Aug. 21, 1928.

1,681,910

D. C. SLAGHT

INTERNAL COMBUSTION ENGINE

Original Filed July 6, 1926 2 Sheets-Sheet 1

Fig. 1.

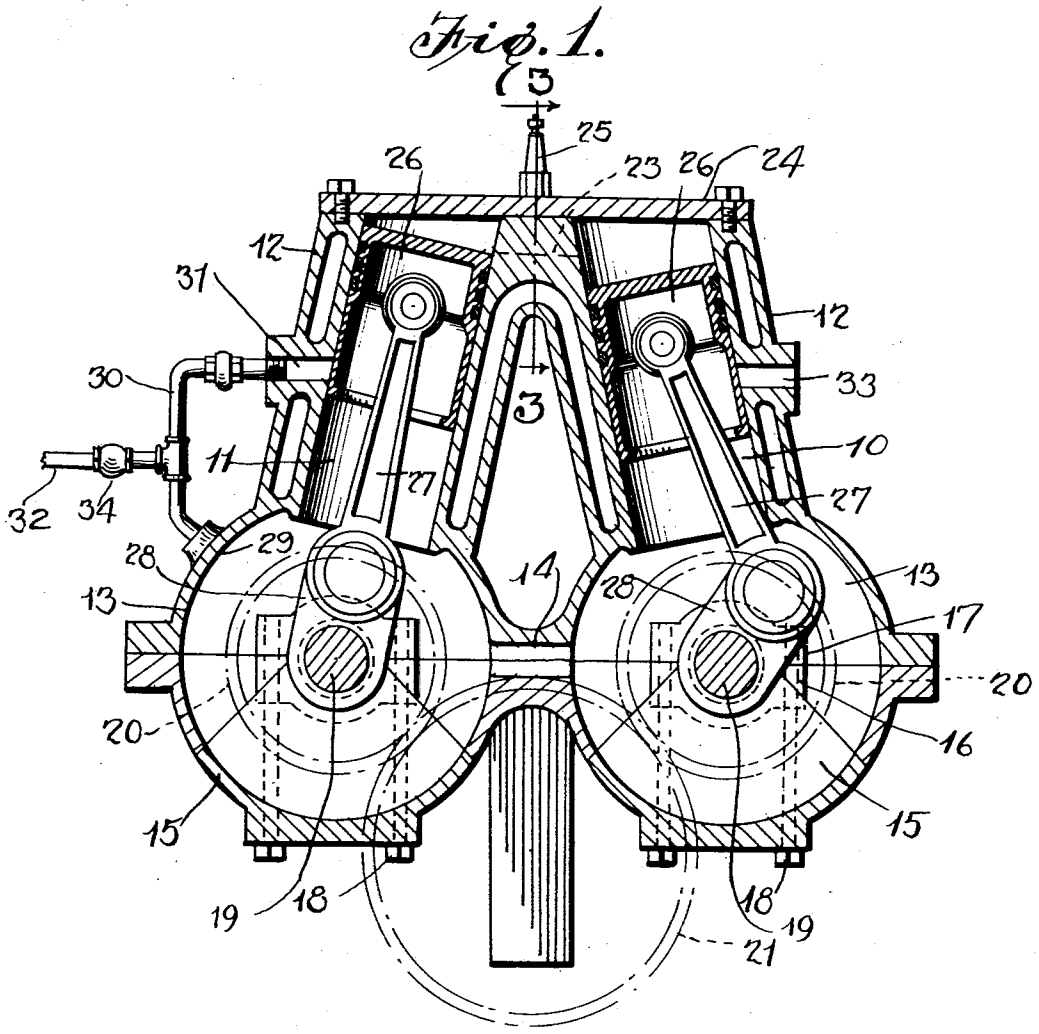
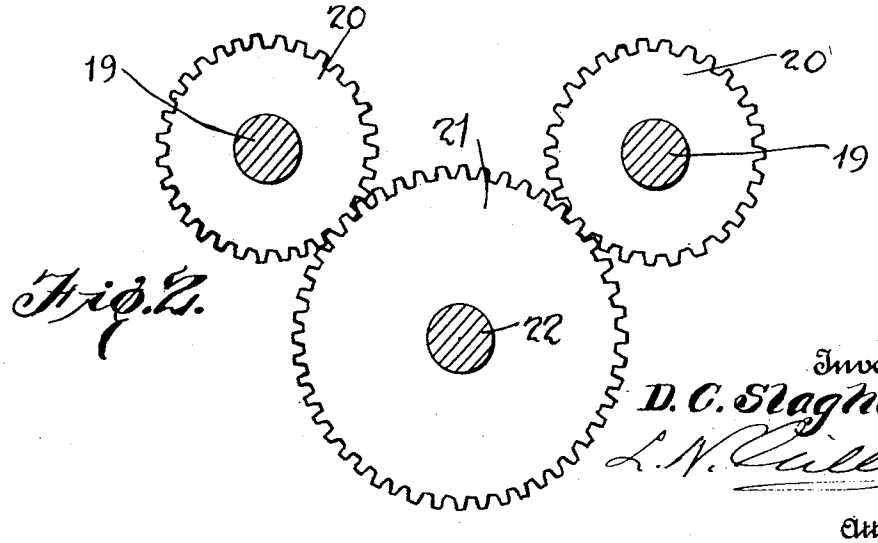


