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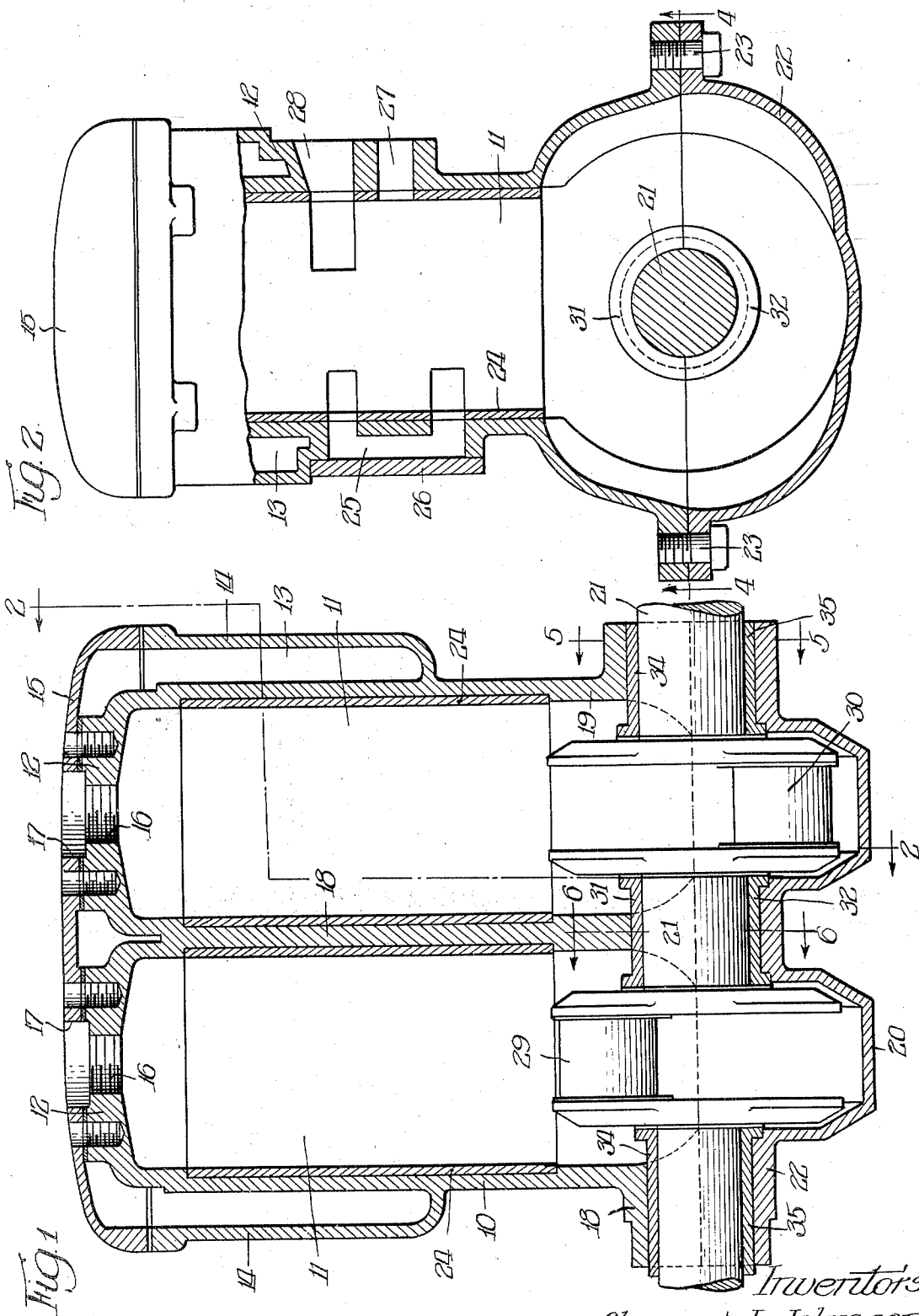
C. L. JOHNSON ET AL

