Feb. 7, 1928.

M. G. WOOD

1,658,698

TWO-CYCLE INTERNAL COMBUSTION ENGINE

Filed Aug. 23, 1926

2 Sheets-Sheet 1

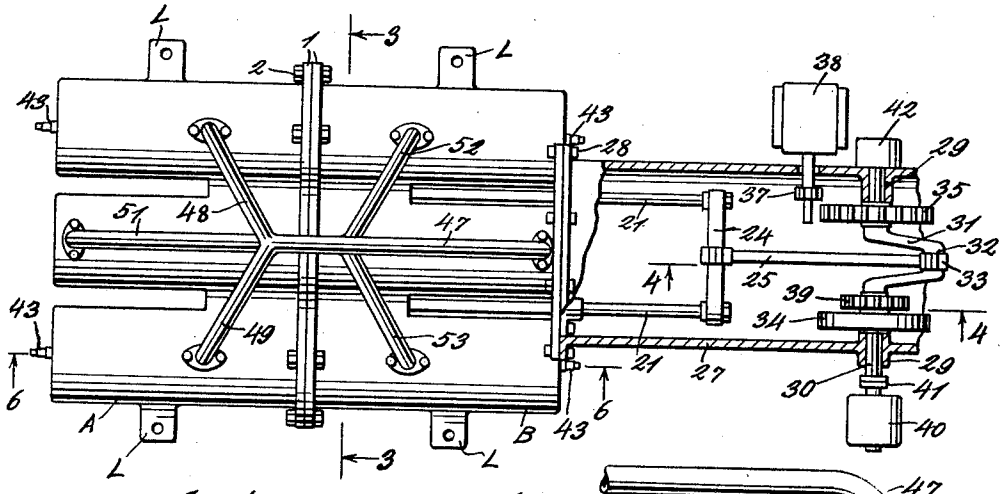

Fig. 1.

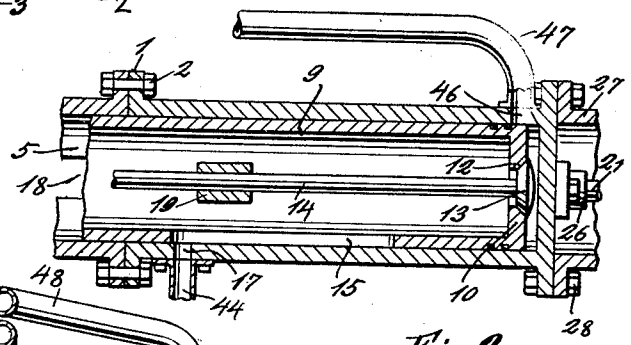

Fig. 2.

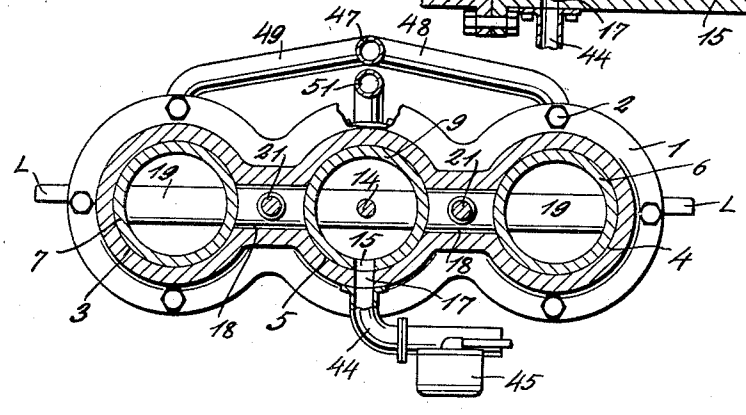

Fig. 3.

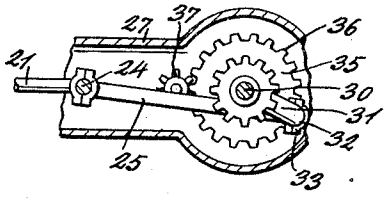

Fig. 4.

Inventor

Makinley Guy Wood.

By A. J. O'Brien

Attorney

Feb. 7, 1928.

