T. KEENAN.

EXPLOSIVE ENGINE.

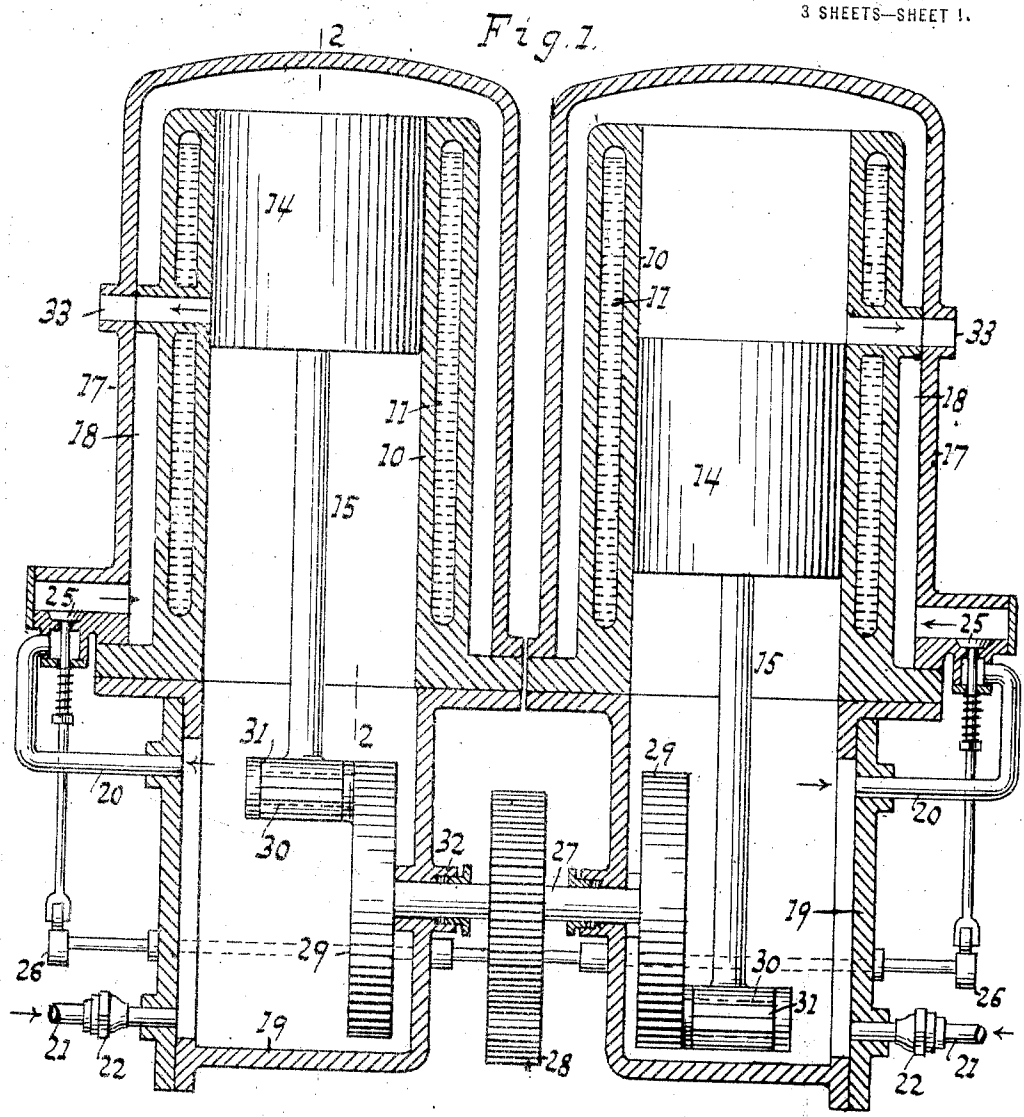
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1,372,955.

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3 SHEETS—SHEET 1.

Fig. 1.



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3 SHEETS—SHEET 2.

Fig. 2.

