No. 825,867. PATENTED JULY 10, 1906.

A. G. RONAN.

COMBINED INTAKE AND EXHAUST VALVE FOR GAS ENGINES.

APPLICATION FILED AUG. 18, 1904.

3 SHEETS—SHEET 1.

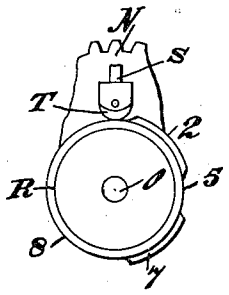

Fig. 4.

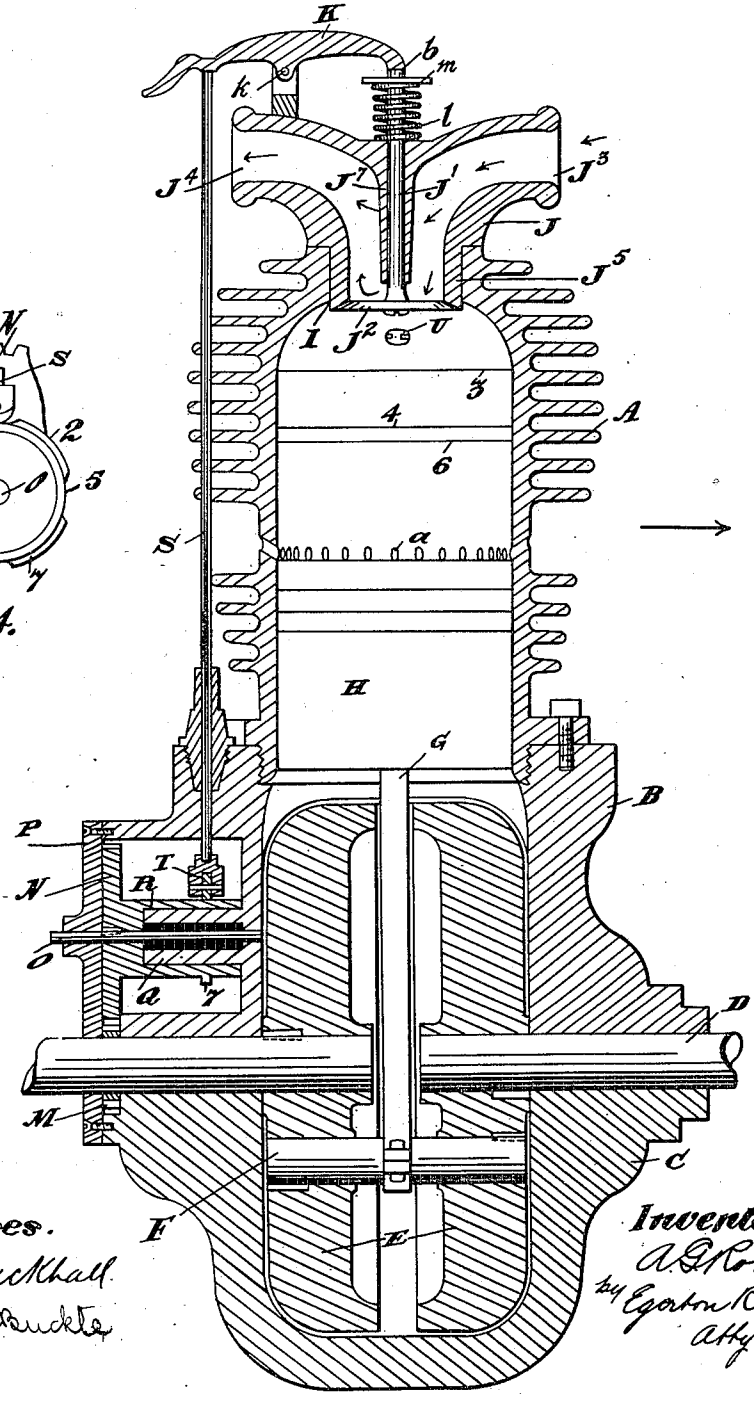

Fig. 1.

Witnesses.
W. R. Blackhall.
Irene B. Buckle

Inventor:
A. G. Ronan
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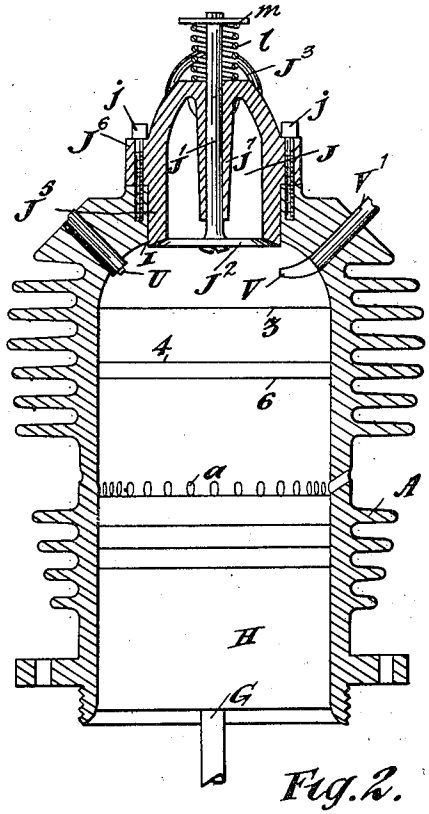

Fig. 2.

