No. 662,181. Patented Nov. 20, 1900.

G. J. ALTHAM & J. BEATTIE, JR.

GAS ENGINE.

(Application filed May 17, 1900.)

(No Model.)

FIG. 1.

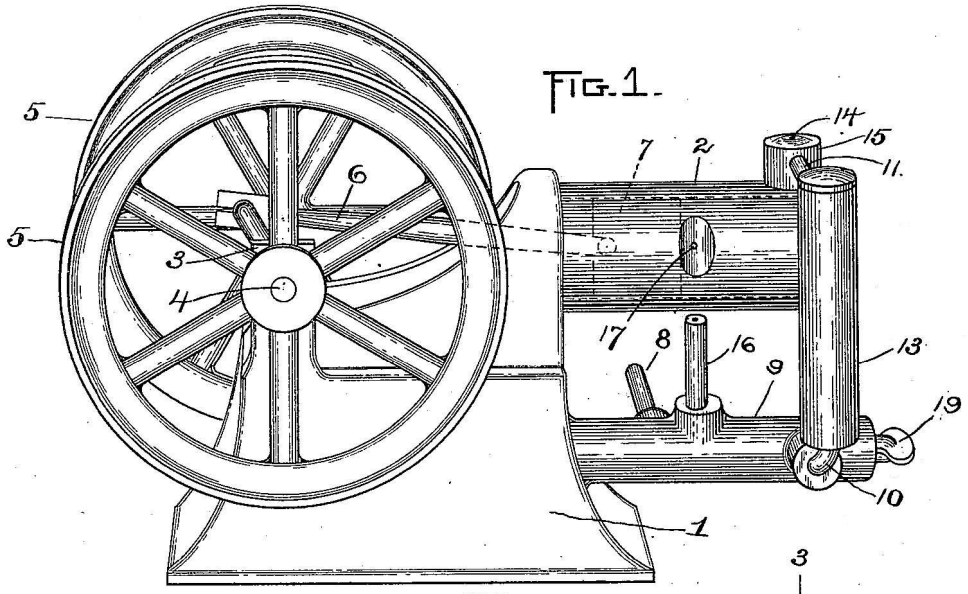


FIG. 2.

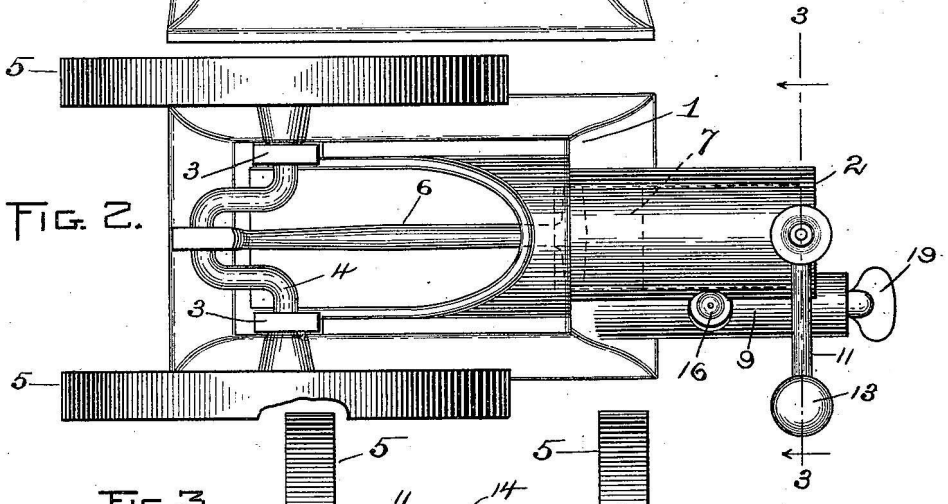


FIG. 3

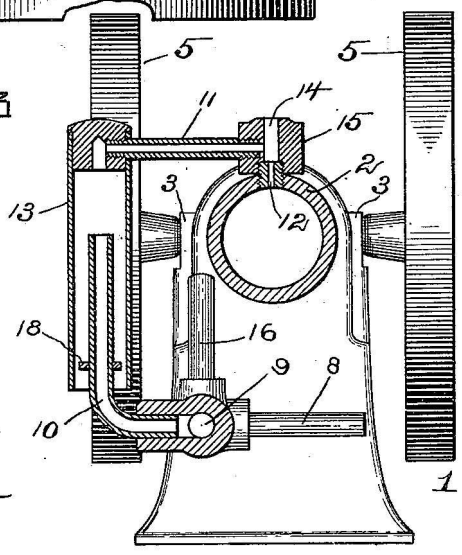


FIG. 4.

