No. 623,190. Patented Apr. 18, 1899.

E. J. STODDARD.

EXPLOSIVE ENGINE.

(Application filed Sept. 23, 1896.)

(No Model.)

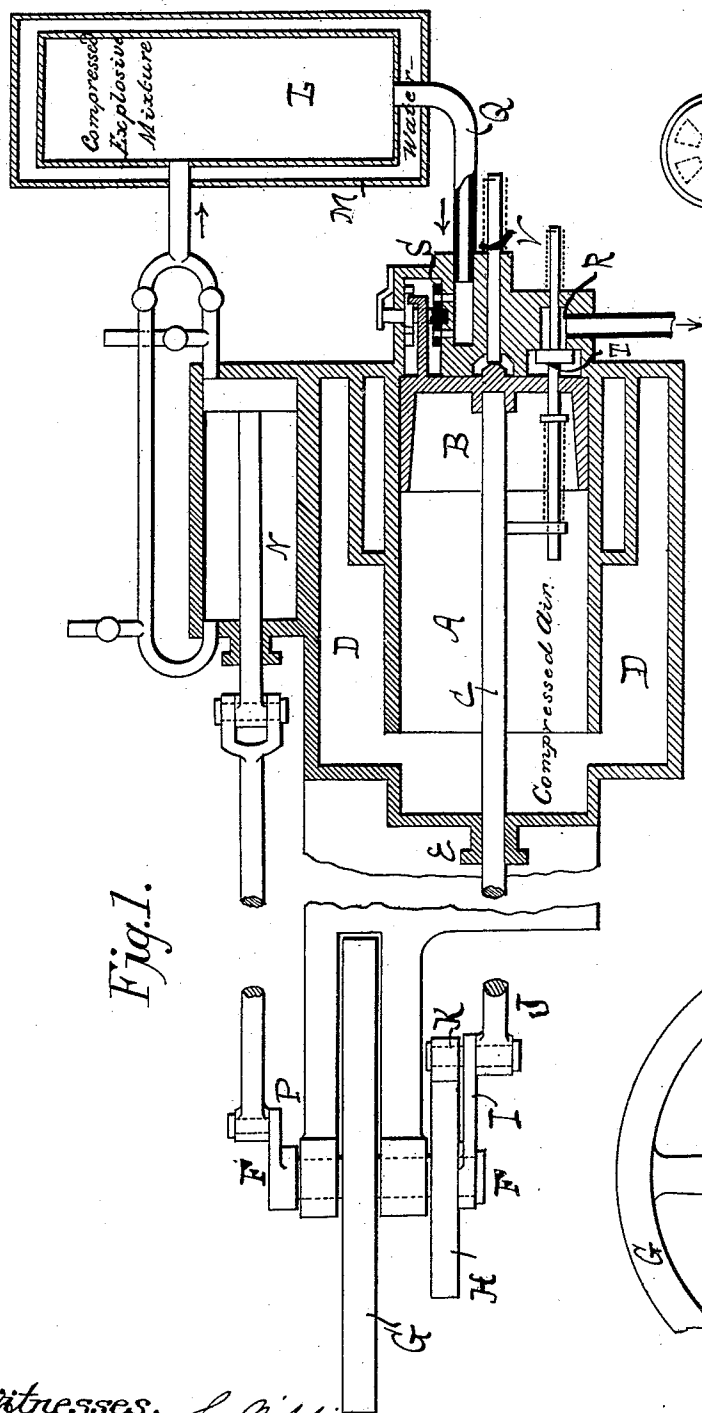

Fig. 1.

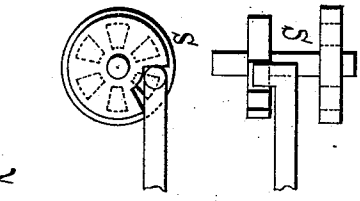

Fig. 4

Fig. 3.

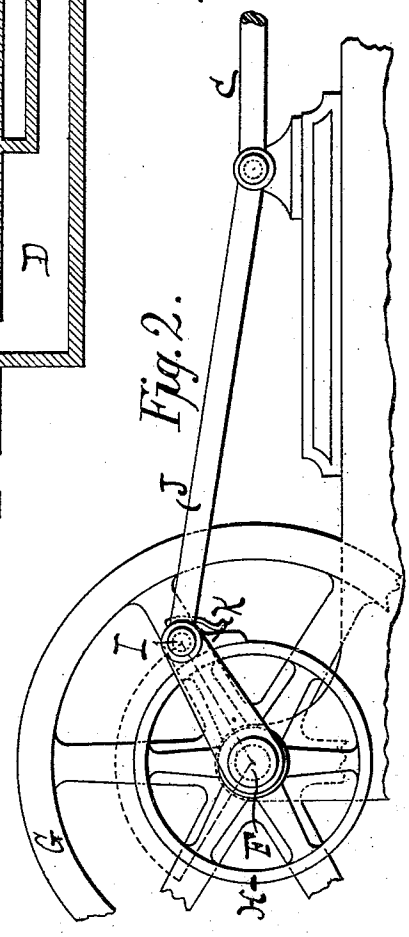

Fig. 2.