Fig. 2.



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Fig. 3.

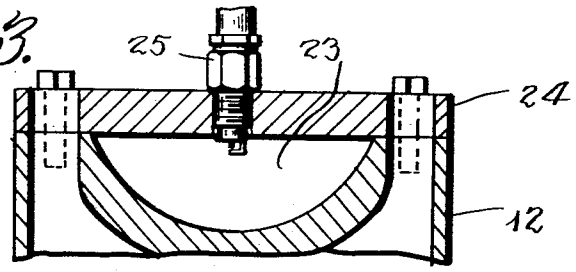


Fig. 4.

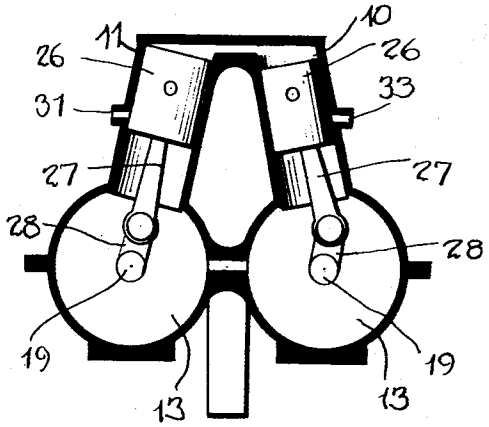
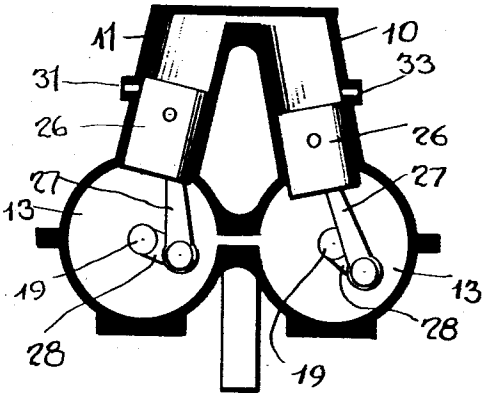


Fig. 5.



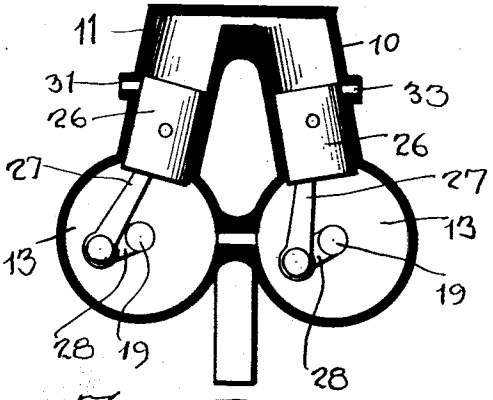
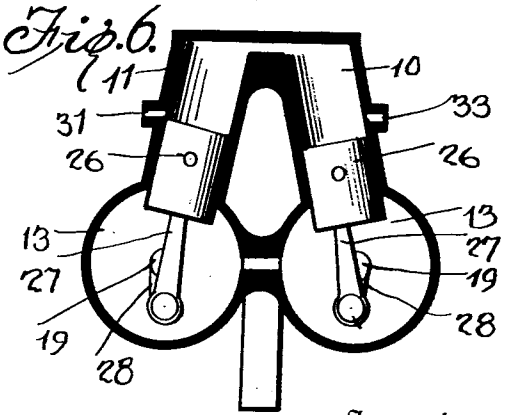


Fig. 7

Fig. 6.



