E. M. WHITE.

SPLASH OILING SYSTEM.

APPLICATION FILED OCT. 12, 1916. RENEWED SEPT. 4, 1917.

1,256,754. Patented Feb. 19, 1918.

2 SHEETS—SHEET 1.

Fig. 6.

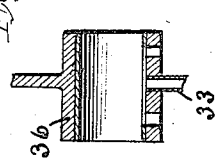

Fig. 1.

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2 SHEETS—SHEET 2.

Fig. 2

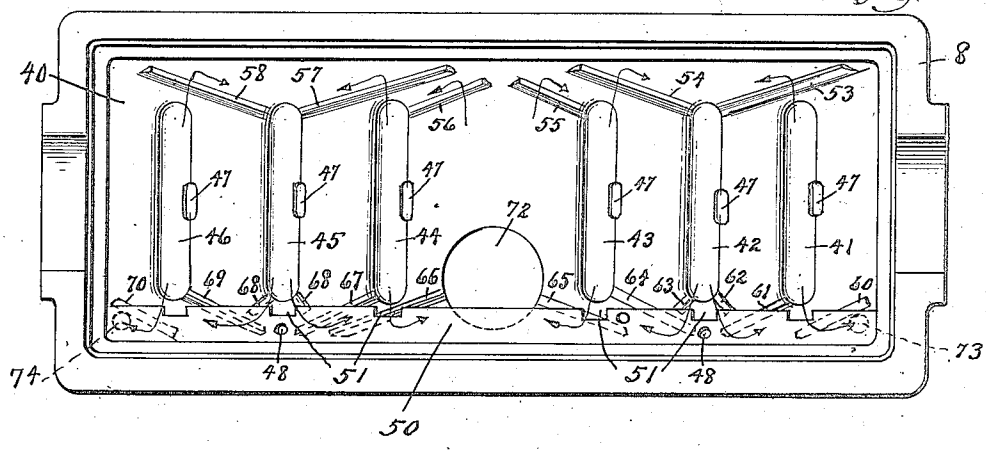

Fig. 3.

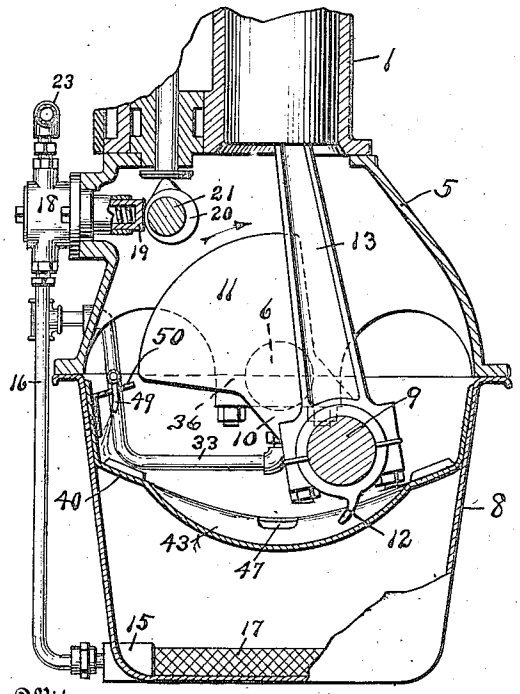

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Fig. 4.

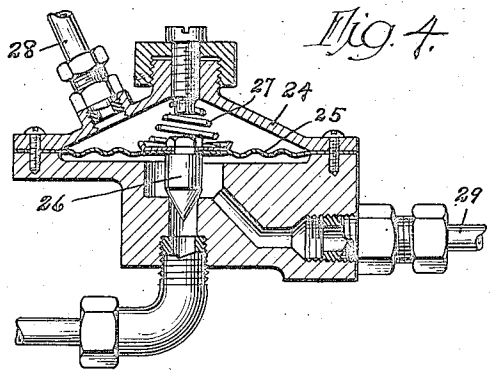
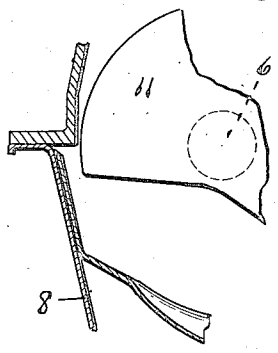


Fig. 5.



