

APPLICATION FILED MAY 9, 1912.

3 SHEETS--SHEET 1.

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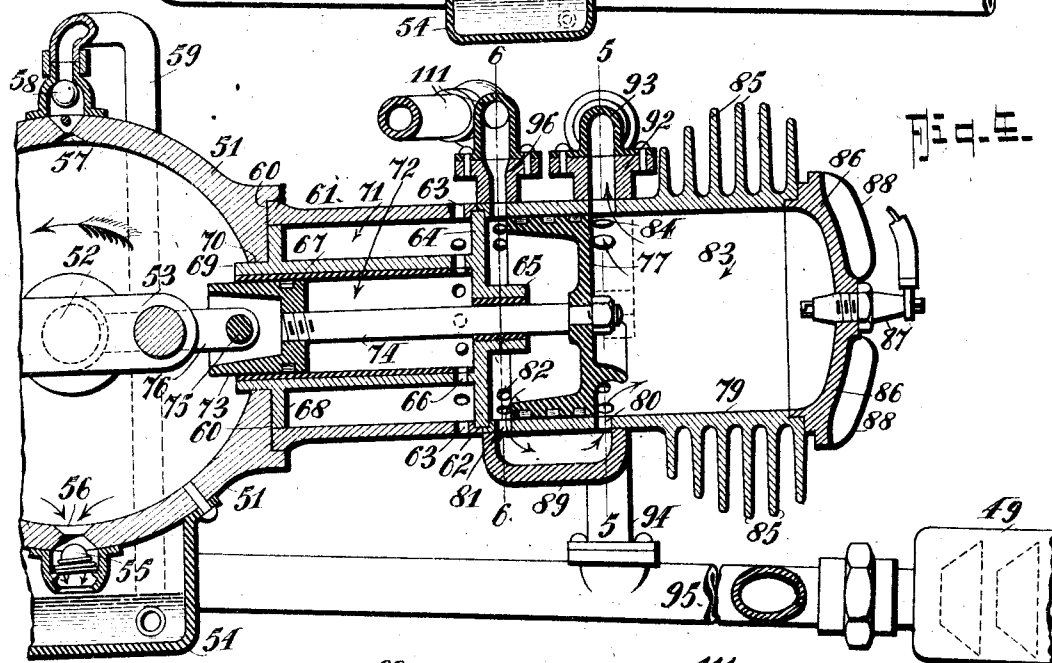
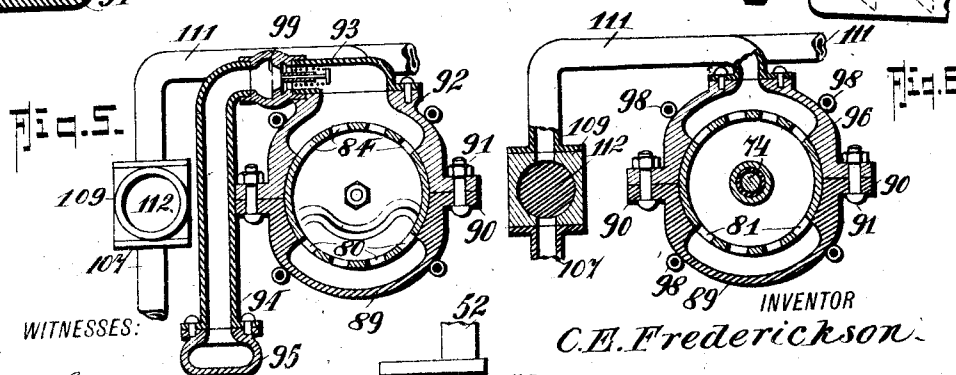
John E. Schrott.
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Patented Apr. 28, 1914.

