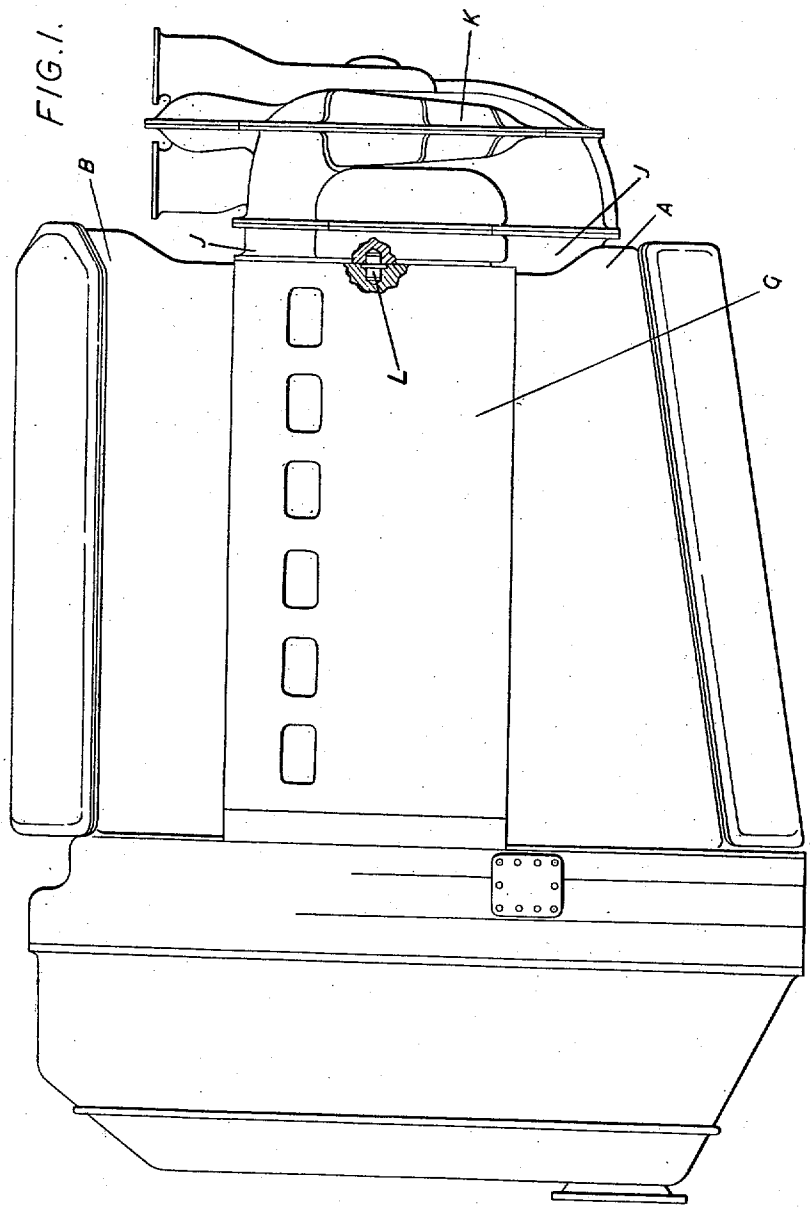
June 24, 1952 B. W. BARLOW 2,601,584

INTERNAL-COMBUSTION ENGINE

Filed March 31, 1950 2 SHEETS—SHEET 1

FIG. 1.



