J. KERNER.

INTERNAL COMBUSTION ENGINE.

APPLICATION FILED AUG. 27, 1912.

1,082,341.

Patented Dec. 23, 1913.

2 SHEETS—SHEET 1.

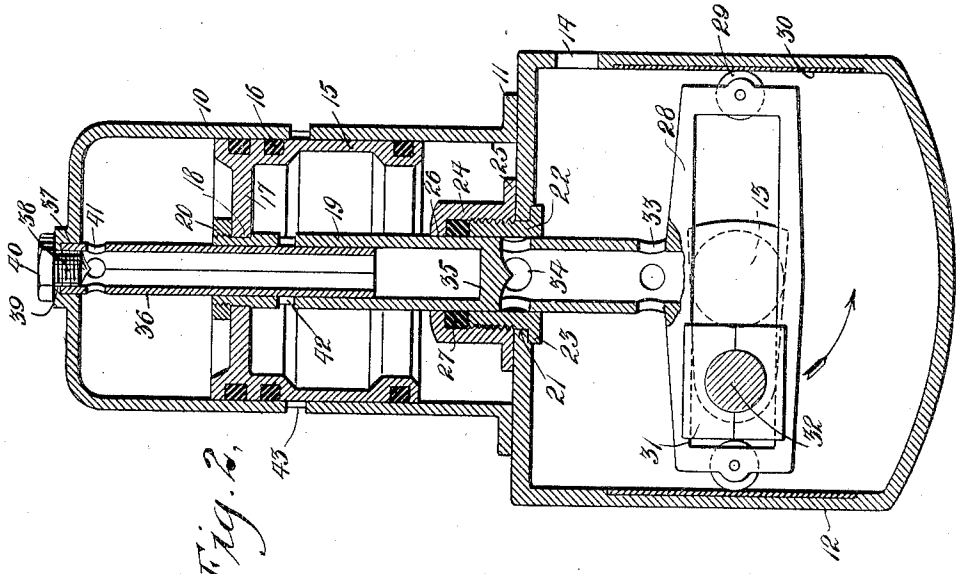


Fig. 2.

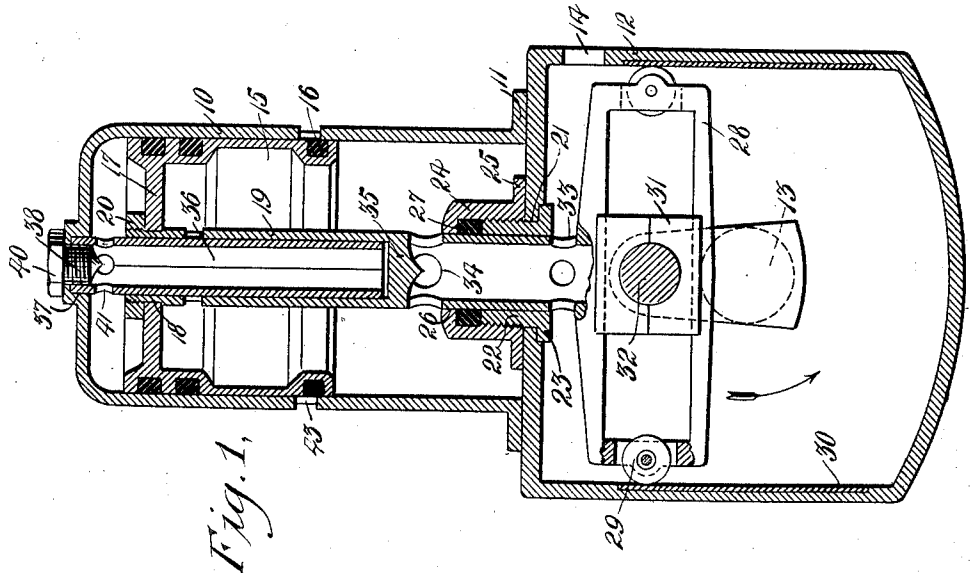


Fig. 1.

WITNESSES

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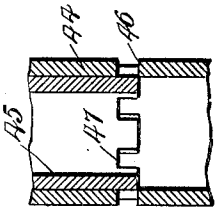
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2 SHEETS—SHEET 2.

Fig. 4.



