S. D. SHAKLEY.

EXPLOSIVE ENGINE.

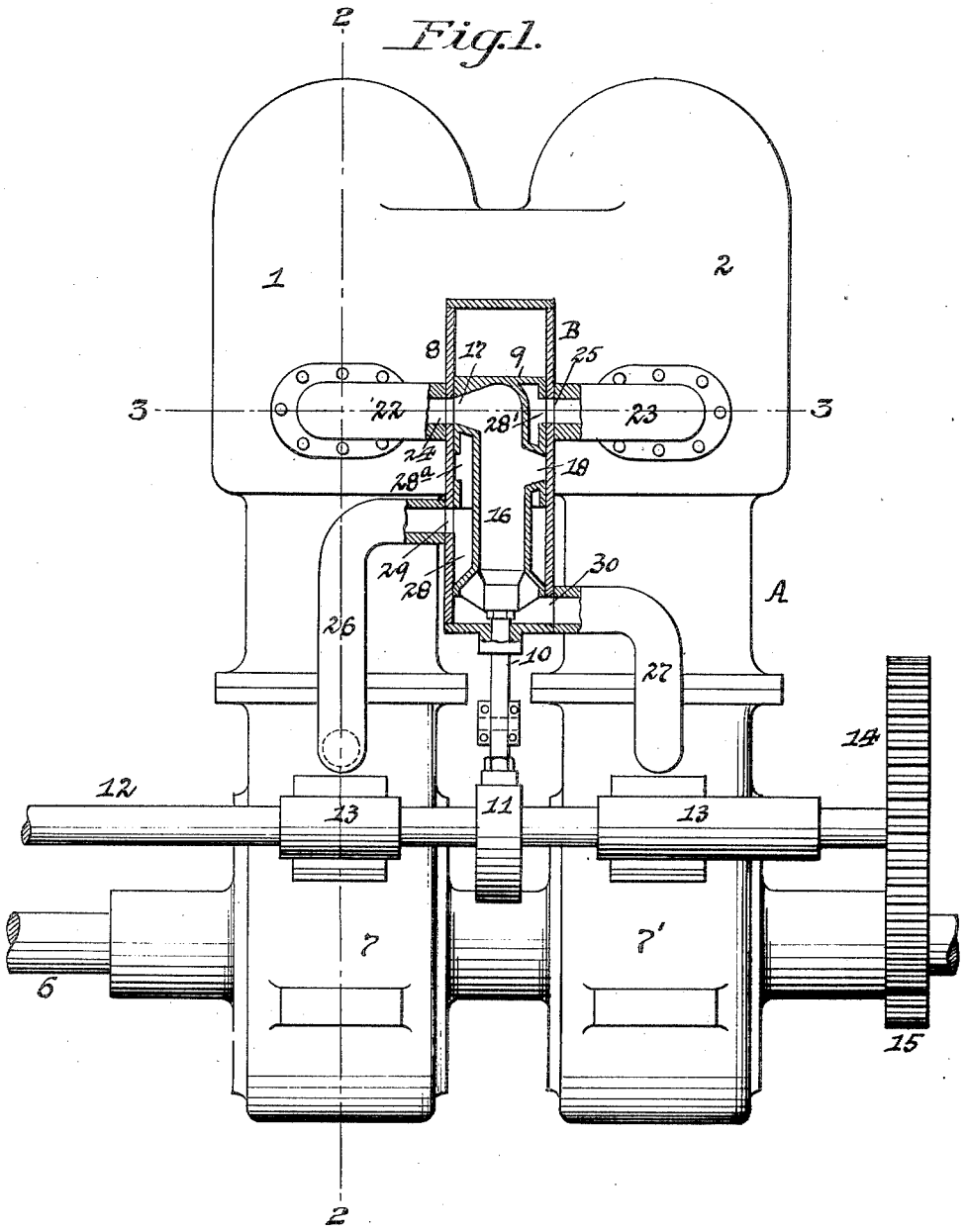
APPLICATION FILED JULY 17, 1912.

1,068,086.

Patented July 22, 1913.

2 SHEETS—SHEET 1.

Fig. 1.



WITNESSES

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2 SHEETS—SHEET 2.

Fig. 2.