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UNITED STATES PATENT OFFICE.

ERNEST M. WHITE, OF DETROIT, MICHIGAN.

SPLASH-OILING SYSTEM.

1,256,754. Specification of Letters Patent. Patented Feb. 19, 1918.

Application filed October 12, 1916, Serial No. 125,132. Renewed September 4, 1917. Serial No. 189,684.

To all whom it may concern:

Be it known that I, ERNEST M. WHITE, a citizen of the United States, and residing at Detroit, in the county of Wayne and State of Michigan, have invented a new and Improved Splash-Oiling System, of which the following is a specification.

This invention consists in means for conveying and holding the oil employed to lubricate the main moving parts of internal combustion engines in such a manner that the lower ends of the connecting rods or the downwardly extending fingers on these rods will splash up proper amounts of oil at all times, while at the same time, all excess of oil will be intercepted and conveyed to a main oil reservoir.

It further consists in means for intercepting the oil thrown up by the counterweights of the crank shaft so as to prevent over-lubrication of the engine cylinders.

It also consists in means for controlling the amount of lubricant passing directly to the crank case by means of a by-pass and a valve that is positioned according to the pressure in the connection between the carbureter and the engine, so that the amount of lubricant passing to the bearings will be substantially proportioned to the fuel consumed.

It also consists in providing auxiliary receptacles for the lubricant with overflow passages so that the amount therein will be less when one end of the crank case inclines downwardly than when it inclines upwardly, and with inclined troughs to convey the splashed up oil in opposite directions on opposite sides of the crank shaft.

It also consists in the details of construction illustrated in the accompanying drawings and particularly pointed out in the claims.

In the drawings, Figure 1 is a side elevation of a six-cylinder engine, a portion of the crank case being broken away to show the interior construction. Fig. 2 is a plan of the lower portion of the crank case. Fig. 3 is a central vertical transverse section of this engine. Fig. 4 is a central section of the control valve for the lubricant. Fig. 5 is a detail of a modified form of crank case. Fig. 6 is a vertical section of the central bearing for the crank shaft.

Similar reference characters refer to like parts throughout the several views.

In Fig. 1 the cylinders 1, exhaust manifold 2, intake manifold 3, carbureter 4, upper crank case 5, crank shaft 6, timing gear 7 and lower crank case 8 are shown conventionally, as their construction forms no part of the present invention. The lower crank case constitutes the main reservoir for the lubricating oil and so constitutes a part of the combination set forth in several of the annexed claims although its particular form is immaterial. The crank shaft is formed with six crank pins 9 and cranks 10 between them, to which are attached the counterweight sectors 11 in well known manner. The fingers 12 on the connecting rods 13 splash up the lubricant into the lower ends of the cylinders and the present invention is designed to control the amount of this oil that is thus splashed up and also the amount that flows to the crank case bearings.

At the bottom of the crank case is a boss 15 into which a suction pipe 16 is connected. Within the crank case a strainer 17 of any desired form may be secured, if desired. The pipe 16 connects to any desired form of circulating pump 18, that shown in the drawing having a plunger 19 operated by the cam 20 on the cam shaft 21.

The oil passes from the pump to the T 23 and thence directly to the bearings and to the auxiliary receptacles into which the fingers 12 dip to splash up the lubricant, or to the control valve 24 and thence back to the main reservoir.

When the engine is being started, the absolute pressure within the intake manifold is usually lower than at any other time. With many engines, this is also true when "idling". At such times the quantity of lubricant fed to the auxiliary oil receptacles and crank shaft bearings should be less than when the engine is running at high speed. For this reason, a relief valve 24 is preferably provided having a flexible diaphragm 25 to which a valve 26 is attached, the valve being held onto its seat by the spring 27.

A pipe 28 connects to the intake manifold 3 or other connection between the carbureter an engine, and to the space above the diaphragm so that when the pressure in the intake manifold falls below a fixed point, the diaphragm will rise and permit oil to flow from the T 23 through this valve and down the pipe 29 preferably into the main reservoir. So long as the pressure in the intake manifold is not below a predetermined normal, all the lubricant will pass from the T 23 down the pipe 31 to the pipes 32, 33 and 34 to the front bearing 35, intermediate

bearing 36 and rear bearing 37 of the crank shaft 6, from which bearings the oil will flow to the auxiliary oil receptacles. The lower crank case 8 may be formed with a small dam 38 to hold a sufficient depth of the oil to lubricate the teeth of the gear 7 on the main crank shaft.

