

Dec. 4, 1945.

V. POGIOLI

2,390,169

VALVELESS ENGINE

Filed June 9, 1941

2 Sheets-Sheet 1

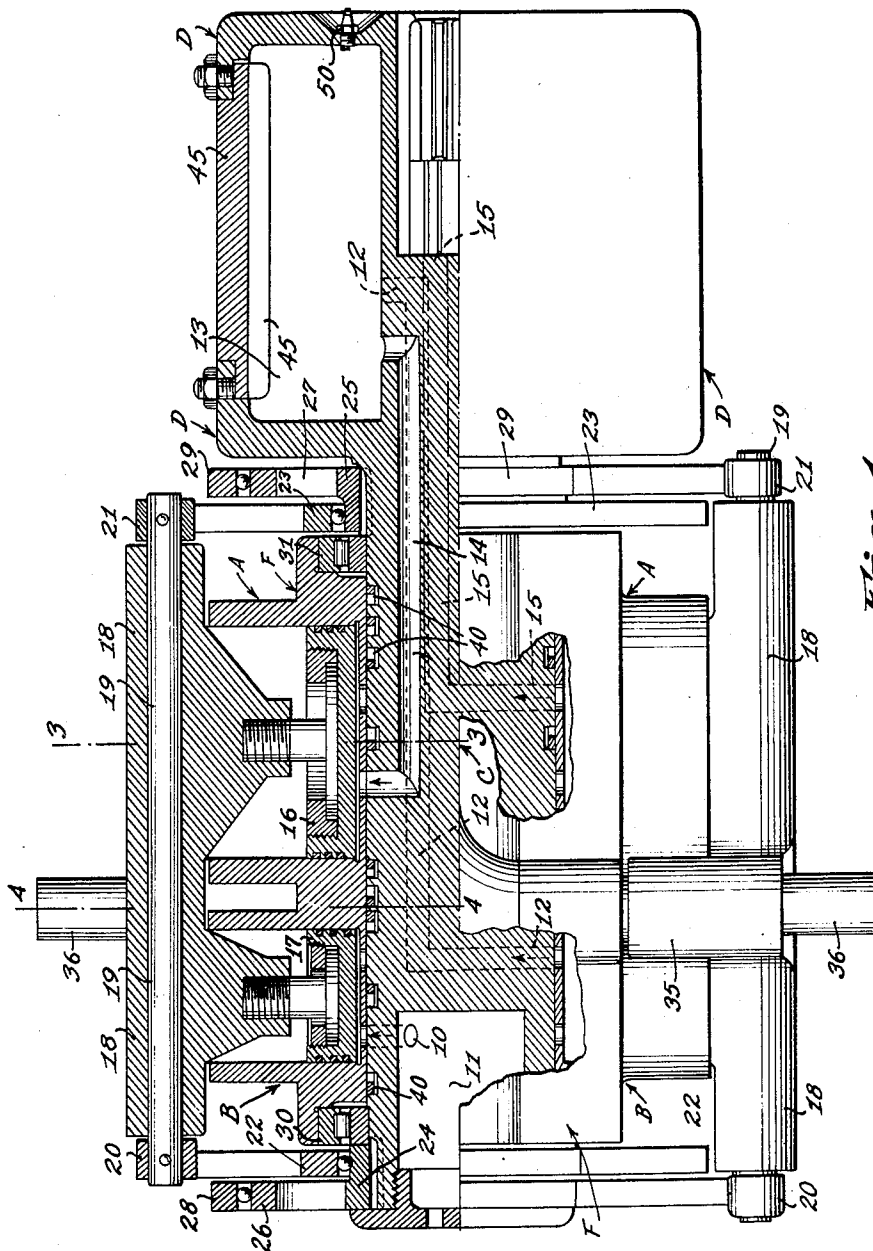


Fig. 1

Inventor  
VITTORIO POGIOLI

By *Alfred S. ...*  
Attorney.

Dec. 4, 1945.

