L. B. STEDMAN.

INTERNAL COMBUSTION ENGINE.

APPLICATION FILED JULY 12, 1916.

1,262,602.

Patented Apr. 9, 1918

2 SHEETS—SHEET 1.

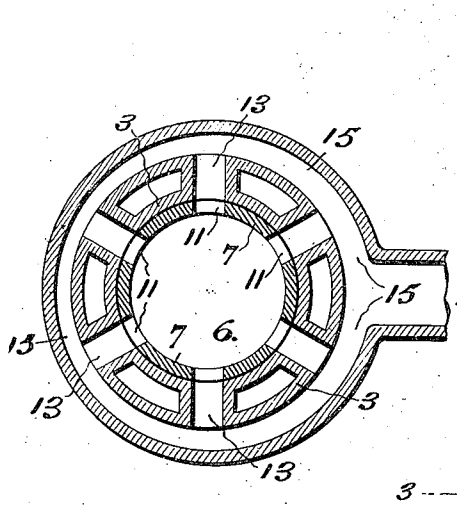


Fig. 2.

Fig. 1.

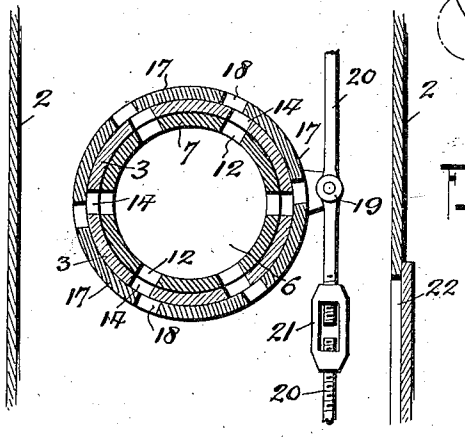


Fig. 3.

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2 SHEETS—SHEET 2.

Fig. 5.

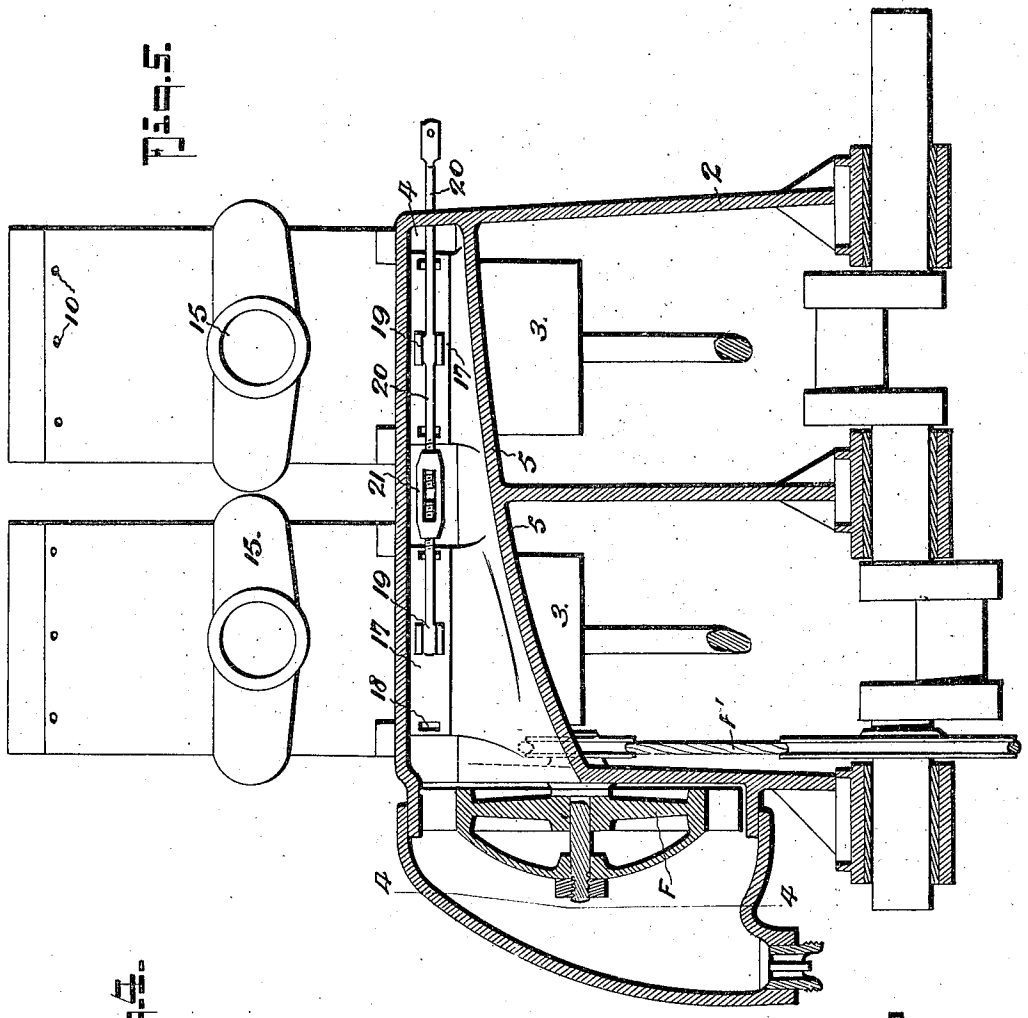
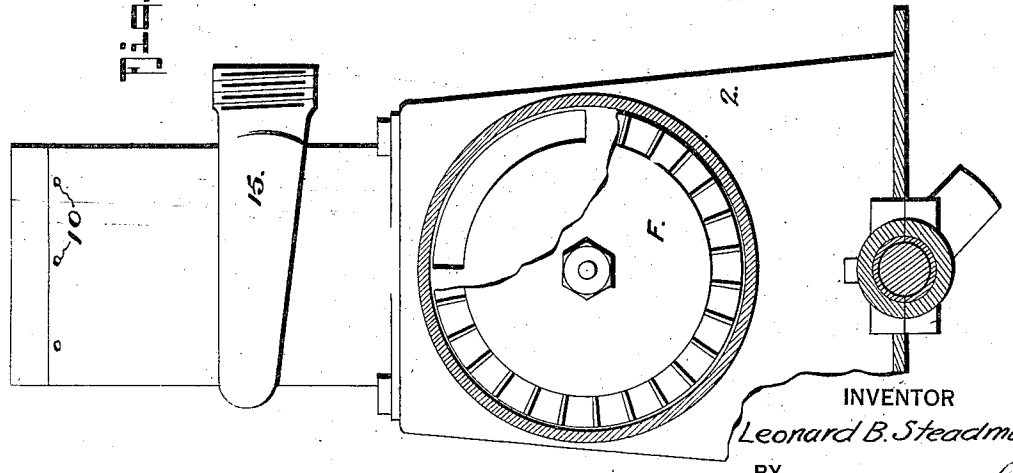


