Jan. 30, 1923. 1,443,719.

C. S. SCHOTT.

INTERNAL COMBUSTION ENGINE.

FILED OCT. 15, 1921. 4 SHEETS—SHEET 1.

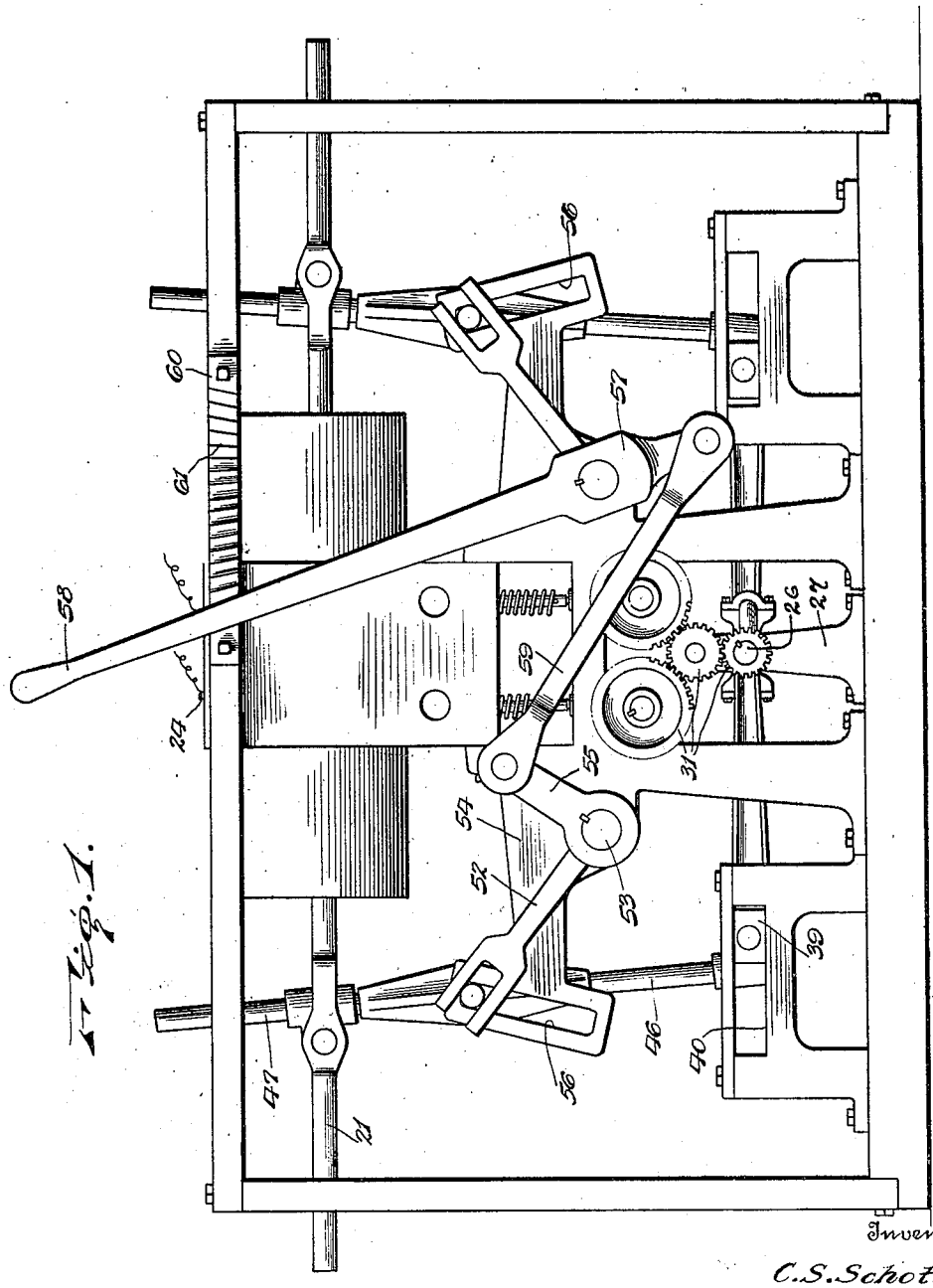


Fig. 1.

