Oct. 16, 1934. H. B. CLARKE 1,976,772

VISCOSITY REGULATOR

Filed July 30, 1932

Fig. 1.

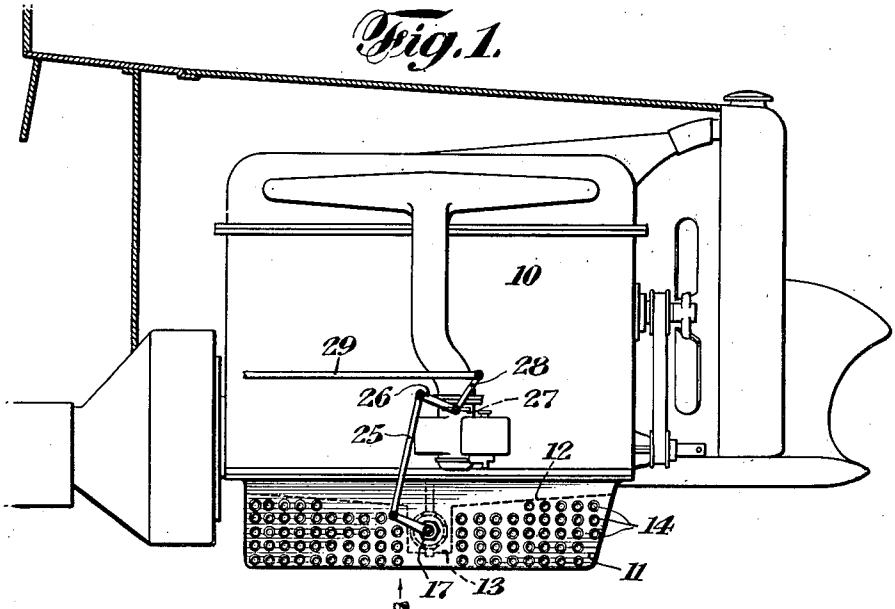


Fig. 2.

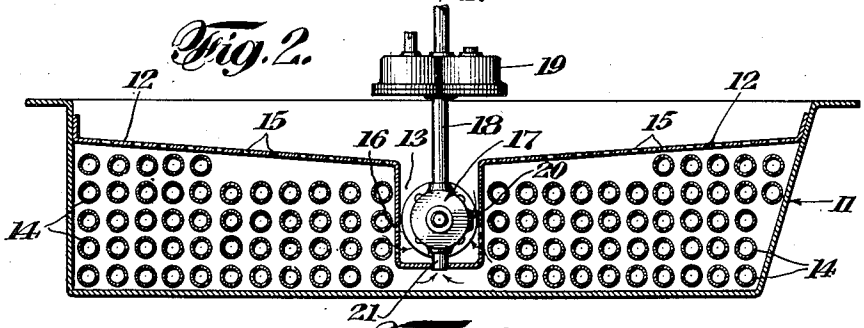


Fig. 3.

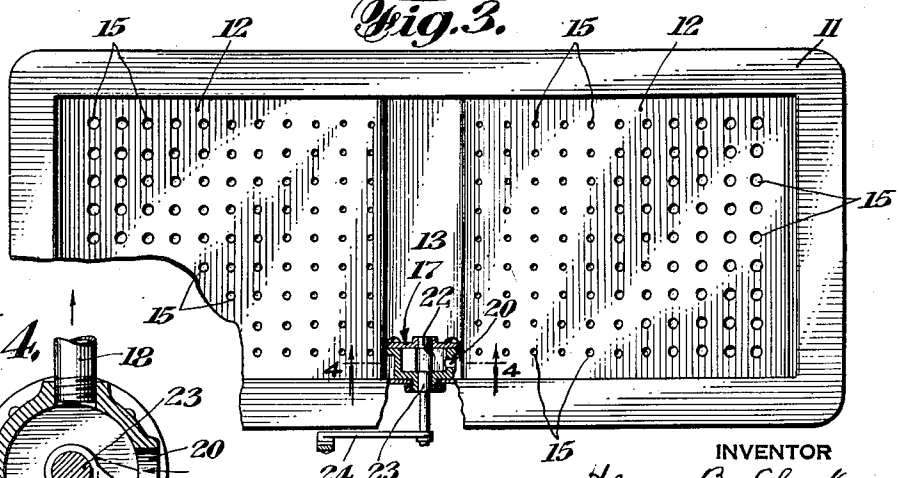
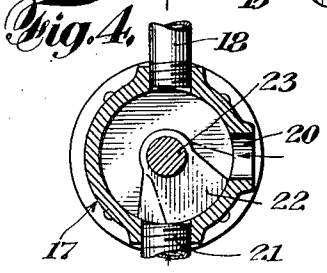