Fig. 4.



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LEONARD B. STEDMAN, OF VICTORIA, BRITISH COLUMBIA, CANADA.

INTERNAL-COMBUSTION ENGINE.

1,262,602. Specification of Letters Patent. Patented Apr. 9, 1918.

Application filed July 12, 1916. Serial No. 108,837.

To all whom it may concern:

Be it known that I, LEONARD B. STEDMAN, a citizen of the Dominion of Canada, residing at Victoria, in the Province of British Columbia, Canada, have invented certain new and useful Improvements in Internal-Combustion Engines, of which the following is a specification.

This invention relates to an internal combustion engine of the two-cycle class and the improvements are directed to the manner of exhausting the products of combustion from the cylinder and for admitting a supply of gaseous fuel thereto whereby the products of combustion are completely scavenged from the cylinder by the inflow of gas for the next power stroke.

The invention also comprises the manner of controlling the available area of the admission port whereby the gas admission may be regulated to the engine's requirements.

The invention is particularly described in the following specification, reference being made to the drawings by which it is accompanied, in which:

Figure 1 is a vertical longitudinal section of the engine on the axis of the cylinder.

Fig. 2 is a cross section through the engine exhaust port being on the line 2—2 in Fig. 1, and

Fig. 3 is a cross section through the admission ports and their control valve being on the line 3—3 in Fig. 1.

Fig. 4 is a section and elevation on the line 4—4 of Fig. 5.

Fig. 5 is a side elevation and part section showing the location of the charging fan and its operative connection with the crank shaft.

In these drawings 2 represents the crank case of the engine, to the upper side of which the several cylinders 3 are secured to project their lower ends into the crank case. From the upper part of this crank case a gas delivery chamber 4 is divided off by a partition 5 through which the lower end of each cylinder passes and is fitted gas-tight in any approved manner. The piston 6 of each cylinder has an extension 7 outward from its head and the cylinder 3 is correspondingly extended in length.

The inner side of the piston extension 7 is bored, and the cylinder head 8, which is inwardly projected from the cylinder end and centrally threaded, as shown, to receive the ignition plug, is turned so that the bore of the piston extension 7 may slidably fit the head 8; and to insure a gas-tight fit the head 8 is provided at its lower end with a ring 9. The end of the cylinder extension has a vent or vents 10 to relieve the compression and suction of air in the annular space inclosed between the wall of the cylinder 3 and the inwardly projecting cylinder head 8 during movement of the piston extension 7 within it.