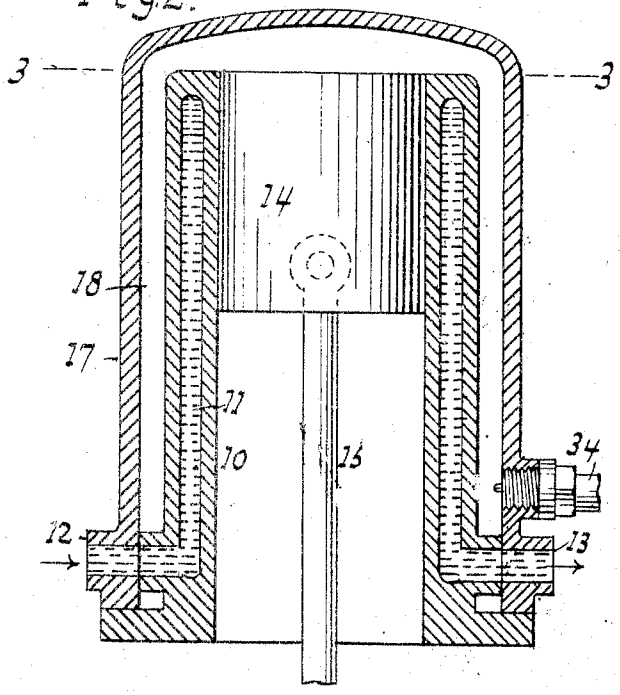
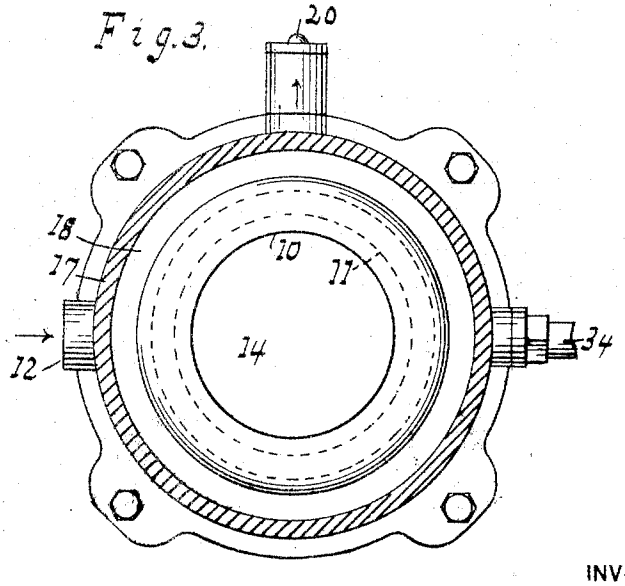


Fig. 3.



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3 SHEETS—SHEET 3.

Fig. 4.

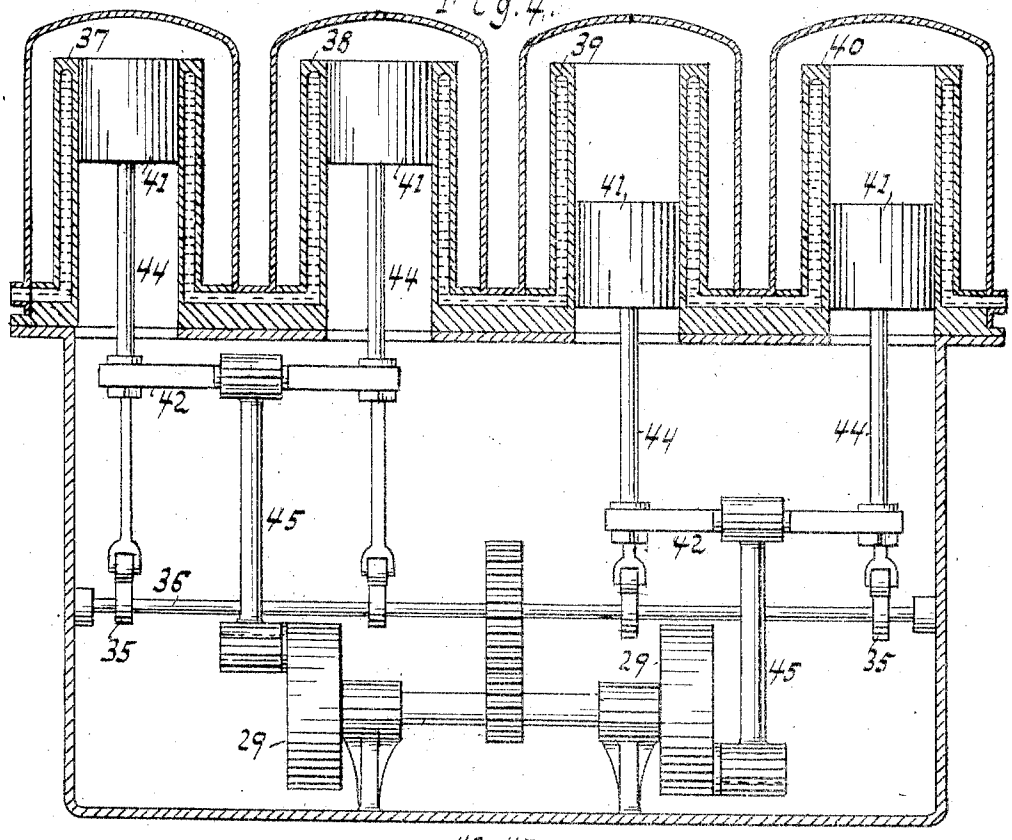
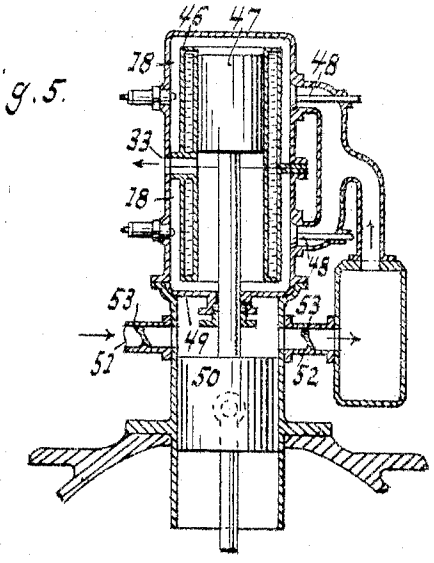


