Feb. 15, 1927. 1,617,710

E. H. GRUBERT

VALVE MECHANISM FOR INTERNAL COMBUSTION ENGINES

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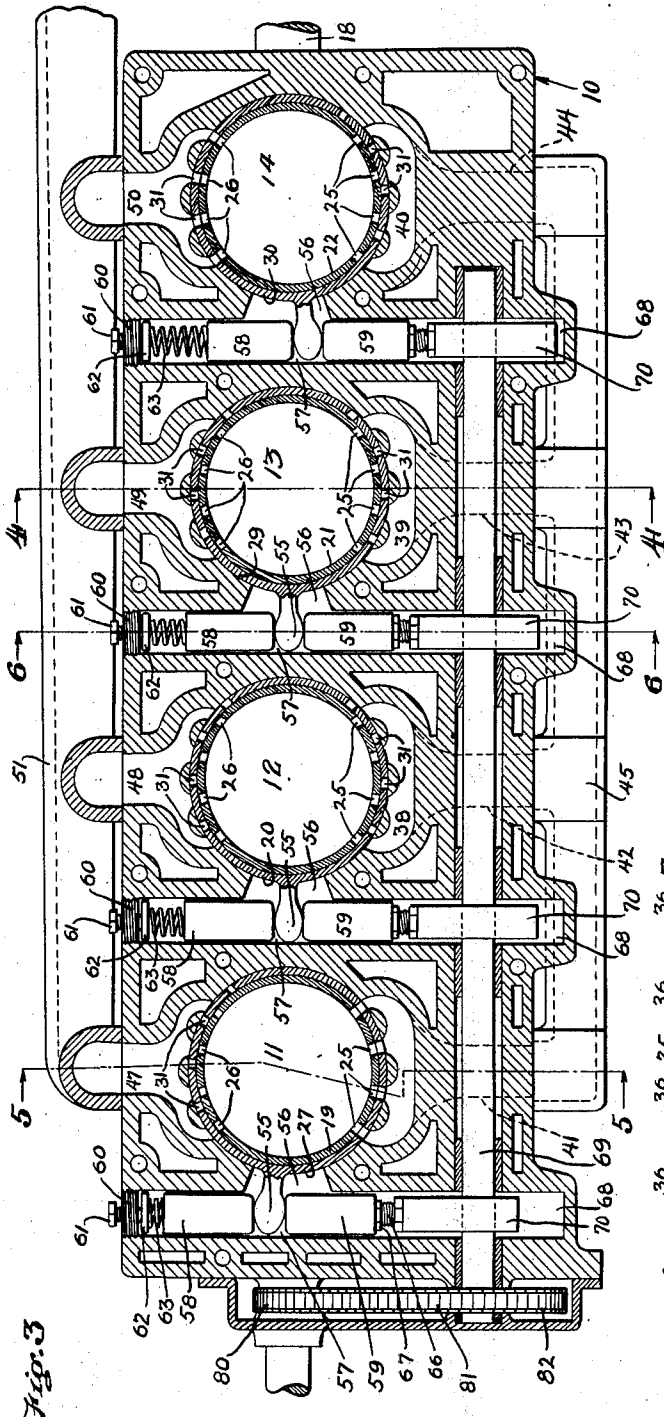