2,227,500

DIE-CAST MOTOR BLOCK

Filed Jan. 3, 1938

3 Sheets-Sheet 1



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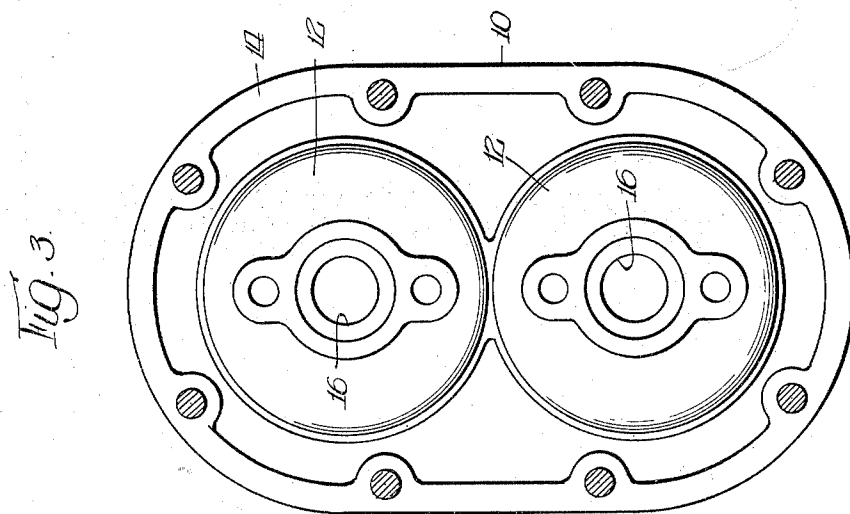
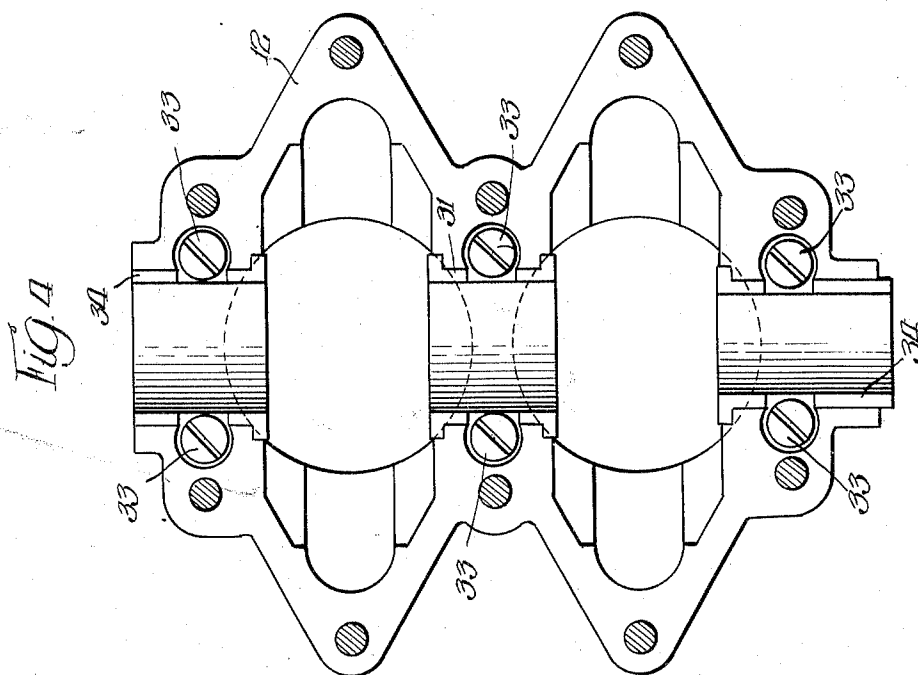
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DIE-CAST MOTOR BLOCK