V. POGIOLI

2,390,169

VALVELESS ENGINE

Filed June 9, 1941

2 Sheets-Sheet 2

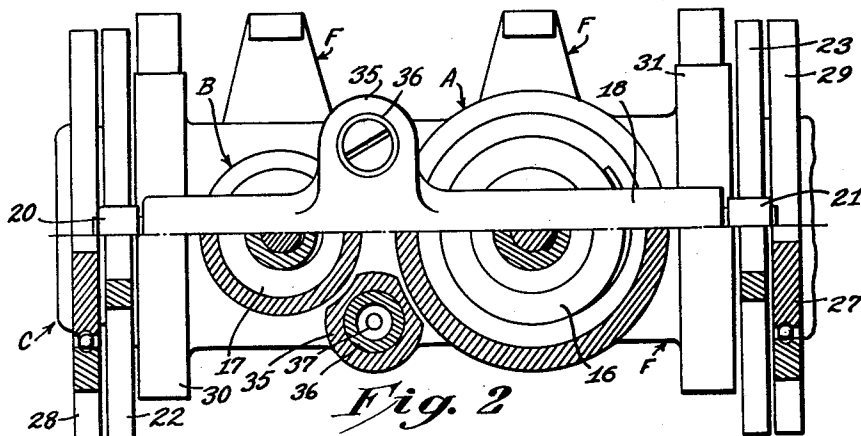


Fig. 3

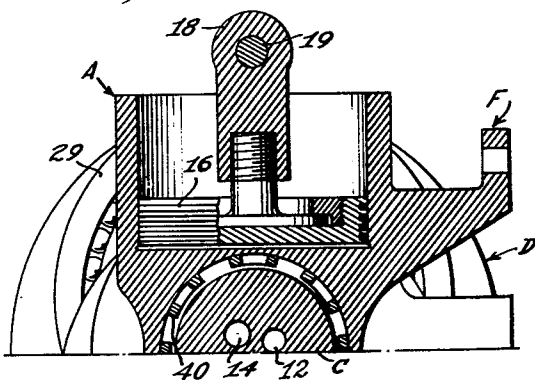


Fig. 5

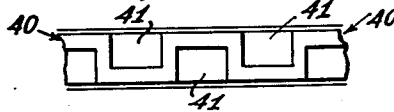


Fig. 6

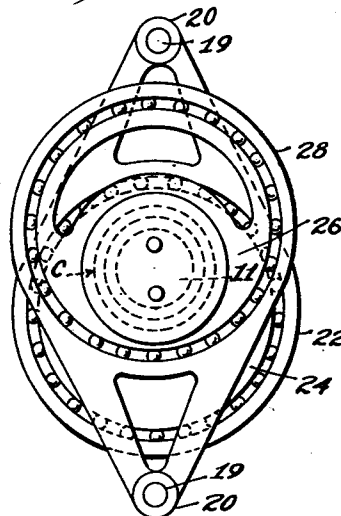
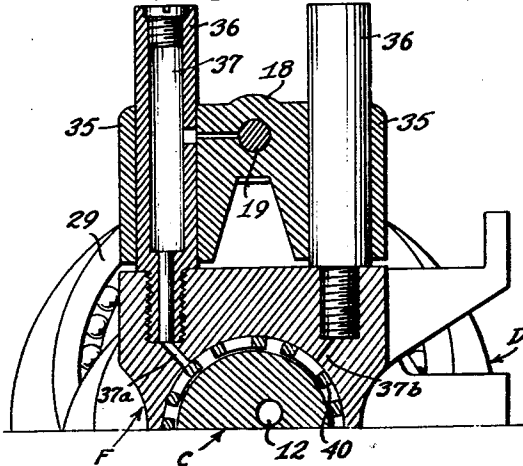


Fig. 4



Inventor  
VITTORIO POGIOLI

By *Alfred H. H. H. H. H.*  
Attorney.

