

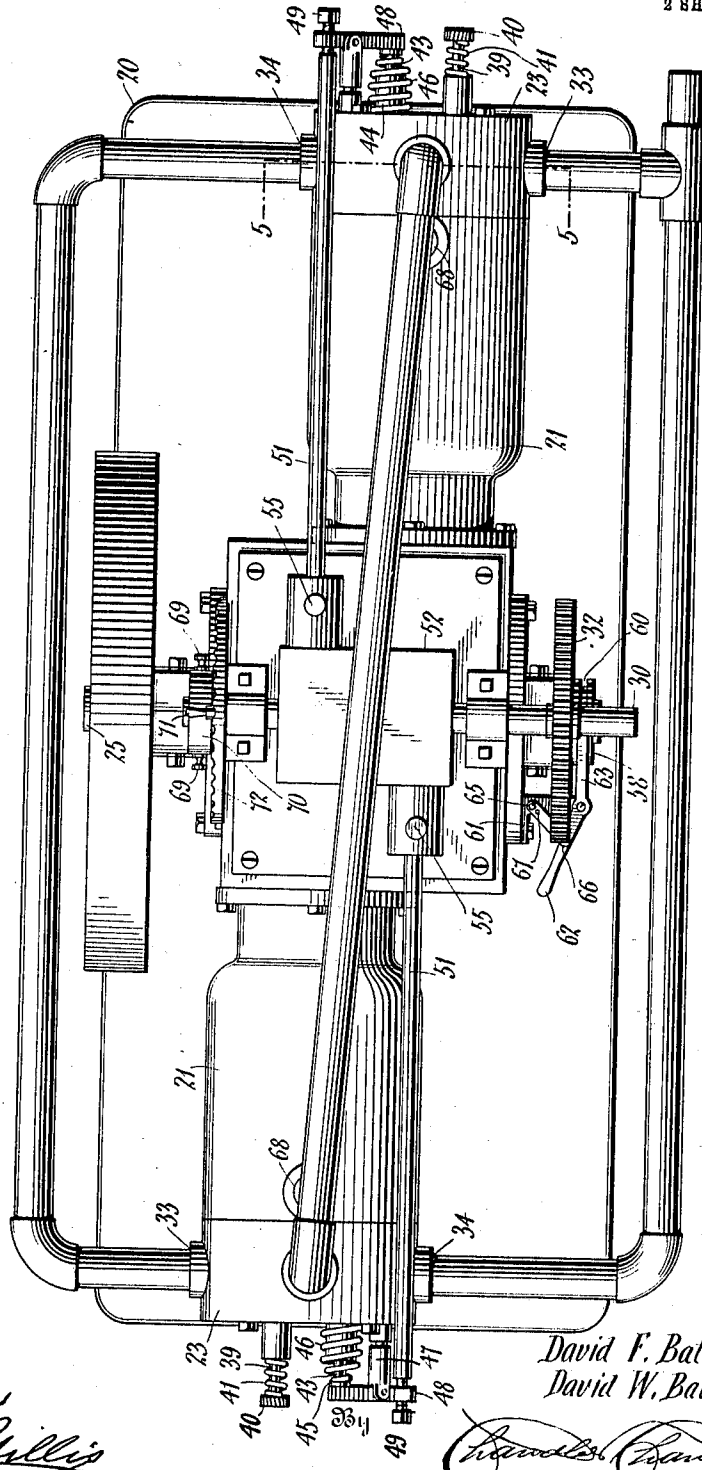
D. F. & D. W. BATTERMAN.
INTERNAL COMBUSTION MOTOR.
APPLICATION FILED SEPT. 16, 1909.

1,004,526.

Patented Sept. 26, 1911.

