

Dec. 6, 1932.

L. E. CADWELL

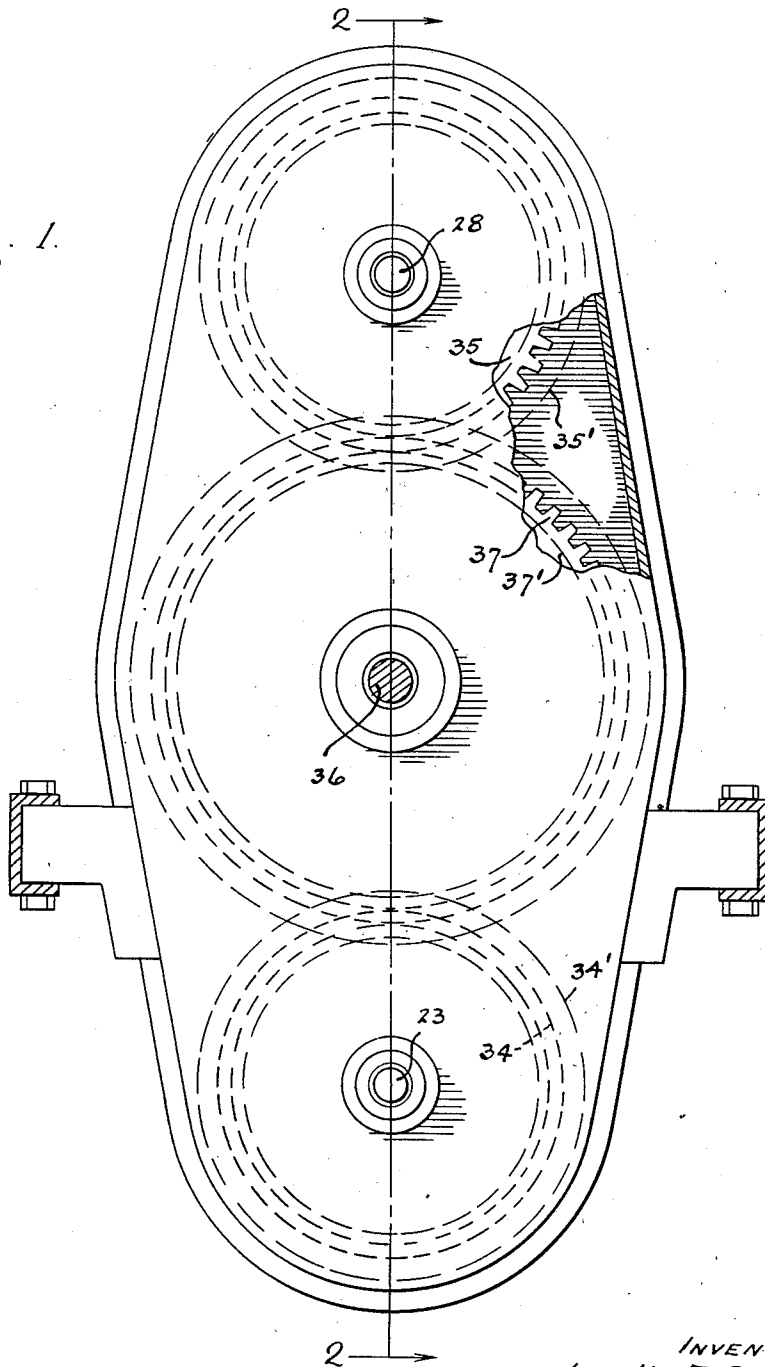
1,889,946

GAS ENGINE

Filed Jan. 15, 1930

3 Sheets-Sheet 1

Fig. 1.



INVENTOR,
Leslie E. Cadwell,
By *Minturn & Minturn,*
Attorneys.

