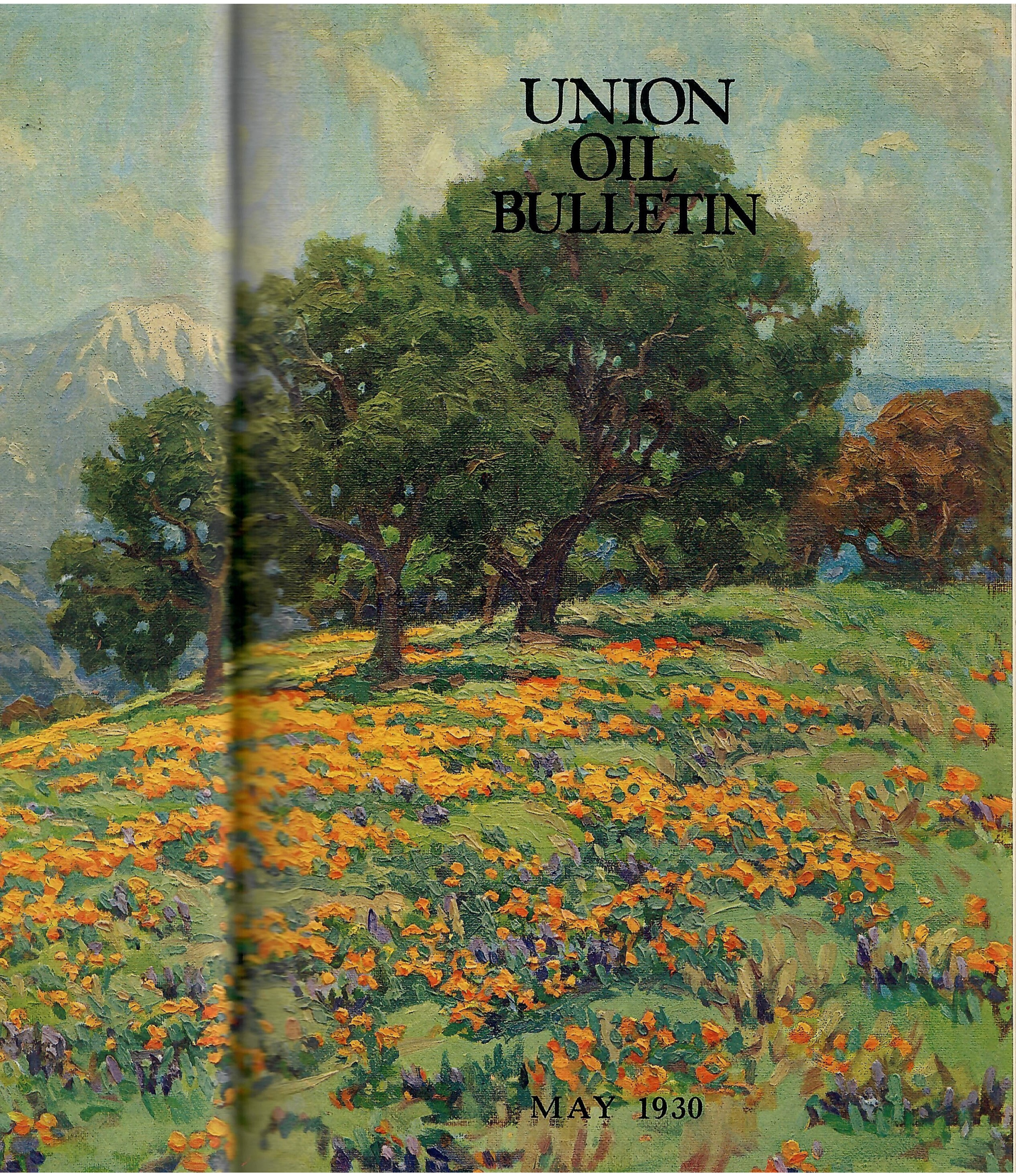
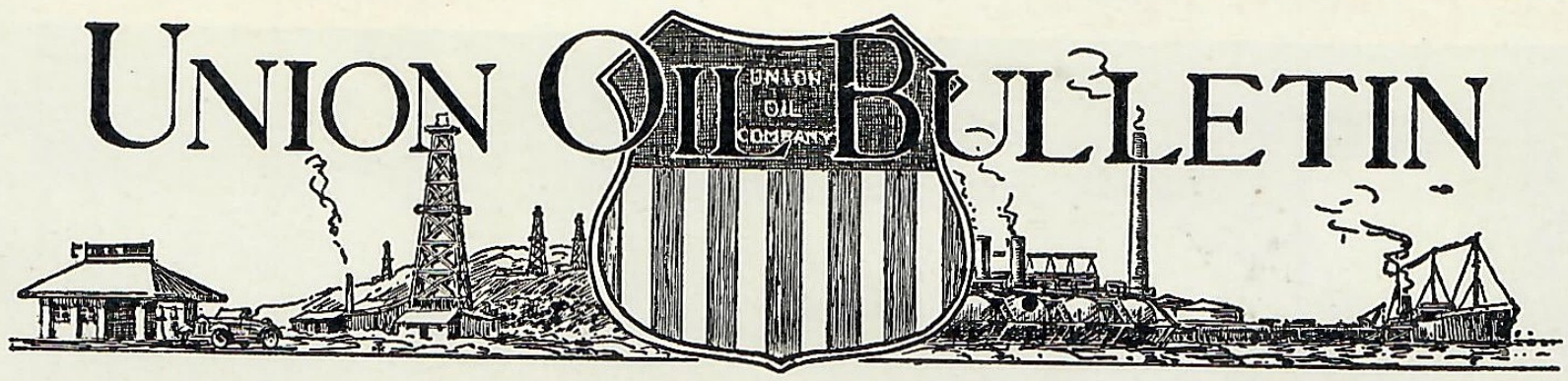

