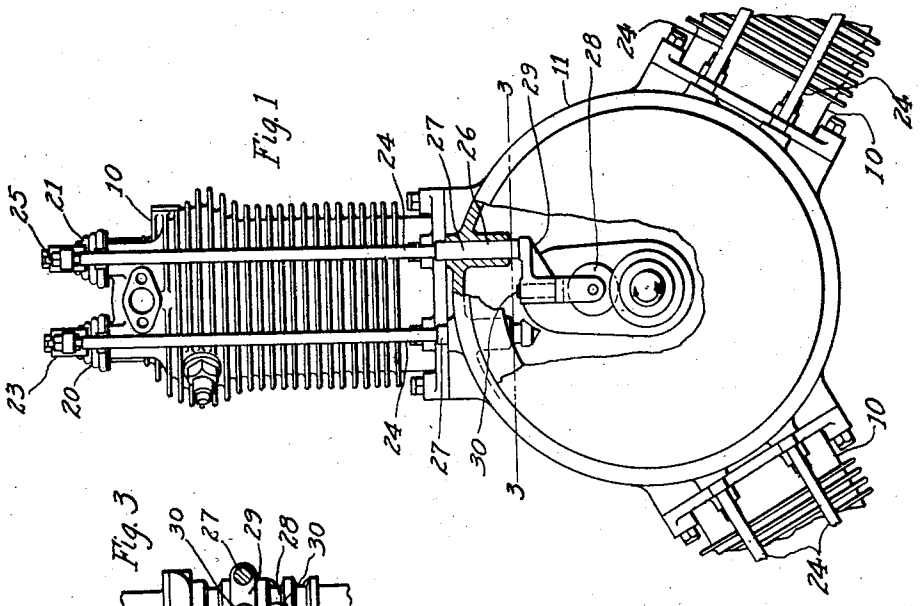
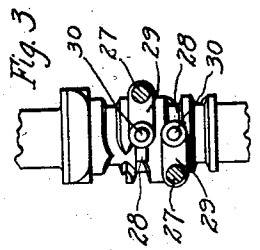
J. HALTENBERGER.

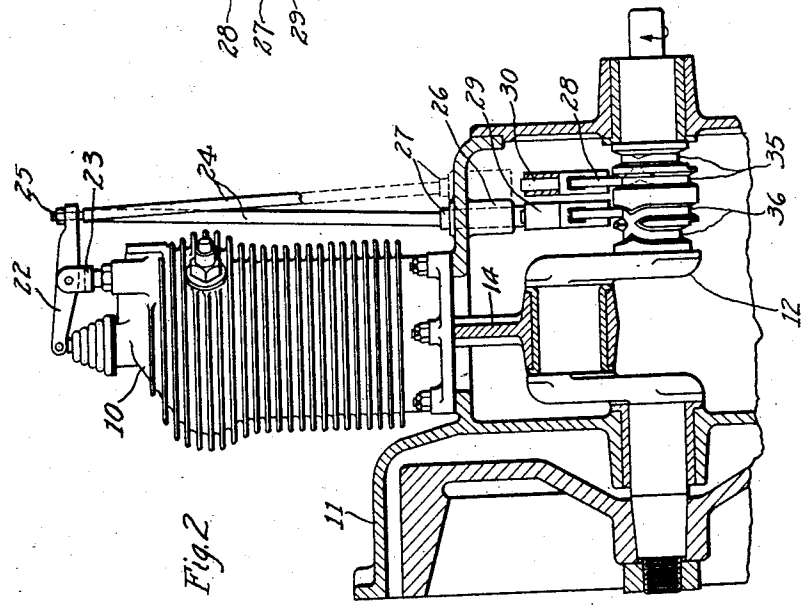
ENGINE.

APPLICATION FILED NOV. 22, 1920.

1,409,710. Patented Mar. 14, 1922.







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UNITED STATES PATENT OFFICE.

JULES HALTENBERGER, OF INDIANAPOLIS, INDIANA.

ENGINE.

1,409,710. Specification of Letters Patent. Patented Mar. 14, 1922.