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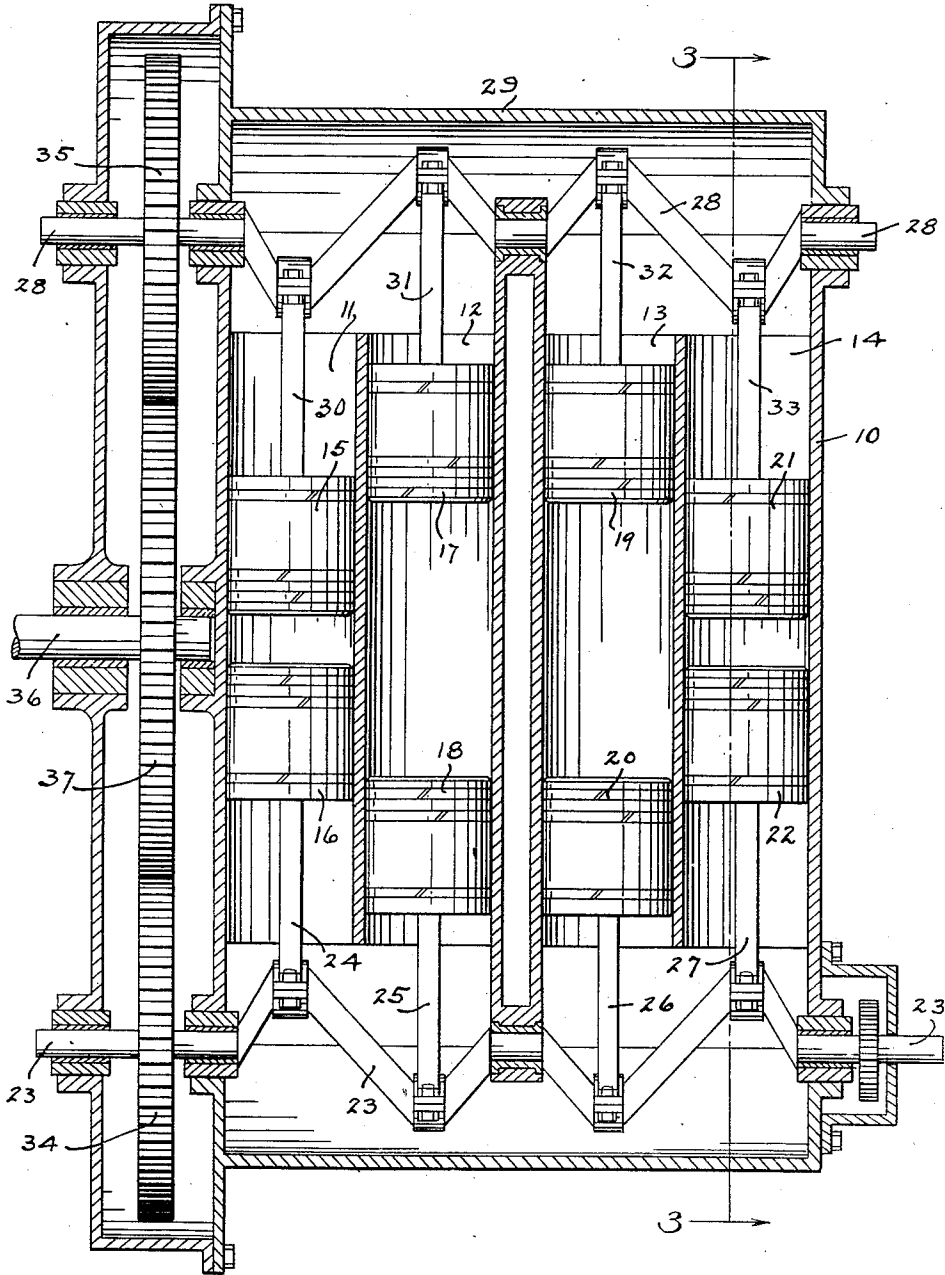


Fig. 2.

INVENTOR,
Leslie E. Cadwell,
By *Minturn & Minturn,*
Attorneys.

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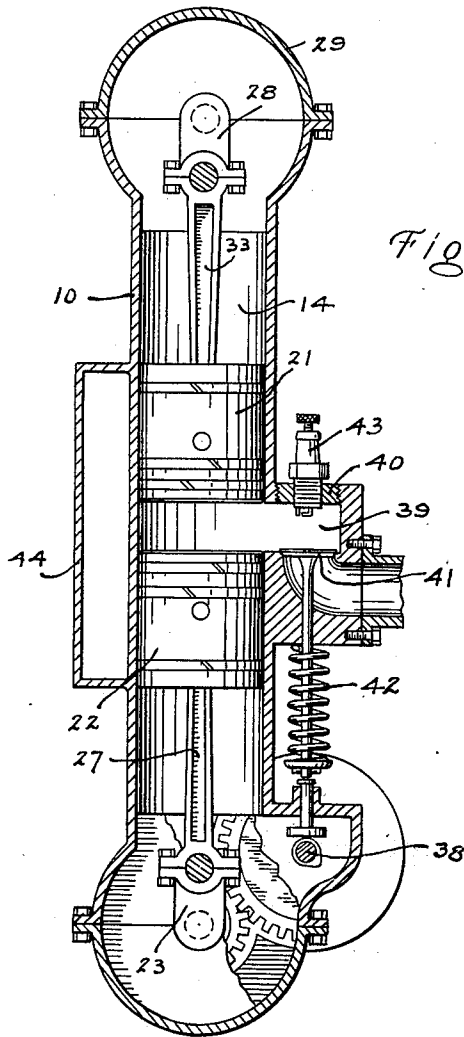


