March 11, 1952 A. J. SLEMMONS 2,588,666

PISTON ASSEMBLY

Filed March 10, 1949 3 Sheets-Sheet 1

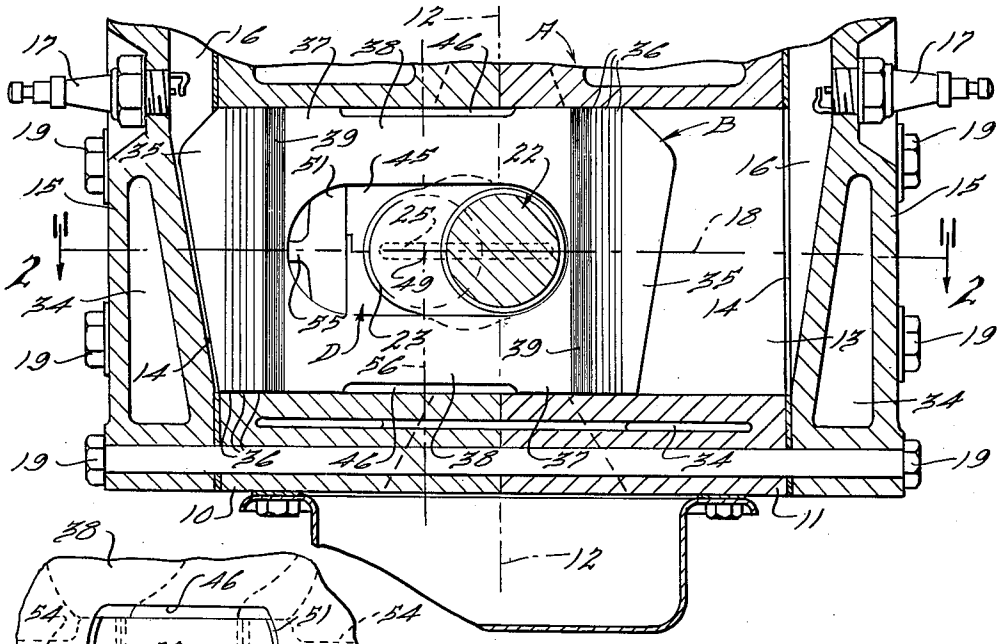


Fig. 1.

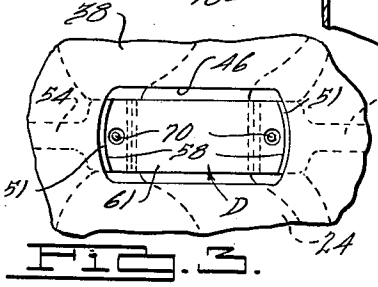


Fig. 3.

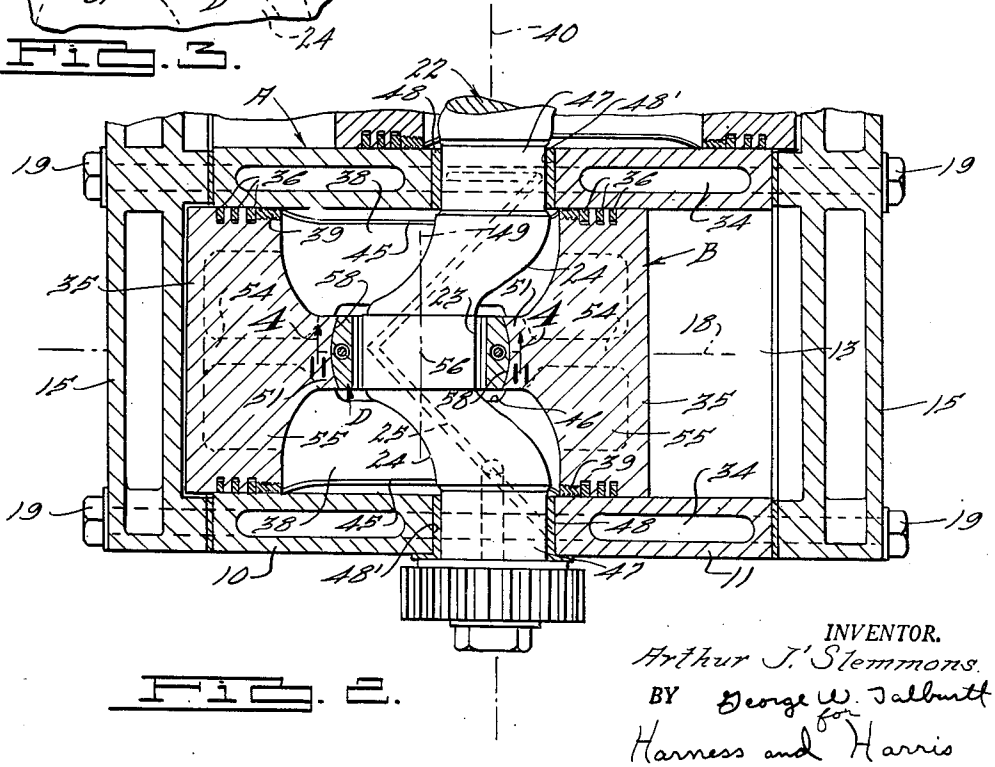


Fig. 2.

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PISTON ASSEMBLY

Filed March 10, 1949 3 Sheets-Sheet 2

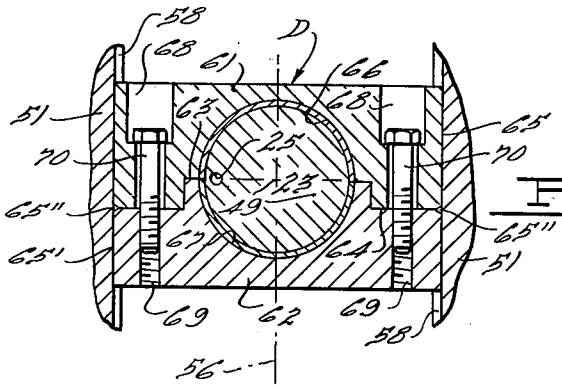


Fig. 4.

