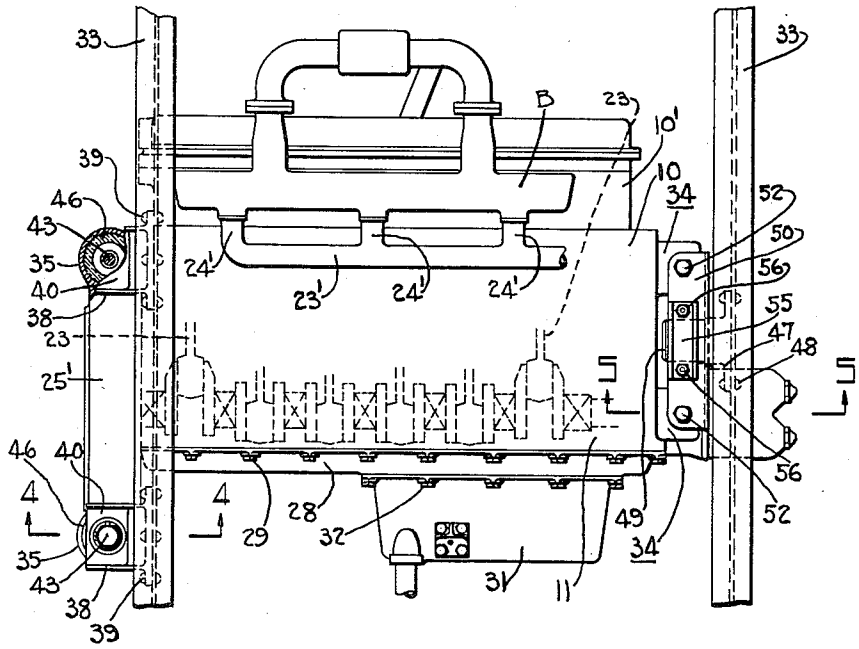
May 4, 1937. H. L. MORRIS ET AL 2,079,357