Fig. 3

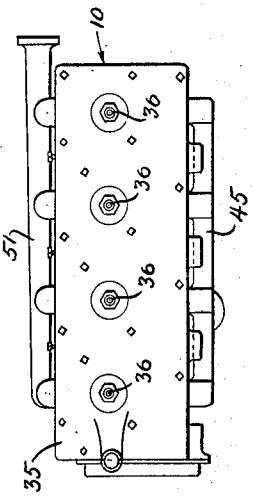


Fig. 2

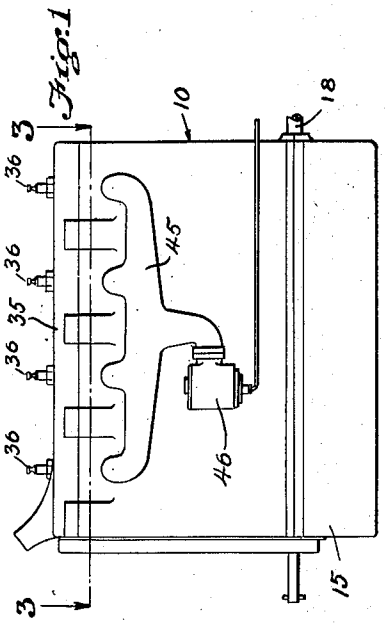


Fig. 1

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Fig. 4

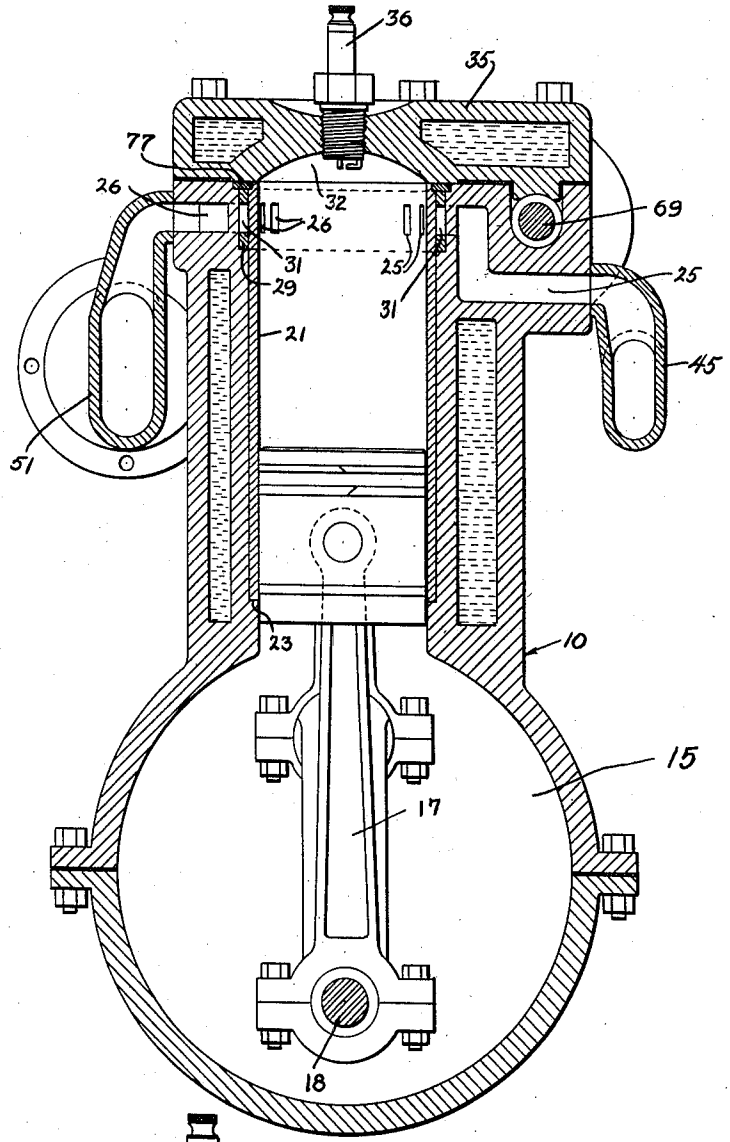
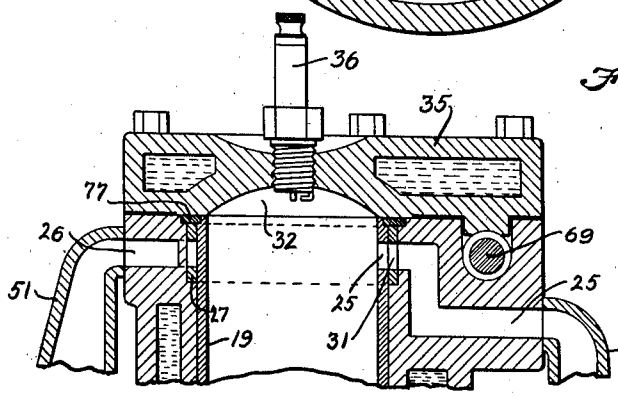