Mounted within the lower crank case is an oil pan 40, formed with transverse depressions 41, 42, 43, 44, 45 and 46 which constitute the auxiliary oil receptacles into which dip the fingers 12 on the connecting rods to splash up the lubricant into the lower ends of the cylinders. It has been found that this action of the connecting rods not only splashes up large drops of oil, but it also beats these drops into fine particles which are held in suspension by the mass of air that whirls around with the crank shaft which often makes sixty revolutions per second. The particles fly out by centrifugal force and cover the inside of the cylinders with a coating whose thickness depends upon the amounts of oil splashed up. This revolving movement of the oil mist is also caused largely by the counter-weights 11, and provisions are therefore made to regulate the amount of oil thus thrown up into the cylinders, it being understood that all attempts to feed the exact necessary amount to the bearings have been unsuccessful.

The amount splashed up will depend somewhat upon the depth of the oil in the auxiliary receptacles and the desired amount, when the engine is mounted on a motor vehicle, will depend upon whether the vehicle is going up or down hill or running on level ground, the necessary amount being much less when going down hill than when on a level and greatest when going up hill. Openings 47 are therefore formed in the front side walls of the receptacles, through which the oil may flow away so that its level will vary, and the connecting rods dip into the oil more deeply when the right hand end in Fig. 1 is elevated and less deeply when it is depressed than when the structure is level. Forming these openings in the side walls of the receptacles is more effective than forming them in the bridges between the receptacles.

The oil from the front bearing 35 flows into the front receptacle 41; the oil from the rear bearing 37 flows into the rear receptacle 46, while the oil from the central bearing 36 flows into the two central receptacles 43 and 44. In order to insure a sufficient supply of oil for the receptacles 42 and 45, the pipes 32 and 34 may be provided with discharge nozzles 49 which extend through the holes 48 in the plate 50.

Secured to or formed on one side of the pan 40 is a deflector, preferably a plate 50, shown in Figs. 2 and 3, formed with gaps or notches 51 to permit the nuts on the connecting rods to pass through. This plate extends quite close to the outer edges of the counter-weights 11 and intercepts the oil carried around at the circumference of these weights and cranks. The pan 40 is formed with or has secured to it a series of inclined troughs 53 to 58 inclusive on one side, and troughs 60 to 70 inclusive on the other side. It is also formed with an opening 72 at the middle and openings 73 and 74 at its ends through which the excess of oil may pass to the reservoir.

As the crank shaft revolves, part of the oil in the receptacles will be thrown up against the deflector and a portion will be beaten up into a mist that will be thrown up into the cylinder and properly lubricate it. A portion of this mist will also be thrown against the wall of the crank case opposite the deflector and drip down, the major portion being caught by the troughs 53—54 and 57—58 and conveyed to the receptacles 42—45. The remainder will be caught by the troughs 56—57 and flow to the troughs 43—44. If the oil that is received by these troughs is excessive, it flows freely through the openings 47. The oil splashed up and caught by the deflector falls to the troughs 60 to 70 inclusive, and is conveyed away from the receptacles 42 and 45 (excepting small amounts caught by the troughs 62, 63 and 68) and soon arrives at the openings 72, 73 and 74 and drops into the main reservoir.

The result is that the oil is kept at substantially the same level in each of the receptacles and that therefore, the amount splashed up into the cylinders will be very uniform for each condition of operation. The valve 24, however, will vary this amount so that at all times, excessive lubrication and deposit of carbon will be avoided. The details of construction and the proportions of the parts may all be changed without departing from the spirit of my invention.

I claim:—

1. In an internal combustion engine, the combination of a main oil reservoir and auxiliary oil receptacles into which the lower ends of connecting rods may dip to splash oil up into the cylinders, a pump and a system of pipes to convey oil from the main reservoir to the auxiliary receptacles and to the main reservoir, and a valve controlled by the pressure within the intake manifold of the engine to determine the proportions of the oil that shall pass from the pump to said receptacles back to the main reservoir.