INTERNAL COMBUSTION ENGINE

Filed Oct. 21, 1933 3 Sheets-Sheet 1

Fig. 1



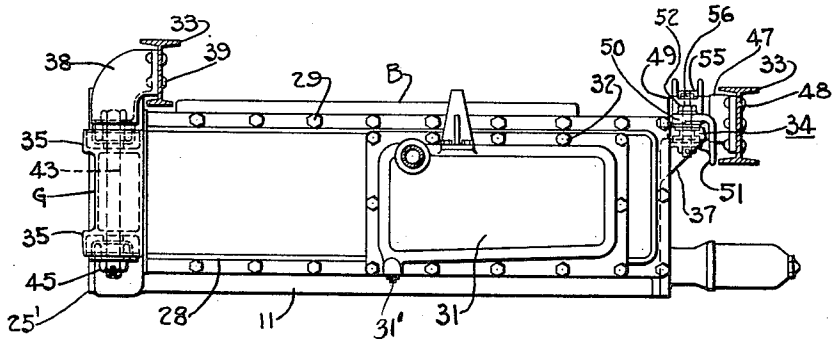


Fig. 2

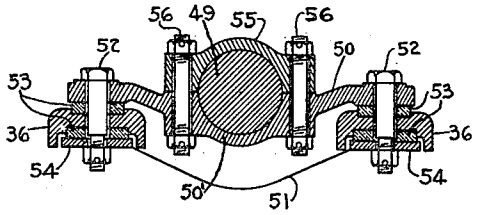


Fig. 3

INVENTORS

HAROLD L. MORRIS

AND

FREDERICK E. DAYES

BY F. H. Gibbs

ATTORNEY

May 4, 1937. H. L. MORRIS ET AL 2,079,357

INTERNAL COMBUSTION ENGINE

Filed Oct. 21, 1933 3 Sheets-Sheet 2

Fig. 3

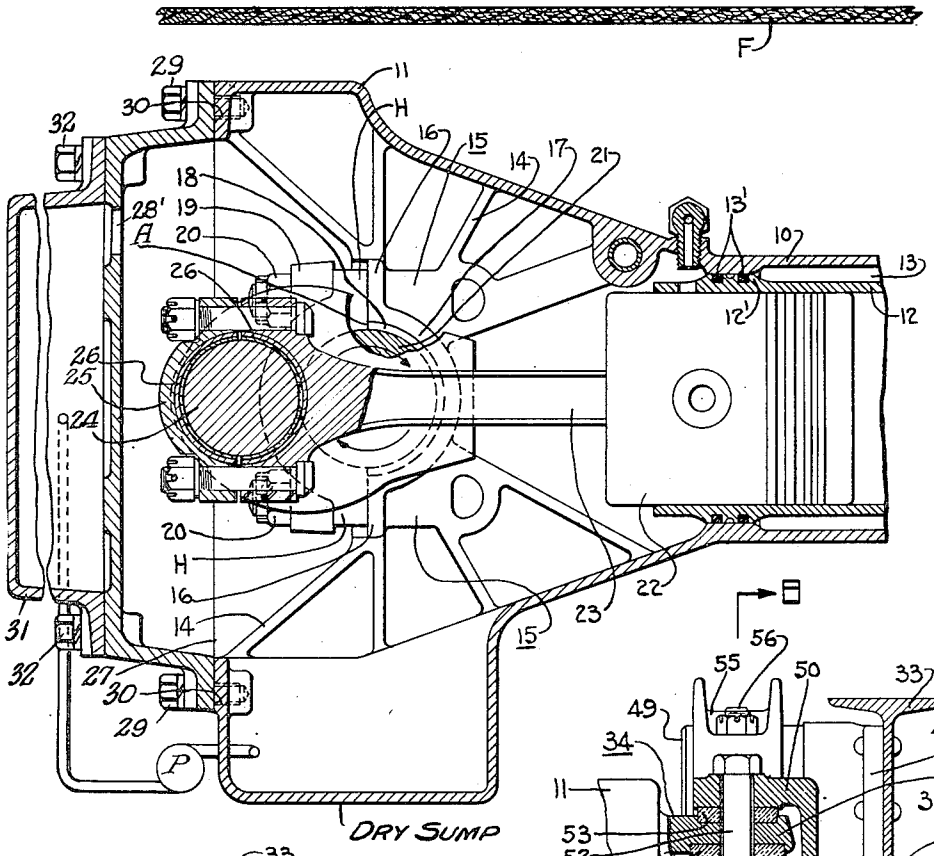


Fig. 5

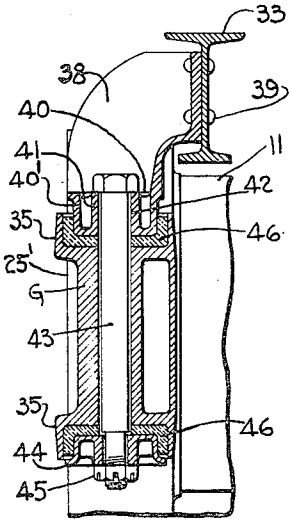


Fig. 4

INVENTORS

HAROLD L. MORRIS

AND

FREDERICK E. DAYES

BY J. H. Gibbs

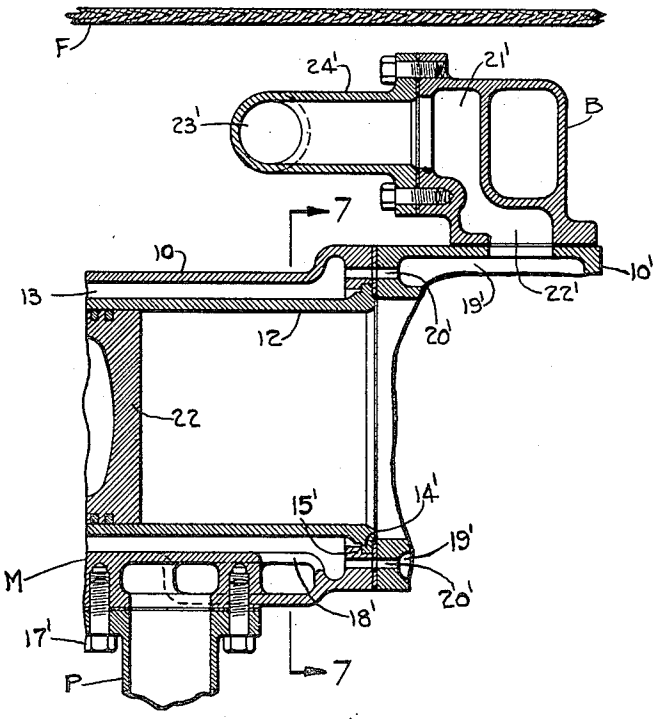
ATTORNEY

May 4, 1937. H. L. MORRIS ET AL 2,079,357

INTERNAL COMBUSTION ENGINE

Filed Oct. 21, 1933 3 Sheets-Sheet 3

Fig. 6



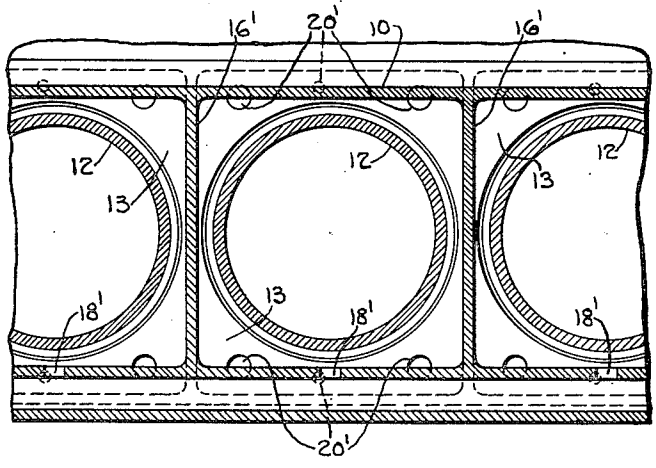


Fig. 7

INVENTORS
HAROLD L. MORRIS
AND
FREDERICK E. DAYES
BY J. H. Gibbs
ATTORNEY

Patented May 4, 1937 2,079,357

UNITED STATES PATENT OFFICE

2,079,357

INTERNAL COMBUSTION ENGINE

Harold L. Morris, Berkeley, Calif., and Frederick E. Dayes, Philadelphia, Pa., assignors to American Car and Foundry Motors Company, New York, N. Y., a corporation of Delaware

Application October 21, 1933, Serial No. 694,552

7 Claims. (Cl. 121—194)

This invention relates generally to internal combustion engines, and more particularly to engines of the horizontal type.

The object of the invention is to provide for gaining access to the working members and bearings of horizontal engines mounted in vehicles through entrance openings provided in the side walls of the engine.

It is also an object of the invention to provide a three-point mounting for engines which may be employed for suspending the engine under vehicles.

Other objects of the invention will in part be obvious and in part appear hereinafter.

The invention accordingly is disclosed in the embodiment thereof shown in the accompanying drawings and comprises the features of construction, combination of elements and arrangement of parts which will be exemplified in the construction hereinafter set forth, and the scope of the application of which will be indicated in the claims.