## UNITED STATES PATENT OFFICE

2,390,169

## VALVELESS ENGINE

Vittorio Poglioli, Milan, Italy; vested in the  
Alien Property CustodianApplication June 9, 1941, Serial No. 397,246  
In Italy June 11, 1940

2 Claims. (Cl. 60—44)

The subject-matter of this invention is a valveless engine with feeding cylinders, combustion chamber and working cylinders.

An object of this invention is the provision of a multiple cylinder, reciprocating piston, engine, adapted to use any suitable fuel and obtain increased efficiency therefrom. Toward this end one or more pistons draw the fuel from a mixing chamber, compress it and force it into a combustion chamber where the compressed fuel is ignited, and one or more cylinders larger in proportion than the compressor cylinders receive the thrust from the ignited fuel and the pistons thereof are reciprocated for useful work. On the return stroke of these larger driving cylinders the fuel is exhausted into the atmosphere.

Combustion takes place in a chamber for this purpose and the work is entrusted to cylinders whose sizes are calculated in such a way as to thoroughly exploit all the heat which, after having been generated by the combustion, will have increased the volumes of the fluid.

Practically, the highest pressure given by the compressor cylinders is equal to that of the combustion chamber as well as that which acts in the working cylinders.

The ducts in the engine shaft and distributor are arranged in such a way as to interrupt communication with the driving cylinders in the suitable position in which the compressor cylinder passage opens. This is because the quantity of fluid which has been admitted into the working cylinders can expand until the volume and heat are exhausted, and act according to an identical diagram both in the stage of compression as well as in the driving stage.

The invention will now be explained with reference to the annexed drawings which is to be considered only as an indicating example which does not confine the range of the invention in any way.

Fig. 1 is a vertical elevation with parts in section, of the engine according to the invention, of the type with cylinders set against each other.

Fig. 2 is a plan with parts in section.

Figs. 3 and 4 are sections on lines 3—3 and 4—4 of Fig. 1.

Fig. 5 is a detail plan view on a larger scale developed in a plane, of one arrangement of the packing for the shaft.

Fig. 6 is an end elevation of the engine, looking from the left in Fig. 1.

The engine comprises a set of driving cylinders

A in line with a second set of compressor cylinders B, two cylinders A and B being shown in Fig. 1 in diametrically opposed positions. Each cylinder B draws the air and fuel mixture through an inlet duct 10 which puts the fuel-mixing chamber 11 adjacent one end of shaft C (which chamber may also be used if necessary as a filter or purifying chamber) in communication with the compressor cylinders B. The air and fuel mixture sucked from chamber 11 is compressed and then forced through a second duct 12, which runs into an annular combustion chamber 13 formed by a container D, which as herein illustrated, is integral with shaft C. A third duct 14 extends through shaft C, and connects the combustion chamber 13 with the driving cylinders A. A fourth duct 15 in the shaft C is the exhaust duct, connecting the said driving cylinders with the atmosphere. The ducts are arranged and positioned in shaft C so that when the aforesaid shaft revolved, the different cylinders A and B communicate through the respective ducts, with the proper chambers only at the proper times, whereby the different driving and compressing stages ensue.

The pistons 16 and 17 of each pair of aligned cylinders A and B, are coupled to a crosspiece 18 mounted on a cross rod 19 secured at its ends in arms 20 and 21 extending radially of the shaft C and provided with collars 22 and 23 respectively, which with balls or the like interposed encircle eccentrics 24 and 25 keyed on shaft C. To these eccentrics other eccentrics 26 and 27 are connected and as herein shown they are angularly spaced by 180° from the positions of eccentrics 24 and 25. Similarly, collars 28 and 29 encircling the eccentrics 26 and 27 are coupled as mentioned before with the other set of cylinders A and B opposite to that under consideration. Shaft C is supported by roller bearings 30 and 31 in housing F of the engine which also carries the sets of cylinders A and B.

