

WHAT LUBRICATION MEANS TO THE LIFE OF MOTOR CARS

The Third of a Series of Articles on the Care of Automobiles.

By WALTER SHIELDS.

If every moving part of the automobile were kept perfectly lubricated all the time the machine would never wear out. The achievement of perpetual perfect lubrication would mean that all moving parts were continually kept from contact with any other part by a thin film of oil. While this is a theoretical idea it is scarcely possible of realization with present types of lubricating systems. It should be the aim of every car owner to approximate as nearly as possible this perfection of lubrication, and to do this constant care directed by full understanding of the needs of the situation is necessary.

They test for specific gravity, for viscosity, for flowing quality, for ability to withstand heat and cold, etc.

There are two tests which the individual owner may make in regard to the oil he is using and by their result he will be able to get a very fair idea of the value of the lubricant under consideration. One of these is the emulsion test and the other is the water test. The emulsion test is used to detect certain compounds, such as vegetable oils or substances, which have been used in treating the oil. In this test a small quantity of oil is placed in a bottle and as much water is added. The whole is vigorously shaken until the emulsion test is complete. The bottle is then

lubrication means inevitable wear. It is cheaper to buy good oil and use it plentifully than to buy new parts and pay repair bills. In addition the car that is well lubricated runs smoothly and quietly, giving greater comfort to the driver than the friction riven vehicle which goes about the highways crying for the oil it never gets. To obtain a car as nearly perfectly lubricated as possible the oil ought to be changed every 500 miles. Every 400 miles would be better and every 300 still better, though we fear to test the patience of the average car owner with this latter suggestion.

Even the best oils undergo decomposition during their service in the engine. The decomposition in contact with the pistons, the temperature of which may run as high as 400 degrees Fahrenheit, with the bearings at 200 degrees and with the cylinder walls at somewhat over 300 degrees. This heat decomposes some of the oil and causes sediment to form. The longer the oil remains in the crank case the more sediment there is and the more actual lubrication there is. The letter of the oil is lessened, but even the best oils suffer from sedimentation. The moral is, change the oil often before the unavoidable sediment has a chance to cut down its lubricating qualities.

Aside from the decomposition due to heat the oil also is expected to do its own work efficiently in the presence of water. In some engines a considerable quantity of water finds its way into the crank case as a result of the products of combustion working their way down past the piston rings. This is mainly a cold weather trouble. This water forms an emulsion with the oil that has been used for some time. The quality of the lubricant will not prevent this after a while, letting it settle to see what proportion of water is present.

The editor of a prominent magazine recently said to me that his engine had not needed any oil for 500 miles, and that in fact, when he came to test the oil level after that amount of running he had to drain off some lubricant to bring the level even with the petcocks. This is nothing more than a case of high level induced by the addition of water to the crank case oil. Some of our multi-cylinder engines are particularly particular in this matter of water in the crank case. With lubrication systems none too perfect to begin with, that additional trouble makes it a hard matter to keep the various parts getting the oil they need.

Coming down to definite directions for lubrication: every 500 miles, as we mentioned before, the whole lubricating system of the engine should be drained and flushed with kerosene to remove any sediment that may remain. The strainer should be removed, if possible, and cleaned. This operation must be done conscientiously every 500 miles. Do not skip one of these periodical attentions, promising yourself to make it up later, for during the longer interval of running with lower lubricating efficiency, the engine may do itself irreparable harm.

