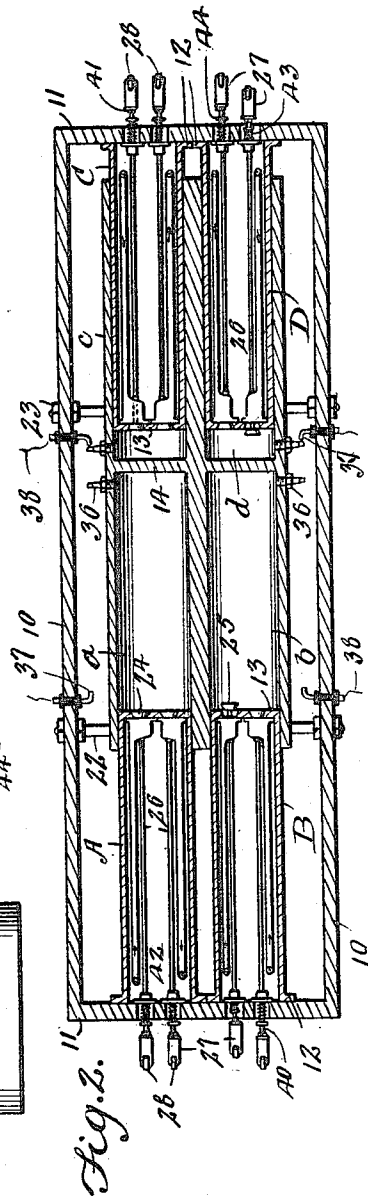
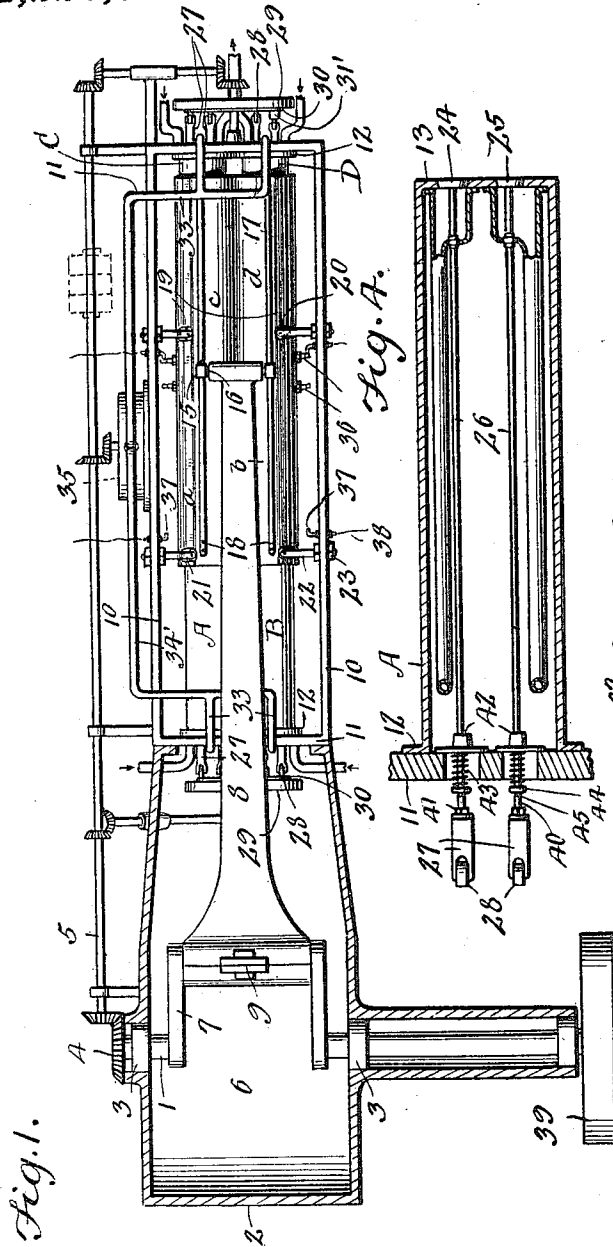


F. H. KRIENITZ.
INTERNAL COMBUSTION ENGINE.
APPLICATION FILED DEC. 18, 1915.

Patented Apr. 24, 1917.
3 SHEETS—SHEET 1.

