

H. F. MARANVILLE.
LUBRICATING SYSTEM.
APPLICATION FILED MAR. 20, 1911.

1,096,550.

Patented May 12, 1914.

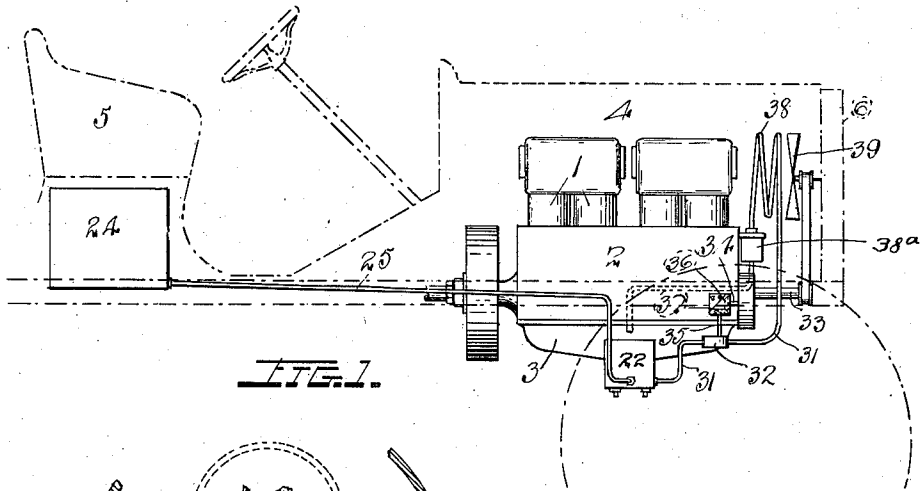


FIG. 1.

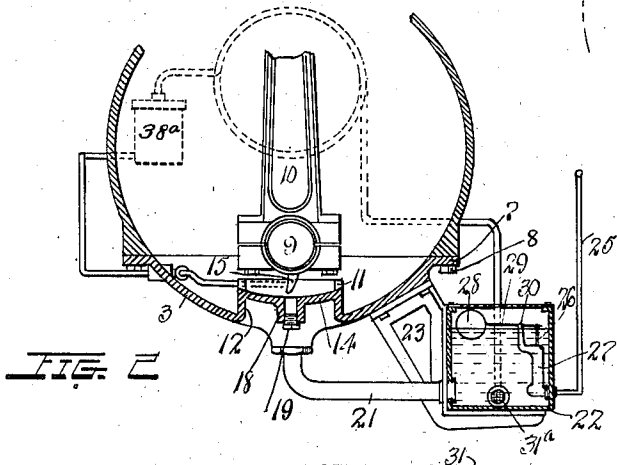


FIG. 2.

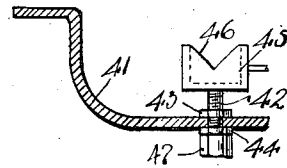


FIG. 3.

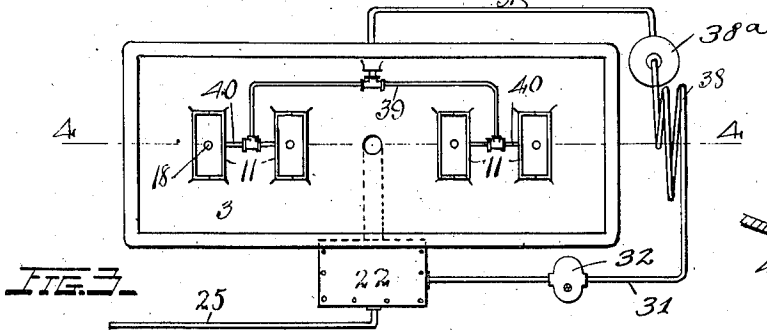


FIG. 4.

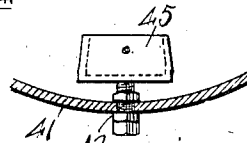


FIG. 5.