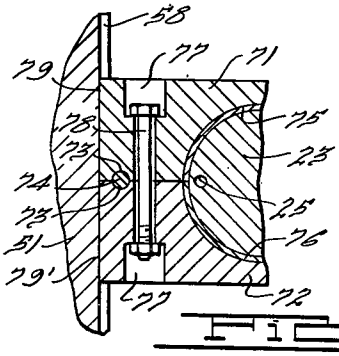


Fig. 5.

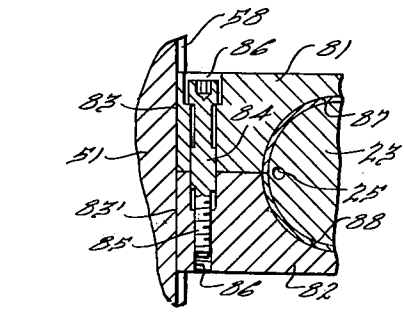


Fig. 6.

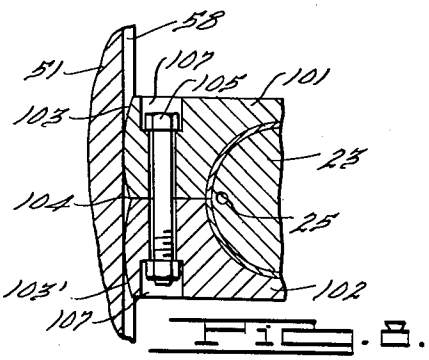


Fig. 8.

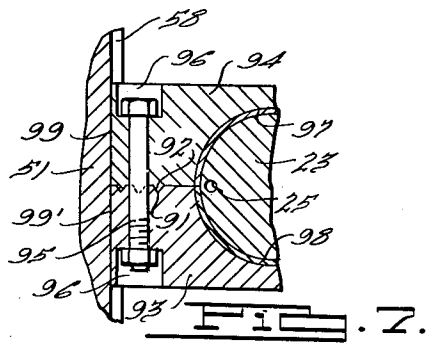


Fig. 7.

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PISTON ASSEMBLY

Filed March 10, 1949 3 Sheets-Sheet 3

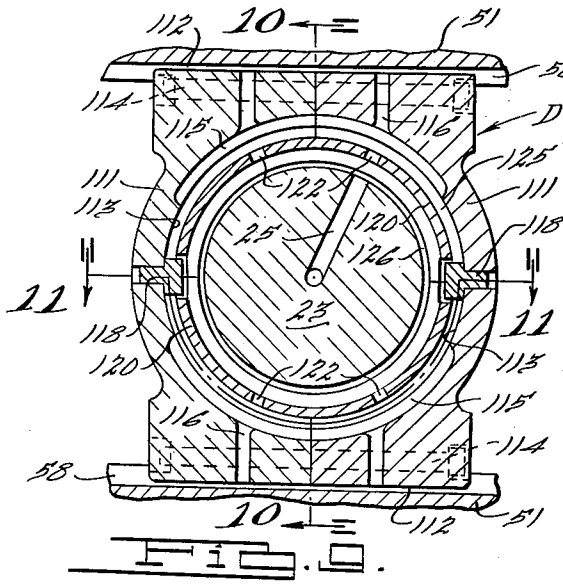


Fig. 9.

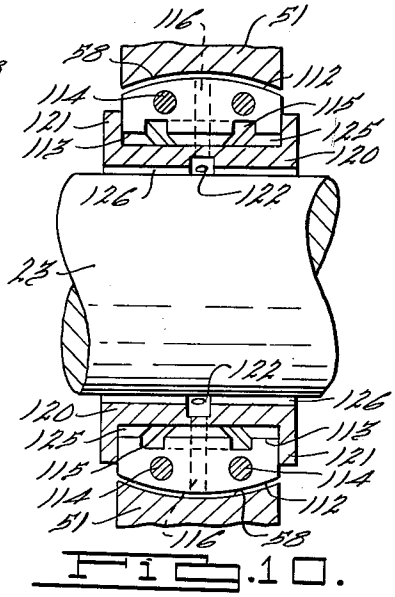


Fig. 10.

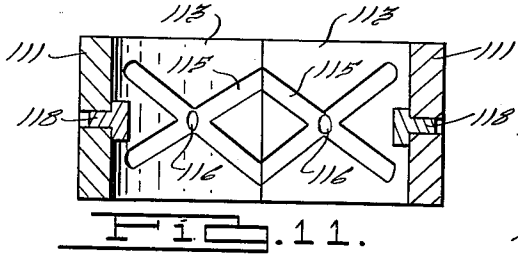


Fig. 11.

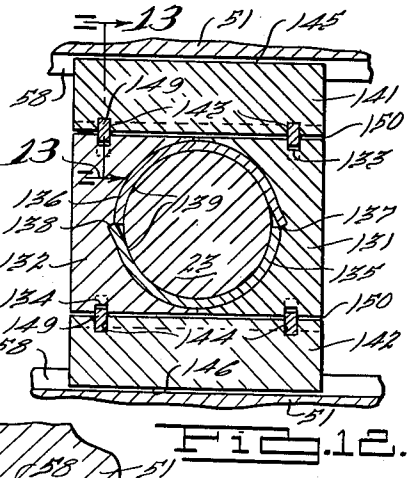


Fig. 12.

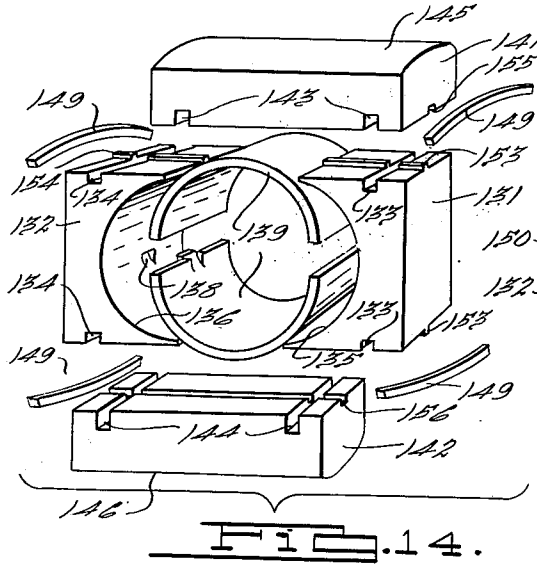


Fig. 14.

