MINES BRANCH

DEPARTMENT OF MINES

OTTAWA, CANADA

A STORY OF GASOLINE

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A STORY OF GASOLINE *

By P. V. Rosewarne **

GASOLINE, YESTERDAY AND TODAY.

The story of gasoline runs more like a fairy tale than a prosaic recital of past events. In the beginning, it is the story of a substance that caused many dangerous and fatal fires when the kerosene lamp was the chief source of illumination throughout the country; a material that forced large refining losses upon the manufacturer. It was a by-product without use or value and dangerous to handle. There are men living today who will remember the time when refiners actually paid money to have gasoline drawn away to a safe distance from the plant, and set on fire. But now, all that is changed. Oil refiners strive nightly to squeeze the greatest possible number of gallons of gasoline from a barrel of crude oil. Enormous fortunes have been piled up due to cheaper and more economical processes having been

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developed for its production. It has become the very Atlas upon whose broad shoulders is borne the world of the entire petroleum industry, with all its many ramifications. And this magical change has been brought about because of the contemporary development and perfection of that type of the internal combustion engine commonly referred to as the "gasoline engine".

THE GASOLINE ENGINE.

The gasoline engine has made a place for itself in modern life by sheer merit. It is used on land for our motor cars, on water for all classes of craft, from the "Flying Bathtub" with its outboard motor, to the stately pleasure yacht, or the more humble fishing dory, and finally it is used in the air in practically all type of aircraft. This wide adaption of the gasoline engine to the demands of modern transportation is due primarily to the fact that its fuel, gasoline, is in a highly concentrated form and enables it to develop reliable and easily controlled power in small units at comparatively low cost.

A DEFINITION OF GASOLINE.

Gasoline itself has been described as a refined distillate of crude petroleum, or a liquid condensate from natural gas, of such a composition that when mixed with air in a carburetor it makes a suitable fuel for internal combustion engines. It is to be noticed in the above definition that no significant distinction is drawn between gasoline produced from crude petroleum and that produced from natural gas. Gasoline, as just defined, may be sub-divided into three classes dependent upon the process by which it has been produced. These three classes are commonly called "straight-run" gasoline, "cracked" gasoline and "natural" gasoline. Each of these classes may vary widely in quality, but each as a rule maintains its

own peculiar characteristics.

STRAIGHT-RUN GASOLINE.

Straight-run gasoline is produced by simply heating crude petroleum in a tank, or still, and condensing the vapours that distill over. The heating may be discontinued at any time, of couse, or, what amounts to the same thing as far as the product is concerned, the distillate may be run into a tank as long as desired and then it may be diverted to another tank. The longer the still is heated, the higher becomes the temperature of the oil (that is, within limits), and the higher is the boiling point of the vapours being condensed.

CRACKED GASOLINE.

Cracked gasoline is produced by breaking up, or "cracking" high-boiling petroleum oils so that a low-boiling product is formed. This is accomplished by heat and pressure. In a simple installation, oils that have been cracked by this method are distilled again exactly as if the refiner were producing straight-run gasoline from a crude oil. A certain proportion of cracked gasoline is then obtained.

NATURAL GASOLINE.

Natural gasoline is obtained from some natural gases, usually by compression and refrigeration. It may also be obtained by washing a suitable natural gas with oil and then distilling off the low-boiling product that has been absorbed by the heavier oil. Natural gasoline is usually more volatile than straight-run or cracked gasoline.

REFINING GASOLINE.

The crude gasoline that has been separated from crude oil or natural gas by the methods just described is rarely or never ready for sale without being further refined and purified. It is usually washed

with sulphuric acid of suitable concentration, with water, and with a solution of sodium hydroxide and lead oxide. These chemicals remove practically all of the compounds that cause the gasoline to corrode metals, to give an unpleasant odour and to darken in colour on exposure to light and air. In some cases it has been found that treatment with a specially prepared and selected clay will give as good a product as chemical treatment and at less cost.

BLENDED GASOLINE.

It was soon found that while a limited number of crude oils produced a satisfactory gasoline on simple distillation and treatment, by far the greater number produced a gasoline deficient in one or more respects. By skillful selection and blending of several gasolines, the deficiency in any particular product can be supplied and a poor gasoline made into a good one. By proper blending the refiner is also able to put upon the market a far more uniform grade of gasoline than he could produce without it.

ANTI-KNOCK GASOLINES.

The final judge of the quality of gasoline is the gasoline engine, and its owner. And this fact led to an interesting development. The engine manufacturer, in a constant effort to improve the efficiency of his product, reached a point where his engine would not operate satisfactorily on the gasoline available. Investigation of the fuel showed that the addition of a very small amount of tetra-ethyl lead permitted the use of a higher compression ratio in the engine. Later it was shown that some of the material formerly removed by the sulphuric acid treatment also gave good results. This was the beginning of our present day anti-knock fuels. Some of them are more odorous than formerly, it is true, but it is also true that they

give just as good results in low compression engines as ordinary gasolines and they give more power per gallon in high compression engines in which ordinary gasolines could not be used at all without serious knocking. Tetra-ethyl lead is a dangerous poison in the concentrated form, but exhaustive investigation has so far failed to indicate any harmful effects when it is used as a fuel in the low concentrations that are feasible for that purpose. In the United States, the sale of gasoline containing tetra-ethyl lead is governed by legislative restrictions in many states. One of these specifies that such gasoline must be coloured red before being offered for sale. This apparently started a fad for prettily colored gasolines, so that a lady driver may now not only choose her car to harmonize with her gown, but may also select her gasoline by the same standard.