Aside from the lubrication of the engine interior there are exterior moving parts which require attention. The generator (if the car has one) should have its armature bearings oiled at short intervals. The maker of the generator usually gives instructions for this and provides means for getting oil to the bearings. If there is an oil well a good rule would be to fill it every time that the engine is cared for. If the car has a magneto its armature bearings should be oiled, and in most makes an oil well is provided for this purpose. If a battery distributor is used the vertical shaft

What fate deserves to overtake the man whose car has, let us say, a disk clutch running in oil and who expects the part to continue efficient service indefinitely without giving it periodic lubrication? To make things worse, the average owner drives with his foot on the clutch pedal all the time, causing a continuous, if slight, slippage. In this way the metal plates generate heat, which thins the oil, so that the plates get little if any real lubrication. Disk clutches running in oil should have the lubricant renewed every 1,000 miles at the longest. As with the engine, the oil in the clutch is renewed the better, especially if the driver is not an expert in operation. The drained clutch case should be flushed with kerosene to remove any gummy deposit that may have collected. Fresh cylinder oil or a mixture of cylinder oil and kerosene should be used. In winter it is best to use the mixture and in summer the straight oil is preferable.

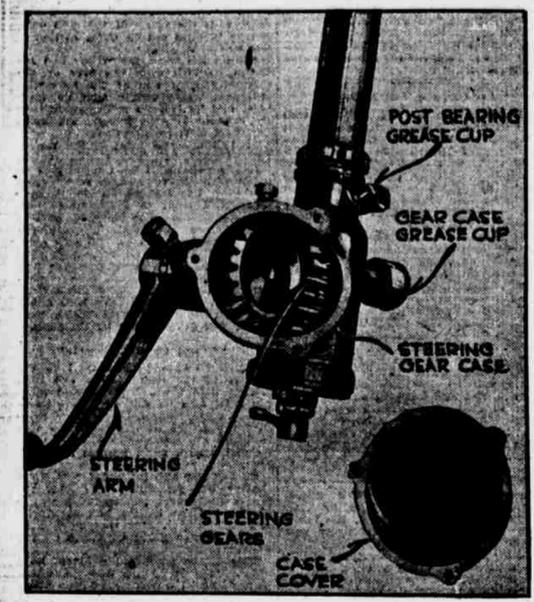
When the lubrication of the clutch plates themselves, which of course applies to only one type of clutch, the other moving parts in this assembly should be given reasonable attention. See to it that the oil gets to the other working parts of the clutch. In some cars a special grease cup is provided for the thrust bearing, but in many this cup is placed at an inaccessible location, while in others no cup at all is supplied.

How many owners see it that the universal joints coupling the propeller shaft with the rear axle and the transmission, or transmission and clutch in some cars, are given attention more than twice a year? These joints turn at engine speed, they move up and down while revolving. Inevitably these joints get hot, if not at once they get hot boards and feel one of them after the car has been running twenty-five miles. Obviously the more efficient the lubrication given these parts the less the heat and the less the wear. Since these joints are in constant motion they should be kept continually supplied with lubricant, and renewals of oil at 500 mile intervals will save the owner a great amount of trouble. Graphite grease or ordinary flake graphite should be used in preference to cup grease. Oil will leak out of the best built universal cover, and moreover, the centrifugal force always present in this part tends to throw the oil to one side and starve the other. The treatment indicated for the universalis is a thorough cleansing with kerosene and a reworking with the graphite lubricant.

Then we must not forget the transmission and rear axle, something that owners very commonly do. These contain gears and bearings for shafts. Gears to operate quietly must always have their teeth covered with oil. While these gears are not subjected to the intense operation of the engine parts and consequently do not require the same close attention, nevertheless they should not be entirely neglected, which seems to be the too common practice. Both the transmission and rear axle should be drained, flushed with kerosene and refilled to the level plug at least every 1,500 miles, though in winter a medium cylinder oil should be used every 500 miles, while a 2,000 mile interval is safe enough. In summer time a semi-fluid oil or a heavy cylinder oil should be used at this location, which in winter a medium cylinder oil is most satisfactory. This is done because the oil tends to thicken with cold, while heat has just the opposite effect.

The wheel bearings should be repacked with cup grease or graphite grease every 2,000 miles and the steering gear case must be cleaned and repacked at the same intervals. Brake connections should be oiled every 500 miles, while the steering pivots and the remainder of the steering linkage need attention every day. The grease cups at the spring ends should be turned around, and especially in cantilever construction, the lubrication of the futerum should be watched continually.