Fig. 5.



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UNITED STATES PATENT OFFICE.

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EXPLOSIVE-ENGINE.

1,372,955. Specification of Letters Patent. Patented Mar. 29, 1921.

Application filed July 7, 1919. Serial No. 308,965.

To all whom it may concern:

Be it known that I, THOMAS KEENAN, a citizen of the United States, residing at Brooklyn, in the county of Kings and State of New York, have invented new and useful Improvements in Explosive-Engines, of which the following is a specification.

This invention relates essentially to an explosive engine in which a jacket or sleeve incloses the cylinder for admitting a combustible adapted to be fired for actuating a piston slidingly mounted in the cylinder.

One of the objects of the invention is to provide the cylinder with an open head so that the combustible in the jacket will be compressed by the instroke of the piston and exploded to drive the piston outward or downward.

Another object of the invention is to surround the cylinder with the fuel jacket in order that the combustible will expand and be heated by contact with the cylinder before it is compressed by the instroke of the piston.

The invention is also designed to include a fly-wheel journaled directly to the connecting rod to counteract the speed fluctuations, secure an even balance and also store up energy sufficient to carry the rotation of the main shaft through the compression stroke of the piston.

The invention resides in the novel combinations hereinafter described and claimed, reference being made to the accompanying drawings in which:—

Figure 1 represents a vertical section showing the invention applied to a two cycle engine.

Fig. 2 is a vertical section of one of the cylinders taken along the line 2—2 of Fig. 1.

Fig. 3 is a horizontal section taken along the line 3—3 of Fig. 2.

Fig. 4 shows the invention applied to a four cycle engine.

Fig. 5 shows the invention applied to a double acting piston type of engine.

Referring to Figs. 1, 2 and 3 the numeral 10 designates a cylinder which is provided with an annular chamber 11 made to contain water for cooling the walls of the cylinder. The water is circulated in the chamber by means of an inlet pipe 12 and an outlet pipe 13 connected to a pump. Within the cylinder is slidingly mounted a piston 14 with one end of a rod 15 connected to it in the usual manner, while the other end is journaled to a fly-wheel shaft of peculiar construction as hereinafter described.

The upper end of the cylinder is open and a jacket 17 surrounds and covers the open head of the cylinder. The jacket as shown incloses the entire side of the cylinder in order to form an annular chamber 18 for the combustible. The jacket and the cylinder are bolted to a crank casing 19 having an outlet conduit 20 in the side of the casing connected to the jacket. An inlet pipe 21 as indicated in Fig. 1, leads from a carbureter not shown, into the casing, and a check valve 22 mounted in the pipe is made to admit the fuel periodically into the casing from the carbureter. The valve opens by the upward movement of the piston and the fuel is drawn into the casing by the suction thus created. The outlet pipe or conduit 20 leads the fuel from the casing to the jacket by the downward throw of the piston, the check valve 22 being automatically closed by the compression to prevent the fuel from being forced back to the carbureter. A valve 25 operated by a cam 26 connected to the crank shaft 27 by means of gears 28 opens at predetermined times to admit the fuel into the jacket from the casing.