PRECAUTIONS IN HANDLING.

As was said in the beginning, gasoline is a dangerous substance when handled carelessly. Producers and refiners have learned by sad experience some things that must not be done and some things that must be done if they are to avoid accidents. Those who handle it only occasionally are not always so well versed in the precautions that have been found desirable, and it may not be amiss to mention some of them here.

DANGER OF FIRE.

Gasoline should not be kept around the house except when necessary and in those cases it should be kept in a distinctive metal container so that it may not be mistaken for kerosene. For instance, the can may be painted red. If gasoline is used for cleaning, it should not be used near

a fire or open flame of any sort nor should it be used in a closed room. These rules are to avoid the obvious danger of the vapours catching fire. A more subtle danger of fire is due to a peculiar characteristic of gasoline itself, whereby a static charge of electricity is built up by internal friction within the fluid to such a point that an electric spark occurs. The writer believes that this spark of static electricity is the chief cause of a great many mysterious gasoline fires. Careful tank wagon drivers are particular to see that a metal chain hangs from the chassis of the truck and actually touches the ground. This chain provides a path so that the electric charge can leak away to the earth as fast as it is formed, and therefore no spark can occur with disastrous results. When pouring gasoline from a container into the tank of an automobile, care should be taken that the metal container is in actual contact with the metal parts of the car. If a funnel is used the funnel should not be raised from the opening of the tank until all the gasoline has been poured in, or as much of it as is desired. Likewise, the metal nozzle of the filling station pump should be kept in contact with the tank opening. If a strainer is needed, a metal screen is safer than chamois leather, and equally efficient. If gasoline is being used for cleaning purposes, it should be in a metal pan on the ground in the open air, or on a table or bench that is on the ground. If the work can be done in the morning while things are still damp with the dew, so much the better. If not, equally good protection is afforded by wetting the bench with water, because wet wood is a much better conductor of electricity than dry wood.

DANGER OF CARBON MONOXIDE POISONING:

In addition to the danger of fire, every motor-car driver should be alert to the danger of carbon monoxide gas. Carbon monoxide gas is slightly

lighter than air, and is absolutely tasteless, colorless and odorless. When inhaled it reacts with the blood in such a way that fresh air can only with difficulty performs its usual function. Air containing only 2/10ths of one percent of carbon monoxide is dangerous when inhaled for even a short time. No symptoms of danger are felt except a feeling of tightness across the forehead, and perhaps a slight headache, before the victim becomes suddenly unconscious. When it is understood that the exhaust gas of an ordinary automobile engine contains about two per cent of carbon monoxide when the carburetor is properly adjusted, and about thirteen percent when the adjustment permits of too rich a mixture -- as when the choke is pulled out -- the danger of permitting an engine to run for even a short time in a closed garage is more readily appreciated. Basement garages would appear to be especially dangerous unless designed and built most carefully. Otherwise, a certain proportion of the gas filters through the floors into the dwelling. As a precaution against the gas, the garage doors should be open before the engine is started; the choke should be used only when necessary; the carburetor should be adjusted to give the most miles per gallon; the ignition system should be in good order so that the engine fires every charge; all exhaust connections should be tight, especially when an exhaust heater is used in a closed car; and the engine should be switched off whenever possible.

THE SELECTION OF SUITABLE FUEL.

Most motor car drivers are faced with the problem of making a choice between standard grade gasoline, and paying two or three cents per gallon more for premium gasoline. This problem is largely a personal one and no general recommendation can be made that would be satisfactory under all conditions. It is believed that for general use in pleasure cars the standard grades will meet all necessary requirements in warm weather, and

that in colder weather, the premium grades will be found more desirable. For delivery cars and trucks, the standard grades will likely give satisfaction all the year round. When a high compression engine is used, or when special conditions require it, the premium gasolines will probably be bought as a matter of course. As between the various brands, the engine itself indicates its preference and the owner only has to note its reactions in order to make an intelligent selection.

MINES BRANCH GASOLINE SURVEY.

For the past six years, the Fuel Testing Division of the Mines Branch has made an annual survey of the gasoline that is being sold on the Canadian market. Samples were collected from thirteen of the more important cities and were analyzed in the laboratories at Ottawa. The results have shown that the average gasoline sold was slightly more volatile than that sold in the United States at the same time, and that it was of good quality, only a small percentage of the samples received having been of really low grade. Those interested in the subject may obtain a copy of the current report by addressing a request to the Director of the Mines Branch, Ottawa, Ontario.

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