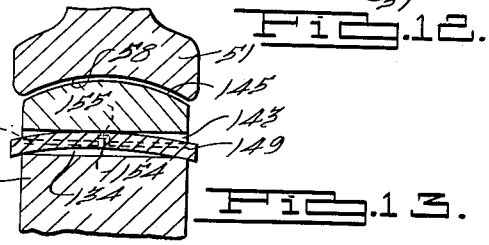


Fig. 13.

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2,588,666

UNITED STATES PATENT OFFICE

2,588,666

PISTON ASSEMBLY

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Application March 10, 1949, Serial No. 80,729

15 Claims. (Cl. 184—6)

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This invention relates to internal combustion engines of the double acting type and is primarily concerned with the means employed to connect the pistons of such engines to the associated crankshaft.

In the double acting type of engine a double-ended piston is employed for reciprocatory movement in each engine cylinder bore, such engines being arranged to provide a combustion chamber at each end of each cylinder for cooperation with one end of the double-ended piston mounted therein. Engines of this general type are known in the art and employ a crankshaft which usually extends through and is directly operably connected to the double-ended piston without the use of a connecting rod such as is employed in the more conventional type of internal combustion engine.

The double acting type of engine offers many advantages over the more conventional types of engines but certain difficulties in the manufacture, assembly and operation of such an engine have heretofore been deemed to be of such serious and unsurmountable character as to cause this type of engine either to be discarded or considered not worthy of the expenditure of additional effort to overcome the various problems restricting its use.

One of the difficulties experienced with this type of engine has been in providing a practicable operating connection between the piston and crankshaft which connection will permit the use of a one-piece or integral type of double-ended piston in combination with an integral or one-piece crankshaft. In the past it has been conventional in this type of engine to use an assembled or built-up type of double-ended piston, such as that disclosed in the application of John P. Butterfield, Serial No. 16,645, filed March 24, 1948, or an integral type of piston in combination with a built-up or sectional crankshaft such as that disclosed in the applications of Alexander G. Herreshoff, Serial No. 16,801, filed March 24, 1948, or that of John P. Butterfield, Serial No. 16,646, filed March 24, 1948. Each of the aforementioned conventional constructions has certain disadvantages which the construction herein disclosed readily overcomes. An engine assembly using an assembled or built-up type of double-ended piston with an integral or one-piece crankshaft is costly to manufacture and assemble due to the multiple part piston structure and its assembly is time consuming and subject to various misalignments of the several piston parts which misalignments have a tendency to produce a noisy, inefficient

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engine assembly that is characterized by undue wear and binding of the various slidably engaged parts. While this latter type of construction does not present a difficult assembly problem, still, the other disadvantages outweigh its relatively few advantages. In a construction using an integral or one-piece type of piston in combination with a built-up or sectional crankshaft, the crankshaft unit is quite costly to manufacture, is subject to increased vibrational disturbances, and lacks the necessary rigidity to prevent the development of noise and unnecessary wear in an engine assembly of the double acting type.

The bearing block constructions herein disclosed overcome the various disadvantages hereinbefore pointed out by permitting the use of a one-piece or integral type of piston in combination with an integral or one-piece crankshaft. Such an arrangement is easy and economical to manufacture, has sufficient rigidity to maintain the desired tolerances between the assembled parts, is not subject to assembly misalignments or the like, and may be assembled economically with the greatest of ease.

Further objects and advantages of my invention reside in the novel combination and arrangement of parts hereinafter described as illustrative of the principles of my invention, reference being had to the accompanying drawings in which:

Fig. 1 is a transverse sectional elevational view through a double acting engine cylinder block structure showing a crankshaft and associated piston connected by a bearing block embodying my invention;

Fig. 2 is a sectional plan view of the structure shown in Fig. 1, the view being taken as indicated by line 2—2 of Fig. 1;

Fig. 3 is a fragmentary side elevational view of a portion of the piston and the bearing block connection to the piston slideways;

Fig. 4 is a fragmentary sectional elevation of the bearing block structure shown in Figs. 1 and 2, the view being taken as indicated by the line 4—4 of Fig. 2;

Figs. 5, 6, 7 and 8 are fragmentary sectional elevational views of modified forms of bearing block constructions embodying my invention;

Fig. 9 is another modified form of bearing block construction including the invention shown in Figs. 1–8 and incorporating means to damp the impact forces transmitted between the piston and associated crankshaft;

Fig. 10 is a sectional elevation of the bearing block construction shown in Fig. 9, the view being taken along the line 10—10 of Fig. 9;

Fig. 11 is another sectional elevational view of the bearing block construction shown in Fig. 9, the view being taken along the line 11—11 of Fig. 9;

Fig. 12 is a sectional elevation of another modified form of a sectional bearing block construction for use with a unitary or one-piece double-ended piston of the internal slideaway type;

Fig. 13 is a fragmentary sectional elevation taken along the line 13—13 of Fig. 12 disclosing the spring strip connecting and clearance adjusting means associated with this sectional bearing block; and

Fig. 14 is an exploded perspective view of the elements comprising the sectional bearing block shown in Figs. 12 and 13.

The engine illustrated in the accompanying drawings is more fully disclosed and claimed in the copending applications of Alexander G. Herreshoff, Serial No. 16,801, filed March 24, 1948, and John P. Butterfield, Serial Nos. 16,645, 16,648 and 16,600, filed March 24, 1948.

In general, the engine comprises a cylinder block structure A formed of component or complementary half portions 10 and 11 having planar face contact in a plane 12—12 which is vertical for the illustrated positioning of the engine in Fig. 1. Each portion of the cylinder block structure A is formed with a half-part of a cylinder 13 of substantially uniform diameter extending between the opposite side faces 14 of the block structure A. Each exposed end of the cylinder 13 is closed by a cylinder head 15 providing a combustion chamber 16. Suitable intake and exhaust valves (not shown) control inlet of the fuel mixture to the combustion chambers 16 and discharge of the exhaust gas from the combustion chambers. Combustion chamber fuel ignition means such as the spark plugs 17 are provided although other types of fuel ignition may be used.