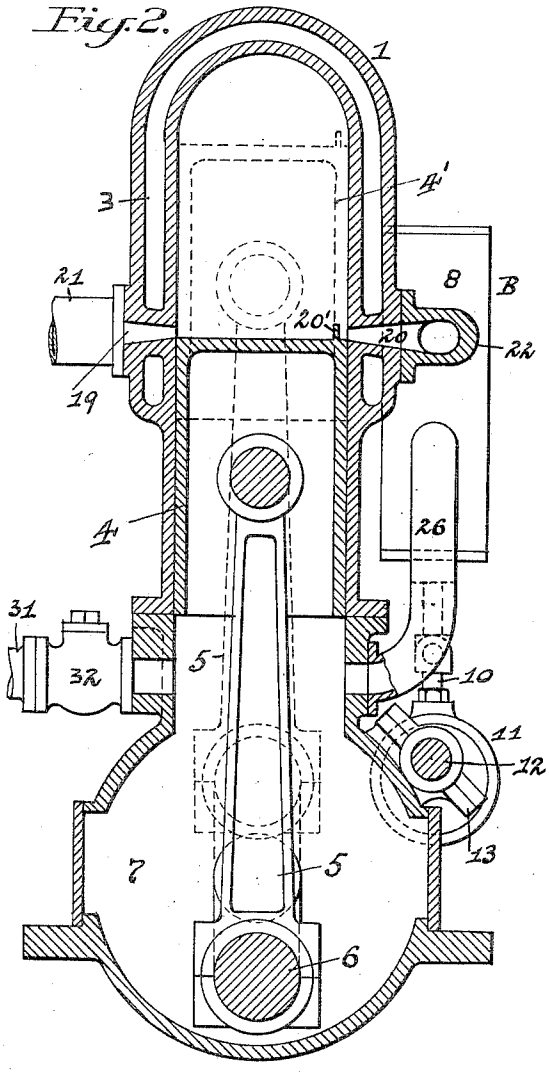


Fig. 3.

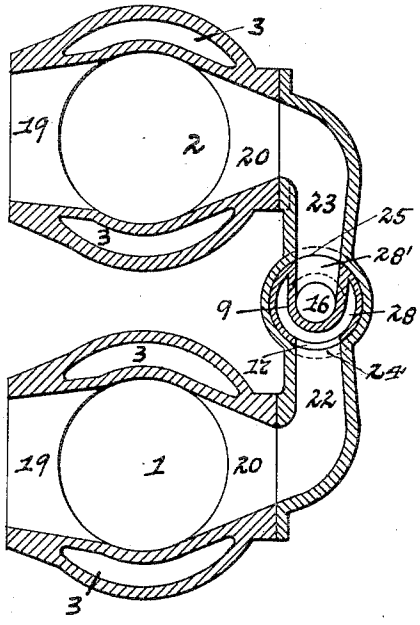


Fig. 4.

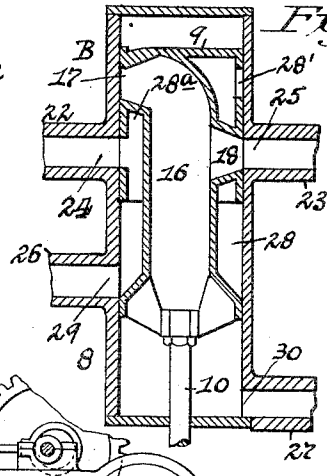
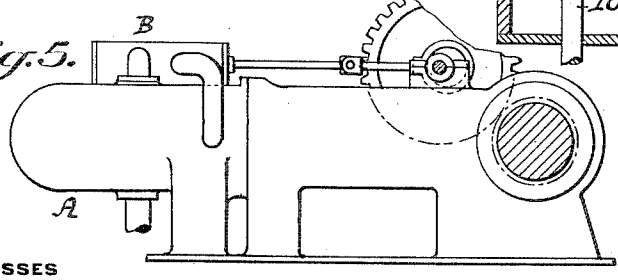


Fig. 5.



WITNESSES

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UNITED STATES PATENT OFFICE.

SAMUEL D. SHAKLEY, OF PITTSBURGH, PENNSYLVANIA, ASSIGNOR OF ONE-HALF TO FRANK C. HOCKETT, OF CLEVELAND, OHIO.

EXPLOSIVE-ENGINE.

1,068,086. Specification of Letters Patent. Patented July 22, 1913.

Application filed July 17, 1912. Serial No. 709,939.

To all whom it may concern:

Be it known that I, SAMUEL D. SHAKLEY, a resident of Pittsburgh, N. S., in the county of Allegheny and State of Pennsylvania, have invented a new and useful Improvement in Explosive-Engines; and I do hereby declare the following to be a full, clear, and exact description thereof.

My invention relates to engines and has special reference to that form of engine known as the four cycle type.

The object of my invention is to provide a cheap, simple and efficient form of four cycle engine in which the cylinders of the same may be charged and scavenged by mixture and scavenging air compressed in the crank cases of the engine and with much greater efficiency than the present form employed.