3 SHEETS-SHEET 2.



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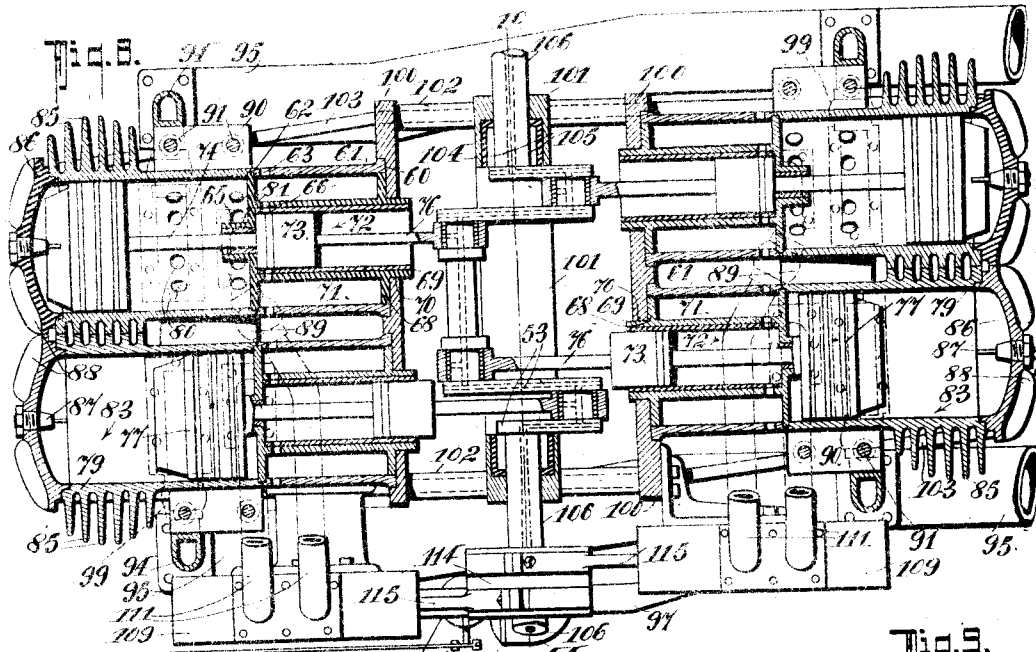
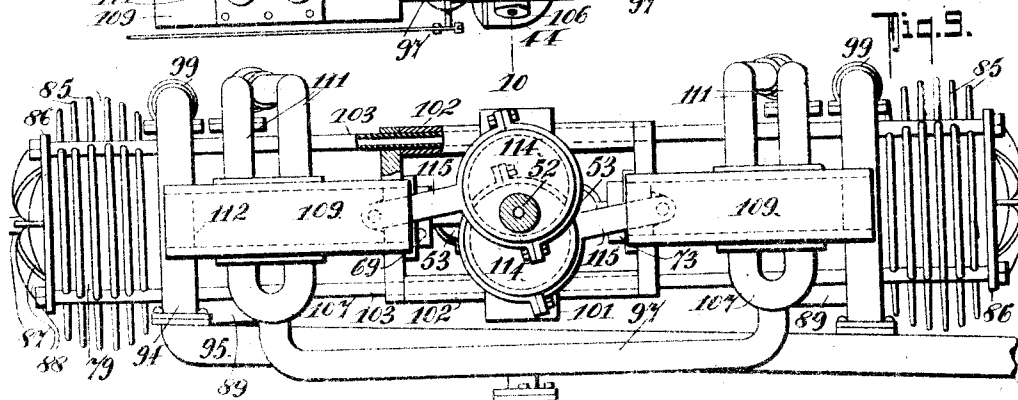
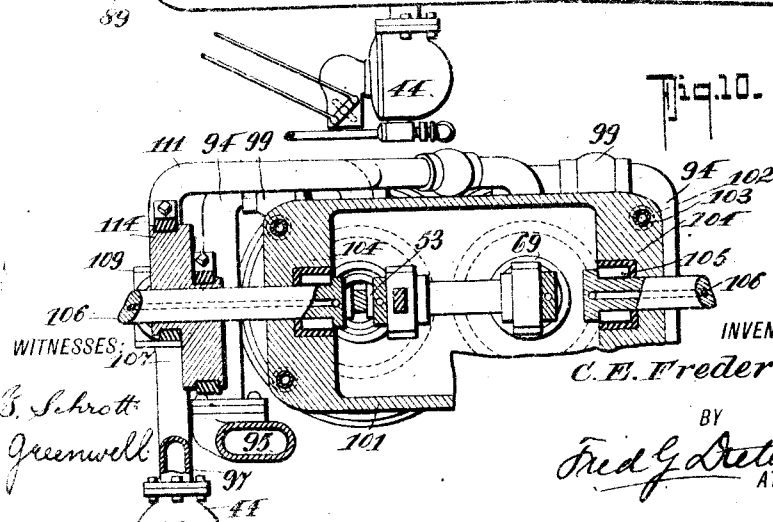
C. E. FREDERICKSON.
GAS ENGINE.