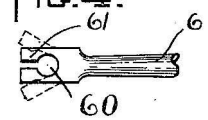
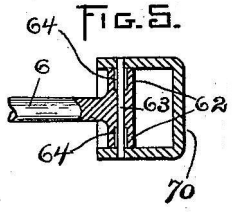


FIG. 5.



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UNITED STATES PATENT OFFICE.

GEORGE J. ALTHAM AND JOHN BEATTIE, JR., OF FALL RIVER, MASSACHUSETTS.

GAS-ENGINE.

SPECIFICATION forming part of Letters Patent No. 662,181, dated November 20, 1900.

Application filed May 17, 1900. Serial No. 16,998. (No model.)

To all whom it may concern:

Be it known that we, GEORGE J. ALTHAM and JOHN BEATTIE, Jr., of Fall River, in the county of Bristol and State of Massachusetts, have invented certain new and useful Improvements in Gas-Engines, of which the following is a specification.

This invention consists in certain improvements, hereinafter described, in gas-engines, whereby a simple and efficient valveless engine is produced adapted for use in small size as a toy.

In the drawings, Figure 1 represents a perspective view of the engine. Fig. 2 represents a plan. Fig. 3 represents a section on line 3 3 of Fig. 2 and partial rear elevation. Fig. 4 represents an elevation of a portion of the connecting-rod. Fig. 5 represents a section of the piston and a portion of the connecting-rod.

Referring to the drawings, 1 is the frame, supporting the cylinder 2 and the bearings 3 3 of the crank-shaft 4, the frame and cylinder being preferably cast in one pièce. The cylinder is closed at one end and open at the other. To the crank-shaft are secured the fly-wheels 5 5. A connecting-rod 6 communicates motion to the shaft from a piston 7 in the cylinder 2. Gas to drive the engine is taken from a supply-pipe by the tube 8, from which it passes through the tubes 9, 10, and 11 into the cylinder through an orifice 12 near the closed end of the cylinder. The tube 11 is connected with a vertical casing 13, open at the bottom, into which the tube 10 projects a considerable distance. Air is drawn in through the orifice 12, which is open to the air by means of a larger orifice 14 in the connection 15, the greater part of the air coming through the orifice 14, though some air is drawn in with the gas from the casing 13. Ignition is produced by a flame supplied by a jet of gas from a burner 16, which communicates with the supply-pipe 9 and is located near the middle of the cylinder 2. A pin-hole 17 in the cylinder-wall allows the flame to enter the cylinder from the jet and fire the mixture within the cylinder.

An explosion occurs once during every revolution, the cycle of the engine being as follows: At the beginning of the head-end stroke the displacement of the piston causes the gas and air to rush into the cylinder through the orifice 12. When the piston reaches approximately its mid-position, the pin-hole 17 is uncovered and an explosion takes place. The pressure produced by the combustion of the gas is rapidly diminished on account of the escape of the products of combustion through the open orifices, but the impulse due to the momentary pressure drives the engine. On the return stroke the products of combustion are forced out into the air through the orifice 14 and tube 11. There is no compression.