UNION
OIL
BULLETIN
MAY 1930

When Army Birdmen Swarmed Southern Skies

Wing to wing, giant bombers, attack planes, observation planes, and the hornets of the air, the speedy pursuit ships, for three hours staged an exhibition of military flying over Los Angeles and vicinity, at the close of the Army Air Corps maneuvers in California, that left no doubt in the minds of the hundreds of thousands of persons who witnessed the performance of the high state of perfection that has been attained by our air forces. The above photographs were taken from United Airport, Burbank.

UNION OIL BULLETIN



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Volume XI MAY Bulletin No. 5

Paleontology, An Aid to Petroleum Geology

By Desaix B. Myers

Chief Geologist

PALEONTOLOGY is that science which deals with fossils. A fossil may be defined as any record of past life preserved in the rocks composing the earth's crust, a record which may be the footprint of a long extinct animal, the skeleton of a dinosaur, a sabre-tooth tiger, or a fish, the imprint of the leaf of some plant, an ordinary clam shell, or minute shells of marine animals so small that their character can be determined only with the microscope.

Workers in paleontology collect these fossils, prepare them for examination, and classify them under an elaborate system of names. They have found from their studies of fossils collected from thousands of feet of rock layers that the character of life has undergone a gradual and systematic change from early geologic time to the present and that it is quite often possible to find, in an area of good rock exposures, an occasional rock layer with fossils which are radically different from those in layers directly above and below. Rock layers containing marine fossils were formed of sediment laid down along the sea bottom when the sea was much more extensive than at present, and it is true that many such individual layers were distributed over wide areas. Since these beds were laid down, the sea has receded and mountain-making movements have uplifted these beds in scattered areas, now represented by our mountains and hills, so that they are now well exposed for study. By careful study of the fossils from rocks of these scattered areas the paleontologist can correlate rock layers, or groups of rock layers, containing distinct fossils from one area to another even though these areas may be ten or several hundred miles apart.