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3 Sheets-Sheet 2



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DIE-CAST MOTOR BLOCK

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Fig. 8

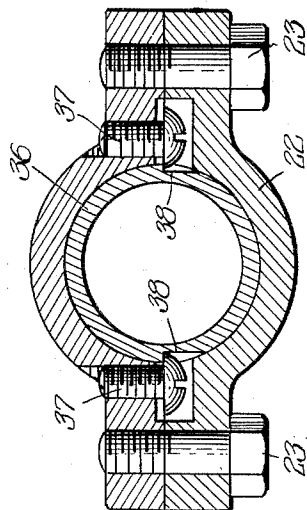


Fig. 7

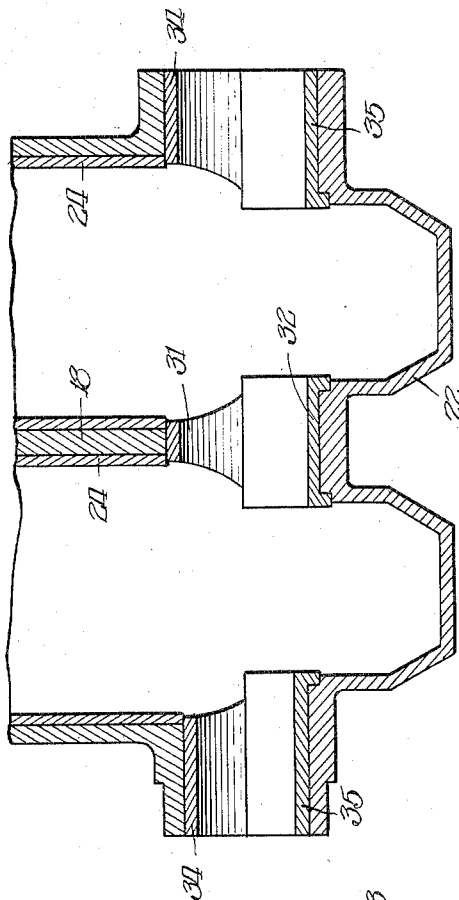


Fig. 5

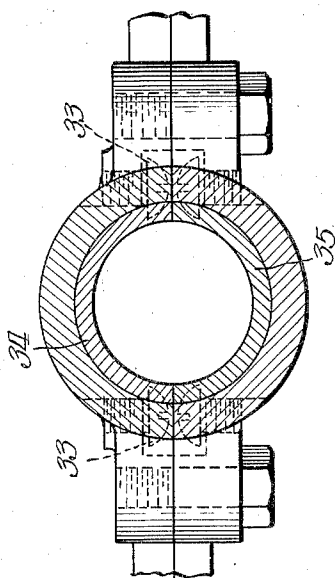
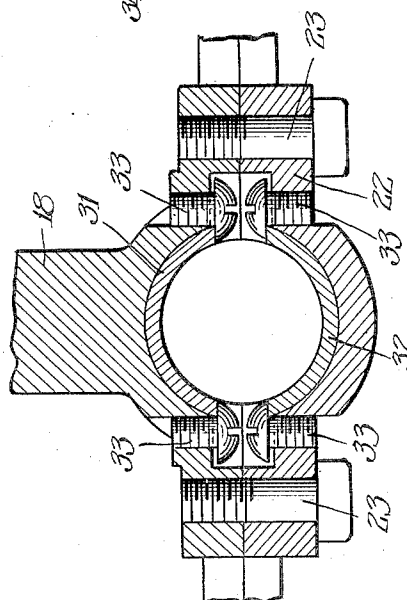


Fig. 6



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UNITED STATES PATENT OFFICE

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DIE-CAST MOTOR BLOCK

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11 Claims. (Cl. 123—173)

The present invention relates to die-cast motor blocks.

More particularly the present invention relates to constructions such for example as internal combustion motors involving cylinders having pistons reciprocating therein and a crank case associated with said cylinders. Economies in manufacture may be effected if the cylinders of such constructions are manufactured by a die casting operation. The die casting of engine cylinders has not been generally practiced, however, for the reason that the constructions of such motor blocks have not adapted themselves well to the die casting operation.

An object of the present invention is to provide a motor construction well adapted to be die cast.

