June 27, 1933. A. P. BRUSH 1,915,977

INTERNAL COMBUSTION ENGINE

Filed Oct. 20, 1930 3 Sheets-Sheet 1

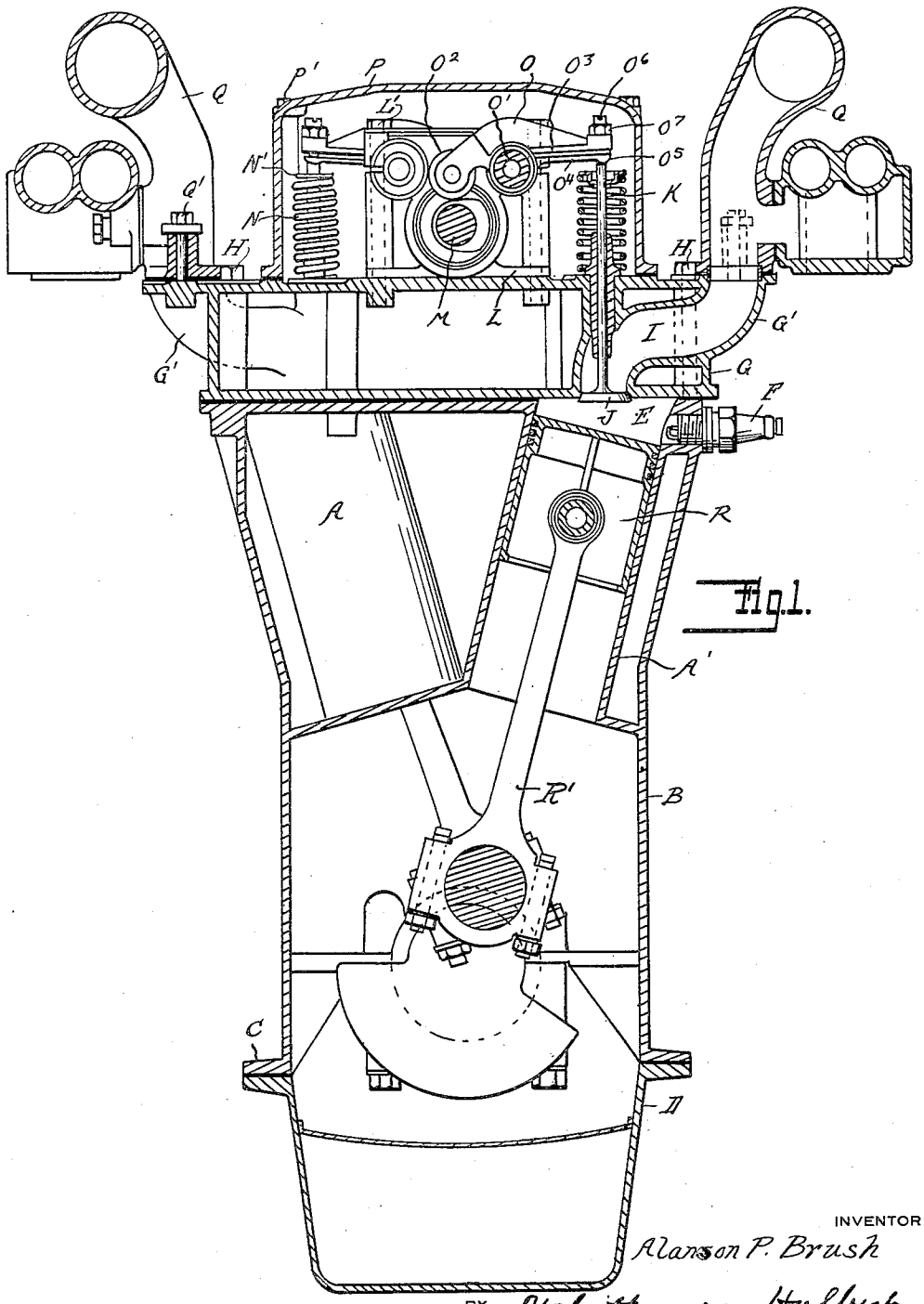


Fig. 1.