1,658,698

M. G. WOOD

TWO-CYCLE INTERNAL COMBUSTION ENGINE

Filed Aug. 23, 1926

2 Sheets-Sheet 2

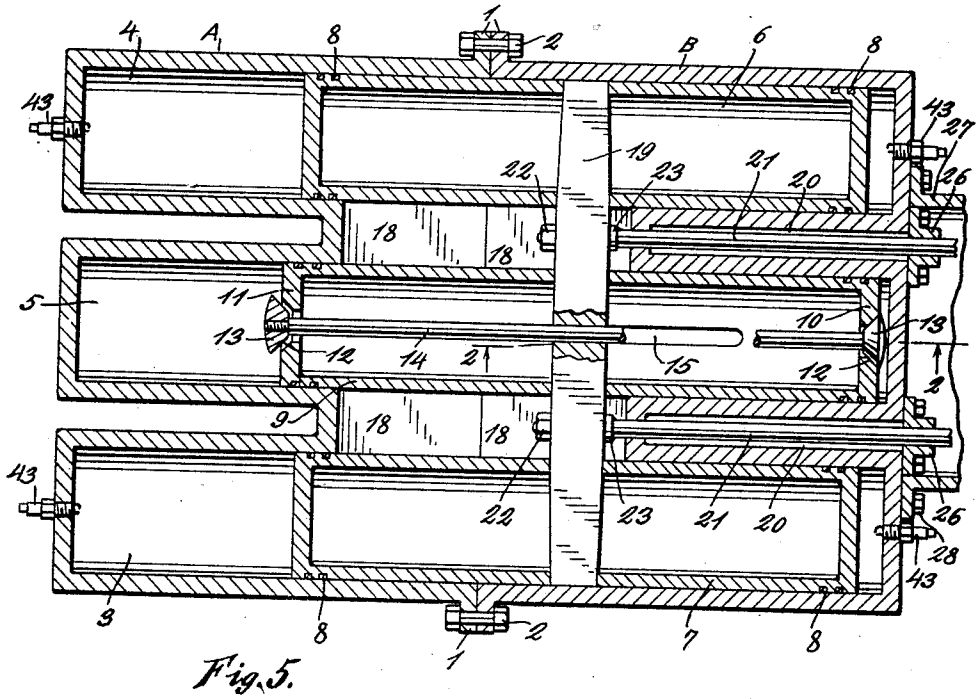

Fig. 5.

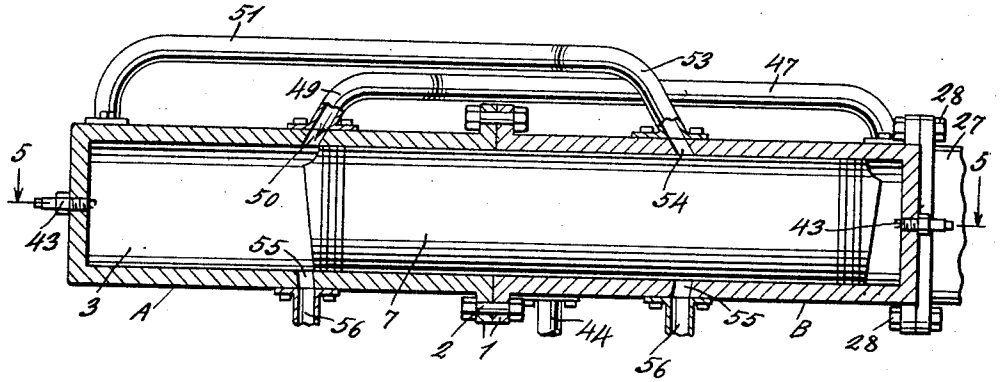

Fig. 6.

Inventor

Makinley Guy Wood.

By A. J. O'Brien

Attorney

Patented Feb. 7, 1928. 1,658,698

UNITED STATES PATENT OFFICE.

MAKINLEY GUY WOOD, OF DENVER, COLORADO.

TWO-CYCLE INTERNAL-COMBUSTION ENGINE.

Application filed August 23, 1926. Serial No. 130,938.

This invention relates to improvements in internal combustion engines of the two-cycle type. It is the object of this invention to produce an engine of a very simple construction that shall be so designed that it will operate equally well in any position, and which will therefore be especially well adapted for aeroplanes or other uses where the machine to which the engine is attached is subject to excessive rocking and which, as in aeroplanes, sometimes necessitates the operation of the engine in an entirely inverted position. It is the further object of this invention to produce an engine designed that shall be adapted to be cheaply constructed and which at the same time will add great strength and be of neat appearance.

My invention briefly described consists in making the cylinder block of two unitary units, each of which is provided with three cylindrical openings whose axes are parallel and which preferably lie in the same plane. These blocks are so constructed that they may be assembled in such a way that the several cylindrical openings will register to form cylinders with closed ends. Double ended pistons are mounted for reciprocation in these cylinders and are rigidly connected in such a way that they move as a unitary structure. The crank shaft, having a crank pin, is mounted for rotation in bearings that lie in a plane perpendicular to the axes of the cylinders and means comprising a connecting rod is used for securing the pistons to the crank pin so that when the crank shaft rotates at a constant speed the pistons will reciprocate with a substantially harmonic motion.