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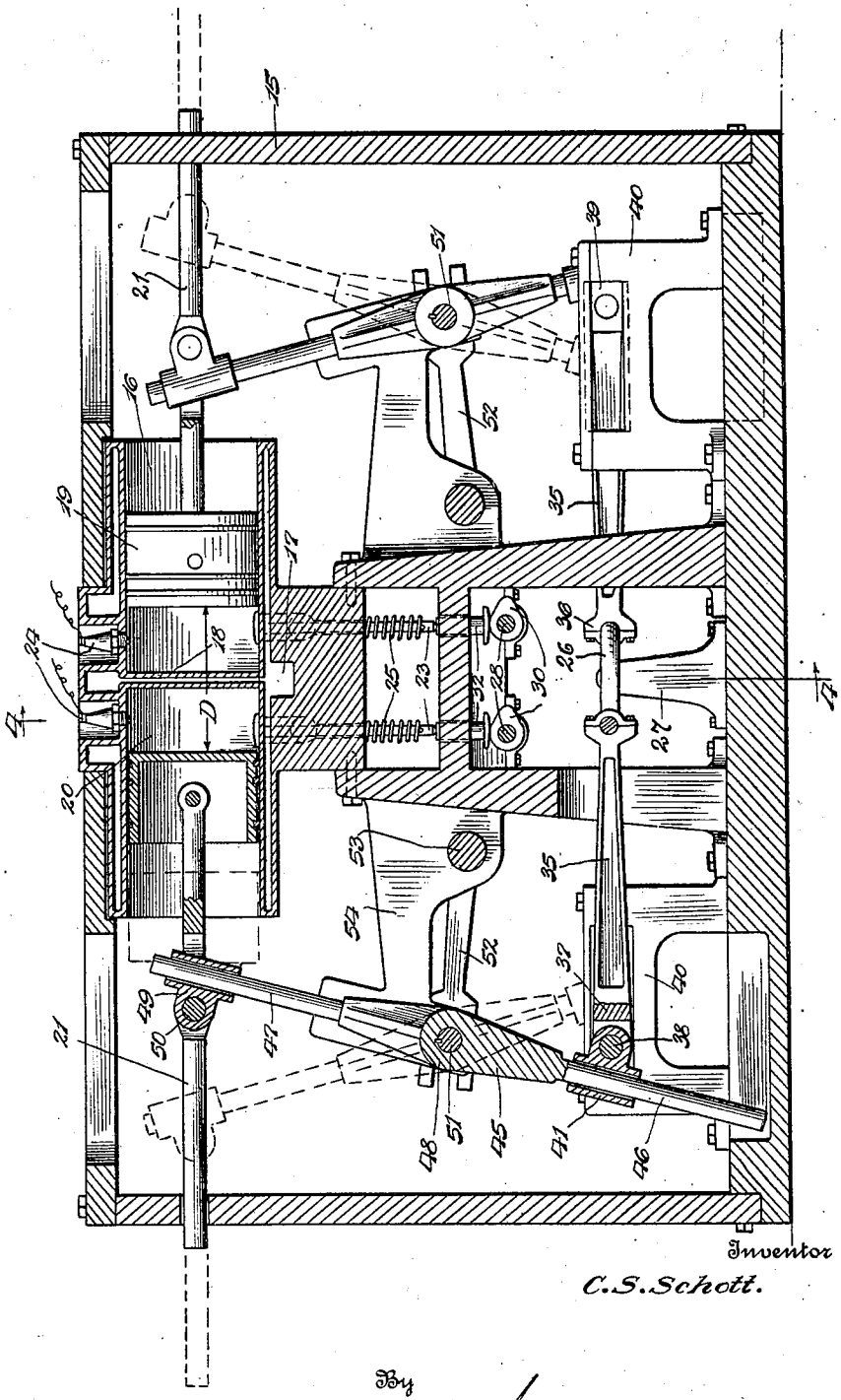
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Fig. 2.



