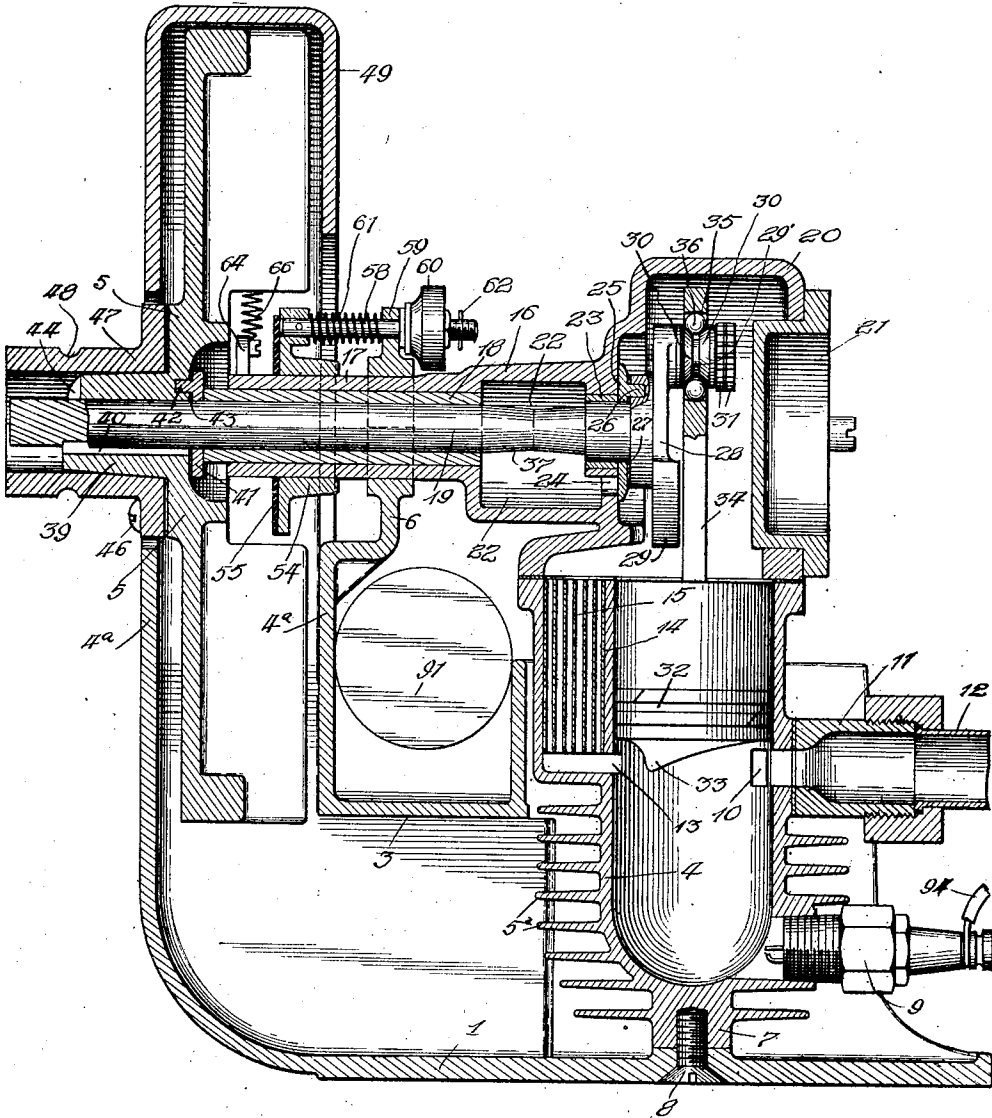


H. L. THOMPSON.
INTERNAL COMBUSTION ENGINE.
APPLICATION FILED APR. 18, 1917.

1,342,976.

Patented June 8, 1920.
4 SHEETS—SHEET 1.

Fig. 1.