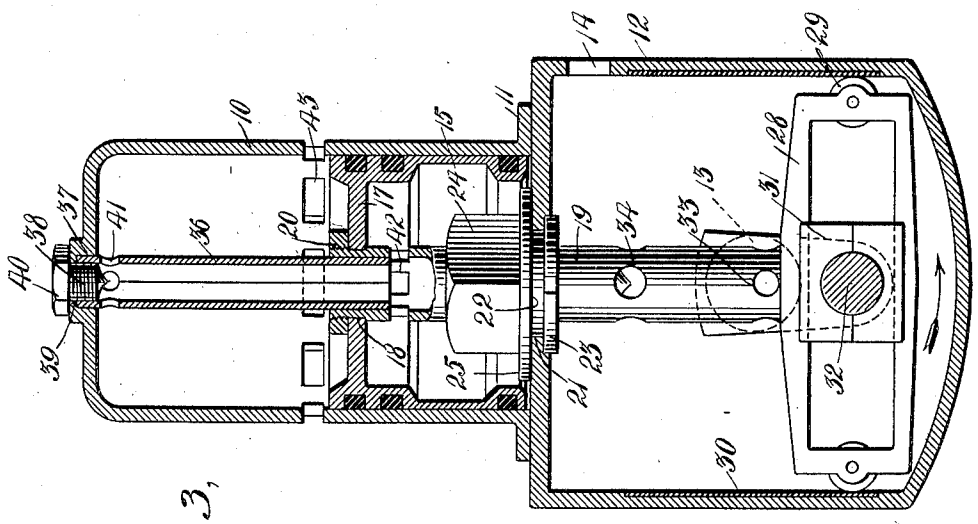


Fig. 3.

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INTERNAL-COMBUSTION ENGINE.

1,082,341. Specification of Letters Patent. Patented Dec. 23, 1913.

Application filed August 27, 1912. Serial No. 717,270.

To all whom it may concern:

Be it known that I, JOHN KERNER, a subject of the Queen of the Netherlands, and a resident of the city of New York, borough of Manhattan, in the county and State of New York, have invented a new and Improved Internal-Combustion Engine, of which the following is a full, clear, and exact description.

This invention relates to internal combustion engines and has reference more particularly to an engine of the two-cycle type which comprises a cylinder, a crank case closed with respect to the cylinder and a piston in the cylinder and having a piston rod intermittently effecting communication between the cylinder and the crank case.

The invention also relates to a two-cycle internal combustion engine in which the fuel is supplied to the cylinder through a hollow piston rod.

The invention furthermore relates to the provision in an engine of this type of a fixed hollow member and a hollow piston rod slidably associated and together affording means for introducing the fuel mixture into the cylinder.

An object of the invention is to provide a simple, strong and efficient two-cycle internal combustion engine which will develop great power in proportion to the fuel consumption, which is light in weight and compact in form, which may comprise any number of units each including a cylinder and the associate parts and which can be easily constructed and readily assembled.

A further object of the invention is to provide an invention of the class described in which leakage of the fuel mixture at the bearings of the crank case and at other points is obviated or minimized, in which the burnt gases are thoroughly exhausted from the cylinder at the end of each explosion stroke, in which escape of the fuel mixture through the exhaust port while the cylinder is being charged is prevented, and which is practically noiseless in operation owing to the absence of valves.

A further object of the invention is to provide a two-cycle internal combustion engine in which the fuel mixture is compressed not in the crank case, but in the cylinder itself at the under side of the piston, and in which the fuel mixture is subsequently after compression conducted to the working side of the piston through a hollow piston rod and a hollow fixed part with which the piston is slidably associated, and in which a plurality of exhaust outlets arranged around the cylinder are provided to insure the evacuation of the burnt gases from the cylinder.

The invention consists in the construction and combination of parts to be more fully described hereinafter and particularly set forth in the claims.

Reference is to be had to the accompanying drawings forming a part of this specification, in which similar characters of reference indicate corresponding parts in all the views, and in which—

Figure 1 is a vertical section of an engine constituting an embodiment of my invention, showing the piston at the beginning of the power stroke; Fig. 2 is a similar view showing the piston during the compression of the fuel mixture; Fig. 3 is a similar view showing the piston at the end of the compression stroke; and Fig. 4 is an enlarged fragmentary section showing a detail of modified construction.