The cylinder block portions 10 and 11 are brought together and the cylinder heads 15 maintained in their illustrated assembled positions by a plurality of through bolt assemblies 19 which extend through the block portions and cylinder heads. For an engine of the liquid circulating cooled type, as illustrated, the cylinder heads 15 and block portions 10, 11 are provided with cored intercommunicating coolant passages 34, the contacting faces of the block portions 10 and 11 being lapped and wiped with a conventional rubber cement or the like prior to assembly to insure proper alignment of the engine parts and to insure against leakage of coolant and lubricating oil in the plane 12—12.

Reciprocating within the typical illustrated cylinder 13 is a piston structure B having a head portion 35 at each end thereof arranged to cooperate with the combustion chambers 16 of the cylinder heads 15. The piston structure B carries a set of rings 36 adjacent each of its head portions 35 and the oppositely disposed piston head portions 35 are connected together by an intermediate skirt structure 37 herein illustrated as comprising a plurality of circumferentially spaced piers or tie-portions 38. The skirt portion 37 is connected to the associated head portions 35 by suitable connections 39 of the sweated, shrunk, or welded type if the piston is a composite unit having different materials forming the head and skirt portions. If desired, the integral or one-piece piston structure B may be formed as a single casting or as a unitary center pier and track section with attached ring carriers, or as a composite unit, such as shown in the application of Alexander G. Herreshoff, Serial No. 84,081, filed March 29, 1949 now Patent No. 2,581,326 issued January 1, 1952.

The skirt portion 37 of piston structure B is provided with two pairs of diametrically disposed, axially extending openings or slots 46 and 46, respectively, which slots are bounded circumferentially of the piston by the piers 38. The slots 45 are adapted to receive the crankshaft 22 and to accommodate reciprocation of the piston structure B relative to the crankshaft 22. Crankshaft 22 is rotatable about its axis 40, the crankshaft having journal portions 47 mounted in bearings 48 carried by the component semi-cylindrical bearing openings 48' formed in the cylinder block portions 10 and 11. The slots 46, circumferentially rotated ninety degrees from the slots 45 (see Fig. 3), are adapted to receive the end portions of the internal piston slideways 51 and are arranged to facilitate assembly of the piston structure B on the crankshaft crankpin portion 23, all as more fully explained subsequently.

Associated with each cylinder and piston structure of the engine is a cylindrical crankpin portion 23 of the crankshaft 22, such portion having its axis 49 offset from the crankshaft axis 40 and parallel therewith. Each crankpin portion 23 is connected to an adjacent pair of journal portions 47 by the obliquely extending crankshaft portions 24, the crankpin 23 and oblique connecting portions 24 being disposed within the hollow chamber formed interiorly of piston structure B intermediate the heads 35 of the double-ended piston structure. It will be apparent that the cylindrical crankpin portion 23 presents a cylindrical journal bearing surface of revolution having the crank axis 49 as its axis of generation.

My improved operating connection between piston structure B and crankshaft 22 comprises internal slideways or bearing guides 51 carried by each piston head portion 35 and extending transversely of the piston structure B and a bearing structure or block D operatively disposed between crankpin 23 and the piston slideways 51, the parts being so constructed and arranged as to provide a sliding rocking bearing connection between the piston structure B and the crankshaft crankpin 23. The similar, opposed, companion slideway portions 51 are preferably cast with the piston heads 35 and connected therewith by the X-brace structure formed by the flanges or webs 54, 55 each of which is swept into its associated guideway portion 51 in order to fix the slideways 51 as a more or less rigid part of the piston head structure. By the arrangement shown the slideway portions 51 are thus spaced from each other in a direction axially of the piston structure and present opposed, arcuately shaped bearing surfaces 58 facing each other.

The slideways 51 extend transversely of the piston structure B parallel to an axis 56 which is normal or perpendicular with the cylinder and piston axis 18 and with the axis 49 of crankpin 23. Each slideway portion 51 is provided with an arcuately shaped bearing surface of revolution 58 having its longitudinally extending surface elements extending parallel with the slideway axis 56 and perpendicular to the piston axis 18, the surfaces 58 being of arcuate formation as viewed in planes extending transverse to the slideway axis 56. Each bearing surface 58

is a portion of a cylindrical surface having axis 56 as the axis of such cylinder about which the surfaces 58 are developed or generated. As will be seen from Figs. 2 and 3 the slideways 51 extend transversely through the piston, the opposite ends of the slideways 51 being open and extending outwardly through the slots 46 located between the piers 38 of the piston skirt portion 37.

The bearing block structure D disclosed in Figs. 1–4 comprises complementary bearing block portions 61 and 62, having stepped contacting side faces 63 and 64, respectively, which faces are arranged to extend transversely of and normal to the parallel, cylindrically formed, bearing surfaces 65, 65' on the ends of block portions 61 and 62. The cylindrical bearing surfaces 65, 65' are generated about the axis 56 of the slideways 51 so as to conform to the curvature of the slideway bearing surfaces 58. Bearing surfaces 65, 65' are adapted to be slidably and rockably received in the piston slideways 51 for mating engagement with the slideway bearing surfaces 58. Each of the bearing block portions 61 and 62 has a side face thereof formed with a semi-ciylindrical crank portion journal opening 66 and 67, respectively, which openings are adapted to be mounted about the associated crankshaft crankpin portion 23. The semi-cylindrical journal surfaces 66 and 67 are generated about the axis 49 of the crank portion 23 so as to provide a journal bearing fit. Each of the bearing block portions 61 and 62 is provided with a pair of bolt receiving bores 68 and 69, respectively, adapted to receive the tie bolts 70. Tie bolts 70 have their heads countersunk in the openings 68 in bearing block portion 61 and their threaded end portions connected to the threaded bores 69 of bearing block portion 62 so as to lock the bearing block portions in assembled position about the crank portion 23. The stepped faces 63 and 64 of the bearing block portions 61 and 62 provide means to align the bearing faces 65, 65' and the journal openings 66 and 67 and to maintain this alignment without relying on any centering action of the tie bolts 70. It is necessary that the bearing surfaces 65, 65' on the adjacent bearing block portions at each end of the bearing block be aligned to prevent a scraping or wiping action as the bearing block reciprocates across the slideways 51. To prevent any possible wiping action at the joining edges of the bearing block surfaces 65, 65' the edges of the block portions may be chamfered as shown at 65''. Bearing blocks D are axially shiftable on the crankpin portions 23 to permit self-alignment of the piston B relative to the cylinder 13 and crankshaft 22. The construction shown in Figs. 1–4 having the bearing block portions split along a plane perpendicular to the bearing surfaces of the block portions permits assembly of a one-piece piston on a one-piece crankshaft in an easy and economical manner.

