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May 24, 1927.

1,629,664

R. K. JACK

INTERNAL COMBUSTION ENGINE

Filed Sept. 2, 1921

2 Sheets-Sheet 1

Fig. 1.

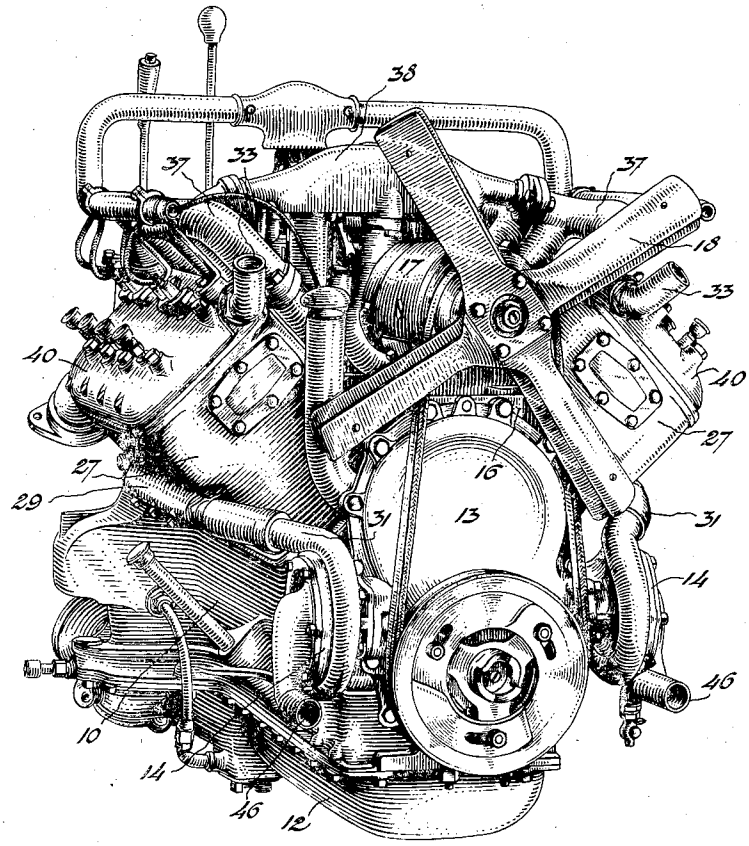
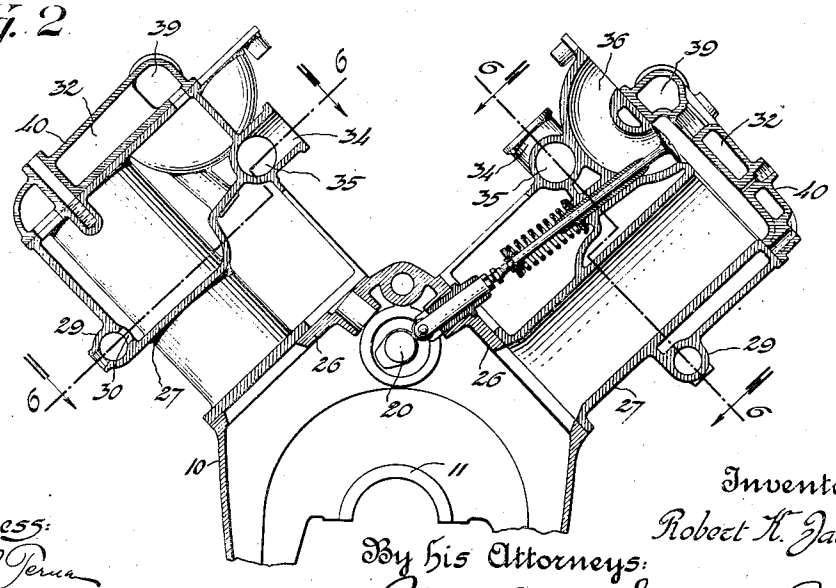


Fig. 2.



