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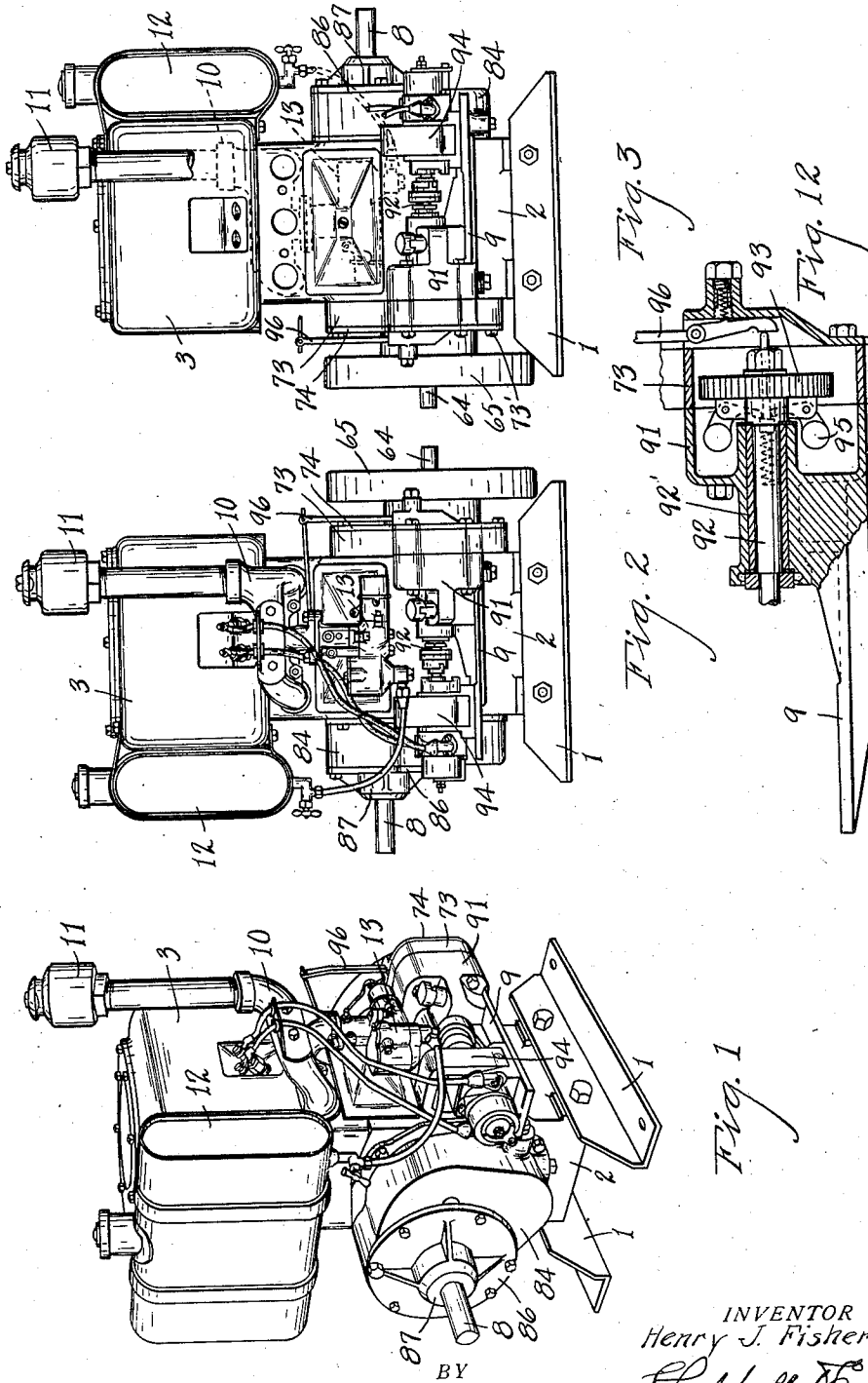
H. J. FISHER