To guide the pistons and attached movable parts the crosspieces 18 are formed with apertured side extensions 35, which slide upon guide rods 36 fixed to the engine's housing. The guide rods have axial holes 37 to store lubricating material and lubricate shaft C and extensions 35 by means of auxiliary ducts 37a and 37b for the lubricating material. To prevent leakage from ducts 10, 12, 14 and 15 of shaft C, the packing segments 40 are positioned in grooves in said shaft. Fig. 5 illustrates one form of these packing segments, whereby efficient lubrication is secured by spaced recesses 41 in the surfaces of

the packing segments 46 which aid in maintaining an oil supply in position to form a continuous film of oil on the shaft C.

The combustion chamber D for the fuel mixture is preferably provided with a large covered port 45 to facilitate access thereto, as for cleaning, and this port can be opened inwardly whenever desired. Ignition preferably takes place within the combustion chamber D, and any suitable ignition means may be provided, as, for example, through the spark-plug 50 threaded into the end wall of the chamber. Also suitable means may be provided in the combustion chamber to control the turbulence and guide the fuel mixture.

From the above it will be evident that with the revolving of shaft C the duct 10 is brought into correspondence with the compressor cylinder B just before the piston 17 of such cylinder is raised. When the piston 17 is raised through the eccentrics 24 and 25, air and fuel mixture is drawn into the cylinder B through duct 10, after which this duct has rotated beyond cylinder B and so out of correspondence therewith. Simultaneously the duct 12 is rotated into communication with cylinder B so that upon the compression stroke of piston 17 the compressed fuel mixture is forced through duct 12 into the combustion chamber D. The compressed fluid is there ignited and the driving cylinders A receive the expanding fluid after such ignition; the piston 16 in cylinder A being forced upwardly and so driving the engine to keep the engine in motion and effecting useful work in addition to elevating the aligned piston 17 of the companion compressor piston in each set of cylinders. Upon the down stroke of the piston 16 of the driving cylinder A the expanded gases are exhausted through duct 15 to the atmosphere. The rotation of shaft C brings ducts 14 and 15 into correspondence with the driving cylinders A so as to admit the expanding and burned fuel mixture into the cylinders through duct 14 and then to permit exhaustion of the expanded gases to the atmosphere through duct 15. The relative size of cylinders A and B in each set of aligned cylinders is such that maximum efficiency from the expanding gases is approached. A cycle is completed with each revolution of shaft C, and the ducts are brought into corre-

spondence with each of the cylinders without necessitating the use of valves.

What I claim is:

1. A valveless engine comprising a revolving shaft having an annular combustion chamber at one end thereof, inlet means for a combustible mixture, a plurality of compressor cylinders having pistons therein, a duct in said shaft adapted to register in succession with each of said compressor cylinders and said combustion chamber, a plurality of working cylinders larger than the compressor cylinders and having pistons therein, a further duct in said shaft adapted to register in succession with said combustion chamber and each of said working cylinders, exhaust means, eccentrics on said shaft adapted to revolve therewith, and means operatively connecting said eccentrics with said pistons within said cylinders, the relationship between the position of said eccentrics and that of said ducts in the shaft being such as to allow of a complete cycle with each revolution of the shaft, said cylinders being arranged in sets, each set comprising a compressor cylinder and a working cylinder longitudinally aligned on the same side of said shaft, and the pistons of each set being simultaneously moved in the same directions and for the same distances by said eccentrics during each cycle.

2. In a valveless engine a revolving shaft, a single combustion chamber at one end thereof, a plurality of sets of cylinders, each set comprising a compressor cylinder and a working cylinder wherein the combustion gases are allowed to expand aligned longitudinally of and on the same side of said shaft, said working cylinder being larger than the compressor cylinder, means for successively causing the compressor cylinder of each set to communicate with the combustion chamber and this latter with the working cylinder, said means comprising ducts provided in said shaft and adapted to register successively with the compressor cylinder and the combustion chamber, and with this latter and the working cylinder during each revolution of the shaft, both cylinders in each set being simultaneously moved in the same directions and for the same distances by said eccentrics during each revolution of said shaft.

VITTORIO POGIOLI.