APPLICATION FILED MAY 9, 1912

Patented Apr. 28, 1914.

3 SHEETS--SHEET 3.

1,094,431.



UNITED STATES PATENT OFFICE.

CLAYTON E. FREDERICKSON, OF SAN FRANCISCO, CALIFORNIA, ASSIGNOR OF ONE-HALF TO WILLIAM H. STENGER, OF SAN FRANCISCO, CALIFORNIA.

GAS-ENGINE.

1,094,431.

Specification of Letters Patent.

Patented Apr. 28, 1914.

Application filed May 9, 1912. Serial No. 696,060.

To all whom it may concern:

Be it known that I, CLAYTON E. FREDERICKSON, residing at San Francisco, in the county of San Francisco and State of California, have invented a new and Improved Gas-Engine, of which the following is a specification.

My invention primarily has for its object to provide an internal combustion engine more especially designed and adapted for use in motorcycle work and aerial navigation, in which engine, provision is made to reduce weight, equalize shocks and vibrations, and to simplify the construction, operation, and reduce the maintenance cost of the engine.

The invention also resides in those novel details of construction, combination, and arrangement of parts, all of which will be first fully described and then be specifically pointed out in the appended claims, reference being had to the accompanying drawings, in which:—

Figure 1 is a top plan view of a four cylinder engine embodying the invention. Fig. 2 is a cross section on the line 2—2 of Fig. 1. Fig. 3 is a vertical central longitudinal section of the engine. Fig. 4 is an enlarged vertical central longitudinal section of one cylinder and a part of the crank case. Fig. 5 is a cross section on the line 5—5 of Fig. 4. Fig. 6 is a cross section on the line 6—6 of Fig. 4. Fig. 7 is a detail view of a part of the crank shaft and cranks. Fig. 8 is a central horizontal section of a modified form of the engine. Fig. 9 is a side elevation of the form shown in Fig. 8, parts being broken away. Fig. 10 is a cross section on the line 10—10 of Fig. 8.

Referring now to the accompanying drawings in which like numerals and letters of reference designate like parts in all the figures, it will be seen that the engine comprises the closed crank case 51 in bearings in which the crank shaft 52, is journaled. The crank shaft 52 has the usual cranks 53, there being one for each cylinder in the form shown in Fig. 7 of the drawings. The crank case 51 supports an oil reservoir 54 which is in communication with the crank case at 56, the opening 56 being controlled by a back check valve 55, whereby the oil from the crank case may flow into the reservoir 54, but will not flow back through the opening 56 into the crank case. At the upper part

of the crank case 51 is another opening 57, through which oil is adapted to pass into the crank case from a suction pipe 59 that is in communication with the reservoir 54 and which is provided with a back check valve 58. The crank case 51 is recessed, at 60 to receive the cylinder section 61. The cylinder section 61 has a shoulder 62 to receive the plate or web 64 of the tubular guide 67, and the cylinder 61 is provided with air openings 63, while the tubular guide 67 is likewise provided with air openings 66. The web 64 has a bushed bearing 65 for the piston rod 74, and the tubular guide or inner cylinder 67 has a second web 68 that seats in the recess 60, the guide 67 projecting at 69 into the crank case 51 through the openings 70. It will be observed that there is a space or chamber 71 between the cylinder section 61 and the tubular guide 67. This space forms an air pocket or chamber for cooling purposes. The interior space 72 of the guide 67 is suitably bushed and forms the chamber in which the auxiliary piston 73, operates. The piston 73 is also in function, a cross head to which the piston rod 74 and the connecting rod 76 are joined, the rod 76 being pivoted at 75 to the piston and also being pivoted to its respective crank 53.