1,751,625

INTERNAL COMBUSTION ENGINE

Filed March 25, 1926

3 Sheets-Sheet 1



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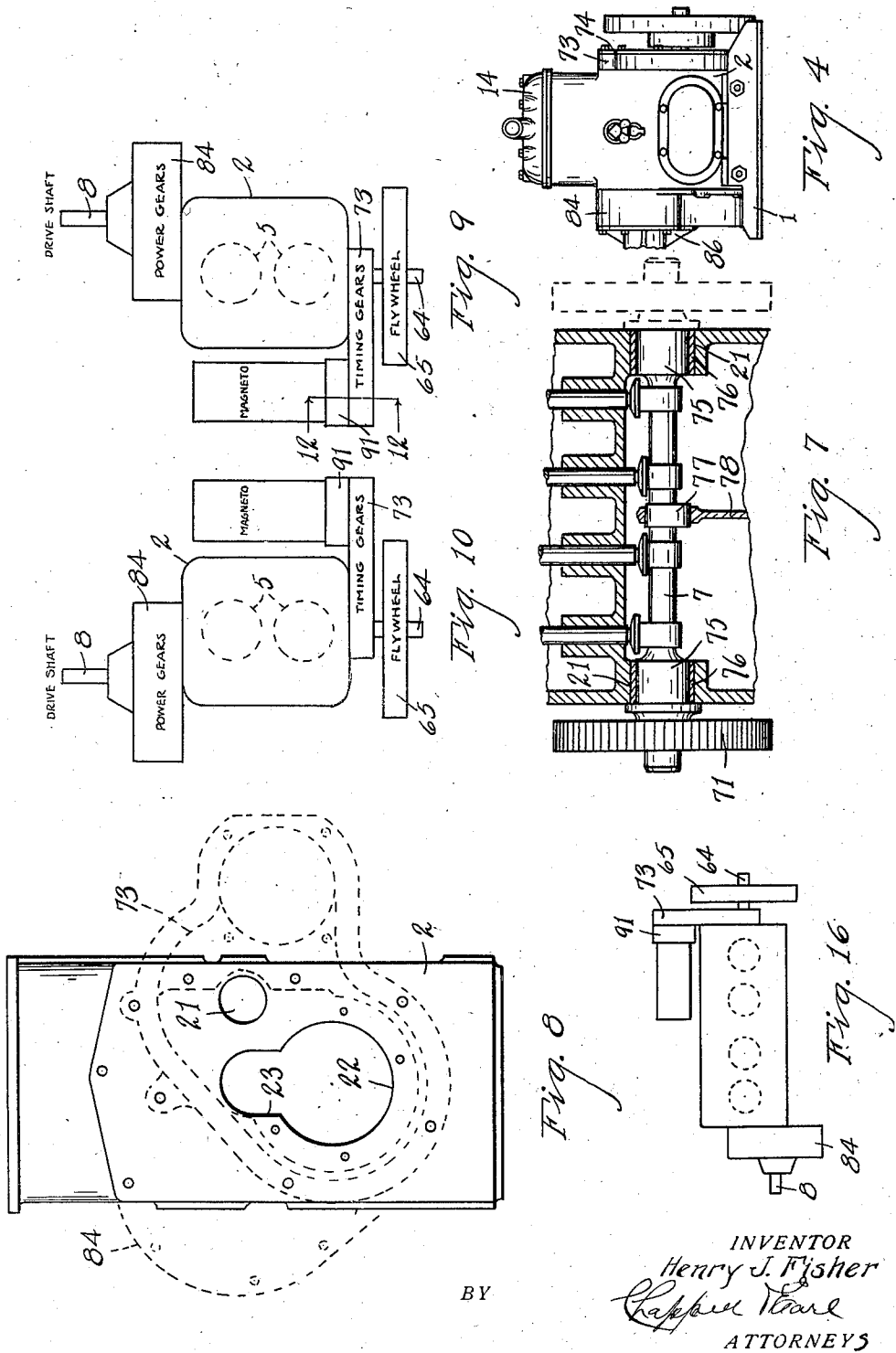