1,223,701.



Witnesses

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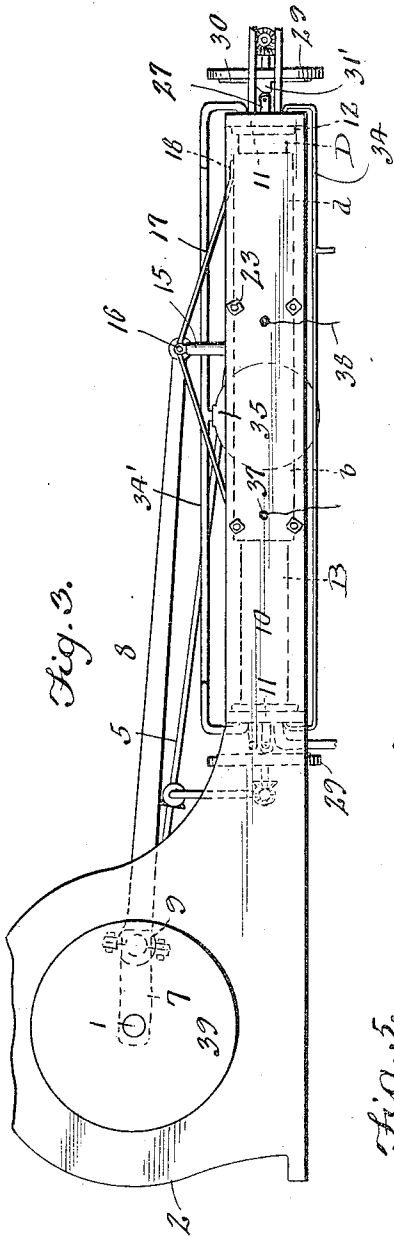


Fig. 3.

Fig. 5.

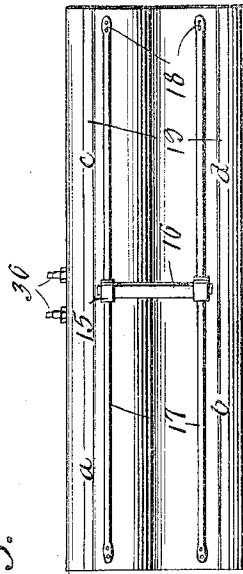


Fig. 6.

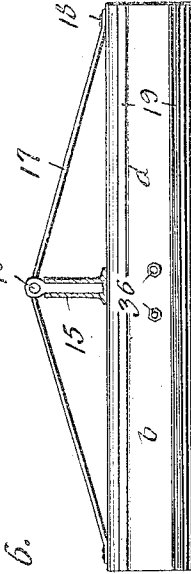
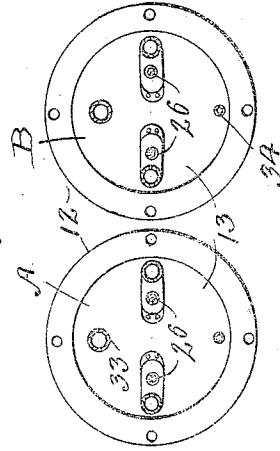


Fig. 8.



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Patented Apr. 24, 1917.
3 SHEETS—SHEET 3.

