

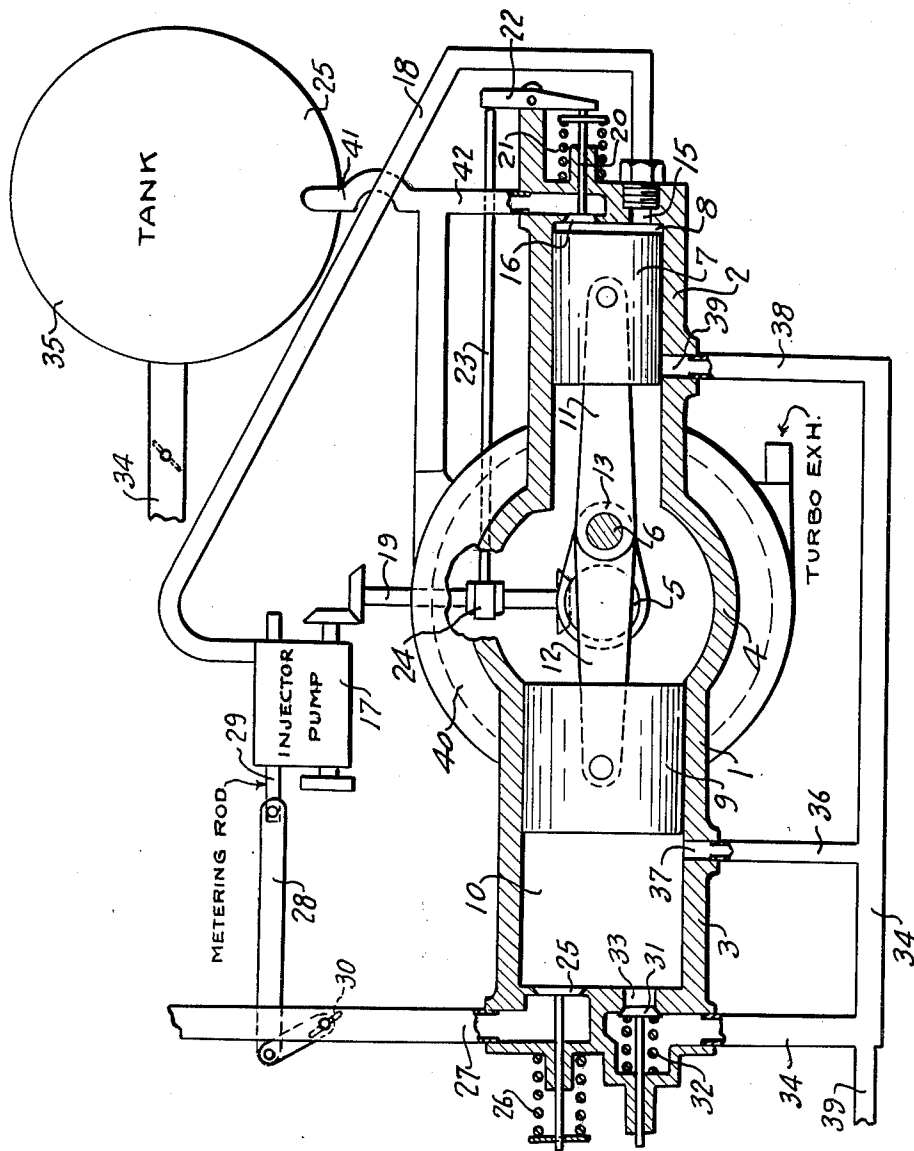
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INTERNAL-COMBUSTION ENGINE WITH COMPRESSOR

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INTERNAL-COMBUSTION ENGINE WITH
COMPRESSOR

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This invention relates to a combined internal combustion engine and fluid compressor, and has for its primary object to improve the construction and operation of units of this character to enhance the practicability and commercial value thereof.

Another object is to provide such an arrangement, construction and operation of the movable parts of the unit as to reduce to a minimum the thrust action of the ignited charges on the crankshaft, and to utilize the crankshaft mainly as a timing means for the pistons, the ignition and the valve mechanism.

Another object of the invention is to construct and arrange the apparatus so that the explosive force of the charge is exerted against the compressor piston when the gas pressure in the compression cylinder is near its maximum.

Other objects of the invention will be apparent from the following description, and from the accompanying drawing, illustrating one embodiment thereof, in which—

The drawing is a central vertical longitudinal section of an apparatus embodying the invention, with parts shown diagrammatically and with the engine piston approximately in firing position.

Referring to the drawing, 1 designates a cylinder unit having at one end an engine cylinder 2 and at its other end a compressor cylinder 3, with a crank case 4 therebetween. A crankcase 5 is journaled in the sides of the crank case 4 and has a wrist-pin 6 in the case.

A power piston 7 is mounted in the cylinder 2 and cooperates with its outer end to form a combustion chamber 8. A compressor piston 9 is mounted in the cylinder 3 and cooperates with its outer end to form a compressor chamber 10. The pistons 7 and 9 are connected at their inner ends to the wrist-pin 6 by respective connecting rods 11 and 12, the connection being such that when the engine piston is at the limit of its out or compression stroke, the compressor piston 9 is at the limit of its in or suction stroke, as shown in the drawing.

Each connecting rod 11, 12, has a loose or floating connection with the wrist-pin 6, and the rods are connected without play to each other. This is accomplished by rotatably mounting the inner ends of the two connecting rods without clearance, other than to provide a free turning fit, on a bearing sleeve 13, which in turn is mounted with a clearance for limited floating movements on the wrist-pin 6. This permits one or the other of the sleeve and piston to have lag-

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ging movements relative to the other during running of the apparatus for the purpose herein-after described.

