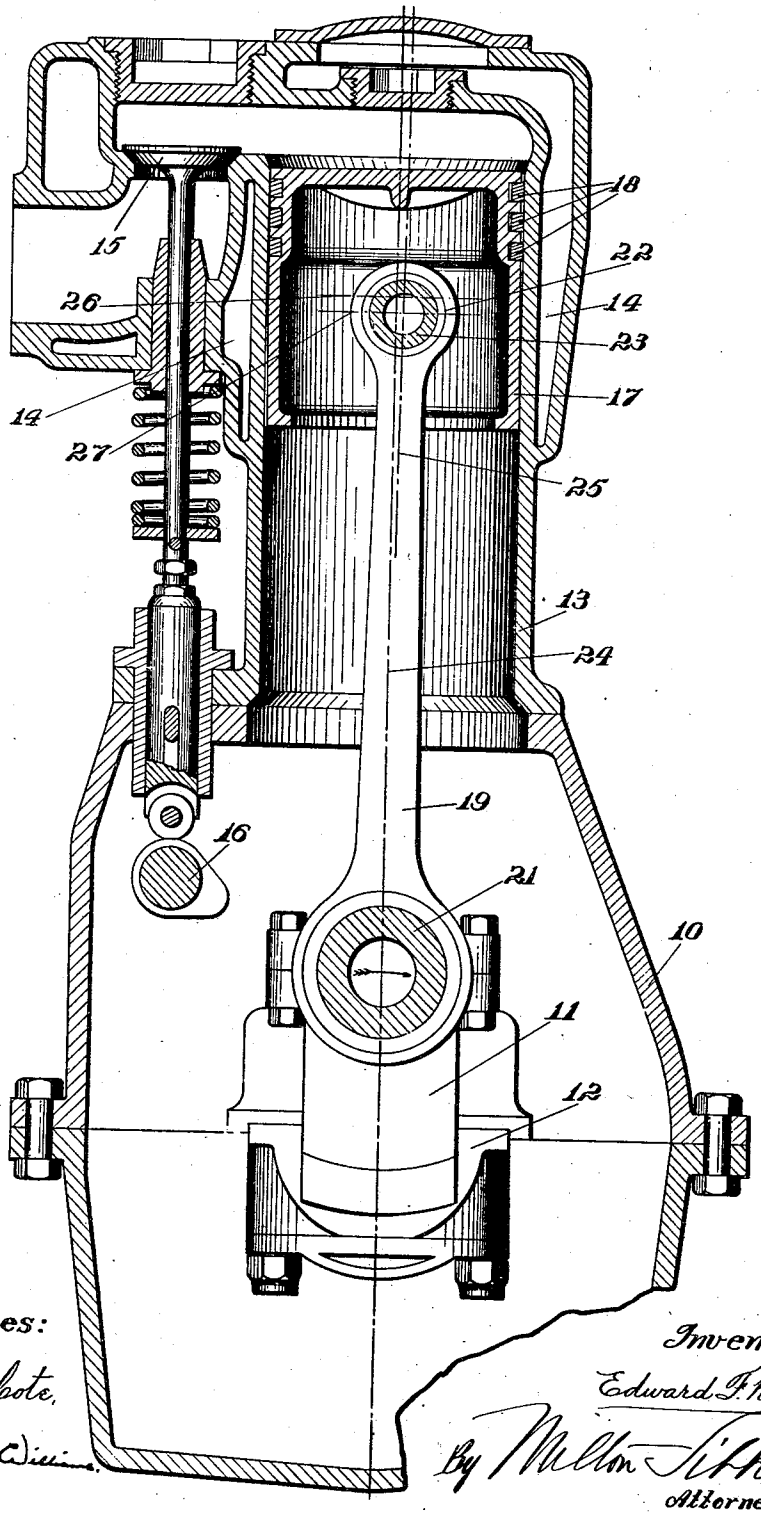
E. F. ROBERTS.

HYDROCARBON MOTOR.

APPLICATION FILED FEB. 23, 1915.

1,138,892.

Patented May 11, 1915.



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HYDROCARBON-MOTOR.

1,138,892. Specification of Letters Patent. Patented May 11, 1915.

Application filed February 23, 1915. Serial No. 9,982.

To all whom it may concern:

Be it known that I, EDWARD F. ROBERTS, a citizen of the United States, and resident of Detroit, Wayne county, State of Michigan, have invented certain new and useful Improvements in Hydrocarbon-Motors, of which the following is a specification.