The paleontologist is then able to materially assist the field geologist in his conclusions as to whether a certain

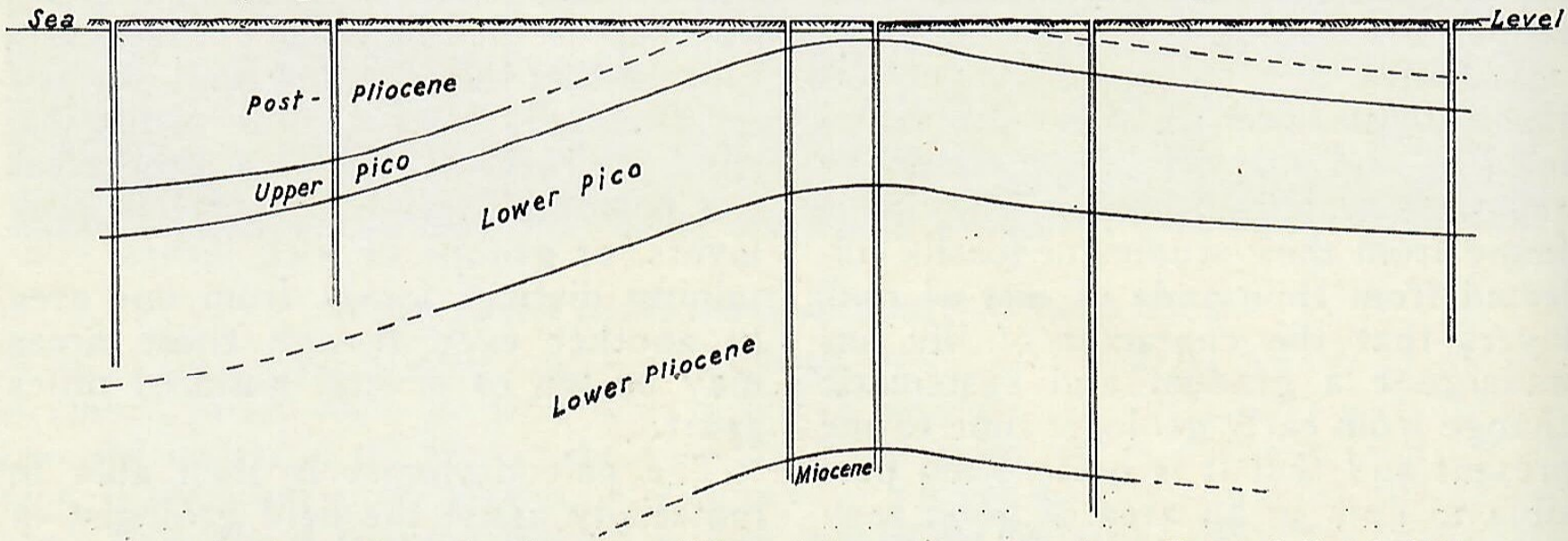
Wash Room of Paleontological Laboratory

The above photograph shows a section of laboratory where core samples are given a preliminary examination, and the method of filing washed samples.

shale formation in a new area under investigation is the same as one in a distant oil-producing district which is regarded as the original source of the oil, or whether another nearby sandstone formation is actually a continuation of the same porous sandstone which contains and yields the oil being produced in that distant oil field. The geologist having this information from the paleontologist is in a better position to compare the geologic conditions in his new area with other areas in his province which are producing oil. The paleontologist is often called upon by the field geologist to assist him in the solution of other of his economic problems, such as the possible existence of an unexposed fault, or the presence and amount of folding in an area of only scattered rock outcrops.

