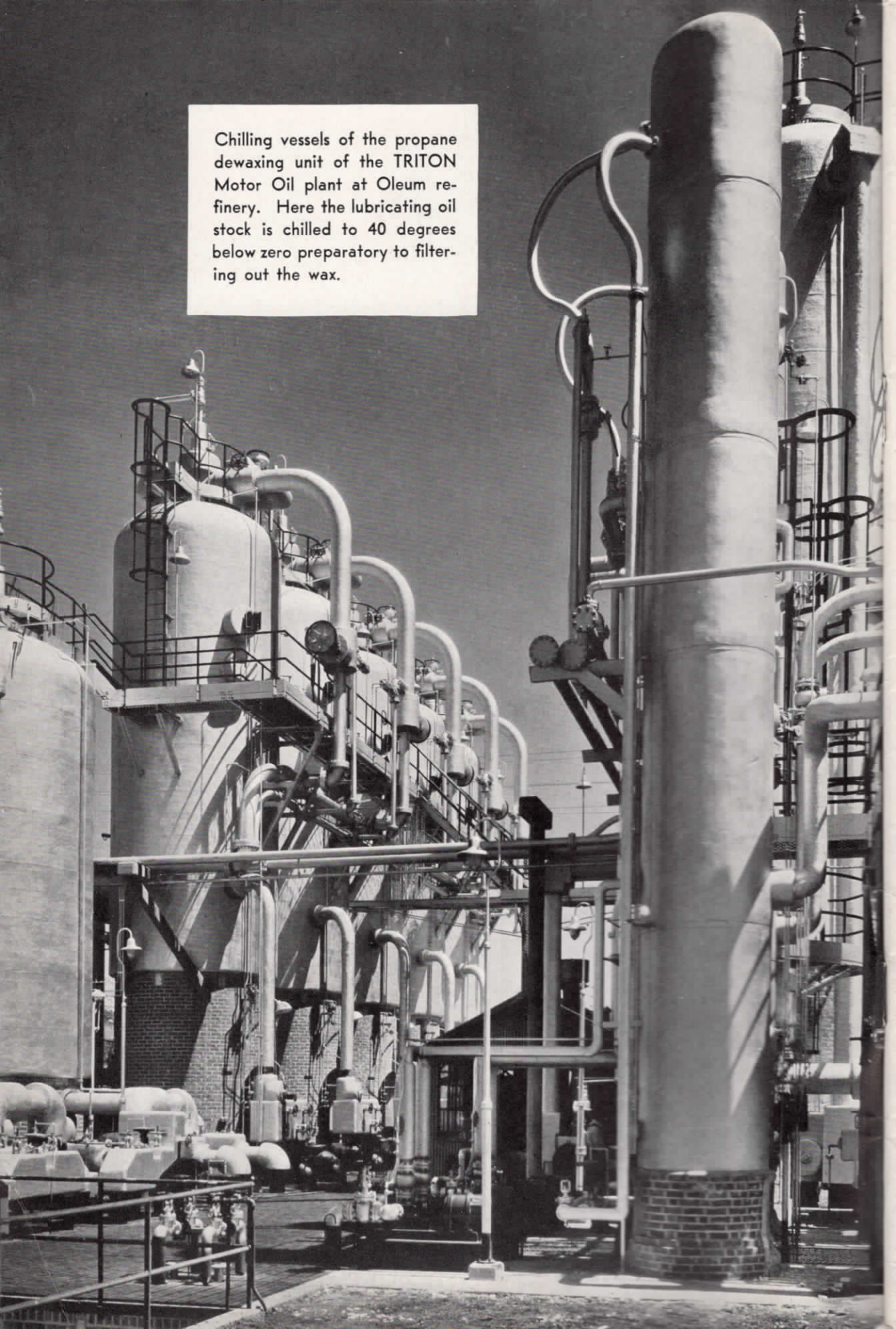
UNION OIL BULLETIN

NOVEMBER 1934



Chilling vessels of the propane dewaxing unit of the TRITON Motor Oil plant at Oleum refinery. Here the lubricating oil stock is chilled to 40 degrees below zero preparatory to filtering out the wax.

UNION OIL BULLETIN

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VOLUME XV NOVEMBER BULLETIN No. 5

TRITON—A Union Oil Company Achievement

A NUMBER of years ago it was a nebulous idea; today it is a reality . . . with the resources of a great institution behind it . . . and the lives of thousands of persons linked with its future. It is TRITON, a product of modern research that is changing the course of motor oil refining in this country, and marks a turning point in the history of the petroleum industry of the West.

Triton is an achievement of the Union Oil Company. It was conceived and brought to maturity wholly within the organization. It represents the courage of leadership . . . the courage of executives to stand by a course of action in the face of adversity . . . and the courage of men to turn their backs on old accepted theories and explore new frontiers.

Arranged in colorful rows on the brilliant orange dispensing racks at service stations, Triton motor oil represents, in our opinion, the finest automobile engine lubricant produced to date. It is a pure paraffin-base oil manufactured from California *wax-bearing* crudes, and is of the highest *quality*. The Propane Solvent process by which it is made is a complete departure from all previous refining methods.

At the outset the sale of Triton is being limited to the metropolitan areas and some 150 key cities on the coast. However, as rapidly as transportation

CONTENTS

W. L. Stewart, Jr.
Vice President in Charge of Manufacturing

R. E. Haylett
Director of Manufacturing

facilities and production permit, distribution will be extended to the balance of the company's regular marketing territory.

Triton will be sold only in one and five-quart cans and at 30 cents per quart.

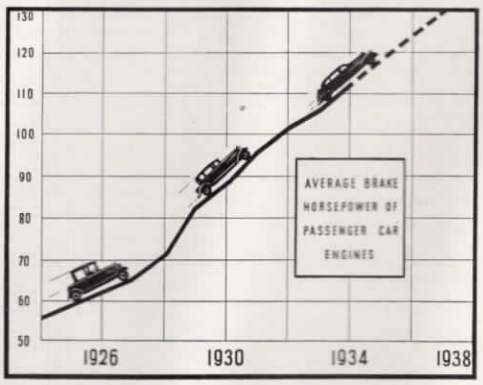
The claims made for Triton are based on years of laboratory tests, the results of which have been checked hundreds of times, and on more than 250,000 miles of road and speedway tests, described in detail elsewhere in the Bulletin in an article written by C. C. Moore, Jr., research supervisor. On the basis of these tests it can be said of Triton that it is the highest quality oil—"Eastern" or "Western"—ever marketed on the Pacific Coast. And as such has not only increased the potential value of Western crudes by many millions of dollars, but opened up new markets for the finish lubricating oil as well. In view of its economic importance Triton has been widely publicized in the newspapers and magazines throughout the coast and in many national publications. If the press can be taken as a criterion, it would appear that Triton has attracted more public interest than any new petroleum product developed in the past decade.

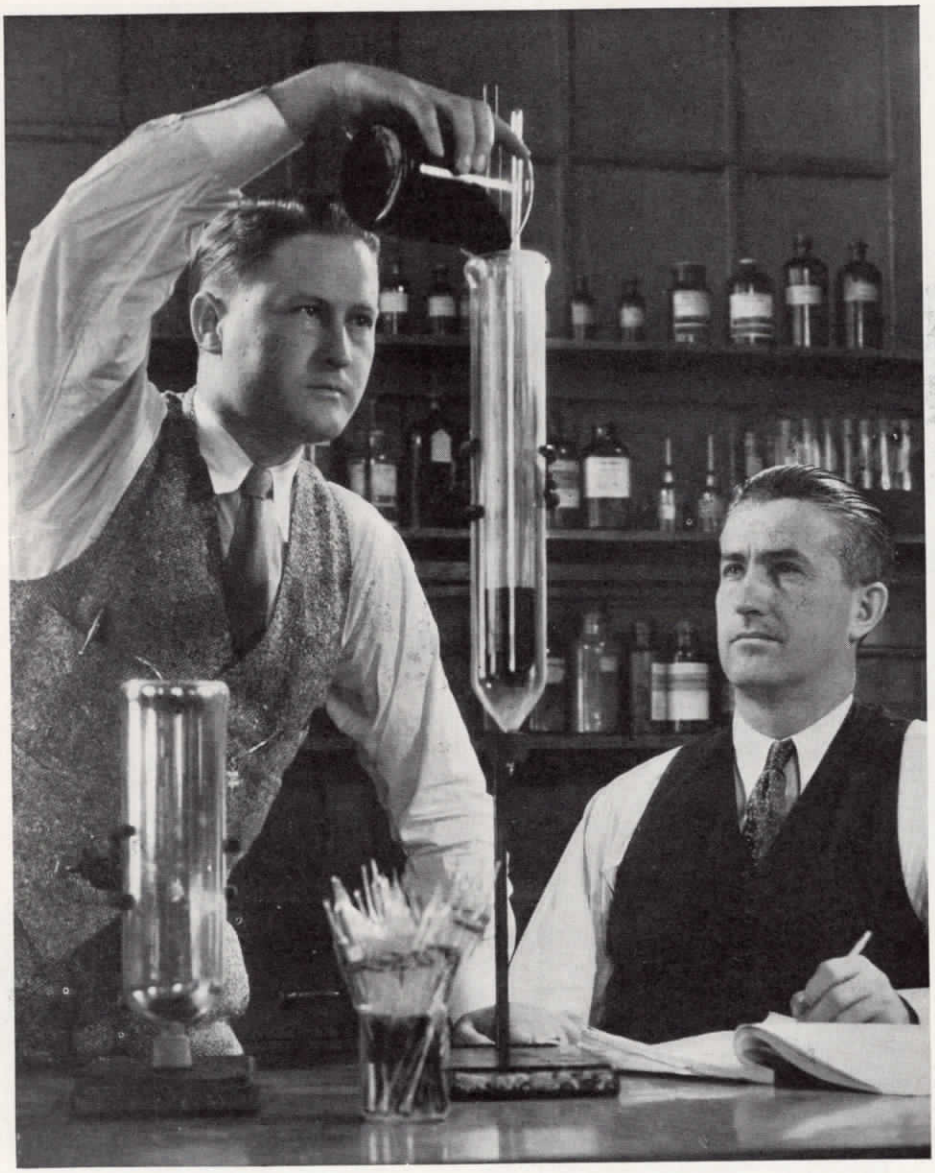
The marketing of the new oil is being supported by one of the most extensive sales promotion programs undertaken by the company since the introduction of "76."

Triton has an inspiring history, the chapters of which are filled with brilliant individual accomplishments and the results of the unselfish teamwork of the entire membership of the Research, Development, Patent and Manufacturing departments.

To start at the beginning we must turn back to the years immediately preceding the depression. We find our sales and manufacturing executives at that time faced, on the one hand, with the steady and unmistakable decline in the sale of Western motor oils, including our own, and on the other, by the rising sale of Eastern motor oils. To quote figures, the sale of Eastern oils on the Coast in 1921 had been only 15 per cent of the total, and during the period when our executives were taking stock of the situation, the up-swing, that was to carry the Eastern oil sales to 45 per cent of an $80,000,000 annual market in 1933, was well under way.

In the face of this situation it was quite





Dr. Ulric B. Bray, standing, research supervisor, and C. E. Swift, demonstrating the precipitation of asphalt and wax from a lubricating oil stock with propane, used in the propane solvent process by which a paraffin-base motor oil is refined from California wax-bearing crudes. The pressure within the flask is atmospheric and the temperature 40 degrees below zero, Fahrenheit, created by the evaporation of the propane. Dr. Bray and Mr. Swift, now a member of the company's Patent department and formerly a chemist in the Research department, are credited with conducting much of the original research work which led to the production of Triton.

evident that drastic action would have to be taken. Analyzing conditions it was found that the principal factor influencing sales was the trend in automobile engine design. In attempting to meet the popular demand for increased power and speeds, engineers were increasing the horsepower unit per cubic inch displacement, instead of increasing the size of the cylinders. This resulted in increased loading of bearings

and increased piston speed. This placed new demands on the lubricating oil, and of the two types available—"Eastern" and "Western"—the former was meeting the requirements far more satisfactorily, because of its greater resistance to oxidation and its lower consumption at high speeds.

It was apparent under the circumstances that if the Union Oil Company, or any other Western refiner or marketer, was to hold its rightful share of the lubricating oil market on the Pacific Coast it would be compelled to manufacture a motor oil that would be equal to or superior to the best of the so-called Eastern group. Accordingly, it was determined to place the resources of the Union Oil Company behind the development of such an oil from Cali-

On this and the preceding page are shown stories, clipped from newspapers, trade and class magazines, and other periodicals, which appeared to herald the coming of Triton months before it was placed on sale.

fornia crudes. How this was to be accomplished was not then known.

The problem was handed the company's Research department. No time limit was set as to when the solution would be expected. With infinite patience the research chemists began probing the hydrocarbon molecules to study the whys and wherefores of their characteristics. At first slow, the exploration picked up momentum as it progressed, until suddenly the men conducting the work found themselves on the brink of a new discovery. The details of that we shall leave to Dr. Ulric B. Bray to tell in his article, "The Research Behind Triton." Stripped of technicalities the discovery proved two things: First, that the much maligned California crudes, long classified as asphalt-base, contained the same hydrocarbon constituents found in Pennsylvania crudes; and, second, that it was possible to recover paraffin-base lubricants in their pure form from California crudes.

It is one thing, however, to make a laboratory discovery, and another to carry it forward from the test tube stage to commercial production. There is a great gap between the two, the bridging of which

required more time and attention to detail than the initial discovery. The work of Union's development engineers and refinery technicians, under the direction of Earle W. Gard, in designing the equipment to carry out the process ranks as equally great an achievement as the work of the research chemists whose laboratory experiments led to the original discovery. The process being entirely new it was necessary to start from scratch in designing the equipment.

Before any attempt was made to design the vessels to be used in the commercial plant, a pilot plant was built at the Los Angeles refinery at Wilmington. In this plant a few barrels of oil were made per day to try out the process and to provide oil for laboratory and road tests. From the experience gained in operating this plant was developed the basic design for the $1,500,000 unit now manufacturing Triton motor oil at Oleum.

Design and construction of the various units were carried on under the direct supervision of B. G. Aldridge, while the operation of the units upon completion, and before being turned over to the refinery department, was carried on under the supervision of E. G. Ragatz, Basil Hopper and K. E. Kingman. L. G. Metcalf, manager of refineries, and A. Roy Heise, manager of the Oleum refinery, are in charge of commercial operations.

It is quite evident, as one reviews the many ramifications of the development of Triton and the process by which it is refined, that it is the achievement of a closely knit organization rather than of individuals, and that when credit is finally awarded for the accomplishment it will be necessary to start with the laboratory inspectors and progress up through the ranks to the top, where it will be found that the supervision of R. E. Haylett, director of manufacturing, along with the executive assistance of Vice President W. L. Stewart, Jr., have been major factors in the success.

Quick Facts About Triton

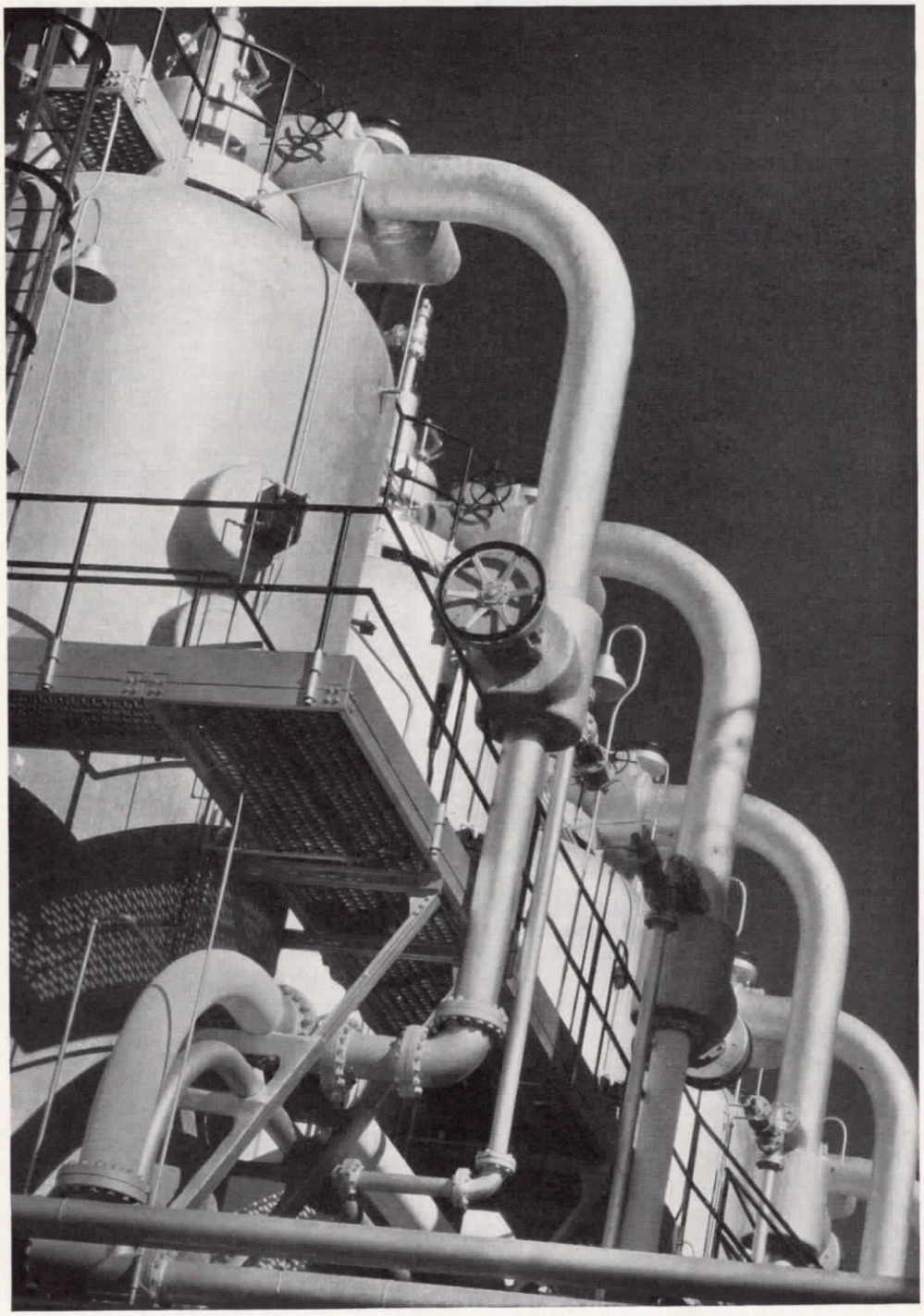
1. It is a pure paraffin-base oil refined from California WAX - BEARING crude.
2. It is composed only of 100 per cent pure "PARATHENES"—the best of the paraffin-base constituents.
3. It is entirely free of CARBOGENS (the low gravity, unstable materials that rapidly form sludge and carbon).
4. It is entirely free of NAPHTHENES (low grade oil).
5. It forms less carbon than other oils.
6. It forms less sludge than other oils.
7. It gives more miles per quart.
8. It reduces motor wear.
9. It is more resistant to oxidation (stable). After 1000 miles of driving TRITON changes viscosity less than 1 per cent, while other oils change as much as 15 per cent.
10. It retains its firm body under all driving conditions.
11. It is sold on a MONEY BACK GUARANTEE.

Significance of the Name TRITON

TO ROBERT T. WILLIS, research inspector at the Oleum refinery, was awarded the prize of $500 and the honor of submitting the winning name—TRITON—for Union's new propane solvent processed motor oil. He was one of 12,000 persons participating in the contest, and Triton was one of 50,000 names suggested.

Triton meets the requirements of a good name from a sales standpoint—it is short and because it is unusual, is easy to remember.

The origin of the name dates back to Greek mythology. Triton was the son of Neptune and Amphitrite. In the songs of the poets, it was Triton's duty to blow a trumpet to announce the coming of his father. (Now, the announcement of Triton heralds the coming of a new era in motor lubricants.) According to later mythology, a race of Triton's was created



The massiveness of pipes and valves, and the sculptor-like moulding of insulation and coverings serve as indices to the innovations in design and operation which characterize the propane plant.

$500 for Triton. R. Cubicciotti, lubricants and special products department, is shown here presenting check for $500 to Robert T. Willis, research inspector at Oleum refinery, as award for submitting the winning name—Triton.

to follow in the train of the great sea god and are represented in art as blowing conch shells to soothe the waves.

The name Triton has wide application in natural science. Various shells, conch-bearing animals, and salamangers, are today identified as Tritons.

Between the Tritons of mythology and the source of crude petroleum there may be seen a relationship. Petroleum, according to the organic theory, comes from the remains of microscopic life that lived in the ancient shallow seas. Of these the diatoms are best known.

Diatoms, microscopic unicellular marine vegetables, are assumed to be an important source, if not the major source of crude oil. Diatoms are alga, the first type of plant life to evolve. They have existed in the seas for over 500,000,000 years, thriving from time to time in certain areas. It is supposed, by some, that upon the death of the organisms, they fell to the sea floor where they were covered up with mud and sand to become part of the sedimentary beds. Later, due to the heat of the earth, time, and pressure, the oil content of the organisms was distilled off and driven from the "source" material by water (hydrostatic pressure) to be lodged in "reservoir" rocks, where it is found today.

Diatoms still exist in some very shallow water,notably off Copalis Beach, Washington (about sixty miles north of the Columbia River). Periodically they appear on the surface as green scum and are deposited on the beach to depth of two or three feet, particularly after a heavy spring rain. These "epidemics" may result from the dilution of the sea water by fresh water.

Tolman, geological authority, states: "Temperature and salinity are important factors controlling the outbreak of the epidemic." Tolman does not believe that oil was distilled from dead diatoms. He points out that only the living diatom contains droplets of oil. If permitted to complete its life cycle, the diation contains no oil whatever: it has been consumed. He says in this regard: "The studies at Copalis Beach may throw light on the amount of oil stored in the diatom at various times in its life history.

"A curious phenomenon was observed when placing the diatom in fresh water. While the living diatom collected did not seem to contain much oil, in the fresh water the brittle shells broke apart, and the green chlorophyll bodies came out. The plastids began to swell. In five minutes the plastids had swollen in diameter from ten to twenty micra, or 100 per cent. The oil began to ooze out. The droplets increased in diameter from two to twenty micra. In about 45 minutes this process seemed to be completed."

If the oil were liberated in this way, it may have been carried to the sea bottom by settling particles of mud and clay, thus to become part of the sedimentary beds.

Prior to the last great Ice Age, the waters of the Pacific invaded California covering the land to the very feet of the mountain ranges. This shallow sea, which was suitable for the existence of diatoms in countless numbers, existed for nearly a score of million years. Geologically speaking, this sea subsided only recently; not over 2,000,000 years ago. Most of our oil is produced from sedimentary rocks that were laid down on the floor of the California Sea that existed during these times (Miocene and Pliocene periods).

