W. I. TWOMBLY.

GAS ENGINE.

APPLICATION FILED JULY 2, 1912.

1,102,457. Patented July 7, 1914.

Fig. 1.

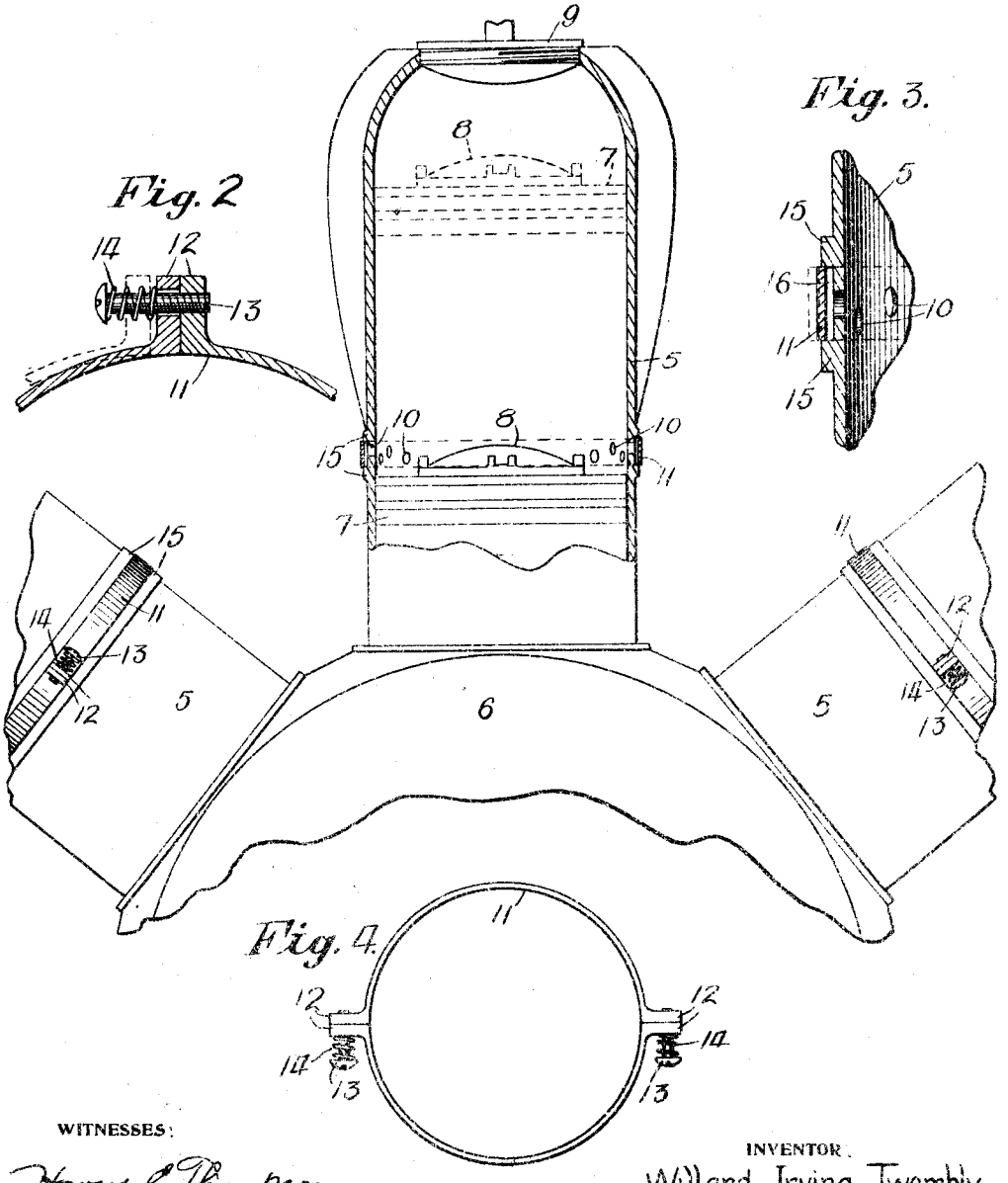


Fig. 2.

Fig. 3.

Fig. 4.

WITNESSES:

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GAS-ENGINE.

1,102,457. Specification of Letters Patent. Patented July 7, 1914.

Application filed July 2, 1912. Serial No. 707,152.

To all whom it may concern:

Be it known that I, WILLARD IRVING TWOMBLY, a citizen of the United States, residing in the borough of Manhattan, in the city, county, and State of New York, have invented new and useful Improvements in Gas-Engines, of which the following is a specification.