In order more clearly to describe my invention so that the construction and the mode of operation thereof can be readily understood, reference will now be had to the accompanying drawings in which the preferred embodiment thereof has been illustrated and in which—

Fig. 1 is a plan view looking down upon my engine, a portion of the structure being broken away so as to disclose the crank shaft and connecting rod.

Fig. 2 is a section taken on line 2—2, Fig. 5 and shows a portion of the compression cylinder and the compression piston, together with the means resorted to for the purpose of making communication from the compression cylinder to the carbureter.

Fig. 3 is a transverse section taken on line 3—3, Fig. 1.

Fig. 4 is a section taken along line 4—4, Fig. 1.

Fig. 5 is a horizontal section taken on line 5—5, Fig. 6, and

Fig. 6 is a section taken on line 6—6, Fig. 1.

The cylinder block is constructed of two sections which have almost the identical shape and size. One of these has been indicated by A and the other by B. Each of these sections is provided with a flange 1 which is perforated at intervals for the reception of clamping bolts 2. These sections are intended to be assembled in the manner shown in Fig. 1. Each of these sections is provided with three (3) cylindrical openings which have been designated by reference numerals 3, 4 and 5. These openings are so located that when the two sections are bolted together they form a continuous cylindrical opening having both ends closed. Openings 3 and 4 are the power cylinders and mounted for reciprocation within these openings are pistons 6 and 7 which have been shown as hollow cylindrical members provided with grooves 8 for the reception of piston rings. The cylinder 5 has mounted for reciprocation therein a piston 9 which is similar in appearance to the pistons 6 and 7, but which has its end walls 10 and 11 provided with openings 12 which have beveled faces that cooperate with the correspondingly beveled surfaces of the valves 13. It will be noticed that the valves 13 are connected by means of a rod 14 which is of such length that when one of the valves is seated the other one will be open in the manner shown quite clearly in Fig. 5. This piston is also provided with a longitudinal slot 15 which registers with an intake port 17 in the cylinder wall (Fig. 2). The cylinder block sections A and B are provided with slots 18 which extend outwardly a short distance from the flanges 1 and form spaces for the reception of the transverse member 19 by means of which the 3 pistons are interconnected. This member 19 may have a rectangular transverse section like that shown in Fig. 2 and extends through openings in the piston walls to which it may be secured by brazing or welding. The object of this transverse connecting member is to so interconnect the pistons that they

are forced to move as a unitary device, each however, reciprocating in its own cylinder. Slots 20 extend inwardly from the end of section B and through these slots piston rods 21 extend. The inner end of these piston rods project through suitable openings in the transverse connector 19 and are secured thereto by means of nuts 22 and the shoulder 23. Referring now more particularly to Fig. 1 it will be noted that the outer ends of these piston rods are connected by a transverse bar 24 which is provided intermediate its ends with a bearing to which the connecting rod 25 is pivotally connected. Secured to the outer end of the block B are bearing members 26 through which the connecting rods 21 pass and in which they are guided. A housing 27 is secured to the end of the block B by means of bolts 28 and this housing is provided with two oppositely disposed bearings 29 within which the crank shaft 30 is journaled. The crank shaft is provided with a crank 31, having a crank pin 32 to which the end 33 of the connecting rod 25 is rotatably secured. It is now evident that if the crank shaft 30 is rotated at a constant speed the pistons will be simultaneously reciprocated with a motion which very closely approximates that of a simple harmonic. Secured to the crank shaft are fly-wheels 34 and 35. The fly-wheel 35 is provided with gear teeth 36 which are adapted to cooperate with the teeth on the pinion 37 which is non-rotatably but slidably connected with the starting motor 38. As it is not my idea to describe the starting mechanism in detail I have merely represented the starting motor and the pinion 37 in a diagrammatic way as I want it understood that these parts form no part of my invention, but that it is my intention to utilize for this purpose such starting motors and mechanism as is now in common use. A spur gear 39 is also connected to the crank shaft 30 and is adapted to transmit motion and power from the crank shaft to a transmission gear set which forms the subject matter of a separate application. A generator 40 is connected to the crank shaft by means of some suitable coupling 41, and I have also indicated at 42 a distributor by means of which high tension electricity is properly distributed to the spark plugs 43. This distributor, as well as the electric connections to the spark plugs, have not been shown for the reason that it forms no part of my invention but merely represents well known devices which are connected in a well known way. The cylinder wall surrounding the cylinder 5 is provided with an intake port 17 which is in communication with a pipe 44 that extends to the carbureter 45. This intake port registers with the slot 15 in the compression piston 9. This slot is so long that even when the piston has moved to the limit of its travel in either direction the interior will still be in communication with the pipe 44. Referring now more particularly to Fig. 2, it will be noticed that the compression cylinder 5 is provided near each end with an exhaust port 46 which communicates with the end of a manifold 47 which extends towards the other end and is provided with 2 branches 48 and 49, which in turn communicate with the intake ports 50 of the power cylinders. A similar manifold 51 is in communication with the other end of the compression cylinder and has 2 branches 52 and 53 which communicate with the intake ports 54 in the engine block section B, see Figs. 1 and 6. From Fig. 5 it will also appear that the walls of the power cylinders are provided with exhaust ports 55 that are in communication with the exhaust pipes 56. The ports 50 and 55 are so located with respect to the travel of the pistons 6 and 7 that they become uncovered when these pistons are in the corresponding dead center position. For example, by referring to Fig. 6, it will be noted that the intake and exhaust ports in section A are uncovered, while those in section B are closed by means of the piston which extends across them.

