

Dec. 20, 1932.

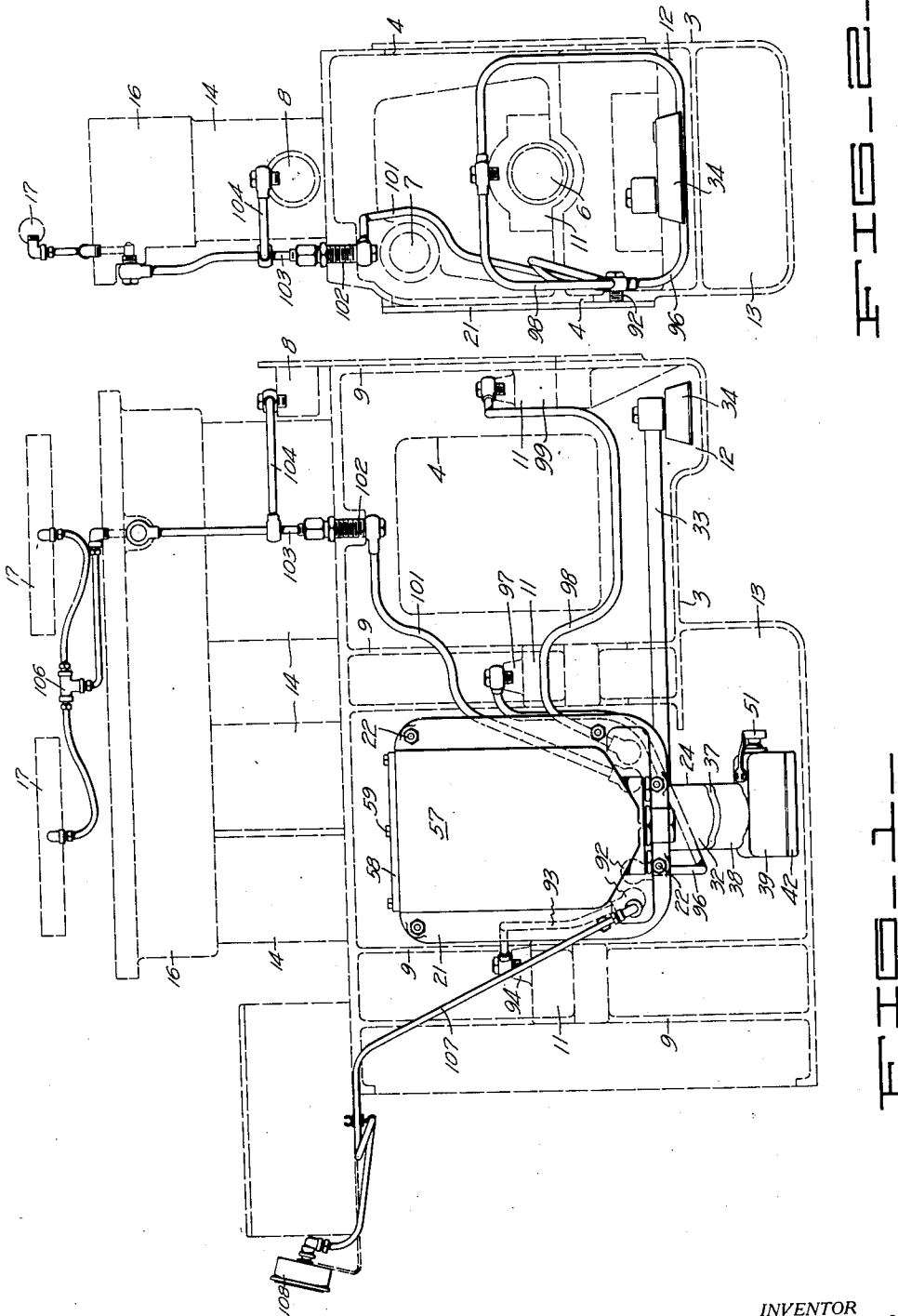
W. H. RADFORD

1,891,726

OILING SYSTEM

Filed July 25, 1928

4 Sheets-Sheet 1



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FIG. 3.