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UNITED STATES PATENT OFFICE.

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INTERNAL-COMBUSTION ENGINE.

Application filed July 6, 1926. Serial No. 120,810. Renewed January 26, 1928.

This invention relates to internal combustion engines of the two cycle type and has special reference to a two cycle engine which includes improvements in the engine shown and described in my prior Patent Number 1,578,476 issued to me March 30, 1926.

The engine shown in said patent is not well adapted for use in automobiles, tractors and other places in which economy of space is essential.

One object of the present invention is to improve the engine there shown so that the parts are arranged in a compact form.

In my prior patent the crank cases are at opposite ends of the engine so that, in order to use crank case compression as is usual in two cycle engines, it is necessary to connect the two crank cases by a long length of pipe.

A second important object of the invention is to so improve the construction of such engine that the crank cases for each pair of cylinders may be located close together and direct communication had through the partition wall between the two crank cases.

A third object of the invention is to so arrange the positions of the cranks in a pair of cylinders in this construction that the exhaust port will be opened before and closed after the corresponding opening and closing of the intake port.

With the above and other objects in view as will be hereinafter apparent, the invention consists in general of certain novel details of construction and combinations of parts hereinafter fully described, illustrated in the accompanying drawings and specifically claimed.

In the accompanying drawings like characters of reference indicate like parts in the several views, and:

Figure 1 is a transverse cross section through a pair of cylinders and their crank cases arranged in accordance with this invention.

Figure 2 is a cross section at one end of the engine showing the gear arrangement.

Figure 3 is an enlarged detail section on the line 3—3 of Figure 1.

Figure 4 is a diagram showing the positions of the pistons at the beginning of the power stroke of the engine.

Figure 5 is a similar diagram showing the positions of the parts just after the exhaust port is opened.

Figure 6 is a similar diagram showing the parts in position to admit the fresh charge and scavenge the burnt gases.

Figure 7 is a similar diagram showing the positions of the parts at the beginning of the stroke giving compression in the cylinders.

It is to be understood that, in order to simplify the drawings and avoid unnecessary duplication of parts there has been here shown but one pair of cylinders. It will be obvious, however, that as many pairs of cylinders may be used as may be necessary or desirable. For instance, four pair of cylinders may be used as shown in the aforesaid prior patent. Also the cranks on each shaft for the several cylinders will be angularly disposed in the usual manner so that where a plurality of pairs of cylinders are used the explosion strokes will be evenly spaced, one stroke overlapping the next.

In the construction of each pair of cylinders under this invention the individual cylinders 10 and 11 are arranged with their axes at an acute angle in inverted V-shaped disposition. Each of these cylinders is provided with a water jacket 12 which extends the full length of each cylinder. Below each cylinder is a crank case 13 and these two crank cases communicate by means of a port 14. Each of these crank cases has an inverted V-shaped section 15 in its bottom and these sections 15 carry lower bearing halves 16, the upper bearing halves 17 being formed directly on the crank cases. These sections are forced firmly into place by means of bolts 18 which pass through the lower bearing halves and screw into the upper halves 17.

The bearings thus formed support crank shafts 19 and fixed on each crank shaft 19 is a gear 20, the two gears meshing with a gear 21 fixed on a main shaft 22. The two cylinders are connected at their upper ends by a passage 23 and are covered by a head 24, common to both cylinders and having a spark plug screwed into a suitable opening therein so that its sparking terminals project into the passage 23. Slidable in each cylinder is a piston 26 which is connected by a piston rod 27 with the crank 28 of one of the crank shafts 18. Leading from a port 29 in one crank case is a pipe 30 which communicates with an intake port 31 in the side of one cylinder and so positioned that the piston in that cylinder will clear this port

when at the bottom of its stroke. A pipe 32 branches from the pipe 30 and connects with the usual carbureter (not shown). In the side of the remaining cylinder is an exhaust port 33 which is so positioned that it is open when the corresponding piston is at the bottom of its stroke.