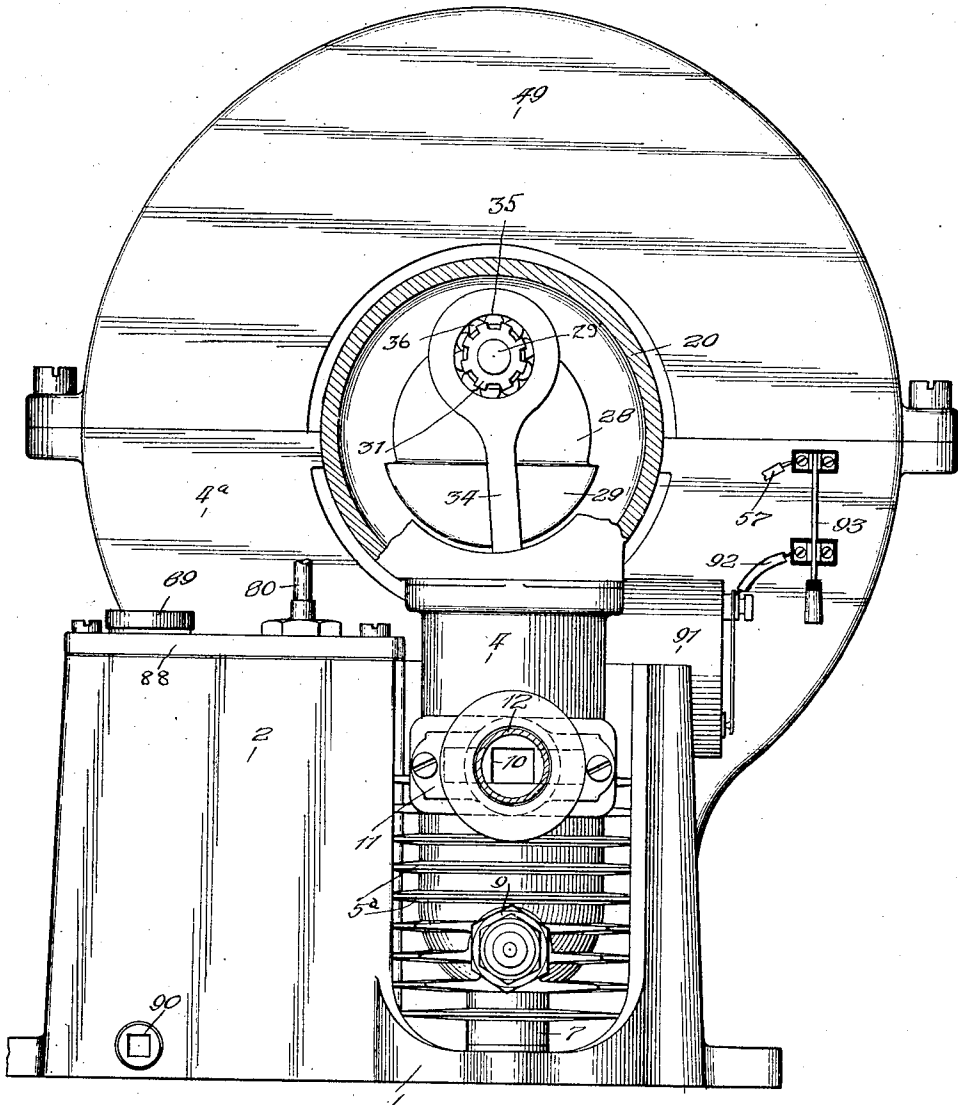


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Fig. 2.



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Fig. 3.