Application filed November 22, 1920. Serial No. 425,597.

To all whom it may concern:

Be it known that I, JULES HALTENBERGER, who am a citizen of the city of Kassa, Kaschau, which was in the Kingdom of Hungary, but who have declared my intention of becoming a citizen of the United States, and have obtained my first citizenship papers, and who reside at Indianapolis, in the county of Marion, and State of Indiana, have invented a new and useful Engine, of which the following is a specification.

It is the object of my invention to improve, simplify, make more accurate and less affected by wear, and render fully interchangeable the valve-operating mechanism of internal combustion engines, especially of the radial type, to avoid the necessity for any separate cam shaft and eliminate all gearing and gear noise in such mechanism, and to provide round surfaces for the interengaging relatively movable parts of the valve-operating mechanism.

The accompanying drawing illustrates my invention: Fig. 1 is an end elevation of a three-cylinder radial-type internal combustion engine embodying my invention, with two of the cylinders and part of the crank-case broken away; Fig. 2 is a side elevation of such engine, with the lower part broken away, and in partial section at the crank-shaft; and Fig. 3 is a section on the line 3—3 of Fig. 1.

The engine shown has a plurality of radial cylinders 10, suitably bolted to a central crank-case 11, in which is mounted a crank-shaft 12 provided with the usual fly-wheel 13. The pistons in the several cylinders are connected by the usual connecting rods 14 to the crank-shaft 12, which has a number of cranks corresponding to the number of planes in which the cylinders are arranged transverse to the crank-shaft, as shown, the crank-shaft has but a single crank, as there is an odd number of cylinders and so they are all arranged in a single plane transverse to the crank-shaft. Though the engine shown has three cylinders, any desired number of cylinders may be used. The structure as so far described is well-known.

Each cylinder 10 is provided at its outer end with an inlet valve 20 and with an exhaust valve 21, shown as of the overhead type, and each of these valves co-operates with one end of a rocker arm 22 pivotally mounted at an intermediate point on a suitable support 23 carried by the cylinder. The valves may be all alike, and the rocker arms may be all alike, so that they are interchangeable. The other end of each rocker arm 22 co-operates with the outer end of a push rod 24, conveniently through an adjusting screw 25 which may be provided on the rocker arm. The push rods 24 are all alike, so that they are interchangeable. The outer ends of these push rods 24 are all in the same plane transverse to the crank-shaft when the cylinders 10 are all in a single plane, and the outer ends of the two rods for each cylinder are spaced apart in such plane, as is clear from Fig. 1; the push rods for each cylinder lie in planes parallel to and on opposite sides of the plane of that cylinder and of the crank-shaft, and preferably the inner ends of the push rods for each cylinder lie on opposite sides of the transverse plane of the outer ends of such rod, and are spaced from such transverse plane by equal distances, as is clear from Figs. 2 and 3. This arrangement permits the valve rods to be all alike and therefore interchangeable.

The inner ends of the push rods abut against the outer ends of two parallel tappet rods 27 rotatably and slidably mounted in suitable guide holes 26 in the crank-case 11; the push rods or the tappets are suitably cupped to receive the other at their interengaging ends. The tappets 27 and the holes 26 are round where they fit together, so that they may readily be machined. Within the crank-case, each tappet has a crank-arm 29, in the free end of which is swiveled a pin 30 carrying a roller 28. The two pins 30 for each cylinder preferably lie substantially in the plane of the axes of said cylinder and of the crank-shaft.

In the crank-shaft 12 are two grooves 35 and 36, one of which receives the rollers 28 for all the inlet valves and the other the rollers 28 for all the exhaust valves. Each groove 35 and 36 is a twin or two-revolution groove, comprising two axially separated parts extending almost completely around the crank shaft in a single plane transverse to the crank-shaft axis, and an X-shaped crossover part interconnecting said two axially separated parts. As the crank shaft rotates, any one roller completely traverses its groove in two revolutions of the crank shaft, to give the desired valve movement for a four-cycle engine, the roller traveling first

in one of the axially separated portions and then passing by the crossover to the other portion, after traveling which it returns by the crossover to the first portion. The bottom of the crossover and of one of the axially separated portions of each groove is wholly cylindrical, but that of the other of said axially separated portions is provided with a cam nose which lifts and lowers the roller 28 and therethrough opens and closes the associated valve. This opening and closing movement of the valve is obtained wholly while the roller 28 is out of the crossover part of the groove.