What We Mean When We Say—
"Triton **Outlasts** Eastern or Western Oils"

WE SAY Triton "OUTLASTS" because it is a good lubricant, not only during the first mile, but during the last mile.

In the past, too much attention has been focused on the quality of a motor oil as it entered the crankcase, and too little on its efficiency during the last 100 miles before draining. In other words, we have heretofore determined the value of our motor oils on the basis of tests made before use, rather than during use. While we claim that *unused* TRITON is unexcelled by any oil—Eastern or Western—we are particularly proud of the fact that TRITON after the normal period of use in an automobile engine is a better lubricant than any motor oil with which it has so far been compared. As it is drained from the motor you will find that TRITON:

(1) Will not have changed in viscosity as much as other oils.

This means that when the proper S.A.E. grade has been chosen to give maximum performance and gasoline economy, the high performance of TRITON will persist until the next drain and will not be lost at the end of 400 or 500 miles of driving.

(2) Will not have been consumed to as great an extent as other oils.

Due to its method of manufacture, TRITON is extremely resistant to oxidation and vaporization.

(3) Will not have formed as much sludge, because it contains no carbogens.

This means that the danger of plugged oil lines is practically eliminated, assuring a full supply of oil to all wearing surfaces.

(4) Will not have formed as much carbon as other oils.

This point, especially important in the case of the newer car models, means that the compression ratio of the engine will not be changed by rapid carbon formation.

In actual tests TRITON has been run 5000 miles by keeping the oil in the crankcase up to the proper level, and it was in better condition than some of the best Eastern oils after 1000 miles of use.

However we do not recommend that TRITON, or any oil, be run more than 1000 miles without draining. This is because certain contaminants, such as dust, dirt, water, soot and minute metal particles from cylinder walls and pistons enter the crank case oil regardless of its quality, making a drain necessary at 1000-mile intervals, as recommended by car manufacturers.

Why are we so confident in Triton's ability to "OUTLAST" other competitive oils?

Because of research laboratory tests over a period of three years in which TRITON was compared with both Eastern and Western oils, and because of more than 250,000 miles of actual road tests in which TRITON'S performance was checked against other oils.

Is Triton a Western Oil?—The Answer is "No."

"WHAT is Triton?"

That is going to be one of the most asked questions among Pacific Coast motorists during the next few months.

"Is it a 'Western' oil?"

The answer is emphatically "NO."

"Is it an 'Eastern' oil?"

The answer is an equally emphatic "NO."

Triton is a pure paraffin-base oil refined from California *wax-bearing* crudes. But being manufactured from a Western crude

does not make it a "Western" oil; nor does being a pure paraffin-base lubricant make it an "Eastern" oil. These two geographic designations, used loosely in the past to indicate the type of oil desired, are too general to be applied to Triton.

The term "Western" applies to motor oils made in the past from wax-free Western crudes. They are essentially naphthenic in character; in other words, are composed primarily of low grade oils and contain a high percentage of carbogens that cause an oil to have low resistance to oxidation, fairly low flash and fire points, instability in service, and too rapidly form sludge and carbon under severe operating conditions.

The term "Eastern" applies to the oils made from Pennsylvania crudes. While composed chiefly of paraffin-base lubricating hydrocarbons these oils have in the past also contained from 10 to 20 per cent low grade oils and carbogens. The latter have been mainly responsible for the high percentage of hard flinty carbon formed by the "Eastern" oils and also the substantial quantity of sludge formed during use.

Being made up only of the pure paraffin-base lubricating hydro-carbons TRITON STANDS ALONE. It cannot be classed either as "Western" or "Eastern." It has set a new yardstick with which to measure the quality of motor lubricants.

Triton Completes Last Sales Link

E. W. HUTTON
Manager Lubricants and Special Products Department

THE addition of Triton motor oil to the list of splendid products which Union Oil Company has for many years offered to the Pacific Coast motorists marks the greatest and most significant step in the progress of our enterprising company.

E. W. Hutton

With the new oil, the sales personnel is placed in a most favorable position, as Triton forms the last link in a chain that cannot fail to bind more closely the hosts of satisfied customers.

Certain characteristics of oils produced in other sections of the country have had great public acceptance because these characteristics were desired by the average motorist. Unfortunately, motor oils heretofore produced on the Pacific Coast failed to meet these requirements.

The criteria of a good motor oil, particularly from the standpoint of motorists, have been low consumption, easy starting in cold weather, adequate protection in hot weather, and resistance to the formation of sludge or carbonaceous material.

Duplicate clear glass bottles, one of which contains gasoline and one of which contains water are identical in appearance; yet the contents are chemically vastly different. Unfortunately, the same thing is true of motor oils, and, in many cases, a motor oil which is pleasing to the eye, gives very poor service and ultimately may be the direct cause of expensive repairs.

By practical tests that are startlingly conclusive it was proved that Triton not only looks good in a bottle but wears well in an engine. The story of these tests and the results obtained are shown elsewhere in the Bulletin.

The most skeptical of motor oil users, however, cannot help but be impressed by the thoroughness with which the company developed and tested the oil before offering it for sale to the public.

A vast potential field for the sale of Triton is immediately available, and the initial sales are expected to reach proportions not hitherto reached by any competitive product. We particularly anticipate extensive demand in that portion of the general market which for years has been

supplied by oils imported from the Atlantic seaboard. Such importations in recent years have reached a volume equal to almost half of the motor oil gallonage potential of the Pacific Coast area. It is reasonable to assume that a very large number of users of this imported material will immediately change to the new propane solvent processed oil and, with the very satisfactory results obtained, will continue to use the new oil.

The future position of Union Oil Company in its relation to the petroleum industry of the West Coast will be greatly enhanced, inasmuch as the term "Leader," which has been applied to "76" gasoline, can be applied to the new motor oil with equal truth. It is undoubtedly the "Leader" and a pioneer in the field of high quality motor lubricants.

Other marketing companies now investigating the several available methods for solvent extraction of motor oil will very likely follow in the footsteps of this company. Because of exclusive manufacturing processes, fully protected by patents, Union is in a most fortunate position, inasmuch as most of the other available methods of improved manufacture do not produce the high quality found in Triton.

As stated above, many hundreds of our sales representatives, the independent resellers, the Union Service Stations, are now in a position where they can enthusiastically tell their customers that Union Oil Company's products necessary for the operation of a motor vehicle, i.e., gasoline, lubricating oil and other lubricants, are the best obtainable at any price.

Pacific Coast motorists will quickly appreciate the quality of Triton and realize the economy effected by its use.

Triton dealers dispensing rack—capacity 2 five-quart and 20 one-quart cans—is an unusual point of sale identification piece for the product.

After all, the automobile represents the largest single investment of most motorists, and the satisfaction obtained from the use of this high-quality material, because of its greater protection for an expensive piece of equipment, will not be found by the use of any other product.

Trucks, loaded at main and substations, en route to dealers with first shipments of Triton.

Research Behind Triton

DR. ULRIC B. BRAY
Research Supervisor

THE story of the origin and development of Triton begins with the realization a number of years ago that none of the motor oils marketed at that time, regardless of source, represented the ideal lubricant for automotive engines, and concludes with the presentation of Triton to the motoring public. Union Oil Company of California recognized the need of a new motor oil for a new motor age and instituted research to produce from California crudes a lubricating oil which would combine the desirable properties of both Eastern and Western oils, and which would be adapted to the most severe service conditions imposed by the ever increasing speed of modern automobile engines. The result is Triton motor oil.

Dr. U. B. Bray

As the story is unfolded, it will be apparent that Triton represents no mysterious accomplishments of the magician's art, but instead is based upon simple, fundamental, and practical principles which are easily understood. No product ever had a more plausible, definite, or realistic (scientific, if you prefer) basis than Triton. In fact, all that we might say of the wherefore of Triton can be summarized by stating: first, that after recognizing the need for a new motor oil, it was discovered that our California crudes do contain at least a small portion of the most desirable paraffinic type lubricants; and second, that practical, economical means have been devised for obtaining these highest grade lubricants in pure form by eliminating all undesirable and low grade materials. These means will be seen to consist of employing liquid propane to remove asphalt, wax, and some of the lowest grade oils, and then completing the removal of the less desirable oils by means of another combination of solvents, sulfur dioxide and benzene, acting as a supplement to the propane treatment.

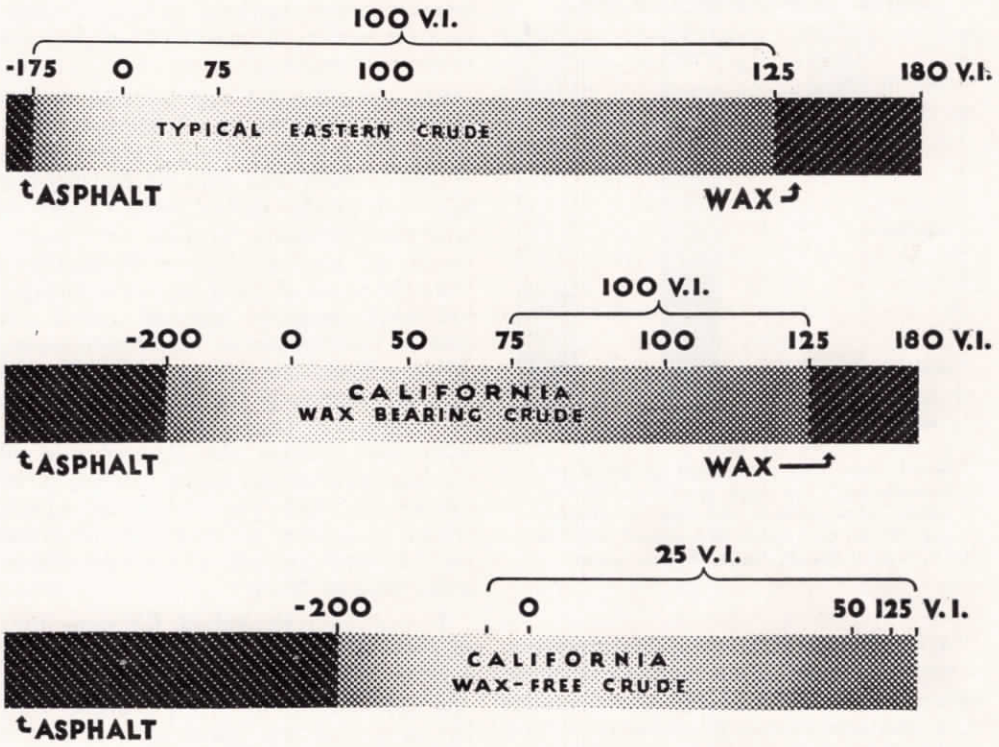
Before proceeding in greater detail with the production of Triton, it is of interest to review what we believe to be the most desirable characteristics of a motor oil in order to show the goal toward which the research was directed in developing Triton.

The primary function of any lubricating oil in the automobile engine is, of course, to protect the mechanism against wear, and the oil should have the inherent property of clinging to the metal surface under the most severe circumstances which might otherwise cause the lubricating film to break down.

The oil should show as little change in viscosity as possible with change in temperature so that it will reach the parts to be lubricated upon cold starting, and yet maintain adequate body with an ample margin of safety at the highest operating temperatures, as well as giving low consumption under severe operating conditions. A scale or yardstick was developed a few years ago for comparing different motor oils with regard to change in viscosity with temperature, which is called the viscosity index scale. The numerical values are analogous to the scale on a thermometer. The value of 100 was arbitrarily assigned a particular sample of Pennsylvania oil while zero was assigned a particular sample of western-type oil, with intermediate oils or blends falling in between. There are some oils, however, which are better in this respect than the reference Pennsylvania oil chosen, giving a V.I., of 115 for example; whereas there are other oils that are so asphaltic in character, being on the border line between asphalt and oil, that they have considerably steeper slopes than the reference western oil, giving V.I.'s of —75 or even —150.

In addition to high lubricating value and

Figure I



The lubricating oil stocks of three typical crudes, Eastern, California wax-free (from which all Western motor oils, except Triton, are made), and California wax-bearing (from which Triton is refined) are analyzed above from the standpoint of viscosity index. The full explanation will be found in the accompanying article.

high resistance to change in viscosity with temperature, it is necessary that an oil be stable in service and undergo the minimum change in composition which would impair its lubricating efficiency. We should be concerned with the efficiency of the lubrication during the last mile the oil is in the crankcase as well as the first. The main source of degradation of motor oils in service is through oxidation, which causes formation of sludge and acidity. The formation of sludge results in an astonishing increase in the carbon-forming tendency of the oil, sticking of the piston rings, plugging of the oil drain holes in the pistons due to carbon deposits, excessive carbon deposition in the combustion chamber, sticking of valve stems, plugging of oil passages, and other conditions contributing to faulty lubrication.

It was one time the practice of oil technologists to emphasize the carbon residue test of unused motor oils, but experience has shown that attention should be focused on the carbon-forming tendency of the oil after it has had, say, two-thirds of its expected life in the crankcase. In many cases, oils which had originally very low carbon residue values deteriorated so much in service that the carbon residue tests after use were considerably greater than those for more stable oils which may have given initially higher carbon residue tests.

High flash points are also characteristic of oils of the best quality and appear to be very desirable as one of the factors leading to minimum consumption under severe driving conditions.

Figure 2

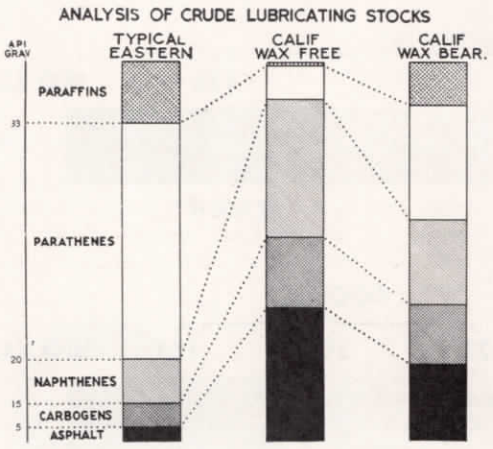


Chart shows the percentage of paraffines, "parathenes," the high grade material of which Triton alone is exclusively composed; naphthenes, carbogens, and asphalt, and the A. P. I. gravity limits of each group.

All of the foregoing desirable properties —high lubricating value, low temperature susceptibility, high stability against oxidation, and low consumption—were judged to be characteristic of a certain definite type of hydrocarbons. In other words, all of these properties were considered to be associated with a particular chemical structure for the hydrocarbon molecules, rather than being connected with a geographic location. The best Eastern oils possessed these properties to a marked degree, presumably on account of the preponderance of certain types of hydrocarbons, but they commonly gave high carbon residue tests which were correctly attributed to other causes. Therefore it was concluded that if the hydrocarbons that predominate in the best eastern oils could be obtained from any source in pure form they would exhibit the desired properties, including a low carbon residue. In fact, the various properties of this type of oil are so interrelated that when we obtain the distinguishing characteristics, many of the minor characteristics automatically follow. Notable in this respect is the high API (modified Baume) gravity or low specific gravity for a given viscosity that always goes with this type of hydrocarbon. Advantage has been taken in recent years of the change in gravity with average composition of lubricating oils to develop a relationship known as the viscosity-gravity constant in order to measure the extent of approach of a given oil to Pennsylvania quality.

Having concluded that in order to realize all of the foregoing ideals in a lubricating oil, it would be necessary to obtain a certain recognized type of hydrocarbon lubricant in the purest possible form, it was then necessary to look for possible means of producing these hydrocarbons from the materials available. The thought had been commonly accepted, and is still held in many quarters, that Pennsylvania, Midcontinent, and Western crudes were each different from the other in regard to the chemical or hydrocarbon series present, with, for instance, the Pennsylvania oil corresponding almost entirely to one series (paraffinic) and the California asphalt crudes to another series (napthenic) and the Midcontinent oils to an intermediate series (mixed base).

It had been recognized for some time that certain California crudes, containing wax in addition to asphalt, would yield oils approaching the Midcontinent type, but even that was taken to indicate the occurrence of only some of the intermediate series. In attacking our problem, it became clear that the properties measured by the analytical methods available at that time represented the average of all components present, whether homogeneous or heterogeneous. The thought occurred that in the random distribution of things, Nature had not been so prejudiced as to give only one or two types of hydrocarbons to each field of crude oil, to the exclusion, in some cases, of the most valuable type of lubricants, but that in all probability, at least some of every imaginable type of oil is present in every oil pool, with the difference in crudes being due to a difference in percentage distribution of the various possible components. In other words, there should be present in the best Eastern crude oil at least some of the materials predominating in our lowest grade or most asphaltic California oil, and conversely our poorest oil should contain at least a little bit of the best material present in Eastern crudes.

In order to make it practicable, therefore, to obtain our desired ideal type of lubricants from California crudes, it was necessary to select and segregate the crude carrying the highest percentage of these materials and then to devise economic methods of recovering them in pure form from the crude. The correctness of this general picture has been thoroughly demonstrated during the subsequent years of intensive research and development which have culminated in the production of Triton on a commercial scale.

For the sake of what is to follow, we may discuss generally the types of hydrocarbons present in lubricating oils in the light of our present knowledge obtained largely from actual separations accomplished by solvent extraction methods. Upon examining the different fractions of the lubricating oil stock, it was found, first of all, that there are no sharp or sudden breaks in properties in going from the truly asphaltic components through the lubricating oils to the hardest paraffin waxes. Taken collectively, however, certain groups or classes are readily discernible which have properties easily recognized. These groups or classes have been designated as follows; namely, (1) asphaltenes, (2) carbogens, (3) napthenes, (4) parathenes, and (5) paraffin waxes.

1. The asphaltenes are dark colored, high melting thermoplastic solids having very low hydrogen and high carbon contents. The API gravity is less than 5° at 60°F., which, of course, is heavier than water.

2. The fraction designated as carbogens consists of psuedo-asphaltic or border-line material representing a transition from asphaltenes to viscous oils. Carbogens are, therefore, characterized by low hydrogen and high carbon contents, and are believed to represent, chemically, unsaturated compounds related to the aromatic or coal tar series, which are readily converted into sludge and carbon in an automobile engine. Carbogens have a viscosity-gravity constant in excess of 0.910, and consist of those materials ranging in gravity from about 5° to 15° API at 60°F.

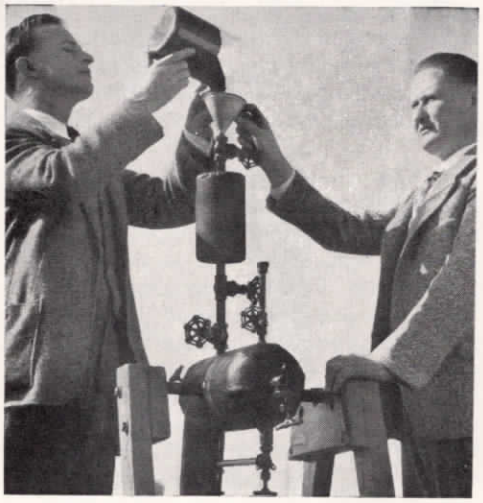
3. Napthenes constitute the major portion of high grade Western oils made from wax-free crudes. They are cyclic compounds of the polymethylene series. They are characterized by comparatively low flash points for a given viscosity at 100°F., and a comparatively steep viscosity-temperature curve. They are noticeably more stable than the carbogens, but form sludge and carbon under severe conditions. The napthenes in lubricating oil may be classified as having a VGC range of 0.910 to 0.860, and a gravity range of approximately 15° to 20° API at 60°F.

4. The name parathenes has been given to the highest type hydrocarbon lubricants since they are believed to consist largely of napthene rings with which are combined paraffin side chains in the same molecule. These compounds represent the true paraffin-base lubricants in that they combine oiliness, flat viscosity-temperature curve, high flash point, extreme stability towards sludge formation, and relatively low carbon content, and range in VGC from 0.860 to 0.770. They range in gravity from approximately 20° to 33° API at 60°F.

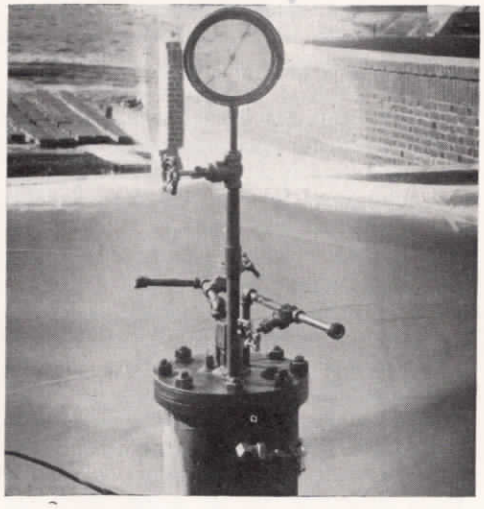
5. The paraffins represent the high API gravity, light colored or colorless, compounds which are solid rather than liquid at atmospheric temperatures. When the paraffin side chain in a parathene predominates to such an extent that it causes the compound to solidify at temperatures likely to be encountered in service, the material is then classified as a wax and is considered as a paraffin. The paraffins range in consistency from soft petrolatums ("vaseline") to hard, brittle waxes, depending on the molecular arrangement of the carbon and hydrogen atoms into chains. The VGC is lower than 0.770, and the gravity of the paraffins from an SAE 30 oil will generally range from 33° to 43° API at 60° F.

In order to illustrate the foregoing and to demonstrate the scientific basis for the production of Triton motor oil, Figure 1 shows composition charts of the lubricating portion of three typical crude oils of widely varying overall properties. Viscosity index was taken as the convenient identifying characteristic of the various fractions, but gravity or VGC could be used if desired. The brackets indicate the actual divisions of the crude lubricant into asphaltenes, carbogens, napthenes, parathenes, and paraffins, whereas the arrows indicate the portions of the crude comprising the typical motor oils made at present from the respective crudes.

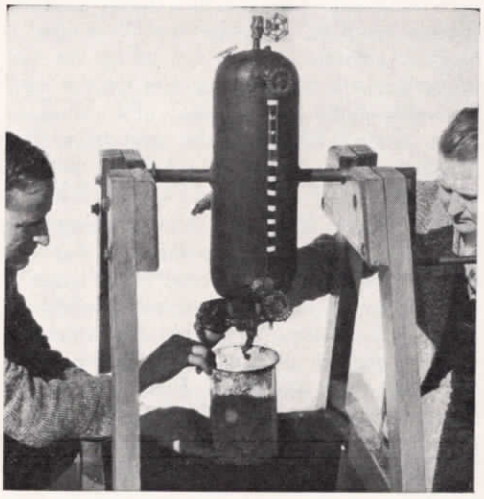
Miniature Laboratory Plant Used in Developing Propane Solvent Process



The complete refining of Triton was carried out on a small scale in the miniature plant shown on this and the adjoining page. Above, Donald E. Carr, left, and Dr. Bray are pouring a California wax-bearing lubricating oil stock into a pressure bomb containing propane, initial step in the process.