2. In an internal combustion engine, the combination of a main oil reservoir and auxiliary oil receptacles into which the lower ends of connecting rods may dip to splash oil up into the cylinders, a pump and a system of pipes to convey oil from the main

reservoir to the auxiliary receptacles, and means controlled by the pressure within the intake manifold of the engine to by-pass a portion of the oil back to the main reservoir from the pump.

3. In an internal combustion engine, the combination of a main oil reservoir and auxiliary oil receptacles into which the lower ends of the connecting rods may dip to splash oil up into the cylinders, means for carrying oil from the main reservoir to said receptacles, and means for regulating the amount of oil thus conveyed by the pressure within the intake manifold of the engine.

4. In an internal combustion engine, the combination of the crank case and the crank shaft therein provided with counterbalancing sectors, said crank case constituting a main oil reservoir, an oil pan formed with auxiliary oil receptacles below the crank shaft into which the lower ends of the connecting rods may dip to splash oil up into the cylinders, means to convey oil from the main reservoir to the auxiliary receptacles, and a deflector extending from a side wall of the crank case toward said crank shaft to intercept a portion of the oil thus splashed up.

5. In an internal combustion engine, the combination of the crank case and the crank shaft therein provided with counterbalancing sectors, said crank case constituting a main oil reservoir, an oil pan formed with auxiliary oil receptacles below the crank shaft into which the lower ends of the connecting rods may dip to splash oil up into the cylinders, means to convey oil from the main reservoir to the auxiliary receptacles, and a deflector extending from a side wall of the crank case toward said counterbalancing sectors on the crank shaft to intercept a portion of the oil thus splashed up, said oil pan being provided with inclined troughs to convey the splashed up oil longitudinally of the crank shaft.

6. In an internal combustion engine, the combination of the crank case and the crank shaft therein provided with counterbalancing sectors, said crank case constituting a main oil reservoir, an oil pan formed with auxiliary oil receptacles below the crank shaft into which the lower ends of the connecting rods may dip to splash oil up into the cylinders, means to convey oil from the main reservoir to the auxiliary receptacles, and a deflector extending from a side wall of the crank case toward said counterbalancing sectors on the crank shaft to intercept a portion of the oil thus splashed up, said oil pan being formed with an opening in one wall of each receptacle to regulate the depth of oil therein.

7. In an internal combustion engine, the combination of a cylinder, a connecting rod, a carbureter, a crank case, an oil pan mounted in the crank case and provided with a depression to hold oil into which the lower end of the connecting rod may dip to splash oil into the cylinder, means for conveying oil to the said depression from the crank case, and means controlled by the pressure between the carbureter and cylinder for regulating the flow of oil to said depression.

8. In an internal combustion engine, the combination of a cylinder and connecting rod therefor, a main oil reservoir, an auxiliary receptacle into which the connecting rod may dip to splash oil into the cylinder, a conduit to convey oil from the reservoir to the auxiliary receptacle, and means influenced by the pressure of the gases of the engine to regulate the flow of oil through said conduit.

9. In an internal combustion engine, the combination of a main oil reservoir and auxiliary oil receptacles into which the lower ends of the connecting rods may dip to splash oil up into the cylinders, a crank shaft and the bearings therefor, a pump and a series of pipes to convey the oil from the main reservoir to said bearings from which the oil flows to a plurality of said auxiliary receptacles, discharge nozzles connected to said pipes to deliver oil to the remainder of said receptacles, and means controlled by the pressure within the intake manifold of the engine to proportion the flow of oil to said bearings with said pressure.

10. In an internal combustion engine, the combination of the crank case and the crank shaft therein, said crank case constituting a main oil reservoir, an oil pan mounted in the crank case below the crank shaft and formed with auxiliary oil receptacles into which the lower ends of the connecting rods may dip to splash oil up into the cylinders, and with a series of inclined troughs to convey a portion of the splashed up oil longitudinally of the crank shaft, and means to convey the oil from the main reservoir to the auxiliary receptacles.

11. In an internal combustion engine, the combination of the crank case and an oil pan mounted therein, said pan formed with transverse depressions and with openings in the side walls of said depressions which are toward one end of the engine, and means to convey lubricating oil to said receptacles.