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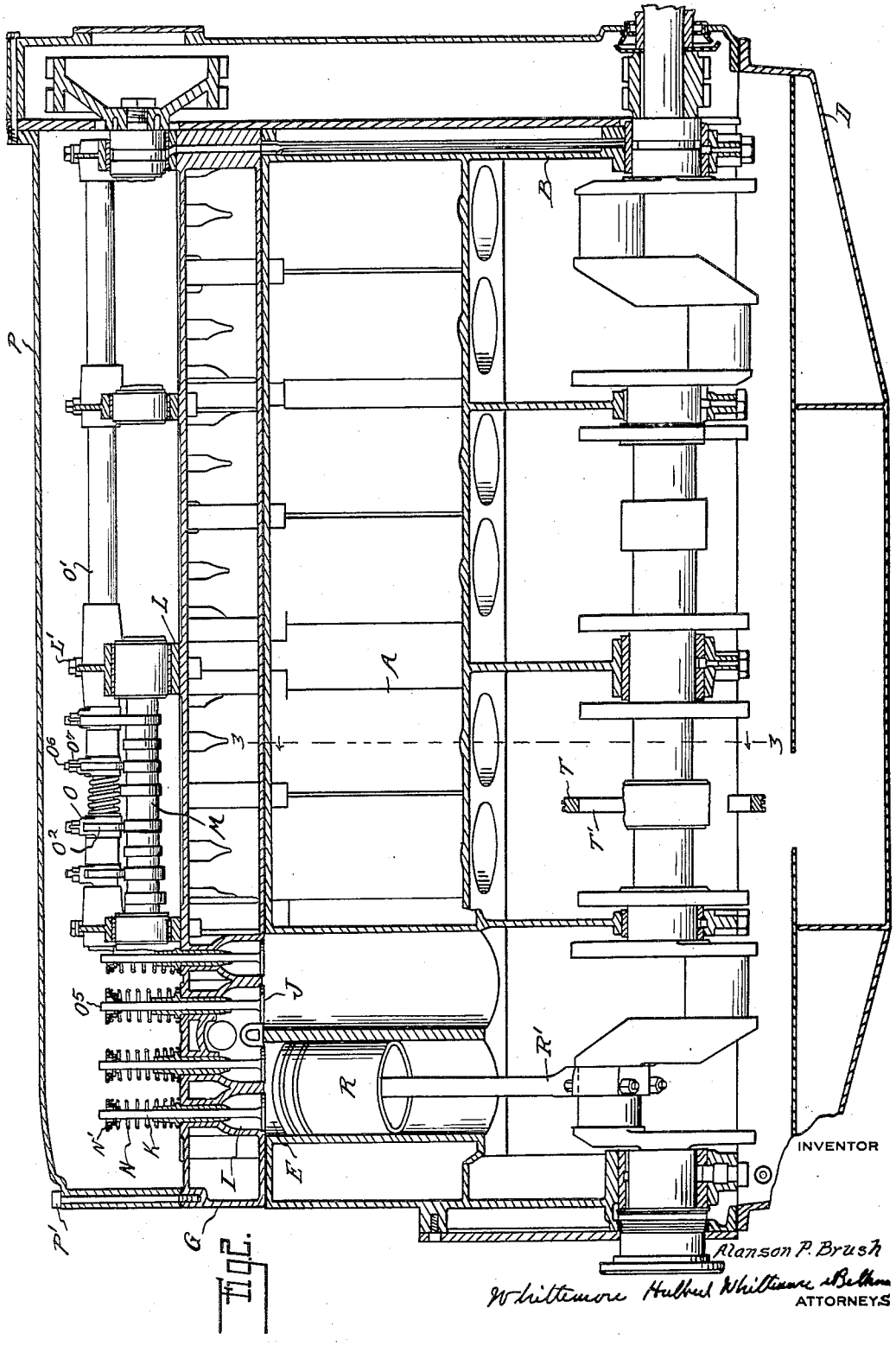


Fig. 2.

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Filed Oct. 20, 1930 3 Sheets-Sheet 3