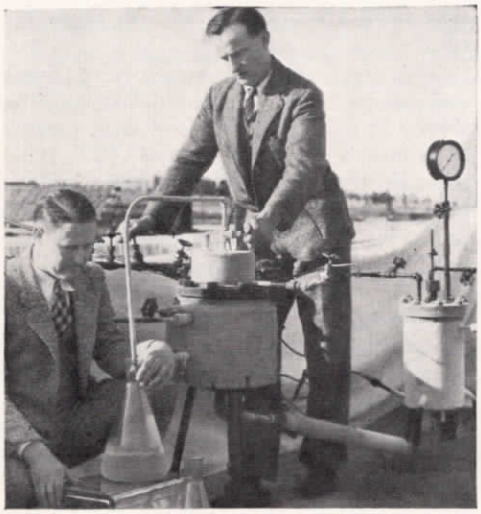


In the next step in the process, the propane and oil solution is transferred to the chilling vessel under a pressure of 180 pounds per square inch, as indicated on the above gauge. Wax under this pressure is soluble in propane. To precipitate the wax the pressure is released, causing the propane to evaporate.

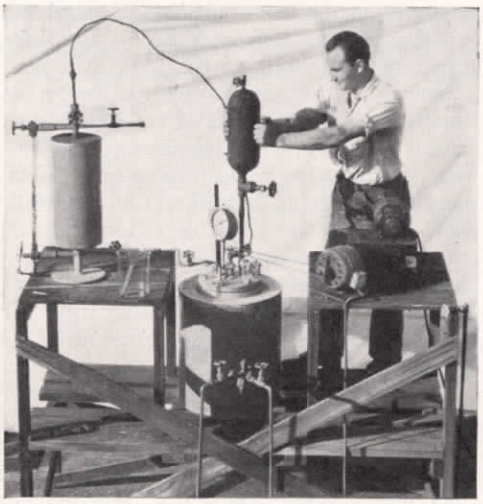


Under pressure all the hydrocarbon constituents in a lubricating oil stock are soluble in propane, with the exception of asphalt, which settles to the bottom of the vessel in solid form, and is easily drawn off, as shown here.

The rapid evaporation of the propane reduces the propane and oil solution to a temperature of 40 degrees below zero. Note the frost on the outside of the vessel.



To remove the wax, the chilled solution is passed through a pressure filter. The filter is housed in the insulated case shown above. The wax-free propane and oil solution is being drawn off in the flask being held by Dr. Bray. Note the frost on the chilling vessel and the tubing carrying the oil through the filter. Preparatory to the next step the de-waxed solution is heated, causing the propane to evaporate. In actual practice the propane is recovered to be used over again.



Above is a view of the laboratory solvent treating plant. The de-waxed and de-asphalted oil is here being introduced into the treater containing a solvent — liquid sulfur dioxide and benzene. The solvent acts as a washing agent similar to soap in water. The low grade oils and low gravity materials are soluble in the solvent, while the paraffin-base lubricating hydrocarbons are not, and as a result the two are separated completely.

Here is the wax-caked filter showing the amount of wax removed. Propane has so far proven the most thorough de-waxing agent ever used, and has materially reduced the expense of this operation.

R. C. Pollock, research chemist, above, is holding in his left hand the raffinate (the pure paraffin-base oil, free of wax, asphalt and all unstable materials) and in his right, the solvent extract in which sludge and carbon forming constituents are held in solution.

As might be expected, it was found that oils having the highest V.I., or containing the largest amount of the high V.I. parathenes, are not yielded by the heavy, asphaltic, non-waxy crudes from which practically all California lubricating oils have been made in the past in order to avoid expensive de-waxing operation. On account of the fact that our available crudes carrying the highest content of the desired type of lubricants contained both asphalt and wax, in addition to low grade lubricating oils (carbogens and napthenes), which must also be eliminated in the isolation of the desired materials in pure form, it was apparent that at least three steps would be required in reaching the desired goal; namely, the elimination of (1) asphalt, (2) wax, and (3) low viscosity index oils. In contrast to the usual method of refining which consisted of distilling to remove asphalt, pressing or centrifuging to remove wax, and acid treating to improve stability, one of our earliest conceptions was to accomplish all of the major steps by solvent extraction which, it was thought, would permit the isolation of the desired materials in an unchanged state of native purity.

The general idea of employing solvent extraction to remove impurities was certainly not new, nor was the idea of using solvents to refine petroleum oils an entirely new idea, but the thought of accomplishing by means of solvents as huge a task as that outlined represented a distinct departure from previous ideas and practices.

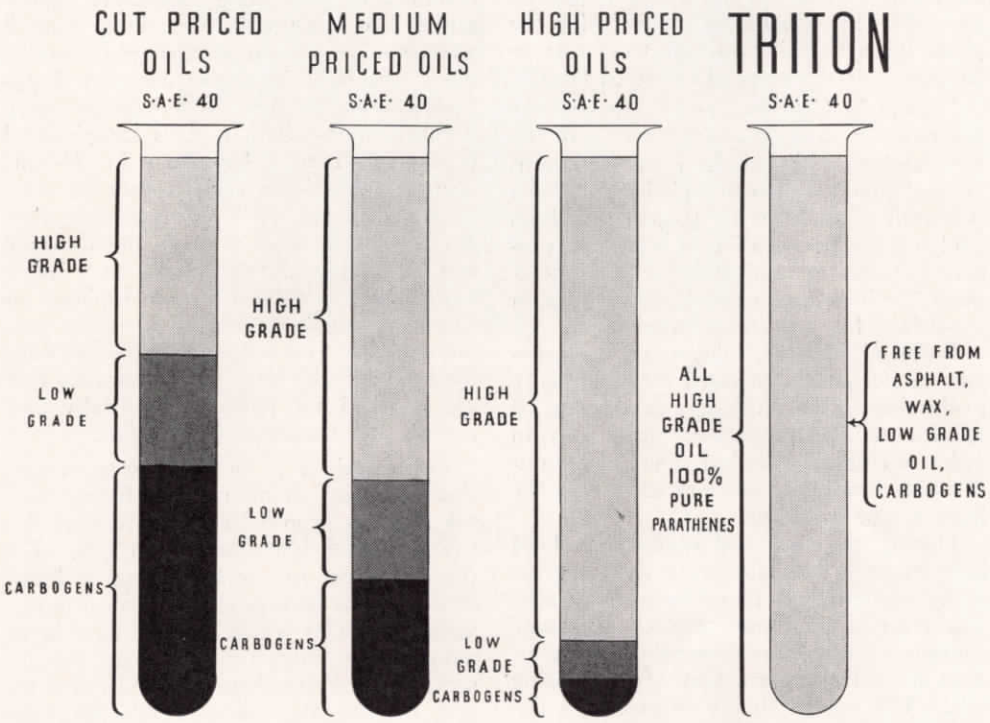
In contemplating the problem of isolating the ideal lubricants, an idea occurred which has developed into the keynote in the manufacture of Triton; namely, the use of liquefied propane. It will be recalled that propane is one of the compounds generally present in natural gas and can be kept a liquid only under pressure at ordinary temperature. Our first thought was to use propane for separating wax from any wax-bearing lubricating stock at very low temperatures, but upon deciding to complete the removal of asphalt also by solvent extraction rather than by distillation, it appeared that propane should also be effective in precipitating or eliminating asphalt at ordinary temperatures. Contrary to the usual course of experimentation, the first experiment performed with propane was successful in eliminating both asphalt and wax from a heavy Los Angeles Basin fuel oil.

This first experiment was very simple and can be easily reproduced. It consisted simply in mixing the fuel oil with propane at atmospheric pressure and 40° below zero, F., temperature in a vacuum-jacketed bottle similar to an ordinary thermos food jar, except that the inside was unsilvered in order to permit visual inspection of the contents. Next, it was shown that by mixing the oil and propane at ordinary temperatures under about 175 pounds pressure, which is required to keep propane in a liquid condition at that temperature, only the asphalt can be separated from the oil, and then by releasing the pressure, the propane automatically "boils" and refrigerates itself until a temperature of 40°F. below zero is obtained when the pressure is fully released. This refrigeration causes all wax and some of the lowest grade semi-asphaltic oils to be thrown out of solution, so that after filtering, only lubricating oils remain dissolved in the propane. By heating the filtered propane solution under pressure, the propane is completely evaporated and recovered for re-use. This leaves the propane-extracted oil free of wax and asphaltic impurities.

It was found that the oils obtained by propane extraction were remarkably high in viscosity index, but were still short of our goal in that all of the undesirable lubricating oil had not been rejected along with the asphalt and wax. Following our original intention of accomplishing the entire task with solvents, plans were developed for further treatment of the propane extracted oils with additional solvents, either with or without propane being present during the second solvent extraction. Along with several other possible solvents, liquid sulfur dioxide with benzene was considered. When tested it was found to be quite effective in accomplishing a further elimination of undesirable oils. In performing this type of solvent extraction, a fortunate condition exists in that the low grade carbogen and napthene oils are readily soluble in certain liquids, whereas the high grade parathenes resist being dissolved.

Since those earliest experiments, an almost unbelievable amount of experimental work has been done to develop various details and optimum operating conditions

Solvent Analysis Shows How Triton Compares With Other Lubricants



By means of a new method of analysis, known as solvent fractionation, it is possible to isolate the various hydrocarbon groups present in lubricating oils and determine the quality of each. Above are shown the results of a series of solvent analyses in which Triton was compared with a large number of lubricating oils in the various price brackets. It will be observed that Triton is a lubricant composed entirely of "parathenes" which form the pure paraffin-base oil.

of the many possibilities involved. When it is realized that the introduction of propane into lubricating oil refining has opened an entirely new field which promises to have a profound influence on future motor oil production everywhere, it is no wonder that a large amount of research and development work was necessary. The personnel actively engaged in this work since its inception has been very large and there has hardly been a person in the research and testing laboratories who has not had at least some contact with the project. It is, therefore, impractical to name all those who have worked upon Triton, but it is desired to identify some of those who have been of the greatest assistance in pursuing the desired goal in the laboratory since the early stages of the work.

At the beginning of the research project

which has culminated in the development of Triton, Claude E. Swift was selected as the chemist to conduct the laboratory work, and, although he subsequently was transferred to the Patent department, he has at all times worked enthusiastically for the success of Triton. While still at the laboratory Mr. Swift collaborated in laying the plans for a finishing solvent treatment to be applied to the propane extracted oils.

Donald E. Carr has been of the greatest assistance in working out the details of the physico-chemical principles involved in separating asphalt and semi-asphaltic oils from lubricating stocks with propane, and in studying the precipitation of wax from propane solutions of lubricating oil at low temperatures in order to develop the optimum conditions for propane de-waxing.

Ralph C. Pollock, who wears a fifteen-year service pin, has assisted very materially in developing the finishing treatment to be applied to the propane-extracted oils in order to eliminate the last traces of the undesirable low grade oils and leave only the highest type lubricant.

During the last few years, tests have been made in the laboratory with a great many combinations of solvents and chemical reagents, and our research files now contain a most comprehensive collection of data on solvent extraction of lubricating oils. The process finally selected as a finishing treatment for Triton to bring it up to the high standard which had been set as the goal, was chosen from the results of these exhaustive experiments.

The solvent selected to supplement propane is a mixture of sulfur dioxide and benzene, applied in a continuous countercurrent manner. The use of sulfur dioxide alone as a selective solvent for refining petroleum oils had been in use for some time but the extent to which this solvent alone could go toward reaching the desired goal was limited. By admixing benzene with the sulfur dioxide in regulated proportions, however, the solvent action of the mixture can be controlled to a point where practically any desired degree of splitting or cutting of the lubricating stock into its component fractions can be accomplished.

For the sake of obtaining the highest efficiency in this operation, the extraction is carried out continuously with countercurrent flow of oil and solvent through the extraction apparatus. In this manner, the oil leaving the system has been treated with incoming fresh solvent which then travels down the system until it is brought into contact with incoming raw stock. In order to eliminate as nearly as possible the uncertainty of translating laboratory experiments into large scale operations, a small scale continuous countercurrent extraction plant was built in almost complete duplicate, except for size, of the design for a commercial installation. This experimental continuous treater has been in 24-hour operation practically continuously for nearly two years, except for maintenance shutdowns. It is only through the checking and rechecking of experiments on a larger and larger scale in order to duplicate as closely as possible practical operating conditions, that justification can be obtained for investing the large sums of money that are required for putting a radically new process into commercial operation.

Perhaps there is no better way to conclude the story of the research behind Triton than to emphasize the difference between Triton and other motor oils. For the first time, to our knowledge, a lubricating oil has been produced from ordinary asphaltic crudes which is more pure in its paraffin-base characteristics than are the present type Pennsylvania oils. In even the best of the Pennsylvania oils we have tested, there is an appreciable percentage of very low grade carbogen material of high carbon-forming tendencies. This material is more nearly an asphalt than a high grade lubricating oil, and in the conditions existing in the crankcase, rapidly oxidizes to sludge which in turn produces carbon or coke deposits in the most undesirable places.

By the application of the principles of solvent extraction that have been developed in refining Triton, we have actually isolated and determined the carbogen and napthene contents of a wide variety of motor oils including the best and the worst being sold in our territory. It is seen from Figure 2 that Triton alone contains no low grade carbogens and napthenes and consists entirely of parathenes. We are proud to say that Triton represents a realization of our fondest hopes, and it is with perfect confidence that we have recommended it for the most difficult tasks required of a lubricating oil.

R. L. Daugherty, left, professor of engineering, California Institute of Technology, weighing in measures before oil is placed in crankcase of test cars on Ascot speedway runs.

Defeat of the Skeptics

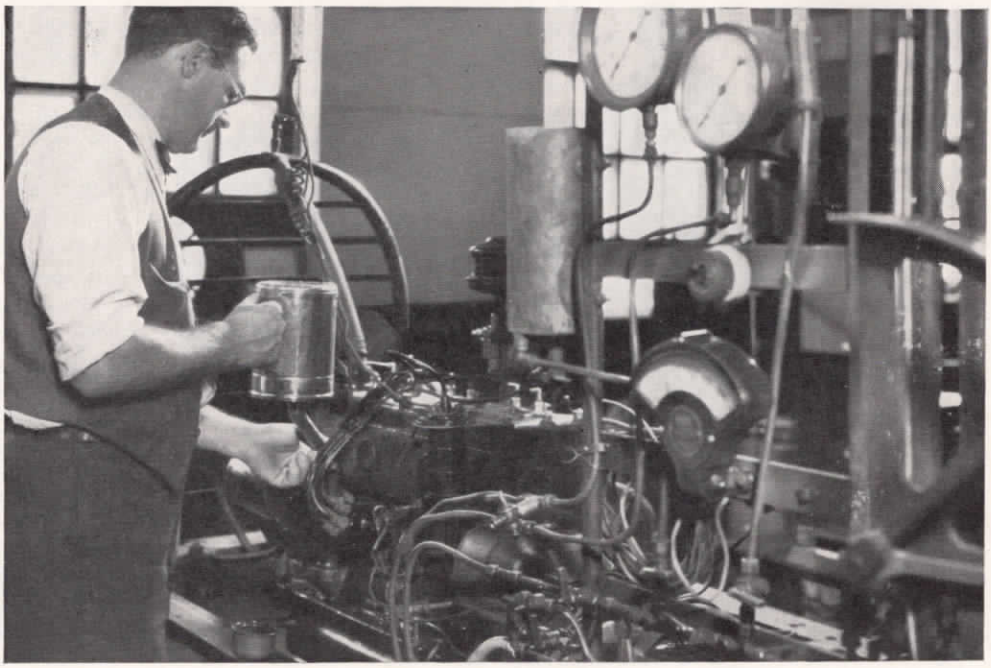
C. C. MOORE, JR.
Research Supervisor

TESTING engineers are by nature skeptical. If Saint Peter offered them a set of specially designed, mothproofed, non-skid wings, they would probably ask for the chemical formula, and then subject them to break-down tests to determine wherein they might be poorly constructed. When, at the end of the day, you see a look of satisfaction on their faces, you can be certain that they have uncovered some flaw and destroyed the hopes of some hard-working inventor or designer. The recent glumness, therefore, of some of the company's testing engineers tells a different story of defeat—not of the inventor or designer, but the almost unheard of defeat of the testing engineers themselves in their effort to find something wrong with Triton! The battle was bloodless, but nevertheless decisive.

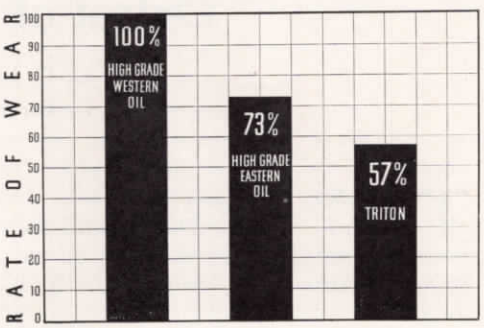
C. C. Moore, Jr.

Automotive engine design has changed rapidly in the last ten years; and research men who keep abreast of the newest developments in engines and the oils intended for use in them have known for some time that the lubrication demands of modern engines were becoming so severe that the current oils on the market could no longer completely satisfy their requirements. This real need for a decidedly better oil caused the Union Oil Company to start intensive research to improve the quality of its motor oils, with the objective of producing oils that would be adequate for use in the most highly developed motors.

A study of the various types of oils on the market showed that none of them had all of the good qualities needed in a truly modern motor oil. Such an oil would neces-



Under carefully supervised comparative "wear index" tests in which Triton was observed in operation in a dynamometer laboratory engine along with a high grade Western and a high grade Eastern oil, results showed that 22 per cent less wear occurred during the period the engine was lubricated with Triton than while being lubricated with its nearest competitor. The chart indicates the comparative results of the "wear index" tests.



sarily combine all the good points of both the Eastern and Western types, with the additional feature of being more stable in use than either one. This ideal combination would cause minimum engine wear, produce a minimum amount of combustion chamber carbon and crankcase sludge and have only a minimum change in viscosity during use. In addition to having the proper viscosity at the operating temperature, it should permit easy starting and have high fluidity at low temperatures, so that instant lubrication is provided, and, of most importance from the average motorist's viewpoint, it should "last longer."

Only men doing lubricating oil research can appreciate the difficulties that were encountered in such an undertaking. However, after many years of unceasing effort, the Research department produced, by certain solvent processes, a series of the different SAE grade oils that were very satisfactory when judged by the various physical and chemical tests. The policy of this company, however, has always been that its products must prove their worth in service by actual service tests so the new oil was turned over to the test engineers and the instructions were to "give it the works."

The first step in the proving process was a thorough test in a modern automobile engine in the dynamometer laboratory, where such conditions as engine speed and load, water temperature, oil temperature, etc., can be exactly controlled. In normal service, wide variations in engine speed and

load are required as one first threads his way through traffic, picks up speed on the boulevard, and then encounters more traffic with its consequent demands for sudden acceleration and deceleration. In the dynamometer laboratory, these varying conditions of operation are duplicated by means of an automatic cam device that operates the engine throttle.

The new oils (which were then designated by serial numbers, but are now the different SAE grades of Triton) were tested in comparison with high grade Eastern and Western oils to determine the relative oil consumption, condition of the oil after service, and wear on the engine. Repeated tests showed that the Triton oils gave equal or less oil consumption than the Eastern oils and markedly lower consumption than the Western oils. The condition of the oils after service was also in favor of the Triton oils, as tests on the used oils showed that they had formed less sludge and acidic bodies during use. This superiority was definite when Triton was compared with both the Eastern and the Western oils.

The principal reason, however, that the informed motorist is so careful about his lubricating oil is that he wants to reduce the engine wear to a minimum, and the Triton oils did a remarkable job of wear prevention in these dynamometer runs. Wear comparison between the various test oils was made by chemical analysis of the used oils for iron content by a method so delicate that, under favorable conditions, one part of iron in many million parts of sample can be detected. The iron analyses on the used oils from a long series of runs showed that the use of Triton caused about three-fourths as much wear as its nearest competitor and only about half as much wear as other oils. By this time, the test engineers were willing to admit that the Triton oils really *had* something.

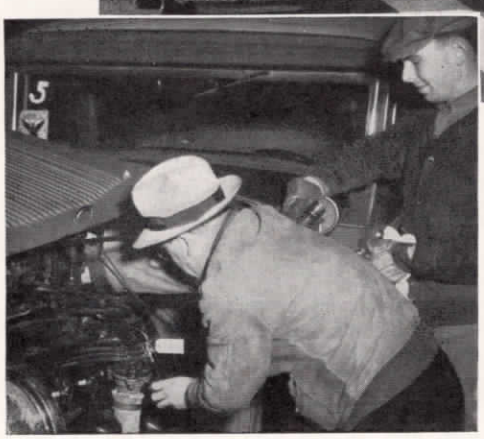
Now that the dynamometer engine tests had discovered no weaknesses in the new oil, the final phase in the testing program was to try this oil, in comparison with high quality Eastern and Western oils in a number of cars under severe driving conditions so that no objection could be raised that the oil had not been tested in actual service. Accordingly the American Legion speedway at Ascot was rented for several weeks, and Professor R. L. Daugherty, head of the mechanical engineering department of California Institute of Technology, was invited to supervise an impartial test of the new oil in competition with the best Eastern and Western oils in five representative cars. Professor Daugherty selected a crew of drivers from upper-classmen and graduates at the Institute, and the cars were started on the long grind, which totaled 60,000 miles.

Each test oil was used in four runs of 1000 miles in every car, and the oils were used in rotation so that any change in weather conditions during this test would not favor any one oil. All oil was weighed into and out of the cars at the beginning and end of the runs to insure maximum accuracy of consumption data. Samples of the used oils were taken at regular intervals during the run and sent to the company laboratory at Wilmington for analysis. When the mass of data obtained finally was tabulated and digested several facts stood out: Triton gave slightly better mileage than the Eastern oil and much better mileage than the Western oil, it also showed less tendency than the Western oil to form carbon deposits, and its oxidation resistance and wear prevention ability were excellent.