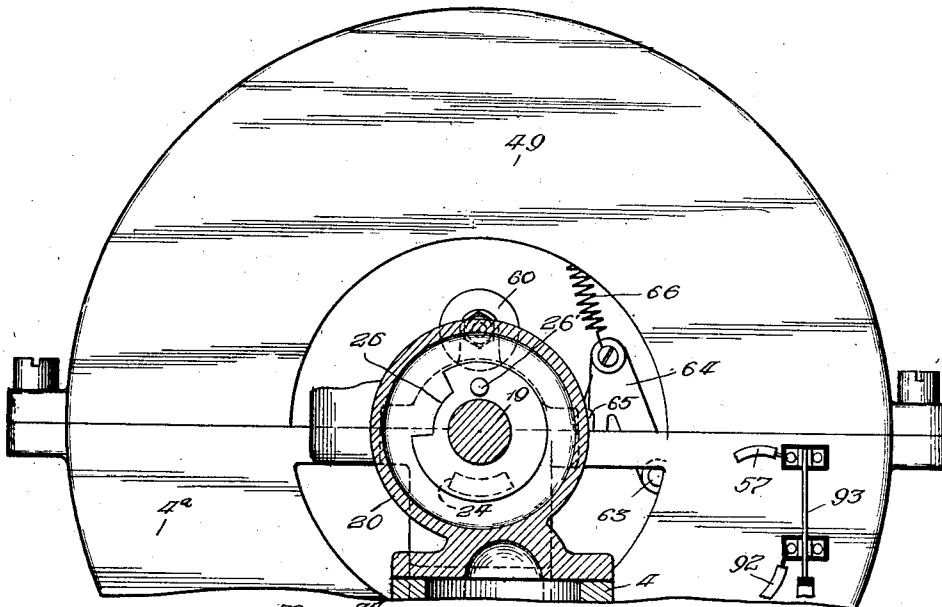
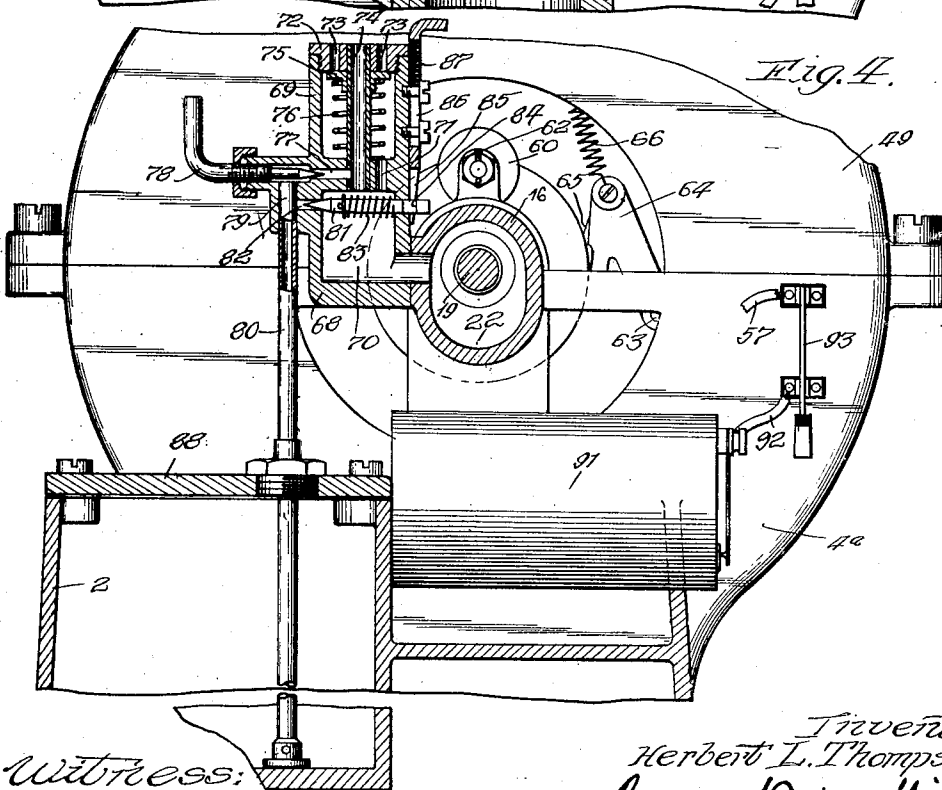


Fig. 4.