FIG. 3.

INVENTOR,
Leslie E. Cadwell,
By *Wentworth & Wentworth,*
Attorneys.

UNITED STATES PATENT OFFICE

LESLIE E. CADWELL, OF INDIANAPOLIS, INDIANA, ASSIGNOR TO HEADLESS MULTIPLE MOTOR CORPORATION, OF INDIANAPOLIS, INDIANA, A CORPORATION

GAS ENGINE

Application filed January 15, 1930. Serial No. 421,041.

This invention relates to the art of internal combustion engines and has for its primary objects the provision of means whereby an expansion of gases may take place between two oppositely traveling pistons; in the elimination of a cylinder head with its accompanying gasket; the provision for a plurality of power take-off shafts and in the provision of means permitting a drive shaft speed differing from that of the motor crank shaft speed.

These and other objects will become apparent in the following description of my invention as illustrated in the accompanying drawings, in which—

Fig. 1 is a front elevation of a motor embodying my invention;

Fig. 2, a vertical longitudinal section through the motor on the line 2—2 in Fig. 1; and

Fig. 3, a vertical transverse section through a cylinder of the motor on the line 3—3 in Fig. 2.

Like characters of reference indicate like parts throughout the several views in the drawings.

Referring principally to Figs. 2 and 3, I form a motor block 10 here shown as having four vertically disposed cylinders 11, 12, 13, and 14 therein. Within each of these cylinders I place a pair of opposing pistons 15, 16, 17, 18, 19, 20, 21 and 22 respectively, all of the usual type carrying expansion packing rings. A crank shaft 23 is rotatably carried across the undersides of the four cylinders and has rockably attached thereto the connecting rods 24, 25, 26 and 27 which in turn are rockably secured to the respective pistons 16, 18, 20 and 22 all in the usual and well known manner.

Above the cylinders, in the same plane with the shaft 23 is rotatably mounted a second crank shaft 28 surrounded by the removable crank case 29.

The crank shaft 28 is of the four throw

type corresponding exactly to the shaft 23 and has the connecting rods 30, 31, 32, and 33 interconnecting it with the respective pistons 15, 17, 19 and 21. On similar ends of the crank shafts 23 and 28 are fixed the gears 34 and 35, each having the same number of teeth thereon. Midway between the two gears 34 and 35 is rotatably carried a stub shaft 36 on which is fixed a gear 37 in mesh with the gears 34 and 35.

The two gears 34 and 35 are meshed with the gear 37 to have the corresponding throws of the shafts 23 and 28 opposing one another as indicated in Figs. 2 and 3 whereby the pistons in each cylinder will be traveling in opposite directions one in respect to the other upon rotation of the shafts.

Gear driven from the crank shaft 23 is the usual cam shaft 38 running at one-half crank shaft speed as is customary in four cycle gas engine practice. The length of each of the respective cylinders is such that when the two pistons within that cylinder have reached their limit of travel toward each other, Fig. 3, there is a space therebetween serving as a compression and combustion space in communication with a pocket 39. Entrance into this pocket 39 is to be had from the upper side by removing the plug 40 to permit the insertion of the necessary intake and exhaust valves 41 fitting over ports in the bottom of the pocket and slidingly pass on down to carry the compression spring 42 therearound as a means of seating the valves after being lifted by the cams on the shaft 38 in the usual manner. A spark plug 43 is screw-threadedly carried by the plug 40 as a means of igniting combustible mixtures within the pocket 39 and communicating space between the pistons. A water jacket 44 is centrally located about the cylinders as a means of conducting away excessive heat.

