No. 835,908. PATENTED NOV. 13, 1906.

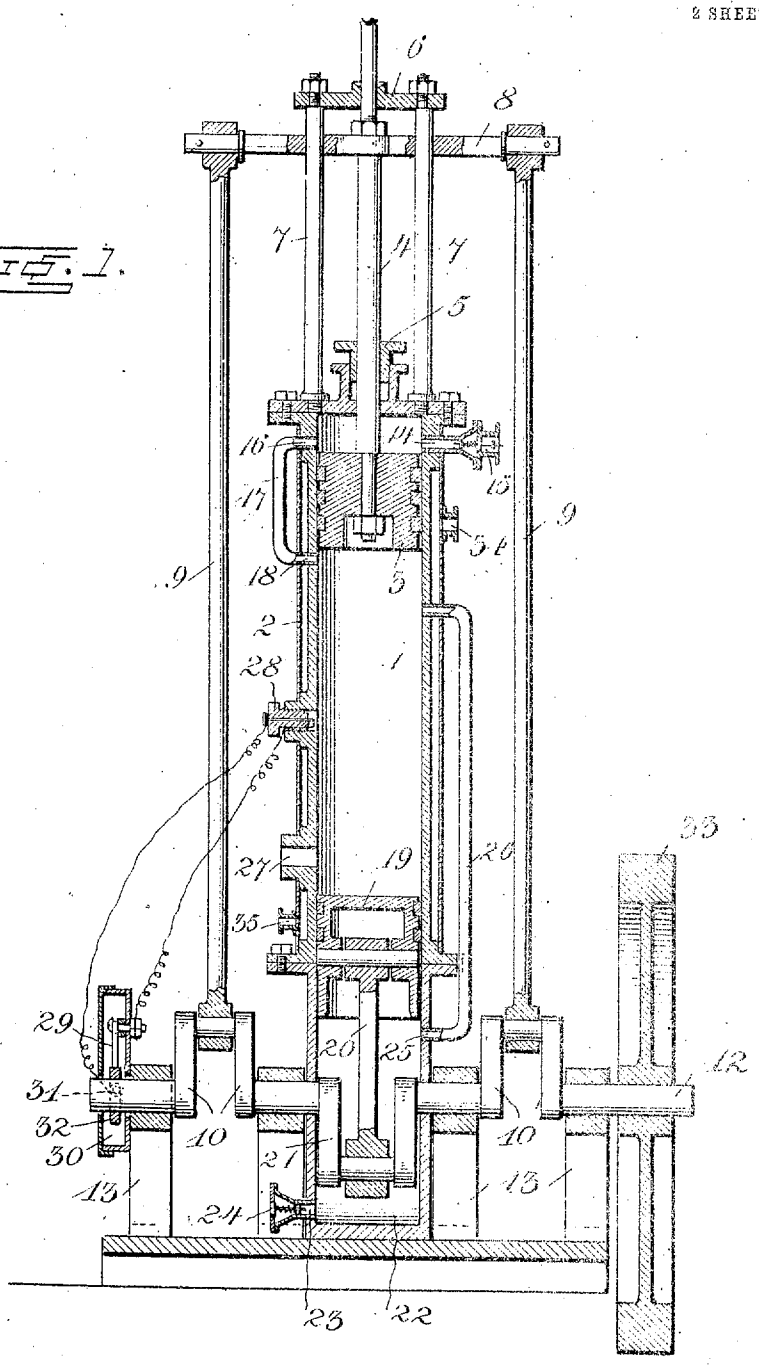
J. F. JENSEN.

EXPLOSIVE ENGINE.

APPLICATION FILED MAR. 20, 1905.

2 SHEETS—SHEET 1.

Fig. 1.



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2 SHEETS—SHEET 2.

Fig. 3.

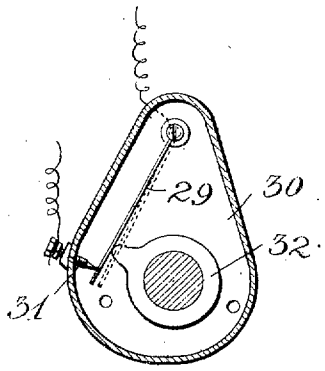


Fig. 2.

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UNITED STATES PATENT OFFICE

JACOB FREDRICK JENSEN, OF EVANSTON, ILLINOIS, ASSIGNOR OF THREE-FOURTHS TO MARIE STILLMAN, OF EVANSTON, ILLINOIS.

EXPLOSIVE-ENGINE.

No. 835,908. Specification of Letters Patent. Patented Nov. 13, 1906.