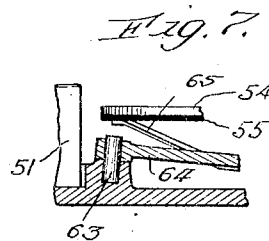
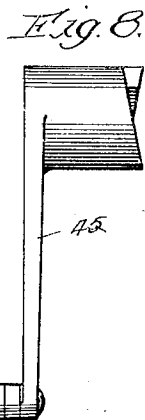
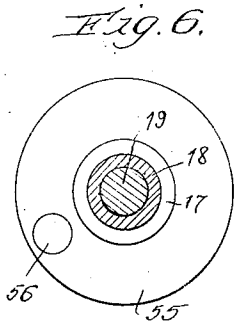
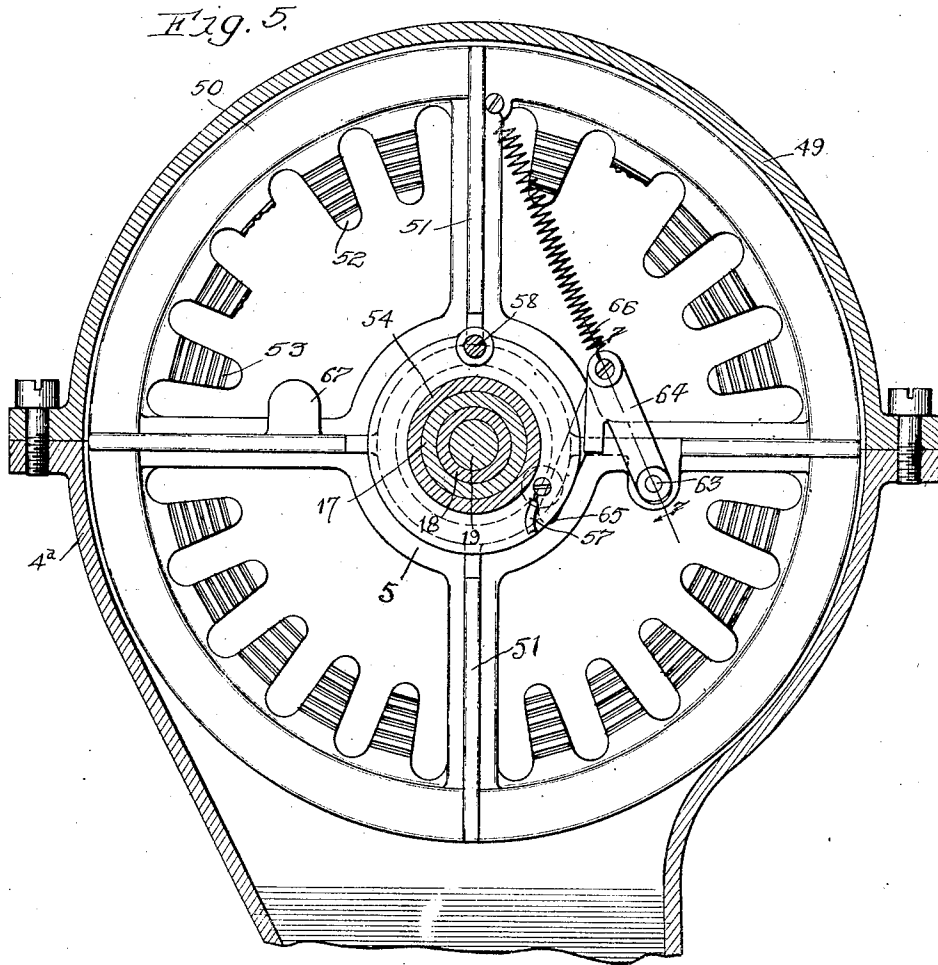
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1,342,976.

Patented June 8, 1920.
4 SHEETS—SHEET 4.



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UNITED STATES PATENT OFFICE.

HERBERT L. THOMPSON, OF ELGIN, ILLINOIS.

INTERNAL-COMBUSTION ENGINE.

1,342,976.

Specification of Letters Patent.

Patented June 8, 1920.

Application filed April 18, 1917. Serial No. 162,826.

To all whom it may concern:

Be it known that I, HERBERT L. THOMPSON, a citizen of the United States, residing at Elgin, in the county of Kane and State of Illinois, have invented certain new and useful Improvements in Internal-Combustion Engines, of which the following is a specification.

This invention relates to an air cooled gas engine of the two-cycle type and one of the principle objects is to provide an engine which is simple, durable and inexpensive in construction and effective and efficient in operation. The invention consists in the features of novelty in the construction, combination and arrangement of the several parts.

In the accompanying drawings, Figure 1 is a sectional view of an engine constructed in accordance with the principles of this invention; Fig. 2 is an end view with some of the parts omitted; Fig. 3 is an end view of the opposite end of the engine; Fig. 4 is a cross sectional view showing the carburetor construction; Fig. 5 is a view showing the construction of the fly wheel and the governor device; Fig. 6 is a view of the governor contact device; Fig. 7 is a sectional view taken on the line 7-7 of Fig. 5, and Fig. 8 is a view of a starting crank.