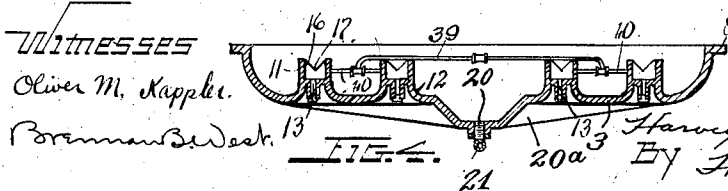


FIG. 6.

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UNITED STATES PATENT OFFICE.

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LUBRICATING SYSTEM.

1,096,550.

Specification of Letters Patent.

Patented May 12, 1914.

Application filed March 20, 1911. Serial No. 615,803.

To all whom it may concern:

Be it known that I, HARVEY F. MARANVILLE, a citizen of the United States, residing at Akron, in the county of Summit and State of Ohio, have invented a certain new and useful Improvement in Lubricating Systems, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings.

10 This invention relates to lubricating apparatus or systems of the type shown in my application No. 547,742, filed Feb. 24, 1910.

The object of this invention is to provide a system or apparatus of this type in which 15 the crank case will have a very small quantity of oil therein at any one time while insuring efficient lubrication under all conditions and in practically all positions of the engine and crank case, the lubricating of the engine parts being accomplished by the 20 "splash" system.

A further object of the invention, and one which is to some extent dependent upon the maintenance of so small a body of oil in the 25 crank case, is the prevention of overheating of the oil. This overheating is also prevented by the quick circulation of the oil through the crank case, which follows from the maintenance of a small body of oil therein, the facility for draining the oil quickly to the central bottom outlet and the free 30 communication of said outlet with a receptacle in which a level is maintained below, or substantially below, the bottom of the 35 crank case.

With the foregoing general objects in view, the invention may be defined further as consisting of the combinations of elements embodied in the claims hereto annexed and 40 illustrated in the drawings forming part hereof, wherein—

Figure 1 represents a side elevation of an engine with my lubricating apparatus connected thereto, the engine and lubricating 45 apparatus being shown as applied to an automobile; Fig. 2 represents a transverse sectional view through an engine base having my apparatus applied thereto; Fig. 3 is a plan view of the lower section of an engine base, showing the same equipped with 50 my apparatus; Fig. 4 is a longitudinal section of the engine base in Fig. 3 corresponding to the line 4—4 of Fig. 3; Fig. 5 is an enlarged detail of a modification of one of 55 the lubricating troughs or receptacles shown

in the preceding figures; and Fig. 6 is a view of the same type of trough taken at right angles to Fig. 5.

Describing by reference characters the various parts shown herein, 1 denotes the 60 cylinders, 2 the upper section, and 3 the lower section of a crank case of a multi-cylinder engine, the embodiment shown herein comprising four cylinders. The engine is shown as applied to an automobile, the hood 65 of which is shown at 4, the seat at 5 and the radiator at 6, said parts being indicated by dotted lines in Fig. 1. The engine cylinders, the upper crank case section, and the parts 4, 5 and 6 may be of any convenient 70 or conventional construction.

In the preferred form of my invention, the lower crank case section will be of the general construction shown herein, such special section being bolted to the upper section 75 through flanges 7 and bolts 8. This lower section is conveniently made as a casting, although it may be made of pressed metal. In the longitudinal central portion of the lower crank case section there is located a 80 plurality of trough-like receptacles, one for each crank 9 and connecting rod 10 of the engine. These trough-like receptacles are shown at 11 and each is located above the lowermost portion of the lower section 3. 85 These receptacles are conveniently supported upon the central bottom portion of the section 3 by integral upwardly projecting walls 12, there being a cavity within said walls and projected upwardly from the bot- 90 tom of the section 3, beneath each receptacle 11, as shown at 13. The bottom 14 of each receptacle 11 is preferably transversely curved on an arc concentric with that described by the lower end of the connecting 95 rod and the "dipper" or "spoon" 15 projecting downwardly from the journal cap thereof. Each receptacle 11 is preferably narrow in width as compared with its length, the trough having its greatest length trans- 100 versely of the lower crank case section. The end walls 16 of each trough are provided each with a notch projecting downwardly from the top thereof, said notch being shown at 17 and being preferably V-shaped and 105 having its lowest point substantially flush with the adjacent bottom portion of the trough. One purpose of notching the end walls of the troughs is to make it possible to employ a trough which is extremely 110