This invention relates to internal combustion engines, and particularly to means to relieve the cylinder of the high pressures of combustion previous to the exhausting of the burnt gases therefrom.

To relieve the cylinder of the high pressures of combustion previous to the exhausting of the burnt gases, particularly in engines of the four cycle type, it has been customary to provide the cylinder with a plurality of circumferentially disposed ports or openings adjacent to the base of the cylinder, which ports are normally closed by the piston, but are uncovered by the piston as it reaches the end of its power or outward stroke. This arrangement works satisfactorily after a power stroke has been imparted to the piston and the cylinder relieved of a portion of the burnt gases. However, these ports are also uncovered at the end of the suction stroke of the piston. Should a full charge of fuel not enter the cylinder air would rush into the cylinder through said ports at atmospheric pressure, and should the charge be weak it would still further weaken the charge with the liability that it would not be ignited. Should a compressed charge of fuel enter the cylinder during the suction stroke of the piston, a portion of the charge would pass out through the ports and be wasted. Furthermore, the noise of the exhaust from said ports is very objectionable.

It is the object of the present invention to overcome the above disadvantages; that is, the preventing of any loss of the charge of fuel to the cylinder during the suction stroke and the muffling of the exhaust from said ports, and for this purpose I provide an expansible member, in the form of a sectional ring, to extend around and lie contiguous to the cylinder to normally close the ports, means being provided to permit of the radial expansion and contraction of said member, and to prevent movement thereof longitudinal of the cylinder.

In the drawing accompanying and forming a part of this specification, Figure 1 is a sectional front elevation of a portion of a rotary multiple cylinder engine illustrating an embodiment of my invention. Fig. 2 is a sectional detail view of the expansible member or ring to illustrate the manner of expansibly connecting the ring sections. Fig. 3 is a sectional view of a portion of a cylinder showing the connection of the expansible member thereto; and Fig. 4 is a plan view of the expansible member or ring.

Similar characters of reference designate like parts throughout the different views of the drawings.

In the embodiment of my invention illustrated in the drawing I have shown it in connection with a rotary multiple cylinder engine, and have shown only so much of the engine as is essential to an understanding of the invention.

Cylinders 5 are fixed to and project radially from a casing 6 rotatably mounted on a hollow crank shaft (not shown), pistons 7 having the usual piston rings and oil grooves working in said cylinders and connected to the crank shaft. The charge of fuel to the cylinders is controlled by valves 8 in the pistons and the exhaust is controlled by valves 9 in ports in the heads of the cylinders, all of which is substantially as shown and described in my co-pending application filed Sept. 19, 1911, Serial No. 650,194, and to which reference may be had, although it will be obvious that my improvements may be applied to and work efficiently in connection with other types of engines.

The cylinder is provided with a plurality of circumferentially disposed auxiliary exhaust ports or openings 10 adjacent to the base of the cylinder, which ports are normally covered by the piston during the inward or fuel compression and exhaust strokes of the piston, as shown in dotted lines in Fig. 1, and are uncovered by the piston at the end of its outward or power and suction strokes, as shown in full lines in Fig. 1.

At the end of the power stroke of the piston as the ports 10 are uncovered, the high pressures of combustion are exhausted through said ports, such exhaust making an objectionable noise, and should complete combustion not have taken place in the cylinder a flame will shoot from said ports. The ports are also uncovered by the piston

at the end of the suction strokes and should a full charge not enter the cylinder and this charge be weak, air at atmospheric pressure will enter through the ports 10 further weakening the charge with the liability that it will not be ignited. Furthermore, should a charge of fuel under compression enter the cylinder as the ports are uncovered a portion of the fuel would pass out from the cylinder through said ports and be wasted.

To overcome the above objections I provide an annular and radially expansible member 11 to extend around and lie contiguous to the cylinder to normally cover the ports. This member is in the form of a band comprising a pair of semi-circular sections, each section having a laterally projecting ear or lug 12 at each end, and connected by guide screws 13 each passing through an opening in a lug 12 of one band section and screw threaded into the lug 12 of the other band section. Said band sections are normally maintained in contracted position by coil springs 14 confined between the heads of the screws and the lugs 12 of one of the band sections, as clearly shown in Fig. 2. The expansible member 11 is guided and supported in an annular seat formed in the walls of the cylinder by annular projecting ribs 15, 15. By this construction it will be noted that the band sections can expand and contract only in one direction radially opposite to each other, and owing to the connection of the band sections they will always be maintained in their seat and prevented from having movement along the cylinder.