A paraphrase of the old saying that



Lower portion of the steering post, showing the gear case with cover removed. This case should be flushed with kerosene, and after a thorough cleaning in this way should be repacked with cup grease, graphite or graphite grease.

allowed to stand over night. If the oil is a good product it will separate entirely from the water, which will drop to the bottom. There usually is a fine line of demarcation between the liquids. Pour oil instead of separating from the water will purify form an emulsion. Cloudy water will be at the bottom of the bottle and above it will be a milky mass, with a portion of the oil at the top. This action indicates that the oil contains vegetable or animal oils or that acid has been used in the process of manufacture. In the heat test a small quantity of oil is heated in a flask or other glass vessel. The oil will be thoroughly

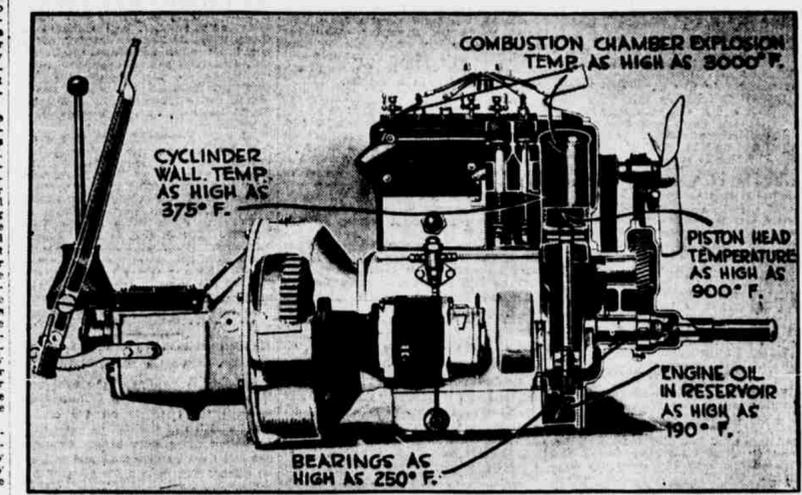
Complete understanding of automobile lubrication is not a simple matter because of the many and diverse factors that must be taken into consideration. The moving parts operate at widely different speeds and under various conditions of temperature and load. The car owner cannot take a single grade of oil and use it for all parts, nor by mastering thoroughly the lubrication needs of the engine does he necessarily understand what are the lubrication needs of the rest of the mechanism. The average car owner needs a complete course in the subject of lubrication. The more thoroughly he masters the subject and the more conscientiously he applies his knowledge the longer his car will live and be free from serious troubles. Systematic lubrication is the basis of successful automobile maintenance. I know a number of owners who have had their vehicles in service for four years or more without any serious trouble. They have the engine dismantled and all because lubrication was properly carried out.

A diversity of need exists among automobile engines and their accessories for lubricants. The power plants differ radically in design and operation, and what may be good oil for one engine will not serve as well when placed in another. There are a number of vitally important points to be considered in the selection of an oil, and while it is possible for the individual car owner to know some of these, he cannot, unless he has made a special study of lubricants, work out the entire problem and intelligently select a certain oil to meet a given set of conditions. Under the circumstances the choice of lubricants must be left to some one else, and no better authority could be found than the manufacturer of the car, in which the oil is to be used. He is vitally interested in having the vehicle receive the lubrication that will give it maximum efficiency. When the manufacturer advises the use of a certain grade and quality of oil it is because he has discovered through exhaustive and costly experiments that that particular lubricant will give the best results under the conditions of temperature, speed, clearances, etc., which exist in his engine.

Among the numerous conditions to be considered in the selection of a lubricant one of the most important is that of temperature. All engine parts do not operate at the same temperature, and identical parts in different engines frequently vary greatly in this respect. Also the design of the lubricating system must be considered, the speed characteristics of the engine, the clearances, and the bearing loads. We need not go into details in regard to these matters, for even by knowing them the individual car owner could not make an intelligent selection without knowing the characteristics which are needed to meet the conditions existing in the engine.

