M. C. WHITE & O. C. DURYEA.

INTERNAL COMBUSTION ENGINE.

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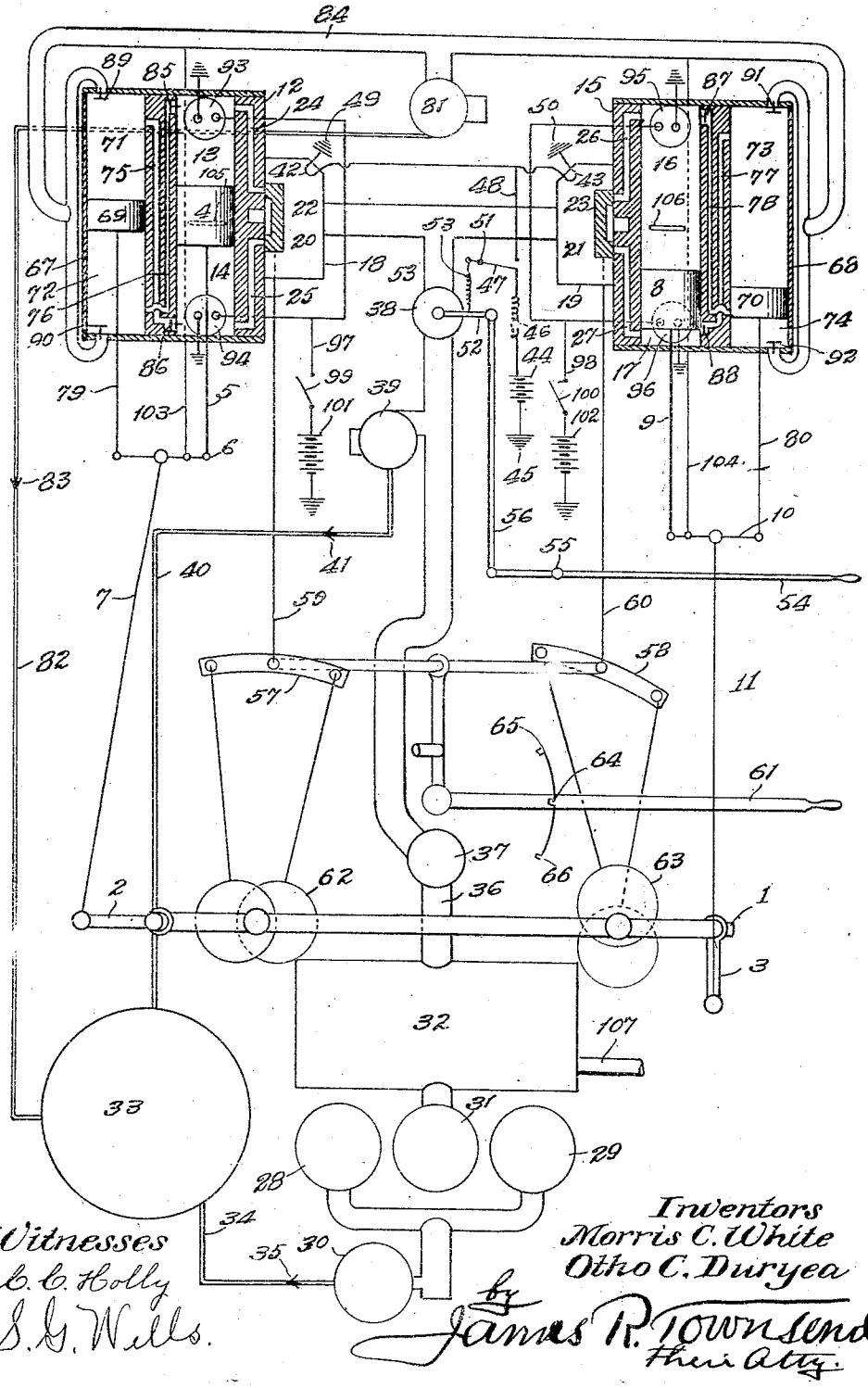
1,033,504. Patented July 23, 1912.



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UNITED STATES PATENT OFFICE.

MORRIS C. WHITE AND OTHO C. DURYEA, OF LOS ANGELES, CALIFORNIA, ASSIGNORS OF ONE-TENTH TO JAMES R. TOWNSEND, OF LOS ANGELES, CALIFORNIA.

INTERNAL-COMBUSTION ENGINE.

1,033,504. Specification of Letters Patent. Patented July 23, 1912.

Application filed October 20, 1908. Serial No. 458,705.

To all whom it may concern:

Be it known that we, MORRIS COLUMBUS WHITE and OTHO CROMWELL DURYEA, both citizens of the United States, residing at Los Angeles, in the county of Los Angeles and State of California, have invented a new and useful Internal-Combustion Engine, of which the following is a specification.

An object of this invention is to provide an internal combustion engine which may be connected direct to its load, and which may be started as gradually as desired and without cranking.