For a fuller understanding of the nature and objects of the invention, reference should be had to the following detailed description taken in connection with the accompanying drawings, in which:

Figure 1 is a view in top plan of a horizontal engine constructed in accordance with this invention, certain parts being broken away to show other parts in section.

Fig. 2 is a view in side elevation of the engine illustrated in Figure 1.

Fig. 3 is a view in transverse vertical section of the engine illustrated in Figure 1 showing details of construction.

Fig. 4 is a view in section taken along the line 4—4 of Figure 1.

Fig. 5 is a view in section taken along the line 5—5 of Figure 1.

Fig. 6 is an enlarged detail view, in section, through a portion of the cylinder block at its forward end, the view also showing a portion of the cylinder head associated therewith.

Fig. 7 is a sectional view on the line 7—7, Fig. 6, and

Fig. 8 is a sectional view on the line 8—8 of Fig. 5.

Referring now more particularly to the drawings, the engine of the horizontal type comprises an engine or cylinder block indicated in Figs. 3 and 6 at 10, and a crank case 11. In the instance shown the crank case and cylinder block comprise a single casting but obviously this is merely by way of example as they may be cast separately and connected together in any suitable or desired manner. The crank case 11 at its bottom and approximately beneath the crank shaft is formed with a pan 11' which acts as a dry sump to gather and accumulate oil drippings from the lubricated parts of the motor. The engine is also provided with a cylinder head indicated at 10', see Figs. 1 and 6, the latter showing only a portion of the cylinder head but sufficient thereof to disclose a water jacket as more clearly described hereinafter.