short, but which will enable the crank spoons or dippers to dip into the body of oil in the event that the pressure falls within the oil supply pipe (referred to hereinafter). By so notching the end walls, the dippers may enter the troughs and pass below the surface of any oil that may accumulate therein without the necessity for troughs of considerable length. In the practical operation of my invention I am enabled to employ troughs of not over five inches in length. The curving of the bottom of the troughs secures, in troughs of such shortness, a sufficient central depth of oil for the dippers.

The bottom wall 14 of each receptacle or trough is provided with a small sediment receptacle 18 depending therefrom and communicating with the lowest portion of the bottom of the receptacle 11, the lower end of the receptacle 18 being closed by a removable plug 19. The bottom of the crank case section 3 is provided at its central and lowest point with an outlet port 20 through which oil that may accumulate in this section may be delivered into a drain pipe 21 and thence into a receptacle 22, which is shown as supported from the lower crank case section by means of a freely perforated or openwork bracket 23. The bottom of the crank case section is preferably provided with gutters 20^a inclined toward said port, so that oil may flow thereto in all usual positions of the crank case. In this way the delivery of oil from the crank case is constant when the machine is ascending or descending all ordinary grades.

In the embodiment of my invention shown herein, the tank 22 is of small size and is itself supplied from a storage tank 24 (shown as located under the seat 5) through a pipe 25. This pipe discharges into the tank 22 through an outlet which is controlled by a valve, said valve having a stem 26 which is located within an upwardly extending pipe 27, the valve stem being connected to and operated by a float 28 supported on a lever 29 which is pivoted intermediate of its ends, as shown at 30. The construction of the valve needs no further illustration nor description, since the construction and arrangement of parts 26 to 30 inclusive are ordinary in numerous cases where a certain level of liquid is to be maintained in an intermediate tank. These parts perform the same function in connection with the receptacle 22, and maintain the level of oil below the surface of the oil in the receptacles or troughs 16 thus insuring the segregation of the filtered and unfiltered oil.

From the tank 22 there extends a pipe 31 which communicates with the casing 32 of a pump of ordinary construction, said pump being driven from the engine shaft 33 by means of shafts 34 and 35 having the beveled gears 36 and 37, respectively, there-

on. From the pump casing 32 the pipe 31 extends upwardly and is formed into a coil 38 located at the rear of the fan 39 which draws air through the radiator and forces said air through the hood and the coil 38. A filter 38^a may also be employed either in connection with the coil 38 or in substitution therefor. The pipe 31 extends along the opposite side of the section 3 from the tank 22, projecting into the section and communicating with the pipe 39 within said bottom section. The pipe 39 is provided with a pair of branches and each branch extends between a pair of the troughs or receptacles 11, where it communicates with a pipe section 40, which extends through the opposed walls of said pair of troughs or receptacles. The ends of the pipes 40 are located at substantially the longitudinal center of the troughs 11 and at a height substantially the same as and preferably slightly above the bottom of the V-shaped notches in the end walls thereof.

