PETROLEUM'S WHITE KNIGHT

John B. Tuttle

"Can you help us make Tom Collins three feet high?" Bizarre as the question sounded, it was but another of the telephone inquiries about paraffin regularly made to our Engineering Division. Far from facetious, it came from a well known creator of window displays. Commissioned to execute giant drinks in characteristic glasses for bar advertisement, the Tom Collins lemon slice was moulded from paraffin. Easily dyed pale yellow, its glossy surface was pleasingly realistic and a Park Avenue hotel bar received the first unit.

Afternoon sun caused the hasty plea for help. The paraffin had behaved characteristically - the lemon slice melted and ran down the glass. Candle making experience offered the solution. Higher melting paraffin blended with a common candle ingredient - stearic acid, yielded as realistic a giant lemon slice with excellent ability to withstand the sun.

Dozens of similarly varied and unusual applications typify paraffin, one of petroleum's little known but widely used products. To most it is simply - "The stuff on top of jelly glasses" - or "Your know, - what they make waxed paper with." While both these consume large quantities of paraffin, they hardly indicate the many important contributions it makes to our oormal daily life. War also makes widespread use of paraffin and since Pearl Harbor it has played an increasingly important role in many military projects.

Paraffin has no history in antiquity. First manufactured from petroleum at Corry, Pennsylvania in 1867, it entered a world possessed

of few inexpensive waxy materials. Most waxes were rare and not easily obtained. Candles were made from tallow, beeswax or such vegetable waxes as bayberry painstakingly separated from the small, hand-harvested wild berries. The advent of paraffin first offered an inexpensive, readily available base for candle production and it has continued so up to the present.

When we consider the changes in our lives made possible by petroleum, the automobile, the airplane, the Diesel engine and the oil burner come first to mind. We are seldom aware that following its use in candles, paraffin made possible many developments whose effect on our mode of living has been similarly far reaching.

Bread was traditionally a home prepared food and its sale seldom reached beyond a community due to its perishability. Paraffin-coated paper protected it and permitted the evolution of today's large, central bakeries serving communities a hundred miles distant. With this came a new standard of uniformity and excellence, making home baking the exception rather than the rule.

Cookies and crackers followed soon afterward out of the cracker barrel into individual consumer packs, lined or wrapped with paraffin-coated paper. Confectioners realized their dreams of mass distribution of even such perishables as sugar-coated popcorn. Cracker Jack soon became synonymous with a ball game or the circus, its freshness guarded by a paraffin-coated inner box.

Paraffin contined to change our food habits. Prepared cereals, similarly protected, outmoded cooked breakfast foods. We have become a

nation whose morning Wheaties or Crunchies are second in universality only to breakfast fruit juice. With cellophane came visibility in wrapping and frozen foods. Even the most perishable of fruits, vegetables, meats, fish and poultry were selected at the peak of their freshness, quick frozen and, weeks or months later, eaten with original flavor and freshness intact. Paraffin continued to help. Cellophane owes its moisture vapor resistance to a lacquer coating with this petroleum wax as an essential ingredient.

Among the foods, milk is one of the latest to benefit from this petroleum wonderworker. Waxed paper containers have become the standard for public individual dispensing and in most store sales. Postwar, with wood pulp readily available, paraffin may still forever the clink and rattle of morning milk bottles.

With this established utility in every day life, it is not surprising that paraffin early went to war. Sooner, in fact than some other petroleum products for the world has long depended on the United States for much of its supply. Normally our exports approach 200,000,000 pounds annually, over one-third of our production. This source became even more strategic after Pearl Harbor when the East Indies and Borneo, large paraffin producing areas, fell to the Japanese.

Also, the global aspects of World War II made preservative packaging a must. Practically all the material of mechanized war had to be protected from the ravages of climate ranging from tropic heat and humidity to arctic cold. The worth of both manufacturing man hours and transportation cost is a loss if the item is not usable when needed.

All the well known treated wrappings were required in tremendous volume and many new combinations were evolved to meet anticipated travel and storage conditions.

To meet this unprecedented demand the domestic petroleum industry has practically doubled its paraffin production, last year's amazing total being approximately 800,000,000 pounds. In step with this, Standard Oil of New Jersey, one of the major producers of paraffin, has accounted for its part of the increase at Bayonne and Baton Rouge, both refineries having exceeded all previous production.