The engine operates on the two-cycle principle and its cylinder 2 has the intake port 15 and the exhaust port 16 located in the end of the cylinder. A fuel supply means 17, shown diagrammatically, is connected to port 15 by conduit 18, and is timed by a timer shaft 19 driven from crankshaft 5. A valve 20 is normally held by a spring 21 in position to close port 16. At proper time a lever 22 is operated by rod 23 from cam 24 on timer shaft 19 to open port 16.

In the outer end of compression cylinder 10 there is an inlet valve 25 which opens when the vacuum in the cylinder overcomes spring 26 and admits air through pipe 27. A rod 28 connects the metering rod 29 of device 17 with throttle valve 30 in pipe 27, so that the amount of air admitted to the compression cylinder is increased and decreased automatically with the increase or decrease of the fuel supply to the combustion cylinder. A valve 31 is held by spring 32 in position to close outlet port 33 from the compression cylinder until the pressure in the cylinder is sufficiently greater than that in outlet pipe 34 to overcome the spring. Pipe 34 leads to pressure tank 35, and also has a branch pipe 36 leading to port 37 in the compression cylinder and another branch 38 leading to port 39 in the combustion cylinder.

A turbine 40 is mounted on the crankshaft, which may carry the usual flywheel.

The turbine receives gases through pipe 41 from the tank 35 and through exhaust pipe 42 from the combustion cylinder.

The operation of the apparatus will now be described. Beginning with the parts in the positions shown in the drawing, the working stroke of the combustion piston exerts most, if not all, of its energy through the piston in the compression cylinder. The pistons being both connected to sleeve 13 the driving power is transmitted through that sleeve from the firing chamber to exert pressure on the gases in the compression chamber. The turbine has driving connection to the crankshaft constructed so that the turbine rotates many times to one rotation of the crankshaft, but still the turbine exerts driving force on the crankshaft, so that the driving force of the burning gases is exerted to drive the compression piston instead of being exerted to turn the crankshaft. The gases from pipe 36 enter the compression chamber tending to equalize the pressure in the chamber with that

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in pipe 34, so that the pressure in the compression chamber is about equal to that in the outlet pipe 34 before the piston covers port 37, and the compression piston has a long even stroke, very different from what would be the case if pipe 36 were absent, in which case a large part of the stroke of the compression piston would be taken up in bringing the pressure in the compression cylinder up to that in pipe 34.

Just before the piston 7 uncovers port 39, exhaust valve 20 is opened. Because of the surges of gas in pipe 34 due to the long effective compression stroke of piston 9, the pressure in pipe 34 and branch 38 is enough higher than that in pipe 42 at the time port 39 is opened, so there is effective scavenging. The compression of scavenging gases, the fuel supply, and the firing may follow any usual or obvious course.

During the movement of piston 9 to the right, air is admitted through valve 25 when the pressure in the cylinder falls below atmospheric. As soon as piston 9 begins to uncover port 37, air rushing in through that port raises the pressure in the cylinder above atmospheric. Just how much air is admitted through pipe 27 depends on how valve 30 is set, and connecting rod 28 insures that the throttle valve and fuel charge are properly related to supply the fuel needed for compressing the air admitted past the throttle valve.

I wish it understood that my invention is not limited to any specific construction, arrangement or form of the parts, as it is capable of numerous modifications and changes without departing from the spirit of the claims.

Having thus described my invention, what I claim as new, and desire to secure by United States Letters Patent, is:

1. In combination, a receiver for compressed gas, a compressor cylinder and a piston reciprocating in the cylinder with a charging stroke and a compression stroke, means for charging the cylinder with gas at atmospheric pressure through the greater part of the charging stroke, means for charging the cylinder with gas under pressure approximating that within the receiver nearing the final end of the charging stroke, means directing gas from the cylinder to the receiver during the compression

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stroke, an internal combustion engine having a piston with a working stroke, and means connecting said pistons for substantially simultaneous movement during the compression stroke of the compressor and the working stroke of the engine.

2. In combination, a gas compressor comprising a cylinder, a piston reciprocating in the cylinder with a charging stroke and a compressing stroke, with a two-cycle internal combustion engine having a charging stroke and working stroke, and connections between said pistons compelling them to move substantially simultaneously on their charging stroke and their compressing and working strokes respectively, a container for the compressed gas, and means for connecting the gas in said container to the compressing cylinder while the compressing piston is nearing the end of its charging stroke and before the beginning of its compressing stroke.

3. In combination, a gas compressor comprising a cylinder, a piston, and valves admitting gas at atmospheric pressure during a charging stroke of the piston and directing gas into a container for high pressure gas during a compression stroke of the piston, and a two-cycle internal combustion engine comprising a cylinder and a piston having a working stroke and a charging stroke, and means connecting the pistons and compelling the two pistons to move substantially simultaneously on their charging strokes and on their compressing and working strokes respectively, and means admitting high pressure gas from the container to the compressing cylinder nearing the end of the charging stroke and before the beginning of the compressing stroke.

References Cited in the file of this patent

UNITED STATES PATENTS

Number	Name	Date
1,912,443	Goosmann	June 6, 1933
1,912,444	Goosmann	June 6, 1933
2,002,307	Brier et al.	May 21, 1935
2,147,935	Steiner	Feb. 21, 1939
2,222,260	Janicke	Nov. 19, 1940
2,344,058	Pescara	Mar. 14, 1944
2,423,720	Mullejans et al.	July 3, 1947