As each roller 28 travels its groove, it is given three motions, and its tappet is given two motions. The cam nose in the bottom of the groove lifts and lowers the roller and the tappet, and therethrough raises and lowers the associated valve, the round part of the tappet 27 sliding longitudinally within the hole 26 as required for such movement; the side walls of the groove guide the roller, both turning it and moving it longitudinally of the crank-shaft, thus causing both the swiveled pin 30 to turn in the crank-arm 29 and the round part of the tappet 27 to turn in the hole 26. These motions are all permitted by the tappet and roller mounting.

Not only are the valves, the rocker arms, and the push rods interchangeable, but so are the tappets; so that the entire valve-operating mechanism is interchangeable throughout.

I claim as my invention:

1. In an internal combustion engine, the combination of a crank-shaft provided in its outer surface with a two-revolution cam-operating path of which the two parts are connected by a crossover, a tappet mounted on one side of the plane of the crank-shaft and of the engine cylinder associated with such tappet and both rotatable and longitudinally slidable, and means connecting the outer end of said tappet with an engine valve to operate the latter upon longitudinal movement of said tappet, said tappet having a crank-arm which at its free end has means co-operating with said path, the point where said last-named means engages said path being substantially in the aforesaid plane.

2. In an internal combustion engine, the combination of a crank-shaft provided in its outer surface with a two-revolution cam-operating path of which the two parts are connected by a crossover, a tappet mounted on one side of the plane of the crank-shaft and of the engine cylinder associated with such tappet and both rotatable and longitudinally slidable, means connecting the outer end of said tappet with an engine valve to operate the latter upon longitudinal movement of said tappet, said tappet having a crank-arm, and means having a swivel mounting in the free end of said crank-arm and co-operating with said path, the point where said last-named means engages said path being substantially in the aforesaid plane.

3. In an internal combustion engine, the combination of a crank-shaft provided in its outer surface with a two-revolution cam-operating path of which the two parts are connected by a crossover, a tappet both rotatable and longitudinally slidable, and means connecting the outer end of said tappet with an engine valve to operate the latter upon longitudinal movement of said tappet, said tappet having a crank-arm which at its free end has means co-operating with said path.

4. In an internal combustion engine, the combination of a crank-shaft provided in its outer surface with a two-revolution cam-operating path of which the two parts are connected by a crossover, a tappet both rotatable and longitudinally slidable, and means connecting the outer end of said tappet with an engine valve to operate the latter upon longitudinal movement of said tappet, said tappet having a crank-arm, and means having a swivel mounting in the free end of said crank-arm and co-operating with said path.

5. In an internal combustion engine, the combination of a crank-shaft provided in its outer surface with a two-revolution cam-operating path of which the two parts are connected by a crossover, a tappet mounted on one side of the plane of the crank-shaft and of the engine cylinder associated with such tappet and both rotatable and longitudinally slidable, means connecting the outer end of said tappet with an engine valve to operate the latter upon longitudinal movement of said tappet, said tappet having a crank-arm, and a roller having a swivel mounting in the free end of said crank-arm and in such plane and co-operating with said path, the point where said last-named means engages said path being substantially in the aforesaid plane.

6. In an internal combustion engine, the combination of a crank-shaft provided in its outer surface with a two-revolution cam-operating path of which the two parts are connected by a crossover, a tappet both rotatable and longitudinally slidable, means connecting the outer end of said tappet with an engine valve to operate the latter upon longitudinal movement of said tappet, said tappet having a crank-arm, and a roller having a swivel mounting in the free end of said crank-arm and co-operating with said path.

In witness whereof, I have hereunto set my hand at Indianapolis, Indiana, this 4th day of November, A. D. one thousand nine hundred and twenty.

JULES HALTENBERGER.