As in every day life, coated and impregnated paper is one of war's largest uses of paraffin. Data on consumption, apart from civilian demand, are not readily available. WPB's estimate for 1944 was 1.2 billion pounds of treated paper consumed while the Waterproof Paper Association compute that each soldier entering combat requires 94 pounds of waterproofed paper. Packaged items cover the gamut of accoutrements of modern warfare from the tiniest instrument part to a huge mechanical unit such as a complete power generator. Some 7000 different items are shipped for troop maintenance apart from heir weapons and most of these must be protected with some treated paper.

Of this multitude, food for all corners of the world has had to surmount seemingly impossible packaging obstacles. One of the most difficult has been the feeding of troops unable to be supplied from organized mess. Paraffin has proven a highly adaptable packaging adjunct. Perhaps the best known are the alphabetic series of rations whose designations so frequently appear in war commentaries such as those of

the late Ernie Pyle. Illustrated on page are the contents of "K" ration with the "10-in-1" ration package as a background.

"K" ration is assembled in three menus - breakfast, dinner and supper. Each contains a separate hermetically sealed can of a protein food such as ham and eggs, processed cheese or canned pork. Included are biscuits, a fruit or chocolate bar, chewing gum, cigarettes, a beverage powder such as citrus juice dehydrated, bouillon extract or coffee and a wooden spoon. All the items other than the can and cigarettes, are sealed into a transparent film bag protected and sealed with a wax containing coating.

The bag, the can and the cigarettes are then assembled in a carton similar in size and shape to the familiar Cracker Jack box. This filled box is completely dipped in molten wax. Paraffin is the coating almost universally used, modified to render it ductile at low temperatures. Excellent sealing power combines with low cost and abundance to make it an ideal preservative medium.

"Ten-in-1" ration is a larger unit intended to supply ten men for one day under the contingencies of mountains, desert or jungle. Capable of being easily divided in halves for groups of five, it provides three well balanced daily meals. All items may be eaten uncooked when necessary and the entire ration weight of 45 pounds is convenient for pack-board or pack-saddle.

Here again paraffin, blended for low temperature ductility is used as the protective coating. The entire box is twice deipped in molten wax after assembly and sealing. The first dip is primarily to penetrate some 50% of the boxboard. An interval between dips partially hardens this coating so that the wax from the second dip is a moisture resistant surface layer.

With food provided, combat morale can next best be supported by an approximation of satisfactory habitation. Light and heat are paramount in such considerations. While all the rations are ready to eat as they come from the package, many components may be improved by heating and hot water for coffee or cocoa is always cheering under combat conditions. Modern Packaging, discussing this development, states that Quartermaster's earliest specification was "a small fuel unit that will boil a pint of coffee in a foxhole in a snowstorm." The Emergency Fluid Cooker and the Fuel Tablet, illustrated on page resulted from this development and paraffin made still another contribution to the comfort and good health of our troops.

These field heating units consist of a mixture of fine wood flour and refined paraffin. This is poured molten into a specially designed carton about two inches on a side and solidified. One end of the carton is scored for easy tearing off, leaving the torn edges as wicks. These light easily and burn long enough to ignite the top surface of the block. The wood flour acts as an all-over wick permitting the whole block to blaze, providing a hot flame and rapid delivery of heat. The composition of the different types is essentially the same, the variation being in size. The small Fuel Tablet is for heating the

"K" ration can while the larger blocks can be used with the "10-in-1" ration and even for space heating when covered by a can or a shovel blade.

All the unique properties of paraffin combine to make this achievement possible. The heating units are imperishable, require no elaborate protective packaging and can be carried by a soldier without danger of personal harm or deterioration. The heating units are absolutely waterproof and will burn even after extended submersion, suiting them for jungle and tropic use. Above all, they are easily made, the raw material is immediately available thanks to the oil industry, and the cost so slight that every soldier can have them.

For light, Quartermaster has developed what is called "the flat or foxhole candle." Realizing the advantages of paraffin candles as illuminants under field conditions, this design avoids some of the disadvantages of conventional styles. The ordinary household or plumber's candle becomes badly bent when carried in warm climates, breaks readily in cold weather, and when used must be set up with care. Exposed to wind and draft, it burns poorly and if it tips over may burn clothing or other objects. All such limitations were considered in designing "the foxhole" candle along with examination of captured Nazi equipment which included such items.

The flat candle is made by pouring paraffin into a seamless pressed steel shell, about two inches in diameter and one-half inch high, with a wick in the center. The shell protects the candle from

distortion during shipping or carrying in the field and the flat bottom permits use almost anywhere with no danger of tipping. The candle may be blown out and relit repeatedly and the metal shell holds the paraffin so it may all be used. Quartermaster are now purchasing these by the million from several concerns, some of which use Standard Oil of New Jersey paraffin exclusively.