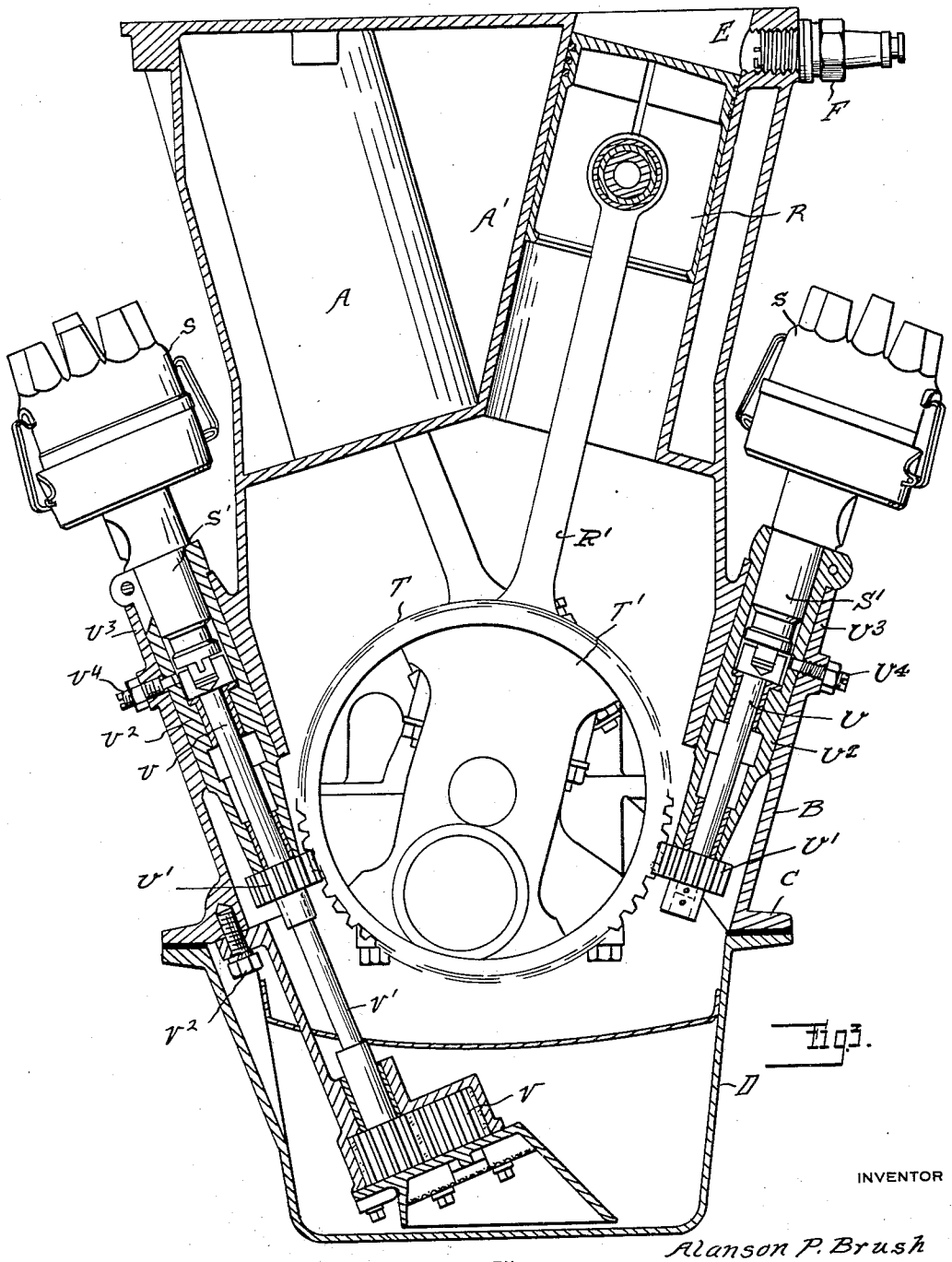


Fig. 3.

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UNITED STATES PATENT OFFICE

ALANSON P. BRUSH, OF DETROIT, MICHIGAN

INTERNAL COMBUSTION ENGINE

Original application filed September 9, 1929, Serial No. 391,419. Divided and this application filed October 20, 1930. Serial No. 490,070.

The invention relates to multi-cylinder internal combustion engines of the V-type and forms a divisional of an earlier filed application Serial No. 391,419, filed September 9, 1929. The invention consists in the means employed for driving accessory devices as hereinafter set forth.

In the drawings:

Figure 1 is a vertical cross section;

Figure 2 is a longitudinal section broken away to show parts in different planes;

Figure 3 is a cross section on line 3—3 of Figure 2 illustrating the pump and distributor mechanism and manner of driving the same.

In the present state of the art in the construction of internal combustion engines it has been found impracticable to arrange more than eight cylinders in alignment or in a single plane. Where a large number of cylinders is desired the double bank or V type construction may be used, but this increases complication and cost of manufacturing. With my improvement I combine certain advantages in the aligned type of engine with those secured by the V type, particularly with respect to simplicity in construction, reduction in the number of parts and in compactness of arrangement.