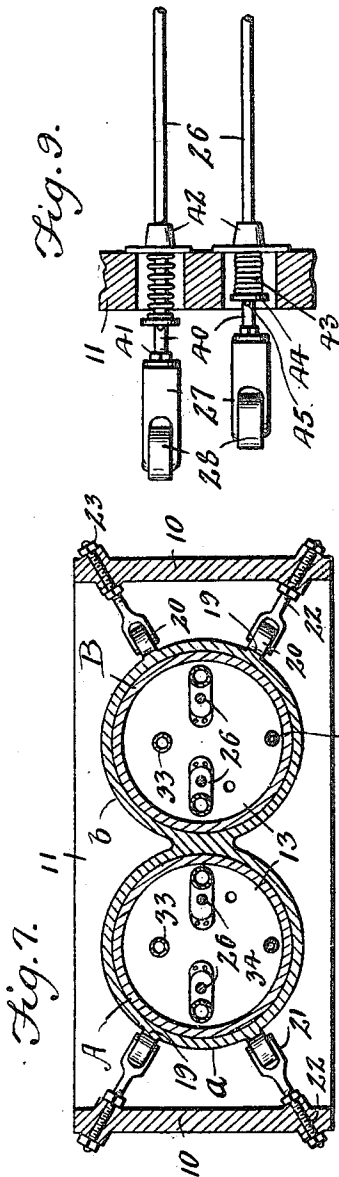


Fig. 9.

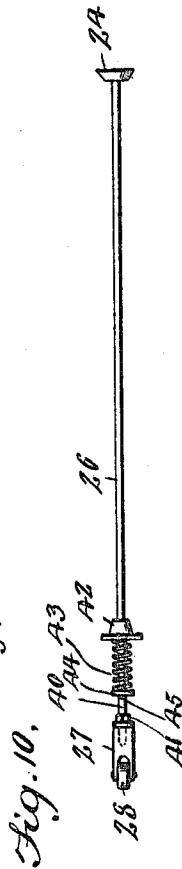
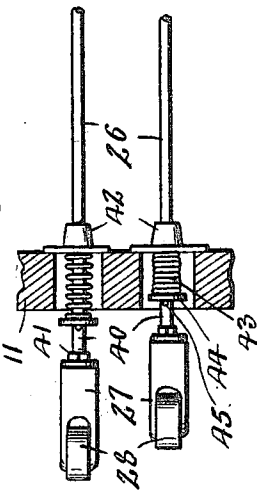


Fig. 10.

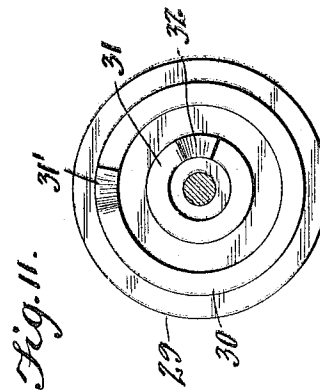
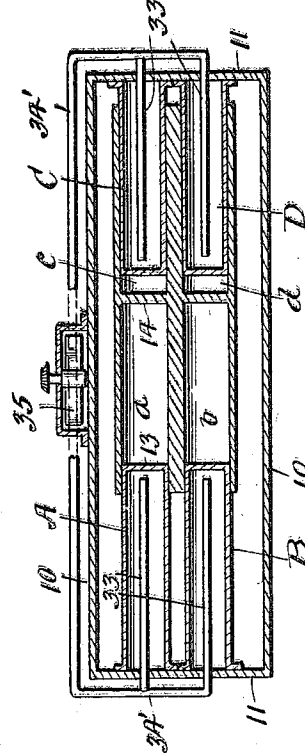


Fig. 11.

Fig. 12.



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INTERNAL-COMBUSTION ENGINE.

1,223,701.

Specification of Letters Patent.

Patented Apr. 24, 1917.

Application filed December 18, 1915. Serial No. 67,620.

To all whom it may concern:

Be it known that I, FRANK H. KRIENITZ, a citizen of the United States, residing at McFarland, in the county of Wabaunsee and State of Kansas, have invented new and useful Improvements in Internal-Combustion Engines, of which the following is a specification.

This invention relates to internal combustion engines, the object in view being to provide a compact powerful multiple cylinder engine in which the cylinders reciprocate as a unit and the pistons are stationary, the arrangement being such that all of the cylinders are coupled by a single connecting rod to a crank shaft having a single crank, thereby materially reducing the number of parts, rendering a minimum number of bearings necessary and also producing a construction by means of which the impulse or working stroke in one cylinder is cushioned by the compression stroke in an opposing cylinder, resulting in a material reduction in vibration and producing an engine of smooth and powerful action.