This invention is designed and intended for use in small sizes, and being of the air-cooled type it can be made both light and strong, adapting it to be used as a portable engine. Generally speaking the fly wheel acts as a fan which drives a current of air through a passage provided in the base against a vaned cylinder, and the valve action is controlled by the rotation of the shaft which carries the engine crank and the fly wheel. The speed of the engine is controlled and regulated by a centrifugal device connected to the fly wheel and a movable ring carrying a contact with which the device coöperates. The engine bearings as well as the cylinder are lubricated by oil which is introduced into the fuel and is carried by it against the shaft and into the explosion chamber.

In the preferred construction a base member 1 is formed at one side with a receptacle 2 which constitutes a fuel receptacle and adjacent the receptacle is a passageway 3 at one end of which is an enlargement for containing an engine cylinder 4 which has cooling vanes 5^a. The other end of this passageway

3 turns upwardly into a casing 4^a which forms the lower half of a housing for a fly wheel 5. One side of the casing 4^a is formed with a hollowed bracket 6 which constitutes a bearing and a support for one of the main engine parts.

The engine cylinder 4 is supported in an inverted position and at the lower end it has a projection 7 with a threaded perforation into which a fastening screw 8 is inserted from the bottom of the base member 1 to hold the cylinder rigidly in place. Inserted through a suitable opening at the lower end of the cylinder is a spark plug 9. Intermediate the ends of the cylinder is a discharge port 10 having a fitting 11 to which a discharge pipe 12 is connected, and opposite the discharge port is an inlet port 13 at the bottom of a chamber 14 at the side of the cylinder which constitutes a bypass for fuel admitted to the cylinder. In this by-pass is a quantity or roll 15 of corrugated sheet metal or the like to prevent back-firing from the cylinder.

Attached to the upper end of the cylinder and mounted in the bracket 6 of the base 1 is a bearing member 16 which has a tubular portion 17 supported by the bracket 6 containing internally grooved bearing metal 18 within which is an engine shaft 19. At the end over the engine cylinder the bearing member is enlarged to form a crank housing 20 having an opening at the end closed by a removable tight plate 21. Between the ends of this bearing member and surrounding the shaft 19 is a mixing chamber 22 which is separated from the interior of the housing 20 by a bearing 23 which fits tightly around the shaft but has a port 24 to form communication with the interior of the housing 20. This port 24 is controlled by a valve 25 which surrounds the shaft and has a peripheral opening 26 (see Fig. 3) which registers with the port 24 as the shaft and the valve 25 are rotated. This valve 25 fits tightly over the shaft and has a projection 26' adapted to be inserted in a corresponding opening in an adjacent enlargement of the shaft so that the valve will be properly timed, and interposed between the enlargement of the shaft and the valve is a spring 27 which tends to press the valve in the direction of the port 24 and against bearing 23 thereby making a fluid tight connection around the shaft.

At this end of the shaft is a crank portion

28 circular in form with a counterweight 29 at one side. Projecting from the other side is a crank pin 29' upon which are bearing cones 30 which are adjusted and held in place by lock nuts 31. In the cylinder 4 is a piston 32 formed at the lower end with a baffle 33 to direct the fuel admitted at the port 13 downwardly in the cylinder thereby assisting in discharging the burnt gases from the discharge port 10. Connected to the piston 32 is a piston rod 34 which may be formed of a stamping with a circular opening 35 with concave edges which with the bearing cones 30 forms a race for the bearing balls 36, thereby constituting an easily adjustable bearing which is accessible from the end of the housing by simply removing the plate 21.

In that portion of the bearing member 16 which is designated as the mixing chamber 22, the shaft 19 has a portion 37 of reduced diameter tapering outwardly to the bearings 18 and 23. With this construction oil which is dropped or deposited upon the portion of reduced diameter is thrown outwardly along the shaft by centrifugal force until it reaches either of the bearings 18 or 23 so that these bearings and the shaft will be suitably lubricated.

At the outer end of shaft 19 is the fly wheel 5 formed with a hub portion 39 attached to the shaft by a key 40. Abutting the end of the bearing metal 18 and surrounding the shaft is a leak-proof ring 41 which has a projection 42 for holding it in connection with the fly wheel by a suitable perforation therein, and interposed between the ring and the fly wheel is a flat spring 43 which presses the ring against the end of the bearing metal 18 thereby preventing the admission of air to the mixing chamber 22 through the shaft opening in the bearing metal 18 even though the bearing metal becomes greatly worn by the shaft. The end of the hub 39 is formed with teeth or notches 44 which may be engaged by corresponding notches of a starting crank 45, as shown in Fig. 8. Surrounding the hub and attached thereto by fastening screws or bolts 46 is a pulley 47 having a groove 48 to accommodate it to flat and round belts.