Fig. 5



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VALVE MECHANISM FOR INTERNAL COMBUSTION ENGINES

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Fig. 6

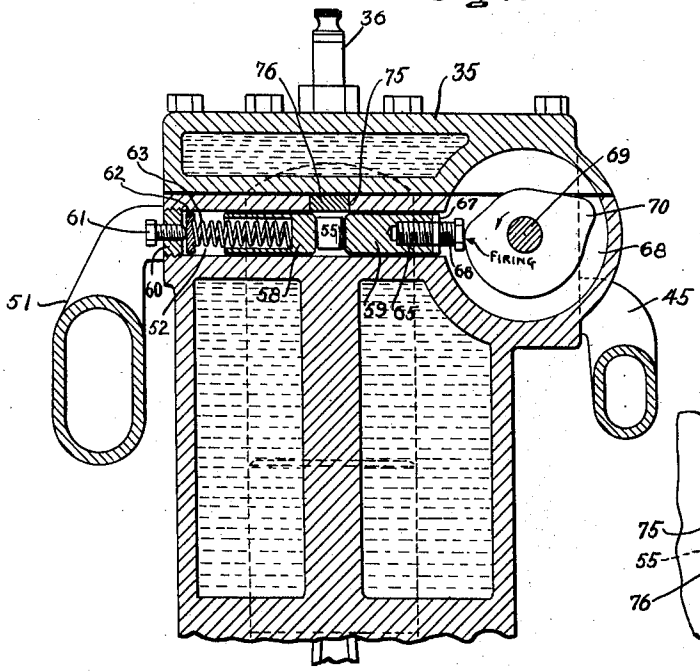


Fig. 6a

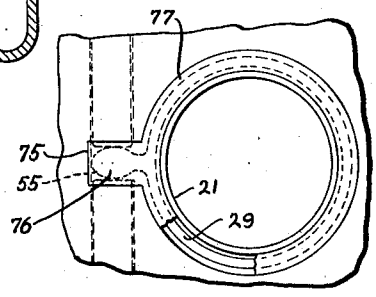


Fig. 8

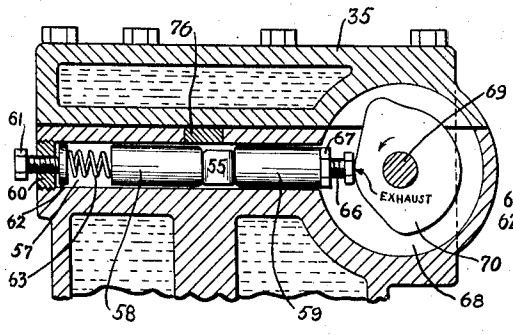


Fig. 7

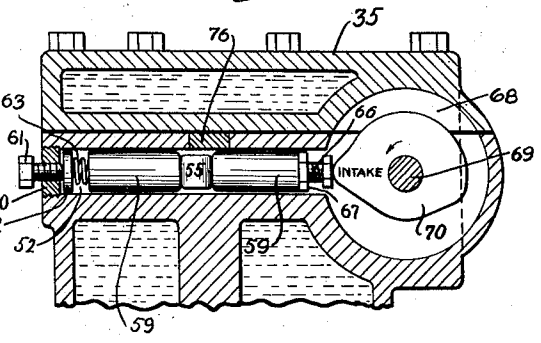


Fig. 9

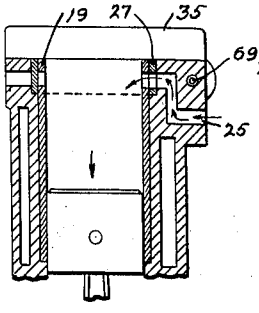


Fig. 10

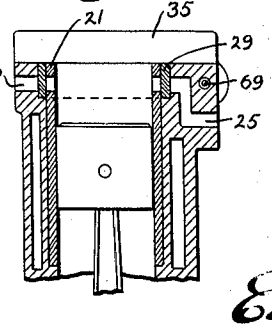
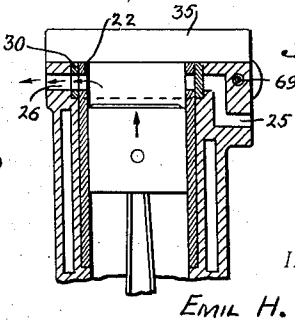


Fig. 11



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UNITED STATES PATENT OFFICE.

EMIL H. GRUBERT, OF LOS ANGELES, CALIFORNIA.

VALVE MECHANISM FOR INTERNAL-COMBUSTION ENGINES.

Application filed January 4, 1926. Serial No. 79,103.

This invention has relation more specifically to a rotary sleeve valve construction for controlling the admission of vaporized fuel to the combustion cylinders of an internal combustion engine and exhausting the burnt gases therefrom after a firing operation.

A main object of the invention is to provide a simple rotary sleeve valve construction for engine cylinders in which the various sleeves are positively operated by a plurality cams to accurately open and close the inlet and exhaust ports on the various strokes of the cylinder pistons during the operation of the engine.

Another object is to provide a rotary valve construction for internal combustion engines that will materially increase the power of the engine.

A further object is to provide a valve construction which will not require grinding, that will reduce friction in its moving parts to the minimum, evenly distribute the fuel to the cylinders, and which may be readily repaired should occasion arise.