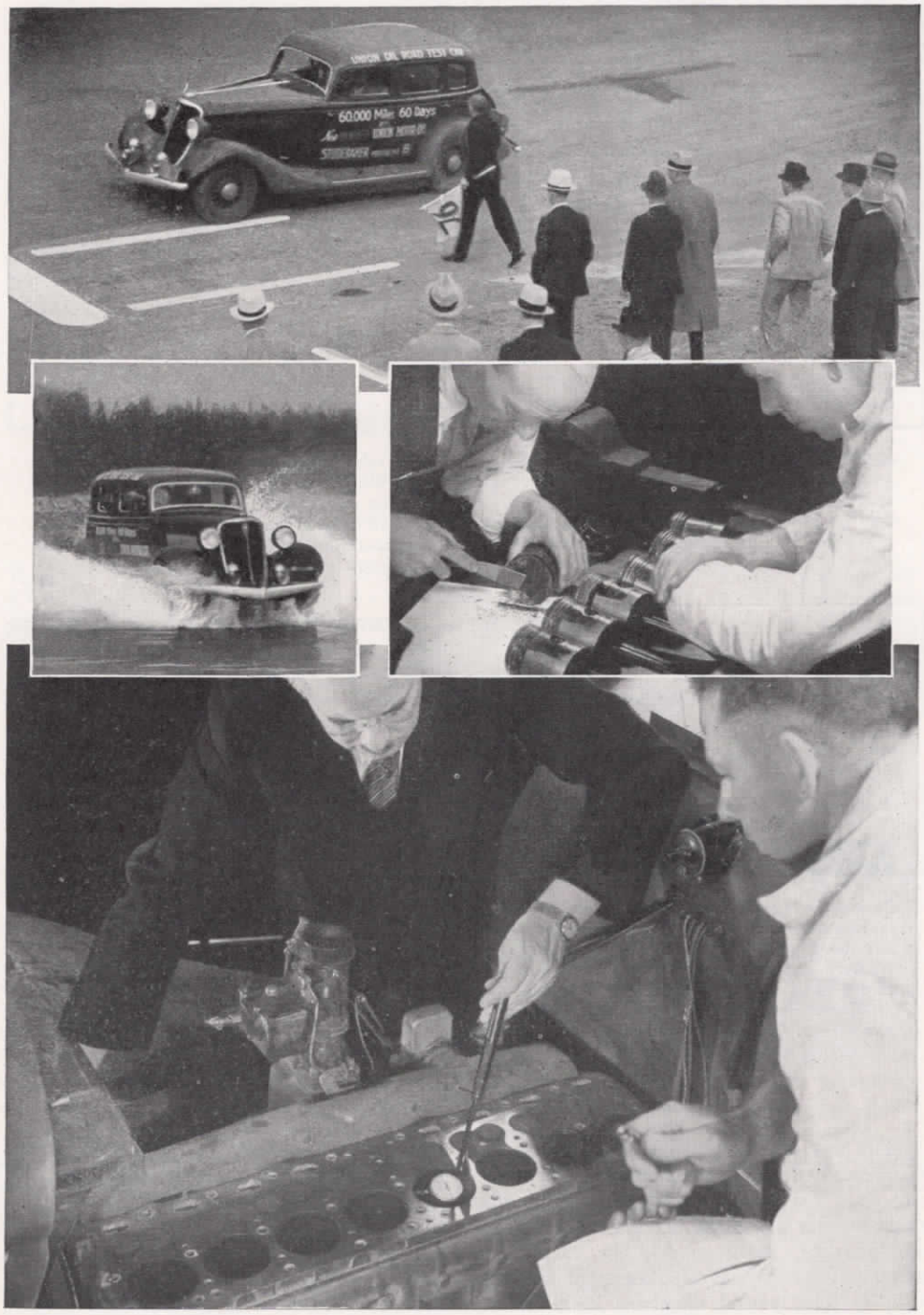
These results agreed well with the previous findings from the dynamometer laboratory and further confirmed the good opinion of Triton which the test engineers had formed from the laboratory results.

While the five test cars were circling the track at the Ascot speedway, Triton was being proved in another and very different manner. Most cars are operated on a variety of oils during their careers, but the test engineers wanted to see just what would happen to a new car if it ran at high speed for the ordinary automotive lifetime on Triton alone. To do this, arrangements were made with the Studebaker agency at Los Angeles for the use of a shiny, new 1934 Studebaker President 8 for testing purposes. This car first was broken in on Triton, then the engine was torn down, and under the supervision of Professor Daugherty micrometer measurements were taken of the cylinders and crankshaft. After assembling, the oil filter was removed to increase the severity of the test, the engine was filled with Triton,

and the car was started on its way to run between San Diego and Seattle on a schedule calling for 60,000 miles in 60 days. Earl Cooper, former AAA race track champion and now chief sales engineer of the company, said this schedule was feasible, and selected a crew of nine drivers made up almost entirely of racing pilots. Schedule maintenance required much high speed driving on open roads where such speeds were safe.

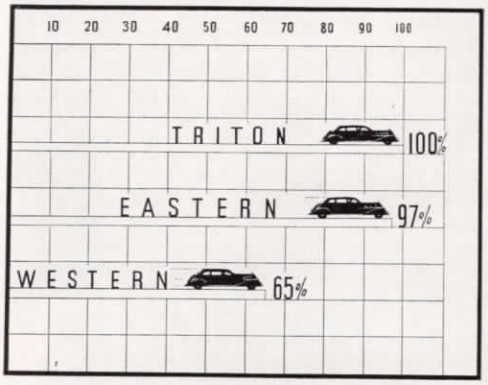


The start of the 60,000-mile Ascot speedway runs in which Triton was compared with high grade Western oils. Inset at top shows pit crew draining crankcase of a test car. Below, drawing off sample of the crankcase lubricant at end of 500 miles.

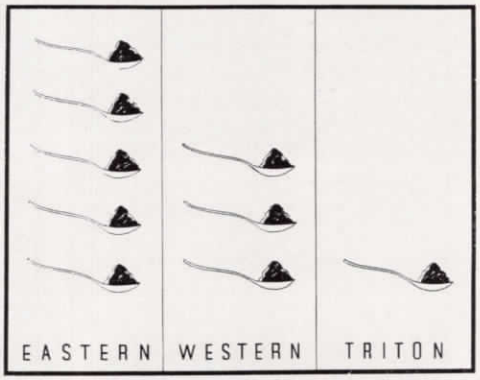


Prof. R. L. Daugherty flags Studebaker to stop at the end of 60,000 miles in 60 days road test on Triton. All the climatic vicissitudes of Pacific Coast weather were encountered. Center right, after 60,000 miles the carbon deposit on piston heads was negligible. Below, Professor Daugherty micrometers cylinder walls to discover that wear on Studebaker motor lubricated with Triton was less than half experienced on a car driven 60,000 miles.

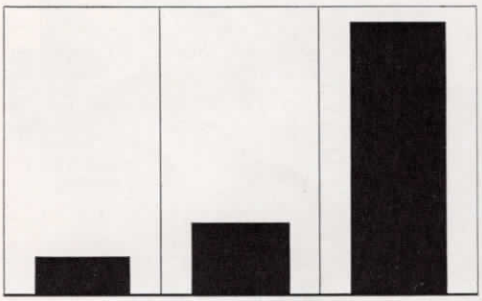
Road and Speedway Prove Triton Merit



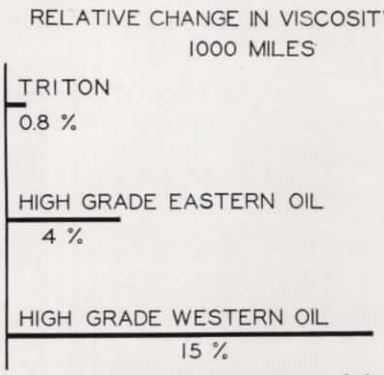
60,000 miles of comparative tests at the Ascot speedway showed that Triton gave approximately 4 per cent better mileage than its Eastern competitor and 55 per cent better mileage than the Western oil.



The relative amounts of carbon produced by the Eastern, Western, and Triton motor oils during the Ascot speedway runs are revealed in this chart. Even after 1000 miles of operation the carbon-forming tendencies of Triton were less than either of the other oils used for competition.



During the Ascot speedway runs, when five representative cars were used in comparative tests with Triton and a high grade Western and Eastern oil, results of analysis of the used oil for sludge formation indicated that nearly 500 per cent more sludge was formed in Western oils than in Triton and 80 per cent more sludge in Eastern oils than in Triton.



It was found at the termination of the Ascot runs that the relative change in viscosity in Eastern oils after 1000 miles of service was 500 per cent greater than in Triton, and in Western oils was 1900 per cent greater than in Triton.

The test was carried on through all the vicissitudes of the winter weather prevailing over the entire length of the Pacific coast territory, and the drivers stopped only for gasoline, make-up oil, the taking of samples for analysis, oil changes at the unusually long period of every 2000 miles, and the minor car adjustments required. The company laboratory in Wilmington analyzed the samples of used oils brought in throughout the test, and in every instance pronounced the oil to be in exceptionally good used condition. The oil drained at the end of each 2000 mile test could have been continued in use for a much greater mileage.

Sixty days to the minute from the beginning of the test, the Studebaker rolled back to the starting point at the Ascot speedway after one of the most gruelling endurance tests that any oil and car have ever undergone. The speedometer showed it had covered a total of 60,183 miles. The engine was torn down, and under the su-

pervision of Professor Daugherty micrometer measurements were again taken of the cylinders and crankshaft to determine the amount of wear that had taken place. It was found that the wear on the crankshaft was negligible and that the wear on the cylinders was so small that after 60,000 miles of operation, reboring was unnecessary! In fact, the Studebaker factory representative (who made the same measurements independently) stated that the cylinder wear was less than half of what normally would be expected at this mileage.

Even such confirmed skeptics as testing engineers can be convinced. The results obtained on Triton in this combined program of dynamometer and road testing compelled them to admit that Triton is a really modern motor oil, capable of adequately meeting every demand of modern motors to a degree that cannot be equalled by other motor oils now on the market.

From Test Tube To Reality

EARLE W. GARD
Development Engineer

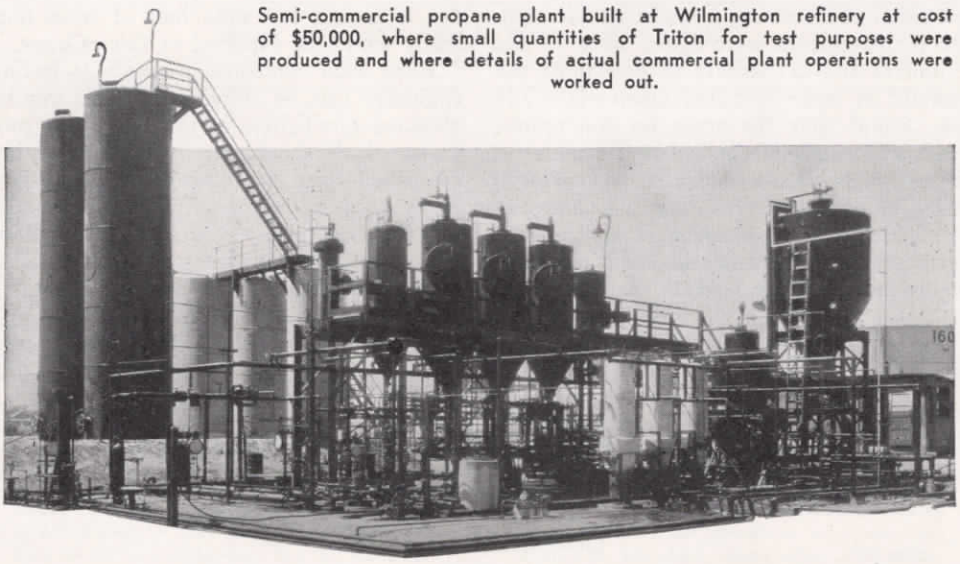
MANY of the outstanding inventions in history have been the result of an accidental discovery. However, this was not the case with Union's new lubricating oil. Several years ago a definite program was outlined to develop a method of producing a lubricating oil from California crude that would be superior to any oil then marketed from any source.

Earle W. Gard

The successful commercial development of any process in the oil industry is dependent upon a planned program and in particular to two different, yet allied, lines of investigation. First, it is essential that a thorough research program be followed in order to determine the correctness of the many assumptions that must be made. The research program must develop the various fundamentals needed in the design of the plant, such as: Can propane be used as a solvent for the good lubricating fractions and an anti-solvent for asphalt and other non-lubricating fractions? Is it possible to separate with certain solvents the best lubricating fractions from the average and poor fractions in the same oil? Is it possible to impart new and desirable characterstics to these best lubricating oil fractions? These are but a few of the questions which must be answered in the laboratory in small scale equipment before it is possible to further develop a process.

Second, the research program must be followed by the development of the small or semi-commercial plant. Where the research has served its purpose in developing the soundness of the fundamentals, the semi-commercial plant is used to carry these ideas into practice and to obtain actual operating data that can be used to design the large scale plant. It is possible to jump from research data to a commercial design, but seldom do the results warrant this step. In our case with a million and a half dollars involved, it was the sane and correct method to design from the results obtained from the various semi-commercial units.

The first unit to be built was the vacuum distillation plant which is used to closely fractionate the oils into the various grades. Before the unit was finally designed, E. G. Ragatz, distillation engineer, visited the latest installations over the country and discussed the problem with several of the country's leading distillation engineers. It was then necessary to utilize the semi-commercial unit of one of the equipment manufacturers to determine the final design for the commercial plant.

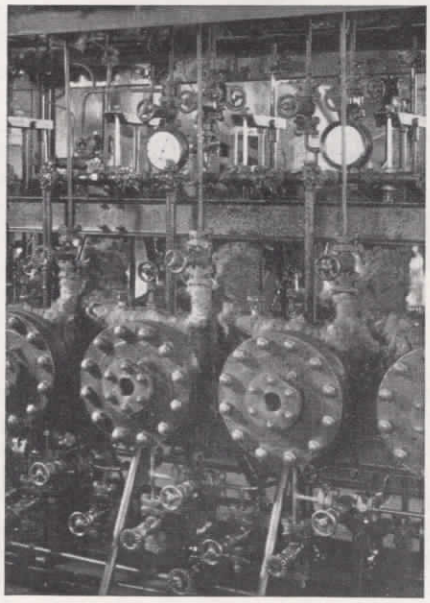


Semi-commercial propane plant built at Wilmington refinery at cost of $50,000, where small quantities of Triton for test purposes were produced and where details of actual commercial plant operations were worked out.

The next unit to be analyzed was the de-asphalting and de-waxing plant. A semi-commercial plant was built which had a feed capacity of 25 barrels per day. The entire design data for the new plant at Oleum was obtained from the operation of this unit which was under the direct supervision of Basil Hopper, who was assisted by Messrs. K. E. Kingman and H. F. Fisher.

The next section of the plant to be developed was the solvent treating unit. Solvent treating was not a new problem, since we had been using such methods for several years. However, in the treatment of the new lubricating oil, the entire solvent treating procedure was changed and more effective solvents were used. A semi-commercial solvent treating unit was built to determine the treating characteristics of the oil. Since this method of solvent treating is the first of its kind to be applied commercially, the unit for this operation had to be designed from the ground up. The semi-commercial unit was under the operating supervision of A. L. Blount, assisted by Drs. W. E. Bradley and C. D. Barnes.

After the fundamental data from the Research department and from the semi-commercial units were obtained, it was necessary to draw complete plans and specifications for each of the commercial units. During the development of a new process many new and confusing problems arise which complicate and retard its progress as well as its final operation. These difficulties require the consideration of special methods and materials for their ultimate solution. The successful solution of minor points occurring intermittently contribute immeasurably to the attainment of a feasible and desirable commercial process. Since Triton is an entirely new and improved

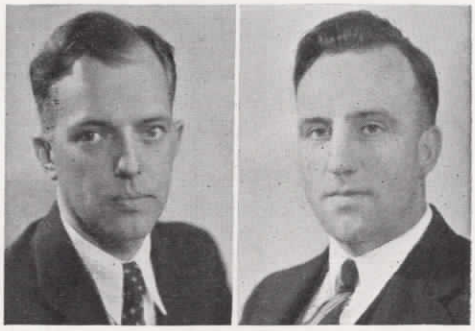


Interchangers in miniature. These heat units were used in the semi-commercial solvent plant in working out specifications for commercial solvent plant.

motor oil manufactured by methods radically different from older practices, it was found that each phase of the new process introduced many complex problems requiring special attention.

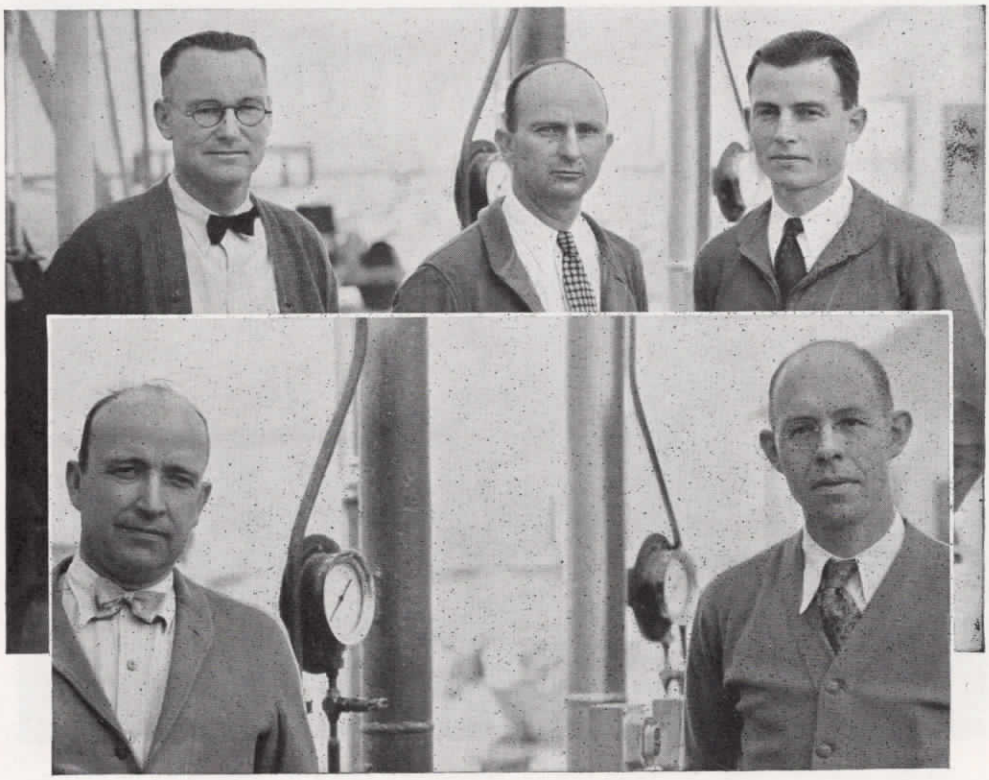
The handling of the wax crystals in the de-waxing step is an operation which entails precision and care, and it was necessary to develop a new type of pump for this service.

While other builders had used ordinary steels for low temperature work, such as refrigerating equipment, carbon dioxide, and liquid air manufacture, our investigation proved these materials unsafe for refrigerating service at very low temperatures. With the cooperation of many of the steel manufacturers a nickel steel alloy was developed for this service. The pipe for low temperature service was also the first seamless tubing of special nickel alloy to be manufactured.

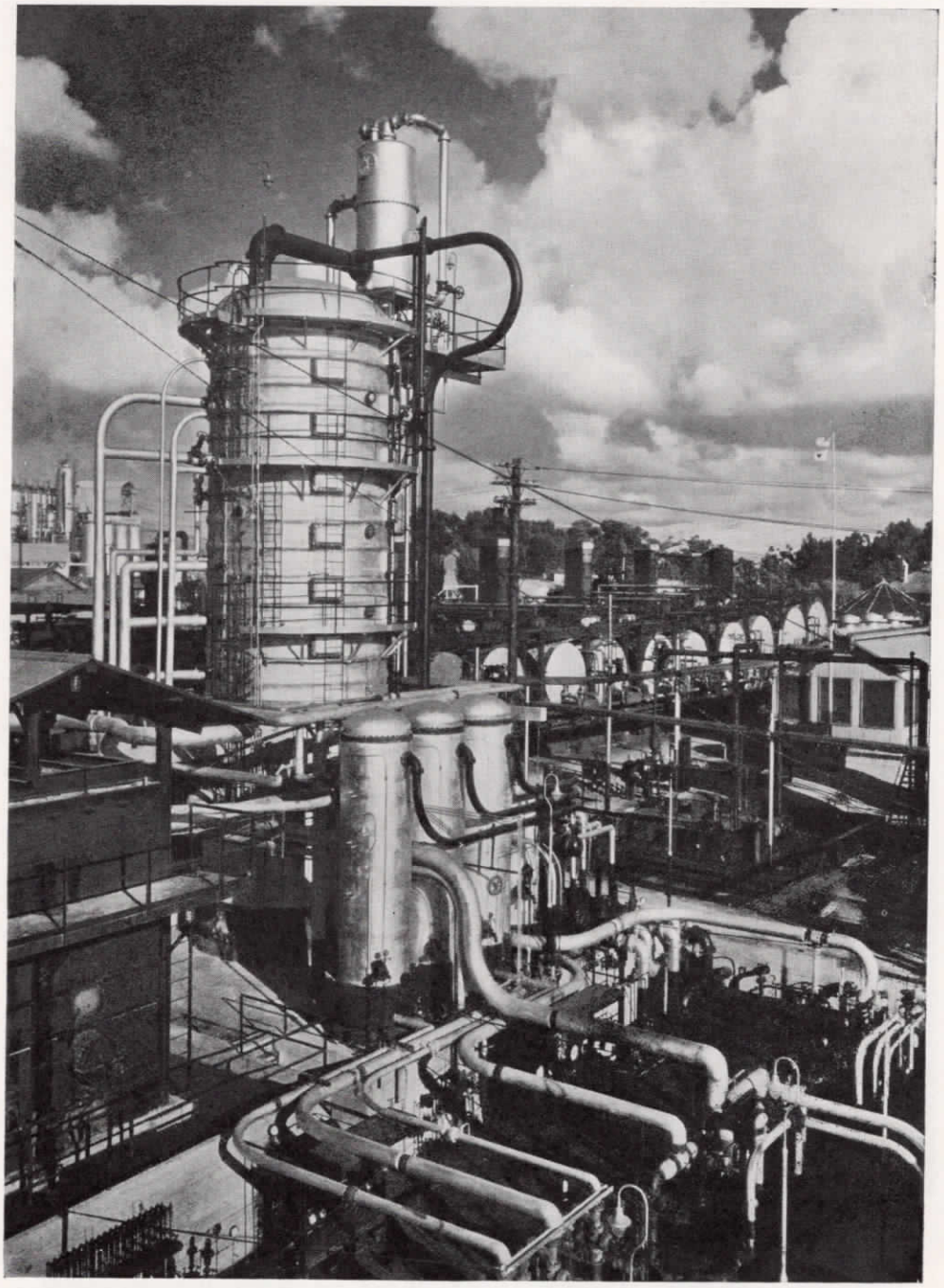


C. D. Barnes, left, and A. L. Blount, research supervisors under whose guidance the successful operation of the Triton semi-commercial plant at Wilmington, where much of the technique and details of the actual plant were worked out, was carried forward.

