnecessary.

The engine 10 is employed for driving the air compressor, the latter comprising cylinders 12 and 13, respectively, the former being a high pressure cylinder, and the latter a low pressure cylinder, the volume of the latter being considerably greater than the former. The engine and pump cylinders may be cast *en bloc*. The engine and pump cylinders are cooled by being provided with a water jacket, and a radiator 14 is provided through which the jacket water circulates. In the pump cylinder 12 operates a piston 15 having a rod 16 which is connected to a crank 17 on the shaft 11. In the cylinder 13 operates a valved piston 18 which is connected by a rod 19 to a crank 20 on the shaft 11. The two pump pistons are therefore reciprocated in the pump cylinders when the shaft is in motion. The cranks 17 and 20 are set 180° apart so that when the piston of one of the pump cylinders is making a suction stroke, the piston of the other cylinder is making a compression stroke. On the shaft 11 is a fly wheel 21.

At 22 is indicated a reservoir into which the pump cylinder 13 discharges, through a pipe 23 having a check valve 24. This reservoir is the lower pressure reservoir, and incloses a second reservoir 25 which is the high pressure reservoir, and into which the pump cylinder 12 discharges through a pipe 26 having a check valve 27. By locating the high pressure reservoir within the low pressure reservoir, danger of an explosion is lessened. The intake port of the pump cylinder 12 is connected by a pipe 28 to the reservoir 22. In the port is a check valve 29 which opens into the cylinder. The intake port of the pump cylinder 13 is connected by a pipe 30 with the radiator 14, and this port is also provided with a check valve 31.

A pipe 32 leads from the high pressure reservoir 25 to the motor 33, which latter may be an ordinary reciprocating engine, and which is connected in a suitable manner to the drive gear of the car. The exhaust from the engine is led by a pipe 34 into a muffler 35, and from the muffler a pipe 36 extends and is connected to the bottom of the radiator. The pipe 30 is connected to the top of the radiator. The pipe 36 has a portion 37 which extends upwardly above the level of the water in the reservoir, to prevent the water from running back to the engine when the same is not working.

When the engine is in operation, the exhaust air passes through the muffler, and is conducted by the pipe 36 into the radiator, and passes through the water therein. The air then leaves the radiator through the pipe 30 and enters the pump cylinder 13 when

the piston 18 thereof is making its suction stroke and is compressed and pumped into the reservoir 22. By thus drawing the air through the water in the radiator, it will be washed free of all grit before going to the pump cylinder, and it is also cooled. The pump cylinder 12 obtains its air supply from the reservoir 22 and discharges into the reservoir 25.

A device is provided for automatically stopping the operation of the engine 10 when a predetermined pressure has been pumped into the reservoir 25. This device comprises a flexible diaphragm 38 mounted in casing 39, and exposed on one side to the pressure in the reservoir 25, the latter being connected to the casing, on one side of the diaphragm, by a pipe 40. In the casing, on the other side of the diaphragm, and engaging the latter, is a coiled spring 41. To the diaphragm is connected a stem 42 which carries a switch 43, the latter operating between two contacts 44 interposed in the ignition circuit 45 of the engine 10, and controlling said circuit. The spring 41 opposes the pressure in the reservoir 25 against the diaphragm, and flexes the latter in a direction to move the switch 43 so as to close the ignition circuit when the reservoir pressure drops below the normal. When the pressure in the reservoir 25 rises above the normal it becomes sufficiently great to overcome the tension of the spring, the diaphragm is flexed, and it moves the stem 42 in a direction to break the ignition circuit. When the pressure in the reservoir drops below the normal, the spring flexes the diaphragm in the opposite direction, and the switch engages the contacts 44 to again close the ignition circuit. A starting device for the engine 10 is also provided. This device operates automatically by the compressed air supply, through the following means: A valve casing 46 is connected by a pipe 47 to the low pressure reservoir 22, and has two oppositely extending branches to which are connected pipes 48 and 49 respectively. The pipe 48 is connected to the pump cylinder 12, and the pipe 49 is connected to the pump cylinder 13. The outlet ends of the pipes 48 and 49 are provided with check valves 50. The valve 51 operating in the casing 46 has a seat in said casing, which seat is located so that the valve controls the flow of air into the casing from the reservoir 22 through the pipe 47. When the valve 51 is open, air flows from the reservoir 22 through the pipe 47 into the valve casing 46, and thence passes by the way of the pipes 48 and 49 into the pump cylinders 12 and 13. The casing 46 is connected by a tube 52 to a casing 53 containing a flexible diaphragm 54. The casing 53 is connected by a pipe 55 to the reservoir 25 so that one side of the diaphragm will be exposed to the pressure in said reservoir. On the other side of the diaphragm, the casing contains a coiled spring 56 which engages the diaphragm and opposes flexion of the diaphragm by the reservoir pressure thereagainst. To that side of the diaphragm which is engaged by the spring, is connected the stem 57 of the valve 51, said stem passing through the tube 52, and extending into the casing 46.