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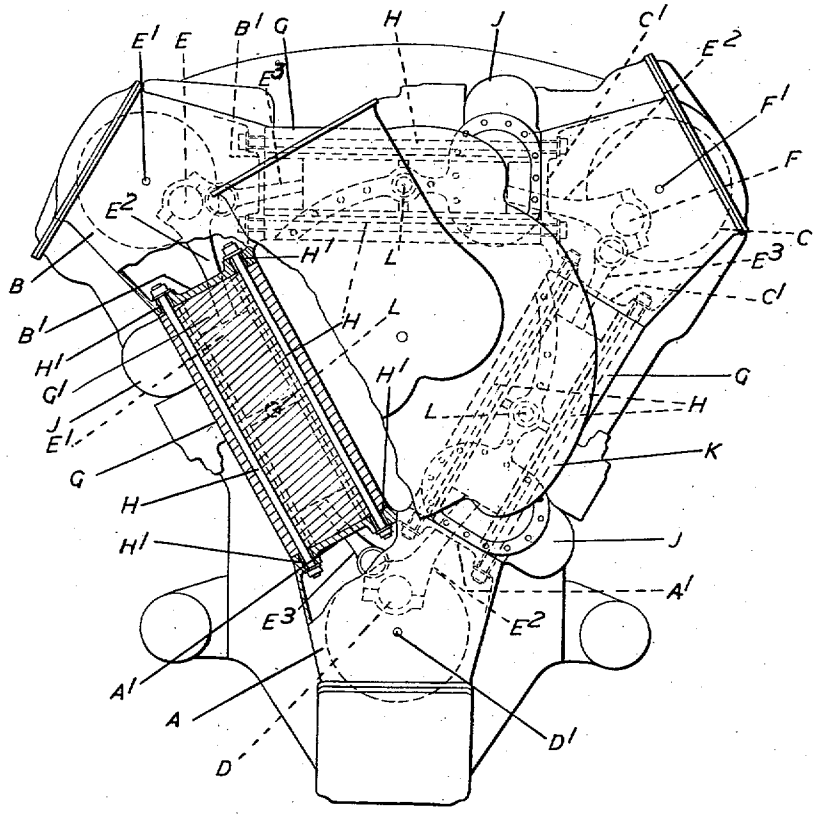
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FIG. 2.



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2,601,584

UNITED STATES PATENT OFFICE

2,601,584

INTERNAL-COMBUSTION ENGINE

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Application March 31, 1950, Serial No. 153,053
In Great Britain April 28, 1949

3 Claims. (Cl. 121—194)

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This invention relates to reciprocating internal combustion engines operating on the two-stroke cycle of the kind comprising three crankshafts having their axes parallel to one another and disposed at the apices of a triangle, preferably an equilateral triangle, each crankshaft being enclosed in a crank case structure with a cylinder block or cylinder blocks or banks extending between each pair of crank cases and including cylinders each containing two pistons connected respectively to the adjacent crankshafts.

In such engines difficulty has been experienced in providing an arrangement suited to commercial manufacture due to the fact that small differences in dimensions from the theoretically correct dimensions at one point will tend to be attended by the occurrence of inaccurate positioning of parts which have to be connected at other points. Moreover, differences in thermal expansion during use tend to have similar results producing undesirable stresses.

The object of the present invention is to provide an engine of the kind in question in which the arrangement is such that these difficulties will be reduced or eliminated.

In an engine of the kind referred to according to the present invention the faces of the cylinder banks or blocks which engage surfaces on the crank case structures are approximately at right angles to the axes of the cylinders and each cylinder block is connected to each of its adjacent crank case structures in a manner permitting limited relative sliding movement during assembly between the engaging surfaces of the cylinder block and the crank case structure towards and away from the adjacent cylinder block, that is to say at right angles to the plane in which the axes of the cylinders in the block lie.

In a preferred arrangement each cylinder block is connected to the two crank cases between which it extends by tension rods or bolts extending between the crank cases through the cylinder block, the holes in the crank cases through which the tension rods or bolts pass being of somewhat greater diameter than the rods or bolts so as to permit the necessary limited relative sliding movement between the cylinder blocks and the crank cases.

It will be understood that the degree of relative movement permitted between each cylinder block and its crank cases is conveniently limited to that necessary to allow manufacturing tolerances and/or variations in thermal expansion without permitting excessive variations from the theoretically correct positioning of the cylinder blocks relatively to the crank cases.

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A rigid casing for example the casing of an air compressor for supplying scavenging and charging air to the engine, will usually be mounted on one end of the engine and in such an arrangement the casing may conveniently be located relatively to the body of the engine by dowels or like locating members engaging the casing and the cylinder blocks and each lying with its axis parallel to the crankshaft axes, midway between the faces of its cylinder block which engage the associated crank cases, and in the plane in which lie the axes of the cylinders in that block.