The modified form of bearing block shown in Fig. 5 differs from the form shown in Fig. 4 in that the contacting faces of the bearing block portions 71 and 72 are not stepped but instead include pin receiving channels 73 to seat the aligning pin 74 which maintains alignment of the bearing surfaces 79, 79' and the journal bearing openings 75 and 76. Each bearing block portion 71 and 72 includes bores 77 to receive the tie bolts 78.

The Fig. 6 modification dispenses with the self aligning formations in the contacting faces of the bearing block portions 81 and 82 and accomplishes this alignment of the bearing surfaces 83, 83' and journal openings 87 and 88 by means of a pilot portion 84 on tie bolt 85 that is threadably mounted in the aligned bores 86 of the engaged bearing block portions 81 and 82.

Fig. 7 shows a modified form of the Fig. 4 and 5 constructions having serrated mating faces 91 and 92 on the bearing block portions 93 and 94, respectively, cooperating with the tie bolt 95 mounted in the aligned bores 96 to align the bearing surfaces 99, 99' and the journal openings 97 and 98.

Fig. 8 is another modification wherein the bearing block portions 101 and 102 are each formed with a transversely as well as a longitudinally curved bearing surface 103, 103' to engage the slideway bearing surfaces 58. This arrangement provides a chamfered construction 104 at the meeting edges of the bearing surfaces 103, 103' that prevents a wiping action. A conventional tie bolt 105 is mounted in the bores 107 to lock the bearing block portions about the crankpin 23. The Fig. 8 construction is of a simple form that does not require specially machined aligning portions on the contacting faces of the mating bearing block portions nor are special bolts or bolt bores required to assure a non-wiping action between the bearing block and the slideway bearing surfaces 58.

Figs. 9–11 show another form of the invention wherein the bearing block D comprises a pair of complementary bearing block portions 111 each of which has at the opposite ends parallel, arcuately formed, bearing surfaces 112 adapted to be mounted in the spaced piston slideways 51 for slidable engagement with the mating slideway bearing surfaces 58. The bearing surfaces 112 are formed in the manner previously described with regard to the bearing surfaces 65, 65' so that they will matingly engage the cylindrically curved slidway bearing surfaces 58. Each bearing block portion 111 is formed with a portion of a crankpin journal opening 113 extending inwardly from one side face thereof, the complementary journal openings 113 being arranged to fit about the crankshaft crankpin portion 23 and to be slightly spaced therefrom when in assembled position. Tie bolts 114, like any of the forms shown in Figs. 4–8, may be used to fasten the complementary bearing block portions 111 about the crankpin portion 23. The journal surfaces of the journal openings 113 in the bearing block portions 111 are formed with a crisscrossed arrangement of oil passages 115 and bores 116 connect the oil passages 115 with the adjacent bearing surfaces 112. Mounted on the journal face 113 of each bearing block portion 111 and projecting radially inwardly therefrom is an anchor pin 118. Anchor pins 118 are adapted to non-rotatably support the cylindrical bearing shell 120 which journals the crankpin 23 of the crankshaft. Bearing shell 120 is adapted to be floatingly supported in concentrically arranged oil films that are formed in the space 125 between the journal faces 113 of the bearing block portions 111 and the bearing shell 120 and in the space 126 between the bearing shell 120 and the journal surfaces on the crank portion 23. Bearing shell 120 is perforated to provide the spaced oil bores 122 which connect the oil supply passage 25 in crank portion 23 with the oil passages 115, the oil bores 116 and the bearing surfaces 112. The bearing shell 120 has side flanges 121 arranged to fit closely against the outer sides of the bearing block portions 111 as clearly shown in Fig. 10. The side flanges 121

cooperate with the outer sides of the bearing block portions 111 to restrict the flow of the lubricating oil against movement outwardly from the space 125 between the journal surfaces 113 and the bearing shell 120 and this enhances the damping action of the oil film in space 125. As a result of this construction, there is an impact damping oil film maintained in the space 125. The usual oil wedge film is maintained in the space 126 between the crank portion 23 and bearing shell 120. By the construction shown in Figs. 9–11 fluid pressure means are provided for damping of the impact force due to the taking up of the clearance in the crankpin journal during firing in the combustion chamber and a reliable lubricating system is provided for servicing all movable portions of the bearing block construction. The clearances shown between the various elements are shown greatly enlarged for the sake of clarity.