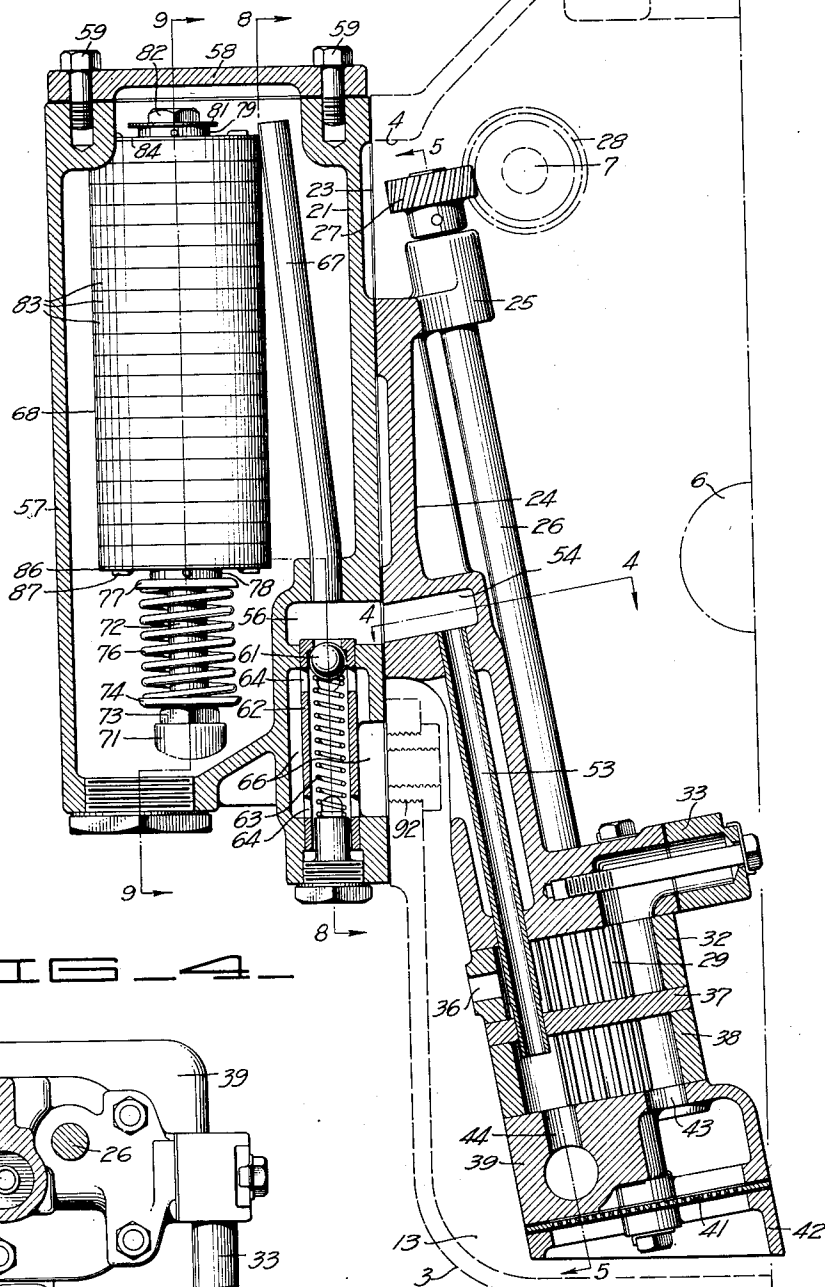
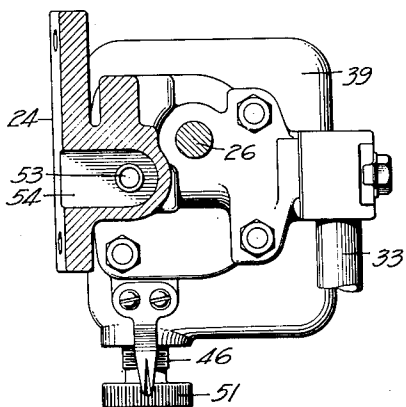


FIG. 4.



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FIG. 5. FIG. 6.