Extending over the fly wheel and attached to the upper ends of the casing portion 4^a of the base 1 is an upper casing member 49. The inner and outer edges of this casing are rounded away sufficiently to allow the fly wheel parts to rotate freely therein and to allow the air to be drawn in at the center when the fly wheel is rotated. The upper portion of the casing acts only as a protection for this portion of the fly wheel, and as a top for the casing 4^a.

The fly wheel is formed with an outer rim 50 supported from the hub by means of spokes having vanes 51 and intermediate

the spokes are a number of tongues 52 extending radially inward and provided with a plurality of score marks 53 by means of which the tongues can be easily broken to assist in quickly balancing the fly wheel.

Mounted on the tubular portion 17 of the bearing member is a slidable collar 54 which has an insulating disk 55 on the face adjacent the fly wheel with a contact 56 (see Fig. 6) flush with the surface thereof to which an electric conductor 57 is connected on the rear side of the collar. Attached to the upper part of the collar is a threaded rod 58 which extends through an unthreaded opening in a cap plate 59 secured in place over the tubular portion 17 and attached at the sides to corresponding portions of the bracket 6. Mounted on the rod on the side of the cap plate opposite the collar is an adjusting nut 60 and interposed between them is a spring 61 so that the movement of the adjusting nut 60 causes a corresponding movement of the collar 54. The bracket 6 limits the movement of the collar in one direction and a pin 62 inserted through the end of the rod 58 limits the movement of the collar in the other direction.

Projecting from one of the spokes of the fly wheel is an inclined pin 63 upon which is pivoted a governor device 64 which has a spring contact finger 65 and is resiliently held against centrifugal movement by a spring 66 attached at one end to the governor device and at the other end to one of the adjacent spokes of the fly wheel. At the other side of the fly wheel is a counterweight 67 to partially balance the governor device. The finger 65 bears yieldingly against the insulating disk 55 and may make connection with the contact 56 upon each rotation thereof. However, when the speed of the fly wheel is increased the governor device will fly outwardly against the tension of the spring 66 moving the contact finger 65 outwardly so that the contact 56 will make an earlier connection at each rotation of the fly wheel thereby in effect advancing the spark, since the governor device is connected with the spark plug 9. The inclination of the pin 63 is such that when the speed of the fly wheel is unduly increased for the position at which the collar 54 is set, the contact finger 65 may upon the outward rotation of the governor device move entirely free or away from the insulating disk 55 so that it will not make connection with the contact 56. This, of course tends to reduce the speed of the engine in the well known manner, so that for any set position of the speed adjusting device comprising the collar 54 and the contact disk, the speed of the engine will be automatically maintained substantially constant. The resiliency of the contact finger 65 and the limitation of the movement of the collar 54 is such

that when the engine is at rest the contact finger will always make connection.

Connected with the fuel chamber 22 is a carbureter which comprises a casing 68 having an upper chamber 69 and a lower chamber 70 connected through a central partition by openings 71. At the top of the upper chamber is a plug 72 having perforations 73 and a central opening to receive a pipe 74 which extends downwardly through the central partition communicating with the lower chamber 70. Surrounding this pipe is a valve 75 held in place over the apertures 73 by a spring 76. Communicating with the interior of the pipe through the central partition is a passage 77 controlled by a needle valve 78. Extending downwardly from this passage is another passage 79 which is connected by means of a pipe 80 with the fuel receptacle 2 immediately below it. The bottom of the lower chamber is directly connected to the side of the fuel chamber 22 and extending across the upper end of the chamber 70 is a needle valve 81 for controlling a direct inlet 82 to the chamber 70 from the passage 79. This needle valve has a spring 83 tending to keep it closed and has a notch 84 at the outer end which is engaged by a beveled extremity 85 of a slide 86 connected to the side of the casing 68 and pressed upwardly by a spring 87 so that by moving the slide downwardly against the spring the needle valve 81 will be opened against the tension of its spring 83 thereby forming a direct communication from the fuel receptacle 2 through the pipe 80 to the chamber 70 without passing the needle valve 78 as in the ordinary operation. The receptacle 2 is provided with a removable lid 88 which has a filling plug 89 and with a drain plug 90 at the bottom thereof.