This invention relates to hydrocarbon motors, and particularly to the cylinder, piston and connected parts. It is well known in hydrocarbon motors, and particularly in upright or vertical motors, that on the compression and exhaust or up or outward strokes of the piston, the latter tends, by reason of the angularity of the connecting rod and the pressure on top of the piston, to press closely against one side of the cylinder, causing all of the clearance to be between the opposite side of the piston and the cylinder. On the intake or first down or inward stroke there is probably little change in this respect as the piston is being pulled down by the connecting rod, unless perhaps the top of the piston may be rocked across to the opposite side by reason of the change in angularity of the connecting rod at the top of the stroke. But on the firing or second down stroke, that is, the stroke following the compression stroke, as soon as the crank pin passes dead center and the explosion occurs, the side pressure on the piston is immediately transferred from one side of the cylinder to the other, and if there is a small amount of play or looseness between the piston and cylinder, that is appreciable clearance as when the motor is cold, what is termed a "piston slap" results. In other words, this "flopping" of the piston from one side of the cylinder directly to the other at the moment of explosion causes a sharp click which is objectionable in motors for use in motor vehicles where quietness is very desirable. The piston of a hydrocarbon motor is usually connected to the motor crank shaft through a connecting rod which is journaled at its big end on the crank pin and is pivotally connected at its smaller end to the piston centrally of the latter.

One of the objects of the present invention is to provide means for opposing the rocking action of the piston on its support, usually the piston pin, at the top of the stroke.

Another object of the invention is to oppose or prevent the piston from rocking suddenly on its pin at the top of the stroke, thus eliminating a "slap" at that time.

Another object of the invention is to arrange the piston pin of a motor such as hereinafter described in offset relation with the center of the piston or cylinder, and preferably only slightly offset, to thereby retain the position of the piston at or near the top of its stroke and prevent its sudden rocking.

Another object of the invention is to produce a motor in which the piston will not rock or "slap" suddenly from one side of the cylinder to the other.

These and other objects of the invention are obtained in the motor illustrated in the drawing forming a part of this specification, and in which the figure is a vertical transverse section of a motor embodying one form of this invention.

In the drawing, the invention is illustrated in a strictly vertical hydrocarbon motor of the four cycle type. It is particularly applicable to this and other upright motors such as multiple cylinder motors of the V-type, as distinguished from horizontal motors.

Referring to the motor illustrated in the drawing, 10 represents the motor base or crank case and 11 is the crank shaft mounted in suitable bearings 12 of the crank case. Mounted upon or forming a part of the crank case is a vertical motor cylinder 13, having the usual water jacket 14, and valves such as 15 operated through suitable mechanism by the cam shaft 16. The cylinder shown is of single interior diameter and opens into the crank case. It is devoid of ports throughout its bore leaving an unbroken, usually ground, surface for the piston 17 to slide upon. This is a trunk piston of the single diameter type, being adapted substantially throughout its length to contact with the cylinder walls. Any desired number of piston rings 18 may be used. A connecting rod 19 has its big or lower end journaled or pivoted on the crank pin 21 of the crank shaft 11, in the usual manner, and its upper or small end 22 supports the piston through a pivotal connection comprising a piston pin 23.

Heretofore, it has been customary to have

the axis of the piston pin in line with the axis of the cylinder and in such construction, as suggested above, the angularity of the connecting rod relatively to the piston and cylinder tends to rock the piston suddenly from one side of the cylinder to the other as at the end of the compression and the beginning of the firing strokes. In the present motor, the piston pin 23 is offset relative to the axis of the cylinder as shown in the drawing thus causing the pressure on top of the piston to be unbalanced so that the piston is not free to rock to either side of the cylinder at the top of its stroke as is the case when the piston pin is centrally arranged. Preferably the pin is offset away from the side of the cylinder having the greatest pressure on the firing stroke, as shown, and for the purpose of accentuating the unbalanced condition of the piston, the pin is arranged below the middle of the piston. The broken line 24 is drawn through the center line of the cylinder, piston and crank shaft, the latter being arranged at right angles to the cylinder, and the line 25 is drawn through the center of the connecting rod 19, thus indicating the offset relation of the piston pin very clearly. The line 26 is drawn through the middle of the piston between its upper and lower ends and the line 27 through the center of the piston pin showing the latter as being arranged below the middle of the piston.

Experiments with various degrees of offset have proven that an offset of substantially one thirty-second of the diameter of the piston, or one-eighth inch on a four inch piston, gives excellent results, and in some motors anything more than one twenty-fourth is reaching toward the impractical. Also, it is desirable to arrange the pin substantially one sixteenth of the length of the piston below the center thereof. It will be seen from the drawing, which shows the clearances exaggerated, that this construction tends to oppose the rocking of the piston on its pin at the top of the stroke, and cause it to maintain its position.

It will be understood that the invention is not limited to the exact details of construction shown as it will be apparent that changes may be made without departing from the spirit or scope of the invention.