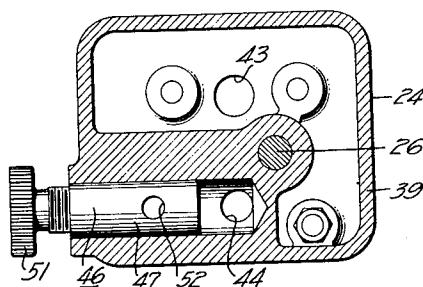
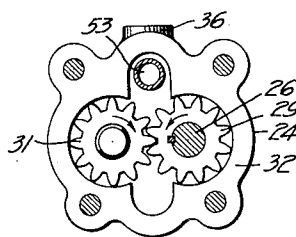
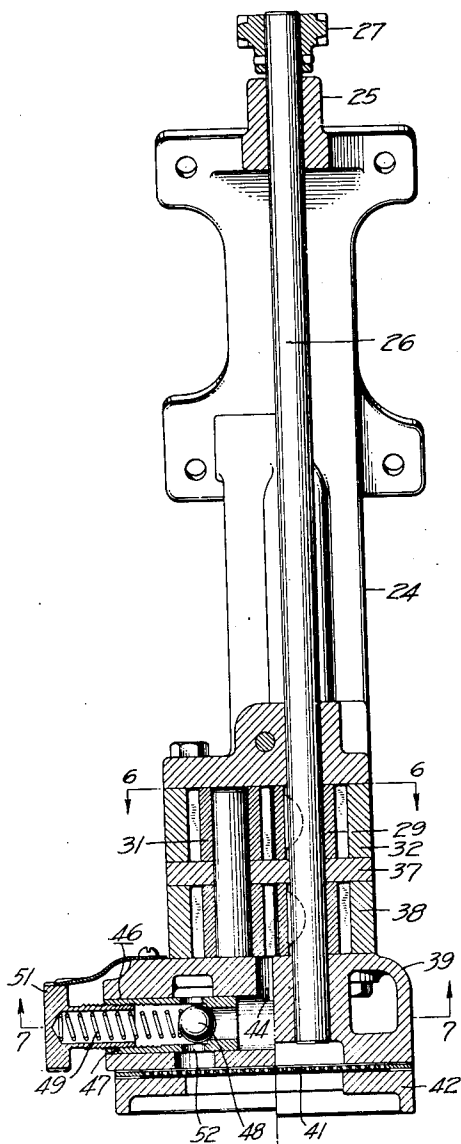


FIG. 7.

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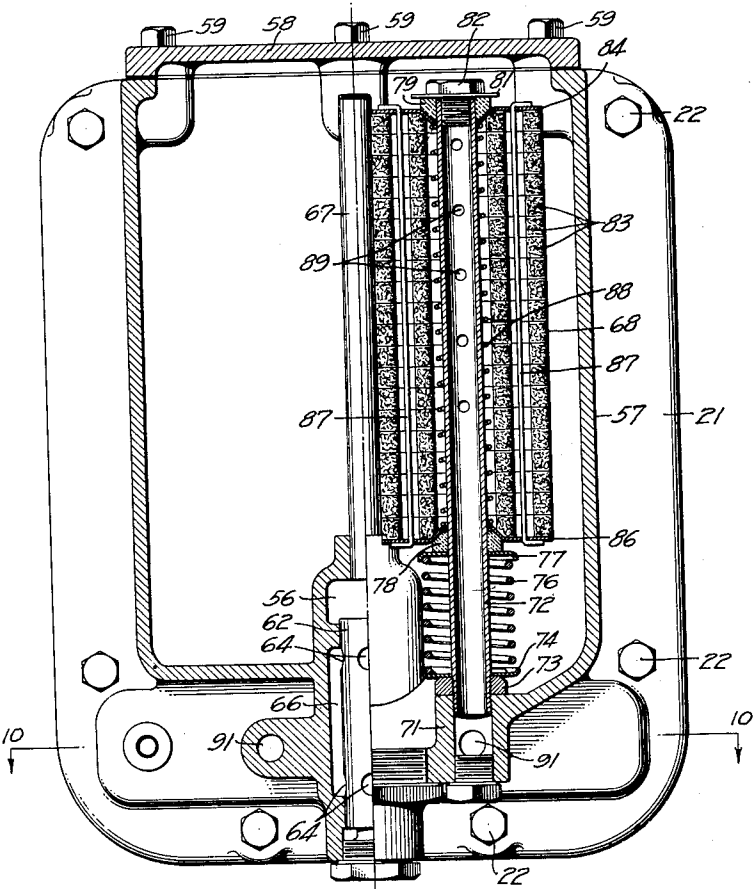


FIG. 8.