To these ends my invention consists, generally stated, in the novel arrangement, construction and combination of parts as hereinafter more specifically set forth and described and particularly pointed out in the claims.

To enable others skilled in the art to which my invention appertains to construct and use my improved four cycle internal combustion engine, I will describe the same more fully referring to the accompanying drawings in which—

Figure 1 is a side elevation of the engine showing the distributer in section. Fig. 2 is a vertical sectional view of the engine on the line 2—2 of Fig. 1. Fig. 3 is a cross sectional view of the cylinders on the line 3—3 of Fig. 1. Fig. 4 is a vertical sectional view of the distributer. Fig. 5 is a view of a horizontal engine showing my improvement applied thereto.

Like symbols of reference herein indicate like parts in each of the figures of the drawing.

As illustrated in the drawing A represents my improved internal combustion engine and such engine is provided with the cylinders 1 and 2 in the usual manner, and such engine may be used in connection with motor vehicles, such as automobiles, marine vessels, etc. In each of the cylinders 1 and 2 of the engine A the usual water jacket 3 extends around the same, and such cylinders have pistons 4 and 4′ operating therein through piston rods 5 connected thereto and to the crank shaft 6 which extends through the crank cases 7 and 7′ of such engine.

At one side of and at the lower end of the cylinders 1 and 2 is the distributer B, and such distributer consists of the outer valve casing 8, within which is the traveling valve 9 and said distributer is secured to the cylinders 1 and 2 in any suitable manner to hold the same in position. The valve 9 is slidably mounted within the valve casing 8 and has an operating rod 10 secured to the bottom end of the same and said rod extends through the said casing and connects to an eccentric 11 which is mounted on an auxiliary or valve shaft 12, said shaft being mounted in bearings 13 on the sides of the crank cases 7 and 7′. At one end of the auxiliary shaft 12 is a gear 14, which is adapted to mesh with the pinion 15 on the end of the crank shaft 6 so that the valve 9 in the valve casing 8 will thus be operated positively by said crank shaft but any other means of connection which is positive, such as a chain belt will suffice.

The distributer B is adapted to have the valve 9 in the same move in a vertical direction and such valve has a chamber 16 within the same and two openings 17 and 18 leading therefrom. The cylinders 1 and 2 are provided with admission and exhaust ports 19 and 20 respectively, and the said exhaust ports communicate with an exhaust pipe 21 while the admission port in the cylinder 1 communicates with a pipe 22 and the admission port in the cylinder 2 communicates with a pipe 23. The pipes 22 and 23 communicate with the valve casing 8 through ports 24 and 25 respectively. The cylinders 1 and 2 are also provided with projections or lips 20′ in front of the admission ports 20, the purpose of which is explained hereinafter.

The crank cases 7 and 7′ are provided with pipes 26 and 27 leading therefrom and such pipe 26 communicates with the chamber 28 which surrounds the valve 9 through a port 29 while the pipe 27 communicates with the chamber 16 in said valve through the port 30. The chamber 28 is also provided with openings 28′ and 28ª, which are referred to hereinafter.

The use and operation of my improved internal combustion engine is as follows:—The crank case 7 is first filled with explo-

sive mixture in any suitable manner, such as through the pipe 31 and check valve 32, and the crank case 7′ is filled with air for scavenging the cylinders 1 and 2 of the engine. The cranks on the crank shaft 6 are set at 180 degrees apart and the engine, being of the four cycle type, a complete operation is effected by four complete strokes of the piston, or while the valve shaft 12 is making one complete revolution through the medium of the spur gear 14 and pinion 15. In considering the cylinder 1 and the crank case 7′ the piston is shown at its downward position and said cylinder has just had the explosion occur therein and is now receiving a charge of air from the crank case to remove the waste products of combustion or to scavenge said cylinder. The air enters the pipe 27 from the crank case 7′ and passes through the port 30 and into the chamber 16 of the valve 9 from whence it passes through the opening 17 and port 24 and into the pipe 22 through which it enters the cylinder 1 through the admission port 20 and strikes against the lip or projection 20′ in front of said port which directs the same upward in said cylinder while the waste products of combustion are all forced downward and are exhausted from said cylinder through the port 19 into the exhaust pipe 21. During this operation the cylinder 2, as shown in Fig. 1, is receiving a charge of operating mixture and such mixture leaves the crank case 7 and travels upward through the pipe 26 and enters the chamber 28 through the port 29. The mixture then passes through the port 29 of the chamber 28 and through the opening 25 into the pipe 23 from which it passes through the admission port 20 in the cylinder 2 and strikes against the lip 20′ which directs it into the upper port of the said cylinder. The piston 4′ in the cylinder 2 then travels upward to a position as shown in dotted lines in Fig. 2 whereupon the mixture is exploded and the piston returns to its lower position compressing the air below the same in the crank case 7′. The admission of air from the chamber 16 now takes place and such air is admitted from the port 18 which has traveled to a position in line with the opening 25 while the opening 24 leading to the pipe 22 and cylinder 1 now communicates with the port 28ª so that operating mixture will be admitted thereto while scavenging air is admitted to the cylinder 2. It will thus be observed that when the operating mixture is being admitted to one of the cylinders to charge the same, air is being admitted to the other for scavenging the same, while the air and operating fluid in the crank cases 7 and 7′ will be compressed therein by the pistons 4 and 4′ respectively, during their downward stroke of the same.