Witnesses.
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ELLIOTT J. STODDARD, OF DETROIT, MICHIGAN.

EXPLOSIVE-ENGINE.

SPECIFICATION forming part of Letters Patent No. 623,190, dated April 18, 1899.

Application filed September 23, 1896. Serial No. 606,778. (No model.)

To all whom it may concern:

Be it known that I, ELLIOTT J. STODDARD, of Detroit, in the county of Wayne and State of Michigan, have invented a new and useful Improvement in Gas-Engines; of which the following is a specification.

My invention relates to gas-engines; and the object of my improvements is to secure greater economy of operation by increasing the rate at which the heat energy of the explosion is transformed into available work. I secure this result in the engine illustrated in the accompanying drawings, in which—

Figure 1 is a plan view, partly in section, of an engine embodying my invention. To economize room, part of the connecting-rods and frame are broken away. Fig. 2 is a side elevation showing the connection between the power-cylinder and shaft in detail. Fig. 3 is a side elevation, and Fig. 4 is a plan view, of the inlet-valve.

A is the cylinder, B the piston, and C the piston-rod, of a gas-engine.

D is a jacket inclosing the cylinder A. The outer end of the cylinder A opens into the jacket D. Said jacket is made air-tight. The piston-rod C passes through a stuffing-box E in the jacket D.

F is the main shaft, and C is the fly-wheel.

H is a drum on the shaft F.

I is a lever pivoted at one end to the shaft F beside the drum H.

J is a connecting-rod pivoted to the movable end of the lever I and to the piston-rod C.

K is a clutch upon the movable end of the lever I, adapted to prevent said lever from moving counter-clockwise independent of the drum H and to allow said lever to move freely in the other direction.

L is a reservoir for containing a compressed explosive mixture.

M is a tank inclosing the reservoir L and adapted to contain water for cooling the compressed explosive mixture in the reservoir L.

N is a pump for compressing an explosive mixture into the reservoir L. Said pump may be operated from a crank P on the main shaft F or otherwise.

Q is a pipe connecting the reservoir L with the inlet-port of the cylinder A.

R is the exhaust-port of the cylinder A.

S is a valve adapted to open to admit the explosive mixture to cylinder A when the piston B is at or near the rear end of the stroke and to close after said charge is in the cylinder.

T is a valve adapted to open to let out the exhaust when the cylinder is at the forward end of its stroke. These valves have been described and claimed in a separate application for improvements in gas-engines, filed December 28, 1896, by Henry C. Hart, Serial No. 617,295, for which reason further explanation of the valves is deemed unnecessary.

V is a lighting-rod.

Of course suitable screens or check-valves, or both, should be interposed in the pipe Q to prevent burning back into the reservoir L.

The operation of the above-described device is as follows: The jacket D is filled with compressed air and the reservoir L with compressed explosive mixture. The pressure should be slightly less in the jacket D than in the reservoir L, and the size of the jacket D should be so large that the pressure will be raised but slightly by the forward movement of the piston B.

The operation of the above-described device is as follows: The valves being open, the cold compressed explosive mixture rushes in, forcing the piston B forward and closing said valve, as in the application above referred to. The charge is then lighted by an electric spark or otherwise. The explosive drives the piston B forward very rapidly against the pressure of the air in the jacket D, carrying with it the clutch K. When the explosion has spent its force, the exhaust-valve opens, allowing the products of combustion to escape, and the air-pressure in the jacket D forces the piston B back again, turning the drum H by means of the clutch K, and the above cycle of operations is repeated.

In the above-described device the explosive mixture is cold at the time that it is fired, and therefore the initial pressure is much higher than if the mixture retained its heat of compression. The pressure being higher, the rate of transforming the heat energy into work is of course proportionally greater with the same velocity of the piston; but in this form of engine the piston velocity is proportional to

the pressure upon it, so that by the use of a cold compressed explosive mixture the maximum explosion pressure and the maximum piston velocity are obtained—that is to say, the maximum rate of converting the heat energy into available work—while the area of the cylinder-walls to the unit of explosive mixture is a minimum.

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

1. In a gas-engine, the combination of a cylinder, a piston in the cylinder, a spring resisting the motion of the piston in one direction and acting to return it to normal position, means for connecting the piston to work during the return stroke under the influence of the spring, and means for compressing explosive mixture and introducing the compressed explosive mixture into the cylinder, and igniting the same within the cylinder and behind the piston, substantially as and for the purposes described.

2. In a gas-engine, the combination of a cylinder, a piston in the cylinder, a spring resisting the motion of the piston in one direction and acting to return it to normal position, means for connecting the piston to work during its return stroke and under the influence of the spring, means for compressing an explosive mixture, means for cooling the compressed explosive mixture, and means for introducing the cooled compressed explosive mixture into the cylinder and for igniting the same within the cylinder and behind the piston, substantially as and for the purposes described.

ELLIOTT J. STODDARD.

Witnesses:
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