Before proceeding to a more detailed description of my invention, it should be understood that while I have shown for example herewith an engine consisting of a single cylinder and its allied parts, any number of these units can be combined into a single motor. This can be used in motor vehicles, power boats and for other purposes.

Certain of the details of construction shown for example herewith constitute no part of the invention and can be varied in accordance with individual preference and special conditions without departing from the underlying spirit of the invention as defined in the appended claims.

Referring more particularly to the drawings, I provide a cylinder 10 of the usual general construction, having the lower end open and provided with a radially disposed flange 11 seated upon the top of a crank case 12. The latter has bearings of the usual construction for the crank shaft 13. It is provided with an opening 14 by means of which it communicates with a suitable carbureting device for supplying fuel mixture to the engine. Arranged within the cylinder is a piston 15 of somewhat elongated cylindrical form and provided with piston rings 16. The piston head 17 is at the upper end of the piston and has a cen-

tral opening 18 in which is received the upper end of a hollow piston rod 19. The projecting extremity of the piston rod is threaded and is secured in place by means of a correspondingly threaded nut or ring 20. The hollow piston rod extends into the crank case through an opening 21 in the upper part of the crank case and passes through a sleeve 22. The latter is threaded and projects upwardly into the cylinder having at the lower edge a laterally extended flange 23 which engages at the under side of the upper part of the crank case around the opening 21. A cap 24 having at the lower edge a radially extended flange is located within the cylinder and is screwed upon the sleeve 22 having a flange 25 which seats against the upper side of the crank case top. The cap has a central opening 26 through which the hollow piston rod passes. Packing 27 is located between the cap and the end of the sleeve 22 so that these parts in effect constitute a stuffing box. As a result, there is no direct communication between the crank case and the cylinder, the former being closed with respect to the cylinder and the piston rod alone affording communication between the crank case and the cylinder as will be pointed out hereinafter.

At the lower end, the piston rod has rigidly associated therewith in the crank case a laterally extended substantially rectangular cross-head 28 having at the ends rollers 29 contacting with bearing faces 30 arranged in suitably proportioned recesses of the crank case sides so that the cross-head is properly guided in the crank case as the piston reciprocates. A cross-head block 31 constituting a bearing and of the usual construction is slidably arranged within the cross-head. It constitutes a bearing for the crank 32 of the crank shaft 13. The hollow piston rod directly above the cross-head is provided with a plurality of inlet openings 33 and again a distance above these openings with outlet openings 34. Above the last mentioned opening is a partition 35 so that the hollow piston rod is divided into two parts which do not communicate.

Located within the cylinder is a centrally disposed hollow guide member 36 consisting of a split tube or like cylindrical member. It has its upper end rigidly mounted in a recess 37 in the head of the cylinder. A threaded stud 38 extends through an opening 39 of the cylinder head into the member 36, in the upper end of which it is screwed. It has a head 40 by means of which it can be manipulated. The hollow member 36 has at the upper end closely adjacent to the cylinder head a plurality of openings 41. The piston rod near its upper end within the piston has a plurality of openings 42 which may be of angular form. The cylinder itself near the center thereof has extending completely around it a plurality of exhaust openings 43 through which the burnt gases escape. It will be understood that if so desired, the cylinder may be provided with a water jacket and that an exhaust pipe is also preferably employed for conducting the escaping gases of combustion from the openings 43. The gases are ignited in any suitable manner, for example by means of an electric ignition system including a spark plug.

The operation of the engine is as follows: At the end of the travel of the piston toward the head end of the cylinder, a charge of fuel mixture enters the cylinder under the piston through the hollow piston rod and by way of the openings 33 and 34. The last mentioned openings are uncovered at the end of the upward stroke of the piston as is shown in Fig. 1. When the piston moves downward the openings 34 are again covered and the charge of fuel in the cylinder is compressed during the downward stroke. When the piston reaches the lower end of its travel, the openings 42 of the piston rod pass beyond the fixed member 36 and thus can communicate internally therewith. As a result, the compressed fuel passes through the openings 42 of the hollow piston rod into the hollow member 36 and through the openings 41 thereof into the space above the piston owing to the fact that the pressure above the piston is materially less than underneath it. At the same time the exhaust openings 43 have been uncovered as is shown in Fig. 3 and the burnt gases from the last explosion thus escape through the openings. The inrushing charge of fuel mixture also assists in expelling the burnt gases so that the cylinder is thoroughly scavenged. When the piston again moves upward, the fuel mixture is again compressed. It is subsequently exploded when the piston reaches the upper end of its travel and is again ready to begin a downward stroke. The reciprocation of the piston and piston rod is transformed into a rotary movement of the crank shaft in the usual manner. It will be understood that the end thrust in both directions of the cross-head is taken up by the sides of the crank case, against which the rollers 29 bear. The piston rod and the member 36 are so proportioned that they fit snugly together. Preferably the split member 36 is slightly compressed within the piston rod and tends to expand outwardly to form a tight joint.