An object is to provide an internal combustion engine having a constant combustion system for starting and for gradual and for comparatively-light work, and having an explosive combustion system for comparatively-heavy work after starting.

An object is to provide an internal combustion engine which will start under heavy loads and will be reversible and applicable for use in all situations where locomotives or marine engines are required.

An object is to dispense with the necessity of furnaces, smoke-stacks, open fires, heavy loads of water, and to accomplish a maximum amount of work with a minimum amount of fuel, thereby enabling locomotives to make longer hauls without stops for fuel, and to enable war and other vessels to make longer voyages without the necessity of stopping for fuel.

An object is to build an engine having several times the power in proportion to its size and weight, as compared with other engines of present construction.

The invention is capable of various embodiments, and we do not limit the same to any specific form.

In the drawings we have shown a diagrammatic plan of an internal combustion engine having two double-acting pistons.

The driving-shaft 1 has cranks 2 and 3 set at right angles to each other. The piston 4 is connected to the crank 2 through the piston-rod 5, the cross-head 6, and the connecting-rod 7. The piston 8 is connected to the crank 3 through the piston-rod 9, the cross-head 10, and the connecting-rod 11. The piston 4 is mounted in the engine piston cylinder 12, there being an explosion-chamber 13 at one end of the piston and a second explosion-chamber 14 at the other end of the piston. The piston 8 is mounted in the piston-cylinder 15, there being an explosion-chamber 16 at one end of the piston and a second explosion-chamber 17 at the other end of the piston.

The cylinder 12 has a slide-valve-casing 18, and the cylinder 15 has a slide-valve-casing 19, said casings forming chambers 20 and 21 for constant combustion outside of the slide-valves 22 and 23. A port 24 leads from the constant combustion chamber 20 to the explosion-chamber 13, and a similar port 25 leads from said chamber 20 to the explosion-chamber 14; said ports 24 and 25 being controlled by the slide-valve 22. A port 26 leads from the constant combustion chamber 21 to the explosion-chamber 16, and a similar port 27 leads from said chamber 21 to the explosion-chamber 17; said ports 26 and 27 being controlled by the slide-valve 23.

The air-compressor comprises the two gas engines 28 and 29 taking fuel from the carbureter 30 and driving the air-pump 31, said air-pump discharging into the compressed air tank 32. The carbureter 30 is supplied from the fuel-tank 33 through the pipe-line 34, there being a check-valve 35 in said line to hold the pressure from passing back into the fuel-tank. A compressed air pipe 36 leads from the compressed air tank 32 to the constant combustion-chambers 20 and 21. A pressure-regulator 37 is incorporated into this compressed air pipe, and the passage through the pipe to the constant combustion chambers is controlled and regulated by a throttle 38; the pipe being forked beyond the throttle to supply pressure equally to each constant combustion chamber. Gas is supplied to the compressed air pipe from the carbureter 39, said carbureter being supplied with fuel through the pipe-line 40, there being a check-valve 41 in the fuel-pipe 40 to keep the pressure from going back into the fuel-tank 33. A fine platinum wire is run into the constant combustion chamber 20 to produce the constant igniter 42, and a similar wire is run into the constant combustion chamber 21 to produce the constant igniter 43. A constant igniter battery 44 is grounded at one end to the frame, as indicated at 45, and the other end of the battery passes through a retractile coil spring 46 to the switch 47, and from the other end of the switch 47

the line 48 is forged and runs to the constant igniters 42 and 43; said igniters being grounded upon the frame at 49 and 50. The switch-bar 47 is mounted on a pivot 51 and is yieldingly connected to the throttle-crank 52 by the spring 53. The throttle-lever 54 is mounted upon the pivot 55, and the short end of the lever is connected to the crank 52 by the connecting-rod 56. The links 57 and 58 are connected to the slide-valves 22 and 23 by the rods 59 and 60. The link-operating lever 61 is connected to the links in the usual way, and the links are operated by the eccentrics 62 and 63 in the usual way. Thus we have produced a constant combustion system for starting the pistons 4 and 8 gradually and with the load connected directly to the piston so as to avoid the sudden jerks caused by starting an explosive engine with a crank, and avoiding the necessity of disconnecting the load from the pistons during the operation of starting.

The engines 28 and 29 are comparatively small and may be of any ordinary construction of explosive engine. These engines may be started with a cranking system to supply air under compression to the tank 32, and when a sufficient pressure has been attained the lever 61 is set on the neutral point as indicated at 64, thus bringing the links 57 and 58 to neutral position and holding the slide-valves neutral. Then the lever 61 is thrown forwardly to the forward position 65 to shift the links into proper relations to start the engine forwardly. Then the throttle 38 upon the pipe-line 36 is operated, and as the crank 52 swings backwardly the tension of the spring 53 will overcome the tension of the spring 46 and close the switch 47, thereby causing the constant igniters 42 and 43 to become incandescent, and as the compressed air passes through the pipe-line 36 it will be impregnated with gas from the carbureter 39, and passing into the constant combustion chambers 2 and 21 will be ignited by the constant igniters 42 and 43, causing a steady conflagration in each of the chambers 20 and 21, thereby greatly expanding and increasing the volume of the fluid, and this fluid will pass into the chambers of the pistons and cause the pistons to reciprocate and start the engine. This operation of starting may be gradual and the force will be constantly exerted to start the engine without disconnecting the engine from the load.