The spring 56 is adjusted so that it balances the pressure in the reservoir, when said pressure is normal, and the valve stem 57 is so arranged that the valve 51 is then closed, thus shutting off the pressure in the reservoir 22 from the pump cylinders 12 and 13. Now, if the pressure in the reservoir 25 drops below normal, the spring 56 is permitted to expand, and thereby flex the diaphragm 54 in a direction to open the valve 51 whereupon compressed air from the reservoir 22 flows through the pipe 47, and passes through the pipes 48 and 49 into the pump cylinders 12 and 13, and is exerted against the pistons therein to give the crank shaft a turn, and thus start the engine 10.

The operation is as follows:—When the pressure in the reservoir rises above the predetermined point the valve 51 closes, and at the same time the ignition circuit is broken by the device already described, thus causing the engine 10 to stop. The back pressure from the reservoir 22 will then fill the pump cylinder 12 through the pipe 28, and force the piston 15 back to the position it occupies at the end of the suction stroke, unless it is already in this position. This movement of the piston moves the piston 18 in its cylinder 13 in the opposite direction, by reason of the fact that the cranks 17 and 20 are set 180° apart, so that said piston 18 is now in the position it occupies at the end of its compression stroke. The momentum of the fly wheel 21 is added to the back pressure, and assists to move the pistons as stated. The parts are now in a position for automatically starting the engine 10, the operation being as follows:—When the pressure in the reservoir 25 drops below the predetermined point, the ignition circuit 45 is closed as already described, and the valve 51 opens, and lets compressed air from the reservoir 22 pass into the pump cylinders 12 and 13. By reason of the greater area of the piston 18, said piston is forced rearwardly in its cylinder, thereby rotating the shaft 11 to start the engine 10. When the reservoir 25 has again been pumped to the desired pressure, the engine automatically stops, and the pump pistons again come into starting position as already described.

In order that the engine may be started manually if necessary, or desired, there is provided an ordinary starting crank 58 for

this purpose. The reservoirs 22 and 25 are connected by a pipe 59 which opens into the reservoir 22, and the inlet from the reservoir 25 into said pipe is controlled by a check valve 60.

The mechanism herein described, when applied to an automobile or other motor vehicle, makes a noiseless, and extremely economical and highly powered car, and the latter is easily controlled. The mechanism is also without complicated parts to get out of order, and is efficient and reliable in operation.

The preferred embodiment of the invention has been shown, but it will be understood that various minor changes in the structural details may be resorted to without a departure from the invention. The application of the compressor mechanism and its controlling devices is not limited to motor vehicles, but said parts may be employed in various other capacities.

What is claimed is:—

1. The combination with an air compressor and its reservoir, of an internal combustion engine driving the compressor, and having an electric ignition system, a switch interposed in the circuit of the ignition system, and means for starting the engine, said switch and starting means being controlled by the reservoir pressure.

2. The combination of an air compressor having high and low pressure cylinders, a storage reservoir for each cylinder, an internal combustion engine driving the compressor, inlets into the cylinders from the reservoir of the low pressure cylinder, and a valve controlling said inlets, said valve being controlled by the pressure in the reservoir of the high pressure cylinder.

3. The combination of an air compressor having high and low pressure cylinders, a storage reservoir for each cylinder, an internal combustion engine driving the compressor, inlets into the cylinders from the reservoir of the low pressure cylinder, and a diaphragm valve controlling said inlets, said valve being under the influence of the pressure in the reservoir of the high pressure cylinder.

4. The combination with an internal combustion engine of an air compressor having high and low pressure cylinders, a storage reservoir for each cylinder, the high pressure cylinder obtaining its supply from the reservoir of the low pressure cylinder, inlets from the reservoir of the low pressure cylinder into the cylinders, and a valve controlling said inlets, said valve being controlled by the pressure in the reservoir of the high pressure cylinder.

5. The combination with an internal combustion engine of an air compressor having high and low pressure cylinders, the low pressure cylinder having a greater volume than the high pressure cylinder, storage reservoirs for each cylinder, inlets from the reservoir of the low pressure cylinder into the cylinders, and a valve controlling said inlets, said valve being controlled by the pressure in the reservoir of the high pressure cylinder.

In testimony that I claim the foregoing as my own, I have hereto affixed my signature in the presence of two witnesses.

WILLIAM K. READ.

Witnesses:
EUGENE D. ELLIS,
HORACE W. VAUGHAN.