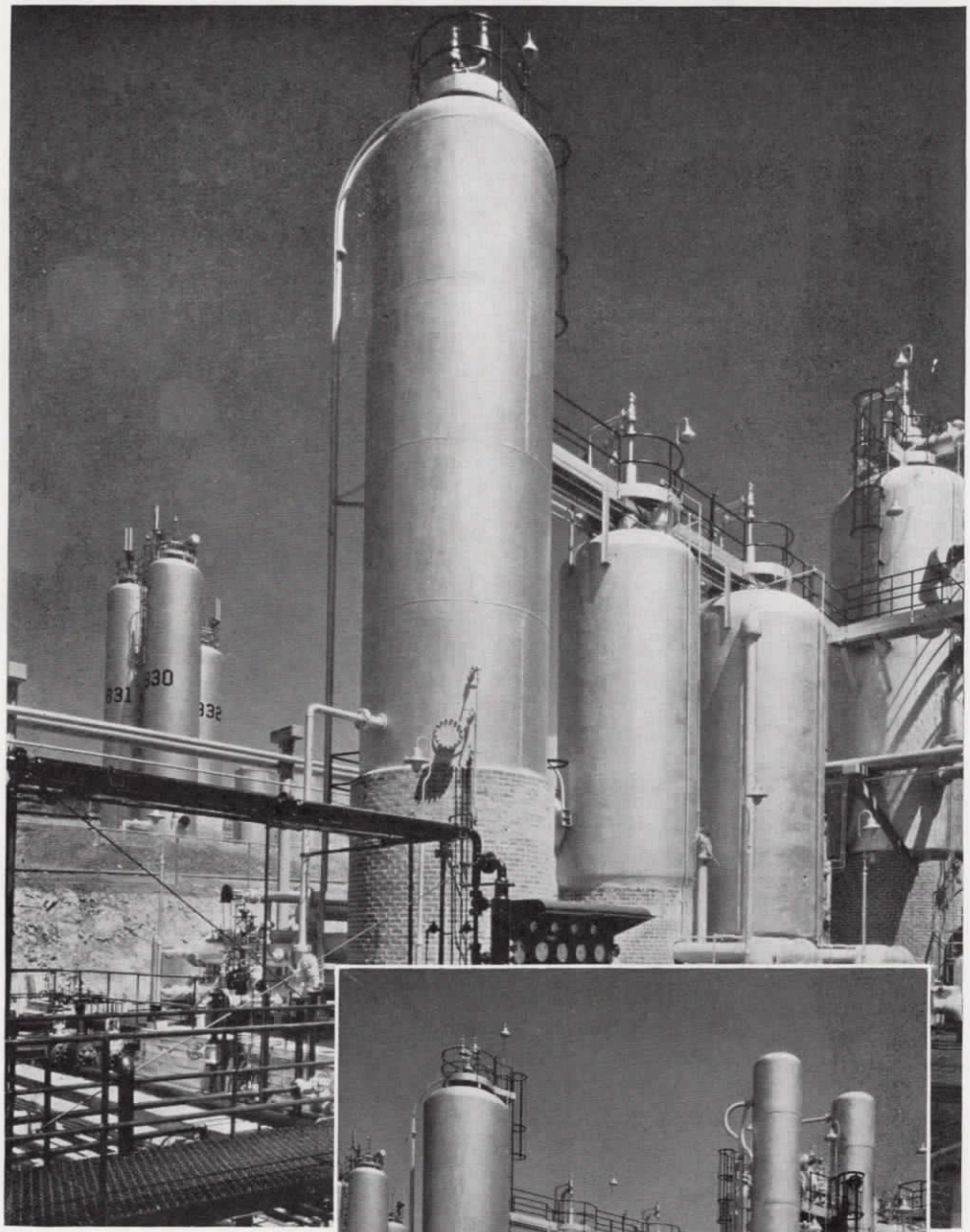
The design and manufacture of the vessels to be used at low temperature also was



The men who designed and built the new propane plant and supervised the change-over of the solvent treating plant. At the top, left to right, Basil Hopper, who assisted with the design and operation of the de-waxing and solvent treating units: B. G. Aldridge, design engineer for the vacuum, de-waxing, and solvent treating units, and K. E. Kingman, who assisted Hopper. Below at the left is E. G. Ragatz, directly connected with the design and operation of the vacuum and solvent treating units, and E. A. Wilson, who assisted Ragatz.



Vacuum distillation tower, where the various "cuts" of lubricating stock are taken before the oil is routed to the propane plant. Stock passes through interchangers and heaters, and then to the vacuum fractionating tower shown in the background. The various cuts flow from the column to the three stripping vessels located in the center, where the flash is controlled. The high vacuum—28 inches—is maintained by the use of the barometric condenser on top of the column. The unit is so designed that either topped crude or propane de-asphalted oils may be run through.



Top: Propane storage drums may be seen in the rear at the left. In the foreground is the de-asphalting plant. Below: De-asphalting plant in the center and at the right the propane and oil recovery columns through which propane-oil solution is routed after removal of wax.

a serious problem. No vessels of this size, specification, or composition previously had been fabricated. All vessels were welded and each joint was x-rayed and tested. The vessels in the solvent treating plant were the first Class I pressure vessels manufactured on the Pacific Coast.

The compressors were of special design so that slugs of liquid could be passed through them without injury. Also, special alarms were installed to automatically shut down the compressors in case liquid did come through the vapor lines.

The de-waxing plant is protected against leaks and possible fire by the installation of special indicators, that give a signal when a leak occurs at specified points in the plant. The same device is used to indicate leakage of air into the vacuum system.

The insulation problem also required special attention and extra thickness due to the low temperatures employed.

All valves directly connected to the chilling and filtration cycle are of an especially designed remote-controlled type. The arrangement of these valves is such that their operation by remote control can be effectively accomplished.

The points just mentioned are only a few which largely contributed to the successful evolution of the new plant. However, they are indicative of the type of question frequently encountered by those developing a new theory.

The design and construction of the various plants has been under the direct supervision of B. G. Aldridge. As the units were completed, they were put into operation under the supervision of Messrs. Ragatz and Hopper, assisted by Messrs. Wilson and Kingman. A large corps of workmen were especially trained and schooled for the operation of this specialized equipment.

We have been ably assisted in our portion of the development work by Messrs. Metcalf, Merrill, and Subkow and their respective staffs. In a project of this magnitude the cooperation of the manufacturing group comprising the refineries, research, development, and patent departments, is the dominant factor in achieving the ultimate goal.

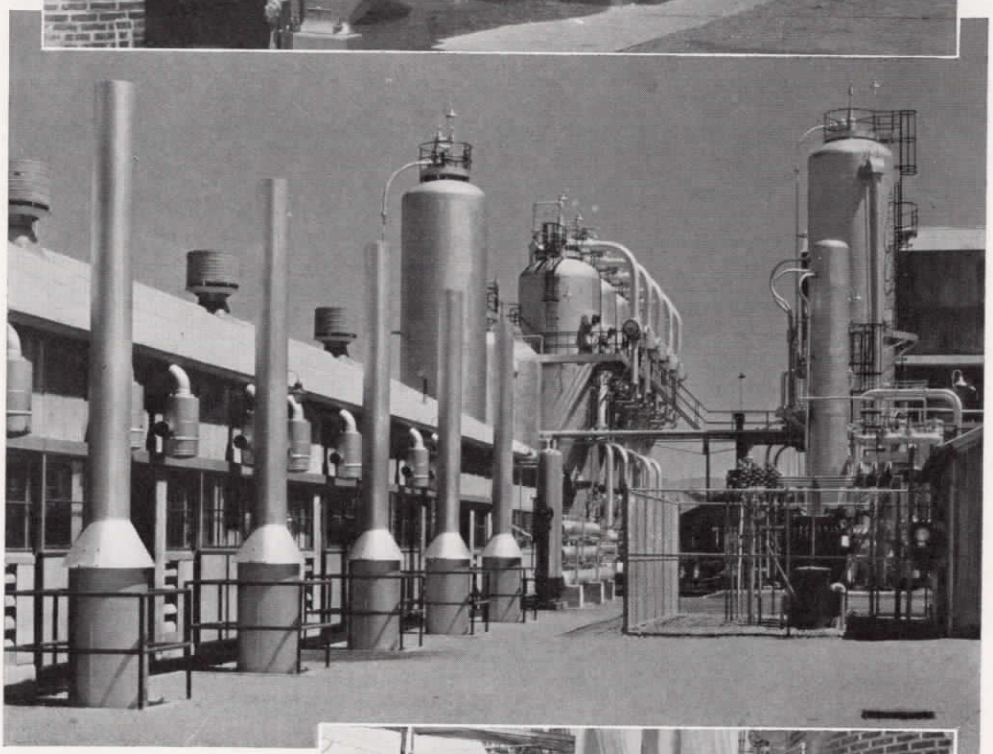
Reviewed briefly, the commercial operation of the Triton plant at Oleum consists of the following five general steps:

1. Vacuum distillation,
2. Propane de-asphalting,
3. Propane de-waxing,
4. Double selective solvent refining, and
5. Final finishing for uniformity of color and grade.

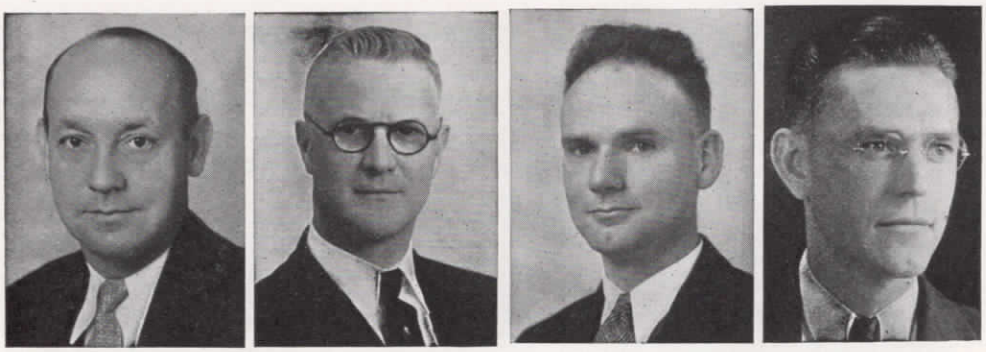
The vacuum distillation unit is used to closely fractionate the various grades of oil before solvent refining. On account of the high boiling point characteristics of the desirable lubricating oil fractions in the crude processed by this unit, it was found that it would be necessary to carry extremely high vacuums on the column in order to take these fractions off as an overhead cut. The tower was especially designed for this operation, and its operation has been extremely satisfactory in the production of heavy grades of lubricating oil, including grades as heavy as the SAE 70 stocks. This unit also is designed so that it can be used for the rerunning of the various cuts after they have been given other treatments.

The next step in the operation of the plant is the removal of the asphaltic fractions that may be contained in some of the grades of oils, particularly the heavier grades. Our research work has developed the fact that, by using several volumes of propane for each volume of lubricating stock treated, all asphaltic fractions can be readily precipitated and removed. Propane de-asphalting is particularly effective when it is desired to utilize short or long residuum stocks remaining as bottoms from the distillation of lubricating crudes. Following the de-asphalting of the various oils, and while the propane is still in solution with the lubricating oil, it is passed on to the de-waxing section of the plant.

In the de-waxing plant, propane serves a dual purpose: that of a diluent for cutting the viscosity of the oil undergoing treatment, and that of a chiller by direct refrigeration. The oil-propane solution from the de-asphalting section of the plant flows into several chilling vessels where the propane pressure is gradually released. This release of pressure causes an evaporation of the propane liquid from the oil, which evaporation lowers the temperature of the oil-propane solution until it has reached a temperature of between –40° and –50°F. The various waxes are crystallized out



At the top are the five motor-driven plunger pumps used in slowly circulating the propane-oil solution through the chillers. A general view of the propane plant may be seen in the center. Below, the remote controlled hydraulic valves which operate the chiller pumps.



As assistant manager of research, T. F. Ott, left, has served in an advisory capacity in working out problems in the production of Triton. A. R. Heise, second from left, as manager of Oleum refinery, will have executive supervision of new plant. P. S. Clark, next in order, research supervisor at Oleum, cooperated with development department in placing new plant on production. Don E. McFadden, right, who assisted E. G. Ragatz in the basic design of the solvent plant and its operation.

during the chilling operation. While the propane is being evaporated it is necessary to add additional propane in order to keep the oil-propane ratio at a constant value. During this operation the oil-propane solution is slowly circulated by especially designed pumps so that the wax will not settle to the bottom of the vessel and, in turn, plug the pipe lines.

The chilled oil solution at –50°F. is then transferred by special pumps through a series of filters. The filters are so arranged that any of them, or any of the leaves of the filters, can be cut out of service if an emergency should arise. In the filters the wax that has been formed during the chilling operation is completely removed from the oil, and the clear oil and propane solution is then passed to a propane recovery column where the propane is removed from the oil. The wax that is removed from the filters contains a certain amount of propane and, therefore, must also go to a recovery column in order to be stripped of its propane fractions. The transfer of the wax through the plant is accomplished by the use of especially designed gear pumps.

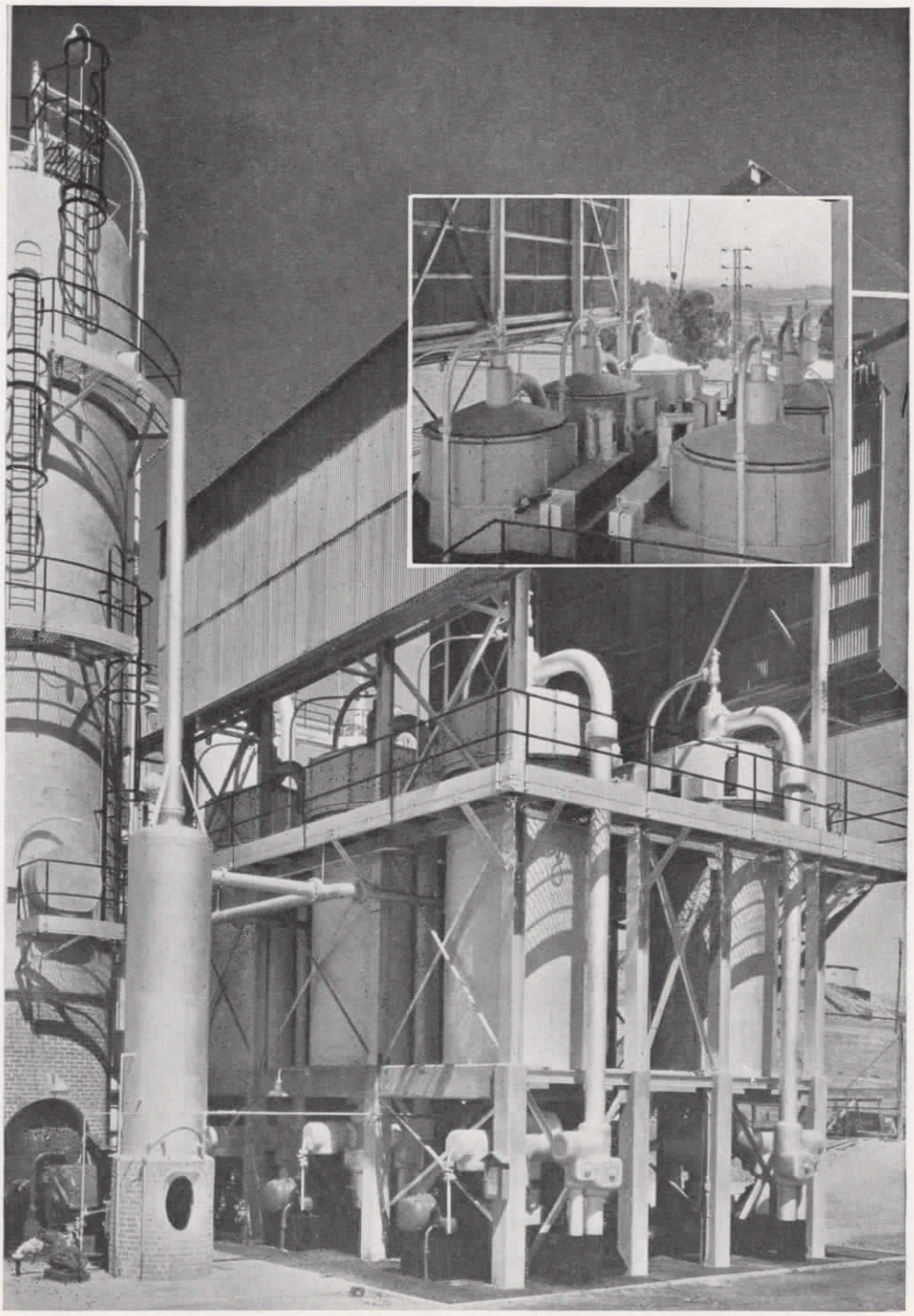
The entire plant is automatically controlled from a central control house located midway in the plant. From this control house the operators manipulate all valves either by hydraulic or air motor power. All plant control indicators are brought into the control house so that the operators have directly in front of them, at all times, sufficient indicating apparatus to inform them of the condition of the oil at any point in the plant.

Due to the fact that during a part of the operation cycle it is necessary to maintain a slight vacuum on certain sections of the plant, there is a possibility of drawing in a small amount of air, thus contaminating the propane. Special equipment has been installed for the automatic rejection of any air thus taken into the system.

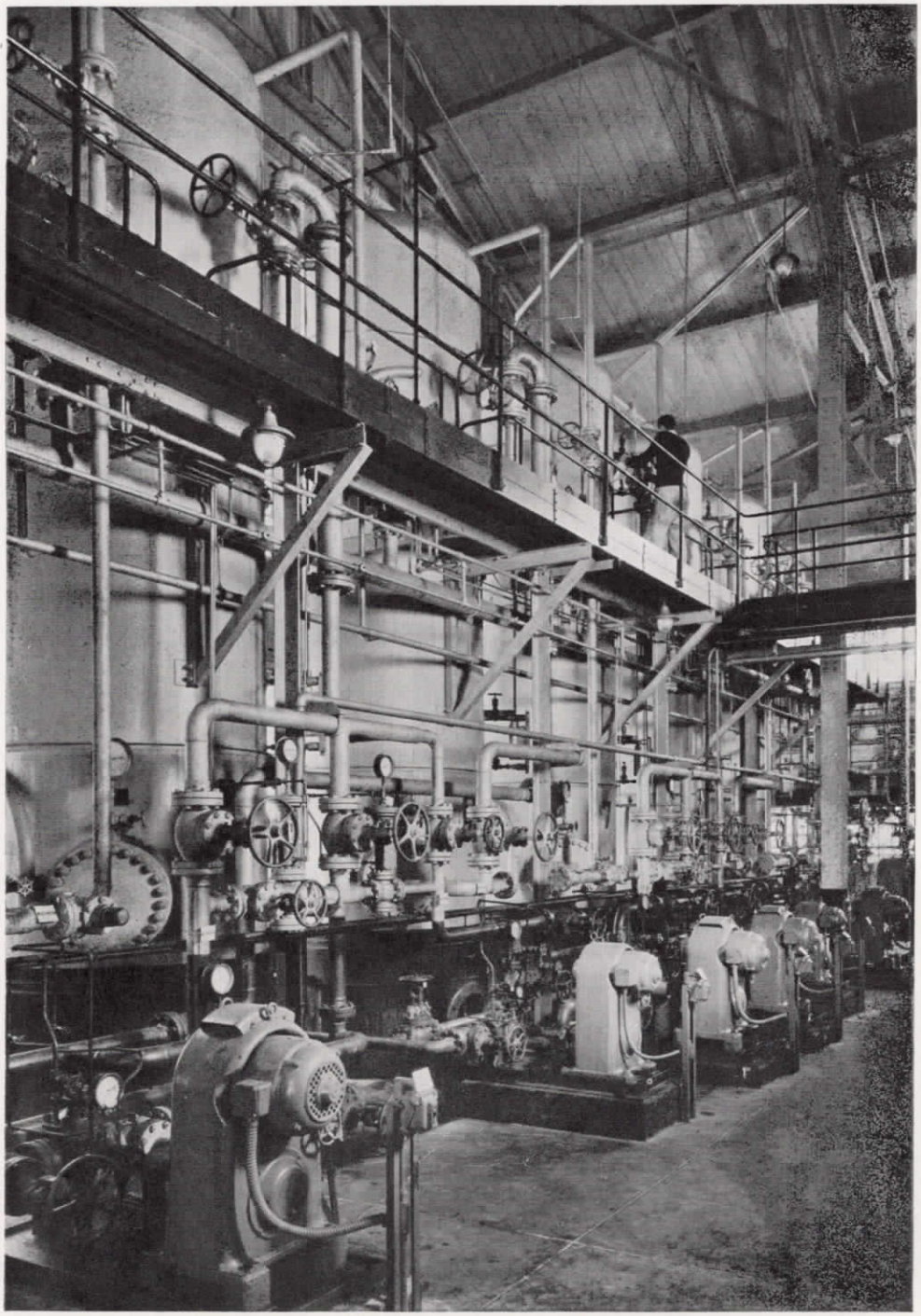
In addition to the above features we have installed an alarm system that notifies the operator whenever there is a serious leakage or concentration of propane gases any place in the plant.

During the refrigeration cycle it is necessary to compress the gases that are evolved during the evaporation of the propane, and especially constructed gas compressors are used for this purpose. Safety devices also are located on this unit in order to protect the compressors from breakage due to liquid coming into the compressor cylinders along with the gas. If any liquid does come through to the suction of the compressors, automatic valves and controls are operated to remove the liquid or completely shut down the compressors until all of the liquid has been removed.