My improvements are applicable to engines with any number of cylinders but are particularly advantageous in engines having more than eight cylinders, as for instance twelve or sixteen, the construction being as follows:

A and A′ are two banks of aligned cylinders in an integral block and having their axes arranged at a limited angle to each other, preferably thirty degrees. The integral block also includes a crank case B which is of the width of the two banks of cylinders at their lower ends and extends downward below the plane of the crank shaft, being provided with flanges C for the attachment of the oil pan D. The top and bottom faces of the block are parallel and in horizontal planes which makes the upper face intersect the cylinders at an oblique angle resulting in wedge shaped clearance spaces E above the pistons, the large ends of the wedges being on the outer side. This gives room for the insertion of the spark plugs F which are thus directly attached to the block independent of its removable head.

For closing both banks of cylinders I employ a single head G having a horizontal lower face abutting against the upper face of the block and secured thereto by suitable bolts H. The head G has formed therein the inlet and exhaust valve ports I which are arranged in alignment longitudinally of the block and substantially centrally with respect to the axes of the cylinders. J are the valves for controlling these ports which are substantially flush with the lower face of the head G and have the axes of their stems K arranged perpendicular to this face. The upper face of the head G is parallel to the lower face and has centrally mounted thereon at spaced points bearings L having cam shafts M, these bearings being secured to the head by bolts L′. The valve stems K project upward beyond the upper face of the head G being provided with valve springs N and collars N′ of any suitable construction. Intermediate the cam shaft M and the respective valve stems are rockers O which are centrally fulcrumed at O′, their inner ends being provided with rollers O^2 for engagement with a cam and their outer ends bearing on the upper ends of the stems K to provide for adjustment and seating of the valves. The rockers O are longitudinally slotted at O^3 to leave a comparatively thin and flexible section O^4 which carries the bearing O^5 engaging the valve stem. Above the slot O^3 is a rigid portion in which is arranged an adjustment screw O^6 bearing against the portion O^5 and held in its position of adjustment by a lock nut O^7. This simple arrangement permits of direct engagement of the rocker with the cam and the valve stem while providing for setting and adjustment of the valves.

The valve mechanism just described is enclosed in a housing or cover P resting upon the upper face of the head G and secured thereto by bolts P′. On opposite sides of this housing P are the inlet and exhaust manifolds Q which preferably engage the

upper faces of lateral extensions G′ of the head, being coupled thereto by the bolts Q′. The specific construction of these manifolds is not essential to the present invention and therefore will not be described in detail.

The pistons R are connected to the crank shaft by rods R′ so constructed as to permit of insertion and removal through the upper ends of the cylinders, and the rods for the adjacent cylinders of the opposite banks engage the same crank. Separate distributors S are used for each bank of cylinders and these are arranged at an oblique angle on opposite sides of the block. For driving the distributors and also for driving the oil pump I arrange a single ring gear T which is mounted on one of the throws T′ of the crank shaft. The distributor shafts U are located in the same transverse plane as this ring gear and are so arranged that the gears U′ thereon will intermesh with said ring gear. The shafts U are journaled in bearings U^2 which together with the gears U′ may be inserted longitudinally through quills U^3 formed integral with the block. The bearings U^2 also form sockets for receiving the shank S′ of the distributor casing and all parts are held in position by the lock screws U^4 inserted laterally through the quill.

The oil pump V has its drive shaft V′ arranged in axial alignment with the shaft U and suitably coupled thereto. The pump casing is bolted at V^2 to a suitable bearing on the block and extends downward into the oil pan where it is arranged substantially centrally thereof. Thus the single ring gear T serves as a driving means for both distributors and both oil pumps.

What I claim as my invention is:

1. In a multi-cylinder internal combustion engine, the combination with an integral V block having two oppositely angling banks of cylinders and a crank case, of a crank shaft journaled in said crank case, a single gear surrounding one of the crank throws intermediate pairs of cylinders, a shaft extending obliquely of said crank case and outward through an aperture in the side wall thereof in the plane of said gear, a gear on said shaft intermeshing with said first mentioned gear and a distributor and pump driven by said shaft respectively located outside and inside said case.