If combat conditions permit, troops usually find temporary homes in tents. During training such were the only barracks which could be hastily erected and on many of the Pacific Islands they are preferable to more permanent structures either due to ease of ventilation or scarcity of wood. And what has paraffin to do with canvas - you ask? Its waterproofing ability is not confined to paper - it works the same for canvas and has been applied as a component of waterproof treatment to most Army canvas. In addition it appears in the flame-retardant treatment, thus helping in another World War II "first" in the safety of our troops.

Tent canvas burns easily and rapidly as will be recalled from the recent circus disaster. It can be treated to avoid this. Plans for World War II included that all tent canvas should be fire-retardant. Thus, in cas of air raid, fires would not spread easily through a camp and if an accidental fire occurred from a careless act, it could be easily and quickly controlled. Here paraffin demonstrated its unusual adaptability Alone it burns as fuel for a candle - combined chemically with chlorine, it retards burning.

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Under controlled conditions paraffin and chlorine react chemically to provide a material of valuable new characteristics. The two grades most generally used contain forty and seventy per cent chlorine by weight. The latter is a resinous solid, while the former is semi-liquid. Both grades are mixed with pigments and other chemicals and applied to the canvas from solvent solution. The solvent is frequently SOLVESSO, a high solvent power aromatic naphtha pioneered by Standard Oil of New Jersey. After drying between heated rollers, the canvas is ready for tailoring into tents much safer for the occupants than those possessed by previous armies.

Since Pearl Harbor, chlorination has been a regular war user of paraffin, at times the demand approaching 75,000,000 pounds annually. At present, consumption is at a new high as we prepare to house an Army on the Chinese mainland, already devastated with nearly eight years of war with the Japs. Standard Oil of New Jersey supplies paraffin to many chlorinators, some using over thirty tank cars of paraffin per month.

Food - light and heat - shelter, these are the necessities of war, the essentials without which it cannot be waged or our assailants repulsed. Paraffin plays a significant role in each, deserving of the title PETROLEUM'S WHITE KNIGHT. But its service does not stop there - its other uses are legion, seldom recognized even by those who handle the implements of war.

Practically all explosives and pyrotechnics must be protected from moisture. Flares, shells of all sizes, signal lights, smoke pots,

all use paraffin coated containers. Paraffin is an ingredient of smokeless powder itself, helping the grains keep their shape during storage and burning without ash during firing. Paper bands which protect bombs during shipping are paraffin impregnated and the sealing compound used following the explosive charge contains petroleum wax. Most of these require some treated paper or cardboard in their shipping containers.

There are so many other uses. As an essential ingredient in ships bottom paint to minimize fouling from barnacles; in the compounding of rubber from inner tubes to special rubber fixtures of all types; in rust preventives to protect the machined surfaces of almost every type of war mechanism. Paraffin possesses unusual electrical characteristics, being an insulator. This is capitalized on in a host of communication uses and in almost all other types of electrical field equipment.

Paraffin is used to waterproof leather, it is an ingredient in the crayon the fieldman marks the wounded with to indicate treatment received or necessary, it seals drug and medicine bottles and vials, and it is the mounting in which the Medical Corps sends specimens to its various laboratories for study.

The list is long - the service is great. Name any phase of modern war and those experienced in the material used can point to the role of paraffin - frequently hidden but usually essential, not capable of replacement with difficulty, and at greater cost.

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With the coming of peace, paraffin will go on serving as it has since it was first prepared in the small town in Pennsylvania less than one hundred years ago. There will be paper milk bottles to be coated, matches to be tipped, frozen foods to be packaged in even greater abundance and moistureproofed paper for locker storage and dozens of new uses. Petroleum will continue then also to provide paraffin which has come to serve mankind so well.

OIL NOTES

The paraffin supply situation became especially critical early in 1945. The Petroleum Administration for War asked Standard Oil of New Jersey to supply a technician versed in the manufacture and use of paraffin to cooperate with the Armed Forces in making the best use of the available supply.

John B. Tuttle of our Engineering Division, author of PETROLEUM'S WHITE KNIGHT, was loaned to PAW where he continues as consultant in the War Section. Naturally his work has been primarily war uses such as those which make up the article, several of them having received little previous publicity.

JBT:MLB
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