C. T. WADE.

GAS ENGINE.

APPLICATION FILED MAY 4, 1906.

1,006,989. Patented Oct. 24, 1911.

Fig. 1.

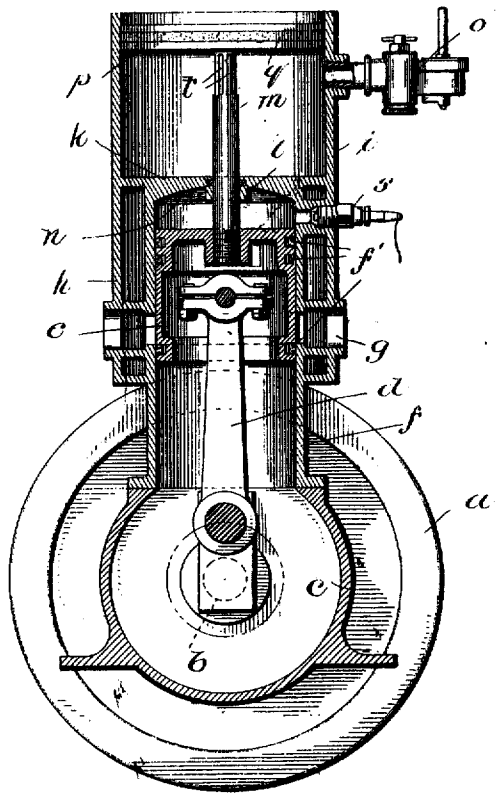


Fig. 2.

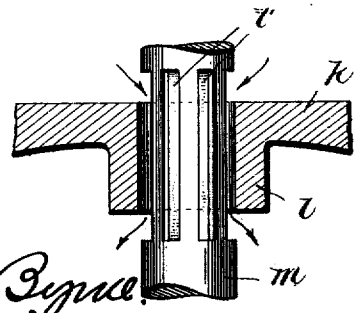
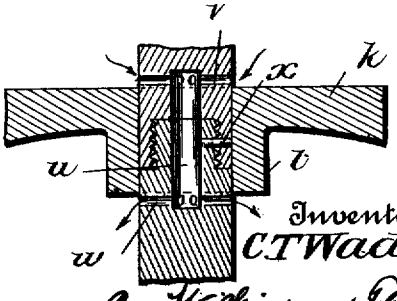


Fig. 3.



Witnesses
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CHARLES T. WADE, OF THE UNITED STATES NAVY.

GAS-ENGINE.

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Application filed May 4, 1906. Serial No. 315,198.

To all whom it may concern:

Be it known that I, CHARLES T. WADE, a citizen of the United States and ensign in the United States Navy, serving on board the U. S. R. S. *Huncock*, have invented certain new and useful Improvements in Gas-Engines; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to improvements in gas engines and the object of my invention is to provide a simple device of this type in which the compression piston and the piston in the explosion chamber are carried on a single rod and the use of valves between the compression cylinder and the explosion cylinder is dispensed with, and in which all the burned gases in the explosion chamber are driven out, and replaced with fresh carbureted air at the end of the stroke.

With this object in view, my invention consists in the construction and combinations of parts as hereinafter described and claimed.

In the accompanying drawings, Figure 1 is a vertical section of my improved gas engine. Fig. 2 is a cross section on an enlarged scale, showing the means for delivering the compressed carbureted air from the compression cylinder into the explosion cylinder, and Fig. 3 is a modified form of the same.

My invention is a two-cycle engine and is shown at Fig. 1 as a vertical engine, but obviously it could be arranged horizontally or inclined, as desired.

a represents the fly wheel mounted on the shaft *b* located in the crank chamber *c*. The shaft *b* is connected by means of the usual crank connections *d* with the piston *e* in the explosion cylinder, said piston being provided with packing rings *f'* of any suitable material.

The explosion cylinder *f* is provided with a series of ports *g* extending at intervals completely around the circumference of the cylinder, and a water jacket *h* is provided, mounted on the upper part of the cylinder *f*, although this entire cylinder may be air cooled if desired.

Located above the cylinder *f* is the compression cylinder *i* which is of slightly greater diameter than the explosion cylinder *f* in order to easily obtain a sufficient quantity of carbureted air under compression.

k represents a partition separating the two cylinders which is provided with a bearing *l* and packing ring for the piston rod *m*. The lower part of this partition *k* is curved, as shown at *n* for a purpose hereinafter described.

