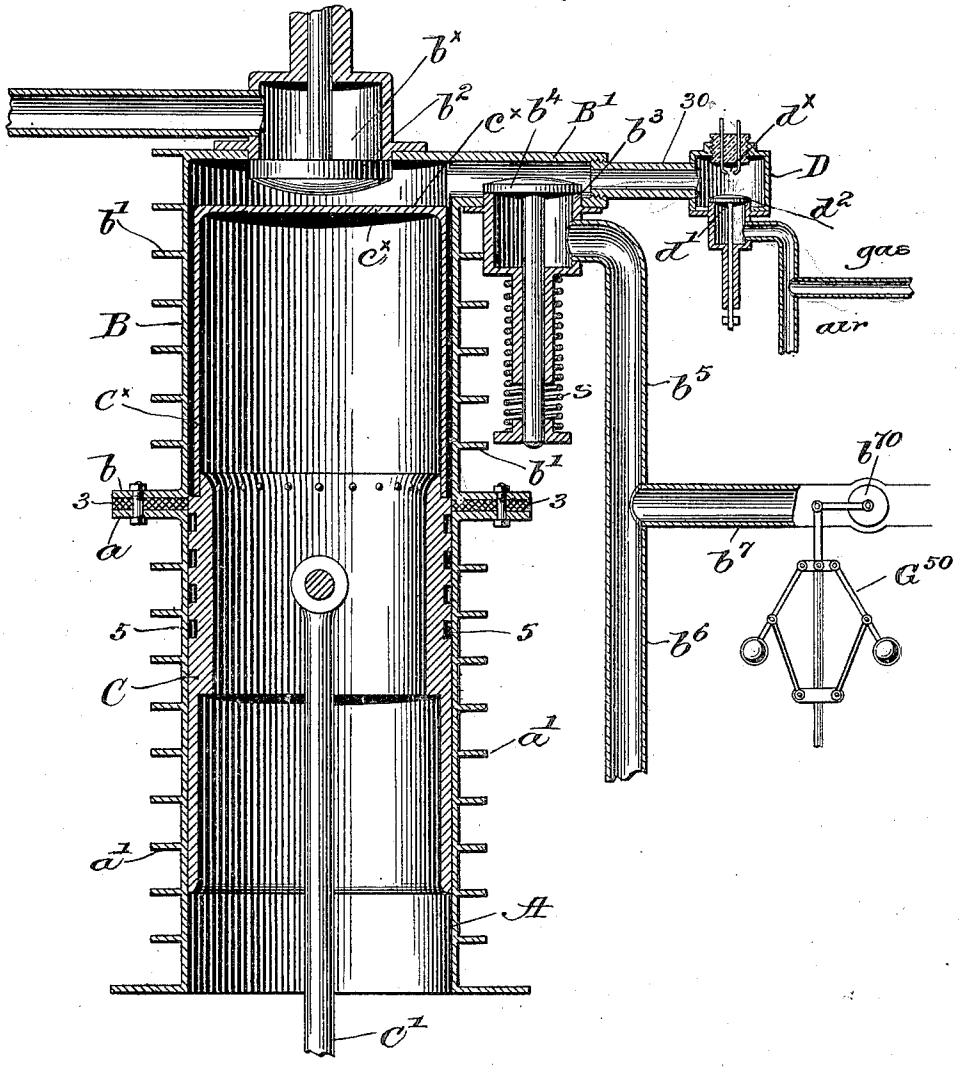
No. 678,823. Patented July 16, 1901.

C. C. BRAMWELL.

GAS ENGINE.

(Application filed Feb. 25, 1898.)

(No Model.)



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UNITED STATES PATENT OFFICE.

CLARENCE C. BRAMWELL, OF HYDE PARK, MASSACHUSETTS.

GAS-ENGINE.

SPECIFICATION forming part of Letters Patent No. 678,823, dated July 16, 1901.

Application filed February 25, 1898. Serial No. 671,556. (No model.)

To all whom it may concern:

Be it known that I, CLARENCE C. BRAMWELL, of Hyde Park, county of Norfolk, State of Massachusetts, have invented an Improvement in Gas-Engines, of which the following description, in connection with the accompanying drawing, is a specification, like characters on the drawing representing like parts.