Ports 11 are circumferentially disposed around the upper end of the piston extension, and similar ports 12, staggered in relation to those 11, are provided in the other end of the extension, that is, adjacent the head of the piston 6. When the piston 6 is at the downward limit of its stroke, that is, toward the crank shaft, the ports 11 of its extension 7 register with ports 13 in the wall of the cylinder 3, which ports 13 communicate with an annular exhaust passage 15 leading to the exhaust of the engine, and at the same limit of the piston's stroke the ports 12 of its extension 7 register with ports 14 in the wall of the cylinder within the gas delivery chamber 4. If the crank casing 2 is not provided with the partition 5 and the gaseous fuel is delivered into the crank casing these ports 14 will communicate therewith. Packing rings 16 are provided on each side of the ports 11 and on each side of the ports 12.

With this construction, the exhaust ports 11 and 13 being arranged in relation to the admission ports 12 and 14 so that the exhaust ports commence to open before the admission ports, and the admission ports before the piston attains the lower limit of its stroke, the pressure of the exhaust is released from the cylinder before the gas admission ports are opened, and the inflow of gas commences before the upward stroke of the piston begins, as shown in Fig. 1. This inflow of gas is thus enabled to fully expel the residue of the inert products of combustion from the cylinder, so that when the upward movement of the piston has closed both exhaust and admission ports, a cylinder full of an explosive mixture of gas and air is compressed between the cylinder head and piston head ready for ignition.

In Fig. 1 of the drawing the piston is shown as approaching the lower limit of its

movement on the power stroke with the exhaust port well opened and the admission port just commencing to open.

It will be noted that the outflow of the exhaust from the ports 11, 13 and the inflow of gas through the admission ports 12, 14 is in the same direction, so that the inductive action of the earlier outflow from the exhaust will aid the inflow of a fresh supply of a gaseous mixture.

That this inductive effect may not draw in a greater charge of gas than is desirable when the engine is idling a ring control valve 17 is mounted on the end of the cylinder over the ports 14. This ring is provided with ports 18 corresponding with those 14 of the cylinder and is circumferentially movable, so that under partial rotation the passage opening through the ports 14 may be regulated to control the admission of gas to the requirements of the engine.

The ring valve 17 may rest on a turned face around the passage of the cylinder end through the partition 5 and will thus preserve this joint gas-tight. The ring valves of the several cylinders are partially rotated by link rods 20 pin-connected at 19 to them, which rods are provided with a turn buckle 21 between each cylinder by which the ring valves 17 may be adjusted through hand holes 22 provided in the wall of the casing 2. The end rod passes gland-packed through the end of the casing 2 and may be operated by hand to regulate the position of the ports, or may be automatically adjusted in any approved manner.

Gaseous fuel may be delivered to the gas chamber 4, or to the crank case of the engine if such chamber is not separated therefrom, from a carbureter or other source of gaseous supply.

Although the exhaust from the cylinder is relied on to produce the required inflow of gas from the carbureter, it may be found advantageous to supplement this inflow pressure by providing a fan F operable as at F′ from the engine crank shaft, which fan will draw its supply from the carbureter and deliver to the gas chamber 4. Such fan will not only serve to increase the gas inflow, but will atomize and mix the gas as furnished for combustion, as the use of gauze or the like means to insure fine separation and mixing would add a resistance to the gas inflow which it is undesirable should exist.

Although the engine has been described as drawing its supply of gas by means of the inductive action of the engine exhaust, it must be distinctly understood that the arrangement of cylinder and piston ports as set forth (with or without the use of the port control valve 17) may be used with a supply of gaseous fuel delivered under pressure to the gas chamber 4 or crank case.

The engine, as drawn, is shown as water-jacketed but the same may be air-cooled if found desirable without departing from the spirit of the invention.

Having now particularly described my invention, I hereby declare that what I claim as new and desire to be protected in by Letters Patent, is:

1. In an internal combustion engine, a crank case having a gas delivery compartment in its upper part divided from the lower part by a partition, a cylinder seated on the upper side of the crank case and projected through the gas delivery compartment into the partition which divides it from the crank case, said cylinder having circumferentially disposed admission and exhaust ports at approximately the stroke of the engine apart and staggered in relation to one another, and a piston having a hollow cylindrical extension beyond its head, said piston extension having admission and exhaust ports registering with those of the cylinder when the piston is at the lower limit of its movement toward the crank case.

2. In an internal combustion engine, a crank case, a cylinder supported on said crank case, said cylinder having inlet and exhaust ports, a piston operating in said cylinder and adapted to control said ports, a crank and a connecting rod between said crank and said piston, a gas delivery compartment around said cylinder and with which said inlet ports communicate, a ported ring in said chamber for controlling the passage of gas into the cylinder independently of the piston, and a fan atomizer for drawing the gas from the carbureter and delivering it to the intake ports, and means by which said ring valve may be operated.

In testimony whereof I affix my signature.

LEONARD B. STEDMAN.