The connection between the tubes 10 and 11 is made discontinuous, in the manner shown in Fig. 3, to prevent the flame at the burner 16 being extinguished by the explosion. If the connection between the supply-pipe and the cylinder were continuous, the rush of products of combustion into the tube 11 would produce a back pressure, which would cause the flow of gas from the supply-pipe to cease for an instant, so that the supply of gas to the burner 16 would be momentarily stopped and the igniting-flame would cease. We have found that by connecting the tube 11 with the casing 13, which is open to the air, the waste gases pass out into the atmosphere without producing pressure enough in the supply-pipe to stop the flow to the burner 16. The lower portion of the casing 13 has a contracted throat formed by an obstruction, such as a flange 18, attached to the tube 10 and nearly filling the internal diameter of the casing, so that the casing constitutes a chamber having a contracted outlet communicating with the atmosphere. The tube 11, casing 13, and tube 10 constitute a gas-supply conduit, which is open to the atmosphere through said contracted throat. The object of said contracted throat is to enable the engine to be run at any speed desired. It has been found that without the contracted throat the engine would run at a high speed, but would not run slowly. We believe the reason of this result to be that the obstruction 18 impedes the escape of that part of the products of combustion which pass through the tube 11 and pro-

duces a pressure in the cylinder 13 slightly greater than the atmospheric, which pressure aids in forcing the gas into the engine-cylinder.

The opening 14 must be larger than the orifice 12 in order that the greater part of the waste gases shall pass through the orifice 14; otherwise too large a part of the exhaust would flow through the tube 11.

The speed of the engine is regulated by a screw-plug 19, which throttles the supply by varying the opening at the end of tube 10.

The connecting-rod 6 has an orifice 60 near one end and a slot 61 dividing the rod between said orifice and the end of the rod. The orifice 60 is formed to receive the wrist portion of the crank-shaft, and the slot 61 enables the parts separated by the slot to be bent outwardly, as shown by dotted lines in Fig. 4, thus permitting the free entrance of the crank-wrist into the orifice 60, after which the bent parts may be restored to their original position, as shown by full lines.

The piston 7 is preferably composed of a cylindrical body portion open at one end and closed at the other end by a head 70, Fig. 5, the body and head being made from a single piece of metal formed by suitable dies. The connecting-rod 6 has two arms 62 62, which extend across the interior of the piston. A pin 63, passing through the arms 62, pivotally connects said arms with the piston. The orifice formed for the reception of the pin is enlarged at its ends, as shown at 64 64, to prevent binding of the pin and permit easy working of the connected parts.

We claim—

1. A valveless gas-engine having a continuously open duct connecting one end of the cylinder with the atmosphere.

2. A valveless gas-engine having a continuously open duct connecting one end of the cylinder with the atmosphere, and a gas-supply conduit communicating with the same end of the cylinder.

3. A valveless gas-engine having a continuously open duct connecting one end of the cylinder with the atmosphere, and a gas-supply conduit communicating with the same end of the cylinder, the said conduit being open to the atmosphere.

4. A gas-engine comprising a cylinder having at its outer end a duct continuously open to the atmosphere, and a gas-supply conduit communicating with said duct.

5. A gas-engine comprising a cylinder having at its outer end a duct continuously open to the atmosphere, the outer portion of said duct being enlarged, and a gas-supply conduit communicating with the enlarged portion of the duct.

6. A gas-engine having a cylinder, a duct at the outer end of the cylinder continuously open to the atmosphere, a gas-conduit communicating with said duct, an ignition-opening between the ends of the cylinder, and a burner connected with the gas-conduit and arranged to direct a flame in operative proximity to the ignition-opening.

7. A gas-engine having a cylinder, a duct at the outer end of the cylinder continuously open to the atmosphere, and a gas-conduit communicating with said duct and open to the atmosphere between its receiving end and the cylinder-duct.

8. A gas-engine having a cylinder, a duct at the outer end of the cylinder continuously open to the atmosphere, and a gas-conduit comprising a section connected with the duct, a section connected with a gas-supply pipe, and a chamber open to the atmosphere and communicating with said sections.

9. A gas-engine having a cylinder, a duct at the outer end of the cylinder continuously open to the atmosphere, and a gas-conduit comprising a section connected with the duct, a section connected with a gas-supply pipe, and a chamber open to the atmosphere and communicating with said sections, said chamber having a contracted neck through which it communicates with the atmosphere.

In testimony whereof we have affixed our signatures in presence of two witnesses.

GEORGE J. ALTHAM.
JOHN BEATTIE, JR.

Witnesses:
MERTON C. FISHER,
GUY V. H. SLADE.