The valve 9 in the valve casing 8 will be so arranged that it will make a complete operation, *i. e.* a stroke upward and downward during two complete operations of the pistons or in other words there will be two complete revolutions of the crank shaft to one revolution of the auxiliary shaft.

With the use of my improved internal combustion engine, such engine must in all cases be of the four cycle type and must have two or more cylinders and such cylinders must be connected in pairs so that the alternating process of admitting explosive mixture and air for scavenging may be accomplished, and it will be obvious that with my type of engine all springs and puppet valves in the combustion chamber will be entirely eliminated so that much inconvenience and annoyance caused by such parts getting out of repair will be done away with.

Fig. 5 shows a horizontal engine where the parts are located in practically the same manner and the operation accomplished the same as in the vertical type shown and explained.

Various changes in the design and construction of my improved internal combustion engine may be resorted to without departing from the spirit of the invention or sacrificing any of its advantages.

What I claim as my invention and desire to secure by Letters Patent is—

1. In a four cycle internal combustion engine comprising a pair of cylinders each having a piston therein connected to a crank shaft with one of said pistons adapted to compress air at one end of the same and the other piston adapted to compress an explosive mixture at its same end, a distributer having movable means within the same, said movable means having two chambers therein, one of said chambers communicating permanently with the explosive mixture supply and the other communicating permanently with the air supply, and means for alternately communicating said chambers in said movable means with said cylinders for charging and scavenging the same.

2. In a four cycle internal combustion engine comprising a pair of cylinders each having a piston therein connected to a crank shaft with one of said pistons adapted to compress air at one end of the same and the other piston adapted to compress explosive mixture at its same end, a distributer having longitudinally movable means within the same, said movable means having two chambers therein, one of said chambers communicating permanently with the explosive mixture supply and the other communicating permanently with the air supply, and means for alternately communicating said chambers in said longitudinally movable means with said cylinders for charging and scavenging the same.

3. In a four cycle internal combustion engine comprising a pair of cylinders each having a piston therein connected to a crank shaft with one of said pistons adapted to compress air at one end of the same and the other piston adapted to compress explosive mixture at its same end, a distributer having a valve within the same, said valve having two chambers therein, one of said chambers communicating permanently with the explosive mixture supply and the other communicating permanently with the air supply, and means for alternately communicating said chambers with said cylinders for charging and scavenging the same.

4. In a four cycle internal combustion engine comprising a pair of cylinders each having a piston therein connected to a crank shaft with one of said pistons adapted to compress air at one end of the same and the other piston adapted to compress an explosive mixture at its same end, a distributer having movable means within the same, said movable means having two chambers therein, one of said chambers communicating permanently with the explosive mixture supply and the other communicating permanently with the air supply, and means connected to said crank shaft for alternately communicating said chambers in said movable means with said cylinders for charging and scavenging the same.

5. In a four cycle internal combustion engine comprising a pair of cylinders each having a piston therein connected to a crank shaft with one of said pistons adapted to compress air at one end of the same and the other piston adapted to compress explosive mixture at its same end, a distributer having longitudinally movable means within the same, said movable means having two chambers therein, one of said chambers communicating permanently with the explosive mixture supply and the other communicating permanently with the air supply, and means connected to said crank shaft for alternately communicating said chambers in said longitudinally movable means with said cylinders for charging and scavenging the same.

6. In a four cycle internal combustion engine comprising a pair of cylinders each having a piston therein connected to a crank shaft with one of said pistons adapted to compress air at one end of the same and the other piston adapted to compress explosive mixture at its same end, a distributer having a valve within the same, said valve having two chambers therein, one of said chambers communicating permanently with the explosive mixture supply and the other communicating permanently with the air supply, and means connected to said crank shaft for alternately communicating said chambers with said cylinders for charging and scavenging the same.

In testimony whereof, I the said SAMUEL D. SHAKLEY have hereunto set my hand.

SAMUEL D. SHAKLEY.

Witnesses:

D. N. GRILL,

S. H. HERBESON.