The bearing block construction shown in Figs. 12–14 comprises complementary crankpin journal block portions 131 and 132. Each of the block portions 131 and 132 is provided with a pair of slots 133 and 134, respectively, that extend across the end surfaces of the block portions 131 and 132 in a direction parallel to the axis of the crankpin journal openings 135 and 136, respectively, in these block portions. Each of the crankpin journal openings 135 and 136 is formed with an anchor slot 137 and 138, respectively, to provide means to non-rotatably anchor a section of the two-piece bearing shell 139 to the block portions 131 and 132. Portions of each bearing shell section are forced into one of the anchor slots in block portions 131 and 132 in a manner known to the art and forming no part of this invention. A pair of bearing block end members 141 and 142, which are adapted to extend across the opposite end surfaces of the crankpin journal block portions 131 and 132, are each formed with a pair of slots 143 and 144, respectively, arranged to be aligned with the slots 133 and 134 in block portions 131 and 132 when the several bearing block elements are assembled about the crankshaft crankpin portion 23. Bearing block end members 141 and 142 each have an arcuate bearing surface 145 and 146, respectively, that is adapted to seat in a mating bearing surface 58 of the associated piston slideway 51. Arcuately shaped spring strips 149 of substantially rectangular cross-sectional configuration are adapted to be inserted in the aligned slots 133, 134, 143 and 144 to connect the several bearing block elements in assembled relationship. The curved spring strips 149 are shaped so as to tend to force the bearing block end members 141 and 142 away from the crankpin journal blocks 131 and 132 and into a tight fit with the piston slideway bearing surfaces 58. This spring action of the strip 149 compensates for variations in clearance between the bearing block bearing surfaces 145 and 146 and the piston slideway surfaces 58 and tends to reduce noise and always maintain a close sliding fit between the bearing block and piston slideways. Furthermore, the minute spaces 150 between the end surfaces of the crankpin journal block portions 131 and 132 and the adjacent inner sides of the end members 141 and 142 provide channels for retaining films of lubricating oil or the like and these oil films act as cushioning means to damp impact forces applied to the piston due to fuel combustion or the like. To further assist in the mounting of the end members 141 and 142 on the journal blocks 131 and 132 and to also maintain these block portions in aligned assembled relationship, the several block elements may be provided with aligning tongue and groove connections such as the tongues 153 and 154 on the crankpin journal blocks 131 and 132 and the grooves 155 and 156 in the end members 141 and 142 respectively.

By the construction shown in Figs. 12–14 a sectional bearing block has been provided that may be easily assembled on a crankshaft mounting, a one-piece, double-ended, internal slideway type piston and the bearing block will automatically compensate for variations in clearances between the bearing block slide surfaces and the piston slideway due to the action of the spring strip connecting means 149 between the several elements of the bearing block. Also, this sectional bearing block provides channels for retaining oil films that act as impact damping means to absorb the forces that would otherwise be applied to the crankshaft crankpin and its associated elements.

It is thought to be obvious from a consideration of Figs. 2 and 3 of the drawings that the use of an integrally formed one-piece or unitary piston structure, such as that identified by the reference numeral B, having curved, transversely extending, internals slideways, such as the slideways 51, prevents the use of the conventional built-up bearing block structure that is formed from complementary portions separable along a plane extending parallel to the bearing surfaces of the block D and the slideways 51. In a piston construction of the type herein disclosed, the curvature of the bearing surfaces 58 on the slideways 51 and the mating surfaces on the bearing block D prevents mounting of the complementary bearing block portions on the crankshaft 22 from the sides of the piston adjacent the slots 45 in the piston skirt 37. As the piston B is of the one-piece or integral type, it must first be mounted on the crankshaft 22 and then the complementary bearing block sections mounted on the crankshaft crankpin portion 23 between the piston slideway surfaces 58. Use of a one-piece crankshaft prevents first mounting the bearing blocks in the piston slideways and the subsequently attempting to thread the crankshaft through the bearing block crank portion journal openings as may be done when using a built-up crankshaft.

The bearing block constructions herein disclosed permit mounting of the bearing block D on the crankshaft crankpin portions 23 after the crankshaft 22 has been threaded through the piston skirt portion 37 of the unitary piston B so as to extend between and at right angles to the direction of the piston slideway portions 51. After mounting the crankshaft 22 in the piston B as aforedescribed the complementary portions of the bearing block D may be slidably inserted through the slots 46 on opposite sides of the piston skirt 37 and into the oppositely disposed open ends of the slideways 51. After mounting the complementary bearing block portions in the slideways 51 with the crankpin journal openings fitted about the crankpin portion 23, the connecting tie bolts for the complementary bearing block portions are inserted through the appropriate piston skirt slots 46 and threaded into the receiving openings in the bearing block portions to lock the complementary bearing block portions about the associated crankpin portion 23. By the herein disclosed construction of a bearing block structure, a connecting means for operably

associating a one-piece, double-ended piston with a one-piece crankshaft has been provided that is easy and economical to manufacture and assemble and one that will lend itself to smooth, noiseless, efficient, engine operation. Furthermore, the particular construction disclosed in Figs. 9–11 of the drawings provides, in addition, a means for properly lubricating the bearing block construction and damping the impact loads created by ignition of the fuel charges in the engine combustion chambers. By the Figs. 12–14 construction a sectional bearing block construction has been provided in which the bearing block includes means to assist in control of the clearances between the bearing surfaces of the bearing block and the mating bearing surfaces 58 on the piston slideways 51. The Figs. 12–14 construction also includes additional means providing oil films for damping impact loads.

I claim:

1. A bearing block structure adapted to connect a crankpin portion to the spaced parallel, arcuately shaped, slideways of a movable structure comprising a pair of complementary bearing block portions, each bearing block portion having a pair of spaced parallel ends formed to provide arcuately shaped bearing surfaces and a side face extending transversely of and normal to the spaced block ends, said side face being formed with a portion of a cylindrical crankpin journal opening extending inwardly therefrom, and connecting means extending between said bearing block portions in planes parallel to said block ends adapted to fasten the complementary bearing block portions together with said side faces in engaging relationship and the complementary portions of the crankpin journal openings assembled in aligned relationship.

2. A bearing block structure adapted to connect a crankpin portion to the spaced, parallel, arcuately shaped slideways of a piston structure or the like comprising a pair of complementary bearing block portions, each bearing block portion having a pair of spaced parallel ends formed to provide arcuately shaped bearing surfaces and a side face extending transversely of and normal to the spaced block ends, said side face being formed with a portion of a cylindrically shaped crankpin journal opening extending inwardly therefrom, and connecting means extending between said bearing block portions adapted to fasten the complementary bearing block portions together with said side faces in engaging relationship and the portions of the crankpin journal openings assembled in aligned relationship, said engaged side faces of said complementary bearing block portions having complementary aligning formations thereon adapted to align the bearing surfaces and the crankpin journal openings on the complementary bearing block portions.