The engine is provided with a plurality of cylinder sleeves 12 (see Fig. 7) which are fitted within the cylinder block in such a manner as to provide a separate water jacket 13 around each of said sleeves 12. As shown in Fig. 3, the rear end portion of each cylinder sleeve is enlarged as shown at 12' and said enlarged portion is provided with sealing elements 13'. The forward end portion of each cylinder sleeve 12 is provided with a flange 14' extending completely around the sleeve and being fitted in a circular recess formed in an in-turned flange 15' at the forward end of the cylinder block. The construction just described provides for spacing the upper and lower walls of the cylinder block from the cylinder sleeves 12 to provide the water jacket 13 around each cylinder sleeve. As clearly shown in Fig. 7, the upper and lower walls of the cylinder block 10 are provided with a plurality of partitions 16' arranged between adjacent cylinder sleeves. These partitions 16' preferably extend the full length of the water jacket 13, thus providing independently functioning water jackets 13 for the several cylinders of the engine.

Formed integrally with the cylinder block 10 at the lower wall thereof is a water intake manifold indicated generally at M having a water intake pipe P connected thereto by suitable fasteners such as the bolts 17'. The manifold M extends substantially the full length of the cylinder block 10 and, adjacent each water jacket 13, a port 18' is provided for passing water from the manifold to each of the water jackets 13.

As mentioned before, the cylinder head 10' is connected to the cylinder block 10. This cylinder head 10' is so formed as to provide a water jacket 19' which receives water from the water jackets 13' through registering ports 20' in the cylinder block and cylinder head respectively; ports 20' being formed respectively in the upper and lower portions of the connected cylinder block and cylinder head, there being separate ports for each of the several cylinders of the

engine which feed into the water jacket 19' of the cylinder head 10'. Secured to the cylinder head 10', as more clearly shown in Fig. 6, is an intake manifold B which comprises preferably a casting having formed integral therewith a plurality of water receiving portions 21' connected to a water return line 23' by lead-off connections 24' (see Figure 1), and each portion 21' is adapted to receive water from the water jacket 19' of the cylinder head through ports 22'.

From the description just above it can be seen that the present invention provides an internal combustion engine of the horizontal type having a plurality of cylinders, each of which is completely surrounded by a water jacket whereby water completely surrounds each of the cylinders. In addition, it is to be noted that the water inlet is arranged at the bottom of the engine, more particularly, the water enters the cylinder block from below whereby as it becomes heated it passes upwardly and flows into the cylinder head and then to the return line 23'. With this arrangement the possibility of steam pockets being formed in the water jacket is eliminated.

Formed integral with and arranged within the crank case 11 is a crank shaft seat member indicated generally at 15 which is stiffened by ribs 14 formed integral with said member and said crank case 11. The member 15 is formed to provide a plurality of spaced semi-cylindrical bearing portions 17 of which one is shown in Fig. 3, but in the specific form of engine shown in Figure 1 seven bearing portions necessarily are provided. The crank shaft seat member is also formed with attaching flanges 16 to which a complementally formed bearing portion 19 is secured by fasteners 20 extending through flanges H of said bearing portion 19. The bearing portion 17 is preferably lined with steel backed Babbitt metal 18 which is so connected with portion 17 as to be readily removable therefrom for replacement, while the bearing portion 19 which may be made of cast iron or any other suitable material is also lined with Babbitt metal. For convenience in description the bearing portion 17 is termed the case portion of the bearing while the bearing portion 19 is termed the cap portion and it is apparent that the cap 19 may be readily removed from its attachment with the case portion of the bearing should occasion arise.

The crank shaft 21 is rotatably mounted in the bearings before described and one end portion thereof carries a fly-wheel (not shown) arranged in a fly-wheel housing 25' bolted or otherwise suitably secured to the crank case 11. As will be apparent from the following description, this fly-wheel housing forms an element for supporting the engine and preferably said housing is so formed that the crank shaft may be removed from the engine without removing said fly-wheel housing.