One embodiment of the invention is illustrated in the accompanying drawings, in which

Figure 1 is a side elevation of an internal combustion engine embodying the invention, and

Figure 2 is an end elevation of the engine with one cylinder block and adjacent parts of the two associated crank cases shown in cross section in a plane midway between the axes of two adjacent cylinders.

In the construction illustrated the engine comprises three crank cases A, B and C containing and supporting conventional six throw crankshafts D, E and F and axes D^1, E^1, F^1 of which lie theoretically exactly and in fact approximately at the apices of an equilateral triangle.

Extending between each adjacent pair of crank cases is a cylinder block G containing six cylinders, usually in the form of inserted sleeves, separated by transverse walls or diaphragms extending across the block between the cylinders. One of such diaphragms is shown at G^1 in section in Figure 2 and it is to be understood that although the diaphragm is shown as imperforate it may be of perforated or skeleton form.

The end faces of the cylinder blocks engage mating faces or the appropriate walls A^1, B^1, C^1 of the crank cases to which the cylinders are connected by the rods H each of which passes through a bore in the cylinder block with which it makes a close fit and through holes in the crank case walls as shown in Figure 2.

As shown in exaggerated manner in Figure 2 the holes H^1 in the crank case walls A^1, B^1, C^1 according to the present invention are larger in diameter than the tie rods which pass through them so as to permit limited relative movement between each end of each cylinder block and the crank case walls, A^1, B^1 and C^1, which it engages in the plane of the mating faces. This permits proper mating of the faces at the ends of the cylinder blocks and the faces on the crank cases in spite of variations in dimensions which may

occur due to the necessary manufacturing tolerances or small manufacturing errors, the effect of such variations or errors only being to cause slight changes in the relative position of the crank cases and hence of the axes of the crank shafts so that the latter may not lie truly at the apices of an equilateral triangle. This, however, has no appreciable effect on the phasing or strokes of the pistons and is therefore without effect on the operation of the engine.

The engine has two pistons E^1 in each cylinder connected respectively by main and subsidiary connecting rods E^2 and E^3 to the two associated crank shafts so as to move towards and away from one another, inlet ports being uncovered by one of the pistons E^1 in each cylinder towards the end of its out stroke while exhaust ports are uncovered by the other piston and the inlet ports in each cylinder block are fed with air through inlet manifolds J from an air compressor K of the centrifugal type mounted on one end of the engine and driven therefrom by suitable gearing. In Figure 1 one of the inlet manifolds is removed. The position of the compressor relatively to the engine is determined by three dowels L each of which engages a socket in one of the cylinder blocks and a socket in the compressor casing and is positioned with its axis in the plane in which also lie the axes of the cylinders in the cylinder block which it engages and at right angles to such cylinder axes and at a point midway between faces of the cylinder block which engage the crank cases.

What I claim as my invention and desire to secure by Letters Patent is:

1. A reciprocating internal combustion engine comprising three parallel crankshafts each supported and housed in a crank case structure, cylinder blocks extending between each adjacent pair of crank cases and containing cylinders in the opposite ends of which reciprocate pistons connected respectively to the adjacent crankshafts, wherein the faces of the cylinder blocks which engage surfaces on the crank cases are approximately at right angles to the cylinder axes and each cylinder block is connected to each of its adjacent crank cases in a manner permitting limited relative sliding movement during assembly between the engaging surfaces of the cylinder block and the crank case towards and away from the adjacent cylinder block.

2. A reciprocating internal combustion engine as claimed in claim 1, in which each cylinder block is connected to the two crank cases between which it extends by tension rods or bolts extending between the crank cases through the cylinder block, the holes in the crank cases through which the tension bolts or rods pass being of slightly greater diameter than the bolts or rods so as to permit the necessary limited relative sliding movement between the cylinder blocks and the crank cases.

3. A reciprocating internal combustion engine as claimed in claim 2, in which a rigid casing is connected to the end of the cylinder blocks with dowels positively locating such casing or similar structure relatively to the three cylinder blocks which it engages, the axes of the dowels lying in the planes in which the cylinders in the blocks lie, being at right angles to the cylinder axes and situated midway between the faces of the cylinder blocks which engage the crank cases.

BENJAMIN WILLIAM BARLOW.

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