Between the casing 4^a and the engine cylinder and below the bracket 6 is a space 45 for the insertion of a spark coil 91 which is connected by a conductor 92 and through a switch 93 to the conductor 57 which is connected with the contact 56. Another conductor 94 extends from the spark coil to the spark plug 9 and the spark coil, of course, is connected to a suitable source of current supply, such as a battery.

In operation it may be advisable to move the speed controlling collar somewhat nearer the fly wheel in starting the engine then to increase the speed by turning the thumb screw 60. To start the engine the hand crank 45 is inserted within the pulley 47 and rotated until its teeth are in engagement with the teeth 44 of the hub and at the same time the end of pipe 74 and the opening 73 at the top of the carbureter may be covered by the hand or thumb of the operator after first opening the needle valve 81 by pressing downwardly on the slide 87, so

that when the fly wheel of the engine is turned over with the other hand, the suction produced by the engine piston will cause fuel to be drawn upwardly from the receptacle 2 directly into the lower chamber 80 of the carbureter and from there it will pass through the fuel chamber 22, into the housing at the end of the bearing member 16 which will be termed the compression chamber, through the valve port 24. This will introduce a very rich mixture into the compression chamber of the engine, which will be forced downwardly through the by-pass 14 into the engine cylinder where it will be ignited by a spark from the spark plug 9 at the proper time. When the engine has been turned over once or twice, or as soon as the engine has received one or two impulses, the thumb or covering for the top of the carbureter can be removed and the slide 86 is moved upwardly by its spring to allow the needle valve 81, to be closed by its spring, after which the fuel will pass to the carbureter through the passages controlled by the needle valve 78. If the tube 74 does not admit sufficient air, the valve 75 will be automatically opened against the tension of its spring 76 so that more air can be admitted to the carbureter under certain conditions as for example at high speed. After the engine has been started, the speed can be varied or regulated by the rotation of the thumb screw 60.

A partial compression of the fuel mixture is obtained in the compression chamber when the piston 32 is on its upward movement which causes the mixture to flow through the inlet port 13 of the engine cylinder as soon as it is uncovered by the piston 32 and as the incoming fuel mixture strikes the baffle 33 of the piston it aids in expelling the previously exploded charge from the engine cylinder through the exhaust port 10, this port being closed before any substantial portion of the new fuel charge can escape. The engine can be stopped by opening the switch 93.

This engine has few parts and they are designed and arranged to require a minimum of machine work and fitting; the engine being light and portable is therefore adapted to be used for driving any device for which it has sufficient power; the fly wheel and the base member are both castings; and the fly wheel is even provided with cast tongues which may be easily broken therefrom for balancing it instead of boring holes therein as in the present practice where the fly wheels are balanced. All of these features combine to reduce the cost of manufacture and assembly and the reduction in the number of parts simplifies the construction rendering it more durable and efficient.

I claim:

1. In a gas engine, the combination of a

collar having an electrical contact thereon, a centrifugal electrical contact member mounted for movement on a pivot inclined to the axis of the collar and adapted to engage the contact on said collar, and means for moving the collar toward and away from the centrifugal contact to control the engine speeds.

2. In a gas engine, the combination with a centrifugal contact member with an inclined pivot, of a collar having a relatively fixed contact adapted to be engaged by the contact member, and means for rotating the contact member whereby its rotation makes and breaks its engagement with the said contact in accordance with its speed of rotation.

3. In a gas engine, the combination with a centrifugal contact device having a resilient contact finger and pivoted on an inclined pin, of a collar slidable toward and from the device having a contact thereby adapted to be variably engaged or free from engagement with the finger, means to limit the movement of the collar, and means to rotate the said device to advance or retard the engagement of the contact finger with the said contact in controlling the speed of the engine.

4. In a gas engine, the combination with a centrifugal device having a resilient contact finger, a collar having a contact adapted to be engaged by the finger, and means for rotating the said device comprising an inclined pin upon which the device is pivoted so that the contact finger will be moved relatively toward and from the said contact in accordance with its speed of rotation to maintain the speed of the engine constant.