A piston 22 is disposed in the cylinder or cylinder sleeve 12 for reciprocatory movement. As shown, the piston is connected to the connecting rod 23 rotatable on the crank 24 of the crank shaft 21.

The crank arm end of the connecting rod is provided with a removable cap 25 and two semi-cylindrical steel backed bearing members 26. These bearing members 26 may be removed and replaced at any time.

In the operation of internal combustion engines, it is important that the bearings be inspected periodically, and if worn, replaced. In order to facilitate the inspection and replacement of the bearings, an opening 27 is provided in the side wall of the crank case 11 (see Fig. 3). This opening is in line with the crank shaft 21 and through it access may be had to the main bearings of the crank shaft and to the crank shaft ends of the connecting rods 23.

As illustrated in Figures 1 and 2, a cover plate 28 is provided for closing opening 27 in the crank case 11. The cover plate 28 is of sufficient area that when removed, access to all the crank shaft bearings may be had. The cover plate 28 is removably mounted on the crank case 11 by means of screw bolts 29. As illustrated in Fig. 3, threaded openings 30 are provided in the crank case for receiving the screw bolts.

An opening 28' is provided in cover plate 28 and a lubricant reservoir 31 is removably mounted on the cover plate over this opening by means of screw bolts 32. The lower wall of the oil reservoir 31 or wet sump is inclined downwardly to facilitate drainage through plug 31' when necessary. By means of pump A oil accumulating in the dry sump 11' is forced through the oil line *a* and delivered into the lubricant reservoir 31 from which delivery is made through conventional means not shown to such parts of the motor as require lubrication.

One of the advantages of horizontal engines of this type is that the height is substantially that of the crank case and the size of the crank case need not be substantially greater than that required to permit the operation of the crank shaft. This type of engine is therefore very suitable for mounting under the floor of vehicles and in places where the vertical space available governs the height of the engine, as for example in Figs. 3 and 6 where the floor of a vehicle is indicated at F.

When engines of this type are employed for propelling vehicles, they may be disposed under the floor of a bus. If desired, they may be located centrally of a bus and suspended from the frame structure supporting the floor. In this type of engine, the provision of the openings 27 and removable cover plates 28 greatly facilitates the making of inspections and repairs.

As illustrated in Figures 1, 2, 4 and 5, the engine is suspended from cross-beams 33 of a vehicle structure. In this particular instance the cross-beams are illustrated as I-beams but the engine may be as readily suspended from cross-members of other cross-sectional shape.

As mentioned before, the fly-wheel housing is secured to the crank case 11. The relative arrangement of the fly-wheel housing and crank case is shown clearly in Figures 1, 2 and 4, wherein it can be seen that opposite end portions of the fly-wheel housing are provided with attaching elements indicated at G, simulating a spool in cross-section and having circular flanges 35 projecting from the upper and lower end portions thereof so as to provide pockets in opposite ends of said attaching elements. The fly-wheel housing is arranged at what may be termed the rear end portion of the engine. Formed on the opposite end of the engine, for convenience said end being designated as the forward end, are spaced supporting lugs 34 in the form of relatively wide plates, as shown clearly in Figure 1. For reinforcing the lugs 34 webs 37 extend from the crank case to said lugs, as clearly shown in Fig. 5.

Secured to the cross-member 33 at the rear end of the engine by fasteners 39, and projecting

from said members, are spaced hangers 38, each having a web 40 formed in such a manner as to provide a depending bearing 40' having an opening 42 extending therethrough. In the instance shown the web 40 has a portion which extends downwardly and is cylindrical in shape, the cylindrical portion being hollow and provided with a substantially centrally arranged collar 41 which provides the opening 42.

The upper end of the collar 41 serves to support a bolt 43 arranged in the opening 42 and extending through the attaching element G. The bearing 40' extends into the pocket formed by the upper flange 35 and arranged in the pocket is a pad 46 which may be of resilient material. Arranged in the lower pocket formed by the lower flange 35 is a pad 46 of resilient material and to support the engine nuts 45 are provided on the lower end portions of the bolts 43 and work against washers 44 loosely mounted on the bolts.

In suspending the forward end of the engine a bracket 47 is secured to the adjacent cross-member 33 by fasteners 48 and projects from said cross-member in a position such that it is arranged intermediate the lugs 34, as clearly shown in Figures 1 and 5. The outer end portion of the bracket is cylindrical in shape to provide a trunnion 49.