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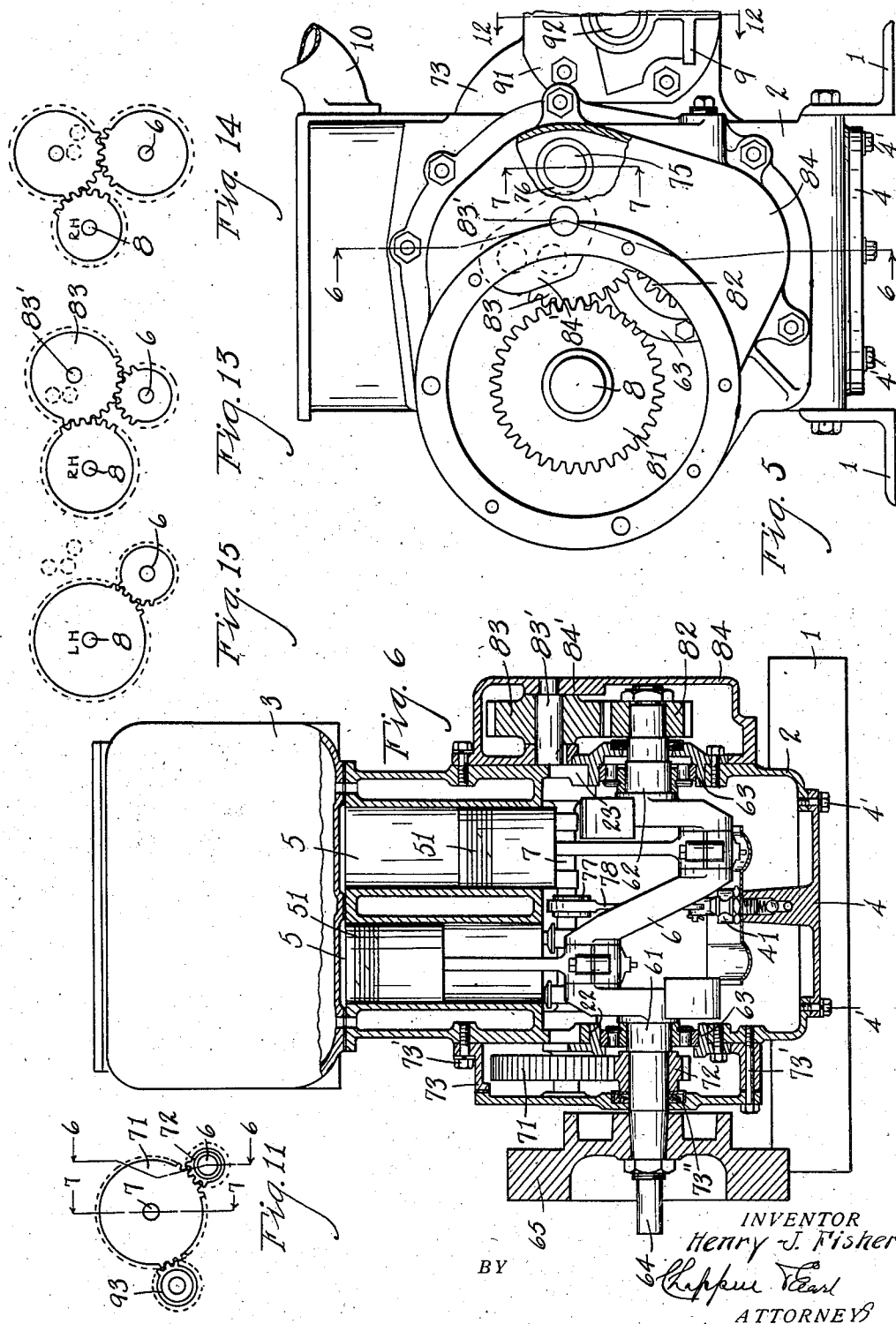
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INTERNAL COMBUSTION ENGINE