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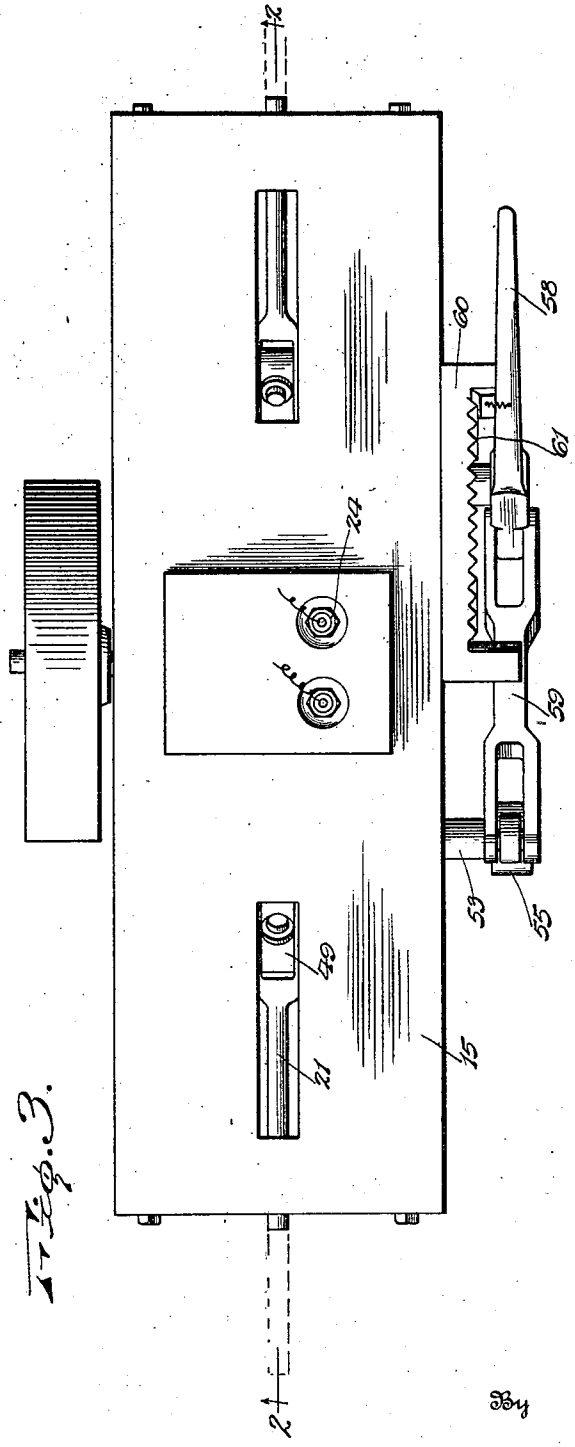


Fig. 3.

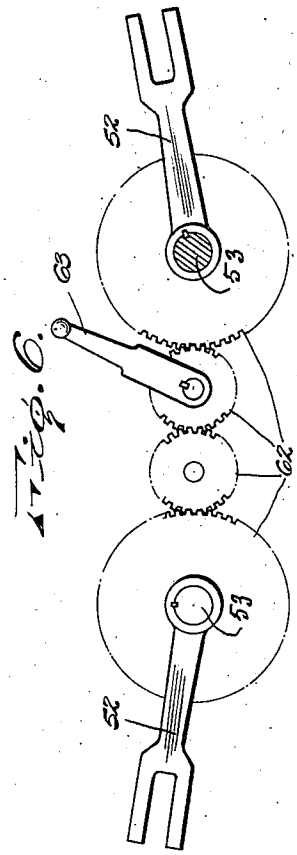


Fig. 6.

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INTERNAL COMBUSTION ENGINE.

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Fig. 4.