Let us now assume that the parts are in the position shown in Figs. 1, 5 and 6, and that the crank shaft 30 is rotated by some suitable means, such as the starting motor 38. Any movement from the position shown will cause the pistons to move towards the left and the first portion of this movement will cover the exhaust and intake ports 55 and 50 so that any gas or air that is contained in the cylinder space will be trapped and will be compressed upon the further movement of the piston towards the left. When the parts assume the dead center position 180 degrees from the one shown in the drawings the intake and exhaust ports 54 and 55 will be open. Let us now consider the action of the compression piston 9 whose interior is always in connection with the carbureter. As this piston moves towards the left any gas in the cylinder space between the end of this piston and the end of the block section A will be put under compression and this will move the valve 13 against its seat, thereby opening the valve at the other end of the piston. As the piston continues to move towards the left the space between the right-hand end of this piston, and the corresponding end of the cylindrical chamber, will continue to increase and a mixture of gasoline and air will therefore enter this chamber. When the parts have moved to the extreme left-hand position in which position the ports 54 and 55 in section B are uncovered, any gas that has been compressed in the cylinder 5 between the end of the piston 9 and the corresponding end of cylinder 5 will pass

through the manifold 51 into the right-hand end of the power cylinders. When the crank shaft is further rotated the ports 54 and 55 will be closed and the charge that has just been received into this part of the cylinder will be compressed. After this charge has been compressed and the crank shaft has been rotated to the desired position the distributor 42 will cause a high tension current to flow to the spark plugs and ignite the charge which will then explode and produce a force tending to move the pistons towards the left. During the movement towards the right the explosive mixture between the right-hand end of piston 9 and the corresponding end of cylinder 5 will be compressed, and as the parts reach the extreme right-hand position this charge will be transferred to the left-hand end of the power cylinders. This cycle will be repeated continuously and thereby produce an engine operating on the two-cycle principle and in which the cylinder 9 serves to compress the charge in a manner similar to the way in which the charge is now usually compressed in the crank casing.

It is evident from the above description that after the engine has once been started it will continue to operate in a manner quite similar to that of the usual two-cycle internal combustion engine, and that since the charge is compressed in a separate cylinder the engine will be more especially adapted to operate in various positions than the present two-cycle engine. It is also apparent that the construction is very simple and that the engine can therefore be cheaply made and readily assembled. For the purpose of securing the engine blocks A and B to a suitable support they have each been provided with lugs L that extend outwardly from opposite sides and which are perforated for the reception of a suitable bolt by means of which they may be held in place on a supporting form.

Having described the invention what I claim as new is—

1. An internal combustion engine of the two-cycle type having a two part cylinder block provided with two parallel power cylinders with parallel axes, a compression cylinder located intermediate the power cylinders and having its axes parallel to the axes of the power cylinders, a double ended piston in each of said cylinders, said pistons being all of substantially the same length and shorter than the cylinders, means for rigidly interconnecting the pistons so that they will reciprocate as a unit, means for reciprocating the pistons with a simple harmonic motion, means for producing an explosive charge of hydrocarbon vapor and air means for compressing said charge and means for transferring said charge to the power cylinders.

2. An internal combustion engine having a two part cylinder block each of which is provided with three cylindrical openings arranged with their axes parallel and in the same plane, said openings being so arranged that they will aline with the corresponding openings in the other part so as to form three cylinders with closed ends, a double ended piston in each cylinder, means for rigidly interconnecting the pistons, and means for causing them to reciprocate with a simple harmonic motion.

3. An internal combustion engine of the two-cycle type having a cylinder block formed in two parts, means for securing the two blocks together, the two sections having equidistantly spaced cylindrical openings that will be in axial alignment when the cylinder block is in assembled position, said openings having their axis in a plane, the wall between the central opening and each of the other two having a slot that extends parallel to the axes of the openings, an elongated hollow piston in each of the openings and a rigid bar extending from the central piston to the other two pistons so as to connect them rigidly together.

In testimony whereof I affix my signature.

MAKINLEY GUY WOOD.