Following the de-asphalting and de-waxing step, the oil is transferred to the solvent plant for further treatment. In the solvent plant the oil is treated with a dual solvent of high selective powers so that all of the undesirable fractions in the oil can be completely removed before the oil passes out of the system. This plant also is auto-

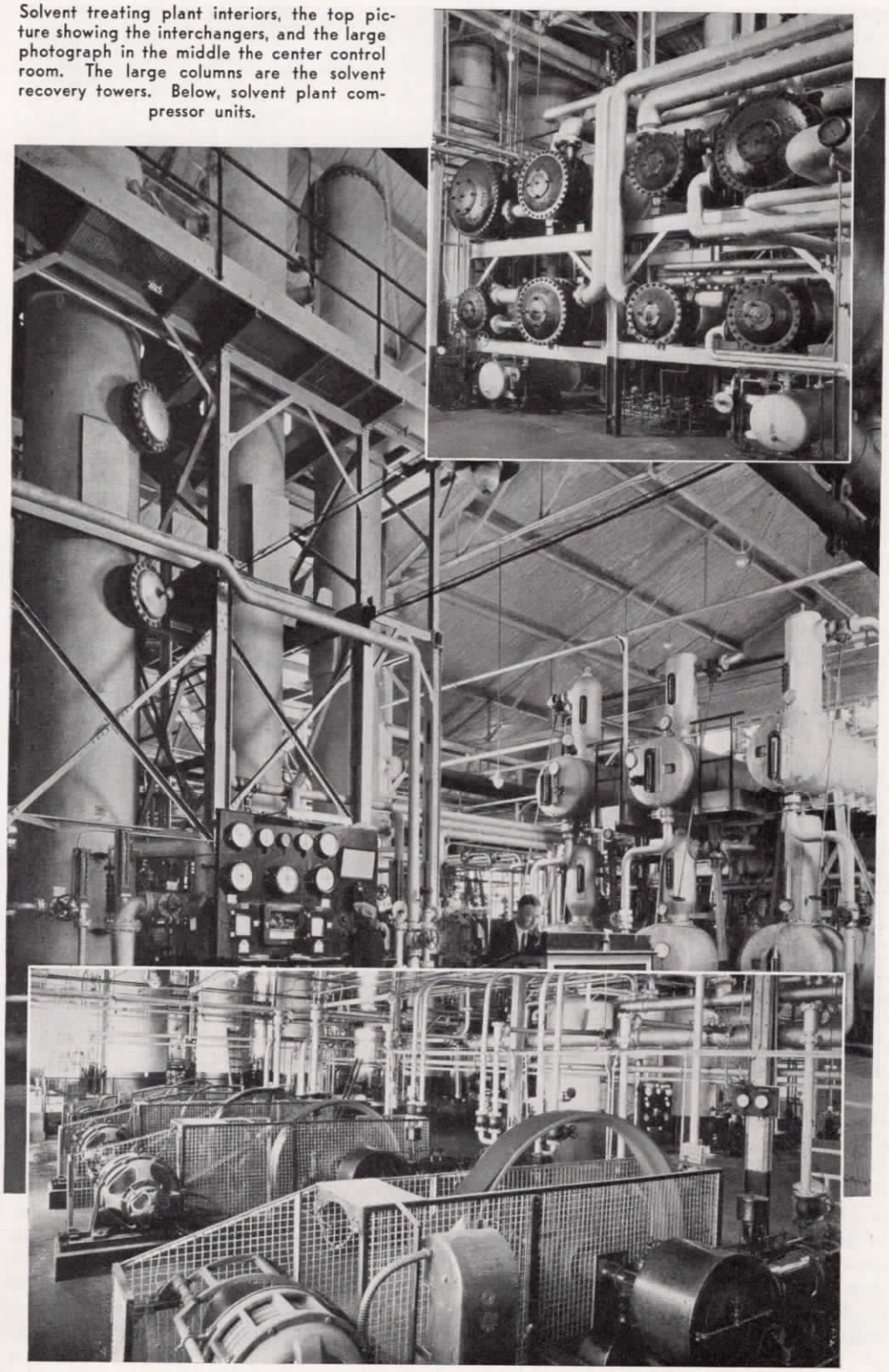


Filter section of the propane de-waxing plant. Propane-oil mixture is transferred from the chillers to the cold mix tank, shown here at the left, and then routed through the filters. Oil leakage from relief valves is collected in small tank in foreground. Inset shows top of filter leaves, which are removable for inspection and repair.



The solvent phase of the manufacture of Triton is an expansion of the Edeleanu process and is divided into two treating steps. As the oil enters the plant it is treated with sulfur dioxide in four counter-current stages. The raffinate is then pumped to the eight counter-current sulfur dioxide-benzene treaters, shown here. Extract and raffinate are transferred between stages. Special precautions have been taken to eliminate sulfur dioxide and benzene leakage.

Solvent treating plant interiors, the top picture showing the interchangers, and the large photograph in the middle the center control room. The large columns are the solvent recovery towers. Below, solvent plant compressor units.



matically controlled in many parts, and special equipment has been installed for the protection of the plant and the operators.

By careful control of the temperature and solvent ratios in the plant, any desired grade of lubricating oil may be produced. Due to the manner in which the solvents are used in the plant, a careful system of fractionation must be employed in order to thoroughly separate the solvents from the oil and from each other. Special devices also are installed to keep the concentration of solvents and solvent ratios at a constant figure during the operation of the plant. Following the solvent treatment of the oil, it is transferred to the final finishing plant where the color and grade are controlled, so that the product will be of uniform quality.

Since the oil will be marketed only in sealed containers, special canning equipment has been installed for the packaging of all grades of oil in various size containers.

In putting any new plant into operation, difficulties usually are encountered which must be ironed out before the plant is placed in continuous commercial production. This was true of the Triton plant, and, although minor operating difficulties were encountered at the start, no changes had to be made in the basic design of the plant.

The Production of Triton

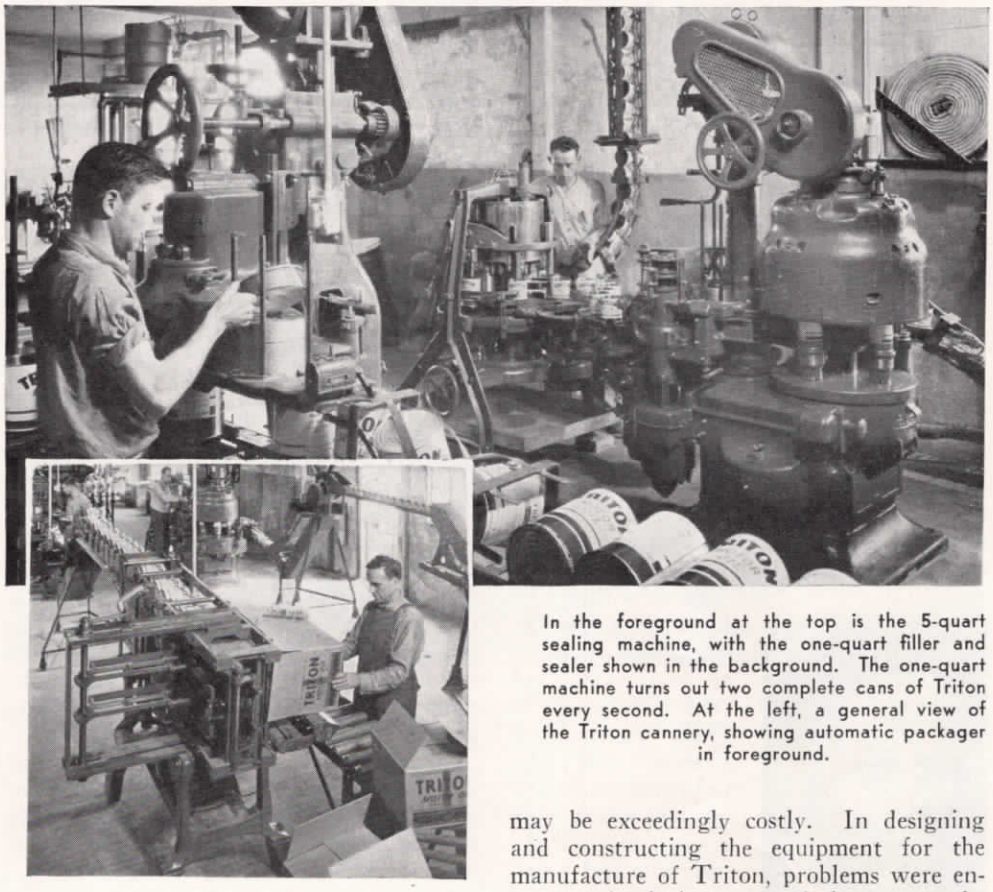
L. G. METCALF
Manager of Refineries

THE production of Triton has required not only the development of treating methods and equipment new to the world, but has also necessitated extensive changes in production and transportation methods and facilities to the end that the selected crude may be delivered to the refinery uncontaminated. In the course of the work on the various engineering, operating and personnel problems which arose, the refineries drew heavily on other departments of the company, and the experience of these other departments was often of great assistance in arriving at a satisfactory solution of the difficulty.

L. G. Metcalf

Before the real work of designing the new plant could be started two major problems had to be solved in the determination of the production capacity needed and the selection of the best location for the plant. As no data were available from which the size of the plant required could be calculated, the Sales department made a very careful survey of the probable market demand, taking into account the high quality of the new product, the available means for distribution and sale, and the proposed sale price. From the results of this survey the necessary present capacity of the plant was calculated. The plant was then designed with a capacity considerably in excess of the present expected demand, for we feel confident that as the merits of Triton are demonstrated in service the market for it will expand.

In the selection of the location for the new plant many factors were given consideration, such as nearness to the source of supply of the proper crude oil and of the essential solvent propane; convenience of the available site; existing equipment which could be used for the new plant; available operating personnel; and expense of distribution of the finished product. The Oleum refinery, located on San Francisco Bay, was found to offer the greater advantages, as there were available at that point considerable tankage, pipe lines, treating facilities and packaging equipment which could be used for the new product and which were not in existence at the Los Angeles refinery. At Oleum there was



In the foreground at the top is the 5-quart sealing machine, with the one-quart filler and sealer shown in the background. The one-quart machine turns out two complete cans of Triton every second. At the left, a general view of the Triton cannery, showing automatic packager in foreground.

also a complete organization of lubricating production and shipping operating personnel which could easily be expanded to handle the new operations. Oleum is also centrally located for the distribution of the finished oil with favorable transportation costs to sales points. These advantages more than offset the Los Angeles refinery's advantage through being nearer to the source of supply of the crude oil and propane. In other minor factors studied neither plant showed any great advantage over the other.

The production of any new product in a present day complete refinery requires very careful planning and the thorough consideration of many factors, each of which is of importance. This is particularly true if the new product is to be manufactured in such large volume as to require the construction of much expensive new equipment, since any serious errors in design or material will then entail corrections which may be exceedingly costly. In designing and constructing the equipment for the manufacture of Triton, problems were encountered which were entirely new to the refining industry. The new treating processes have required the education of the operating personnel along new lines, as they involve the use of treating agents which are difficult to handle and in which no previous operating experience existed.

To maintain the high quality of Triton, an adequate supply of the raw material for present and future requirements must be secured, and it is essential that the selected crude shall be handled from the wells to the refinery in such a manner that it will not be mingled with any other crude. In fact, it is even necessary to separate the desirable crude oil produced by a certain zone, or sand from the less suitable production of other zones in the same field, then transport this selected crude uncontaminated to the harbor through a complicated pipe line system which must serve also for the transportation of oil from ten producing fields, and store it separately until it can be loaded on a vessel for its

five hundred mile voyage to Oleum. This required extensive changes in the methods of operating all production and transportation facilities, and the rearrangement of production operations, pipe line runs and ship movements.

The final production of the finished Triton is a source of pride to us all, a pride and interest extending to everyone in the organization even though their immediate work is not connected in any way with the actual operations.

Twelve Years of Research

DR. D. R. MERRILL
Manager of Research

RESEARCH in recent years has taken its place as an essential part of industry. In this competitive age, not only profits, but even continued existence, may depend upon adequate and active research.

Dr. D. R. Merrill

The Union Oil Company recognized this trend at an early date, and twelve years ago, in 1922, organized a Research and Development department in which were brought together the men who had previously been carrying on experimental work in the refineries and natural gasoline plants. A great impetus was given to research in the company at that time by the construction of a large concrete and brick laboratory building at the Los Angeles refinery in Wilmington, California. Preparatory to the design of this building, R. E. Haylett, at present director of manufacturing, and at that time manager of research and development, made an extended tour of large industrial and institutional research laboratories in the United States. As a result, the building contains many outstanding features of convenience and flexibility of arrangement.

There is a saying that "Mark Hopkins on one end of a log and a student on the other constituted a university," and it is equally true of industrial research laboratories that the men in the organization are more important than the physical facilities. In the period from 1922 to 1929 there was a steady increase in the number of chemists and engineers in the Research department and great care was taken in selection to insure, as far as possible, obtaining men of high promise of scientific achievement. In spite of the severe economic stress of the last several years, the company has maintained the full quota of employees in the research laboratories.

Research carried on for the purpose of determining proper operating conditions for manufacturing standard products of highest quality at the lowest cost has an important bearing on profits from operations, but from the longer range viewpoint, the development of new processes and products is of even greater importance. The first step towards invention is usually visualizing a need, but sometimes this requires almost as much ingenuity as making the invention itself. Methods of invention cover a wide range. At one extreme is the method which Thomas Alva Edison is reputed to have used, that of trying everything whether it appeared logical or not. At the other extreme is the invention coming as a brilliant inspiration and requiring only a single experiment to prove its value.

In practice most inventions are reached by an intermediate course: A need is visualized; some preliminary experiments are made to map out a field; the results are studied and analyzed, if possible, mathematically, in an attempt to bring out the principles involved; and further work is planned and performed leading eventually to a definite conclusion. This conclusion may be a favorable or an unfavorable one.

Administration building, company's Los Angeles refinery at Wilmington, Calif., which houses research department where Triton was born in the test tube and upon the roof of which the experimental plant, that first produced Triton, was built.

Even if the conclusion is favorable and the process appears both technically and economically sound, it may not involve invention because of lack of novelty. Every research chemist at some time has the sad experience of thinking he has invented something worth while, only to find that the idea is old or covered by active patents held by others. The more obvious and satisfying the solution of a problem, the more likely it is that someone, somewhere, has thought of it already. Another discouraging aspect of research is the development of a satisfactory solution only to find that an entirely different but better solution has been found by someone else. It has become recognized that the useful life of industrial processes is often very short due to their being superseded by better ones, but sometimes, unfortunately, a process is obsolete even before it is possible to apply it commercially. In effect, all research laboratories in the same industry are in competition, with the one reaching the best solution first reaping the reward.

Because of the extreme importance of time in obtaining patent protection for inventions, it is necessary in a research laboratory to anticipate the needs of the industry as far in advance as possible. It is only by the early visualizing of a need and the building for the future that a particular laboratory is likely to be first in an important patent field.

As contrasted with the discouraging aspects of research mentioned, there is the great satisfaction of constructive accomplishment. A few may even achieve the reward of seeing their processes accepted by the industry under their names as the inventors. The creative instinct is particularly strong in the inventive type of research worker, but everyone assisting in the solution of a problem takes pleasure in seeing a new plant or a new product grow out of his efforts. Anyone connected with the development of the automotive and petroleum industries over the last ten or fifteen years may feel that he has contributed towards a higher standard of living by increasing the availability of efficient and inexpensive individual transportation.

In reviewing the work of the research department of the Union Oil Company for

the past twelve years, there are several accomplishments which are worthy of particular mention. In 1932 the company placed on the market "76" gasoline, which represented a distinct advance, particularly in knock rating, over competitive non-premium gasolines. The extensive research which made this advance possible included a study of processes of stabilization of natural gasoline, production of pressure distillate by various cracking processes and from various charging stocks, and treatment and blending of gasoline stocks. The required characteristics of the gasoline were established after a thorough study of the effect of varying composition of the gasoline blends on motor performance under widely different conditions, such as idling, accelerating, and partial and full load operation under extremes of temperature and altitude.

In marine service there has been a marked trend from steam to diesel engines, and in recent years the installation of stationary diesel engines and of automotive diesel engines, particularly in heavy trucks, is also progressing at an accelerated rate because of the economy of operation obtainable with these engines. The resulting demand for gas oil as diesel fuel, as well as for cracking stock for gasoline production, has offered a serious problem. Some years ago the company developed and installed an economical process whereby the gas oil fractions in ordinary fuel oil are removed by distillation and the heavy residue is cracked just sufficiently to reduce the viscosity and convert it into a satisfactory fuel oil for steam boiler use. The various gas oil fractions obtained from the crude oil distillation and viscosity reduction operation are blended together to give diesel fuels of the desired commercial grades. After exhaustive practical tests, a blending procedure was developed for producing a heavy diesel fuel for large engines which has attained an enviable reputation for ignition characteristics, economy, and avoidance of wear of engine parts.

The production of lubricating greases by the company dates back about twenty years, but even twelve years ago production was largely dependent upon the skill of the grease-makers, and failure to reach the desired standard was all too frequent. Standardization of procedures for manufacturing greases of the usual cup and fiber grease types, and the development of new greases, was undertaken by the research department. Grease-makers are now trained in the research laboratory where many new greases have been developed. In starting commercial manufacture of new greases, the chemist responsible for the development actually makes the first few batches in the commercial equipment before turning the operation over to the plant grease-makers. In this way an extensive line of greases for both automotive and industrial lubrication has been brought into commercial production. A few examples of lubricants enjoying wide use are Union Wheel-Bearing Lubricant, Translubo and Extreme Pressure Gear Oil.

At the present time one of the most extensive research projects undertaken by the company is being fulfilled in the presentation of a new lubricating oil to the public. This new oil is the first commercial production from California crude of a lubricating oil fully equivalent and superior in many respects to the highest grade and most expensive oils on the Pacific Coast market. The development of this oil is so interesting and important that it is being made the subject of separate articles. Prior to this recent development, much effort was expended in bringing the western-type lubricating oils to their present standard of quality and in producing oils for special purposes, such as turbine, transformer, agricultural spray, and technical white oils.

The problems just mentioned have led to particularly interesting and important results, but many other problems have been carried to successful conclusions during the period. An extensive line of household, automotive, and industrial specialties has been developed and placed on the market. Among the industrial specialties, many special asphalts have been produced, such as pipe line coatings, pipe dipping asphalts, battery sealing compound, and colored asphalts. Other industrial specialties are paint and lacquer solvents, and by-products, such as naphthenic acids. While the new products do not yet compare in importance with established products, such as gasoline and fuel oil, there undoubtedly is a marked trend in the industry towards a better utilization of the chemical possibilities of petroleum.

An important function of the Research department, often not directly connected with research, is the furnishing of technical advice and information in reply to inquiries. This ranges from assisting the Manufacturing department with its technical problems, such as correction of difficulties in operations, adapting operations to meet product specifications, and choice of materials of construction, to advising the Sales department and customers on selection and application of products. Due to the ramified operations of the company and its customers, the field of knowledge covered by the problems submitted is very broad.

As to the future, no one can be sure what the most important technical development in the industry will be in the next year or the year after next. But the research chemist can hope that among the large number of projects carried on simultaneously in the laboratory, an occasional one will lead to an outstanding contribution; and the others, if pursued diligently, will usually more than return the effort expended. In research no results are valueless, provided they are true, as all of the bits of information, when pieced together, lead to a better understanding. It is only through such an understanding that the more complex problems can be solved and real progress made.

Patent Protection for Triton Process

PHILIP SUBKOW
Patent Counsel

Editor's Note:—Triton is a research and technical achievement, but a substantial share in the credit for presenting it to the public belongs to a small corps of patent attorneys headed by Philip Subkow. They seldom come in contact with the rest of the company employees, and their existence is really known to a comparatively few persons within the company. Their work in protecting the company's patent rights in the development of the Propane Solvent process is outstanding. Every step in the development, beginning in the earliest test tube stage, has been carefully followed. Claude E. Swift, who aided Dr. Bray and others in the original research work and later was transferred to the Patent department, has been one of Mr. Subkow's chief aides in preparing the patent claims.

THE discovery and development of Triton has presented a large number of interesting and involved patent problems. The necessity for the adequate protection of this new process has brought about an extensive patent development program. As is not unusual in the petroleum field, a large number of patent conflicts have arisen because of the impingement of these new processes in a number of their features upon the developments of other companies. As a consequence of these patent conflicts the patent development program has resulted in a number of arrangements with other oil companies, and extensive litigation has thereby been avoided.

Philip Subkow

The development of the process from the original observation in Dr. Ulric B. Bray's laboratory by Dr. Bray and Claude E. Swift to its implementation in steel, in an extraordinary ingenious plant at Oleum, is a romance of research and engineering achievement. The story of this development told by those who have had a leading part therein will be found elsewhere in this Bulletin.

It has been the duty of the Patent department to protect the process by patents and to clear the way for its development by opening patent barriers that have been set up by patent conflicts with other oil companies. The description of the pro-

cess and the story of the development, as told in this Bulletin, is of necessity but the barest outline, and omits a large number of subsidiary developments which support the structure here described and neglects, as it must, the by-products of that research, some of which are of the first magnitude of importance. The protection of the process in its multitudinous forms would have been impossible but for the cooperation and patience on the part of all the members of the Research and Development departments who have given generously of their time and thought to the end that the Patent department may be properly advised and guided in its efforts to protect the various inventions resulting from the efforts of the Research and Development departments. The mechanism by which this was accomplished may be of interest.

The Patent department is represented in the Manufacturing Committee and at each of the Research conferences. All reports of the Research and Development departments are available to the Patent department. These reports and the discussions at the meetings of the Manufacturing Committee and at Research conferences are carefully studied to select all possibilities for patent protection. The Patent department maintains a complete library of patents relating to the petroleum industry. Its experience with patents in this field has made it possible for the attorneys to choose possibilities for patent protection from the mass of data which appears in the Research and Development departments' reports. When the occasion requires, supplementary searches are made through the Patent library. Periodical conferences are held with the director of manufacturing, manager of research, development engineer, and manager of refineries, at which conferences the practical utility of various of the possibilities is discussed. If the ideas withstand the scrutiny of this committee the Patent department is instructed to file patent applications, if in the judgment of the Patent department any substantial patent protection can be obtained.

The filing of the patent applications initiates the difficulties of the Patent department. It may be of interest to follow briefly the history of a patent application in the United States Patent Office.

The problem of drafting a patent application is a problem in definition. The patent attorney has a two-fold duty to perform. He must adequately describe the invention so that the description will permit others to operate the invention upon the expiration of the patent. This is a statutory duty, and is essential for the validity. His second duty is to distinguish the invention from the whole mass of what has gone before in the field to which the invention pertains. The prosecution in the Patent Office is a struggle between the Patent Office and the attorney, both seeking to obtain a definition of the invention in the form of claims. Since the protection or monopoly granted by the patent is measured by the claims, it will be obvious that the main duty of the patent attorney is to draw the claims so that they be not so extensive as to include what is old, but not so narrow as to omit any portion of that which is new.

Upon presentation of the claims to the Patent Office, the case is assigned to a patent examiner who is a specialist in the field to which the patent application pertains. The examiner searches in literature and the prior patented art to determine the inventor's contribution, and either accepts or rejects the claims which are presented. If he believes that the claim is so broad as to include what has gone before, he will reject the claims, citing such prior knowledge as he believes anticipate the claimed invention. The attorney will either amend the claim by restricting its scope or will argue the propriety of the examiner's rejection.

A series of such proceedings usually results, sometime with a continued attrition of the claim, until an agreement is reached with the Patent Office as to the proper scope of the protection which may be claimed for the invention. If no such agreement is reached the examiner will finally reject the claims and then an appeal may be taken from the decision of the examiner to the Board of Appeals. This Board of Appeals will either affirm or reverse the examiner. If the examiner is reversed the claims will then be allowed. If the examiner is sustained, the inventor has two courses open to him. He can either appeal to the Court of Customs and Patent Appeals in Washington, or proceed by a bill in equity to the Federal District Court where the Commissioner will accept serv-

ice. Usually this is the Federal District Court in the District of Columbia. From this court an appeal may be had to the Circuit Court of Appeals in the District of Columbia. If, in the Court of Final Resort the decision of the examiner is finally sustained, the claims which have been finally rejected must be stricken from the case and the case then proceeds to allowance on the claims which the examiner may have originally allowed. If, however, the examiner's decision is finally reversed, the whole case may then proceed to allowance.