Fig. 4.



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Patented Oct. 16, 1934 1,976,772

UNITED STATES PATENT OFFICE

1,976,772

VISCOSITY REGULATOR

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Application July 30, 1932, Serial No. 626,787

7 Claims. (Cl. 123—196)

This invention relates to lubricating systems for internal combustion engines and has for an object a lubricating system in which a portion of the oil in the system is equally heated to lower its viscosity with subsequent gradual heating of the remainder of the oil to reduce the viscosity of the entire body of oil and also to prevent overheating of the oil and consequent viscosity decrease.

In a lubricating system embodying this invention, the oil pan is equipped with a partition formed with sloping walls terminating in a central well. Perforations are provided in the sloping portions and also in the well near the bottom thereof, these perforations being sufficiently small in diameter to oppose ready flow of cold lubricating oil. The oil pump has its intake communicating through a two-way valve with the interior of the well and with that portion of the pan exterior of the well, the well being termed the hot oil sump and the remainder being termed the cold oil sump. The two-way valve is connected with the throttle valve in such manner that when the engine is running at low speeds oil is drawn solely from the hot oil sump, but when running at higher speeds is drawn from both sumps or solely from the cold oil sump, depending upon the engine speed. With cold oil and the engine running at idling speed, the pump circulates only the oil contained in the central well and so much other oil as may seep into the well through the perforations. Oil discharged from the bearings drips on to the sloping portions and the major portion thereof runs back into the well, but some drips through the perforations. However, as the oil becomes heated and of lower viscosity, more and more of the oil flows through the perforations instead of flowing into the well. The hydrostatic head outside the well is thus increased and more oil is caused to flow through the perforations into the well to be supplied to the bearings. This continues until the entire body of oil is heated and eventually substantially all of the oil dripping from the bearings showers through the perforations in the sloping portions and is circulated around the cooling tubes and then to the pump.

At higher engine speeds, the pump draws some oil directly from the cold oil sump so that the ratio of oil drawn from the two sumps is subject to car speed.

The oil pan is equipped with tubes extending therethrough for passing air into indirect heat exchange relation with oil in the pan to prevent undue heating of the oil. Preferably, the perforations in the sloping portions are larger near the ends of the pan so that the major portion of the oil is returned to the pan near the ends thereof, thus getting the full benefit of the cooling effect of the tubes.

With this arrangement, a small body of oil is quickly heated to bring it to the proper viscosity for efficient lubrication. The remainder of the oil is gradually circulated by the pump and brought to proper viscosity. Thus oil of proper viscosity is supplied to the bearings almost immediately upon starting of the engine.

Other objects, novel features and advantages of this invention will be apparent from the following specification and accompanying drawing, wherein:

Fig. 1 is a side elevation of an automobile engine equipped with a lubricating system embodying the invention;

Fig. 2 is a vertical section through the oil pan;

Fig. 3 is a plan view of Fig. 2; and

Fig. 4 is a section on the line 4—4 of Fig. 3;