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3 Sheets-Sheet 3



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INTERNAL-COMBUSTION ENGINE

Application filed March 25, 1926. Serial No. 97,248.

This invention relates to improvements in internal combustion engines. It relates more particularly to the general structure of the framework and main parts.

5 The objects of the invention are:

First, to provide an improved framework structure to simplify construction and to facilitate production of the attached gears, gear casing, brackets and working parts.

10 Second, to provide such a structure that facilitates the production of opposed symmetrical forms of the engine.

Third, to provide an improved engine frame of block form and structure which can be rapidly and effectively manufactured and assembled.

Fourth, to provide an improved invertible crankshaft structure with power gear train structure capable of use on either side of the engine.

Fifth, to provide such a power gear train and casing as a unitary structure.

Sixth, to provide such an engine structure with an invertible cam shaft and gear.

25 Seventh, to provide an improved arrangement of encased cam shaft and gear structure.

Eighth, to provide a cam shaft, gear, governor and magneto gear casing and bracket in unit form and capable of interchangeable use.

Ninth, to provide an improved construction of magneto bracket and support to facilitate the reversing of the structure.

35 Objects relating to details and economies of construction and operation of my invention will definitely appear from the detailed description to follow.

The invention is clearly defined and pointed out in the claims.

A structure which is a preferred embodiment of the invention is clearly illustrated in the accompanying drawing, forming a part of this application, in which:

Fig. 1 is a perspective view of a hopper cooled engine embodying the features of the invention of what might be denominated right-hand construction.

50 Fig. 2 is an elevational view of said engine

from the magneto and governor or right-hand side of Fig. 1.

Fig. 3 is a view of an engine symmetrical to that appearing in Figs. 1 and 2, or what might be called a left-hand construction, showing the symmetrical parts reversed and the same gears used.

Fig. 4 is an elevational view of the rear side of the engine as illustrated in Figs. 1 and 2, showing a top structure adapted to a radiator and circulation cooling as distinguished from the hopper cooling illustrated in Figs. 1, 2 and 3, showing the hand hole cover and the petcock and water inlet plug for the water jacket.

Fig. 5 is an enlarged detail elevational view from the left-hand side of Fig. 2, with the power gear case cover removed and a portion of the power gear case broken away to show the end of the cam shaft and its location.

Fig. 6 is a detail sectional view taken on line 6—6 of Figs. 5 and 11, showing details of the crankshaft, the gears and roller bearings, and its invertible construction.

Fig. 7 is an enlarged detail sectional view taken on line 7—7 of Figs. 5 and 11, showing details of the cam shaft, its enlarged plain journal bearings at each end, and the cam shaft gear.

Fig. 8 is an enlarged detail elevational view of the engine block taken from the left-hand side of Fig. 2, from the front in Fig. 5 and from the right in Fig. 6, the position of the power gear and cam gear cases being indicated by dotted lines.

Fig. 9 is a diagrammatic plan of the engine as assembled in Figs. 1 and 2.

Fig. 10 is a diagrammatic plan of the same as arranged and assembled and illustrated in Fig. 3.

Fig. 11 is a diagram of the cam and magneto gear train.

Fig. 12 is an enlarged detail view partially in section on line 12—12 of Figs. 5, 11 and 9 showing the bracket housing and the driven gear and shaft for the governor and magneto.

Fig. 13 is a diagram of the power gear train as seen in Fig. 5.

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Fig. 14 is a diagram of the power gear but with a different gear ratio.

Fig. 15 is a diagram of the power gear train, showing direct or left-hand drive.

Fig. 16 is a diagrammatic view of the invention as applied to a four-cylinder engine.

The parts will be referred to by their numerals of reference which identify the same parts in all the views.

1, 1 are the angle bar base supports or skids. 2 is the engine or cylinder block and is in form a rectangular parallelepiped or cuboid. It embraces the crank case, the cam shaft bearings, the valves, stem guides, valve chambers and seats on the upper surface and cylinders, all in an integral block. It encloses the working parts of the engine including the pistons, valves, the crankshaft and cam shaft and connecting rods which are arranged to cooperate in the usual way for the engine parts and the valve control. This it is not deemed necessary to show in detail. The block frame also comprises the water jacket for cooling.

3 is the top of the engine which here comprises the hopper for cooling and the usual recesses for the combustion chamber and supports for the spark plug. This engine head structure is detachably secured to the plane top surface. 4 is the bottom plate held in place by screws 4', 4' and carrying the oil pump 41 and oil dips.

5, 5 are the engine cylinders, two in number, (there may be one or a plurality), containing the pistons 51, 51 which are connected by the usual connecting rod to the crankshaft. 6 is the crankshaft which is provided with end bearing parts 61, 62, which are here made identical, and are provided with taper roller journal bearings comprising the bearing cases 63, identical in size, secured in suitable apertures 22 in the sides of the frame block so that the shaft is invertible end for end. The openings 22 for the crankshaft are large enough to accommodate the said roller bearing shells and extend upwardly into a key-hole form at 23, permitting the ready introduction and removal of the shaft and the installing of it either end to.

64 is the extended end of the crank shaft for the starting crank. 65 is the balance wheel of usual construction which may also be adapted as a driving pulley.

