May 21, 1929. O. E. HUNT 1,713,872

INTERNAL COMBUSTION ENGINE

Filed Dec. 15, 1923

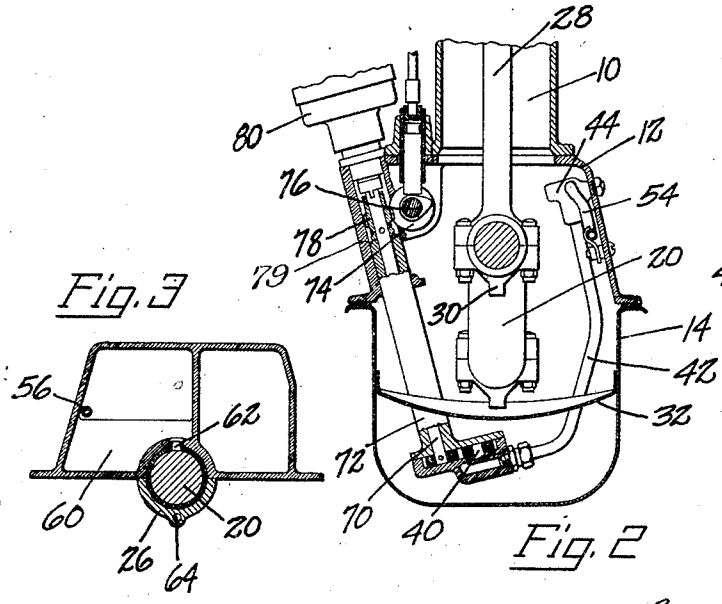

Fig. 2

Fig. 3

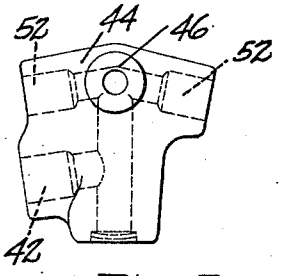

Fig. 5

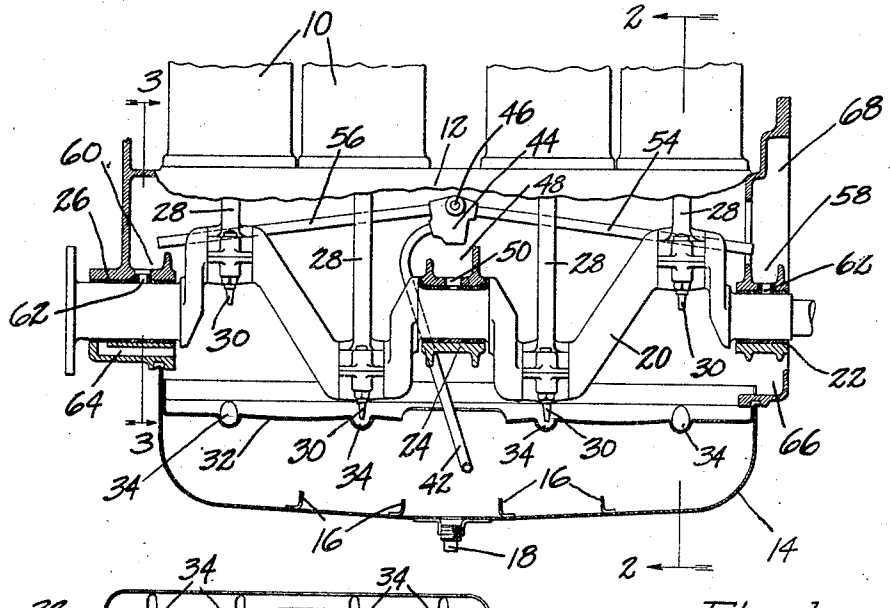

Fig. 1

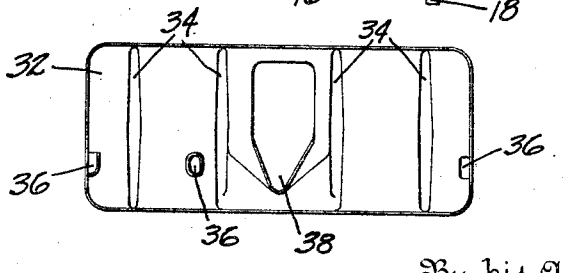

Fig. 4

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UNITED STATES PATENT OFFICE.