A further object is to provide a cylinder construction having an integral head portion, which cylinder construction may have the pistons conveniently mounted therein from the crank case end of said cylinder construction.

As a corollary to the last named object, a further object is to provide a cylinder construction of the kind referred to in which the bearings may be easily mounted and easily held in place, which construction will provide adequate supporting surface for said bearings.

A further object is to provide a motor block construction which may be die cast in its manufacture, which construction is well adapted to meet the needs of commercial service.

Further objects will appear as the description proceeds.

Referring to the drawings—

Figure 1 is a vertical sectional view illustrating one embodiment of the present invention;

Figure 2 is a view, partly in section, taken along the planes indicated by the arrows 2—2 of Figure 1;

Figure 3 is a view of the top of a cylinder block of the present invention, the cooling jacket cover being removed;

Figure 4 is a horizontal sectional view taken along the plane indicated by the arrows 4—4 of Figure 2;

Figure 5 is a sectional view taken along the plane indicated by the arrows 5—5 of Figure 1 and illustrating a bearing construction which may be utilized in practicing the present invention;

Figure 6 is a sectional view taken along the plane indicated by the arrows 6—6 of Figure 1, and illustrating a construction which may be used

for the center bearing of a twin cylinder construction;

Figure 7 is a sectional view somewhat similar to a portion of Figure 1 but illustrating a modified construction in which the split bearings for the crank shaft may be cast integral with two halves of the crank case; and

Figure 8 is a view illustrating a modified construction which may be used in place of the construction illustrated in Figure 5.

In the drawings, an internal combustion motor of the two-cycle type is illustrated. The numeral 10 indicates a cylinder block comprising two cylinders 11—11. Said cylinders have the heads 12—12 formed integral therewith. Surrounding the cylinder block 10 is a water jacket 13, said water jacket being enclosed within the wall 14. Said water jacket 13 will preferably open toward the head end of the cylinder block 10, and for purposes of manufacture will be of uniform cross-sectional dimensions, or at any rate will be so formed as to present no obstructions to the withdrawal of the die forming the water cavity. Disposed at the head end of the cylinder block 10 is the water jacket cover 15, which may be secured by bolts or other securing means to the cylinder block 10. The cover 15 will, of course, cover the water jacket 13, and inasmuch as said water jacket is not subjected to high pressures, no difficulty will be encountered in sealing the cover 15 to the wall 14 to provide a liquid-tight water cavity. As appears from the drawings, the bearing of the cover 15 upon the heads 12 is at a plane disposed outwardly of the plane marking its bearing in the jacket wall 14.

The cylinder heads 12—12 will be provided with apertures 16—16, which may be screw-threaded for the reception of spark plugs. The water jacket cover 15 will be provided with apertures 17—17 for accommodating said spark plugs.

The two cylinders 11—11 are separated by the partition 18. The cylinder block 10 is extended below the cylinders 11—11 to provide a portion 19 of the crank case, which crank case is indicated as a whole by the numeral 20. The crank case 20 is split along a plane which includes the axis of the crank shaft 21, which plane is disposed at right angles to the axes of the cylinders 11—11. The lower half of the crank case 20 is embodied in the closure member 22. Said closure member 22 may be held in place by any preferred means, such for example as the bolts 23—23 illustrated in Figures 2, 6 and 8.

Each of the engine cylinders 11 may be provided with a bearing sleeve indicated by the nu-

meral 24, which receives the pistons (not shown). Said bearing sleeves 24—24 may be made of material highly resistant to wear and may be cast in the cylinder block 10 during the die casting operation.

As indicated hereinabove, the particular embodiment of the present invention chosen for illustration is a two-cycle engine. The material forming the cylinder block adjacent to each cylinder 11 will be provided with the U-shaped passageway 25 (Figure 2), whereby communication may be provided from the interior of the crank case 20 to the explosion side of each piston (not shown). This passageway 25 may be formed during the die casting operation. A plate 26 is provided for defining the outer boundary of said passageway 25. The sleeve 24 will, of course, be provided with apertures coinciding with the passageway 25, whereby no obstructions will be presented to the flow of gases through said passageway 25.