This invention relates to that type of engine wherein the motive power is provided by the successive explosions in a suitable chamber or cylinder of an explosive mixture of air and gas acting to propel a piston and through intervening mechanism change reciprocating to rotary motion. Heretofore such engines have been ill adapted to operate with varying loads on account of the difficulty experienced in devising suitable governing means, and so far as I am aware such variation in power has been effected by varying the number of explosions. For instance, when the power unduly increases the explosive mixture is cut off and the engine runs by its own momentum until the power decreases sufficiently to effect the introduction into the cylinder and explosion of the mixture, resulting in jerking or pounding of the engine and sudden instead of gradual changes of power. Obviously this is objectionable, and in consequence the field of usefulness of explosive-engines has been a rather restricted one, confined to cases where steady running is not material or essential.

My present invention has for its object the production of a novel explosive-engine the power of which can be easily and gradually changed to conform to variations in the load without the objectionable features hereinbefore noted. I am thus enabled to use my engine under conditions where the ordinary gas-engine has proved to be wanting—such, for instance, as the motive power for horseless vehicles or for driving dynamos or other machinery requiring a steady-running engine which shall be as nearly free from vibration as possible.

The drawing in vertical section represents a sufficient portion of an explosive-engine embodying my invention to be understood.

Referring to the drawing, the cylinder A, of suitable length, has at its inner end an annular flange a, to which is bolted or otherwise secured a cylindrical extension B, also flanged at b, a packing-ring 3, of suitable non-heat-conducting material, being interposed between the flanges, it being noted that both ends of the cylinder are open.

The piston C, of a construction common in explosive-engines and having an attached piston-rod C′, is tightly fitted to reciprocate in the cylinder A and may have packing-rings 5 of any suitable construction. It will be noticed, however, that the inner end of the piston has attached to or forming a part of it a cylindrical extension $C^{\times}$, having a closed inner end $c^{\times}$, said extension substantially filling the cylinder extension B when the piston is at the inner end of its stroke. The piston extension $C^{\times}$ does not contact with the walls of the chamber B, however, a narrow annular clearance-space being left between them.

As the explosive mixture is ignited at the termination of the compression-stroke of the piston or when the parts are in the position shown in the drawing, the flame does not enter the cylinder C at all, and hence the latter is not heated thereby.

In order to prevent the conduction of heat to the cylinder from the chamber B, I have herein interposed the packing 3, of non-heat-conducting material, and the cylinder has formed upon its exterior a series of thin broad metallic flanges a', which serve to reduce the heat of the cylinder by radiation.

After several explosions dead gas will fill the annular clearance-space between the piston extension $C^{\times}$ and the wall of the explosion-chamber, and this dead gas will travel with the piston, acting to still further prevent the transfer of heat to the cylinder. An exhaust-port $b^{\times}$ for the chamber B is provided with a controlling-valve b^2, operated in any suitable manner, to permit the escape of the exploded gas at every other inward stroke of the piston. The chamber B is also shown as provided with thin external metal rings or flanges b' to act by radiation in reducing the temperature of the chamber. An inlet-passage B′ opens into the explosion-chamber at its closed end, said passage having an inlet-port b^3, controlled by a valve b^4, held seated, as herein shown, by a spring s, the inlet-port communicating

by a pipe b^5 with a suitable supply of air and gas adapted to be mixed in varying proportions. The passage B′ is directly connected with an igniting-chamber D, shown as provided with a sparking device $d^\times$ of any suitable or well-known character, said chamber having an inlet-port d' for a uniform and readily-explosive mixture of air and gas controlled by a valve d^2, operated by suitable means. (Not shown.)