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INTERNAL-COMBUSTION ENGINE.

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This invention relates to oiling systems, and is illustrated as embodied in an internal combustion engine designed for use in a motor vehicle.

An object of the invention is to secure a simple and reliable oiling system which positively delivers the oil to the various parts requiring lubrication.

Other objects are to secure a slow oil circulation to promote sedimentation, to make the oil supply independent of changes in the grade over which the vehicle is moving, and to increase the supply of oil as the motor speed increases.

Having these objects in view, the invention contemplates flowing the oil in substantially continuous streams through pipes discharging above the crankshaft bearings, preferably in such a manner that it overflows from the bearings to transverse splash troughs below the crankshaft. In the arrangement shown in the drawings, the oil is delivered from a distributor fitting carried by one side of the crankcase above the crankshaft, through downwardly inclined pipes discharging above oil pockets formed on the upper sides of the crankshaft bearings and communicating with the surfaces of the bearings which are in engagement with the crankshaft. The downward inclination of these pipes is sufficient to offset any change in the grade over which the vehicle moves, and the pipes are arranged to discharge respectively at the front and rear of the engine, so that oil will always flow downwardly from one or the other pipe, or both pipes, into the splash troughs.

As one desirable manner of delivering oil to the above described lubricating system or its equivalent, the invention contemplates providing an oil pump in an oil reservoir, which may conveniently be formed in the lower part of the crankcase, which pump is driven by an upwardly inclined drive-shaft passing through a transverse partition in which the splash troughs are formed, and which drive-shaft is geared at its upper end to the camshaft. If desired, a suitable accessory device such as a timer may be connected to the upper part of the drive-shaft to be operated thereby. Preferably the pump acts rather slowly, and the distributing pipes are of comparatively large diameter, so that the oil has the desired low rate of circulation.

The above and other objects and features of the invention, including various novel combinations of parts and desirable particular constructions, will be apparent from the following description of one illustrative embodiment shown in the accompanying drawings, in which

Fig. 1 is a view partly in side elevation and partly in longitudinal vertical section, showing an internal combustion engine embodying my novel oiling system;

Fig. 2 is a section on the line 2—2 of Fig. 1 showing the engine in transverse vertical section;

Fig. 3 is a section on the line 3—3 of Fig. 1 showing one of the oil pockets;

Fig. 4 is a top plan view of the horizontal partition or baffle plate in which the splash troughs are formed; and

Fig. 5 is a detail view on a large scale of the distributor fitting which communicates with the oil delivery pipes.

In the illustrative arrangement, the invention is embodied in an internal combustion engine having a cylinder block or cylinder blocks 10 supported on a crankcase having a cast upper portion 12 and a sheet metal lower portion 14, shown as being formed at its bottom as an oil reservoir having surge plates 16 and a drain plug 18. A crankshaft 20 is supported in bearings 22, 24, and 26 in the crankcase, the crankshaft being provided in the usual manner with connecting rods 28 shown as being provided with depending fingers or dippers 30 or equivalent devices for splashing up oil.

Immediately below the crankshaft there is arranged a horizontal partition or baffle plate 32 shown in plan in Fig. 4 and which is provided with pressed transverse horizontal splash troughs 34 arranged to hold oil to be splashed up by fingers 30. The partition is also provided with openings 36 through which surplus oil may drain back into the reservoir in the bottom of the crankcase, and with a large central opening 38 to receive the drive-shaft of the oil pump, and to permit of bodily inserting the pump in assembling the engine.

Oil is forced from the reservoir in the bottom of the crankcase by a pump 40 of any desired form, but preferably a pump which operates at a comparatively low speed, through a connection 42 to a distributor fitting 44 supported on the side of the crank-

case above the crankshaft. The fitting 44 is provided with a pipe or spout 46, shown as being formed integral with the fitting, and which delivers a stream of oil into an oil pocket 48 formed in the top of the center crankshaft bearing 24. The pocket is provided with an opening 50 communicating with the surface of the bearing which engages the crankshaft. The fitting 44 is also provided with openings 52 communicating with downwardly inclined pipes 54 and 56 discharging immediately above oil pockets 58 and 60 formed in the upper parts of the front and rear crankshaft bearings 22 and 26, each of these oil pockets being provided with an opening 62 communicating with the surface of the bearing which engages the crankshaft. The oil pocket 60 is shown in vertical section in Fig. 3. The bearing 26 is provided with a drain passage 64 to return surplus oil from the bearing past the edge of portion 14 onto the partition 32, where it flows into the splash troughs 34 from which troughs it overflows through the openings 36 back into the reservoir.