The cylinder block 10 is also provided with intake apertures 27 communicating with each cylinder 11, which apertures may be connected with a carburetor (not shown). The cylinder block 10 is also provided with exhaust apertures 28, each communicating with a corresponding cylinder 11. Each sleeve 24 will, of course, be provided with apertures communicating with the corresponding apertures 27 and 28, whereby to present no obstruction to flow of fluid medium through said apertures 27 and 28.

It will be noted that each cylinder 11 has its bore extending with undiminished diameter to the crank case 20. By reason of this construction, together with the fact that the lower wall 22 of the crank case is removable, it is readily possible to assemble pistons within the cylinders 11—11 and to properly locate the crank shaft 21 with its cranks and piston rods. The two cranks are indicated by the numerals 29 and 30, and the crank shaft 21 between said cranks 29 and 30 is provided with a bearing split longitudinally. As will be clear from an inspection of Figure 6, a pair of bearing members 31 and 32 are provided between the cranks 29 and 30, the bearing member 31 being secured to the lower extremity of the partition 18 by means of the screws 33—33, which have their heads engaging with opposed edges of the bearing member 31 to hold said bearing member in contact with the extremity of the partition 18. The bearing member 32 is similarly held in position in the crank case closure member 22.

In the construction illustrated in Figures 1 to 7, the crank shaft 21 adjacent to its ends outside of the cranks 29 and 30 is provided with cylindrical bearings split longitudinally, the upper bearing member at each end of the shaft being indicated by the numeral 34 and the lower member of the bearing being indicated by the numeral 35. Said bearing members 34 and 35 at each end of the crank shaft 21 may be secured to the cylinder block 12 and to the crank case closure member 22, respectively, by any preferred means, such for example as screws 33 (Figures 4 and 5), the heads of which engage in recesses in the outer peripheries of said bearing members substantially on chords of said bearing members. From an inspection of Figure 7 it will be noted that it is quite feasible to cast the bearing members 34—34 integral with the cylinder block 10 and to cast the bearing members 35—35 integral with the crank case closure member 22. Said semi-cylindrical bearings are mounted upon cor-

responding casings formed integrally with the crank case.

Figure 8 shows a modified construction of bearing for the end portions of the shaft 21. According to the embodiment illustrated in Figure 8, the bearings at the two ends of the shaft 21 are cylindrical members, indicated by the numeral 36. Said bearings 36 may be held in place by means of the screws 37—37, the heads of which engaged shoulders 38—38 milled out on the periphery of the bearing 36.

Assembly of the parts constituting the elements of the illustrated embodiments may be readily accomplished. The center bearing members 31 and 32 will, of course, be located in their operative positions with respect to the cylinder block 10 and the crank case closure member 22. The bearing members 34—34 and the bearing members 35—35 will also be located in their operative positions in the cylinder block 10 and the crank case closure member 22, respectively. The crank shaft 21 with its associated pistons and piston rods will then be assembled relative to the cylinder block 12 with said pistons located in the cylinders 11—11, after which the crank case closure member 22 with its bearing members 32 and 35—35 will be assembled with respect to the cylinder block 10 and the crank shaft 21, said closure member being tightly secured by means of the bolts 23—23. With the embodiment of the invention shown in Figure 8, the bearings 36 at each end of the crank shaft 21 will be positioned upon the ends of said crank shaft and will be secured in position by means of the respective screws 37. The closure member 22 and crank shaft with its appurtenant pistons and piston rods will be assembled with respect to the cylinder block 10.

The invention has the practical advantage that the parts may be die cast by simple die casting operations. No difficulties will be encountered in inserting the pistons from the crank case end of the cylinder block. Inasmuch as the greatest efforts upon the bearings are exerted in a direction away from the cylinders 11—11, no harm can result from the fact that the structure involves a smaller area of backing for the crank shaft bearings on the sides thereof adjacent to the cylinders than on the other sides thereof.