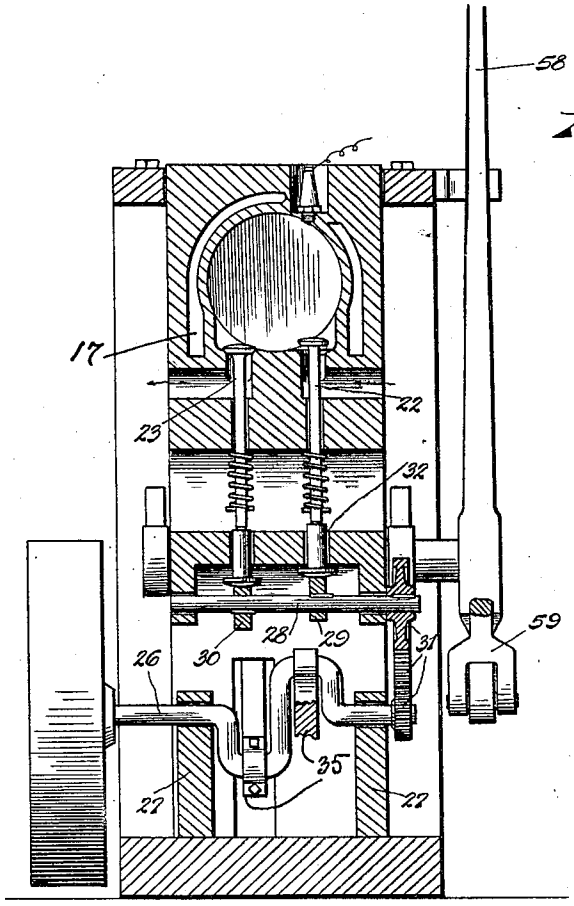


Fig. 5.

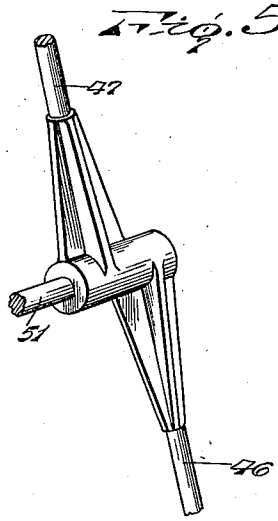


Fig. 8.

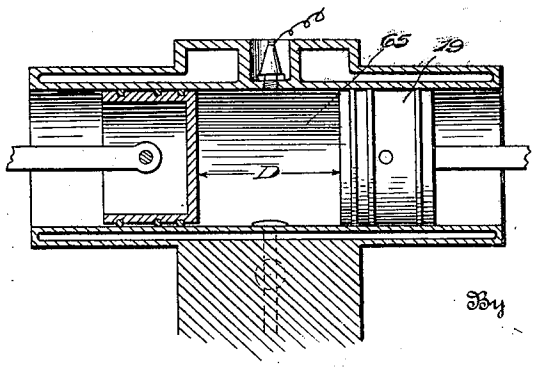
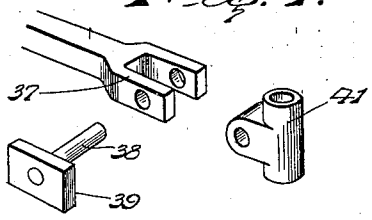


Fig. 7.



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Patented Jan. 30, 1923. 1,443,719

UNITED STATES PATENT OFFICE.

CALVIN S. SCHOTT, OF BUCK CREEK, INDIANA.

INTERNAL-COMBUSTION ENGINE.

Application filed October 15, 1921. Serial No. 507,851.

To all whom it may concern:

Be it known that I, CALVIN S. SCHOTT, citizen of the United States, residing at Buck Creek, in the county of Tippecanoe and State of Indiana, have invented certain new and useful Improvements in Internal-Combustion Engines, of which the following is a specification.

My invention relates to internal combustion engines and more particularly to four stroke cycle gasoline engines.

One object of the invention is to eliminate, as far as possible, all gear wheels, using levers and links in preference.