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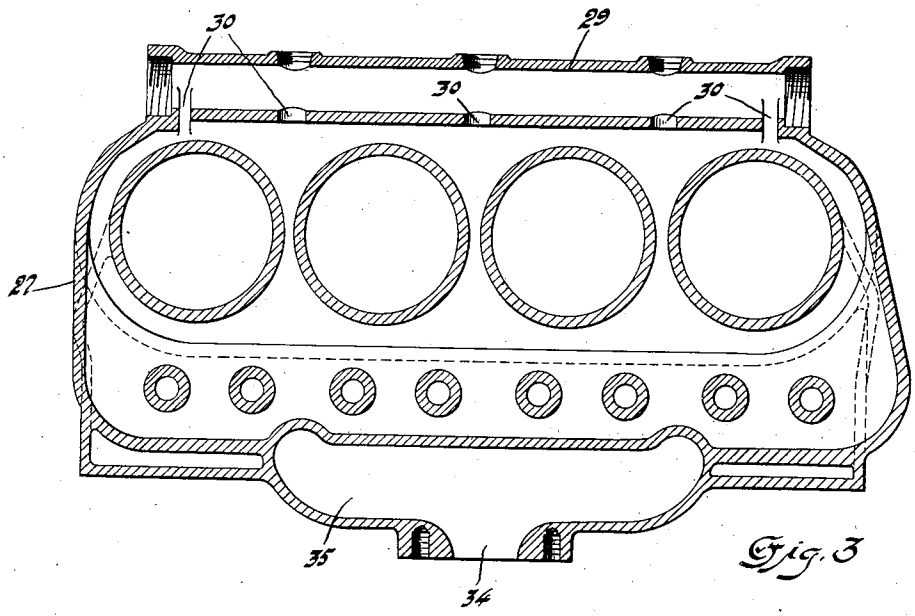

Fig. 3

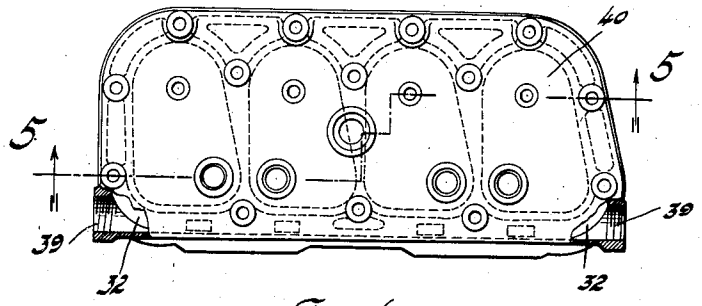

Fig. 4

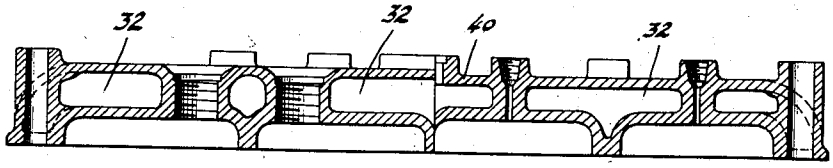

Fig. 5

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Patented May 24, 1927. 1,629,664

UNITED STATES PATENT OFFICE.

ROBERT K. JACK, OF LANSING, MICHIGAN, ASSIGNOR TO GENERAL MOTORS CORPORATION, OF DETROIT, MICHIGAN, A CORPORATION OF DELAWARE.

INTERNAL-COMBUSTION ENGINE.

Application filed September 2, 1921. Serial No. 497,957.

My invention relates to internal combustion engines of the inclined cylinder or V-type, and the principal object thereof is to provide an engine in which the two cylinder blocks present in the assembled engine are alike in all particulars so that only a single form of block has to be produced, as it may be used either upon the right or upon the left hand side of the engine.

Other objects of my invention will appear from the following description which, in connection with the drawings, constitutes a disclosure of the preferred form of my invention; it being appreciated, however, that my invention includes such variations and modifications of the particular embodiment thereof illustrated as come within the scope of the concluding claims.

In the drawings accompanying and forming a part of this specification:

Figure 1 is a view showing my improved internal combustion engine in perspective.

Figure 2 is a view showing a section thereof upon vertical transverse planes.

Figure 3 is a view showing a section of a cylinder block upon planes at right angles to the axes of the cylinders, and the positions of which are indicated, approximately, by the broken line 6—6, Figure 2.

Figure 4 is a view showing a cylinder head in plan.

Figure 5 is a view upon a larger scale showing a section of the head upon planes indicated, approximately, by the broken line 5—5, Figure 4.

Referring now to the drawings, the crank case 10 of my improved internal combustion engine is of the type having bearings 11 located inside and up above the open lower end thereof, which open lower end is closed by an oil pan 12 with which the lubricating mechanism of the engine, not herein disclosed, is associated; and the open ends of said crank case are closed by cover plates which carry various accessory devices of the engine and of the power plant when the engine is used to drive a motor vehicle, as is contemplated herein; the front cover plate 13 serving as a support for two pumps 14, 14, the impellers of which are carried by a shaft 15 supported in bearings provided in said cover plate and which pumps force a cooling liquid through the usual jacket spaces of the two cylinder blocks of the engine.