If it is desired to reverse the engine the link-lever 61 is moved backwardly to the reverse position 66, thereby shifting the action of the slide-valves 22 and 23 as required to move the engine backwardly instead of forwardly.

The gas-pump-cylinders 67 and 68 are formed integral with the engine-piston-cylinders 12 and 15, and the pump-pistons 69 and 70 are mounted in the pump-cylinders so as to form pump-chambers 71, 72, and 73, 74, there being a chamber at each end of each piston. A port 75 leads from the pump-chamber 71 to the explosion-chamber 14, and a port 76 leads from the pump-chamber 72 to the explosion-chamber 13. A port 77 leads from the pump-chamber 73 to the explosion-chamber 17, and a port 78 leads from the pump-chamber 74 to the explosion-chamber 16.

The pump-pistons 69 and 70 are connected to the cross-heads 6 and 10 by the piston-rods 79 and 80 so that the pump-pistons 69 and 70 are operated in unison with the engine-pistons 4 and 8. The explosive-system carbureter 81 is connected to the fuel-tank 33 by the oil-pipe-line 82, there being a check-valve 83 in the oil-pipe-line to prevent pressure passing backwardly from the carbureter to the fuel-tank. A gas-pipe-line 84 connects the carbureter 81 to each of the chambers 71, 72, and 73, 74, so that the gas-pump-pistons 69 and 70 will draw gas from the carbureter 81.

Check-valves 85, 86, 87 and 88 control the ports 75, 76, 77 and 78, said check-valves discharging into the engine-piston-chambers 13, 14, 16 and 17, and holding the pressure from passing backwardly into the pump-chambers. Check-valves 89, 90, 91 and 92 control the passages from the carbureter 81 into the gas-pump-chambers 71, 72, 73 and 74, said check-valves discharging into the chambers and holding the pressure from passing back into the carbureter.

Intermittent or sparking igniters 93, 94, 95 and 96 are mounted in communication with the engine-piston-chambers 13, 14, 16 and 17; said igniters being grounded to the frame, and said igniters being connected by circuits 97 and 98 to the switches 99 and 100, and said switches being connected to the batteries 101 and 102 and said batteries being grounded to the frame. The tappet-rods 103 and 104 are connected to the cross-heads 6 and 10 and arranged to operate the sparking igniters 93, 94, 95 and 96 in the usual way.

If the engine has been started and it is desired to increase the force or speed or power, the switches 99 and 100 are closed and the throttle 38 is closed, and the momentum of the engine will continue to operate the gas-pumps and supply gas from the carbureter 81 to the explosion-chambers, and said gas will be exploded by the sparking igniters, and the operation of the engine continued by said explosions.

The exhaust-ports 105 and 106 are formed at the longitudinal centers of the piston-cylinders 12 and 15 so as to exhaust from the chambers 13, 14, 16 and 17. The pipe-line 107 may lead from the compressed air

tank 32 to the fuel-tank 33 to supply pressure for the discharge therefrom of the liquid fuel under necessary pressure.

We claim:—

1. In an internal combustion engine, the combination with a cylinder and piston, movable one with relation to the other, of means for subjecting the moving member to the driving force of products of combustion of fluid under continuous combustion, means for subjecting said moving member to the driving force of intermittent explosions, and means for substituting one of said forces for the other.

2. In an internal combustion engine, the combination with a cylinder and piston, movable one with relation to the other, of means for subjecting the moving member to the driving force of products of combustion of fluid under continuous combustion, means for subjecting said moving member to the driving force of intermittent explosions, and means for substituting one of said forces for the other during the movement of said moving member.

3. In an internal combustion engine, the combination with a cylinder and piston, movable one with relation to the other, of means for subjecting the moving member to the driving force of products of combustion of fluid under continuous combustion, engine-reversing means, means for subjecting said moving member to the driving force of intermittent explosions, and means for substituting one of said forces for the other.

4. In an internal combustion engine, the combination with a cylinder and piston, movable one with relation to the other, of means for subjecting the moving member to the driving force of products of combustion of fluid under continuous combustion, a throttle-valve for controlling the flow of said fluid, means for subjecting said moving member to the driving force of intermittent explosions, and means for substituting one of said forces for the other.

In testimony whereof, we have hereunto set our hands at Los Angeles, California, this 24th day of September, 1908.

MORRIS C. WHITE.
OTHO C. DURYEA.

In presence of—
JAMES R. TOWNSEND,
M. BEULAH TOWNSEND.