2. In a multi-cylinder internal combustion engine, the combination with an integral V block having oppositely angling banks of cylinders and a crank case a crank shaft journaled in said crank case, a gear surrounding one of the throws of said crank shaft and mounted thereon and distributor and pump shafts arranged obliquely on opposite sides of the crank case in the plane of said gear, each of said shafts having a gear mounted thereon which intermeshes with the said first mentioned gear.

3. A multi-cylinder internal combustion engine comprising an integral V block having two oppositely angling banks of cylinders and a crank case, an oil pan beneath said crank case, a crank shaft in said case, a ring gear surrounding one of the throws of the crank shaft and mounted thereon, a shaft extending obliquely to said crank case in the plane of said ring gear, a gear on said shaft intermeshing with said ring gear, an oil pump in said oil pan engaging and driven by the lower end of said shaft, and a distributor outside of said block engaging and driven by the upper end of said shaft.

4. In a multi-cylinder internal combustion engine the combination with a V-block and a crank case, of a crank shaft journaled in said crank case, a gear in the plane of one of the throws of said crank shaft surrounding and mounted thereon, and a shaft for driving an accessory having a gear thereon intermeshing with said first mentioned gear in the plane thereof.

5. In a multi-cylinder internal combustion engine the combination with a V-block and a crank case integral therewith, of a crank shaft journaled in said crank case, a gear surrounding one of the crank throws, an obliquely extending apertured bearing in said crank case in the plane of said gear, a distributor outside the crank case and a shaft and gear for said distributor insertable through said apertured bearing into operative engagement with the gear surrounding the crank throw.

6. In a multi-cylinder internal combustion engine the combination with a V-block and a crank case integral therewith, of a crank shaft journaled in said crank case, a gear surrounding one of the crank throws and mounted thereon, a distributor assembly including a distributor casing, a shaft, a bearing for said shaft and a gear on said shaft and an obliquely extending quill integral with said crank case in the plane of the gear on said crank throw, said quill forming a mounting for said distributor casing and bearing through which the gear on said shaft is insertable into operative engagement with the gear on said crank throw.

7. In a multi-cylinder internal combustion engine the combination with a V-block and a crank case integral therewith, of a crank shaft journaled in said crank case, a gear surrounding one of the throws of said crank shaft and mounted thereon, a distributor assembly comprising the casing, a shaft, a gear on said shaft, a bearing for said shaft having an external diameter greater than that of said gear and an obliquely extending quill integral with the side wall of said crank case in the plane of the gear surrounding said crank throw, said quill being adapted for the insertion of said distributor shaft and gear

therethrough into operative relation to the crank throw gear and forming a mounting for the distributor outside the crank case.

8. In a multi-cylinder internal combustion engine, the combination with a V-block and a crank case integral therewith, of a crank shaft journaled in said crank case, a gear surrounding one of the throws of said crank shaft and mounted thereon, a distributor assembly including a casing, a shaft, a gear wheel on said shaft and a bearing for said shaft having an external diameter in excess of that of said gear, an obliquely extending quill integral with the side wall of said crank case in the plane of said crank throw gear, said quill being adapted for the mounting of said bearing therein and permitting the insertion of the distributor shaft and gear therethrough into operative engagement with the crank throw gear, a pump and an operating shaft therefor having a coupling engagement with said distributor shaft, a supporting bearing for said pump mounted on said crank case and an oil pan secured to said crank case for receiving said pump and supporting bearing.

9. In a multi-cylinder internal combustion engine, the combination with a V-block and a crank case integral therewith, of a crank shaft journaled in said crank case, a gear surrounding one of the throws of said crank shaft and mounted thereon, obliquely extending quills integral with the opposite side walls of said crank case in the plane of said gear, distributor assemblies mounted in said quills, each having a shaft and gear insertable through the quill into operative engagement with the crank throw and gear, a pump having a shaft coupled with one of said distributor shafts, a mounting for said pump on said crank case and an oil pan for said crank case receiving said pump and its mounting.

10. In a multi-cylinder internal combustion engine, the combination with a U-block having a crank case integral therewith, of a crank shaft journaled in said crank case, a gear surrounding one of the throws of said crank shaft and mounted thereon, an obliquely extending quill integral with a side wall of said crank case in a plane of said gear, a distributor assembly mounted in said quill and having an operating shaft and gear insertable through the quill into engagement with said crank throw gear, an oil pan and a pump within said oil pan having a shaft coupled with said distributor shaft to be driven thereby.

In testimony whereof I affix my signature.

ALANSON P. BRUSH.