Another object is to provide two pistons in each cylinder, the twin pistons working in synchronism but always in opposite directions.

By constructing the device in this manner, a light and smooth running engine is produced, which will not readily get out of order and which is easy to repair.

The engine is particularly well suited for automobiles, as one of its advantages is the possibility of changing the stroke length of the piston while the engine is running and the piston in any position. That is to say, the length of the stroke may be changed at any intermediary position of the pistons as well as at their end positions. It is, moreover, possible to obtain an unlimited number of speeds, between the highest and lowest for which the engine has been constructed, merely by manipulating a lever and without stopping the engine.

In the accompanying drawings:

Figure 1 shows a front elevation of the engine,

Figure 2 is a longitudinal sectional view on the line 2—2 of Figure 3,

Figure 3 is a top plan view,

Figure 4 is a transverse sectional view on the line 4—4 of Figure 2,

Figure 5 is a perspective view of one of the details,

Figure 6 is a slightly modified form of the adjusting device for the stroke length,

Figure 7 is a perspective view of a combined hinge and sliding connection for the rocking lever, and

Figure 8 is a simplified form of the cylinder shown in longitudinal section.

At the top of a suitable housing 15, the twin cylinders 16 are rigidly mounted in axial alinement with each other. The cylinders are provided with a water jacket 17 along their entire length and with a bottom 18 situated in the middle. A piston 19 is provided for each cylinder and a combustion chamber 20 is formed on each side of the bottom 18 and between the same and the inner end of each piston. Each piston has a piston rod 21 preferably guided in the housing 15 so as to run in the axial direction of the cylinder. Each combustion chamber is provided with an inlet valve 22 for the combustion gases and an exhaust valve 23 with suitable conduits, not shown. On the top of the cylinders are shown the usual spark plugs 24 for igniting the fuel. The valve stems are continued downwardly and provided with coil springs 25 to hold them in their seats in the cylinders. The valves are actuated from the crank shaft 26 carried in bearings 27 mounted in the lower part of the housing 15. A pair of intermediary shafts 28 carry cams 29 and 30 for the respective valves 22 and 23 and said shafts are connected to the crank shaft through a train of gears 31 which, in the present instance, has been indicated as for a four stroke cycle engine. In alinement with each piston and above the corresponding cams 29 and 30, plungers 32 are slidably mounted in the housing 15 so as to transfer the lifting action of the cams to the respective valves.

A pitman 35 for each piston is journaled at its inner end as at 36, to the corresponding crank of the crank shaft 26. The opposite end of each of the pitmen is bifurcated as at 37 (see Figure 7) and carries a journal 38 which, at each end, has a bearing block 39 adapted to slide in guideways 40 rigidly mounted on the bottom of the housing 15. A sleeve 41 is mounted in the bifurcated end 37 on the journal 38 so as to be able to oscillate on the journal.

A two-arm lever 45 having a lower shank 46, an upper shank 47 and a central bearing portion 48, engages with the lower shank 46 in the sleeve 41 so as to have sliding motion therein. The upper shank 47 runs in a sleeve 49 similar to the sleeve 41

and mounted on a journal 50 provided on the piston rod 21 so as to be able to oscillate thereon. The bearing portion 48 of the two-arm lever 45 has a transverse bearing pin 51 which is supported directly or through the intermediary of suitable blocks in the outer end of a rocking arm 52. This rocking arm is rigidly secured on a stub shaft 53 carried in a bracket 54 secured to the bottom of the housing 15, and on the same stub shaft a short arm 55 is also secured. The outwardly projecting portion of the bracket 54 has a guide slot 56 in which the bearing pin engages and this slot is inclined upward and may be either straight or curved, depending on conditions and size of the engine. The direction of this guide slot has been so selected that the distance D between the inner ends of the two pistons, at the turning point is constant whether the bearing pin is at the top or at the bottom of said slot or in any intermediary position. This is for the purpose of preserving the volume of the combustion chamber independently of the length of the piston stroke.