Briefly the present invention consists of employing removable cylinder sleeves in lieu of the usual polished bores, having on their upper ends inlet and outlet ports for the admission of fuel thereto and the exhaust of exploded or burnt gases therefrom. Surrounding the upper end of each cylinder sleeve for controlling the ports therein is a short circular valve sleeve provided with openings adapted to be brought into and out of register with the ports of the cylinder sleeves on a rotation thereof. Each valve sleeve is provided with an operating arm extending radially therefrom, for rotating the same to open and close the ports leading to and from the combustion portions of the engine cylinders. A cam shaft mounted in bearings and extending along one side of the engine frame is provided having a plurality of cams mounted thereon, a cam for each cylinder, for operating plunger mechanisms connected to each valve sleeve operating arm for rotating the valve sleeves during the cyclic operation of the engine. It will be understood that the cam shaft is driven from the engine crank shaft, and the various valve sleeves are operated in cycles to open and close the ports in the cylinder sleeves on a reciprocation of the cylinder pistons.

This disclosure is to be regarded as descriptive only and not as restrictive or limitive of the invention, of which obviously an embodiment may be constructed including many minor modifications without departing from the scope herein indicated and hereinafter claimed.

In the drawings hereto attached and forming a part of the following specification:

Fig. 1 is a side elevation of an internal combustion engine of usual form, with my valve construction applied thereto.

Fig. 2 is a plan view of the same.

Fig. 3 is an enlarged plan section taken on line 3—3 of Fig. 1.

Fig. 4 is a transverse section taken on line 4—4 of Fig. 3 showing the engine valves in a neutral position.

Fig. 5 is a partial transverse section taken on line 5—5 of Fig. 3 showing the intake valve ports open.

Fig. 6 is a partial transverse section taken on line 6—6 of Fig. 3 showing the valve sleeve operating cam in a neutral position.

Fig. 6ª is a plan of the metal valve retaining gasket.

Fig. 7 is a view similar to the above showing the valve sleeve operating cam in an intake position.