The front bearing 22 and the center bearing 24 are also so arranged that surplus oil drains back onto the partition 32, the oil from the bearing 24 flowing directly onto the partition and the oil from the bearing 22 being directed back onto the partition by the lower part 66 of the usual rear portion 68 of the timing gear housing, which is integral with the upper part of the crankcase and which cooperates with a removable front cap to enclose the timing gears.

Pipes 54 and 56 are inclined at a sufficient angle to practically offset any grade the vehicle may be operating on, so that there will be no failure to lubricate any one of the bearings even in ascending or descending a steep grade. Since one of these pipes discharges at the front of the engine and the other at the rear, oil will always flow from one of them, or from both of them, over plate 32 into troughs 34. Pipes 54 and 56, and also the other connections, are of comparatively large cross section, to secure the desired slow oil circulation while at the same time supplying an ample quantity of oil.

With increased engine speed the pumping action becomes greater with the result that the level of the oil in the troughs 34 is raised. Consequently at the high engine speeds the fingers 30 splash up more oil than at low speeds thus providing the desired increase in lubrication.

The pump 40 is driven by an upwardly inclined drive-shaft 70 provided with a sleeve 72 forming a support and bearing and a housing therefor, and also extended to form the top of the pump housing (Fig. 2). The upper portion 12 of the crankcase is formed with an elongated cylindrical guide portion or recess 79 within the lower portion of which sleeve 72 is secured by any preferred fastening devices, not shown. The upper portion of the recess is slotted to permit engagement of worm 74 on the cam shaft 76 with worm wheel 78 on shaft 70. If desired, another accessory device, such as a timer 80, may be supported on the top of the crankcase and driven by the upper end of the drive shaft 70. With this construction the auxiliary shaft is securely mounted in position and is provided with large bearing surfaces insuring satisfactory performance over a long period of time. At the same time the casting of the upper portion of the crankcase is greatly simplified.

From the foregoing description, it will be clear that by the use of comparatively few parts of a form which can be manufactured at a minimum expense I have provided means for positively feeding oil to most of the parts of the engine which require lubrication, and at the same time securing a constant supply of fresh oil to the splash troughs 34, which supply builds up as the engine speed increases, and from which the oil is splashed up by the connecting rods or equivalent means in order to lubricate the other moving parts of the engine. Moreover, the oil supply is practically independent of the grade, and the circulation is comparatively slow without reducing the quantity of oil delivered.

While one illustrative embodiment of the invention has been described in detail, it is not my intention to limit its scope to that particular embodiment, or otherwise than by the terms of the appended claims.

I claim:

1. An internal combustion engine comprising, in combination, a crankcase having a lower oil reservoir portion and a partition above said portion formed with transverse splash troughs in position to cooperate with the cranks, bearings in the crankcase, and means for forcing oil from the reservoir portion and freely pouring it in substantially continuous streams upon the bearings for the lubrication of the bearing surfaces, the surplus oil unable to find access to the bearing surfaces passing directly over the outer surface of the bearings on to the splash troughs, said partition being apertured to permit the excess oil to drain back into the reservoir.

2. An internal combustion engine comprising in combination, a crankcase having a lower portion forming an oil reservoir, a baffle partition above the reservoir formed with transverse splash troughs in position to cooperate with the cranks, a crankshaft and bearings therefor above the partition, a pump communicating with the reservoir portion, and connections from the pump arranged to direct a free, substantially continuous stream of oil on to the bearings, the surplus oil unable to find access to the bear-

ing surfaces passing directly on to the partition for supplying oil to the splash troughs.

3. In the combination as defined by claim 2, reservoirs above each of said bearings into which oil is freely poured by said connections from which oil is discharged to the bearings and overflows onto the partition.

4. In the construction as defined by claim 2, said connections comprising an elevated distributing device and downwardly inclined conduits leading from said distributing device to points adjacent said bearings, the inclinations of the conduits being such as to insure even distribution of oil within certain limits of angular tilt of the engine.