2 SHEETS-SHEET 1.

FIG. 1



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Witnesses

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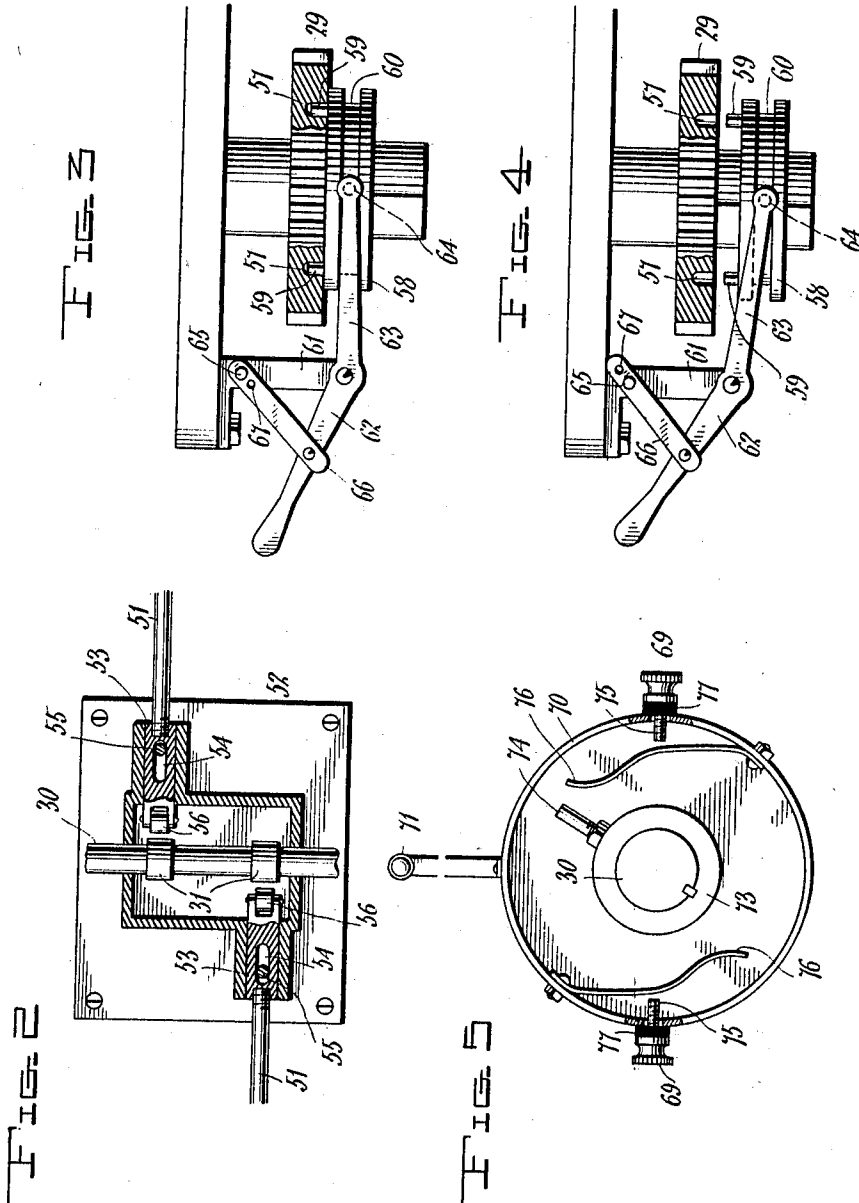
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UNITED STATES PATENT OFFICE.

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INTERNAL-COMBUSTION MOTOR.

1,004,526.

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To all whom it may concern:

Be it known that we, DAVID F. BATTERMAN and DAVID W. BATTERMAN, citizens of the United States, residing at Gettysburg, in the county of Adams, State of Pennsylvania, have invented certain new and useful Improvements in Internal-Combustion Motors; and we do hereby 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 internal combustion engines and has special reference to a reversible four cycle motor.

One object of the invention is to provide improved mechanism for operating the valves of an engine of this description, the mechanism being so arranged that the engine may be run in either direction as desired.

With the above and other objects in view, the invention consists in general of a four cycle explosive engine provided with novel means for controlling the valves and the spark.

The invention further consists in certain novel details of construction and combinations of parts hereinafter fully described, illustrated in the accompanying drawings, and specifically set forth in the claim.

In the accompanying drawings, like characters of reference indicate like parts in the several views, and:—Figure 1 is a top plan view of an explosive engine constructed in accordance with this invention. Fig. 2 is a longitudinal section through the guide casing shown in Fig. 1. Fig. 3 is a detail view partly in section showing the clutch mechanism by which the cycles of the engine are shifted. Fig. 4 is a view similar to Fig. 3 with the parts disengaged. Fig. 5 is a detail view of one form of timer mechanism adapted to be used in connection with this invention.