Both sides of the engine are similarly constructed except that instead of the short arm 55 pointing upwards, as indicated to the left in Figure 1, to the right, a corresponding arm 57 is pointing in the opposite direction to the arm 55 and has an upward extension forming a hand lever 58 for operating the rocking arms 52, and a connecting link 59 is journaled to each of the arms 55 and 57, so that the movement of the hand lever will be communicated simultaneously to both rocking arms 52 and give them the same angle of movement. At the top of the housing is provided a ratchet 60 with a plurality of notches 61 for engaging and holding the hand lever 58 in different angular positions so that, for instance, in the position indicated in Figure 1, with the hand lever thrown to the extreme left, the arms 52 are raised to their upper position holding the bearing pin 51 at the top of the slot 56. In this manner, each upper lever arm 47 above the fulcrum point of the pin 51 is shortened and the lower lever arm 46 below the fulcrum point is lengthened. The crank stroke being constant, this will effect, as a consequence, a shortening of the stroke of each piston. With the hand lever 58 swung to its other extreme position, the parts will take the relative positions indicated in Figure 2; that is to say, with the rocking arms 52 near the horizontal and the bearing pins 51 at the bottom of the guide slots 56. In this position, the length of the lever arms 46 and 47 will be reversed, so that the pistons will be permitted to have their longest stroke. It will now be seen that with the hand lever 58 in any intermediary position, any corresponding length of piston stroke can be obtained between the two extremes and in accordance with the number of notches 61 on the ratchet 60, this number being practically unlimited.

In Figure 6, a slight modification of the connection between the rocking arms 52 is shown, a train of gears 62 having been interposed between the rocking arms 52 which are simultaneously actuated by means of a crank or hand wheel 63 on one of the gear shafts.

Instead of dividing the two cylinders by a partition or bottom 18, as indicated in Figure 2, I may remove this partition and form a common combustion chamber 65 having the constant length D between the inner ends of the two pistons 19. This is particularly suitable for small engines and requires only one spark plug and one intake and exhaust valve instead of two.

It is evident that many minor modifications in the design may be made without departing from the scope of the invention, as, for instance, the connection between the two-arm lever 45 and the piston on the one hand and the pitman on the other hand. Instead of the sleeves 41 and 49, I may form a slot or an open fork at each end of the two arm lever engaging directly with the journals 38 and 50 carried by the pitman 35 and the piston rod 21 respectively. The invention is, of course, not limited to an engine having only one pair of cylinders, which is its simplest form, but any number of cylinders may be arranged in a similar manner to suit the requirements presented.

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

1. In an internal combustion engine having an open-ended cylinder, a transverse central partition in the cylinder, a pair of pistons with piston rods in said cylinder, a combustion chamber being formed between each of said pistons and said partition in said cylinder, a crank shaft, a pitman for each piston having connection with said crank shaft and with the respective piston rods, and means for adjusting the stroke length of the pistons.

2. In an internal combustion engine having an open-ended cylinder, a transverse central partition in the cylinder, a pair of pistons with piston rods in said cylinder, a combustion chamber being formed between each of said pistons and said partition in said cylinder, a crank shaft, a pitman for each piston having connection with said crank shaft and with the respective piston rods, and means for adjusting the stroke length of the pistons while the volume of the combustion chamber remains constant.

3. In an internal combustion engine having an open-ended cylinder, a transverse central partition in the cylinder, a pair of

pistons with piston rods in said cylinder, a combustion chamber being formed between each of said pistons and said partition in said cylinder, a crank shaft, a pitman for each piston having connection with said crank shaft and with the respective piston rods, and means for adjusting the stroke length of the pistons, said means forming the connection between said pitmen and the respective piston rods.

4. In an internal combustion engine having an open-ended cylinder, a transverse central partition in the cylinder, a pair of pistons with piston rods in said cylinder, a combustion chamber being formed between each of said pistons and said partition in said cylinder, a crank shaft, a pitman for each piston having connection with said crank shaft and with the respective piston rods, and means for adjusting the stroke length of the pistons, said means comprising two-arm levers having sliding connection with corresponding pitmen and piston rods, a journal for each lever, and an adjustable bearing for said journal.