77 designates the working piston which operates in the working cylinder section 79. The cylinder 79 has the piston controlled new charge inlet ports 80 that communicate with the by-pass duct 89, through which the compressed working agent from the compressing chamber 82, is passed, via the ports 81. The working cylinder section 79 is also provided with piston controlled exhaust ports 84 from the working chamber 83. The working chamber is cooled by suitable radiators 85 or otherwise, and is closed by a cap 86, which is also provided with cooling elements 88 and with the spark plug 87. The by-pass 89 is formed of macadamite and has flanges 90 through which the securing bolts 91 pass. The bolts 91 secure the macadamite exhaust pocket 92 and the macadamite intake pocket 96 to the by-pass duct body 89 and over the respective cylinder ports, as best illustrated in Figs. 5 and 6 of the drawings.

93 designates the exhaust pipe of the cylinder which communicates at 94 with the main exhaust duct 95 that delivers into the muffler 49.

97 is the fuel feed pipe from the carbureter 44 that delivers into the Y member 107 that communicates in turn with the inlet ports 108 of the valve casing 109, the outlet ports 110 of which deliver through pipes 111 into the inlet pocket members 96 of the respective cylinders 79.

The charge controlling valves have their casings 109 designed to receive the slide valves 112, each of which has a port 113 to bring the opposite ports 108 and 110 into communication, at proper times. The valves 112 are operated by cams 114 on the crank shaft, and by connecting rods 115, as shown. The cams 114 are set 180 degrees apart and 90 degrees around from the position of the cranks, so that the cams will be imparting the slowest motion to the valves while the pistons are traveling fastest, and vice versa, thus allowing the ports to be wide open while the pistons are moving fastest, and thereby enabling the cylinders to be fully charged. The cylinder sections 61 and 79 and caps or cover plates 86 are secured to one another and to the crank case 51 by suitable stay bolts 98 which pass through the radiator grooves. The back check valves 99 may be provided in the exhaust duct 93 if desired.

In Figs. 8 *et seq.*, I have shown a modification of the invention in which the construction is still further lightened for enabling the engine to be well adapted for aerial navigation. In this form, the crank case is an open structure made by uniting plates 100 and a central ring 101 together by stay bolts 103 that pass through the same and through the spacing sleeves 102. The central ring 101 has bearing portions 104 to contain the anti-friction bearings 105 for the crank shaft 106 of the engine. In this form, as in the other form, the engine is shown as a four cylinder one, in which the cranks are so related that diametrically opposite cylinders operate together in order to reduce shock and vibration.

In the operation of my invention, the pistons 73 on their out strokes cause a reduction of pressure in the crank case 51, thereby sucking the oil into the crank case through the opening 57 in the form of a spray or vapor to distribute it throughout the crank case, and effectually lubricate the crank shaft, its bearings, connecting rods, and the pistons 73. On the inner stroke of the pistons 73, excess oil in the crank case, will be forced out through the passage 56 into the reservoir 54, thus keeping up an efficient circulation of the lubricant. The pistons 73 gathering oil will lubricate the tubular guides 67 and in order to keep the same cool, air will be drawn by the pistons 73 into the chambers 72 and 71, through the ports 63 and during one stroke of the piston 73, while air will be forced out of such cham-

bers on the other stroke. On the out stroke of the piston 77 a new charge of working agent will be drawn into the compression chamber 82, while the charge in the working chamber 83 will be put under compression. As soon as the piston 77 has reached the limit of its out stroke, the charge will be fired in the usual manner to impel the piston 77 on its working stroke, thereby compressing the new charge by working agent in the compression chamber 82 until the piston 77 uncovers the ports 80 and 84, at which time the compressed new charge will enter the working chamber 83.

From the foregoing description taken in connection with the accompanying drawings, it is thought the complete construction, operation, and advantages of the invention will be apparent to those skilled in the art.

What I claim is:—

1. In an internal combustion engine, a crank case, a crank shaft mounted therein, a main cylinder mounted on said crank case, a stationary partition dividing said cylinder into an outer and an inner part, a working piston in said outer part dividing the same into a working chamber and a pump chamber, said main cylinder having a new charge inlet port and an outlet port for the pump chamber and having a new charge inlet port and an exhaust port for said working chamber, a by-pass duct secured on said cylinder over said pumping chamber outlet port and said working chamber inlet port to connect the same, a new charge duct secured over said pumping chamber inlet port and secured to said by-pass duct, an exhaust duct secured over said exhaust port and to said by-pass duct, said working chamber ports being piston controlled, and operative connections between said working piston and said crank shaft.