In Figs. 5 and 6 there is shown a modification of my invention which is conveniently applicable to the bottom sections of existing crank cases. In this view, 41 denotes the bottom section of a crank case of ordinary construction. At the transverse center, this section is tapped to receive pipe sections 42, each of said pipe sections being retained in place by nuts 43 and 44 located, respectively, above and below the bottom of the lower case section. On top of the pipe section is mounted a trough 45, which is similar to the troughs 11 except that the bottom is shown as straight instead of curved, the end walls being provided with the V-shaped notches 46. The bottom of the pipe 42 is closed by a removable cap 47. The end of the pipe 31, within the tank 22, is provided with a wire gauze screen 31^a, to prevent any sediment which may be within the tank from entering said pipe.

With the parts constructed and arranged as described, the operation will be as follows: Oil for lubricating the various parts of the engine will be pumped from the tank 22 through the pipe 31, coil 38, pipe 39 and branches 40 into the trough-like receptacles 11 and will be ejected forcibly into such receptacles through one side wall of each. Owing to the narrowness of the troughs and the force under which the oil is pumped to the supply pipe 31 and connected parts, the oil will strike the opposite wall of each trough, will fill the rounded or concaved bottom of the trough and overflow at the ends or at whichever end may be temporarily below the other. In practice, the troughs need not be more than from three-quarters inch to one and one-half inches in width. The surplus oil will be delivered through the pipe 19 into the tank 22, whether such surplus oil be the oil overflowing from the

troughs or receptacles 11 or the oil which runs down from the engine parts above the lower section 3. Owing to the very small capacity of the troughs or receptacles 11, a correspondingly small quantity of oil is maintained within the crank case. In practice, with a four cylinder engine, it will not be necessary to have over eight ounces of oil in the case at one time and yet insure the presence of a sufficient quantity to provide for efficient lubrication by the "splash" system. Each trough is of sufficient width to allow the spoon or dipper 15 carried by its corresponding crank or connecting rod to enter and dip into the oil contained therein, the oil being distributed by the spoon or dipper in the usual manner. The location of the sediment receptacles 18 produces the same result, on a small scale, in the removal of sediment as is accomplished in the constructions shown in my application hereinbefore referred to. The shortness of the troughs 11 and the elevation of the bottoms of the same above the bottom section 3 prevents the dirty oil which flows down from the engine parts above from mingling with the clean oil supplied to and present in these troughs or receptacles. The manner of forming the troughs 11 elevates them above the bottom of the crank case, increases the bottom area of the case and thereby increases the cooling action produced by the air on the case. One great advantage of using so small a quantity of oil in the crank case is that it permits me to cool the oil much more efficiently and without the necessity for a special cooler. The oil is circulated practically continuously, in a small, rapidly flowing stream, through the crank case, pipes 21 and 31 and the coil 38, which coil may be cooled by the same fan which is employed to cool the engines and radiator. In actual operation, there is generally less than a quart of oil present in the crank case at any one time. The employment of an isolated storage receptacle, with a smaller receptacle 22 carried in such manner as not to be heated by the crank case, further contributes to the prevention of overheating of the oil. This overheating of the oil materially lessens its lubricating qualities, requiring the use of a greater quantity of oil than would be necessary were the oil cool. Furthermore, if the oil becomes heated to or above the flashing point, it will become ignited, carbonizing the rings of the piston. By the use of my apparatus, this overheating is prevented, and it will generally be feasible to dispense with the use of filters and special coolers, the sediment traps shown herein being sufficient to keep the oil clean. The parts are so arranged that the level of oil within the tank 22 is always kept substantially below the bottom of the crank case. Oil is admitted to this tank through the pipe 25 only as fast

as oil is consumed by the engine, the result being that the oil supplied to the engine will be of uniform viscosity.