This engine is provided with the usual base 20 whereon are carried cylinders 21 having the usual water jackets 22 and these cylinders are each provided with a water jacket head 23. Mounted in suitable bearings 24 is a crank shaft 25 provided with cranks 26 which are arranged at an angle of 180 degrees from each other. It will be observed that these cranks are offset with re-

spect to each other so that the centers of the cylinders 21 are also offset with respect to each other. In each of the cylinders 21 there is provided the usual piston 27 and these pistons are connected to the respective cranks by means of connecting rods 28. Upon the shaft 25 is mounted a gear 29 and this gear is revoluble on the shaft. Supported in suitable bearings above the crank shaft is a cam shaft 30 whereon are mounted cams 31. There is also mounted on this cam shaft a gear 32 which meshes with the gear 29 and the gear 32 has a pitch diameter double that of the gear 29 so that the latter gear revolves twice to each revolution of the gear 32.

The piston head for each of the cylinders is provided with an inlet passage 33 and an exhaust passage 34. The inlet passage 33 terminates in an inlet port 35 while the exhaust passage terminates in an exhaust port 36. An inlet valve 37 is normally seated in the inlet port 35 and the stem of this valve extends through a suitable bonnet 38 supported on the head. The stem 39 of this valve is further provided with a collar 40 on its upper end and between the collar and the valve bonnet is held a spring 41 which serves to keep the valve 37 closed except during the suction stroke of the respective piston, the spring being of such strength as to yield under the influence of the suction stroke and permit the valve to suck open and admit a charge of explosive mixture to the cylinder. Each of the cylinders is further provided with an exhaust valve 42 having a stem 43 which projects outward through a bonnet 44 carried on the head and this valve stem is likewise provided with a collar 45. A spring 46 surrounds the valve stem and bonnet and normally holds the valve closed except during the exhaust stroke when the valve is opened by certain mechanism now to be described.

On each of the heads 23 there is provided a bracket 47 where to is pivoted a lever 48 one end of which lies against the collar 45 while the other end of this lever is provided with a threaded aperture where through passes an adjusting bolt 49, the point of which bears in a recess 50 formed in the end of a valve rod 51. At 52 is a guide casing and slidable in guides formed in this casing are cross heads 53 which have slots 54 extending therethrough. Bolts 55

pass through the casing and through these slots so that the movement of the cross heads is limited. Each of these cross heads is connected to one of the valve rods 51 and the cross heads are further provided with rollers 56 which are so positioned as to be engaged by the respective cams 31 as the shaft 30 rotates. Now, in order to lock the gear 29 in position on the shaft 25 this gear 29 is provided with certain recesses 57 and on the shaft is splined a disk 58 provided with pins 59 which are adapted to enter the recesses 57 when the disk is slid toward the gear 29. The recesses 57 are so positioned in the gear and the pins 59 so positioned on the disk that the gear may be revolved through 180 degrees between the two points at which the pins are engageable in the recesses. In order to slide this disk to or from the gear the disk is provided with a peripheral groove 60, and there is mounted on a bracket 61 secured to the engine a shipper lever 62 having a forked end 63 provided with inwardly extending pins 64 which fit in the groove 60. On the bracket 61 is a pin 65 and pivoted to the lever 62 is a locking bar 66 having perforations 67 through the free end, these perforations being engageable over the pin 65 so that the lever will be held in position accordingly as to whether it is desired to hold the disk in engagement with the gear or to hold the disk out of engagement with said gear.

There will now be described one form of timer mechanism adapted to be used in connection with this invention, it being understood that the same is merely typical of any such mechanism as can be used with an engine of this type and forms no part of the present invention. At 68 are provided the usual spark plugs and one terminal of each of these plugs is connected to a battery or magneto by suitable wire while the other terminal is connected to one of the binding posts 69 carried on a disk 70 which is revolvable on the shaft 30. Connected to this disk 70 is an operating handle 71 and this operating handle bears against a notched segment 72 mounted on the engine. Fixed upon the shaft 30 is a collar 73 projecting from which is a pin 74. The binding posts 69 are provided with extended contact ends 75. Attached to the disk 70 are spring members 76 which, when the pin 74 revolves, are struck by that pin and moved so as to make contact with the end 75 of the respective binding post. It is to be understood that these binding posts are insulated from the disk by means of suitable insulation 77 and that when the contact is made the circuit will be closed and the sparking terminal which is connected to that binding post will be grounded thus causing the spark to pass. By properly positioning the handle 71 on the quadrant it is possible to advance or retard

the spark as the change of position moves the disk to such point that the contact is made sooner or later as may be desired. It is also to be observed that the other pole of the battery or magneto which is not connected to the spark is grounded in the usual manner.