2. In an internal combustion engine, a crank case, a crank shaft mounted therein, a main cylinder mounted on said crank case, a stationary partition dividing said cylinder into an outer and an inner part, a working piston in said outer part dividing the same into a working chamber and a pump chamber, said main cylinder having a new charge inlet port and an outlet port for the pump chamber and having a new charge inlet port and an exhaust port for said working chamber, a by-pass duct secured on said cylinder over said pumping chamber outlet port, and said working chamber inlet port to connect the same, a new charge duct secured over said pumping chamber inlet port and secured to said by-pass duct, an exhaust duct secured over said exhaust port and to said by-pass duct, said working chamber ports being piston controlled, a tubular cross head guide mounted in said inner cylinder part, a cross head piston in said guide.

a piston rod rigidly connecting said pistons, a connecting rod between said cross head piston and said crank shaft, and means for cooling said cross head piston and guide.

- 5 3. In an internal combustion engine, a crank case, a crank shaft mounted therein, a main cylinder mounted on said crank case, a stationary partition dividing said cylinder into an outer and an inner part, a working
10 piston in said outer part dividing the same into a working chamber and a pump chamber, said main cylinder having a new charge inlet port and an outlet port for the pump-
15 ing chamber and having a new charge inlet port and an exhaust port for said working chamber, a by-pass duct secured on said cylinder over said pumping chamber outlet
20 port, and said working chamber inlet port to connect the same, a new charge duct secured over said pumping chamber inlet port
25 and secured to said by-pass duct, an exhaust duct secured over said exhaust port and to said by-pass duct, said working chamber ports being piston controlled, a tubular
30 cross head guide mounted in said inner cylinder part, a cross head piston in said guide, a piston rod rigidly connecting said pistons,
35 a connecting rod between said cross head piston and said crank shaft, said cross head guide being spaced from the walls of said
inner cylinder part to leave a chamber, means for admitting air into said last
named chamber and into said cross head guide between said cross head piston and
said stationary partition.

4. In an internal combustion engine, a crank case, a crank shaft mounted thereon, a main cylinder mounted on said crank case,
40 a working piston operating in said cylinder and dividing it into a working chamber and a compression chamber, a cross head cylinder mounted in said main cylinder and hav-
ing a flange forming a partition to separate said compression chamber from the crank
45 case end of said main cylinder and from said cross head cylinder, said cross head cylinder being spaced from said main cylinder to leave a chamber between said cyl-
inders, means for bracing the crank case end
50 of said cross head cylinder, a cross head piston in said cross head cylinder, a piston rod connecting said pistons, a connecting rod connecting said crank shaft with said cross
55 head piston, a piston controlled by-pass between said working and compression cham-
bers, and said main cylinder having a new charge inlet to the compression chamber,
and an exhaust port for said working chamber.

5. In an internal combustion engine, a crank case, a crank shaft mounted thereon, a main cylinder mounted on said crank case,
60 a working piston operating in said cylinder and dividing it into a working chamber and
65 a compression chamber, a cross head cylin-

der mounted in said main cylinder and hav-
ing a flange forming a partition to separate
said compression chamber from the crank
case end of said main cylinder and from
said cross head cylinder, a cross head piston
70 in said cross head cylinder, a piston rod connect-
ing said pistons, a connecting rod connect-
ing said crank shaft with said cross
head piston, a piston controlled by-pass be-
tween said working and compression cham-
75 bers, and said main cylinder having a new
charge inlet to the compression chamber, an
exhaust port for said working chamber, said
cross head cylinder being spaced from the
walls of the main cylinder to leave a pocket
80 or chamber therein and said main cylinder
and said cross head cylinder having ports
in communication with said pocket.