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

1. In a hydrocarbon motor, the combination with the cylinder and a piston adapted to have play therein, of means including a pivotal connection laterally offset only slightly from the axis of the piston and opposing rocking action of the piston on its support at the top of the stroke.

2. In a hydrocarbon motor, the combination with a vertical cylinder and a piston arranged to slide therein, of a piston pin connection offset only slightly from the axis of the cylinder and piston for the purpose set forth.

3. In a hydrocarbon motor the combination with a vertical cylinder and a piston arranged to slide therein, of a piston pin connection offset only slightly from the axis of the cylinder on that side away from the side of the cylinder having the greatest pressure on the firing stroke.

4. In a hydrocarbon motor the combination with the cylinder and a piston smaller than the cylinder and sliding therein with a small amount of play, of a connecting rod, and a pivotal connection between the piston and connecting rod offset only slightly from the axis of the piston, for the purpose described.

5. In a hydrocarbon motor, the combination of a cylinder, a piston arranged to slide therein, a crank shaft arranged at right angles to the cylinder axis, and a connecting rod journaled at its lower end to a crank of said shaft and at its upper end to the piston, the piston pivot being laterally offset only slightly from the center of the piston.

6. In a hydrocarbon motor, the combination of a cylinder, a piston arranged to slide therein, a crank shaft having its axis arranged approximately intersecting the axis of the cylinder, and a connecting rod journaled at its lower end to said crank shaft and at its upper end to said piston, the piston pivot being laterally offset only slightly from the center of the piston.

7. In a hydrocarbon motor, the combination of a vertical cylinder, a piston arranged to slide therein, a crank shaft having its axis arranged approximately intersecting the axis of the cylinder, and a connecting rod journaled at its lower end to said crank shaft and at its upper end to said piston, the piston pivot being laterally offset only slightly from and arranged below the center of the piston.

8. In a hydrocarbon motor the combination with the cylinder, a single diameter valveless trunk piston sliding therein, and a crank shaft arranged at right angles to the cylinder axis, of a connecting rod journaled to a crank of said shaft, and a direct offset pivotal connection between the piston and connecting rod.

9. In a hydrocarbon motor, the combination with the crank case, a single diameter cylinder mounted thereon and having its full diameter opening into the crank case and a trunk piston sliding in said cylinder and adapted substantially throughout its length to contact with the walls of said cylinder, and a crank shaft mounted on the crank case at right angles to the cylinder axis, of a connecting rod journaled to a

crank of said shaft, and a direct offset pivotal connection between the piston and connecting rod.

10. In a hydrocarbon motor the combination with the crank case, a cylinder mounted thereon, a valveless trunk piston sliding in said cylinder, said cylinder being devoid of ports opening beneath the piston at any point in its stroke whereby the piston is entirely mechanically supported, and a crank shaft mounted in the crank case at right angles to the cylinder axis, of a connecting rod journaled to a crank of said shaft, and a direct offset pivotal connection between the piston and connecting rod.

11. In a hydrocarbon motor, the combination with a cylinder, a piston arranged to slide therein, and a connecting rod having a pivotal connection with said piston, said connection being offset from the axis of the piston substantially one thirty-second of the diameter of the piston.

12. In a hydrocarbon motor, the combination with a cylinder, a piston arranged to slide therein, and a connecting rod having a pivotal connection with said piston, said connection being offset from the axis of the piston not more than one twenty-fourth of the diameter of the piston.

13. In a hydrocarbon motor, the combination with a cylinder, a piston arranged to slide therein, and a connecting rod having a pivotal connection with said piston, said connection being offset from the axis of the piston substantially one thirty-second of the diameter of the piston, and arranged below the center of the piston approximately one sixteenth of the length of the piston.

14. In a hydrocarbon motor, the combination of a cylinder, a piston adapted to slide therein, a crank shaft having its axis intersecting the axis of the cylinder, and a connecting rod pivotally connected at one end to said crank shaft and at the other end to said piston, the axis of the piston connection being offset only slightly from the axis of said crank shaft.

15. In a hydrocarbon motor, the combination of a cylinder, a piston adapted to slide therein, a crank shaft having its axis intersecting the axis of the cylinder, and a connecting rod pivotally connected at its lower end to said crank shaft and at its upper end to said piston below the middle of the piston, the axis of the piston connection being offset only slightly from the axis of said crank shaft.

16. In a hydrocarbon motor, the combination with the cylinder and a piston adapted to have play therein and having its head end formed substantially normal to its sides, of means including a pivotal connection laterally offset only slightly from the axis of the piston and opposing rocking action of the piston on its support at the top of the stroke.

In testimony whereof I affix my signature in the presence of two witnesses.

EDWARD F. ROBERTS.

Witnesses:
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CLAIR S. COTE.