The crank case is provided adjacent the cover plate 13 with a pedestal 16 which supports a dynamo 17 at its upper end, and the shaft of which carries the fan 18; and the crank shaft, the cam shaft 20, the usual two-to-one gearing, and fly wheel are of common and well known form in internal combustion engines. The pump shaft is driven from the crank shaft through suitable gears, as will be understood.

The crank case 10 is provided with two inclined surfaces or portions 26, 26 which serve as supports for the two cylinder blocks 27, 27; said blocks being identical one with the other in every respect so that only one form of block has to be made, as any particular block may be placed either upon the right or left hand side thereof as the engine is built up and assembled upon the crank case. These blocks are shown as arranged ninety degrees apart, although the plates 26 may be so inclined that the blocks stand at sixty degrees or at some other angle to one another, if preferred. The blocks are shown as having four cylinders each, although the number of cylinders may obviously be varied.

The several cylinders are provided each with a supply and an exhaust valve, one of the valves together with the operating means therefor being shown in Figure 2; and the cam shaft 20 is provided with cams, one for each valve, that is sixteen in all in an engine having two four-cylinder blocks.

The cylinder block is provided with an integral longitudinally extending cooling liquid supply conduit 29 which is placed in communication at several points along its length with the jacket space of the block by ports 30; and this conduit is open at both its ends, as best shown in Figure 3, so that the discharge conduits 31 of the pumps 14 may be connected with either end of a supply conduit 29, dependent upon which side of the crank case a particular block is placed. In the assembled engine the ends of the conduits remote from the pumps will be closed by plugs as will be appreciated.

Inasmuch as but one form of cylinder block is employed in an engine it follows that one form only of head is necessary; the same being shown in Figures 4 and 5 by itself, and in section in Figure 2. This head 40 has the usual jacket space 32 which

is in communication with the cylinder block jacket space through suitable registering ports in the two, and from which space the conduits 33 lead back to the radiator as is usual in cooling systems. The jacket space 32 within the head is provided with two inlet ports with either one of which a conduit 33 may communicate, as shown at 39 in Figure 4; so that heads identical in form may be placed upon either side of the engine and the proper conduit 33 connected with either end of the head; the port 39 not so used being closed by a plate, a screw or other plug, or otherwise, the same as in the case of the cylinder conduit 29 above referred to. The head is also provided with the usual priming cock and spark plug openings which, however, are of common and well-known form.

The cylinder block is provided with an inlet port 34 which leads into an inlet manifold 35, which is in communication with the several inlet valves through suitable passages; and with exhaust ports 36 which lead into exhaust manifolds 37 shown in Figure 1 only; the two exhaust manifolds in the complete engine being associated with a heater 38 for the combustible mixture supplied to the engine which, however, is not shown in detail, as it forms no part of the invention to which this present application relates.

The cooling liquid flows from the lower end of the usual radiator through the inlet conduit 46 into and through the pump castings, and the outlet conduits 31 of the pumps communicate with the longitudinally extending conduits 29 as hereinbefore explained.

Having thus described and explained my invention, I claim and desire to secure by Letters Patent:

1. In an internal combustion engine, a crank case having two inclined supporting portions at its upper end; and two cylinder blocks identical in form with one another and having each a longitudinally extending cooling liquid supply conduit located substantially midway between the ends of said block, and which conduit is open at both its ends, and the valves of which blocks are operated by a single cam shaft supported by said crank case.

2. In an internal combustion engine, a crank case having two inclined supporting portions at its upper end; and two cylinder blocks identical in form with one another and having each a longitudinally extending cooling liquid supply conduit located substantially midway between the ends of said block, and which conduit is open at both its ends and is in communication with the jacket space of said block at a plurality of points spaced apart from one another, and the valves of which blocks are operated by a single cam shaft supported by said crank case.

3. An internal combustion engine cylinder block having a plurality of cylinders arranged in line and having a jacket for cooling said cylinders; and a longitudinally extending cooling liquid supply conduit located substantially midway between the ends of said block, and which conduit is open at both its ends and communicates with said jacket.

In testimony whereof I affix my signature.

ROBERT K. JACK.