6. In an internal combustion engine, a crank case, a crank shaft mounted thereon,
85 a main cylinder mounted on said crank case, a working piston operating in said cylinder
and dividing it into a working chamber and a compression chamber, a cross head cylin-
der mounted in said main cylinder and hav-
90 ing a flange forming a partition to sepa-
rate said compression chamber from the
crank case end of said main cylinder and
from said cross head cylinder, said crank
case having an opening to receive one end
95 of said cross head cylinder, said cross head
cylinder having a second flange to engage
said crank case, a cross head piston in said
cross head cylinder, a piston rod connecting
said pistons, a connecting rod connecting
100 said crank shaft with said cross head piston,
a piston controlled by-pass between
said working and compression chambers,
said main cylinder having a new charge in-
let to the compression chamber, an exhaust
105 port for said working chamber, said cross
head cylinder communicating at its inner
end with said crank case.

7. In an internal combustion engine, a crank case, a crank shaft mounted therein,
110 a main cylinder mounted on said crank case, a stationary partition dividing said
cylinder into an outer and an inner part, a
working piston in said outer part dividing
the same into a working chamber and a
115 pump chamber, said main cylinder having a
new charge inlet port and an outlet port for
the pumping chamber and having a new
charge inlet port and an exhaust port for
said working chamber, a by-pass duct se-
120 cured on said cylinder over said pumping
chamber outlet port and said working cham-
ber inlet port to connect the same, a new
charge duct secured over said pumping
chamber inlet port and secured to said by-
125 pass duct, an exhaust duct secured over
said exhaust port and to said by-pass
duct, said working chamber ports being
piston controlled, and operative connec-
tions between said working piston and said

crank shaft, together with a slide valve device, and connections between said slide valve device and the new charge inlet port of the pumping cylinder, means for delivering working agent to said valve, and means for operating said slide valve from the crank shaft.

8. In an internal combustion engine, a crank case, a crank shaft mounted therein, a pair of working cylinders each having a new charge inlet port, a single slide valve for controlling the distribution of the charge to the respective cylinder inlet ports, and means for moving said slide valve to open up communication with one or the other cylinder inlet ports at a time whereby said valve will reach its maximum opening position at the fastest portion of the suction stroke of the piston.

9. In an internal combustion engine, a plurality of cylinders and their pistons, a crank shaft and a connecting rod between the crank shaft and each piston, said cylinders each including a new charge inlet port, a single slide valve including a valve casing having fuel inlet and outlet ports, and a piston valve proper having a single passage to bring said casing ports into communication with one another to alternately permit the flow of working agent to the cylinders, fuel conveying connections between said casing outlet ports and the inlet ports of the respective cylinders, and means for moving said piston valve proper to bring said valve casing ports into communication during the suction stroke of said engine piston, said last named means comprising a cam on the crank shaft set ninety degrees from the position of the crank, and a connection between said cam and said piston valve proper.

10. In an internal combustion engine, a crank case, a crank shaft having a pair of cranks mounted in said case, a pair of engine cylinders and their pistons, each of said cylinders including new charge inlet and exhaust ports, a single valve device for

both of said cylinders, said valve device including a valve casing having a pair of inlet ports and a pair of outlet ports, fuel ducts between the respective outlet ports of said valve casing and the respective inlet ports of said cylinders, fuel ducts between the inlet ports of said valve casing and the source of fuel supply, a slide valve in said valve casing having a single cross port for bringing one or the other of said valve casing inlet ports into communication with the opposite outlet port according as said valve is in one position or another, and cooperative connections between said slide valve and said crank shaft for imparting motion to said slide valve.

11. In an internal combustion engine, a crank case having a cylinder receiving seat, a main cylinder mounted on said seat and including a plurality of distinct sections placed end to end, and means for securing said sections together to said crank case, the abutting ends of a pair of said sections having shoulders to form an annular groove, a cross head cylinder mounted within said main cylinder, and having an annular flange to seat in said groove, said cross head cylinder having a second annular flange to engage the crank case, said cross head cylinder including a portion projecting through the crank case wall into the crank case, a working piston mounted on and operating in one section of said main cylinder, a cross head piston operating in said cross head cylinder, a piston rod rigidly connecting said pistons to move in unison, a crank shaft including a crank mounted within said crank case, a connecting rod between said crank and said cross head piston, said main cylinder having intake and exhaust ports cooperative with said piston, and means for cooling said cross head cylinder.

CLAYTON E. FREDERICKSON.

Witnesses:

V. P. SESSIONS,
C. B. SESSIONS.