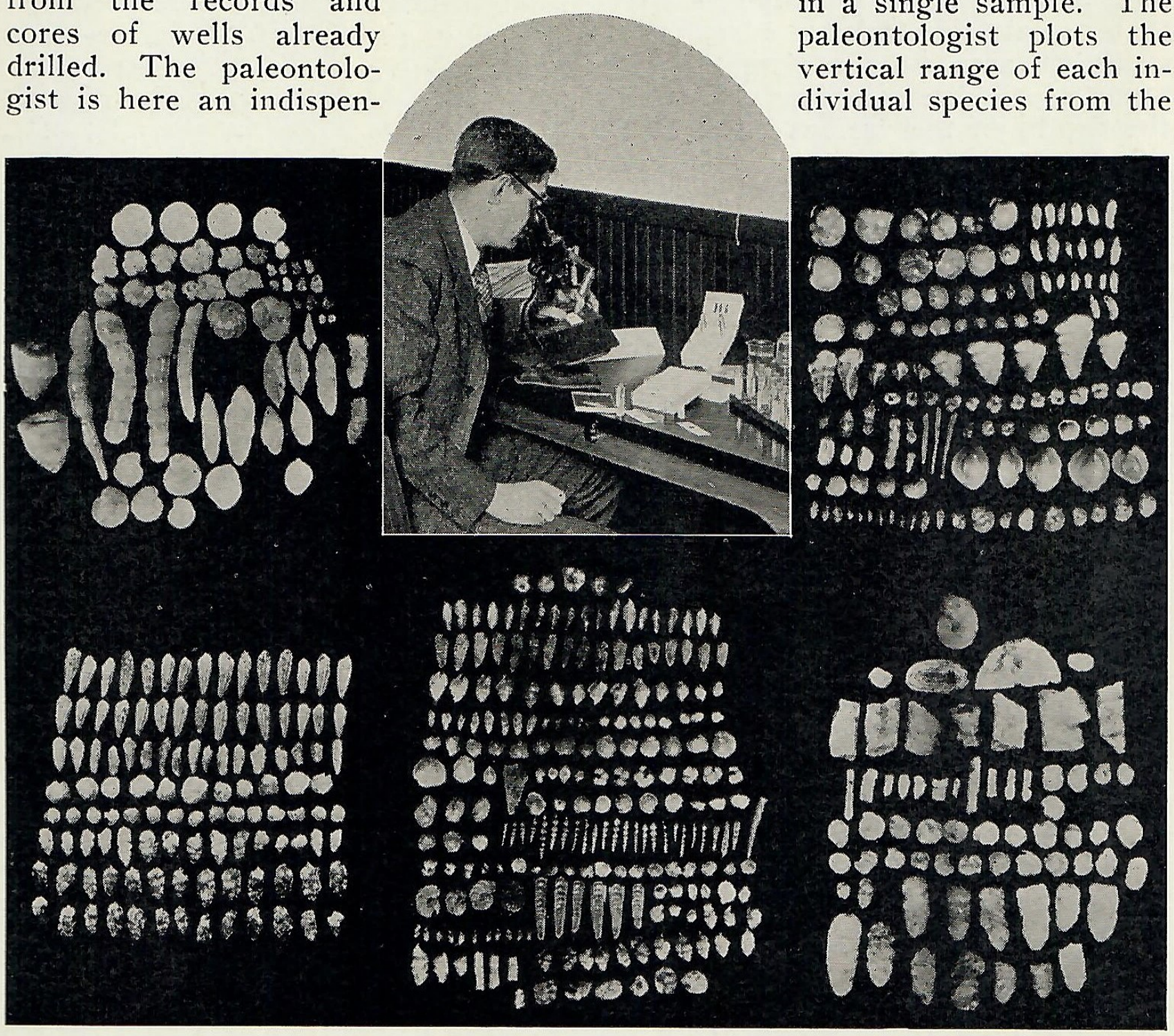
Although the petroleum geologist in California must use evidence available from all types of fossils, he has most need for that evidence derived by the paleontologist from his microscopic study of minute marine fossils. The most common of these small forms are foraminifera and diatoms, and their importance is due largely to their abundance and wide distribution in the rocks of California's oil-producing districts.