A very important advantage of my invention resides in the fact that it insures ample lubrication by the "splash" system in practically every conceivable position of the engine and its parts. Suppose the engine be tilted transversely to such an extent that oil will not remain in the troughs or receptacles 11. If the pump is in operation, each spoon or dipper 15 will, when its crank passes the bottom center, pass through a stream of oil discharged transversely of the path of its movement, and the engine will be lubricated by the "splash" system notwithstanding the fact that the troughs are empty. The manner of forming the end walls of the troughs will enable the engine base to be tilted longitudinally at an angle determined only by the inclination of the V-shaped slots in the end walls before the oil will be discharged over either of the end walls of the troughs. That is to say, these end walls will retain a body of oil in the trough even should the base and trough be so tilted as to bring one edge (16 or 46) of the V-shaped notch substantially horizontal. When further tilted, oil will flow over the side wall of the trough. The spoons or dippers 15 will, however, always have a body of oil into which they may dip, if necessary, in spite of the tilting of the engine base in a longitudinal direction. The employment of a forceful stream with the narrowness of the troughs will insure a supply of oil to the spoon or dipper even though no oil be present in the trough, as when the engine and base are transversely tilted or given an extreme longitudinal tilt or inclination. This ability to secure efficient lubrication, without reference to the tilting of the engine and crank case adapts my lubricating apparatus particularly well for flying machines, wherein the necessity for extreme tilting of the vehicle and the attached engine is always present. A further advantage which arises from the trough construction and particularly from the V shaped notches is that this construction permits of some variation in the height or level of the oil in the troughs in proportion to the speed of the pump, and consequently in proportion to the speed of the engine shaft. When the pump is being driven at a high rate of speed (with a corresponding increase in the oil supplied by the pump to the troughs) the contraction of the overflow, provided by these end notches, allows of some increase in depth or level of the oil in the troughs, whereby the immersion of the spoon or dipper in the oil and the consequent amount of lubrication is proportional to the pump and engine speeds. This result is, in my opinion, best secured through a construction wherein the bottoms of the V shaped notches are

above the lower center of the crank spoon or dipper.

Instead of the cooling coil 38 I may obviously employ the filter disclosed in my co-
 5 pending application, filed, Feb. 24, 1910, Serial Number 547,742, above referred to, or any other oil filter of suitable type, or I may employ such filter in connection with this coil. There is a marked advantage in em-
 10 ploying a filter in this system, inasmuch as the filtered oil is supplied to the receptacles or troughs 11 and is segregated from the soiled oil by means of its elevation above the surface thereof. In this manner only clean
 15 oil is supplied to the engine, while the foul oil is constantly removed and reclaimed.

To the result of quickly circulating the oil through the crank case and maintaining within the crank case as small an amount of
 20 oil as is consistent with lubrication, the following features contribute:

1. The extremely small capacity of the transverse troughs, such smallness of capacity being enhanced by notching the walls 46,
 25 so that the shortness of the troughs is possible while maintaining therewithin a sufficient quantity of oil for the crank spoons to dip into under normal conditions, should the pressure in the oil pipe 31 fall.

2. Maintaining the level in the tank 22 below, or practically below, the bottom of the crank case. Oil in the crank case can thus drain freely into the tank, preventing the accumulation of a body of oil within the
 35 case.

3. Offsetting or spacing the tank 22 from the crank case, thereby preventing the heating of the tank from the crank case and permitting the circulation of air between these
 40 parts.

4. The manner of forming the troughs by pressing them upwardly from the bottom of the case, thereby increasing the cooling area of the case and preventing any oil in the case
 45 from washing from side to side as the machine rocks. The troughs, in fact, are provided merely for the purpose of temporarily supplying the spoons or dippers in the event that the pressure in the oil supply pipe
 50 should fall to such an extent that the oil might not be jetted into the paths of said spoons or dippers. The provision of the sediment receptacles 18 for the troughs assures the retention of the heavy sediment
 55 within the crank case and keeps it out of the tank 22 and the circulating system connected therewith.

Having thus described my invention, what I claim is:

60 1. The combination, with a crank shaft having a crank and connecting rod and a spoon or dipper carried thereby, of an oil supply pipe arranged to discharge substantially parallel to the axis of the crank shaft

and adjacent to the path of rotation of said 65 spoon or dipper.