But this may not be its final history in the Patent Office, for at any stage in its proceedings when an agreement has been reached and the claims found allowable, if there is pending in the Patent Office another claimant for the same invention, the Patent Office will institute an interference proceedings. The purpose of this proceeding is to determine which of the various claimants is the prior inventor of the claimed invention. These inter-party proceedings are complicated and are the most costly proceedings in the Patent Office for they involve protracted litigation which may be carried to the courts, in which not only the priority of invention is contested, but the validity of the claims themselves attacked. While the above is a picture of what may happen to a case in the Patent Office, fortunately it is not the history of all patent applications.

While appeals to the Court of Customs and Patent Appeals and to the Courts are rare, interferences are unfortunately not so rare, and the patent development of Union's new process lubricating oil has had its share of interferences. We have found a large number of our patent applications in interference with other inventors working in the laboratories of large oil companies. These conflicting claims were menacing not only from the point of view of placing in jeopardy our right to the free use of our developments and to free expansion of our research program, but also effectively blocking the possibility of exploiting our patents by licensing other companies. This large number of interferences presented so many interlocking and conflicting claims having such extensive ramifications that the petroleum industry, which upon the communication of this new departure in refining technique showed eager interest, interrupted the development of their plans to await the outcome of what appeared to give promise of being a long and costly patent fight. The most important of the rival claimants included the Standard Oil Company (Indiana), and the Standard Oil Company of New Jersey, who had independently been investigating propane processes and had made important contributions to this technique.

It appeared quite clear that no one company would emerge from this conflict with complete and clear domination of the process. While it may be true that the dominating claims for the process would eventuate in patents to be issued to Union Oil Company, it was obvious that patents also would issue to these other companies for important and necessary developments, so that in the end no one would have a clear right to use the process and the exploitation of the process would be effectually stopped. No oil company would consider the use of a process which would place them in jeopardy and make them liable to a large number of patent holders.

By a series of patent negotiations this warfare has been avoided and a peace treaty drawn wherein all important contestants withdrew from the battlefield with banners flying, and the way has been opened whereby these processes will be available to the whole industry at a reasonable royalty, and the Union Oil Company will be free to use its process and to progress with its research program.

The M. W. Kellogg Company, whose reputation and experience as a builder of cracking plants and petroleum refineries is international in scope, has undertaken the exploitation and the building of propane plants. Licenses will be available to all interested and responsible refiners, who will have the benefit not only of the experience of the M. W. Kellogg Company but will have made available to them the long experience and the continued research of Union Oil Company, Standard Oil Company (Indiana), and Standard Oil Company of New Jersey.

Where Triton will be dispensed to the motorist. Union Oil Company's new modernistic service station at California and First streets, San Francisco.

Chester W. Brown

Long Career of Dean of California Oil Men Ends

TERMINATING a half century of activity in the oil and mining industries, Chester W. Brown, who was a director of the Union Oil Company since 1924 and an associate of the company at the time of its inception, passed away on October 5, 1934, at his home in Balboa, California. Although Mr. Brown would have been but sixty-six years of age last October 29, his long and active participation in the petroleum industry was responsible for his being known as "Dean of California's oil men."

Born in Washburn, Maine, on October 29, 1868, Mr. Brown came to California, when a young man, with his uncle Wallace L. Hardison who, with Lyman Stewart, organized the Hardison and Stewart Oil Company and, later, the Union Oil Company. Mr. Brown was connected with the former company until it was merged with the latter in 1890. However, three years later he and his uncle left the Union Oil Company to follow the adventurous trail of the gold miner, and spent the next seventeen years in Peru.

In 1910 Mr. Brown again became associated with the Union Oil Company, this time as head of the production department. On February 26, 1924, he was elected to the Board of Directors, and on March 3 of the same year he became a member of the Executive Board. On March 31, 1931, he retired from active duty as the company's director of exploration and production, but retained his mem-

bership in the Board of Directors until his death.

Mr. Brown's experience in the petroleum industry dated back to some of the earliest oil wells in California. This was in the 1880's. Notable among the fields in which Mr. Brown participated in developing, were the older Ventura County fields, such as Adams Canyon, Salt Marsh Canyon, Bardsdale, Sespe and Torrey Canyon. Also, he was connected with the early development of the Los Angeles City oil fields.

Known among his business associates and friends as one possessing good judgment in all matters, an even temperament and a decisive manner, Mr. Brown was never known to have spoken unkindly to a fellow employee. Exemplifying his attitude toward those under him, was his statement at the time of retirement. He said, "I believe that we older fellows who can afford it, should step aside when there are younger men capable of taking our places. It gives them greater incentive to put forth their best effort at a time when their services are of the greatest value to the company."

Mr. Brown was one of the few remaining pioneers of what is now California's largest industry, and his passing is a great loss, not only to his immediate family, his friends and business associates, but to the petroleum industry at large.

He is survived by his wife, Mrs. Helen Brown, four daughters, Mrs. Elizabeth Loche, Freida, Ruth and Dorcus, and his son, James. The three unmarried daughters live with their mother in Balboa, whereas the son resides at the Brown Ranch, in Montebello.

E. H. Estill

Elected Assistant Secretary

ON October 22, E. H. Estill, an attorney in the credit division of the company, was elected an assistant secretary, and assumed office on November 1.

Although born in Columbus, Ohio, in 1897, Mr. Estill received his early education in Arizona. In 1918 he was granted a commission in the United States army, later, after an honorable discharge, was employed by the Southern Arizona Bank and Trust Company and, subsequently, by the Southern Pacific Railway Company.

Coming to California in 1921, Mr. Estill entered the University of Southern California Law School, from which he graduated in 1926 and was admitted to the California State Bar Association the following year. For a time he was an attorney for the California Title Insurance Company of Los Angeles, then was engaged in a private practice for several years before becoming associated with the Union Oil Company on September 15, 1933.

New "Earth Movers" Advance Construction Business

ON practically every public works project, a substantial part of expenditures goes for excavation, grading and earth moving in general. This part of each project is of extreme importance in the laying of a proper foundation, whether it is for a road, building or dam, and must be completed carefully, yet with dispatch.

In common with other business, construction work has suffered a decline in compensation during the last several years, and, as a result, dirt contractors have felt the need for new type machinery having greater efficiency and speed of operation. This, plus the fact that usage for this type of machinery has increased rapidly, has brought about a radical change in the design of earth moving and excavation equipment.

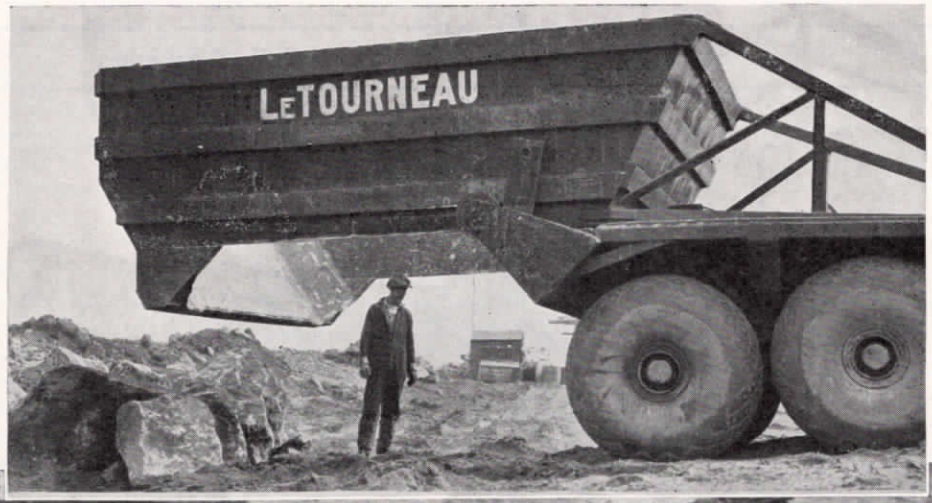
These new and scientifically built machines have further enlarged the field of construction, so that more and larger projects can be undertaken on an economic basis. These developments have had a beneficial effect, not only to the contractor, but to workmen as well, for, contrary to what might logically be assumed upon the advent of improved equipment, there has been a substantial increase in employment in the construction business.

Several years ago the R. G. Le Tourneau Company, road and earth moving equipment manufacturers, was formed. It was not long before R. G. "Bob" Le Tourneau, who originally began as a contractor, realized the necessity for better equipment. During the ensuing years a complete line of this type of equipment has been designed and built by the Le Tourneau Company, which now is recognized as the most modern and dependable grading machinery so far devised.

The first semi-drag scrapers built by Le Tourneau, approximately five years ago, were equipped with steel wheels, an innovation at the time. Many of these machines are still in operation after many thousands of hours service, but this type of scraper has undergone a series of changes and has evolved into the Carryall type, digging its load, picking it up and carrying it easily away. This type is equipped with low pressure pneumatic tires, and, thus, can carry its load over any kind of ground —whether it be sand, soft dirt or mud— and at a greater speed than its predecessors.

In general, contractors continually are demanding equipment capable of more yards per hour of service. Accordingly, Le Tourneau designed the 25 Yard 8 Wheel Buggy. This enormous carrier, mounted on its eight low pressure 46 by 20 ten-inch tires, is handled with such remarkable ease and moves with such speed as to practically revolutionize the big load carrier field, and has become favored by every contractor requiring a large capacity carrier.

Equipment manufactured by Le Tourneau includes power control units of all sizes, heavy grading equipment of all kinds and types, Rooters for breaking up hardpan and decomposed rock, Sheepfoot rollers for stamping highway fills and dams, angledozers and bulldozers—the indispens-



Top to bottom: Le Tourneau 25 Yard Eight Wheel Buggy; 25 Yard Buggy carrying 20 tons of rock; Bulldozer; and 12 Yard Carryall Scraper.

able tools of the contractor—25 Yard 8 Wheel Buggies, and the Carryalls of 6, 8, 12 and super 12 yard capacities.

When first built, the Le Tourneau plant occupied but a small space on Moss Avenue in Stockton, California, but the firm has grown to such size as to require two large buildings. One is of corrugated iron and steel construction, 60 feet wide and 300 feet long; the second, now under construction, will be an electrically welded steel plant, 80 feet wide and 340 feet long. These will house the machinery for fabricating the several Le Tourneau units, and will be equipped with lathes of all types, especially designed heat treating furnaces, presses, etc. Huge cranes reach every portion of the two buildings. An average of three hundred men are employed in three shifts.

Despite the business depression, earth moving in all its phases must continue. Because of such business conditions, however, economy must go hand in hand with the required construction, so it can be said the receding period of economic instability has been instrumental in developing the greatest line of earth moving machines the construction business has ever known, and which is being used on all major projects in the United States and throughout the world.

Participates in California and Washington Fairs

Union Oil Company was well represented at the recent Western Washington Fair, held in Puyallup, and the California State Fair, held in Sacramento, as these pictures show.

Sales Department Forms Candian Division

Robert J. Kenmuir
Division Manager

A. P. Bennett
Division Sales Mgr.

T. A. Power
Division Accountant and
Operating Mgr.

W. A. Sloan
Division Credit Mgr.

IN order to conform with organization procedure, as inaugurated by a reorganization of the Union Oil Company's domestic sales force at the close of 1933, the company's Vancouver, B. C., District has been made the Canadian Division of the sales department. Since the end of last year, the company's domestic marketing area has been divided into three divisions, Northern, Central and Southern; thus, the new division is the fourth to be formed along the 1,400 miles of Pacific Coast territory in which the company markets its products.

R. J. Kenmuir has been named Canadian Division Manager, while A. P. Bennett has been elevated to Division Sales Manager. T. A. Power is now Division Accountant and Operating Manager, and W. A. Sloan, Division Credit Manager.

Mr. Kenmuir first entered the employ of the company as special agent in Vancouver, B. C., on November 1, 1921. On May 1, 1924, he was made district sales manager, and thirteen years to the day after he joined the company, he was advanced to his present position.

Mr. Bennett came with the company on May 12, 1923, as agent at Vernon. On August 1, 1924, he was promoted to special agent at Okanagan, and on October 1, 1932, assumed the position of Assistant District Manager in charge of sales. On February 24, 1922, Mr. Power began

J. Venus

A. M. Kincaid

A. E. Osborough

T. Kaye

H. G. Parrish

M. B. Paige

service as transmission clerk. He was promoted to assistant cashier on June 15, 1923, to assistant district accountant on August 10, 1926, and to district accountant on February 1, 1930. Mr. Sloan joined the company on March 22, 1926, as assistant credit manager and was promoted to district credit manager on October 1, 1931, before assuming his present position.

As in the case of the three domestic divisions, the Canadian Division was formed, not only to permit conformity throughout the sales department, but to secure more intensive sales production, greater economy in operation and closer supervision of all activities. In effect, the four division managers, R. J. Kenmuir, Canadian Division, F. W. Pemberton, Northern Division, W. A. Newhoff, Central Division, and M. W. McAfee, Southern Division, now have the administrative authority over 44 sales districts covering California, Oregon, Washington, western Canada, western Idaho, Nevada and Arizona. Honolulu and Panama districts are uneffected, and continue as in the past.

District sales managers are J. Venus, A. M. Kincaid, A. E. Osborough, M. B. Paige and T. Kaye. Mr. Venus joined the company on April 25, 1923, as agent at Penticton, was made special agent at Alberta on January 1, 1930, assistant district manager of operations the end of that year, then transferred June 1, 1932, as special agent at Alberta, before assuming his present post. Starting September 16, 1926, as a salesman, Mr. Kincaid was promoted to special agent on October 1, 1929. Mr. Osborough came with the company on May 1, 1925, as a service station operator, was promoted June 1, 1928, to salesman, and on June 1, 1932, was made agent at Edmonton, and, on October 20, 1933, was transferred to Victoria. On Feb. 16, 1927, Mr. Paige began as warehouseman and truck driver, and was promoted December 1, 1928, to position of agent at Penticton, but transferred to Kamloops on December 26, that year. while Mr. Kaye joined the company on Aug. 11, 1922, as a service station operator was made service station collector and inspector on September 17 1923 and marine superintendent on February 20 1926.

The two remaining members of the personnel of the new division are H. G. Parrish, district superintendent service station department and S. G. Horton, district sales analyst. Mr. Parrish joined the company on December 6, 1926, as assistant stock clerk, was made price and order clerk March 14, 1927, was assigned to the sales promotion department March 14, 1928, and to properties and equipment the following year. On April 1. 1933, he assumed his present position. For the past several years, Mr. Parrish has handled all matters pertaining to advertising in and around Vancouver. Mr. Horton, beginning September 1, 1926, was sales and equipment clerk, was advanced September 10, 1928, to sales promotion analyst, and, on September 1, 1930, to special agent, Vancouver Island. On November 2, 1933, he took up the duties of his present position.

The sales districts of the Canadian Division, including the marketing stations allocated to each, are given:

Calgary.....J. Venus, D. S. M.
Banff, Calgary, Cranbrook, Edmonton, Field, Grand Forks, Grand Prairie, Nelson, Trail, Wembley.

Vancouver.....A. M. Kincaid, D. S. M. Abbotsford, Agassiz, Boston Bar, Chilliwack, Coal Harbor, New Westminster, New Westminster Mar., Vancouver.

Victoria.....A. E. Osborough, D. S. M. Courtenay, Duncan, Esquimalt, Nanaimo Mar. S. S., Port Alberni, Victoria.

Kamloops (Okanagan)..M. B. Paige, D.S.M. Ashcroft, Kelowna, Merritt, Penticton, Princeton, Kamloops, Revelstoke, Salmon Arm, Vernon.

Coast Marine (Headquarters Vancouver) T. Kaye, D. S. M.
Alert Bay, Butedale, Clayoquot, Claxton, Inverness, Kildonan, Masset Inlet, Naas River (Arrondale), Nootka, Parcher Island, Prince Rupert, Quathiaski, Stuart Island (Bruce Landing), Ucluelet, Wadhams.

Elected President of Petroleum Geologists

On November 9, H. W. Hoots, of the geological department of the Union Oil Company, was elected president of the Pacific Coast section of American Association of Petroleum Geologists. The Association held annual convention this year in Los Angeles on November 8-9. Mr. Hoots is the second Union Oil geologist to be conferred this distinction in the last six years, Earl B. Noble, assistant chief geologist, having held the office in 1929-1930.

H. W. Hoots

Prior to his association with the company, Mr. Hoots was connected with the United States Geological Survey for years, his work taking him to Oklahoma and Arkansas in 1921, to west Texas in 1922,northeastern Wyoming the following year, Southern Wyoming in 1925, San Joaquin Valley, California, in 1924-1926, Humboldt County and the Santa Monica mountains, California, and Washington, D. C., the following year.

For the next year, he was in charge of oil and gas work in California for the United States Geological Survey, and maintained offices at the California Institute of Technology, Pasadena. On May 1, 1928, Mr. Hoots became a member of Union Oil Company's geological staff.

He has prepared several bulletins which have become part of the United States Geological Survey publications. Among these are "Geology of West Texas and Southeastern Mexico," "Geology of Southern Wyoming," "Geology and Oil Resources Along the Southern Border of San Joaquin Valley, California," and "Geology of Eastern Part of Santa Monica Mountains, California."

As an undergraduate, Mr. Hoots attended Oklahoma University, later taking graduate work at Kansas University and Stanford University, receiving from the latter institution the degree of Doctor of Philosophy in 1925.

Prince Rupert Employees Win Praise for Service

RECENTLY there was a fire in the cold storage plant of the B. C. Packers Ltd. cannery in Claxton, which is situated on the Skeena River a few miles south of Prince Rupert, B. C. C. E. Thomas, manager of B. C. Packers Ltd., rushed to Claxton by plane in order to supervise the repair work. The Wells Air Transport Ltd. plane used was serviced by the Union Oil Company of Canada Ltd.

In view of the type of service rendered, W. Hunter Wells of the Wells Air Transport Ltd. forwarded the following letter of appreciation:

Mr. R. J. Kenmuir,
Union Oil Co. of Canada Ltd.,
402 W. Pender St.,
Vancouver, B. C.

Dear Mr. Kenmuir:

Last Saturday our Boeing flying boat left Vancouver for Prince Rupert with Mr. C. E. Thomas of B. C. Packers Ltd., and Mr. Herbert R .Fullerton of Blane, Fullerton & White Ltd., returning to Vancouver on Sunday. The pilot, W. S. Holland, asked us to convey his sincere appreciation for the splendid service rendered by your Mr. Morris and his assistants, Howard and Tony, at Prince Rupert. He could not say too much for the eagerness of these men in doing everything possible for him.

There are not many sections of this province, nor of all Canada, where Holland has not been flying, so we feel that the service given by the Prince Rupert boys must be truly outstanding to call for Holland's enthusiastic compliments.

We add the sincere thanks of our company to the personal thanks of the pilot. Please let your men at Prince Rupert know that we appreciate very much the "Union" spirit.

Cordially yours,
(Signed) W. HUNTER WELLS,
Wells Air Transport Ltd.

Dancing Here and There

On November 16 the annual Union Oil Girls' dance was held at the Jonathan Club, Los Angeles. Several hundred attended the occasion, and pronounced it as one of the best ever sponsored by the Girls' Club.

The many features of the dance assured its success from the beginning. For those who wished dinner at the club, reservations were arranged, after which dancing began and continued to a late hour. One new and interesting attraction this year, was the Continental style of serving refreshments.

Another enjoyable dance was sponsored by the Los Angeles Refinery Girls' Club, which took place October 6 at the Long Beach Belmont Beach Club. It was a colorful affair, and exceptionally well attended. Prize dances were attempted, but judges found themselves in trouble, so finals were run off in a "Paul Jones."

Elected Director of Tax Association

A. W. Milford, an assistant secretary of the Union Oil Company since 1929, was elected a member of the Board of Directors of the California Taxpayers' Association on September 26, last. Also, on the same date Mr. Milford was named a member of the Association's executive committee, succeeding the late John McPeak, former secretary of the company.

A. W. Milford

Each of the twenty-four directors of the Association represents some California industry, and Mr. Milford is the sole representative of the State's large petroleum industry.

It is the purpose of the Association to cooperate with State, county and municipal officials, to aid in bringing about, through non-partisan and non-political means, in the interest of all taxpayers in the State of California by mutual effort, the greatest possible economies with efficiency, in the collection and expenditure of public monies, in the State of California and in the counties, cities and other political subdivisions. The Association does not seek to change the present tax system, nor to change the rates of taxation, except as economies may bring a reduction of taxes.

Fresno Sales District Welcomes New Citizens

A very effective and rather novel means of making new friends for the company is being followed by the Fresno sales district.

For some time the Fresno office has been securing the names and addresses of individuals who had recently received their final citizenship papers from the United States Government, and mailing each a copy of the Declaration of Independence accompanied by a letter of transmittal welcoming each as a citizen of our country. In view of comparatively recent Governmental stipulations, the number of individuals taking out citizenship papers has grown in recent months, and, as a consequence, this method of direct advertising has been stimulated.

The copies of the original Declaration of Independence, distributed in this manner, are mailed in a paper roll in order that the parchment may not become creased or otherwise damaged, and, thus, are suitable for framing. The response to these direct mail pieces has been very gratifying, according to Oliver I. Wooldridge, Fresno District Sales Manager, and as long as the supply of parchments last, our new citizens in that district can expect to receive a copy.

Le Guay Beynon Dies Suddenly

While vacationing alone in Mexico, Le Guay Beynon, who was employed in the Patent Department, died suddenly from heat prostration and exhaustion on September 19, last.

Apparently in the best of health, Mr. Beynon had left a few days before, to tour points of interest in Mexico, but upon reaching Guadalajara he became seriously ill. Upon advice from the American consul there, that some one should accompany him back home, Mrs. Alice Le Guay Beynon, his mother with whom he lived in Los Angeles, asked that a representative from the Union Oil Company be sent.