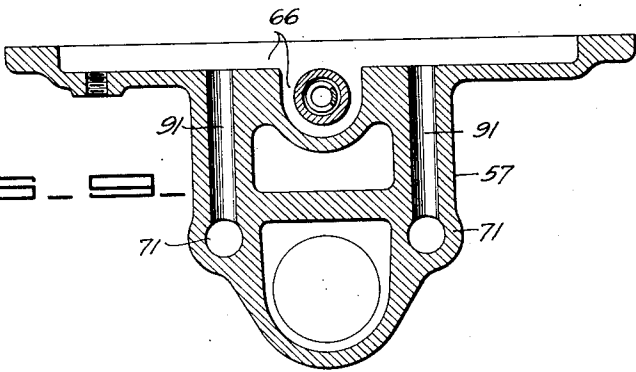


FIG. 9.

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UNITED STATES PATENT OFFICE

WILLIAM H. RADFORD, OF SAN LEANDRO, CALIFORNIA, ASSIGNOR TO CATERPILLAR TRACTOR CO., OF SAN LEANDRO, CALIFORNIA, A CORPORATION OF CALIFORNIA

OILING SYSTEM

Application filed July 25, 1928. Serial No. 295,328.

My invention relates primarily to oiling systems for engines of the internal combustion type and is especially adapted to engines in which the crankcase is enclosed to act as an oil sump and contemplates the complete handling of the oil thruout an entire circuit in the lubrication of the engine.

An object of my invention is to provide a simple, compact arrangement for the mechanism necessary to circulate oil in a lubricating system.

Another object of my invention is to provide an improved installation for an oil filter inserted in the oiling system.

A further object of my invention is to facilitate the placing and removal of the force pump for circulating the oil.

A further object of my invention is to facilitate the removal of certain of the oiling units without necessitating the breaking of complicated oil connections.

The foregoing and other objects are attained in the embodiment of the invention shown in the drawings, in which

Fig. 1 is a phantom view showing in side elevation the oiling system of my invention in a typical installation on an internal combustion engine.

Fig. 2 is likewise a phantom view showing in end elevation the oiling system disclosed in Fig. 1.

Fig. 3 is a cross section on a central vertical plane of the filter and pump units of my system.

Fig. 4 is a detail of the pump, the plane of section being indicated by line 4—4 of Fig. 3.

Fig. 5 is a cross section on the line 5—5 of Fig. 3.

Fig. 6 is a transverse section thru the pump, the plane of section being indicated by line 6—6 of Fig. 5.

Fig. 7 is a section on the line 7—7 of Fig. 5.

Fig. 8 is, on the left half, a section thru the filter housing, the plane of section being indicated by line 8—8 in Fig. 3, while on the right half is a section thru the filter unit itself, the plane of section being indicated by line 9—9 of Fig. 3.

Fig. 9 is a transverse cross section, the

plane of section being indicated by line 10—10 of Fig. 8.

In its preferred form, the oiling system of my invention is used with a crankcase having an aperture therein and a plurality of oil leads opening on the exterior of said crankcase, and includes a cover plate sealing the aperture and registering with the openings of the oil leads. For supplying oil to the leads, a pump extending into the crankcase is mounted on the cover plate for ready withdrawal thru the aperture while the other side of the cover plate serves as a mounting for an oil filter thru which oil from the pump is passed.

Although the oiling system of my invention is well adaptable to a large variety of installations, it is convenient to describe it as it is designed for an internal combustion engine employing forced oil feed thru the principal bearings with splash lubrication to certain interior parts of the engine. The engine preferably comprises a crankcase 3 which in this instance is of the barrel type having a number of covered apertures 4 formed in the sides thereof. Within the crankcase is located a crank shaft 6 of the customary kind and a cam shaft 7 which is operatively driven by the crank shaft thru timing gears, not shown, enclosed in a housing 8. The crankcase is provided with transverse webs 9 to stiffen its construction and carry the main bearings 11 and in its bottom is formed preferably with a pair of sumps 12 and 13. Normally the primary sump 12 is at a considerably higher level than the secondary sump 13. Above the crankcase are cylinders 14 uniting in a cylinder head 16, with which are associated valve rocker shafts 17 of the customary kind.