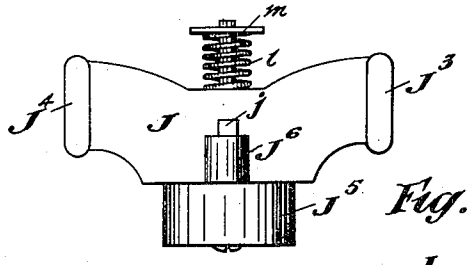

Fig. 3.

Witnesses.
M. B. Blackhall.
Irene B. Buckle

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3 SHEETS—SHEET 3.

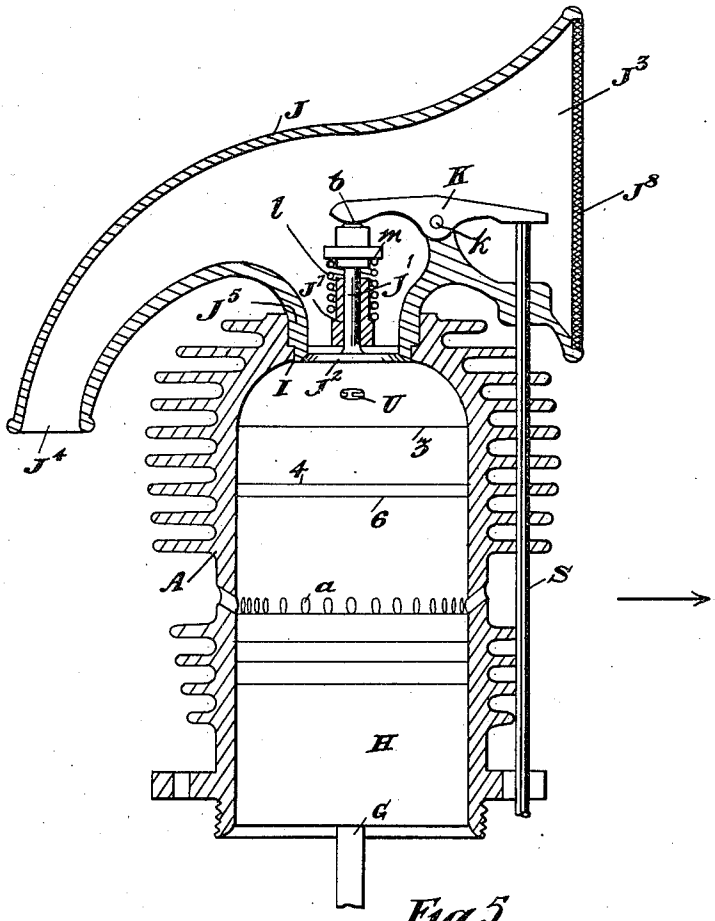

Fig. 5.

Witnesses.

M. B. Blackhall

Irene B. Ruckle

Inventor:

A. G. Ronan

by Egerton R. Case

Atty.

UNITED STATES PATENT OFFICE.

ANSON GROVES RONAN, OF TORONTO, CANADA.

COMBINED INTAKE AND EXHAUST VALVE FOR GAS-ENGINES.

No. 825,867. Specification of Letters Patent. Patented July 10, 1906.

Application filed August 18, 1904. Serial No. 221,168.

To all whom it may concern:

Be it known that I, ANSON GROVES RONAN, machinist, a subject of the King of Great Britain, residing in the city of Toronto, county of York, and Province of Ontario, Canada, have invented certain new and useful Improvements in a Combined Intake and Exhaust Valve for Gas-Engines, of which the following is a specification.

My invention relates to improvements in combined intake and exhaust valves for gas-engines; and the objects of my invention are, first, to provide an explosion-chamber with only one valve of peculiar construction which performs one function of permitting the escape of the waste products of combustion therefrom and a further function of admitting pure air thereinto; secondly, in the preferred form of my invention to place the valve-spring out of the path of movement of the waste products of combustion, so as to prevent its destruction, and, thirdly, to force a continuous draft of cold air down upon the valve, so as to keep same as cool as possible; and it consists, essentially, of a valve-casing provided with two branches which connect together and terminate in a common opening, which is controlled by the valve-head, as hereinafter more particularly described.