Application filed March 20, 1905. Serial No. 251,090.

To all whom it may concern:

Be it known that I, JACOB FREDRICK JENSEN, a citizen of the United States, residing at Evanston, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Explosive-Engines; and I do 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.

This invention relates to improvements in explosive-engines.

The object of the invention is to provide an engine of this character having two pistons within one cylinder driven by the same explosion, said pistons being connected to a common crank-shaft, thereby increasing the force or power of the engine.

A further object is to provide means whereby exhaust vapors will be forced out of the cylinder by a compression of air before the explosive mixture enters the same, thereby preventing back firing and increasing the force or power of the engine.

With these and other objects in view the invention consists of certain novel features of construction, combination, and arrangement of parts, as will be hereinafter described and claimed.

In the accompanying drawings, Figure 1 is a vertical sectional view of the engine, taken on a line with the crank-shaft, showing the pistons at the limit of their outer stroke. Fig. 2 is a similar view taken at right angles to Fig. 1 and showing the pistons at the limit of their inner stroke; and Fig. 3 is a detail cross-sectional view through one end of the crank-shaft, showing the arrangement of the sparking mechanism and the manner in which the same is operated by the crank-shaft.

Referring more particularly to the drawings, 1 denotes a cylinder around which and spaced therefrom is a water-jacket 2. In the upper end of the cylinder is arranged an upper piston 3, the piston-rod 4 of which passes through a stuffing-box 5, arranged on the upper head of the cylinder. The upper end of the piston-rod is adapted to slide through a guide-plate 6, which is secured to the upper end of a guide-frame 7, mounted on the upper end of the cylinder, as shown. Connected to the piston-rod 4 is a cross-head 8, to the ends of which are secured connecting-rods 9, the opposite or lower ends of which are pivotally connected to cranks 10, formed on a crank drive-shaft 12, which is journaled in suitable bearings 13 at the lower end of the piston. In one side of the cylinder, adjacent to the upper end of the same, is arranged an inlet-port 14, having an inlet-valve 15. On the opposite side of the piston and preferably in line with the port 14 is arranged a discharge-port 16, which is connected with a tube 17, arranged on the outer side of the cylinder, as shown. The opposite end of said tube is connected with an inlet-port 18, formed in the cylinder some distance below the upper end of the same. In the lower end of the cylinder is arranged a piston 19, the connecting-rod 20 of which is connected with a crank 21, formed on the driving-shaft 12 between the cranks 10. The crank 21 is disposed within a casing 22, which practically forms a continuation of the lower end of the cylinder. In the lower end of the casing 22 is formed an air-inlet port 23, having arranged therein an inlet-valve 24. In the casing 22, adjacent to the lower end of the cylinder, is formed an air-discharge port 25, which is connected with a tube 26, arranged on the side of the cylinder and opening into the same at its upper end a short distance below the inlet-port 18, as shown.

In one side of the cylinder, adjacent to the lower end thereof, is formed an exhaust-port 27 for the discharge of the exhaust of vapors from said cylinder. Above said port and substantially midway between the ends of the cylinder is arranged a sparking plug 28, through which passes the electric contact-points by which a spark is formed to ignite the explosive mixture within the cylinder at the proper time.

In order to complete the electric circuit and cause the sparking mechanism to ignite the explosive fluid at the proper time, a suitable make-and-break device is provided, said device preferably consisting of a spring arm or blade 29, which is mounted in a suitable casing 30, arranged on one end of the cranked drive-shaft 12. Said arm or blade has arranged thereon a platinum point and is connected with one wire of the electric sparking circuits. In the casing 30 is arranged a screw 31, on the inner end of which is formed a contact-point adapted to be engaged by the platinum point of the spring arm or blade 29. The screw 31 is connected to the opposite

wire of the sparking circuit, so that when the platinum point on the spring-arm 29 is brought in engagement with the contact-point on the screw the electric circuits will be completed, thereby causing sparks to be formed at the opposite ends of said circuit-wire. By means of the screw 31 the contact-point on the end of the same may be adjusted to bring the same into proper working position with respect to the spring-arm 29. In order that the spring arm or blade 29 may be brought into engagement with the point on the screw 31 at the proper time, the cam-shaped disk 32 is secured on the end of the drive-shaft 12 adjacent to the arm 29, said cam being so arranged on said shaft that it will be turned into engagement thereby with the arm 29 to bring the platinum point on the same into engagement with the contact-point on the screw 31 at the moment the pistons 3 and 19 have reached the limit of their inner strokes, thus igniting the explosive fluid which has been compressed between said pistons on their inner strokes, causing an explosion which drives the pistons outwardly or away from each other, as will be understood.