The engine 10 is provided with an oil pan 11 in whch is arranged a partition 12 having sloping portions terminating in a central well 13. Tubes 14 extend transversely through the pan below the partition 12 and serve to flow air into indirect heat exchange relation with oil contained in the pan. Preferably a scoop (not shown) is provided for directing air through these tubes upon forward movement of the automobile. The sloping portions of the partition 12 are perforated, the perforations 15 being of progressively larger diameter from the well to the ends of the pan. Perforations 16 are provided in the wall of the well and these perforations, together with the perforations 18, are of sufficiently small diameter that high viscosity oil will not readily flow through them. A valve casing 17 is connected by a pipe 18 with the inlet of the pump 19. The valve casing is provided with an inlet port 20 communicating with the well or hot oil sump and an inlet port 21 communicating with the cold oil sump. Within the casing is provided a valve 22 adapted to close either inlet port with the other inlet port open. This valve is mounted on a shaft 23, one end of which extends through the casing and carries an arm 24. The arm 24 is connected by a link 25 with an arm 26 attached to the throttle valve 27. The throttle valve is connected by an arm 28 and link 29 with the throttle pedal in the usual manner. The connection between the two valves is such that when the throttle valve is

closed, the inlet 20 is opened and the inlet 21 is closed, the inlet 21 remaining closed while the engine is run at idling or relatively low speeds. As the throttle valve is opened to increase engine speed, the valve 22 moves to partially close the inlet 22 and partially open the inlet 21, this action continuing until the inlet 20 is completely closed and the inlet 21 completely opened at high engine speeds.

Assume that the engine is running at idling speeds with cold oil in the pan and of higher viscosity than required for proper lubrication. The pump 19 draws oil from the well 13 and supplies the same to the bearings, thus reducing the level of oil in the well. Oil from the remainder of the pan will tend to flow into the well, but little if any oil will pass through the perforations 16 due to the small size thereof and the high viscosity of the oil. Oil dripping from the bearings is caught by the partition 12 and until the returned oil is sufficiently heated to be reduced in viscosity, it will flow over the perforations 15 rather than pass through them. However, after a short period of operation, during which substantially only the oil in the well 13 is circulated, the circulated oil becomes sufficiently heated to lower its viscosity and then the oil tends to flow through the perforations 15 rather than down in the well.

The hydrostatic head of oil outside the well is thus increased and more oil tends to flow through the perforations 16 into the well. This continues until the entire body of oil is heated and eventually substantially all the oil dripping from the bearings flows through the perforations 15 into the cold oil sump. By reason of the perforations 15 being larger near the ends of the pan, the major portion of the hot oil dripping from the bearings is returned to the pan near the ends. The returned hot oil circulates around the tubes 14 and is cooled, thus preventing undue heating of the oil and maintaining it at the proper temperature to render it of the desired viscosity. If the engine speed is increased either before or after the oil has been completely circulated, the valve 22 is actuated to permit the pump to draw a portion of oil directly from the cold oil sump, the ratio of oil drawn from the cold oil sump to the oil drawn from the hot oil sump being dependent upon engine speed.

The temperature of the oil in the pan is regulated by the cooling effect of air passing through the tubes 14. The cool air is caused to flow through the tubes by forward movement of the automobile, thus supplying more cooling at high engine speeds than at low engine speeds. Also, at high engine speeds a greater proportion of oil is drawn directly from the cold oil sump than at low engine speed, thus counterbalancing the increased heating effect at the higher engine speeds.

In the lubricating system above described, a small body of oil is quickly heated to bring it to the proper viscosity for efficient lubrication so that the oil of proper viscosity is supplied to the bearings almost immediately upon starting of the engine. The remainder of the oil is gradually circulated through the remainder of the system and heated thereby bringing all of the oil to the desired viscosity. The throttle controlled valve provides for regulation of the oil supply subject to engine speeds and insures full supply of oil from the cold oil sump at high engine speeds when the heating effect is most pronounced and the tendency toward viscosity decrease is likewise most pronounced. Approximately uniform viscosity conditions are thus maintained.

It is of course understood that various modification may be made in the device above described, without in any way departing from the spirit of the invention as defined in the appended claims.