Figure 1 is a vertical central section through the preferred form of explosion-chamber, showing same attached to a suitable engine-casing provided with suitable power-transmitting parts and also showing my preferred form of combined intake and exhaust valve attached thereto. Fig. 2 is a vertical central section through my preferred form of combined intake and exhaust valve and cylinder for same, taken at right angles to the section shown in Fig. 1. Fig. 3 is a side elevation of my preferred form of combined intake and exhaust valve. Fig. 4 is an enlarged detailed view of the mechanism for operating my valve. Fig. 5 is a vertical central section through the preferred form of explosion-chamber, showing an alternative form of my combined intake and exhaust valve attached thereto.

In the drawings like characters of reference indicate corresponding parts in each figure.

Of course my valve may be used in connection with any make of cylinder or combustion-chamber; but I prefer to describe same in connection with the cylinder described and claimed in my application, Serial No. 214,039, filed June 24, 1904.

A is the explosion-chamber, and B the upper portion of the engine-casing, to which said explosion-chamber is suitably secured, and C lower portion of same.

D is the engine-shaft, the inner ends of which are keyed to the fly-wheels E, which by means of the wrist-pin F are secured to the piston-rod G, provided with the usual piston-head H. In the head of the explosion-chamber I construct an opening I, in which is secured my valve-casing J, hereinafter more particularly described. Keyed to the shaft D is the spur-gear M, which meshes with the spur-wheel N, journaled on the shaft O, which has bearing in the plate P, secured to one side of the engine-casing, and the boss Q, which forms part of said engine-casing. The said spur-wheel is preferably provided with a sleeve R, which incloses the boss Q and has bearing thereon.

S is a rod held in any suitable bearing, against the upper end of which rests the lever K. In the lower end of the rod S is suitably pivoted a roller T, which operates upon the sleeve R and its cams, as hereinafter described.

U is an igniter, preferably an electric one, and V the delivery end of the conduit V′ of the fuel-measuring device which enters said explosion-chamber. The fuel-measuring device I use in connection with my engine is fully shown in my Patent No. 752,181, dated February 16, 1904. This said fuel-measurer is also described and the particular cycle of the gas-engine in which I use my valve in Patent No. 753,003, dated February 23, 1904, so I do not consider it necessary to again describe said fuel-measurer.

The shaft D and its connected parts are of course operated by hand in starting up the engine. I will suppose that an explosion has already taken place and forced the piston-head H down into the position shown in Fig. 1. As the piston-head opens the exhaust-ports *a*, waste products of combustion exhaust therethrough, and by the time the piston-head moves upward and closes said exhaust-ports the major portion of the waste products of combustion have escaped from the explosion-chamber. Simultaneously the piston H closes the exhaust-ports *a* the valve-stem J′ is depressed, thus opening the

valve-head J^2 by reason of the cam 2, secured to or forming part of the sleeve R, abutting the roller T, thus moving the rod S upward and depressing the end *b* of the lever K, which is pivoted at *k* on the valve-casing J.

The valve-head J^2 is kept open while the piston H moves to the limit 3 of its inward stroke, thus discharging a second volume of the waste products of combustion through the valve-casing. The said valve-head still remains open during the movement of the piston-head H from line 3 to approximately line 4, thus permitting a charge of pure air to rush into the explosion-chamber on top of the residue of the waste products of combustion therein, thus keeping same next the piston-head. Immediately the cam 2 escapes the roller T the said roller drops onto the uniform periphery of the sleeve R and rests in contact with same for the space 5, (shown between cam 2 and the other cam,) thus permitting the valve-head J^2 to be closed by its spring 1. The length of the space 5 is approximately indicated by the distance between the lines 4 and 6. During the length of this space the required charge of raw liquid fuel is discharged through the delivery end V of the conduit of the fuel-measuring device into the explosion-chamber into the body of pure air above the residue of the waste products of combustion. Immediately the cam 7, secured to or forming part of the sleeve R, abuts the roller T the rod S is moved upward, depressing the lever K, so that the valve-head J^2 is opened, and as the piston-head continues in its outward movement a volume of fresh air simultaneously rushes into the explosion-chamber. From the time the piston-head again opens the exhaust-ports *a* and until it closes same on its return movement the residue of the waste products of combustion are removed from the explosion-chamber. Simultaneously the piston-head H closes the exhaust-ports *a* the roller T escapes the cam 7 and rests again upon the periphery of the sleeve R for the space 8 between the cams 2 and 7, thus permitting the closing of the valve-head J^2. During the continued movement of the piston-head the explosive mixture is compressed, ignited, and exploded and the piston-head H forced down into the position shown in Fig. 1, when the above-described cycle again takes place. My engine is particularly designed for use in the front of the vehicle.