2. The combination, with a crank and connecting rod, of a spoon or dipper carried thereby, an oil supply pipe arranged to discharge across the plane of the path of said 70 spoon or dipper and at substantially right angles to said plane, the discharge end of said pipe being located adjacent to and slightly above the lower end of the spoon or dipper as the crank passes its lower center, 75 and means for forcing oil under pressure through said pipe.

3. The combination, with a crank and connecting rod, of a projection carried thereby, a trough or receptacle, the end walls 80 whereof are provided with restricted outlets, the bottoms of said outlets being located above the bottom of the projection when the crank is on its lower center, and connections for supplying oil to said receptacle. 85

4. The combination, with a crank and connecting rod, of a projection carried thereby, a trough or receptacle having notched end walls, the bottoms of the notches being above the bottom of the projection when the 90 crank is on its lower center, and connections for supplying oil to said trough or receptacle.

5. The combination, with a crank and connecting rod, of a projection carried thereby, 95 a receptacle having V shaped notches in its end walls, the bottoms of said notches being located above the bottom of the projection when the crank is on its lower center, a crank case within which the trough or receptacle is located and having its sides spaced from the end walls of the trough or receptacle, means for supplying oil to said trough or receptacle, and means whereby the crank case may be drained. 105

6. The combination, with a crank case, of a crank and connecting rod, a projection carried thereby, a receptacle in said crank case and located above the bottom thereof and arranged in the path of travel of said 110 projection, said receptacle having its end walls spaced from the sides of the crank case, means for maintaining in said receptacle a body of oil normally extending above the lowest point of travel of said projection, 115 a drainage outlet for the crank case, and a sediment trap communicating with the lower portion of said receptacle.

7. The combination of a crank and connecting rod, a projection extending there- 120 from, a crank case, a trough-like receptacle within said case and above the bottom thereof and extending transversely of the case and in the path of travel of said projection, said receptacle having side walls project- 125 ing above the lower end of said projection when the crank is on its lower center, the end walls of said receptacle being notched

to receive said projection and being spaced from the side walls of the crank case and means for supplying oil to said receptacle.

8. The combination of a crank and connecting rod having a projection, a receptacle in the path of travel of said projection, said receptacle having its bottom wall curved substantially concentric with the path of travel of said projection and being provided with side walls extending above said projection when the crank is on its lower center, the end walls of said receptacle being provided with notches for said projection and being spaced from the side walls of the crank case and means for supplying oil to said receptacle.

9. The combination of a crank and connecting rod having a projection, a receptacle in the path of travel of said projection, said receptacle having its bottom wall curved substantially concentric with the path of travel of said projection and being provided with side walls extending above said projection when the crank is on its lower center, the end walls of said receptacle being provided with V-shaped notches and being spaced from the side walls of the crank case, and means for supplying oil to said receptacle.

10. The combination, with a crank and connecting rod having a projection, of a crank case having a receptacle above its bottom located in the path of travel of said projection, said receptacle having side walls extending above the bottom of said projection when the crank is on its lower center, an oil supply connection communicating with one of said side walls at a point above the lower end of said projection when in its lowest position, and means for supplying oil under pressure through said supply connection and transversely of said receptacle and across the path of travel of said projection.

11. The combination of a crank and connecting rod having a projection, a receptacle located in the path of travel of said projection, said receptacle having side walls extending above the bottom of said projection when the crank is on its lower center, an oil supply connection communicating with one of said side walls at a point above the lower end of said projection when in its lowest position, and means for supplying oil under pressure through said supply connection and transversely of said receptacle and across the path of travel of said projection.

12. The combination, with a crank and connecting rod having a projection, of a crank case having a pair of spaced plates extending transversely of and located above the bottom thereof, said plates being arranged at opposite sides of the path of travel of said projection, and one of said plates having an aperture therethrough

located within the radius of sweep of said projection, an oil supply connection communicating with said aperture, and means for forcing oil under pressure through said connection and across the space between said plates, whereby the oil stream may traverse the path of travel of the lower end of said projection.