The present invention has the further practical advantage that the crank shaft bearings are relatively large in proportion to cylinder diameter without involving excessive axial dimensions of the crank shaft, so that said bearings receive substantial support at the sides of the cylinder or cylinders even though the cylinder block is cut away at the crank shaft end thereof to permit the insertion of the piston or pistons at the crank case end of the cylinder block.

Though certain embodiments of the present invention have been described in detail, many modifications will occur to those skilled in the art. It is intended to cover all such modifications that fall within the scope of the appended claims.

What is claimed is:

1. In an internal combustion motor, a cylinder block having a portion of a crank case formed integral therewith and also having a cooling water jacket formed integral therewith, said crank case portion and said cooling jacket opening in opposite directions and both being free of projections which would prevent the withdrawal of a forming die therefrom, said cylin-

der block having a cylinder therein and a cylinder head therefor integral with said block, cover means at the explosion end of said block for closing said water jacket, and a crank case closure member cooperating with said crank case portion to form a crank case.

2. In an internal combustion motor, a cylinder block having a portion of a crank case formed integral therewith and also having a cooling water jacket formed integral therewith, said crank case portion and said cooling jacket opening in opposite directions and both being free of projections which would prevent the withdrawal of a forming die therefrom, said cylinder block having a cylinder therein and a cylinder head therefor integral with said block, cover means at the explosion end of said block for closing said water jacket, a crank case closure member cooperating with said crank case portion to form a crank case, and a crank shaft with its associated bearings embraced between said crank case portion and said crank case closure member.

3. In an internal combustion motor, in combination, a cylinder block having a portion of a crank case formed integral therewith, said cylinder block having a plurality of cylinders, said cylinders having cylinder heads formed integral with said block, said block having a partition wall between said cylinders formed integral with said block, a crank case closure member cooperating with said crank case portion to form a crank case, a crank shaft disposed within said crank case, said shaft having a plurality of cranks cooperatively associated with said cylinders, said crank case portion leaving said cylinders unobstructed to permit the insertion of pistons within said cylinders from the crank case ends thereof, said shaft being provided with a plurality of bearings including a center bearing and outer bearings, the end to end distance between said bearings being less than the diameter of said cylinders, said center bearing comprising two substantially semi-cylindrical members, one secured to said crank case portion and the other secured to said crank case closure member.

4. In an internal combustion motor, a cylinder block having a cylinder, said block having the cylinder head cast integral therewith, a cooling water jacket for said cylinder opening at the combustion end of said motor, and a water jacket cover bearing upon said block and closing said water jacket, said cylinder block having formed integral therewith a portion of a crank case, said crank case portion leaving said cylinder unobstructed whereby a forming die may be withdrawn therefrom and a piston may be inserted to fit within said cylinder at the crank case end of said motor, said water jacket being free of obstructions to permit the withdrawal of a forming die therefrom.

5. In an internal combustion motor, a cylinder block having the cylinder head and a cooling water jacket cast integral therewith, said cooling water jacket opening toward the head end of said block, said water jacket being free of obstructions to permit the withdrawal of a forming die therefrom, and cover means located at the head end of said block for closing said cooling water jacket, said cover means bearing on said cylinder head in a plane disposed outwardly of the plane marking its bearing upon said jacket.

6. In an internal combustion motor, a cylinder block having the cylinder head and a cooling water jacket cast integral therewith, said cooling water jacket opening toward the head end of

said block, said water jacket being free of obstructions to permit the withdrawal of a forming die therefrom, and cover means located at the head end of said block for closing said cooling water jacket, said cover means bearing on said cylinder head in a plane disposed outwardly of the plane marking its bearing upon said jacket, said cylinder head having a screw-threaded opening for a spark plug, said cover means having an aligned opening for the reception of said spark plug.