7 is the cam shaft supported parallel to the crankshaft 6 and provided with its gear 71 which is driven from the pinion 72 on said crankshaft. This gear 71 is encased by the case 73 provided with gear cover 74 for the crankshaft, the parts being retained in position by screws 73' through the said casing. A felt washer 73'' is provided for the crankshaft. The end journals 75 are in bearings 76. These are larger in diameter than the cams so that the shaft may be readily inserted. As the two bearings are of the same size the shafts

can be turned end for end and assembled either way, the same being inserted and removed from the apertures 21 in the frame block 2 which carry the bearing bushing 76. A central eccentric 77 is on the cam shaft 7 and connected by connecting rod 78 to drive the oil pump 41 which may be of any desired construction.

The engine is provided with a power shaft 8 having a gear 81 which is driven from the engine pinion 82 on the projecting end of the crankshaft. There is provided, preferably, a gear train containing an idler 83 supported on pin 83'. The gear train is encased in a casing 84 which is provided with an internal boss 84' in which to bore the hole for the journal pin 83' for the idler gear 83, so that it is possible to introduce any desired gear train and a proper size idler is readily located in the train.

The power shaft 8 is carried by the power gear case cover 86, having a hub 87, which is secured to 84 by screws, as indicated in Fig. 1, the supporting cover having been omitted from the front of the case as illustrated in Fig. 5.

The cam gear 71 serves to drive the magneto. The magneto is carried by a bracket 9 which carries the magneto shaft 92 in a suitable bearing 92'. It is further provided with a housing 91 which serves as a connection to the cam gear case 73, as appears in Fig. 12.

93 is the driven gear in mesh with the cam gear 71, thereby driving the magneto 94. The weight governor 95 is also on the same shaft and acts upon the governor lever 96 to control the throttle of the engine, all of which governor and magneto parts are in the usual form and not necessary to describe in detail.

10 is the manifold which in a usual construction contains both the intake and the exhaust and is provided with a suitable exhaust pipe and muffler 11. 12 is the fuel tank. 13 is the carburetor of any desired shape, which is carried by the manifold. The manifold is provided with a suitable machined base for attachment to a machined seat on the side of said engine block 2.

Referring to Fig. 4, 14 is a cylinder head which is modified and adapted for use with a radiator or other circulating cooling system. It thus appears that the engine is adapted to any kind of a cooling system. It is especially available as a hopper cooled engine.

In Fig. 16 I show diagram comparable to Figs. 9 and 10, showing the general appearance of the engine when adapted to a four-cylinder structure in which the horizontal cross section of engine block or body would be quadrangular rather than square. It is clear that any number of cylinders can thus be arranged in a row, and also that the engine can be adapted to single cylinder construction.

This invention results in great economy in manufacture, and the production of a very superior engine. The method of manufacture results in an engine block frame which is very effectively supported during manufacturing operations. A broad base is formed insuring accuracy in the positioning of all bearing parts in the process of manufacture. This produces an engine frame which embraces the cylinders, jackets, crankshaft recess, cam shaft recess, all accurately positioned in the frame without the production of any additional parts. It also enables the power take-off unit to be manufactured in quantities as separate parts ready to be assembled by being attached at the time it is desired to ship out the engine.

The same situation prevails as to the cam shaft gear train case which, however, owing to its shallow construction, is put up in rights and lefts. It would be an undue expense to provide detachable reversible covers for these parts because the entire structure can be made about as quickly as the cover could be produced. The saving in the cost of manufacture over ordinary methods is in excess of 25% on engines of the same capacity. There is a great saving in storage and also in shipping.

Owing to the fact that all bearing parts are accurately formed and positioned and not subject to adjustment or defective alinement, it is believed and the indications all are that the engine will be one of very great durability. Apparently the engine delivers a little more power than ordinary engines of the same displacement, although, of course, the power delivered would be closely comparable with that of properly adjusted engines of its class.