In many oil producing districts, such as the Los Angeles Basin and the



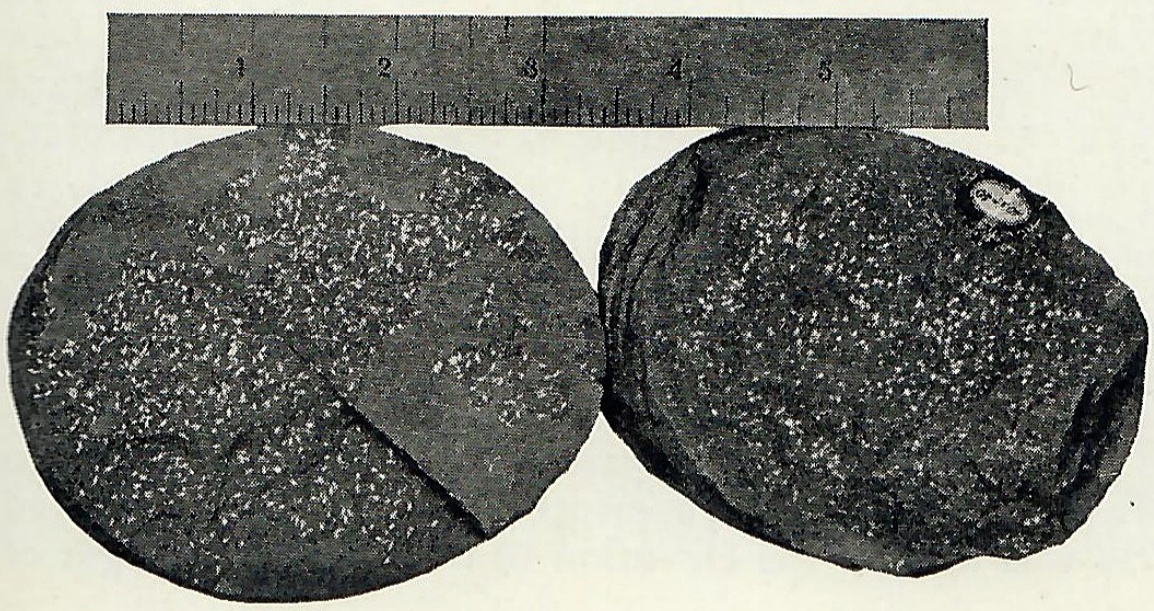
A geologic section showing five different formations based on Foraminiferal data.

San Joaquin Valley, broad areas contain no rocks exposed to aid the geologist in his study of oil possibilities. In such areas he must depend to a large extent on information obtained from the records and cores of wells already drilled. The paleontologist is here an indispensable aid. He examines the cores, prepares samples, and picks out and classifies the contained foraminifera. It is not uncommon to find from 50 to 100 different species of these foraminifera in a single sample. The paleontologist plots the vertical range of each individual species from the



Delving Into Earth's Past

Stanley Wissler, paleontologist, making microscopic examination of fossils taken from well cores. Surrounding him are to be seen photographs of Foraminifera which are typical of the five formations indicated in the accompanying cross section. Starting with the upper left hand photograph the Foraminifera indicate the following geological formations, upper Post-Pliocene, upper Pico, lower Pico, lower Pliocene, the principal oil zone of the Los Angeles Basin, and Miocene.



Fossils in Well Core

This photograph of a Miocene core, taken from a producing well, shows how the Foraminifera (appearing as minute white specks) look before being put under microscope.

top to the bottom of that part of the well from which cores were taken, and divides the rocks penetrated by the well into fossil zones each of which is characterized by a more or less distinct assemblage of foraminifera. He then repeats this task for every other well in the area under investigation and attempts to determine for each well the depths of the various zones identified in the samples from the first well. If fairly complete sets of cores are available from a sufficient number of scattered wells it is possible to determine in a fairly accurate manner the geologic structure and oil possibilities of a non-producing area, even though no rocks are exposed at the surface. The accompany cross-section of subsurface conditions in a California district is based solely on foraminiferal data obtained by our paleontology laboratory from samples taken from wells indicated in the section.