5. In an internal combustion engine having an open-ended cylinder, a transverse central partition in the cylinder, a pair of pistons with piston rods in said cylinder, a combustion chamber being formed between each of said pistons and said partition in said cylinder, a crank shaft, a pitman for each piston having connection with said crank shaft and with the respective piston rods, and means for adjusting the stroke length of the pistons, said means comprising two-arm levers having sliding connection with corresponding pitmen and piston rods, a journal for each lever, a bearing for said journal, a rock arm supporting said bearing, and common means for simultaneously swinging said rock arms.

6. In an internal combustion engine having an open-ended cylinder, a transverse central partition in the cylinder, a pair of pistons with piston rods in said cylinder, a combustion chamber being formed between each of said pistons and said partition in said cylinder, a crank shaft, a pitman for each piston having connection with said crank shaft and with the respective piston rods, and means for adjusting the stroke length of the pistons, said means comprising two-arm levers having sliding connection with corresponding pitmen and piston rods, a journal for each lever, a bearing for said journal, a rock arm supporting said bearing, a guide-way for said bearing, and common means for simultaneously swinging said rock arms.

7. In an internal combustion engine having a housing, an open-ended cylinder, a transverse central partition in the cylinder, a pair of pistons with piston rods in said cylinder, a combustion chamber being formed between each of said pistons and said partition in said cylinder; a crank shaft, a pitman for each piston rod having connection with said crank shaft, guides in said housing for said piston rods and said pitmen, and means for adjusting the stroke length of the pistons.

8. In an internal combustion engine having a housing, a pair of axially alined cylinders in said housing, said cylinders being closed at their inner ends, a piston with a piston rod in each cylinder, a combustion chamber being formed between the closed end of the cylinder and the piston in each cylinder; a crank shaft mounted in said housing, a pitman for each piston rod journaled on said crank shaft, guides for said piston rods and said pitmen respectively provided in said housing; a lever for each piston rod having sliding connection respectively with the piston rod and the corresponding pitman, a rocking arm for each lever mounted to oscillate in said housing, the free end of said rocking arm constituting the fulcrum bearing for said lever, and means for changing the angular position of said rocking arms.

9. In an internal combustion engine having a housing, a pair of axially alined cylinders in said housing, said cylinders being closed at their inner ends, a piston with a piston rod in each cylinder, a combustion chamber being formed between the closed end of the cylinder and the piston in each cylinder; a crank shaft mounted in said housing, a pitman for each piston rod journaled on said crank shaft, guides for said piston rods and said pitmen respectively provided in said housing; a lever for each piston rod having sliding connection respectively with the piston rod and the corresponding pitman, a rocking arm for each lever mounted to oscillate in said housing, the free end of said rocking arm constituting the fulcrum bearing for said lever, a guide-way for each lever-fulcrum provided in said housing, and means for changing the position of said lever fulcrum in said guide way.

10. In an internal combustion engine having a housing, a pair of axially alined cylinders in said housing, said cylinders being closed at their inner ends, a piston with a piston rod in each cylinder, a combustion chamber being formed between the closed end of the cylinder and the piston in each cylinder; a crank shaft mounted in said housing, a pitman for each piston rod journaled on said crank shaft, guides for said piston rods and said pitmen respectively provided in said housing; a lever for each piston rod having sliding connection respectively with the piston rod and the cor-

responding pitman, a rocking arm for each lever mounted to oscillate in said housing, the free end of said rocking arm constituting the fulcrum bearing for said lever, a guide-way for each lever fulcrum provided in said housing, and means for changing the position of said lever fulcrums through the intermediary of said rocking arms, said means comprising a link connection between said rocking arms, and a hand lever and a ratchet therefor in said housing.

In testimony whereof I affix my signature.

CALVIN S. SCHOTT. [L. S.]