13. The combination, with a plurality of cranks and connecting rods of a multi-cylinder engine each having a projection, of a crank case having above its bottom a plurality of transversely extending troughs or receptacles, one for each projection, a tank, a drain pipe extending from the lower part of the crank case to said tank, means for forcing oil from said tank into said troughs or receptacles, a supply connection communicating with said tank, and means for maintaining in said tank a level of oil below the surface of the oil in said receptacles.

14. The combination, with a plurality of cranks and connecting rods of a multi-cylinder engine each having a projection, of a crank case having a plurality of transversely extending troughs or receptacles extending upwardly from the central portion of its bottom, one for each projection, and means for supplying oil to said troughs or receptacles, each trough or receptacle being provided with a sediment collecting chamber in the bottom thereof.

15. The combination, with the cranks and connecting rods of a multi-cylinder engine each having a projection, of a crank case, a plurality of troughs in said case above the bottom thereof and having their end walls spaced from the side walls of the crank case and each located in the path of travel of a projection, a tank outside of the crank case and having its bottom below said case, a drainage connection extending between said tank and the lowermost portion of the crank case, an oil supply pipe communicating with said tank, means for admitting oil from said pipe into said tank and arranged to maintain a level of oil in said tank substantially below the bottom of the crank case, a conduit connecting said tank with said troughs, and a pump for forcing oil from said tank through said conduit.

16. The combination, with the cranks and connecting rods of a multi-cylinder engine each having a projection, of a crank case having a plurality of troughs extending upwardly from the bottom thereof and having their end walls spaced from the side walls of the case, said crank case having a centrally depressed portion, a tank outside of and spaced from said crank case and located below the bottom of said case, a drainage connection extending between the depressed portion of the crank case and the tank, an oil supply pipe communicating with said tank, means for maintaining in said tank a

level of oil substantially below the bottom of the crank case, a conduit extending between the tank and the troughs, and means for forcing oil through said conduit.

- 5 17. The combination, with the cranks and connecting rods of a multi-cylinder engine each having a projection, of a crank case having a drain outlet extending from the lowest portion thereof, a tank supported at
10 one side of and below the crank case and spaced therefrom, a drain pipe connecting said pipe and the lowest portion of the crank case, a pipe for supplying oil to said tank, means for maintaining a level in said
15 tank substantially below the bottom of the crank case, a plurality of troughs in the crank case, one for each projection and arranged in the paths of movement of said projection and having their end walls
20 spaced from the sides of the crank case, a conduit extending from the tank to said troughs, means for forcing oil from the tank through said conduit, and means for cooling the oil in transit through the conduit.
- 25 18. The combination, with the cranks and connecting rods of a multi-cylinder engine each having a projection, of a crank case, a plurality of troughs within the crank case arranged below the projections and each
30 having a sediment receptacle communicating with the lower part thereof and the end walls of said troughs being spaced from the sides of the crank case, the crank case being provided with an outlet extending from the
35 lowest portion thereof, a tank located below and at one side of the crank case, a pipe connecting said outlet and tank, a supply pipe communicating with the tank, means for maintaining within the tank a level of
40 oil below the bottom of the crank case, a pipe extending between the tank and the troughs, means for forcing oil from the tank through said conduit, and means for filtering and cooling the oil in transit through
45 the conduit.

19. The combination, with a crank and a connecting rod having a projection, of a trough below said crank, and means for forcing oil in a stream transversely of said
50 trough and across the path of the projection.

20. The combination, with a crank case, of a trough above the bottom of the crank case and extending transversely thereof,
55 said trough having a sediment chamber in the lower central portion thereof, and a crank and connecting rod having a projection adapted to enter the said trough and dip into the oil therein.