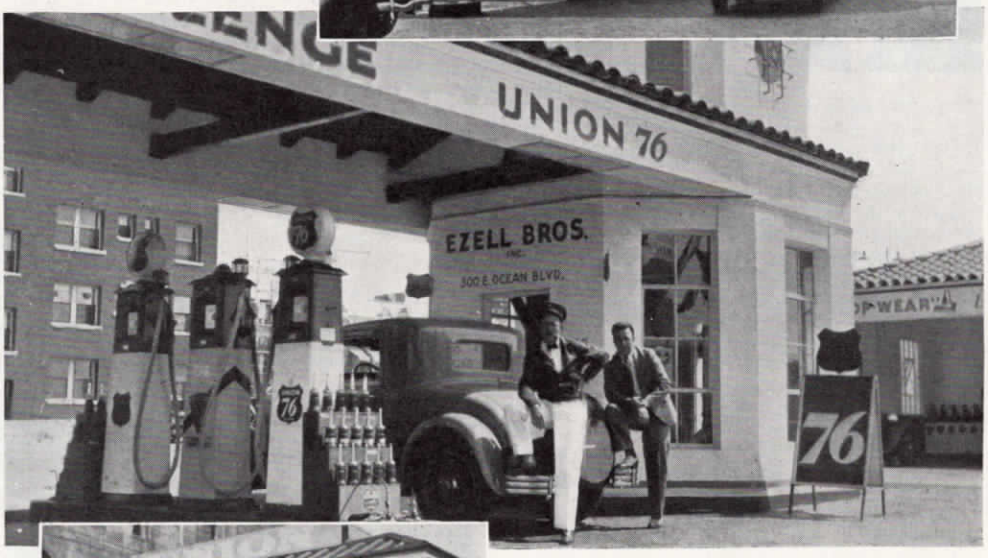
Accordingly, J. P. Rockfellow, of the Insurance and Personnel Department, left by plane for Guadalajara. Arriving there, Mr. Rockfellow arranged for the immediate and careful return of Mr. Beynon to his home, but while enroute two days later, the patient passed away quietly.

Mr. Beynon was 31 years of age, and had been with the company since April 1, 1926, shortly after having graduated from the University of Southern California, where he had received his Bachelor's and Master's degrees in chemical engineering. His passing was a distinct loss to the company, as well as to his mother and many friends, for he appeared destined for a sucessful future.

Set Tire-Selling Records

Winners of this year's Union Service Stations coastwide tire selling campaign, who received awards and trip to World's Fair in Chicago. Left to right: W. E. Munz, Calistoga, Calif., service station manager who received cash prize; J. W. Conroy, central region manager with awarded Dasteel trophy; and A. N. Russell, Portland, Ore., district superintendent holding the Dasteel Plaque which he won.

Union Products Increase Sales for Three-Station Chain



Three stations of the Ezell Brothers' chain. At the top is the Culver City unit; center, the unit at Long Beach, showing George Ezell, left, and J. T. Tye, Union Oil Company agent at Long Beach; and at the left Dan T. Ezell, manager of the San Diego station.

Three brothers, Dan T., George D., and Louis Ezell, operating three service stations, one in each of three cities, San Diego, Culver City and Long Beach, join in a united praise of Union products which they credit with aiding them in increasing business in each of their units.

Incorporating under the name Studio Super Service, Inc., the Ezell Brothers, entered the service station business with the purchase in 1928 of a service station and parking lot directly opposite the Metro-Goldwyn-Mayer studios in Culver City, Calif.

In June of this year arrangements were made between Ezell Brothers and Union Oil Company for the handling of Union 76, 76 plus Ethyl, and Union motor oils and greases. Union products are now being handled at all three stations.

During the four months operation of the Studio Super Service, Inc., with Union products, a substantial increase in business in all departments has resulted. Gasoline sales have increased approximately 30 per cent and parking, washing, polishing, greasing and tire sales have recorded corresponding influxes. The increases have been recorded despite prevailing cut prices all around the location.

The Ezell Brothers unit on Sixth street in San Diego consists of complete super service facilities and large parking lot. As at the Culver City and Long Beach stations, a large increase in business has been noted since July, 1933, when Union 76 and other Union products were stocked for resale.

The New and Old in Truck Transportation

Union Oil Company entries in the Wilmington Jubilee parade on September 29 gave a very interesting contrast between pre-war tank wagon, and the most modern tank truck. The first was driven by K. G. Bentson, Wilmington salesman, and the latter, by Charles Nash, Jr., Los Angeles tank truck salesman.

1934-1935 Bowling Season Opens

Getting off to a good start, Union Oil employees' 1934-1935 bowling season opened early in October with seven different leagues, Head Office, Santa Fe Springs, Dominguez, Los Angeles Refinery, Oleum Refinery, Spokane Sales and Seattle Sales, organized into some 55 teams composed of between 300 and 350 "strike"-aspiring individuals, including alternates.

After championship teams from each league have been established, there will be a play-off between them, which will be held early next year and will determine the ninth annual telegraphic bowling champion. The Oleum Refinery is the organization which other groups are watching warily, as the team from the Bay District won the 1933-1934 telegraphic play-off, and now holds the Burnham trophy, at least until the conclusion of the present season. Three wins by any team, consecutively or otherwise, and perpetual ownership of the Burnham trophy is won.

Union Oil Products Used

One of five new trucks recently placed in service by Security Van and Storage Company, Santa Monica, California. All five trucks are being serviced exclusively with "Union 76" gasoline.

Expert Swimmer

In the Industrial Athletic Association swimming meet, held October 29, at the Crystal Palace Swimming Pool in San Francisco, Mrs. J. Deffenbaugh, of the Central Division acounting office, placed first in each of the only two events scheduled for women, thereby winning two appropriate medals and placing the Union Oil Company in third place for the meet.

The swimming meet was entered by competing representatives from all large industries in San Francisco. Mrs. Deffenbaugh was the Union Oil Company's sole entry.

Point Par Campaign Boosts Fresno District Sales

Kingsburg station made a perfect record.

ENGAGED in a "66" Point Par campaign in the Fresno District, under the supervision of District Sales Manager Oliver I. Wooldridge, several substations in and around Fresno showed considerable increases in sales. The campaign lasted for six months.

To be classified as an honor station and to receive an honor flag, a substation had to show a sales increase in all commodities over the previous year's sales. One point was awarded for each item on which an increase was reported. This system created a remarkable amount of interest even to the general buying public who appeared anxious to contribute to the station gallonage in order to help the local boys either to acquire or retain an honor flag. As a result of this enthusiasm, during one of the months of the campaign, nine of the fifteen stations reported gains in all commodities.

Out of the possible 990 points for the district in the six months period, a total of 804 points were awarded, the Kingsburg station making a perfect record every month of the campaign. Visalia placed second, with Coalinga, Orange Cove, Reedley, and Riverdale tieing for third place. In commendation for their splendid work, Mr. Wooldridge presented each member of the Kingsburg personnel with a fine award, and, in addition, entertained all of the personnel of the six winning stations.

Considerable success has accompanied this campaign method in other districts, and the results achieved in the Fresno district were particularly satisfactory, with sales continuing to be maintained at the higher levels and even increasing in some sections.

Visalia placed second.

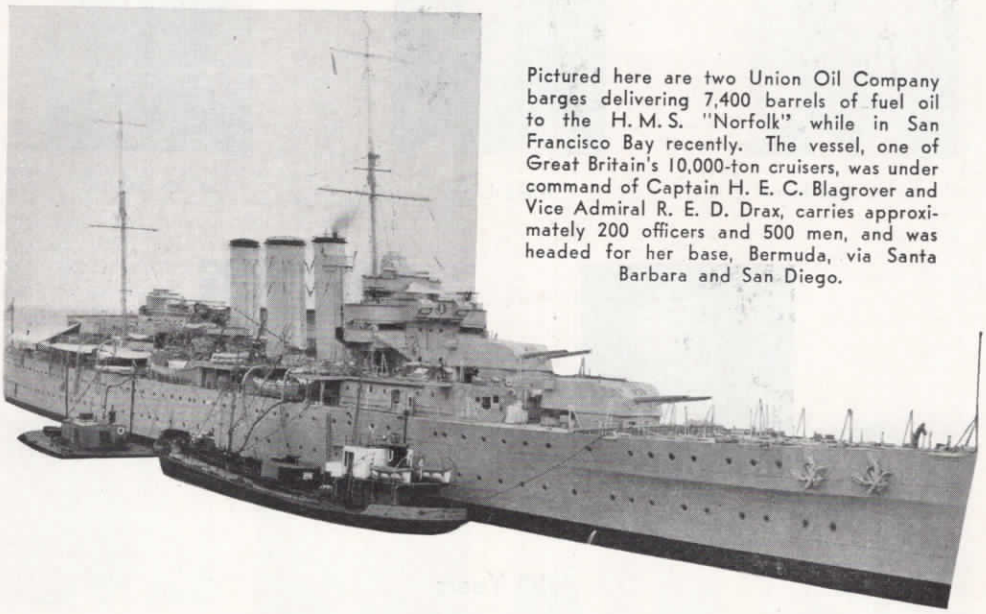
Tennis Tournament Begins

On October 20 the Annual Tennis Tournament got under way for 1934, with more than sixty enthusiastic racketeers turning out, each with the fond hope that he could "ace" somebody out of the picture every Saturday morning during the following month and a half.

Six strenuous Saturday mornings will be required to develop the winner, runner-up and "also rans," and from the competition presented so far, somebody will know he had to be good to win.

Lee Spencer, of the Los Angeles Refinery, was champion last year.

Fueling British Cruiser



Pictured here are two Union Oil Company barges delivering 7,400 barrels of fuel oil to the H. M. S. "Norfolk" while in San Francisco Bay recently. The vessel, one of Great Britain's 10,000-ton cruisers, was under command of Captain H. E. C. Blagrover and Vice Admiral R. E. D. Drax, carries approximately 200 officers and 500 men, and was headed for her base, Bermuda, via Santa Barbara and San Diego.

Union Oil Employees Grow Pioneer Costumes

Entering into the spirit of Bakersfield Frontier Days, an annual event, members of the company's Bakersfield marketing station recently developed several fantastic designs of facial "outcroppings," with results as shown above. A notable "growth" in sales also is reported. From left to right (standing): Harold Cox, Dan Morgan, P. C. Weston, District Sales Manager; Lloyd Gleim, Peter Seibert, Agent; Joe Heekin, A. H. Alexander and H. A. Ferguson. Kneeling: K. A. McKim, B. K. Miller, C. L. Dixon, Art Rufert, C. Bascom, J. W. Knight and L. C. Hamilton.

A. W. Anderson

Anna Lapp

A. O. Marsh

F. M. Penter

Casper Hansen

25 Years

Service Emblem Awards

DURING September and October, the ranks of twenty-five year employees were increased by Anna Lapp, A. W. Anderson, A. O. Marsh, F. M. Penter and Casper Hansen.

In the same period, eight employees completed twenty years of continuous service with the company.

Miss Anna Lapp, who has the distinction of having been with the company longer than any other woman employee, began work with the company on September 4, 1909, as a member of the auditing department of the Head Office, then located in the old Security building at Fifth and Spring streets, Los Angeles. In 1912 Miss Lapp was transferred to the cashier's office. Later, during the change in personnel made about the time the United States entered the World War, Miss Lapp was transferred to the sales department, where she is still employed.

Arthur W. Anderson, the youngest employee in the company wearing a 25 year service pin, entered the employ of the Union Oil Company on September 14, 1909, in the accounting department of the Oakland district. In 1913 he was transferred to San Francisco as stock clerk, but five years later, returned to Oakland as assistant cashier in charge of sales accounting. A year later Mr. Anderson was transferred to Stockton as district cashier, remaining there until March, 1920, when he went to Seattle in the same capacity. From Seattle, he was transferred to the comptroller's department in the Head Office and assigned to the refined oil division, which has since been combined with the station accounts division and where Mr. Anderson is employed at the present time.

Arthur O. Marsh, an employee of the company since September 16, 1909, first worked as a roadbuilder in the Orange field, and at variouh field jobs from mechanic to driller until 1921. At that time, Mr. Marsh entered the Orange field office as clerk. He served there

in a number of positions until August, 1928, when he was transferred to the Santa Fe Springs field as well auditor, subsequently assuming his present position of chief clerk in charge of that office.

During the 25 years' service of Fred M. Penter, which began on September 19, 1909, in the gas department as a pipe fitter at Port San Luis, many changes have taken place to advance the position of his department in the petroleum industry. After several years, Mr. Penter moved to the Orcutt compressor plant in 1917, and in December of the same year, became engineer of that plant. He continued that position until 1921, when he was advanced to chief engineer. Three years later he was appointed to his present position, that of gas superintendent of the Orcutt division in charge of gas operations in the valley division.

First employed as a mechanic, Casper Hansen came with the company on October 1, 1909. Continuing during the greater part of his long service in the field of transportation, Mr. Hansen has witnessed the evolution of the tank truck from the old horse-drawn tank wagons capable of transporting only a few hundred gallons, then mostly kerosene, to the present day giant six-wheeled, motor-driven tank truck with several thousand gallons capacity and mounted on pneumatic tires for delivering gasoline at a speed several times that of its predecessor. For years, Mr. Hansen kept pace with these changes as a mechanic in the Seattle garage. but since 1931, he has been stationed at the Edmonds storage plant as night watchman.

20 Years

H. Halvorsen

Woodson Lazear

Barney McGinley

A. A. Smith

Henry F. Armour

E. W. Brewster

J. P. Osborne

P. C. Rosenberger

First employed on the S. S. "Lansing" as an A. B. seaman, Hans Halvorsen came with the company on August 25, 1914. He served in an unlicensed position on both the "Lansing" and the "Lyman Stewart" until May 18, 1917, when he was transferred to the Barge "Fullerton" as second mate. His first licensed assignment in the major fleet began on September 21, that year, when he joined the S. S. "La Brea" as third officer. Halvorsen continued in various licensed ratings until May 1, 1923, when he became master of the S. S. "Warwick." On January 10, 1927, he was appointed port captain of the Los Angeles home port, and is, at present, in that capacity. Captain Halvorsen began his career at sea when but 14½ years old, and has seen service on vessels of several nations.

On September 14, 1914, Woodson Lazear came with the Union Oil Company in the capacity of tank wagon driver, driving a team of horses and servicing a large part of San Francisco. In 1917 he began operating one of the company's motor trucks on the San Francisco waterfront, serving launches and boats with refined oils. At present, Mr. Lazear is delivering in the district known as Butcher Town and the Sunny Mission, and, due to his faculty of making friends quickly and rendering personal service, he has built up a large following of staunch customers.

Barney B. McGinley was first employed with the company in April, 1913, in the northern division of the field department, but voluntarily resigned a year later. On September 17, 1914, he was re-employed as a roustabout on the Purissima lease, near Lompoc, and has remained in the field department since that time. From time to time Mr. McGinley has worked with cable tools, as a pumper, gauger, on gas engines and at road building. At the present

time he is stationed at Santa Fe Springs.

First employed at the Santa Paula refinery on September 27, 1914, Arthur A. Smith began work with the company as a fireman, but advanced to the position of assistant stillman. In 1917 he was transferred to the Oleum refinery, and, during the ensuing six years, was engaged as draftsman, water inspector and safety inspector. Steadily advancing, he became a refinery foreman in 1923. which position he now holds. Mr. Smith was one of the original sponsors of the Oleum Bowling Club, which is the outstanding sport activity at Oleum.

Coming with the company on October 12, 1914, at the Pasadena district office, Henry F. Armour went almost immediately to Riverside, California, as a salesman. On January 1, 1916, he was appointed agent at the then new Corona plant, but returned to Riverside in 1918 as territory salesman for Riverside, San Bernardino and Clark counties. There he became special agent in 1922, was made acting special agent for Santa Ana in 1925, and, for the next two years, was special agent in Imperial Valley and Old Mexico. During the next three years, he was special agent, first, at Santa Ana. then in San Pedro. On October 12, 1930, Mr. Armour was transferred to Pasadena district offices, and last year assumed his present position as sales manager for that district.

Earle W. Brewster entered the company employ on October 1, 1914, as marketing station agent at Phoenix, Arizona. and was made a drum and barrel clerk on December 1, that year. On February 21, 1916, he was appointed agent at Kingman, but returned to Phoenix on March 1, 1917, as salesman. His next position was that of assistant district sales manager, to which he was appointed on February 15, 1921. On January 21, 1925, Mr. Brewster was made district manager at Phoenix, and on December 1, 1933, he was promoted to his present position of district sales manager.

Starting as order clerk at the Sixth and Mateo plant, Los Angeles, J. Porter Osborne came with the company on October 1, 1914. Later he was transferred to the traffic department, and about two years later, rejoined the sales department in the Head Office. During his 20 years of service with the company, Mr. Osborne has held several responsible positions, both in California and Arizona.

On October 5, 1914, Perry C. Rosenberger began his service with the company as a tank wagon driver in Eugene, Oregon. At that time, Rosenberger recalls, the company marketed lubricating oils and greases in wooden barrels. In 1917, he drove his first motor-driven tank truck, and early in 1918, was transferred to Willbridge as tank truck salesman, later that year, to Portland as a salesman, and in December, to Salem, Oregon, as agent. Mr. Rosenberger remained in Salem until February, 1921, when he returned to Willbridge as gauger, holding that position until 1923 when he was assigned his present position as shipping Clerk.

Fifteen Years—September

Alger, Geo. H., Field, Southern Division
Birmingham, J. P., Mfg., Los Angeles Ref.
Boardman, L. J., Const., Northern Sales.
Butler, W. O., Field, Northern Division.
Cederlof, F. H., Compt., Head Office.
Childers, C. E., Pipe Line, Northern Division.
Combs, C. R., Field, Southern Division.
Dowell, Will, Field, Southern Division.
During, E., Field, Southern Division.
Ellis, W. B., Field, Southern Division.
Ferguson, Elijah, Mfg., Oleum Refinery.
Hood, C. A., Field, Southern Division.
Kahl, A. G., Pur. Head Office.
Larsen, Hans W., Sales, Central Division.
Limbocker, L. E., Compt., Head Office.
Petersen, J. E., Sales, Southern Division.
Rathke, Theresa, Sales, Head Office.
Schlegel, Joe, Pipe Line, Northern Division.
Shepherd, Ernest, Mfg. Los Angeles Ref.
Stull, Dell, Mfg., Los Angeles Ref.
Walz, John A., Field, Southern Division.
Wilson, J. A., Sect., Head Office.
Witter, M. C., Cashier's, Head Office
Woods, G. A., Mfg., Head Office-Oleum
Yager, N. A., Sales, Head Office

Ten Years—September

Baker, G. E., Sales, Northern Division.
Broderick, H. A., Sales, Central Division.
Brown, H. L., Sales, Central Division.
Dakin, E. S., Marine, S.S. "Warwick."
Dun, H. C., Field, Southern Division.
Holbrook, D., Field, Northern Division.
Keahey, L. E., Sales, Central Division.
Margarites, M. C., Sales, Central Division.
Masoner, A. M., Field, Southern Division.
Quackenboss, A. L., Transp., Head Office.
Rockwell, R. H., Sales, Southern Division.
Simonson, R. H., Marine, S.S. "Utacarbon."
Stein, F. E., Traffic, Head Office.
Whitaker, I. N., Sales, Southern Division.

Fifteen Years—October

Austin, C. R., Field, Southern Division.
Brawley, M. H., Field, Southern Division.
Denny, Lester, Mfg., Oleum Refinery.
Doty, Ray E., Mfg., Oleum Refinery.
Forrest, H. F., Mfg., Oleum Refinery.
Hall, T. M., Sales, Southern Division.
Holzinger, E. M., Transp., Prod. Pipe Line.
Kaveney, E. P., Mfg., Los Angeles Ref.
Loftus, E. J., Mfg., Santa Paula Ref.
Lungren, L. M., Field, Southern Division.
McLean, G. B., Transp., Head Office.
Munn, P. E., Field, Southern Division.
Phillipsen, Otto, Marine, S.S. "Cathwood."
Smith, E. F., Sales, Southern Division.
Spooner, F. V., Sales, Northern Division.
Stanley, C. H., Transp., Prod. Pipe Line.
Vorhees, A. A., Field, Southern Division.
Walters, R. A., Sales, Central Division.
Zanussi, E. J., Mfg., Oleum Refinery.

Ten Years—October

Blacklock, Chas., Mfg., Oleum Refinery.
Bryant, A. S., Field, Northern Division.
Edmund, Jr., Field, Head Office.
Livingston, R. M., Sales, Central Division.
Perry, C. H., Auto., Central Div., Garage.
Scott, W. A., Sales, Northern Division.
Whitton, D. G., Transp., Prod. Pipe Line.
Woods, L. E., Field, Southern Division.
Youngman, W. A., Sales, Vancouver.

REFINED AND CRUDE

By RICHARD SNEDDON

The only time you can really be sure that a fisherman is telling the truth is when he calls another fisherman a liar.

Regardless of that fact, however, it is still substantially true that women, generally speaking, are . . . generally speaking.

Indeed, it is a common precept that a woman may be taken for granted, but never under any circumstances goes without saying.

To switch immediately from a highly dangerous topic, it is interesting to note that the old fashioned fellow who never thought anything of going to church three times on Sunday, now has a grandson who never thinks of it either.

One thing to be thankful for, just the same, is that we have about ten months to rest yet, before the arrival of another busy vacation season.

Now comes a wag to ask: If it is true that enormous prices are paid for gags for the movie comedians, why is it that the comedians are not compelled to wear them?

The same gink, when he heard that the movie folks were scouring the country for clean stories, expressed amazement that they didn't scour some of the stories they already had.

Here, let us diverge for a moment, to point out an amusing feature of our political set up: The candidate for vice-president either gets the job and has nothing to do, or loses the job and goes to work.

Really, though, all prejudice aside, there is one thing about the Communist we sincerely envy: No matter what sort of bunk he writes, it is sure to be red.

For the classic case of discomfort we hereby nominate the predicament of the stout golfer: when he places the ball where he can see it, he can't reach it, and when he places it where he can reach it, he can't see it.

Even the moth doesn't suffer half that much, although the poor fellow has to live in a bathing suit all winter, and spend his summers in a fur coat.

Consider now our own profound embarrassment, when we showed the lady next door an old-time photograph of ourself perched on dad's knee, and she promptly beamed, "Oh, isn't that cute? A ventriloquist."

Then there was the indignant husband who exploded, "and not only that, but he had the nerve to call me a barefaced scoundrel." "Oh, well, honey," consoled the wife, "he probably forgot about your mustache."

Lucidity and brevity in all messages was the demand of the railroad company, which explains the following cryptic report of a washout, submitted by an obedient engineer: "Goose Creek. Where the track was the river is. Calaghan."

Usually when a man deplores the present taste in music and keeps recalling the good old songs, it's a cinch he looks better with his hat on.

But watch out when the same fellow starts shaking the hall tree and feeling around on the floor for apples. He's no longer harmless.

Results, after all, are what count. For instance last year we harvested three bushels of potatoes off our little garden plot, which is swell, until you know that we planted four bushels in the first place.

Invariably, also we have noticed, much to our annoyance, that when the baby falls asleep it is time to get up.

Contrary to the general belief, however, lots of nice telephone girls get rings from men they have never even seen before.

And after several calls the doctor remarked, "Your face is still badly swollen, but I'm not worrying." Whereat the patient replied, "I don't blame you, doc. I certainly wouldn't worry if your face was badly swollen."

Nettled over the delay, an irate customer called the waiter and asked: "How long am I to wait for my portion of duck?" "You'll have to wait till someone orders the other half," was the cool reply, "we can't kill half a duck."

To conclude, you can quickly figure the cost of living for yourself by taking your income, and adding forty per cent.

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