I will now describe the particular construction of the valve-casing J. Supposing the engine is traveling in the direction indicated by arrow, it will be understood that a current of fresh air will always be passing into the valve-casing by the branch J^3 of same and out therefrom through the branch J^4. Part of this fresh air will be forced over the valve-head J^2 and will considerably lower the temperature of same. When the valve-head J^2 is first opened, the inward movement of the piston-head drives waste products of combustion into the valve-casing J, and same are immediately carried out of said valve-casing through the branch J^4 by the current of fresh air rushing through said valve-casing. The fresh current of air passing through said valve-casing positively removes all traces of waste products of combustion therefrom. When the valve-head J^2, as before described, is kept open and during part of the inward movement of the piston-head, a supply of fresh air will rush into the explosion-chamber through the branch J^3. The lower part J^5 of the valve-casing J rests in the opening I, and against the lower part of same the valve-head J^2 operates, as will be understood. By means of lugs J^6, secured to or forming part of said valve-casing, and screws *j*, passing therethrough, the said valve-casing is secured in position. The valve-stem J′ has considerable bearing, as shown at J^7, and extends upward through said valve-casing and is provided near its upper end with a disk *m*, between which and the top of the valve-casing is the said spring 1.

From the cycle just described it will be understood that the valve J^2 is an auxiliary exhaust-valve and that the major portion of the waste products of combustion escape through the exhaust-ports *a*. By reason of the exhausting of the major portion of the waste products of combustion in the first instance through the exhaust-ports *a* it will be understood that the second volume of the waste products of combustion exhausted through the auxiliary exhaust-valve J^2 will not possess the force possessed by the first body of exhausted waste products of combustion, and consequently the current of fresh air passing through the valve-casing J will be certain to carry the waste products of combustion therewithin thereout of through the branch J^4.

As is well known, the temperature of the waste products of combustion is very high. Now as the spring 1 is entirely removed from the path of said waste products of combustion it will be understood that its temperature will not be raised sufficiently in order to destroy its power to close the valve-head J^2.

In Fig. 5 I show an alternative form of my valve-casing. Over the front of the branch J^3 of same I secure any suitable netting J^8, so as to screen as much foreign matter as possible from the incoming current of pure air. In this form of valve-casing the lever K is pivoted within same, and the spring 1 is also contained within said valve. In this form of valve-casing it will be understood that the spring 1 is directly in the path of movement of the waste products of combustion, and I much prefer the form shown in Figs. 1, 2, and 3. A current of fresh air continually passing

through said valve-casing and out of the branch J^4 of same will have a tendency to lower the temperature of the spring 1 and other parts associated therewith.

As will be understood, the relative size of the gearing M and N is such that the rod O will be operated at one-half the speed of the engine-shaft.

From this specification it will be understood that my particular construction of valve-casing enables me to positively concentrate to great advantage a current of cold air upon the valve-head, so as to prevent same from getting too hot. Also by reason of the discharge branch J^4 of said valve-casing I am enabled to positively control the direction of exhaust of the waste products of combustion from the valve-casing. Furthermore, as a certain quantity of flame shoots by the valve-head J^2 when same is open my construction of valve-casing J prevents said flame from being seen and becoming a possible source of danger.

I do not confine myself to the means shown and described for operating the valve J^2.

I do not confine myself to the construction herein shown and described, as same can be altered in many ways without departing from the spirit of my invention.

What I claim as my invention is—

1. A combined intake and exhaust valve comprising a casing provided with freely open branch passages which connect together and terminate in a common opening at the valve-seat, the valve, and a spring keeping said valve closed.

2. A combined intake and exhaust valve comprising a casing provided with freely open branch passages which connect together and terminate in a common opening at the valve-seat; the valve; the valve-stem extending through said casing, and a spring on said valve-stem and on the outside of said casing.

3. A combined intake and exhaust valve comprising a casing provided with freely open branch passages which connect together and terminate in a common opening at the valve-seat; the valve; a downwardly-extending bearing for the valve-stem, the valve-stem held therein, and a spring on said valve-stem and on the outside of said casing.

4. A combined intake and exhaust valve comprising a casing provided with freely open branch passages which connect together and terminate in a common opening the lower edge of which is provided with a valve-seat; the valve; a downwardly-extending bearing for the valve-stem, the valve-stem held therein, and a spring on said valve-stem and on the outside of said casing.

5. A combined intake and exhaust valve comprising a casing provided with freely open branch passages which connect together and terminate in a common opening the lower edge of which is provided with a valve-seat; the valve; a downwardly-extending bearing for the valve-stem, the valve-stem held therein; a spring on said valve-stem and on the outside of said casing, and two lugs forming part of said casing whereby same is secured in place.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

ANSON GROVES RONAN.

Witnesses:
EGERTON R. CASE,
L. G. SHARPE