- 60 21. The combination, with a crank case, of a plurality of transverse troughs within the crank case and above the bottom thereof, each trough having at its bottom a sediment collecting chamber extending to and communicating with the exterior of the crank
65

case, and a plurality of cranks and connecting rods, each crank and connecting rod having a projection adapted to enter a trough and dip within the oil therein.

22. The combination, with a shaft having
70 a crank and connecting rod and a spoon or dipper carried thereby, of an oil receptacle arranged beneath said crank and connecting rod, and means whereby the level of the oil in said receptacle may be varied in proportion to the speed of rotation of the shaft,
75 thereby to supply to the parts to be lubricated a quantity of oil which varies with the speed of rotation of said shaft.

23. The combination, with a crank and
80 connecting rod having a projection, of a crank case having a trough or receptacle above its bottom located in the path of travel of said projection, said trough or receptacle having side walls extending above
85 the bottom of said projection when the crank is on its lower center, an oil supply connection communicating with said trough or receptacle, and means for supplying oil under pressure through said supply connection transversely of said receptacle and at
90 substantially right angles to the path of travel of said projection.

24. The combination, with a shaft having
95 a crank and connecting rod and a projection carried thereby, of an oil receptacle arranged beneath said crank and connecting rod, and means whereby the depth of oil within the receptacle may be varied, said means comprising an oil supply pipe communicating with said receptacle, a pump for
100 forcing oil through said pipe, and a driving connection between the pump and the shaft, whereby the supply of oil to the parts to be lubricated is proportional to the speed of
105 rotation of said shaft.

25. The combination, with a plurality of cranks and connecting rods of a multi-cylinder engine, of a crank case having a
110 plurality of troughs or receptacles therein, each trough or receptacle being provided with a sediment chamber or trap the lower end whereof is accessible through the crank case bottom, a tank arranged to receive the oil overflowing the troughs or receptacles,
115 and means for supplying oil from said tank to the troughs or receptacles.

26. The combination, with a crank and connecting rod, of an oil reservoir, a member movable with the crank and connecting rod and adapted to enter the reservoir and remove oil therefrom, and means dependent upon the speed of rotation of the crank and connecting rod for varying the level of the oil in said reservoir, thereby to supply to
125 the parts to be lubricated a quantity of oil which varies with the speed of rotation of said shaft.

27. The combination, with the cranks and connecting rods of a multi-cylinder engine, 130

of a crank case, a plurality of troughs within the crank case arranged below the cranks and connecting rods and each having a sediment chamber communicating with the lower part thereof and accessible through the bottom of the crank case, a tank located below the tops of said troughs and adapted to receive the overflow therefrom, a supply pipe communicating with the tank and adapted to supply oil therefrom to the troughs, and means for forcing oil from the tank through said pipe.

28. The combination, with a shaft having a crank and connecting rod, of an oil supply pipe arranged to discharge below and substantially parallel to the axis of said shaft and adjacent to the path of rotation of said crank and connecting rod and into contact therewith, substantially as the crank passes its lower center.

29. The combination, with a crank and connecting rod, of a projection carried thereby for lubricating by the splash system, there being a body of lubricant which said projection may pass through, and means for

automatically varying the depth of immersion of the said projection in the lubricant in proportion to the speed of rotation of said crank, thereby to supply to the parts to be lubricated a quantity of oil which varies with the speed of rotation of said crank.

30. The combination, with an engine shaft, of a projection carried thereby for lubricating by the splash system, there being a body of lubricant which said projection may pass through, and means for automatically varying the depth of immersion of the said projection in the lubricant in proportion to the speed of rotation of said shaft, thereby to supply to the parts to be lubricated a quantity of oil which varies with the speed of rotation of said shaft.

In testimony whereof, I hereunto affix my signature in the presence of two witnesses.

HARVEY F. MARANVILLE.

Witnesses:

HAROLD E. SMITH,
BRENNAN B. WEST.