Fig. 8 is another view similar to the preceding showing the valve sleeve operating cam in an exhaust position.

Fig. 9 is a diagrammatic sectional view showing the sleeve valve rotated to open the cylinder ports to an intake position.

Fig. 10 is a similar view showing the sleeve valve rotated to close the cylinder ports for the compression and firing strokes.

Fig. 11 is another view showing the sleeve valve rotated to open the cylinder to an exhaust stroke.

In the accompanying drawings the invention is illustrated in connection with a four cylinder, four cycle engine, but it is perfectly obvious that the number of cylinders may be multiplied to any desired extent without entailing any substantial alterations in construction.

Referring now particularly to Figs. 3 and 4 of the drawings it will be seen that the engine comprises a cast iron frame 10, having four cylinder bores 11, 12, 13, 14, and a sealed crank case 15 communicating with the lower open ends of the cylinder bores. The

cylinders are water jacketed in the usual manner, and each cylinder is provided with a piston 16 of usual form connected by a piston rod 17 to the crank shaft 18 of the engine.

Mounted in the bores of the engine cylinders are piston sleeves 19, 20, 21, 22, formed of steel, their lower ends engaging annular seats 23 formed in the bores adjacent their lower ends. The upper end of each piston sleeve is provided with a plurality of inlet and outlet ports 25, 26, respectively, oppositely disposed, and rotatively engaging the upper ends of the piston sleeves are valve rings 27, 28, 29, 30, each provided with openings 31 arranged in oppositely disposed groups, similar to the ports formed in the piston sleeves with which they register at various intervals to open and close the ports during the operation of the engine.

The engine frame is provided with a water jacketed head 35, bolted or otherwise suitably secured thereto, and its under surface is provided with a plurality of concavities 32, one for each engine cylinder, a threaded opening at the crown of each concavity is provided for the reception of the usual spark plugs 36. Each group of intake ports of the various cylinders open to cored chambers 37, 38, 39, 40, formed in the engine frame adjacent thereto, and each chamber is provided with intake passages 41, 42, 43, 44, that are in communication with the usual intake manifold 45, connected at its inlet end with a fuel carburetor 46 of an approved design. The exhaust group of cylinder ports are located diametrically opposite the fuel intake ports, and discharge to cored outlet chambers 47, 48, 49, 50, that are in turn connected to an exhaust manifold 51 of usual form.

In order to operate the valve sleeves of each cylinder, each sleeve is provided with a radially disposed operating arm 55 projecting from its exterior surface. These operating arms project through recesses 56 of sufficient size to permit of the maximum rotation of the valve sleeves during the operation of the engine into transversely disposed bores 57 formed in the engine frame, a bore for each cylinder. Disposed in each of bores 57, is a sleeve operating mechanism preferably consisting of a pair of cylindrical plungers 58, 59, the oppositely disposed ends of the plungers engaging the sleeve operating arms 55 to partially rotate the same on a reciprocation of the plungers, as clearly shown in the various views of the drawings. The bores at the exhaust side of the engine are closed by screw plugs 60, each carrying an adjusting bolt 61, that pass therethrough and engage circular valve spring disks 62 concaved on their outer faces. The outer ends of plungers 58 are socketed for the reception of coiled compression springs 63, the outer ends of the springs engaging the concaved faces of the disks 62. By means of this mechanism the tension of the springs may be increased to compensate for any wear of the sleeve operating mechanisms. Should any of the plunger operating springs 63 at any time become broken, the screw plugs may be quickly removed and new springs substituted therefore.