The crank shaft 27 is equipped with a pair of fly-wheels 29 and each wheel has a stud or pin 30 eccentrically secured to the fly-wheel. The lower end of the said connecting rod 15 includes a box 31 journaled to the pin. The box can be provided with ball-bearings to reduce the friction. The crank shaft projects from the axis of the fly-wheels and it extends through stuffing boxes 32 arranged on the casing to prevent leakage of the fuel. There are two cylinders and two crank casings shown in the drawing but any number can be mounted on the casing and coupled to the crank shaft in the way shown.

It will be readily understood, that when the combustible is admitted into the jacket the piston is at its extreme out-stroke thus uncovering the exhaust port 33 in the cylinder best seen in Fig. 1. The piston then moves upward under the momentum of the fly-wheel until it reaches the upper end of the cylinder thereby compressing the fuel and it is exploded by a spark plug 34 best seen in Fig. 2. In the construction shown

the valve momentarily opens when the piston is out or down to admit the fuel and the spark is timed to explode the fuel when the piston is up. The compression or power strokes of the piston transmit one revolution to the crank shaft and it opens the valve once to admit the fuel. The inlets 21 can be connected to a manifold and a single carbureter employed for any number of cylinders.

In the construction shown in Fig. 4, the invention is applied to a multiple four cycle engine in which the inlet and exhaust valves are operated by means of cams 35 mounted on a secondary shaft 36 geared to the crank shaft 27 as is well known. The secondary shaft is geared to rotate half as fast as the crank shaft thereby revolving once for every two revolutions of the crank shaft. In this arrangement the induction or supply stroke would be occuring in cylinder 37, the firing stroke in cylinder 38, the compression stroke in cylinder 39 and the exhaust stroke in cylinder 40. The crank shaft can be geared to a counter shaft to transmit the power as is well known.

Each pair of pistons 41 are connected by a cross-head 42 to piston-rods 44 secured to the piston. A connecting rod 45 journaled to the cross-head and fly-wheels 29 transmits motion to the main shaft 27 by the movement of the piston. In this device the single connecting rod serves to connect two pistons to the main shaft. The upper and lower portions of the connecting rod can be furnished with ball bearings to ease up the friction and prevent play of the parts.

As shown in Fig. 5 the fuel jacket 18 wholly incloses a cylinder 46 open at the top and bottom. A double acting piston 47 is arranged to reciprocate in the cylinder. Valves 48 control the intake of the fuel into the jacket. The jacket is divided into two chambers by means of a partition to admit the fuel above and below the piston. An exhaust port 33 in the cylinder when uncovered by the upward or downward throw of the piston discharges the products of combustion.

It will be seen that when the piston is up the products of combustion have been discharged and the fuel charge in the upper jacket is ready to be fired. After the explosion the piston moves downward to compress the fuel in the lower chamber until the upper end of the piston uncovers the exhaust and in this position the fuel in the lower chamber is ready to be fired. The fuel from the carbureter is admitted into a compression chamber 49 and a supplementary piston 50 connected to the main piston sucks the fuel through pipe 51 by its downward throw, or forces the fuel through pipe 52 by its upward stroke. Check valves 53 prevent backward movement of the fuel and back-firing, hence the ignition of the fuel in the carbureter mixing chamber is prevented.

What I claim is:—

1. In an explosive engine the combination with a cylinder having an open head and a reciprocating piston therein, of a fuel jacket surrounding the head of the cylinder, means for cooling the cylinder, means for admitting a combustible into the jacket, and means for exhausting the products of combustion from the cylinder.

2. In an explosive engine the combination with a cylinder having an open head and a reciprocating piston therein, of a fuel jacket surrounding the head and sides of the cylinder means for cooling the cylinder, means for admitting a combustible into the jacket, and means for exhausting the products of combustion from the cylinder.

3. In an explosive engine the combination with a water jacketed cylinder having an open head and a reciprocating piston therein, of a fuel jacket surrounding the head and sides of the cylinder, means for admitting a combustible into the jacket, and means for exhausting the products of combustion from the cylinder.

4. In an explosive engine the combination with a water jacketed cylinder having an open head and a reciprocating piston therein, of a fuel jacket surrounding the head and sides of the cylinder, means for admitting a combustible into the lower portion of the jacket, and means for exhausting the products of combustion from the cylinder.

5. In an explosion engine the combination with a plurality of water jacketed cylinders each having an open head and a reciprocating piston therein, of a fuel jacket surrounding the head and sides of each cylinder, means for admitting a combustible into each jacket, means for exhausting the products of combustion from each cylinder, and a valve controlling the intake of fuel into the jacket.

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

THOMAS KEENAN.

Witnesses:
KATHARINE S. KEANE,
WILLIAM MILLER.