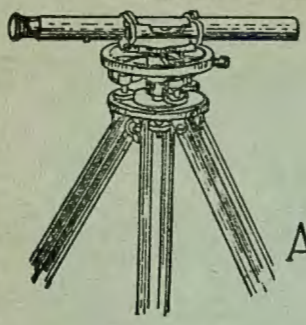

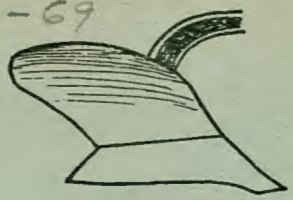

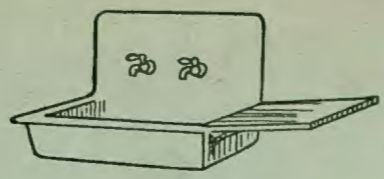

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CHARACTERISTICS OF TRACTOR FUELS

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When the first tractors were built, there was no question as to the fuel to be used. Gasoline was accepted as a matter of course. The rapid increase in use of the internal combustion engine required the production of large amounts of gasoline with corresponding amounts of kerosene. The resulting low price of kerosene influenced many to try it as tractor fuel. At present there are other petroleum fuels (fuel oil, distillate, furnace oil, tractor fuel), most of them heavier than kerosene, which are used in tractors with varying success.

All of these fuels are known as hydrocarbons, that is, they are made up almost entirely of hydrogen and carbon and are obtained from crude oil by certain refining processes. Originally the process consisted of heating the crude oil and condensing the vapors. The liquid thus collected through a fairly low range of temperatures was known as straight-run gasoline, while from the next higher range of temperatures kerosene was obtained. The liquids heavier than kerosene required still higher temperatures in the refining process. It was later discovered that by heating some of the heavier liquids under pressure, the heavier molecules would be broken up or "cracked" into lighter ones which with further refining make up a product resembling straight-run gasoline. Here, then, we have several fuels all obtained from the original hydro-carbon crude oil but which as motor fuels have rather different characteristics. Because of these varying characteristics it is necessary to use slightly different methods with the different fuels if good results are to be obtained.

Heat Requirements for Vaporization

Any liquid which is to be used as fuel in an internal combustion engine must be vaporized and mixed with the proper amount of air. In general the carburetors on engines using gasoline are the same as those which use the heavier fuels. Originally gasoline was produced from crude oil at comparatively low temperatures, so when this gasoline was used as fuel very little heat was needed to vaporize it for proper mixing with air. The heavier fuels, which necessitated higher temperatures in their production, require the application of more heat for proper carburetion. Lack of the necessary heat will result in unvaporized fuel entering the combustion chamber. Much of the fuel, then, will not be burned but will pass down between the piston and cylinder wall diluting the crankcase oil. The operator must use the necessary care to prevent such a condition. Because the heavier fuels can be purchased at a lower price, many are led to use them. Which fuel to use is a problem to be decided by the owner himself after taking into consideration the conditions under which the tractor is to operate and some of the characteristics of the fuels.

Heat Units in Gasoline and Heavy Fuels Compared

Gasoline is vaporized more readily than the heavier fuels so can be used to better advantage in a greater variety of working conditions. General farm operations involve such widely varying load conditions that many prefer to use gasoline for all work rather than take the precautions necessary for the use of other fuel. Because of its greater volatility gasoline will burn more cleanly with less dilution and a cooler engine. There are other considerations, however. Gasoline contains a greater number of heat units per pound than do the heavier fuels. But there are are more pounds to the gallon of the heavier fuel than there are in gasoline, and as fuel is generally purchased by volume the advantage is in favor of the heavier fuels. Besides the price per gallon is higher for gasoline. About the same number of pounds of either fuel is consumed per hour with the same load, so the operator must decide whether the advantages of gasoline are worth the price difference. As many operators seem to favor gasoline as fuel, some manufacturers are building special high compression engines especially for its use. With such engines tests show about the same number of horse power hours per gallon of gasoline as the so-called two-fuel tractors will develop from heavier fuel.

Heat Control for Proper Carburetion

The lower price of kerosene has caused many operators to use it as tractor fuel. Higher temperature of the water in the cooling system is necessary with this fuel to prevent condensation of the vaporized fuel as it enters the combustion chamber and strikes the cylinder walls. The water, especially in the water jacket itself, should be kept around 200° F. This is made possible by the use of thermostats, shutters over the radiators, and motor meters to inform the operator as to the temperature conditions. In addition to the higher engine temperatures it is necessary to pass more of the exhaust heat around the intake manifold so that the heavier fuel may be properly vaporized. Without this, carburetion difficulties, as already mentioned, will be encountered. Steady, heavy work makes it possible to maintain working conditions such that the heavier fuel may be used to good advantage while light or intermittent loads will make such conditions hard to maintain. Kerosene has rather poor anti-knock qualities, making necessary some arrangement for overcoming the "pinging" which occurs. Because kerosene does not vaporize readily, it is necessary to use gasoline to start the engine. The engine should be well warmed before attempting to run it on the heavier fuel. Even when using gasoline many operators do not allow sufficient time for the proper warming of the engine before applying the load. The excessively rich mixture required to keep the engine operating under such conditions is very apt to cause excessive wear.

Other heavy oils, variously called fuel oil, furnace oil, distillate, etc., usually require higher temperatures for their complete vaporization than does kerosene, that is, their end point is usually higher. This means that still more care may be necessary in the application of heat to properly carburet them. As yet there are no definite specifications which may be applied to such fuels. They may be bought under certain specifications but the user of small quantities is not apt to buy under such conditions; hence, lack of uniformity in the fuel purchased is apt to occur from time to time. One lot may do very well and the next cause much trouble. The price may be enough lower, however, to justify the use.

Some of the oil companies have paid special attention to the demand for a better heavy fuel for tractors and have available what some designate as tractor fuel, refined for the definite purpose and well liked by tractor operators. As yet there are no general specifications covering this fuel. It is cleaner than some of the heavy fuels, has a low sulphur content and a lower end point.

One of the tests of a fuel is the determination of the distillation curve. First the initial boiling point is found. This is the temperature at which the first drop is recovered when the fuel is vaporized. From there on the temperatures are taken at which each succeeding 10 per cent of the fuel is recovered when distilled, and finally the "end point" which is the temperature at which the last drop is recovered. Gasolines vary but in general have an initial point around 100° F. and an end point not much over 400° F. Kerosene has an initial point around 350° F. and an end point around 530° F. Some of the heavy fuels which might be considered for use in a tractor have an initial point as high as 400° F. with an end point of about 600° F. A fuel with such points is considered by some companies as the heaviest that should be used in the so-called two-fuel tractor.

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