The operation of my improved device is substantially as follows: Assuming the piston to be in the position shown in dotted lines in Fig. 1 and a charge of fuel compressed in the cylinder about to be ignited. In this position the expansible member 11 will be in its normal contracted position, the said member being so constructed as to leave a slight space between the cylinder walls and such member as clearly shown at 16 Figs. 1 and 3 that is, the curvature of the band sections with relation to the cylinder is such that they will contact with the cylinder adjacent the ends only so that there is a space between the cylinder and said band at diametrically opposite portions of the cylinder, the ports 10 communicating with said space and preferably extending only around a portion of the cylinder and located at diametrically opposite sections of the cylinder. As the charge is ignited and a power stroke imparted to the piston the piston will uncover the ports at the end of said stroke, as shown in full lines in Fig. 1, a portion of the burnt gases in a compressed state passing through the ports into the space 16 in which they further expand, such expansion of the gases forcing the band sections apart until they assume the positions shown in dotted lines in Fig. 3, that is, stand away from the cylinder, with an outlet from the space 16 between the annular ribs 15 and band 11 permitting the exhaust of such gases gradually to the atmosphere substantially at atmospheric pressure. It will be noted that as the band sections expand, such sections adjacent their ends will at all times engage in the seats between the flanges 15, thus preventing the band from moving longitudinally of the cylinder. When the ports 10 are uncovered by the piston at the end of the suction stroke, the vacuum created in the cylinder will tend to draw in and maintain the member 11 in its seat, thus preventing any of the charge from passing out from said ports and the taking in of any air at atmospheric pressure.

Variations may be resorted to within the scope of my invention.

Having thus described my invention, I claim:—

1. In an internal combustion engine, the combination with a cylinder, a piston to work in said cylinder and means to control the charge of fuel to and the exhaust from the cylinder, of an auxiliary exhaust to relieve the cylinder of the high pressures of combustion previous to the exhaust of the gases therefrom, comprising a plurality of ports in the cylinder normally covered by the piston and adapted to be uncovered at the end of the outward strokes of the piston; and an expansible member to normally close said ports.

2. In an internal combustion engine, the combination with a cylinder, a piston to work in said cylinder and means to control the charge of fuel to and the exhaust from the cylinder, of an auxiliary exhaust to relieve the cylinder of the high pressures of combustion previous to the exhaust of the gases therefrom, comprising a plurality of ports in the cylinder normally covered by the piston and adapted to be uncovered at the end of the outward strokes of the piston; and an expansible band extending around the cylinder and normally closing said ports.

3. In an internal combustion engine, the combination with a cylinder, a piston to work in said cylinder and valves to control the charge of fuel to and the exhaust from the cylinder, of a plurality of auxiliary exhaust ports in the cylinder to relieve the cylinder of the high pressures of combustion previous to the exhaust of the gases therefrom, said ports normally covered by the piston but uncovered by the piston at the end of the outward strokes; an expansible member to normally close said ports, comprising a sectional band to extend around the cylinder adjacent to the ports; and springs to normally maintain the sections of

the band in position to lie contiguous to the cylinder.

4. In an internal combustion engine, the combination with a cylinder, a piston to work in said cylinder and valves to control the charge of fuel to and the exhaust from the cylinder, of a plurality of auxiliary exhaust ports in the cylinder normally covered by the piston, but uncovered by the piston at the end of the outward strokes; an annular seat extending around the cylinder adjacent the ports; and an annular expansible band to engage in said seat so that there is a space between the wall of the cylinder and said band at diametrically opposite portions of the cylinder with which the ports communicate, whereby as the piston uncovers the ports at the end of the outward stroke the gases will pass through the ports expanding the band and permitting the escape thereof to the atmosphere.

5. In an internal combustion engine, the combination with a cylinder, a piston to work in said cylinder and valves to control the charge of fuel to and exhaust from the cylinder, of a plurality of auxiliary exhaust ports in the cylinder normally covered by the piston but uncovered by the piston at the end of the outward strokes; a pair of annular ribs extending around the cylinder to form an annular seat therebetween adjacent to the ports; an expansible band engaging in said seat, comprising a pair of semi-circular sections having laterally projecting ears at the ends; screws passing through openings in the ears of one of the band sections and screw threaded into the ears of the other band section; and springs confined between the heads of said screws and the ears of a band section to normally maintain the band in position to lie contiguous to the cylinder and close the ports.

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Witnesses:

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