With the above and other objects in view, the invention consists in the novel construction, combination and arrangement of parts, as herein described, illustrated and claimed.

In the accompanying drawings:—

Figure 1 is a plan view partly in section of an engine embodying the present invention.

Fig. 2 is an enlarged horizontal section through the pistons and cylinders, showing the valve arrangement.

Fig. 3 is a side elevation of the engine.

Fig. 4 is an enlarged longitudinal section through one of the stationary pistons.

Fig. 5 is a plan view of the cylinders which are cast *en bloc*.

Fig. 6 is a side elevation of the same.

Fig. 7 is a cross section through the cylinders of the engine showing the supporting means therefor.

Fig. 8 is an end view of one pair of pistons showing the arrangement of the valves and ports therein.

Fig. 9 is a fragmentary sectional view illustrating the valves, and valve guides.

Fig. 10 is a detail plan view of one of the valves and the actuating push rod thereof.

Fig. 11 is a face view of one of the cam disks.

Fig. 12 is a longitudinal section through the piston and cylinders showing the cooling means.

Referring to the drawings 1 designates the crank shaft of the engine, the same being mounted within a housing 2 containing bearings 3 for the shaft 1. The crank shaft is provided at one end thereof with a gear wheel 4 for operating the magneto and the cam shaft, the latter being indicated at 5. The housing also includes a crank case 6 in which operates the crank 7, there being a single crank used in connection with four cylinders and four pistons, 8 designating the single connecting rod attached to the crank 7 by the connecting rod bearing 9.

Extending outwardly from the crank case 6 is a frame comprising the longitudinal side members 10 substantially parallel to each other and the end members 11 which rigidly connect the side members 10. In the engine as illustrated in the accompanying drawings, four pistons A, B, C and D are employed, each piston being provided at its outer end with an attaching flange 12 by means of which it is bolted or otherwise securely fastened to one of the end frame members 11. The inner end of each piston is closed by a head 13.

Coöperating with the pistons is a corresponding number of cylinders *a, b, c* and *d*, all of said cylinders being cast *en bloc* and having their outer ends open to embrace the pistons while the inner ends thereof are closed by means of a cylinder head 14 common to all of the cylinders.

In the preferred embodiment of this invention all of the cylinders and pistons are horizontally disposed and they all lie in a common horizontal plane. Extending upwardly from the block of cylinders at the center thereof is a post 15 carrying at its upper end a horizontally extending wrist pin 16 to which the adjacent end of the connecting rod 8 is coupled. The wrist pin 16 is braced by means of truss rods 17 which extend from the wrist pin in opposite directions and are fixedly secured to the cylinders adjacent to the ends thereof as shown at 18. The connecting rod 8 is thus located at a sufficient elevation above the cylinders to prevent any interference on the part of said piston rod as the crank shaft end thereof follows the sweep of the crank 7.

Roller tracks 19 extend longitudinally of the outer walls of the cylinders and bear against rollers 20 carried by forks 21 on the ends of supporting rods 22 which are fastened to the frame at 23. The arrangement just referred to forms a support for all of the cylinders and guides the same in the reciprocatory movements thereof.

Each piston is provided with an intake valve 24 controlling an intake port in the head thereof and is also provided with an exhaust valve 25 which controls an exhaust opening also in the head of the piston. Each of the inlet and exhaust valves is provided with a stem 26 which extends from the inner to the outer end of the piston and beyond the end frame member 11 where it is operated by means of a push rod 27 provided with a roller 28 which is acted upon by one of a pair of cam disks 29, said disks being arranged at the opposite ends of the frame containing the cylinders and pistons. Each of the disks 29 comprises an outer track 30 and an inner track 31 one of which is provided with a raised cam face 31' which operates the intake valves at that end of the frame, the other track being provided with a raised face 32 which serves to actuate the exhaust valves at that end. Thus a single disk 29, in each rotation thereof, operates two intake valves and two exhaust valves. The other cam disk at the opposite end performs the same operation in connection with the valves at that end. Both of the cam disks are geared to and driven by the crank shaft 1.