I employ the four cycle principle whereby, upon suitable rotation of the shafts 23 and 28, the pistons 15 and 16 in cylinder 11,

for example, are advanced one toward the other to compress a charge therebetween following which that charge is ignited and the pistons forced apart one from the other to revolve the respective crank shafts in the same direction of rotation, the pistons traveling to their extreme outer limits to positions as would be indicated by pistons 17 and 18 in the cylinder 12. 70

10 The remaining third and fourth cycles of travel of the respective pistons exhaust the products of combustion and draw in a new charge and compress it ready for the next power stroke. It is to be noted that the construction of the motor block 10 is very simple 80

15 in that the cylinders 11, 12, 13, 14 are bored directly therethrough and that no seat is required to be fixed to receive a cylinder head with a gasket therebetween. It is also to be noted, Fig. 1, that the gears 34 and 35 may be of different diameters as indicated by the dash lines 34' and 35' to permit the use of a smaller gear 37 as indicated by the line 37' whereby the stub shaft 36 may be given a different rate of speed. Power may be taken off from the engine at either ends of both shafts 23 and 28 or from the shaft 36, making five points in all available. Since the crank shafts 23 and 28 are interconnected by the gears 34, 37 and 35, the combined power delivered to the shafts 23 and 28 may be utilized at any one of the five points. 90

20 While I have here shown and described my invention in the one form as now best known to me, it is obvious that structural deviations may be made from that form without departing from the spirit of the invention, and I therefore, do not desire to be limited to that precise form, nor any more than may be required by the following claim. 95

25 I claim:
 In an internal combustion engine, a motor block having a plurality of vertically disposed cylinders in pairs, each comprising an upper and lower cylinder, a piston in each cylinder, transverse crank shafts common to adjoining cylinders, at the ends of the engine, and operated by said pistons, the length of each cylinder being such that when the two pistons within a pair of cylinders reach their limit of travel toward each other there is a space between the pistons, a housing laterally of each pair of cylinders defining a pocket in communication with said space, intake and exhaust ports in the bottom of the pocket, valves closing and opening the ports, openings through the top of the pocket for the introduction of the valves, plugs screwed into and closing the openings, spark plugs through the last named plugs, crank cases in two parts containing the crank shafts and cranks, one part being integral with the cylinder walls and the other part removably secured to the first part, the lower integral part having an extension under the valve housing, stems 100

30 from the valves terminating within their respective extensions, springs to normally seat the valves, a cam shaft drivingly connected with the adjacent crank shaft, cams on the cam shaft lifting the valves at each revolution of the cam shaft, a water jacket cooling the cylinders, a stub shaft between the crank shafts, gears drivingly connecting the crank shafts and stub shaft, means for taking power from the stub shaft and means for taking power from each end of the crank shafts. 105

In testimony whereof I affix my signature.
 LESLIE E. CADWELL.

35 I claim:
 In an internal combustion engine, a motor block having a plurality of vertically disposed cylinders in pairs, each comprising an upper and lower cylinder, a piston in each cylinder, transverse crank shafts common to adjoining cylinders, at the ends of the engine, and operated by said pistons, the length of each cylinder being such that when the two pistons within a pair of cylinders reach their limit of travel toward each other there is a space between the pistons, a housing laterally of each pair of cylinders defining a pocket in communication with said space, intake and exhaust ports in the bottom of the pocket, valves closing and opening the ports, openings through the top of the pocket for the introduction of the valves, plugs screwed into and closing the openings, spark plugs through the last named plugs, crank cases in two parts containing the crank shafts and cranks, one part being integral with the cylinder walls and the other part removably secured to the first part, the lower integral part having an extension under the valve housing, stems 110

45 from the valves terminating within their respective extensions, springs to normally seat the valves, a cam shaft drivingly connected with the adjacent crank shaft, cams on the cam shaft lifting the valves at each revolution of the cam shaft, a water jacket cooling the cylinders, a stub shaft between the crank shafts, gears drivingly connecting the crank shafts and stub shaft, means for taking power from the stub shaft and means for taking power from each end of the crank shafts. 115

50 the last named plugs, crank cases in two parts containing the crank shafts and cranks, one part being integral with the cylinder walls and the other part removably secured to the first part, the lower integral part having an extension under the valve housing, stems 120

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