Extending between the lugs 34 and connected thereto by suitable fasteners 52 is a supporting casting 50 having, intermediate its ends, a substantially semi-cylindrical bearing surface 50' which fits against the lower surface or a portion of the trunnion 49, as shown more clearly in Fig. 8. Secured to the supporting casting 50 and extending over the trunnion 49 is a bearing cap 55 formed to fit over the trunnion 49 and secured to the casting 50 by means of the fasteners 56. It can be seen from this description that the bearing at the forward end of the engine and by which the engine is supported at said forward end comprises complementally formed members 50 and 55 which support the forward end of the engine at the trunnion 49. To stiffen the bearing member 50 same is provided with a flange 51 which depends vertically downward from said bearing, as clearly shown in Fig. 5. It will also be obvious that the engine mounting just described is substantially a three-point mounting, one point being at the trunnion 49 and the remaining two points being at the portions G of the fly-wheel housing. For connecting the lugs 34 to the casting 50 the before-mentioned fasteners 52 extend through said lugs and are provided with suitable nuts which engage against washers 54 loosely mounted on the lower end portions of the bolts. For purposes of resilience, members 53 are interposed between the casting 50 and the lugs 34 and between the washer 54 and said lugs 34.

From the above description it can be seen that the horizontal engine of the present invention provides for easy removal of the crank shaft and for easy access to bearings. The cylinder sleeves being entirely surrounded by a water jacket provide for effectually maintaining the engine in proper working condition as far as the pistons and cylinders are concerned. The present invention also provides for a three-point mounting for the engine whereby, should service conditions require, the engine may oscillate to a certain extent about the trunnion 49.

The drawings herein illustrate certain embodiments of the invention but it is to be understood that they are for illustrative purposes only and various changes in the form and proportions of the construction may be made within the scope of the appended claims without departing from the spirit of the invention.

Having described our invention, what we claim as new and desire to secure by Letters Patent, is:

1. In a horizontal engine, in combination, an engine block, a crank-case associated with the engine block and extending laterally therefrom, bearings provided in the crank-case, a crank-shaft mounted in the bearings, the crank-case having an open side to give access to the bearings of the crank-shaft, a cover plate removably mounted on the crank-case closing the open side, the cover plate having an opening therein and an oil reservoir mounted on the cover plate over said opening.

2. In a horizontal engine, in combination, an engine block, a horizontal cylinder disposed in the engine block, a crank-case extending laterally from the engine block, bearings disposed in the crank-case, a crank-shaft rotatably mounted in the bearings, the bearings and crank-shaft being in alinement with the open end of the cylinder, the crank-case having an opening in the side to give access to the crank-shaft and bearings, a cover plate removably mounted over the opening in the crank-case, and an oil reservoir carried by the cover plate, the oil reservoir communicating with the crank-case through an opening in the cover plate.

3. In an internal combustion engine, an engine block provided with horizontal cylinders, a crank case extending laterally of the engine block formed with a pan in the lower portion, said crank case having an opening in the side wall, a removable cover plate for said opening, and an oil reservoir fixed to said cover plate above said pan.

4. In an internal combustion engine, an engine block provided with horizontal cylinders, a crank-case extending laterally of the engine block formed with a pan in the lower portion, said crank case having an opening in its side wall, a removable cover plate closing said opening in the crank case wall, and formed with an overflow opening, and a reservoir carried by the cover plate above said pan and enclosing said overflow opening.

5. In an internal combustion engine, an engine block provided with horizontal cylinders, pistons in said cylinder, a crank shaft, connecting rods between the crank shaft and pistons, a crank case extending laterally of the engine block and terminating short of the throw of the crank shaft, an opening formed in the wall of the crank case adjacent the crank shaft, a cover plate closing said opening and having an offset portion to accommodate the movement of the crank shaft, and a reservoir carried by a portion of the cover plate.

6. The substance of claim 5 characterized in that the cover plate forms one of the walls of the reservoir.

7. The substance of claim 5 characterized in that the cover plate which is provided with an overflow opening forms one of the walls of the reservoir.

HAROLD L. MORRIS.
FREDERICK E. DAYES.