In installing the oiling system of my invention, I preferably close one of the apertures 4 with a special cover plate 21 which is secured to the crankcase by cap screws 22 over an intervening gasket 23 to provide an oil tight joint. On the interior of the cover plate 21 and extending into the crankcase I preferably locate a pump body 24, usually a metal casting bolted in place. The upper end of the pump body carries a bearing 25 in

which rotates a pump shaft 26 at its upper extremity provided with a gear 27, meshing with a similar gear 28 on the cam shaft 7. The lower end of the pump shaft 26 passes thru the lower end of the body 24 and extends downwardly in the crankcase. Secured to the pump shaft is a pump gear 29 meshing with a similar gear 31 and providing a primary gear pump. These two gears are nested in a surrounding shell 32 forming one of a number of members bolted together with the pump body 24.

Communicating with the interior of shell 32 on the intake side of the pump is an oil connection 33 preferably removably bolted in place and extending forwardly in the crankcase from sump 13 into the primary sump 12. The extremity of the connection 33 is provided with an intake body 34 which includes a screen for straining the oil withdrawn by the pump. Opening from shell 32 on the opposite side of gears 29 and 31 is a discharge outlet 36, leading into the secondary sump 13 so that as shaft 26 is rotated during the operation of the engine, the primary gear pump is effective to draw oil from the primary sump 12 thru the connection 33 and discharge it into the secondary sump 13.

Separated from the primary pump by a plate 37 is a secondary gear pump composed of a unit exactly similar to the primary pump with the exception that its shell 38 instead of being closed by a plate 37 is provided with an inlet body 39. This body preferably is a casting almost entirely open at its bottom to the sump 13 and is equipped with a screen 41 held in place by a detachable cap 42 for initially straining the oil taken up by the primary pump from sump 13. During operation of the engine, oil from the secondary sump passes thru the inlet body 39 to the inlet side of the secondary pump thru an aperture 43 in the body and is discharged by the secondary pump in either one or both of two paths.

The first path lies thru a passage 44 in which is situated a pressure release valve 46. This valve preferably comprises a ferrule 47 inserted in the inlet body 39 and apertured to provide a seat for a ball check valve 48 backed by a spring 49 capable of adjustment by manipulation of a thumb screw 51. The ball check valve 48 up to a predetermined pressure is held on its seat by the spring 49 and oil is not permitted to flow thru the passage 44. Upon the development of an excess pressure, however, the ball check valve 48 is unseated and allows the oil to flow from passage 44 thru openings 52 back to sump 13. Under these conditions, the secondary pump simply serves to circulate all or part of the oil locally within the sump 13.

The second path thru which the pumped oil may flow is available when the pressure is not excessive and the ball check valve 48

is on its seat. Then the oil from the secondary pump is free to pass thru an oil connection 53, which preferably comprises a pipe extending upwardly thru the primary gear pump 32 and thru the pump body 24 to a passage 54 registering with a similar passage 56 piercing the cover plate 21.

In the present instance, the cover plate 21 forms one side of an oil filter housing 57 which is substantially a closed chamber sealed by a cover 58, held in place by screws 59. The passage 56 is thus within the oil filter housing 57 and from this passage the oil can take either or both of two courses. If the pressure is excessive, a ball check valve 61 yields. This valve is seated in a sleeve 62 mounted in the housing 57 and is urged in place by a coil spring 63, having a predetermined resistance. Upon overcoming the pressure of the check valve, the oil is free to flow thru apertures 64 into an oil manifold 66, extending substantially the width of the filter housing. The other course for oil flowing from passage 56 is into a stand pipe 67, extending upwardly in the housing 57 to a point adjacent the top thereof, and from which the oil overflows substantially to fill the housing.

Within the filter housing 57 are included a pair of filter units 68. These units are identical so a description of one of them will suffice. Screwed into a hollow boss 71, formed in the wall of the housing 57, is an upstanding conduit 72, locked in place by a nut 73. Slipped over the conduit is a washer 74 engaging one end of a coil spring 76, the other end of which is engaged by a similar washer 77. On the upper washer rests a cone 78, usually of fibrous material, which is faced by an oppositely disposed cone 79 of similar material backed by a washer 81 and a plug 82, threaded into the end of conduit 72. A plurality of washers 83, preferably of felt-like material and annular in form, are held between end plates 84 and 86, under the influence of cones 78 and 79 and the spring 76. Washers 83 are further retained in position by thru rods 87 piercing the entire assembly and bent over at their ends for permanent disposition. Extending axially thru the assembly formed by the annular washers 83 and surrounding the conduit 72 is a coil spring 88 for preventing any displacement of the washers 83 tending to close apertures 89 which pierce the conduit.