It is to be noted that the piston on the exhaust side of the engine is so set that it passes through its cycle of motions slightly in advance of the piston on the intake side.

The operation of the engine can be well understood from the diagrams shown in Figures 4 to 7 inclusive.

It will be seen in Figure 4 that the parts are just at the beginning of the explosion stroke, the right hand piston having moved down slightly in its cylinder. At this time the explosion takes place and, due to the advancement of the right hand piston and the gearing connecting the two crank shafts, the engine must rotate in a clockwise direction. Obviously the engine can be designed to rotate in the opposite direction if desired by connecting the left hand cylinder to the exhaust and advancing the piston therein in such manner that the right hand piston is on dead center at the time the crank of the left hand cylinder is to the left of its upper dead center. As the two pistons descend the right hand piston keeps ahead of the left and the exhaust port 33 is opened while the port 31 still remains closed. Much of the spent gases now pass from the port 33. While this operation is going on carburized air is compressed in the crank cases 13. As the left hand piston moves down to open the intake port 31 this carburized air will rush in through this port and drive the remainder of the spent gases through the port 33 as in Figure 6. The exhaust port will now close followed by the intake port as in Figure 7 and the inertia of the engine will cause the pistons to rise so that the carburized air above the pistons will be compressed ready for firing while a fresh charge will be drawn into the crank cases. A check valve 34 may be used to prevent back pressure on the carbureter.

While the engine here described is a two cycle engine it is obvious that the same arrangement of gearing and cylinders may be used in a four cycle engine. With this construction it will be seen that pressure, due to the explosions in the cylinders, will be practically eliminated on the bearings for the main shaft 22 since the gear 21 is urged upwardly on one side and downwardly on the other. Again the power of both cylinders is transmitted to shaft 22 so that a single pair of cylinders of this type equals in power production two cylinders of the ordinary type in which the explosions take place simultaneously.

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 the invention without departing from the material spirit thereof. It is not, therefore, desired to confine the invention to the exact form herein shown and described, but it is desired to include all such as properly come within the scope claimed.

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

1. In an internal combustion engine, a pair of cylinders arranged with their axes at an acute angle, said axes being disposed in inverted V-shaped arrangement, said cylinders having port communication at their upper ends, a piston in each cylinder, a crank shaft for each cylinder, piston rods each connecting a piston with a respective crank shaft, one of said cylinders having an inlet port and the other cylinder having an exhaust port, said ports being positioned in the sides of the cylinders for covering and uncovering by respective pistons, a pair of closed crank cases each connected to the lower end of a respective cylinder, said crank casing having port communication with each other, a pipe leading from one of the crank cases to said inlet port a carburized air supply pipe communicating with the last mentioned pipe between the crank case and inlet port, and a check valve in the supply pipe opening toward the first pipe.

2. In an internal combustion engine, a pair of cylinders arranged with their axes at an acute angle, said axes being disposed in inverted V-shaped arrangement, said cylinders having port communication at their upper ends, a piston in each cylinder, a crank shaft for each cylinder, piston rods each connecting a piston with a respective crank shaft, one of said cylinders having an inlet port and the other cylinder having an exhaust port, said ports being positioned in the sides of the cylinders for covering and uncovering by respective pistons, gearing connecting the crank shafts arranged to cause them to revolve in unison with the cranks of the crank shafts in relative angular displacement whereby one of said pistons moves through its cycle slightly in advance of the other, a pair of closed crank cases each connected to the lower end of a respective cylinder, said crank casing having port communication with each other, a pipe leading from one of the crank cases to said inlet port a carburized air supply pipe communicating with the last mentioned pipe between the crank case and inlet port, and a check valve in the supply pipe opening toward the first pipe.

In testimony whereof I affix my signature.

DANIEL C. SLAGHT.