5. An internal combustion engine comprising a crankcase, a crank shaft in the crankcase, fixed bearings for the shaft, a distributor in the crankcase arranged above the crank shaft, downwardly inclined substantially unrestricted conduits leading from said distributor to the crank shaft bearings, the crankcase serving as a reservoir for lubricant, and a pump for supplying lubricant to the distributor from the reservoir, said lubricant being freely poured from said conduits on to the bearings under substantially its own head.

6. An internal combustion engine comprising, in combination, a crankshaft, bearings therefor, each of which bearings is formed with an upper oil pocket communicating with the surface which engages the crankshaft, downwardly inclined pipes each arranged to freely pour oil into one of the oil pockets, said pipes being in communication with each other above their discharge ends, and means for directing oil through said pipes to lubricate the crankshaft bearings, the inclination of said pipes being such as to permit gravity flow therethrough to the pockets in all of the inclined positions which the engine assumes in use.

7. An internal combustion engine comprising, in combination, a crankshaft, bearings therefor, each of which bearings is formed with an upper oil receiving pocket communicating with the surface of the bearing which engages the crankshaft, a distributor fitting mounted a substantial distance above the pockets, a pipe connected to the fitting for each of the bearings and inclined downwardly in such a manner as to freely pour oil into the corresponding oil pocket, whatever be the inclination of the car, and means for forcing oil to said fitting whence it is discharged through the pipes to the pockets.

8. An internal combustion engine comprising, in combination, a crankcase having a lower oil reservoir portion, a crankshaft having bearings supported in the crankcase, a horizontal partition above the oil reservoir portion of the crankcase which is provided with transverse splash troughs, a distributor fitting supported on one side of the crankcase above the crankshaft, downwardly inclined pipes from the distributor fitting for freely pouring oil over the crankshaft bearings, the excess oil unable to find access to the bearing surfaces overflowing into the splash troughs, an oil pump in the reservoir portion of the crankcase and a connection therefrom to said distributor fitting.

9. An internal combustion engine comprising a crankcase serving as a lubricant reservoir, a crankshaft in the crankcase, bearings for the crankshaft, pockets above the bearings, passages leading from the pockets to the bearing surfaces to convey lubricant thereto, splash troughs in said crankcase cooperating with the cranks and arranged to receive the over-flow oil from said pockets, an oil pump, conduits leading from the pump to the pockets and discharging oil freely thereinto, and means for driving the oil pump from the engine so that as the engine speed increases the pump will supply a greater quantity of oil to the pockets and a greater quantity of oil will over-flow from the pockets into the splash troughs so that increased splash lubrication is obtained at the higher speeds.

10. An internal combustion engine having a crankcase serving as a lubricant reservoir, a crankshaft in the crankcase, bearings for the crankshaft, pockets above the bearings, passages leading from the pockets to the bearing surfaces to convey lubricant thereto, splash troughs in said crankcase cooperating with the cranks and arranged to receive oil over-flowing from said pockets, an oil pump, a distributor above the pockets, a conduit supplying oil from the pump to the distributor, and downwardly inclined conduits leading from the distributor to the pockets, the inclination of said conduits being such as to insure flow of oil to each of said pockets throughout the range of inclination of the engine in use.

11. An internal combustion engine having a crankcase serving as a lubricant reservoir, a crankshaft in the crankcase, bearings for the crankshaft, pockets above the bearings, passages leading from the pockets to the bearing surfaces to convey lubricant thereto, splash troughs in said crankcase cooperating with the cranks and arranged to receive oil over-flowing from said pockets, an oil pump, a distributor above the pockets, a conduit supplying oil from the pump to the distributor, downwardly inclined conduits of relatively large cross section leading from the distributor to the pockets, said pump being designed to supply oil under relatively slight pressure to said distributor, and said inclined conduits being of sufficiently large cross section so that oil is supplied to said bearings from said distributor substantially by gravity action, and means for driving the pump from the engine whereby the

quantity of oil supplied the pockets and the splash troughs by over-flow from the pockets increases with the engine speed.

12. An internal combustion engine having a crankshaft, a crankcase, splash troughs in which the cranks dip, an oil pump driven from the engine, a distributor arranged above the troughs, a conduit for connecting the pump and the distributor for supplying oil thereto, and means providing substantially unrestricted paths leading oil from said distributor to said troughs under substantially gravity head so that the level of oil in the troughs varies directly with the engine speed.

In testimony whereof I affix my signature.

ORMOND E. HUNT.