Oil which is discharged by the secondary gear pump thru the pipe 67 into the interior of the filter housing 57 fills the housing and flows in a radial direction thru the felt washers 83 and thru the apertures 89 into the interior of conduit 72. It thus passes to the hollow interior of boss 71 and emerges from a passage 91 into the oil manifold 66.

In order to obviate the necessity of breaking a large number of complicated oil pipe

connections when it is desired to remove the filter unit and also to permit the oil pump to be withdrawn from the oiling system in a simple and expedient way, I have preferably provided in the crankcase 3 openings 92, with which the oil manifold 66 registers and communicates. Each of these openings 92 is connected to an oil lead passing to some part of the mechanism to be lubricated. For instance, the rear aperture 92 is provided with a lead 93 extending to the rear main bearing 94, while the adjacent opening 92 is connected to a lead 96 passing to the center main bearing 97. The front aperture 92 likewise is connected to a lead 98 progressing to the front main bearing 99. The opening 92 next to the front opening is provided with a relatively long lead 101 connected to a sleeve 102 threaded into the crankcase. The upper end of sleeve 102 connects with an oil line 103 having one branch 104 leading to the upper part of the timing gear housing 8, while the other branch of the line 103 passes into the cylinder head and forks at 106 to the two rocker arm shafts 17. For convenience, a pipe 107 is attached into the oil manifold 66 and is provided with an oil pressure gauge 108 situate for convenient observation.

In the operation of my system, oil which is initially introduced into the crankcase or which has drained from the various lubricated surfaces thereof, passes either into the primary sump 12 or into the secondary sump 13. When the engine is operating approximately in its normal level position, the forward sump 12 does not accumulate a great quantity of oil and the primary pump occasionally runs idle. When the engine is inclined so that a large portion of the oil flows into the primary sump 12, the primary pump transfers the oil to the secondary oil sump. The secondary pump 38 inducts oil from the sump 13 and passes it to the pressure release valve 46. If the pressure in the rest of the system is not excessive, the valve remains closed and does not permit any of the oil to return directly to sump 13, so that the entire flow continues upwardly into the filter housing 57. It then passes thru the filter unit 68 into the oil manifold 66 from which it is distributed to the various points of lubrication. On the other hand, if the filter is clogged or if the resistance of the filter circuit is too great, the valve 61 is forced open and all or a portion of the oil passes directly to the oil manifold 66 without going thru the filter. Assurance is thus had that even though the filter may be clogged, lubrication will nevertheless be afforded the engine.

With the design of oiling system disclosed herein, it is possible by removing but four cap screws to demount not only the filter unit itself, but also the oil pump, and all of this can be accomplished without separately breaking complicated oil lines or connections.

It is to be understood that I do not limit myself to the form of the oiling system shown and described herein, as the invention, as set forth in the following claims, may be embodied in a plurality of forms.

I claim:

1. An oiling system comprising a crankcase having an aperture therein, means to be lubricated in said crankcase, an oil lead through said crankcase, a filter housing secured to said crankcase to cover said aperture and having an opening communicating with the interior of the housing and registering with said oil lead, an oil filter in said housing discharging through said opening and into said oil lead, and an oil pump within said crankcase and mounted on said housing for withdrawal thru said aperture, an oil conduit connecting said pump to said filter and oil conducting means between said oil lead and said means to be lubricated.

2. An oiling system comprising a crankcase having an aperture therein, an oil lead opening on the exterior of said crankcase, a plate secured to said crankcase to cover said aperture and having an opening registering with the opening of said lead, and oil-handling apparatus mounted on said plate and connected through said opening to said lead.

3. An oiling system comprising a crankcase, a plurality of oil leads having openings on the exterior of said crankcase, a housing secured to the exterior of said crankcase and having an opening registering with said lead openings, and an oil pump mounted on and communicating with said housing and located in said crankcase for supplying oil to said housing.