In Fig. 4 I have shown a slight modification in which the hollow piston rod 44 is provided with openings 46 corresponding to the openings 42. The member 45 corresponds to the fixed member 36. It has at the lower end, however, a number of serrations 47 of angular form. By turning the

member 47 in one direction or the other, the amount of opening uncovered at 46 can be adjusted to regulate correspondingly the amount of fuel mixture which enters the piston at each stroke.

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

1. An internal combustion engine of the two-cycle type comprising a cylinder, a crank case associated therewith but closed with respect to said cylinder, a piston mounted to reciprocate within said cylinder, a hollow piston rod associated with said piston and extending into said crank case, and a packed joint about said piston rod at said crank case, said piston rod having means near the top and bottom thereof whereby communication is effected between said crank case and the cylinder at one side of the piston and between the two parts of the cylinder separated by the piston.

2. An internal combustion engine of the two-cycle type, comprising a cylinder, a crank case, a fixed hollow guide member in said cylinder, and a piston in said cylinder having a hollow piston rod slidably associated with said fixed member and extending movably into said crank case, said piston rod and said hollow member affording communication between said crank case and the cylinder at one side of the piston and between the two parts of the cylinder separated by the piston.

3. An internal combustion engine, comprising a cylinder, a piston therein, a crank case, a hollow piston rod associated with said piston and extending into said crank case, and a hollow fixed member within said cylinder slidably received within said hollow piston rod, said hollow piston rod and said fixed member having openings whereby fuel mixture can enter said cylinder under said piston from said crank case and pass to the other side of said piston.

4. An internal combustion engine, comprising a cylinder, a piston therein, a crank case, a hollow piston rod associated with said piston and extending into said crank case, and a hollow fixed member within said cylinder slidably received within said hollow piston, said hollow piston rod and said fixed member having openings whereby fuel mixture can enter said cylinder under said piston from said crank case and pass to the other side of said piston, said crank case and said cylinder being closed with respect to each other and communicating only through said piston rod, said piston rod having a partition therein dividing it into two parts closed with respect to each other, said cylinder having exhaust openings in the wall thereof.

5. An internal combustion engine comprising a cylinder, a piston therein, a crank casing, a hollow piston rod associated with said piston and extending into said crank casing, a packed joint on said crank casing projecting into said cylinder and engaged by said hollow piston rod, and a hollow fixed member within said cylinder slidably received within said hollow piston, said hollow member having openings near the top thereof, and said hollow piston rod having openings near the top and bottom thereof and openings intermediate said first openings, said crank casing and said cylinder being closed with respect to each other, the lower and intermediate openings in said hollow piston rod establishing communication between said crank casing and the lower end of said cylinder, and the openings in the upper portion of said hollow piston rod and the openings in said hollow member establishing communication between said lower portion of the cylinder and the upper portion of the cylinder, the portions being divided by said piston.

6. An internal combustion engine, comprising a cylinder, a piston therein, a crank casing, a piston rod associated with said piston and extending into said crank casing, said piston rod having two non-communicating central bores open at the extremities, said piston rod having openings near the top thereof into one of said bores and openings near the bottom thereof and intermediate the upper and lower openings into said second bore, a hollow fixed member within said cylinder slidably received within said first bore, said member having openings near the top thereof, and a packed joint on said casing engaging said piston rod, said crank casing and said cylinder being closed with respect to each other, said cylinder being divided into upper and lower parts by said piston therein, and the lower part of said cylinder communicating with said crank casing by means of the openings into said second bore of said piston rod, and the lower part of said cylinder communicating with the upper part of said cylinder by means of said openings in said first bore of said piston rod and the openings in the said hollow member.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

JOHN KERNER.

Witnesses:
W. N. TENER,
PHILIP D. ROLLHAUS.