On the crank-shaft is mounted the usual fly-wheel 33. The water-jacket around the cylinder is provided with suitable inlet and outlet passages 34 and 35, whereby a circulation of water may be provided for within the jacket 2.

In operation, assuming the pistons to be at the limit of their outer strokes, as shown in Fig. 1, they will be brought together on their inner stroke by the momentum or inertia of the fly-wheel 23, and in coming together on their inner strokes the explosive mixture within the cylinder will be compressed between said pistons. The inward movement of the lower piston creates a suction in the casing 22, which draws air into the air-inlet port 23 and valve 24, which when the piston is moved outwardly on its outlet stroke it compresses the air in casing 22, forcing the same into the discharge-port 25 and through the tube 26 into the cylinder, thus forcing the exhausted vapor therefrom through the exhaust-port 27. The inward movement of the upper piston creates the suction which draws gas and air into the cylinder through the gas and air inlet valve 15 and port 14, while the inward movement of the piston 19 creates a suction to draw air through the air-valve 24 and air-inlet port 23 into the casing 22. After the explosion has occurred and the pistons are again forced outwardly the gas that has been drawn in through the gas and air inlet port 14 will be forced thereby through the discharge-port 16 and tube 17 through the inlet-port 18 into the cylinder.

The gas and air are introduced at the upper end of the cylinder and the air is introduced from the lower end thereof, thereby forming an explosive fluid which when the pistons are brought together is compressed, and when the pistons reach the limit of their inner movement the explosive mixture compressed by the inward movement of the same is ignited, causing an explosion which again drives the pistons outwardly. Thus the operation as herein described is repeated.

From the foregoing description, taken in connection with the accompanying drawings, the construction and operation of the invention will be readily understood without requiring a more extended explanation.

Various changes in the form, proportion, and the minor details of construction may be resorted to without departing from the principle or sacrificing any of the advantages of this invention.

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

1. In an explosive-engine, the combination with the cylinder forming a compression and explosion chamber, of opposing pistons working in said cylinder, a crank-shaft having oppositely-disposed cranks, a direct connection between said crank-shaft and one of said pistons, a cross-head connected to the piston-rod of the other piston, connecting-rods connecting said cross-head with the oppositely-disposed cranks of said crank-shaft, a casing arranged on one end of said cylinder to form an air-suction chamber, a passage leading from said chamber and opening into said cylinder between the pistons, a check-valve whereby gas and air is drawn into the opposite ends of said cylinder and forced into the center of the same for forcing out the air previously introduced therein, an exhaust-port in the cylinders, and an automatically-operated sparking device to ignite said gas and air, substantially as described.

2. In an explosive-engine, the combination with the cylinder forming a compression and explosion chamber, of opposing pistons working in said cylinder, a crank-shaft having oppositely-disposed cranks, a direct connection between said crank-shaft and one of said pistons, a cross-head connected to the piston-rod of the other piston, connecting-rods connecting said cross-head with the oppositely-disposed cranks of said crank-shaft, a casing arranged on one end of said cylinder to form an air-suction chamber, a passage leading from said chamber and opening into said cylinder between the pistons, a check-valve whereby gas and air is drawn into the opposite end of the cylinder, an electrical sparking mechanism actuated by the crank-shaft to ignite said gas and air at the limit of the inner strokes of said pistons, and an exhaust-port in said cylinder whereby the exhausted vapor is discharged from the cylinder, substantially as described.

3. In an explosive-engine, the combination with a cylinder having a water-jacket,

said jacket having inlet and outlet ports, of two opposing pistons arranged in said cylinder, a crank-shaft, a centrally-disposed crank formed on said shaft, a direct connection between said central crank and one of said pistons, side cranks formed on said shaft and projecting in an opposite direction to said central crank, a piston-rod connected to the other piston, a guide-frame to receive said rod, a cross-head connected to the latter, connecting-rods connecting said cross-head with the side cranks on said shaft, an air-suction chamber arranged on the lower end of said cylinder, a check-valve communicating with said chamber, air inlet and discharge ports formed in said cylinder, means whereby air from said chamber is introduced into the cylinder, means whereby gas and air is drawn into the upper end of the cylinder and conducted from said end and discharged into the center of the cylinder forcing out the air previously introduced therein, and an automatically-operated, electrical sparking mechanism adapted to ignite said gas and air at the proper time, substantially as described.

In testimony whereof I have hereunto set my hand in presence of two subscribing witnesses.

JACOB FREDRICK JENSEN.

Witnesses:
J. E. MYERS,
FRED J. KEPLER.