3. A bearing block structure adapted to connect a crankpin portion to the spaced, parallel, arcuately shaped slideways of a piston structure or the like comprising a pair of complementary bearing block portions, each bearing block portion having a pair of spaced parallel ends formed to provide arcuately shaped bearing surfaces and a side face extending transversely of and normal to the spaced block ends, said side face being formed with a portion of a cylindrically shaped crankpin journal opening extending inwardly therefrom, and connecting means extending between said bearing block portions adapted to fasten the complementary bearing block portions together with said side faces in engaging relationship and the portions of the crankpin journal openings assembled in aligned relationship, said engaged side faces of said complementary bearing block portions having complementary aligning formations thereon adapted to align the bearing surfaces and the crankpin journal openings on the complementary bearing block portions, said aligning formations comprising complementary engageable step formations.

4. A bearing block structure adapted to connect a crankpin portion to the spaced, parallel, arcuately shaped slideways of a piston structure or the like comprising a pair of complementary bearing block portions, each bearing block portion having a pair of spaced parallel ends formed to provide arcuately shaped bearing surfaces and a side face extending transversely of and normal to the spaced block ends, said side face being formed with a portion of a cylindrically shaped crankpin journal opening extending inwardly therefrom, and connecting means extending between said bearing block portions adapted to fasten the complementary bearing block portions together with said side faces in engaging relationship and the portions of the crankpin journal openings assembled in aligned relationship, said engaged side faces of said complementary bearing block portions having complementary aligning formations thereon adapted to align the bearing surfaces and the crankpin journal openings on the complementary bearing block portions, said aligning formations comprising channel-like formations seating an aligning pin.

5. A bearing block structure adapted to connect a crankpin portion to the spaced, parallel, arcuately shaped slideways of a piston structure or the like comprising a pair of complementary bearing block portions, each bearing block portion having a pair of spaced parallel ends formed to provide arcuately shaped bearing surfaces and a side face extending transversely of and normal to the spaced block ends, said side face being formed with a portion of a cylindrically shaped crankpin journal opening extending inwardly therefrom, and connecting means extending between said bearing block portions adapted to fasten the complementary bearing block portions together with said side faces in engaging relationship and the portions of the crankpin journal openings assembled in aligned relationship, said engaged side faces of said complementary bearing block portions having complementary aligning formations thereof adapted to align the bearing surfaces and the crankpin journal openings on the complementary bearing block portions, said aligning formations comprising complementary, engageable, serrated formations.

6. A bearing block structure adapted to connect a crankpin portion to the spaced, parallel, arcuately shaped slideways of a piston structure or the like comprising a pair of complementary bearing block portions, each bearing block portion having a pair of spaced parallel ends formed to provide arcuately shaped bearing surfaces and a side face extending transversely of and normal to the spaced block ends, said side face being formed with a portion of a cylindrically shaped crankpin journal opening extending inwardly therefrom, and connecting means extending between said bearing block portions adapted to fasten the complementary bearing block portions together with said side faces in engaging relationship and the portions of the crankpin journal

openings assembled in aligned relationship, said engaged side faces of said complementary bearing block portions having complementary aligning formations thereon adapted to align the bearing surfaces and the crankpin journal openings on the complementary bearing block portions, the ends of said engaged side faces of the complementary block portions adjacent said bearing surfaces being chamfered.

7. A bearing block structure adapted to connect a crankpin portion to the spaced, parallel, arcuately formed slideways of a piston structure or the like comprising a pair of complementary bearing block portions, each bearing block portion having a pair of spaced parallel ends formed to provide opposed, arcuate bearing surfaces and a side face extending transversely of and normal to the spaced block ends, said side face being formed with a portion of a cylindrically shaped crank pin journal opening extending inwardly therefrom, and connecting means extending between said bearing block portions adapted to fasten the complementary bearing block portions together with said side faces in engaging relationship and the portions of the journal openings in aligned relationship, said connecting means comprising tie bolts mounted in aligned bores in the complementary bearing block portions, the tie bolts including pilot portions adapted to engage the bores and align the bearing surfaces and the crankpin journal openings on the complementary bearing block portions.

8. A bearing block structure adapted to connect a crankpin portion to the spaced, parallel, arcuately shaped slideways of a piston structure or the like comprising a pair of complementary bearing block portions, each bearing block portion having a pair of spaced, parallel ends formed to provide opposed, arcuately shaped bearing surfaces and a side face extending transversely of and normal to the spaced block ends, said side face being formed with a portion of a cylindrically shaped crankpin journal opening extending inwardly therefrom, and connecting means extending between said bearing block portions and arranged parallel to the block end surfaces and adapted to fasten the complementary bearing block portions together with said side faces in engaging relationship and the portions of the journal openings in aligned relationship, the ends of said blocks adjacent said engaged side faces being shaped to provide a chamfered formation that extends inwardly towards the crankpin journal openings in said block portions.

9. A bearing block structure adapted to connect a crankpin portion to the spaced, parallel slideways of a piston structure or the like comprising a pair of complementary bearing block portions, each bearing block portion having a pair of spaced parallel ends formed to provide bearing surfaces slidably engageable with said slideways and having a side face extending transversely of and normal to the spaced block ends, said side face being formed with a portion of a crankpin journal surface extending inwardly therefrom, and connecting means extending between said bearing block portions adapted to fasten the complementary bearing block portions together with said side faces in engaging relationship and the portions of the crankpin journal surfaces assembled in aligned relationship, said bearing block portions each including lubricant receiving passages formed in the crankpin journal surfaces and lubricating bores connecting said lubricant receiving passages to the bearing surfaces along the ends of the bearing block portions.