4. An oiling system comprising an apertured crank case having primary and secondary sumps, a driven shaft projecting into said secondary sump, a plate detachably secured to said crank case for closing said aperture, an oil filter housing mounted on the exterior of said plate, an oil filter in said housing, a primary pump operated by said shaft mounted on the interior of said plate and located in said secondary sump, a secondary pump operated by said shaft in said secondary sump and communicating with said oil filter, and means connecting said primary and secondary sumps with said pumps for supplying oil to said oil filter.

5. An oiling system comprising a crankcase having primary and secondary sumps, a driven shaft projecting into said secondary sump, a primary pump located in said secondary sump and mounted on a plate detachably secured to said crank case for operation by said shaft, a secondary pump operated by said shaft and located in said secondary sump, a plurality of oil leads having grouped openings on the exterior of said crankcase, a housing mounted on said plate and communicating with said grouped openings, and

means connecting said pumps and sumps with said housing for supplying oil to said oil leads.

- 5 6. An oiling system for an engine having bearings requiring lubrication, and a crank case for holding lubricant, comprising a plurality of oil lines connecting said bearings with openings in said crank case, an aperture in said crank case; a pump adapted to be inserted through said aperture into said crank case, and means to support said pump, close said aperture and establish a connection between said pump and said lines through said openings.
- 15 7. An oiling system for an engine having bearings requiring lubrication, and a crankcase for holding lubricant, comprising a plurality of oil lines connecting said bearings with openings in said crankcase, an aperture in said crankcase, a pump adapted to be inserted through said aperture into said crankcase, and a member to support said pump, close said aperture and establish a connection between said pump and said lines through said openings upon positioning of said member.
- 20 8. The combination with a casing containing mechanism requiring lubrication, a reservoir of lubricant, and a lubricant conduit establishing communication between said mechanism and an aperture in the exterior of said casing, of a lubricant-handling unit adapted upon attachment to said casing at said aperture to establish communication between said reservoir and said conduit through said aperture.
- 25 9. The combination with a casing containing mechanism requiring lubrication, an element adapted to drive a pump, a reservoir of lubricant, and a lubricant conduit establishing communication between said mechanism and an aperture in the exterior of said casing, of a lubricant-handling unit including a pump adapted upon attachment to said casing at said aperture to establish communication between said reservoir and said conduit through said aperture and to connect said pump to said element.
- 30 10. The combination with a casing containing mechanism requiring lubrication, an element adapted to drive a pump, a reservoir of lubricant, and a lubricant conduit establishing communication between said mechanism and an aperture in the exterior of said casing, of a lubricant-handling unit including a pump adapted to be placed in said crankcase in communication with said reservoir, a filter unit, and a member providing a support and housing for said filter unit, a support for said pump, and a connection between said filter, said pump, and said aperture.
- 35 11. A casing containing mechanism requiring lubrication, an element adapted to drive a pump, a reservoir of lubricant, and a lubricant conduit establishing communication be-

tween said mechanism and an aperture in the exterior of said casing, said casing having an opening for insertion of a pump into said reservoir, in combination with a lubricant-handling unit comprising a support, a pump 70 mounted on said support and adapted to be inserted through said opening in said casing into said reservoir and to connect with said driving element, a filter mounted on said support, a conduit establishing communication 75 between said filter and pump and an aperture in the exterior of said support, said unit being rendered operative to supply lubricant from said reservoir to said mechanism upon attachment of said support to said casing with said support aperture opposite said casing aperture.

12. An oiling system for an engine having members to be lubricated and a crankcase for holding lubricant, said crankcase having a 85 plurality of openings with which lines to said members are connected and also having an aperture independent of said openings, a plate member covering said openings and also said aperture and having a manifold passage 90 communicating with said openings, and means for leading lubricant from said crankcase to said manifold, through said openings, and finally through said lines connected with said openings. 95

13. An oiling system for an engine having members to be lubricated and a crankcase for holding lubricant, said crankcase having a plurality of openings with which lines to said members are connected and also having an 100 aperture independent of said openings, a plate member attached to said crankcase and covering said openings and also covering said aperture, said plate member having a manifold passage communicating with said open- 105 ings, a pump attached to said plate member insertable and withdrawable through said aperture for forcing lubricant from said crankcase to said manifold, through said openings, and finally through said lines connected with said openings. 110

In testimony whereof, I have hereunto set my hand.

WILLIAM H. RADFORD.

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