12. In an internal combustion engine, the combination of the crank case and the crank shaft therein, said crank case constituting a main oil reservoir, an oil pan mounted in the crank case below the crank shaft and formed with auxiliary oil receptacles into which the lower ends of the connecting rods may dip to splash oil up into the cylinders, and with a series of inclined troughs to convey a portion of the splashed up oil longitudinally of the crank shaft, and means to convey the oil from the main reservoir to the auxiliary receptacles, the troughs on one

side of the oil pan being inclined in the opposite direction from the immediately opposite troughs on the other side of the pan.

13. In an internal combustion six-cylinder engine, the combination of a crank case constituting a main oil reservoir and an oil pan therein formed with six auxiliary oil receptacles into which the lower ends of the connecting rods may dip to splash oil up into the cylinders, and with a series of inclined troughs on both sides of said pan divided into two groups, one for each end of the pan, two troughs on one side being positioned to convey to the middle receptacle substantially all the oil that flows down from that portion of the adjacent side of the crank case and two troughs on the other side being positioned to convey to the end receptacles the major portion of the oil splashed up from the three adjacent receptacles.

14. In an internal combustion six-cylinder engine, the combination of a crank case constituting a main oil reservoir and an oil pan therein formed with six auxiliary oil receptacles into which the lower ends of the connecting rods may dip to splash oil up into the cylinders, and with a series of inclined troughs on both sides of said pan divided into two groups, one for each end of the pan, two troughs on one side being positioned to convey to the middle receptacle substantially all the oil that flows down from that portion of the adjacent side of the crank case and two troughs on the other side being positioned to convey to the end receptacles the major portion of the oil splashed up from the three adjacent receptacles, and additional troughs to convey excess oil to openings at the ends and middle of said pan.

15. In an internal combustion engine, the combination of the crank case and a crank shaft therein provided with counterbalancing sectors, means to convey oil to said crank shaft whereby it will be carried around in the form of a mist, and a deflector extending from the side wall of the crank case toward said counterbalancing sectors and in close proximity thereto to control the diameter of the body of oil mist carried around by the crank shaft.

16. In an internal combustion engine, the combination of the crank, the crank case and an oil pan mounted therein, said pan formed with transverse depressions and openings through which the oil may flow, a deflector along one side of the crank case projecting in a general direction toward the crank to intercept a portion of the oil splashed out of said depressions, and means to convey lubricating oil to said depressions.

17. In an internal combustion engine, the combination of a crank case, an oil reservoir, a crank shaft, crank shaft bearings, a cylinder, a connecting rod, means to convey oil from the oil reservoir to the crank shaft bearings, a deflector to intercept and divert a portion of the oil thrown by the crank shaft, the said deflector projecting from a wall of the crank case in a general direction toward the crank shaft and parallel to the axis thereof, and means to vary the quantity of oil conveyed to said bearings by the pressure of the gases within the engine.

18. In an internal combustion engine, the combination of a crank case, an oil reservoir, a crank shaft, crank shaft bearings, a cylinder, a connecting rod, means to convey oil from the oil reservoir to the crank shaft bearings, a deflector to intercept and divert a portion of the oil thrown by the crank shaft, the said deflector projecting from a wall of the crank case in a general direction toward the crank shaft and parallel to the axis thereof, and means to vary the quantity of oil conveyed to said bearings.

19. In an internal combustion engine, the combination of the crank case and the crank shaft therein, said crank case constituting a main oil reservoir, an oil pan mounted within the crank case below the crank shaft and formed with groups of three auxiliary oil receptacles into which the lower ends of the connecting rods may dip to splash oil up into the cylinders, and a series of inclined troughs to convey a portion of the oil splashed up out of two of the auxiliary receptacles of one group into the third auxiliary receptacle of said group and out of the third auxiliary receptacle of said group into the other two auxiliary receptacles of said group, and means to convey oil from the main reservoir to the auxiliary receptacles.

20. In an internal combustion engine, the combination of the crank case and the crank shaft therein, said crank case constituting a main oil reservoir, an oil pan mounted within the crank case below the crank shaft and formed with groups of three auxiliary oil receptacles into which the lower ends of the connecting rods may dip to splash oil up into the cylinders, and a series of inclined troughs to convey a portion of the oil splashed up out of one auxiliary receptacle to other auxiliary receptacles and to convey a portion of the oil splashed out of said other auxiliary receptacles into the first named auxiliary receptacle and another portion to the main reservoir, and means to convey oil from the main oil reservoir to the auxiliary receptacles.

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