Now, in the operation of this device, if the engine be running in the direction of the hands of a clock when looked at as in Fig. 3, the shaft 30 will be turning in the opposite direction. Now, let it be supposed that the position of the pistons illustrated in Fig. 3 is that in which the spark has just passed between the sparking terminals on the right hand side of that figure. This will then be the beginning of the explosion stroke. As the right hand piston is moving through the explosion stroke the left hand piston is moving through the suction stroke. This of course draws open the inlet valve for the left hand cylinder and admits an explosive charge to that cylinder. Meanwhile the shaft 30 has revolved so that one of the cams 31 is turned to engage the roller 56 of the right hand valve rod just as the right hand piston reaches the end of its stroke. As the cam engages the roller 56 it forces the valve rod toward the right and opens the exhaust valve. The right hand piston now makes the exhaust stroke while the left hand piston makes the compression stroke. At the completion of the exhaust stroke by the right hand piston the cam 31 has revolved sufficiently to permit the valve rod 51 to be forced back by the respective spring 46 thus closing the exhaust. Meanwhile the rotation of the shaft 30 has revolved the collar 73 so that the pin 74 closes the circuit for the left hand spark plug and as the end of the stroke is reached the spark passes between the terminals of this spark, the exact time of passing of the spark being regulated by shifting the handle 71 on the quadrant. The left hand piston now passes through the explosion stroke while the right hand piston passes through the suction stroke. The other cam 31 now engages with the left hand roller 56 and opens the left hand exhaust valve for the exhaust stroke of the left hand piston. Now, if it be desired to run the engine in the opposite direction it is necessary that the explosion take place at practically the same point in the revolution of the shaft 30. It is therefore necessary that the cycle be shifted forward or backward 180 degrees since the change in the left hand cylinder will be that between beginning with the suction stroke and beginning with the explosion stroke. In order to accomplish this the lever 62 is operated to release the gear 29 from the shaft 25. This being done, either the cam shaft 30 is rotated 180 degrees or the engine itself turned over 180 degrees. The lever

62 is again operated to clutch the gear 29 to the shaft and the engine started. This will cause the first movement in the left hand cylinder to be an explosion stroke and as the shaft 30 rotates during this stroke it will open the exhaust at the end of the stroke. It will thus be seen that the engine may operate in either direction, it being obvious that the exact time of sparking is shifted to agree with the direction in which the engine is run.

There has thus been provided a simple and efficient device of the kind described and for the purpose specified.

It is obvious that minor changes may be made in the form and construction of this invention without departing from the material principles thereof. It is not therefore desired to confine the invention to the exact form herein shown and described, but it is wished to include all such as properly come within the scope of the appended claim.

Having thus described the invention, what is claimed as new, is:—

In an internal combustion motor, a plurality of cylinders, a crank shaft, a cam shaft parallel with said crank shaft, a gear

on the crank shaft rotatable with respect to said crank shaft, clutch means mounted on the crank shaft to rotate therewith and adapted to engage said gear to the shaft in selected positions whereby the gear may be rotated on said shaft to a plurality of positions and be held to rotate with the shaft in any of said positions, a second gear on the cam shaft constantly meshing with the first mentioned gear whereby rotation of the first mentioned gear independently of the crank shaft will rotate the cam shaft independently of the crank shaft; in combination with a timer having a rotating element fixed upon the cam shaft, and a contact for each cylinder whereby the change of position of the gear on the crank shaft simultaneously effects change of angular relation between the rotating and fixed elements of said timer.

In testimony whereof, we affix our signatures, in presence of two witnesses.

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Witnesses:

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Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."