By means of valves in the branches b^6 b^7 the proportions of air and gas admitted through the main port b^3 into the explosion or combustion chamber may be varied, such variable mixture forming the major portion of the explosive, and according to the more or less explosive character of the mixture the greater or less will be the force imparted to the piston. As is well known, the mixture may be so diluted by the large proportion of air to gas as to be exploded with difficulty or only by an extensive igniting-flame, and this is effected in my present invention by the ignition of the highly-explosive mixture in the ignition-chamber D. The uniform mixture admitted thereto by the auxiliary port d' is readily ignited by a small spark, and the comparatively large flame thus produced instantly traverses, as it were, the less explosive mixture in the explosion-chamber B and passage B′ and ignites it. It will now be evident that the variation in the power of the engine will be effected by varying the explosive character and force of the main body of mixed air and gas, so that the piston is actuated by an explosion at every alternate outward stroke, or, in other words, once for every complete cycle, and not, as has been the case heretofore, by completely cutting off the supply of the explosive mixture from the cylinder for a number of strokes until the speed decreases and then admitting the mixture again.

It will be noted that the neck 30, connecting the ignition-chamber D and passage B′, is contracted or reduced in diameter to prevent the rich and the variable mixtures of air and gas from intermingling to any great extent.

In the type of engine herein shown the explosive mixture is drawn into the combustion-chamber on the suction-stroke of the piston, and such mixture, with any inert gas remaining after the previous explosion, will be compressed on the compression-stroke, and the tendency will be to force some of this mixture into the ignition-chamber. This result, however, is prevented by the elongated neck or passage of small cross-sectional area between the ignition and combustion chambers, because the fluid contents of such passage acts as a movable plug to prevent the dilution of the contents of the ignition-chamber by the weaker mixture in the combustion-chamber, so that the ignition-chamber always has a rich and readily-ignitible mixture therein at the time of ignition whatever be the character of the mixture in the combustion-chamber and adjacent portion of the passage. It will be obvious that the fluid plug in the reduced passage would not indefinitely prevent such undesirable admixture, but the formation and dissipation of the plug only occurs when the engine is in operation, and the higher the speed of the engine the more nearly does the fluid contents of the passage resemble and operate as a plug. The capacity of the reduced passage between the ignition and combustion chambers is consequently and of necessity made greater than the capacity of the ignition-chamber.

The gas-inlet pipe b^7 has a valve b^{70} therein controlled by a suitable governor G^{50}, as shown, so that when the engine slows down the valve will be opened, and vice versa.

In a horseless carriage the controlling-valve would probably be operated by the operator.

My invention is not restricted to the precise construction and arrangement shown, as the same may be modified without departing from the spirit and scope of my invention.

While I have herein shown a peculiar form of cylinder and a prolongation of the same to form a combination-chamber and a piston extension to enter the chamber, such construction is not herein claimed, as it forms the subject-matter of another application, Serial No. 730,456, filed by me September 14, 1899, as a division of the present application.

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

1. In a gas-engine, a cylinder having a communicating combustion-chamber, independent inlets for the admission respectively of a uniform mixture, and a variable mixture, of air, and gas to said chamber, means to ignite the uniform mixture, and means to produce said mixtures.

2. In a gas-engine, a cylinder having a communicating combustion-chamber, an ignition-chamber, a passage continuously connecting said chambers, independent inlet-ports, to admit a uniform mixture of air and gas to the ignition-chamber, and a variable mixture to the explosion-chamber, respectively, means to ignite the gas in the ignition-chamber, and means to produce the uniform and variable mixtures.

3. A gas-engine, the cylinder provided with an exhaust-valve and an inlet-valve, an ignition-chamber in continuous communication with the cylinder by an elongated passage of small cross-section, an auxiliary inlet-valve for said chamber, and means to fire the gas in said ignition-chamber.

4. A gas-engine cylinder, an ignition-chamber continuously communicating therewith by means of an elongated passage of small cross-section, and an inlet-valve and an igniting device contained in the ignition-chamber, the capacity of said passage being greater than the capacity of the ignition-chamber to

prevent mixing of the contents of said chamber with the contents of the cylinder on the compression-stroke.

5. In a gas-engine, the cylinder, a combustion or explosion chamber communicating therewith, an ignition-chamber in continuous communication with the combustion-chamber, a main inlet-valve for the combustion-chamber, an auxiliary inlet-valve for the ignition-chamber, and gas-igniting means in said ignition-chamber.

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

CLARENCE C. BRAMWELL.

Witnesses:

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