In addition to the intake and exhaust valves, there is an air intake pipe 33 which enters the open end of each piston and also an oil pipe 34. As shown in Fig. 12, the air pipes 33 are connected to the branches 34' of a compressed air manifold having incorporated therein an air compressor or fan 35 driven by any suitable connection with the crank shaft, whereby air is forced under pressure into all of the pistons for the purpose of cooling the latter. Each piston or frame piece 11 may be perforated to admit of the escape of the air.

The cylinders are provided adjacent to the common head 12 thereof with openings to receive spark plugs 36 and in the reciprocatory movement of the block of cylinders, the plugs 36 approach within approximately one sixteenth of an inch of a pair of electric conductor strips 37 to which lead the high tension wires 38 of the magneto, the latter being geared to the crank shaft 1 as above indicated. 39 designates a fly wheel on the engine shaft.

Each of the valves and its push rod is of the ordinary puppet valve construction now commonly employed in internal combustion engines, the push rod 27 being bored and threaded to receive an adjustable tappet

screw 40 which is held fixed by means of a lock nut 41. The stem 26 of the valve passes through one of a series of valve stem guides 42 and has the valve seating spring 43 which is held between the guide 42 and a washer 44 secured to the valve stem 26 by means of a key 45.

The timing of the engine is preferably such that as an explosion takes place in one cylinder, compression is taking place in one of the opposing cylinders and in this way the working stroke in one of the cylinders is cushioned by the compression of the mixture in an opposing cylinder. The other cycles of operation are arranged to follow each other after the manner of the ordinary four cycle internal combustion engine. Thus in an engine embodying four cylinders there are two impulses for each complete revolution of the crank shaft and the impulses are opposed to each other so that they exert both a pulling and pushing action on the crank 7 of the crank shaft.

Having thus described my invention, I claim:—

1. In an internal combustion engine, the combination of a crank shaft having a single crank, a crank case, a frame extending away from said crank case and comprising longitudinal and transverse members, horizontally opposed pistons having closed heads at their inner ends arranged in spaced relation to each other, the outer ends of said pistons being fixedly secured to said frame, a block of cylinders corresponding in number with the number of pistons and arranged to reciprocate back and forth relatively to and upon said pistons, a wrist pin on the block of cylinders, a connecting rod extending from said wrist pin to said crank shaft, intake and exhaust valves in said piston heads, stems extending from said valves in opposite directions through the outer ends thereof, rotary cam disks cooperating with said valve stems, said disks being operatively connected with and driven by the crank shaft, a post extending from the block of cylinders and supporting said wrist pin, and truss rods connecting said wrist pin with the block of cylinders.

2. In an internal combustion engine, the combination of a crank shaft having a single crank, a crank case, a frame extending away from said crank case and comprising longitudinal and transverse members, horizontally opposed pistons having closed heads at their inner ends arranged in spaced relation to each other, the outer ends of said pistons being fixedly secured to said frame, a block of cylinders corresponding in number with the number of pistons and arranged to reciprocate back and forth relatively to and upon said pistons, a wrist pin on the block of cylinders, a connecting rod extending from said wrist pin to said crank shaft,

an intake and an exhaust valve in each piston head, stems extending from said valves in opposite directions through the outer ends thereof, rotary cam disks cooperating with
5 said valve stems, said disks being operatively connected with and driven by the crank shaft, each cam disk being provided with a raised cam face cooperating with a plurality of intake valve stems, and another raised

cam face cooperating with a plurality of exhaust valve stems. 10

In testimony whereof I affix my signature in presence of two witnesses.

FRANK HENRY KRIENITZ.

Witnesses:

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ALTON H. INGERSOLL.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."