Having thus described my invention what I claim as new and desire to secure by Letters Patent is:

1. In an internal combustion engine, the combination of a main frame comprising a central cuboid block embracing within its surfaces the engine cylinders and jackets, the crank case or recess, intake and exhaust passages and ports, the valves and valve guides, and also the cam shaft recess in parallel relation to the crank shaft recess, said recesses with bearing apertures at both their ends sufficiently large and identical in form to permit the inversion of the shafts end for end, an invertible crank shaft with pinions at both ends with identical detachable end bearing boxes, an invertible cam shaft with gear meshing with a crank shaft pinion supported by identical bearings at both ends, a cam shaft and magneto gear train, a separate independent detachable housing unit for such train, a magneto and a detachable bracket for the magneto carried by the said gear train housing, power take-off means at the opposite end of the said crank shaft comprising a

train of gears embracing an idler, a detachable power gear train housing including an idler, a removable cover for the said housing, and a power shaft journaled in said cover whereby the structure and gears are invertible and usable at either side of the main frame block, coacting as specified.

2. In an internal combustion engine, the combination of a main frame comprising a central integral cuboid block embracing within its surfaces the engine cylinders and jackets, the crank case or recess, intake and exhaust passages and ports, the valves and valve guides, and also the cam shaft recess in parallel relation to the crank shaft recess, said recesses with bearing apertures at both their ends sufficiently large and identical in form to permit the inversion of the shafts end for end, an invertible crank shaft with identical end bearing means with a crank shaft pinion, an invertible cam shaft with gear meshing with a crankshaft pinion supported by identical bearing means at both ends, a cam shaft and magneto gear train, a separate independent detachable housing unit for such train, a magneto and a detachable bracket for the magneto carried by the said cam gear train housing, and power take-off means at the opposite end of the said crankshaft, whereby the structure and gears are invertible and usable at either side of the main frame block, coacting as specified.

3. In an internal combustion engine, the combination of a main frame comprising a central integral cuboid block embracing within its surfaces the engine cylinders and jackets, the crank case or recess, intake and exhaust passages and ports, the valves and valve guides, and also the cam shaft recess in parallel relation to the crankshaft recess, said recesses with bearing apertures at both their ends sufficiently large and identical in form to permit the inversion of the shafts end for end, an invertible crank shaft with identical end bearing means with a crank shaft pinion, an invertible cam shaft with gear meshing with a crankshaft pinion supported by identical bearings at both ends, a cam shaft and magneto gear train, a separate independent detachable housing unit for such train, and a magneto and a detachable bracket for the magneto carried by the said cam gear train housing whereby the structure and gears are reversible and usable at either side of the main frame block, coacting as specified.

4. In an internal combustion engine, the combination of a main frame comprising a central integral cuboid block embracing within its surfaces the engine cylinders and jackets, the crank case or recess, intake and exhaust passages and ports, the valves and valve guides, and also the cam shaft recess in parallel relation to the crankshaft recess, said recesses with bearing apertures at both their ends sufficiently large and identical in form

to permit the inversion of the shafts end for end, an invertible crank shaft with identical end bearing with a crank shaft pinion, an invertible cam shaft with gear meshing with a crank shaft pinion supported by identical bearings at both ends, a cam shaft gear train, and a independent detachable housing unit for such train, whereby the structure and gears are reversible and usable at either side of the main frame block, coacting as specified.

5. In an internal combustion engine, the combination of a main frame comprising a central integral cuboid block embracing within its surfaces the engine cylinders and jackets, the crank case or recess, intake and exhaust passages and ports, the valves and valve guides, and also the cam shaft recess in parallel relation to the crankshaft recess, said recesses with bearing apertures at both their ends sufficiently large to permit the inversion of the shafts end for end, an invertible crank shaft with a crank shaft pinion, an invertible cam shaft with gear meshing with the crank shaft pinion, comprising a cam shaft gear train, whereby the structure and gears are reversible and usable at either side of the main frame block, coacting as specified.

6. In an internal combustion engine, the combination of a main frame comprising a central integral block embracing within its surfaces the engine cylinders and jackets, the crank case or recess, intake and exhaust passages and ports, the valves and valve guides, and also the cam shaft recess in parallel relation to the crankshaft recess, said recesses with bearing apertures at both their ends sufficiently large to permit the inversion of the shafts end for end, an invertible crank shaft with a crank shaft pinion, an invertible cam shaft with gear meshing with the crank shaft pinion, comprising a cam shaft gear train, whereby the structure and gears are reversible and usable at either side of the main frame block, coacting as specified.

In witness whereof I have hereunto set my hand.

HENRY J. FISHER.

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