Connected with the cylinder *i* is a carbureter *o* of any approved construction, and within the cylinder *i* is located a compression piston *p* which is attached to the piston rod *m* and is provided with a packing ring *q* of any desired material, the compression cylinder being closed at the top by means of an ordinary head *r*, or, not being closed at the top.

s represents a sparking plug for the explosion cylinder shown in the drawings as an electric plug, but obviously any means of ignition could be used, such as flame, hot tube, or electrical plugs. The compression piston *r* and the explosion piston *e* are mounted on opposite ends of the piston rod *m*, a single rod serving for both pistons. The cylinders may be of any desired size or shape and any desired means of lubricating them may be used.

In Fig. 2 is shown on an enlarged scale the means for delivering the compressed charge from the compression chamber into the explosion chamber. This consists of a number of slots *t*, cut in the circumference of the piston rod *m* near the point where it is joined to the piston *p*. When the piston rod is in the position shown in Fig. 2, which occurs just after the piston *e* has descended below the exhaust ports *g*, the compressed charge will flow from the compression cylinder into the explosion cylinder. By the arrangement shown, the use of valves is entirely obviated.

In Fig. 3 is shown a modified form in which the compressed charge is delivered from the compression chamber to the explosion chamber by means of a passage *u* located centrally in the piston rod. A series of holes *v* pass through the piston rod to the upper part of the passage *u* and a similar series *w* pass through the piston rod and connect with the lower part of said passage. The piston rod in this instance is preferably made of two parts screwed together and a pin *x* is used to fasten them together, or

made entirely hollow, closed at each end, and with holes from outside in positions shown in the drawing.

The advantages of my invention over the present type of gas engine are that a full new charge of carbureted air is delivered into the explosion cylinder before the compression commences, thus thoroughly scavenging said explosion cylinder and entirely filling it with fresh carbureted air; an increased travel may be given to the engine piston while the gas is doing work because the exhaust openings are located entirely around the explosion cylinder and can therefore be made narrow; the opening from the compression cylinder to the explosion cylinder is automatically governed by the motion of the piston rod without the use of valves; the temperature is kept even around the whole cylinder and the compressed gases being blown into the top of the explosion cylinder at the point where it would naturally be hottest, over-heating and unequal heating are lessened.

The operation is as follows:—Supposing that the parts are in the position shown in Fig. 1 with a compressed charge in the cylinder *f*. This charge being ignited forces the piston *e* down, and by means of the piston rod *m* the piston *p* is drawn down at the same time compressing a charge of carbureted air in the cylinder *i*. This compression continues until the upper end of the cylinder *e* has passed below the upper edge of the exhaust ports *g*. The piston rod *m* has then reached the position shown in Fig. 2 and a full charge of carbureted air is admitted into the top of the cylinder *f*. This completely blows out the burned charge, the shape of the lower side of the partition *k* contributing to this effect. The upward movement of the piston *e* then compresses the charge of the carbureted air in the upper part of the cylinder *f*, and while this compression is going on, the piston *p* is lifted, causing a partial vacuum in the cylinder *i*, whereupon a new supply of carbureted air rushes in below said piston *p*, the operation then being continued indefinitely.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent is:—

1. In a gas engine, the combination of an explosion cylinder and a compression cylinder arranged in the same straight line and separated by a partition, said compression cylinder having a fuel admission inlet adjacent the end remote from said partition and closed between said inlet and partition, a piston in each of said cylinders, a single piston rod connecting said pistons, said compression piston adapted to create a vacuum in the compression cylinder on the upward movement whereby to admit a complete fuel charge when said piston uncovers the fuel inlet; said compression piston compressing the admitted charge on the power stroke of the explosive cylinder piston, and a means associated with the piston rod for admitting the compressed charge into the explosive cylinder at substantially the end of said power stroke.

2. In a gas engine, the combination of a cylinder, a partition dividing said cylinder into an explosive and a compression chamber, said compression chamber being open at the top and having a fuel admission inlet adjacent the end remote from said partition, a piston in each of said chambers, a piston rod connecting said pistons, said explosive chamber piston operable to create a vacuum in the compression chamber between the fuel inlet and said partition to effect charging said chamber when the inlet is uncovered, said compression piston compressing said fuel charge on the power stroke of the explosive chamber piston, and means on said piston rod for admitting the compressed charge into the explosive chamber at substationally the end of said power stroke.

In testimony whereof, I affix my signature in presence of two witnesses.

CHARLES T. WADE.

Witnesses:
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