7. In an internal combustion engine, in combination, a cylinder block having a plurality of parallel cylinders, the cylinder heads of said cylinders and a portion of a crank case being formed integral with said block, a crank case closure member cooperating with said portion of said crank case, said portion of said crank case and said closure member having cooperating partitions to form crank case compartments for said cylinders, said compartments in said crank case portion having opposed walls spaced apart longitudinally of said crank case a distance less than the diameter of their corresponding cylinders, a substantially semi-circular bearing member carried by said partition forming part of said crank case portion, and a cooperating substantially semi-circular bearing member carried by said crank case closure member, said first mentioned bearing member being of sufficient length to extend beyond the projected cross-sectional areas of said cylinders, said first mentioned bearing member being detachable from said partition whereby it may be removed from said partition to permit pistons to be entered into said cylinders from the crank case end thereof, said crank case portion being shaped to leave said cylinders unobstructed to permit the entry of pistons to fit said cylinders.

8. In an internal combustion motor, in combination, a cylinder block having a portion of a crank case formed integral therewith, said cylinder block having a plurality of cylinders, said cylinders having cylinder heads formed integral with said block, said block having a partition wall between said cylinders formed integral with said block, a crank case closure member cooperating with said crank case portion to form a crank case, and a crank shaft disposed within said crank case, said shaft having a plurality of cranks cooperatively associated with said cylinders, said crank case portion leaving said cylinders unobstructed to permit the insertion of pistons within said cylinders from the crank case ends thereof, said shaft being provided with a plurality of bearings including a center bearing and outer bearings, the distance from said center bearing to said outer bearings being less than the diameters of their corresponding cylinders, said center bearing comprising two halves secured respectively to said crank case portion and said crank case closure member, said half secured to said crank case portion having its ends shaped to conform to the contours of the walls of said cylinders whereby to avoid obstructions to the entry of pistons to fit within said cylinders.

9. In an internal combustion engine, in combination, a cylinder block having a cylinder therein, said cylinder block having the cylinder head of said cylinder and a portion of a crank case formed integral therewith, a crank case closure member cooperating with said portion of said crank case to form a crank case compartment, said crank case portion and said crank case closure member being joined in a plane which in-

cludes the axis of said crank case, and journal bearings carried by said crank case portion and by said crank case closure member, the walls of said compartment and said journal bearings being spaced apart less than the diameter of said cylinder but shaped to leave said cylinder unobstructed to permit the entry of a piston to fit said cylinder, certain of said journal bearings being split into halves, certain of said halves being integral with said crank case portion and certain of said halves being integral with said closure member, said half secured to said closure member extending well within the projected cross-sectional areas of said cylinder.

10. In an internal combustion motor, in combination, a cylinder block having a portion of a crank case formed integral therewith, said cylinder block having a cylinder, said cylinder having a cylinder head formed integral with said block, a crank case closure member cooperating with said crank case portion to form a crank case compartment, a crank shaft disposed axially of said compartment, said shaft having a crank co-operatively associated with said cylinder, said crank case portion leaving said cylinder unobstructed to permit the insertion of a piston within said cylinder from the crank case end thereof, said shaft being provided with bearings, the distance between said bearings being less than the diameter of said cylinder, each of said bearings

comprising two halves secured respectively to said crank case portion and to said crank case closure member, said halves secured to said crank case portion having its ends shaped to conform to the contour of the wall of said cylinder whereby to avoid obstructions to the entry of a piston to fit within said cylinder.

11. In an internal combustion engine, in combination, a cylinder block having its cylinder head integral therewith and including a portion formed integral therewith to form a part of a crank case, said cylinder block including a cylinder adapted to receive a piston, a crank case closure member adapted to cooperate with said part of said crank case to form a crank case, journal bearings, certain of said journal bearings being split longitudinally to form halves, certain of said bearing halves being secured to said crank case portion, the other of said bearing halves being secured to said closure member and extending well within the projected cross sectional area of said cylinder, said half which is secured to said crank case portion being integral therewith and being shaped to conform to the wall of said cylinder whereby to permit entry or withdrawal of said piston from said cylinder.

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