5. In a gas engine, a rotatable part having an inclined bearing pin and an adjustable collar having an electrical contact in the face thereof, in combination with a centrifugal contact member pivoted to the rotatable member on the inclined bearing pin and having a movable finger carried thereby adapted to be advanced in accordance with its speed of rotation to relatively vary its time of engagement with the said contact, and to be moved out of position to engage the contact because of the inclination of the pin, a spark plug, a source of current supply, and means for connecting the engine spark plug with the source of electric current supply through said contact member.

6. In a gas engine, the combination with a rotatable member and a slidable collar for controlling the engine speed having its surface at right angles to the axis of the rotatable member and spaced slightly therefrom, a spark plug, and means controlling the supply of electric current to the spark plug, said means comprising a contact on the collar, and a centrifugal member pivoted on the said rotatable member to swing in a

plane at an acute angle to said surface of the collar and adapted to make or break periodic engagement with the contact of the collar.

7. In a gas engine, the combination with a rotatable member, of a collar at right angles to the axis of rotation thereof, the said collar having a contact in the face thereof, a spark plug, means for completing an electric circuit through the engine spark plug comprising a centrifugal device carried by the rotatable member having a contact finger adapted to make periodic engagement with the contact member and movable out of the plane thereof to prevent contact and over the contact member in accordance with its centrifugal action to advance or retard the completion of an electric circuit to the engine spark plug.

8. In a gas engine, the combination with a rotatable member, of a fixed member having an electric contact spaced from the rotatable member, a spark plug, and means for periodically completing an electric circuit through the engine spark plug and the contact, said means comprising a centrifugal device pivoted on the rotatable member, and an inclined bearing pin upon which said device is pivoted whereby the centrifugal device may be rotated away from the said fixed contact when sufficient speed is attained.

9. In a speed control device for gas engines, the combination with a rotatable member, of an insulating disk having a face at right angles to the axis of rotation of said member, and having a contact member in the face of the disk, a centrifugal device pivoted on the rotatable member having a spring finger adapted to make periodic engagement with the said contact, but movable by centrifugal action out of the plane of the said contact when said member attains a predetermined speed of rotation.

10. In a speed control device for gas engines, the combination with a rotatable member, of an adjustable insulating disk having a face at right angles to the axis of the member and a contact member in the face of the disk of a centrifugal device carried by the rotatable member having a spring finger for engaging the said contact, and an inclined pin upon which the centrifugal device is pivoted in a direction to rotate the finger clear from the disk at any set position when a predetermined speed of rotation is attained.

11. In a speed controlling device for gas engines, the combination with a rotatable member, of a slidable collar having an insulating surface at right angles to the axis of said rotatable member, with a contact in the face of the insulating surface, a centrifugal speed controlling device pivoted on the rotatable member to swing in a plane at an

angle to the insulating surface of the collar and having a spring finger adapted to make and break periodic engagement with the said contact, and means for advancing and withdrawing the collar with respect to the centrifugal device.

12 In a gas engine, the combination with a bearing member having a tubular portion, of means for supporting the bearing member at the tubular portion, a rotary member mounted in the tubular portion, a collar slidable on the tubular portion, means in connection with the said supporting means for sliding the collar on the tubular portion, an insulating disk carried by the collar, having a face at right angles to the axis of the rotary member, a contact in the face of the disk, a fly wheel carried by the rotary member, a centrifugal device pivoted on the fly wheel and comprising a spring contact finger for making electrical connection with the said contact upon each rotation of the fly wheel, and an inclined bearing pin upon which the device is pivoted for moving the contact finger out of engagement with the disk when a predetermined speed of rotation

is attained, the centrifugal movement of the device causing the contact finger to be rotated to advance the point of periodic connection with the contact of the said disk upon each rotation of the fly wheel.

13. In a gas engine, the combination with a centrifugal device having a resilient contact finger, a slidable collar having a contact adapted to be engaged by the finger, means for rotating the said device comprising an inclined pin upon which the device is pivoted so that the contact finger will be moved relatively toward and from the said contact in accordance with the speed of rotation for which the collar has been set, and means for moving the collar to different set positions relatively to the device for different speeds of rotation.

In testimony whereof I have signed my name to this specification, on this 16th day of April A. D. 1917.

HERBERT L. THOMPSON.

Witnesses:

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