10. A bearing block structure adapted to connect a crankpin portion to the spaced, parallel slideways of a piston structure or the like comprising a pair of complementary bearing block portions, each bearing block portion having a pair of spaced parallel ends formed to provide bearing surfaces slidably engageable with said slideways and having a side face extending transversely of and normal to the spaced block ends, said side face being formed with a portion of a crankpin journal surface extending inwardly therefrom, and connecting means extending between said bearing block portions adapted to fasten the complementary bearing block portions together with said side faces in engaging relationship and the portions of the crankpin journal surfaces assembled in aligned relationship, said bearing block portions each including lubricant receiving passages formed in the crankpin journal surfaces and lubricating bores connecting said lubricant receiving passages to the bearing surfaces along the ends of the bearing block portions, each bearing block portion having an anchor pin extending radially inwardly from the crankpin journal surface formed therein and adapted to non-rotatably support a cylindrical bearing shell.

11. A bearing block structure adapted to connect a crankpin portion to the spaced, parallel slideways of a piston structure or the like comprising a pair of complementary bearing block portions, each bearing block portion having a pair of spaced parallel ends formed to provide bearing surfaces slidably engageable with said slideways and having a side face extending transversely of and normal to the spaced block ends, said side face being formed with a portion of a crankpin journal surface extending inwardly therefrom, and connecting means extending between said bearing block portions adapted to fasten the complementary bearing block portions together with said side faces in engaging relationship and the portions of the crankpin journal surfaces assembled in aligned relationship, said bearing block portions each including lubricant receiving passages formed in the crankpin journal surfaces and lubricating bores connecting said lubricant receiving passages to the bearing surfaces along the ends of the bearing block portions, each bearing block portion having an anchor pin extending radially inwardly from the crankpin journal surface formed therein and adapted to non-rotatably support a cylindrical bearing shell, and a cylindrical bearing shell mounted on said anchor pins and concentrically arranged within the crankpin journal surfaces of said bearing block portions but spaced therefrom, said bearing shell having perforations therein arranged to establish communication between said bearing shell surfaces and the bearing surfaces on the ends of the bearing block portions via said lubricant receiving passages and said lubricant bores.

12. A bearing block structure adapted to connect a crankpin portion to the spaced parallel slideways of a piston structure or the like comprising a pair of complementary bearing block portions, each bearing block portion having a pair of spaced parallel ends formed to provide bearing surfaces slidably engageable with said slideways and having a side face extending transversely of and normal to the spaced block ends, said side face being formed with a portion

of a crankpin journal surface extending inwardly therefrom, and connecting means extending between said bearing block portions adapted to fasten the complementary bearing block portions together with said side faces in engaging relationship and the portions of the crankpin journal surfaces assembled in aligned relationship, said bearing block portions each including lubricant receiving passages formed in the crankpin journal surfaces and lubricating bores connecting said lubricant receiving passages to the bearing surfaces along the ends of the bearing block portions, each bearing block portion having an anchor pin extending radially inwardly from the crankpin journal surface formed therein and adapted to non-rotatably support a cylindrical bearing shell, and a cylindrical bearing shell mounted on said anchor pins and concentrically arranged within the crankpin journal surfaces of said bearing block portions but spaced therefrom, said bearing shell having perforations therein arranged to establish communication between said bearing shell surfaces and the bearing surfaces on the ends of the bearing block portions via said lubricant receiving passages and said lubricant bores, said bearing shell having radially extending side flanges arranged adjacent the sides of said bearing block portions to restrict the axial flow of lubricant from between the bearing shell and the journal surfaces of said bearing block portions.

13. In combination, a crankpin having an oil supply bore extending therethrough, a perforated bearing shell mounted concentrically about and spaced from said crankpin and a bearing block structure mounted on said bearing shell and adapted to be slidably connected between a pair of spaced slideways comprising a pair of complementary bearing block portions, each bearing block portion having a pair of spaced parallel ends provided with surfaces adapted to be slidably engaged with said slideways and a side face extending transversely of and normal to said block ends, said side face being formed with an opening providing a journal surface to seat a portion of said crankpin bearing shell, means connecting said bearing block portion together, anchor pin means mounted on the journal surface of each bearing block portion adapted to non-rotatably support said bearing shell on said bearing block structure in spaced relation to the crankpin journal surface formed therein, lubricant receiving channels formed along the crankpin journal surfaces of said block portions, and bores connecting said lubricant receiving channels to the bearing surfaces on the block ends.

14. In combination, a crankpin having an oil supply bore extending therethrough, a perforated bearing shell mounted concentrically about and spaced from said crankpin, and a bearing block structure mounted on said bearing shell and adapted to be slidably connected between a pair of spaced slideways comprising a pair of complementary bearing block portions, each

bearing block portion having a pair of spaced parallel ends provided with surfaces adapted to be slidably engaged with said slideways and a side face extending transversely of and normal to said block ends, said side face being formed with an opening providing a journal surface to seat a portion of said crankpin bearing shell, means connecting said bearing block portion together, anchor pin means mounted on the journal surface of each bearing block portion adapted to non-rotatably support said bearing shell on said bearing block structure in spaced relation to the crankpin journal surface formed therein, lubricant receiving channels formed along the crankpin journal surfaces of said block portions, and bores connecting said lubricant receiving channels to the bearing surfaces on the block ends, said bearing shell having radially extending flanges positioned so as to restrict the opening between portions of said shell and the crankpin journal surfaces of said bearing block to tend to retain a lubricant film between said bearing shell and bearing block crankpin journal surfaces to provide a means for damping impact forces applied to said crankpin.

15. In combination, a crankpin having an oil supply bore extending therethrough, a perforated bearing shell mounted concentrically about and spaced from said crankpin, and a bearing block structure mounted on said bearing shell and adapted to be slidably connected between a pair of spaced slideways comprising a pair of complementary bearing block portions, each bearing block portion having a pair of spaced parallel ends provided with surfaces adapted to be slidably engaged with said slideways and a side face, said side face being formed with an opening providing a journal surface to seat a portion of said crankpin bearing shell, means connecting said bearing block portion together, anchor pin means mounted on the journal surface of each bearing block portion adapted to non-rotatably support said bearing shell on said bearing block structure in spaced relation to the crankpin journal surface formed therein, lubricant receiving channels formed along the crankpin journal surfaces of said block portions, and bores connecting said lubricant receiving channels to the bearing surfaces on the block ends.

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