Complete tests cannot be made by the layman, but there are one or two simple experiments which the car owner may carry out, by means of which he may discover certain characteristics in the lubricants he may be using. Again there are a number of observations that the owner should make which will add considerably to the life of the engine and contribute much to the pocketbook of the operator.

Oil refineries invariably have as part of their equipment elaborate laboratories where many tests are conducted to determine the qualities and characteristics of their lubricants. In the final analysis, however, the only way of actually determining the best oil to use is by a series of mechanical and temperature conditions is to try different kinds of oil. The oil that makes these tests in the laboratory is a guide to help them in the final determination of quality for service. These mechanical tests may run as high as forty car a single grade of oil,



Engine oil must withstand high heat for long periods, and under this high heat even the best oils are decomposed, causing sedimentation. This sediment should be removed every 500 miles by draining and flushing the whole oiling system. The draining also removes any water which may have been forced down past the pistons.

heated ten minutes after vapor begins to rise from the surface. Take some of the heated oil and allow it to cool and then compare its color with that of the original oil before heating. If the oil is of good quality the heated oil will appear slightly darker, but still clear, while a poor oil will be cloudy and may even be black and opaque, like India ink.

These tests, be it understood, apply only to fresh, unused oils. Even the best of oil undergoes great changes in use and will probably emulsify and otherwise misconduct itself if it is tested after it has been used in the engine. There are two broad rules which ought to be kept in mind by all motor car owners in regard to lubrication. The first is to lubricate the parts according to the speed at which they move and the second is to lubricate them in accordance with their operating temperature. A part which normally runs hotter than another requires more oil and likewise requires more frequent replenishing of the supply. The faster a part moves the more oil it should get and the greater the speed the more oil it should get. It is always supplied.

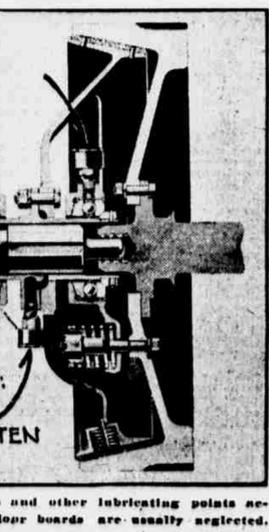
Let us take the moving part of the engine as illustration. It is necessary to keep in mind the fact that the oil is too low the pistons and bearings may run dry and burn. This copious lubrication is necessary for the reason that the shafts in the bearings operate at high speed and get hot, which condition also holds for the pistons. This is so obvious that every car owner who has his engine fairly well lubricated, if he fails in this disaster follows immediately. But there are other parts which need lubrication at regular intervals, parts which operate at high speeds and are hot. There are the universals, transmission and rear axle gears, etc. All of them are in constant motion, and motion without good lubrication means friction, which in turn spells wear.

operating the distributor arm should be given its share of lubricant every 500 miles of running, or every 200 miles if the owner wants to be quite safe. Another exterior moving part usually neglected is the cooling fan shaft, which operates at high speed and should have attention every few days.

The clutch is another part of the mechanism that receives scant attention from the average owner. There are a number of different types of clutches, but the abuse that they get from owners is of a common variety.

"all roads lead to Rome" may be effectively applied to the operation of a motor vehicle, for if we say that all mechanical troubles in the modern car show a plain trail back to lubrication we shall not be oversteating the case. Given perfect lubrication and we should have the immortal car, but even lacking perfection, the motorist who will give his vehicle the best lubrication that can be achieved with present systems will add years to its life, while gaining satisfaction from its smooth running and flexible operation.

Clutch Bearings: Oiling Places Usually Forgotten



The various clutch bearings and other lubricating points accessible by removing the front floor boards are usually neglected.

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