I claim:

1. In an internal combustion engine, an oil pan, a partition in said pan onto which oil drops from the engine bearings, said partition having sloping portions terminating in a central well, perforations in the well portion near the bottom thereof and perforations in the sloping portions, said perforations being sufficiently small to offer high resistance to flow of cold lubricating oil, a pump having its intake communicating both with said well and the chamber formed by said partition with the oil pan, and valve means actuated from the engine throttle for decreasing the ratio between the flow from the well and the flow from the chamber upon increase in engine speed.

2. In an internal combustion engine, an oil pan, a partition in said pan onto which oil drops from the engine bearings, said partition having sloping portions terminating in a central well, perforations in the well portion near the bottom thereof and perforations in the sloping portions of progressively larger diameter from the well to the ends of the pan, said perforations being sufficiently small to offer high resistance to flow of cold lubricating oil, a pump having its intake communicating both with said well and the chamber formed by said partition with the oil pan, and valve means actuated from the engine throttle for decreasing the ratio between the flow from the well and the flow from the chamber upon increase in engine speed.

3. In an internal combustion engine, an oil pan, a partition in said pan onto which oil drops from the engine bearings, said partition having sloping portions terminating in a central well, perforations in the well portion near the bottom thereof and perforations in the sloping portions, said perforations being sufficiently small to offer high resistance to flow of cold lubricating oil, a pump having its intake communicating both with said well and the chamber formed by said partition with the oil pan, valve means actuated from the engine throttle for decreasing the ratio between flow from the well and flow from the chamber upon increase in engine speed, and tubes extending through said chamber for flowing air into indirect heat exchange relation with oil in the chamber.

4. In an internal combustion engine, an oil pan, a partition in said pan onto which oil drops from the engine bearings, said partition having sloping portions terminating in a central well, perforations in the well portion near the bottom thereof and perforations in the sloping portions of progressively larger diameter from the well to the ends of the pan, said perforations being sufficiently small to offer high resistance to flow of cold lubricating oil, a pump having its intake communicating both with said well and the chamber formed by said partition with the oil pan, valve means actuated from the engine throttle for decreasing the ratio between flow from the well and flow from the chamber upon increase in engine speed, and tubes extending

through said chamber for flowing air into indirect heat exchange relation with oil in the chamber.

5. In an internal combustion engine, an oil pan, a partition in said pan onto which oil drops from the engine bearings, said partition having sloping portions terminating in a central well, perforations in the sloping portions of proper size to oppose ready flow therethrough of cold lubricating oil, a pump having its intake communicating both with said well and the chamber formed by said partition with the oil pan, a valve, and means actuated from the engine throttle for decreasing the ratio between the flow from the well and the flow from the chamber upon increase in engine speed.

6. In an internal combustion engine, an oil pan, a partition in said pan onto which oil drops from the engine bearings, said partition having sloping portions terminating in a central well, perforations in the well portion near the bottom thereof and of proper size to oppose ready flow therethrough of cold lubricating oil, perforations in the sloping portions of proper size to oppose ready flow therethrough of cold lubricating oil and being of progressively increasing size from the well toward the ends of the pan, a pump having its intake communicating both with said well and the chamber formed by said partition with the oil pan, and valve means actuated from the engine throttle for decreasing the ratio between the flow from the well and the flow from the chamber upon increase in engine speed.

7. In an internal combustion engine, an oil pan, a partition in said pan onto which oil drops from the engine bearings, said partition having sloping portions terminating in a central well, perforations in the well portion near the bottom thereof and of proper size to oppose ready flow therethrough of cold lubricating oil, perforations in the sloping portions of proper size to oppose ready flow therethrough of cold lubricating oil and being of progressively increasing size from the well toward the ends of the pan, a pump having its intake communicating both with said well and the chamber formed by said partition with the oil pan, valve means actuated from the engine throttle for decreasing the ratio between flow from the well and flow from the chamber upon increase in engine speed, and tubes extending through said chamber for flowing air into indirect heat exchange relation with oil in said chamber.

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