Valve sleeve operating plungers 59 on their outer ends are provided with threaded bores 65 for the reception of adjusting bolts 66, and lock nuts 67, the heads of the bolts projecting into circular chambers 68 formed in the engine frame. Mounted in each of said chambers on an operating shaft 69 disposed in bearings in the engine frame and extending longitudinally thereof, are plurality of plunger operating cams 70, the perimeter of each of said cams being exactly similar. These cams are arranged on the operating shaft so that on their rotation they will successively open and close the inlet and outlet ports in the cylinder sleeves in cycles, as clearly shown in the various views of the drawings, and particularly in Figs. 6 to 11 inclusive, thus in Fig. 6 the cam for operating the plungers to operate the valve sleeve of cylinder 20 is shown at the end of a compression stroke of the cylinder piston, and about to fire, its valve sleeve having been rotated to close the inlet and exhaust ports.

In Fig. 8, the cam for operating the valve sleeve ring of cylinder 22 is shown as rotated to its exhaust position, the cylinder exhaust being opened and the inlet ports closed. In Fig. 7 the cam for operating the valve sleeve of cylinder 19 is shown as contacting with the plunger 59 at its highest point to rotate the ring to open the intake and close the exhaust ports.

The diagrammatic views as shown in Figs. 9 to 11 inclusive represent the relative positions of the pistons in a single cylinder with respect to the position of its inlet and exhaust ports, thus the said views represent respectively, the intake, compression and firing, and lastly the exhaust strokes.

In order that the valve sleeves may be removed from the cylinder sleeves should occasion arise, the top wall of each of the plunger bores 57 is provided with an opening 75 for chambering an arm 76 formed integral with a metal gasket ring 77, best shown in Figs. 4 and in detail in Fig. 6a, the ring seating on the upper edge of each sleeve and preventing any vertical movement of the same on their rotation.

The cam shaft 69 may be operated in any suitable manner, but in this instance it is shown as operated from the engine crank shaft through the medium of a sprocket 80 secured to the forward end of said shaft,

a chain 81, being geared therefrom to a sprocket 82 secured to the forward end of the cam shaft.

The starting of the engine is accomplished in the usual well known manner through the medium of a starting mechanism of the usual well known form, and as the same forms no part of my invention is not shown, the plungers for operating the valve ring sleeves are normally pressed into engagement with the peripheral surfaces of the operating cams by means of the coiled compression springs that are chambered in the socketed ends of the plungers 58. As these springs at all times force the outer ends of the plungers 59 into positive engagement with the irregular surfaces of the cams, it will be perfectly clear that on a rotation of the cams that are arranged so that the sleeves are rotated to open and close the various cylinder ports in cycles, the plunger mechanisms will be accurately and positively operated to rotate the valve rings.

What I claim is:

1. A valve mechanism for internal combustion engines comprising an engine block provided with a cylinder bore, said cylinder being provided in the upper portion of its wall with a plurality of inlet and exhaust ports, a rotary valve ring provided with a plurality of ports adapted to be brought into and out of registry with the cylinder ports seated in said engine block and encircling the cylinder, a valve operating arm secured to said valve ring, a pair of spring pressed plungers disposed in line mounted on said engine block, the oppositely disposed ends of said plungers engaging the valve operating arm, a cam shaft and operating means therefore, and a cam on said shaft engaging one of said valve operating plungers, whereby to rotate the valve ring to open and close the cylinder ports.

2. A valve mechanism for internal combustion engines comprising an engine block provided with a plurality of cylinders, each cylinder provided with a plurality of fuel inlet and exhaust ports, a rotatable valve ring seated at the upper end of each cylinder and provided with ports adapted to be brought into and out of register with the cylinder ports on a rotation of said rings, an operating arm secured to each ring, a pair of plungers mounted in bores formed adjacent each cylinder, the end of the valve ring arms being disposed between the oppositely disposed ends of said plungers, a cam shaft provided with a plurality of cams mounted on said engine block, the cams engaging one of each pairs of plungers and means for rotating said cam shaft in timed relation to the movement of the cylinder pistons, and resilient means engaging one of each pair of plungers for normally forcing the same against the cams.

In witness that I claim the foregoing I have hereunto subscribed my name this 21st day of December 1925.

E. H. GRUBERT.