Occasionally, fossil evidence for correlation of rock layers between two nearby wells is supplemented by evidence gained by a study of the mineral content of individual rock layers. In some instances one or more rock layers are characterized by the presence of distinctive minerals and thus by careful microscopic analyses can be correlated from well to well over limited areas.

The Union Oil Company was one of the first oil companies in California to establish a paleontology laboratory. For the first four years the work was essentially a research problem and was carried on at the laboratory of the research and development department. The practical importance of this work has now been established, and at the present time this laboratory functions as a distinct section of the company's geological department.

Manufacturing Group Changes

A RE-ASSIGNMENT of directing heads of the Manufacturing Group to facilitate the work of the group and to increase its operating efficiency, through a more specific segregation of responsibilities, was announced April 19 by W. L. Stewart, Jr., director of manufacturing.

In line with this program, R. E. Haylett, who has served as technical assistant since June, 1926, has been appointed assistant to the director of manufacturing, and the office of technical assistant discontinued. Mr. Haylett has been responsible for the solution of many of the company's technical problems, during the time he has been with the company. It was under his supervision that the research department was organized.

Mr. Haylett came to the company as a chemist in 1916, following his graduation from Beloit College, Wisconsin, and three years at the Massachusetts Institute of Technology. He was made chief chemist at Oleum in 1917, and in 1920 was promoted to the position of chief chemist of the company. Two years later he was made manager of research and development in recognition of his work along research lines. In 1926 he was selected as technical assistant to Vice-President R. D. Matthews, then in charge of the Manufacturing Group.

A. G. Page, who has been manager of refineries for the past ten years, has been relieved of the detailed direction of the refineries in order to permit him to serve in the capacity of consultant and advisor to the director of manufacturing. In this capacity he will advise with the director on all new processes to be developed.

Mr. Page came to the company in 1913 as a chemist. In a short time he was advanced to the position of assistant superintendent at Oleum, then to the superintendency. Then followed his elevation to the post of manager of

refineries, which position he has filled since 1920. While he has been exacting in his demands on the men who have served under him, his kindly and courageous leadership has won their loyalty and devotion.

L. G. Metcalf, who has served as assistant manager of refineries since June, 1926, has been made manager of refineries. He shared the popularity of his immediate chief during the time he assisted in the direction of the operation of the refineries. He is a graduate of Pomona College and Massacusetts Institute of Technology. During his undergraduate days at Pomona he won statewide recognition as a football player. He came to the company in 1914. His first job was on the pipe line. Later he became master mechanic at Oleum. War service took him from the company for nearly 18 months and on his return he was made assistant superintendent at Oleum. In 1920 he was promoted to superintendent at Oleum and served in that capacity until his promotion to the position of assistant manager of refineries.

Other changes made by Mr. Stewart include the segregation of the research and development work in order to make possible the more efficient handling of process development, design and engineering, as distinguished from

problems involving fundamental research. In line with this change, W. A. Raine, who has served as manager of research and development since 1926, becomes manager of research, reporting to the director of manufacturing. He will be responsible for conducting such fundamental research as is approved by the operating executives, special investigations and such service for operating departments as may be required.

E. W. Gard, who has served as an assistant to Mr. Haylett, has been appointed development engineer, reporting to the director of manufacturing. He will be responsible for the experimental work, design and engineering development of processes for refineries and gas operations. He is a graduate of U.S.C., and during the war served as an engineering officer in the U. S. Navy.

Mr. Stewart, as director of manufacturing, is building up a splendid corps of engineering experts, each with a well defined position and objective. Through the co-ordinated efforts of these men the Union Oil Company can expect to keep to the forefront in the manufacture of petroleum products.

Mr. Buyer Meets Hi Compression Pete

Editor's Note: Mr. Buyer and Motor Mike meet here again, and the former is introduced to "Hi Compression Pete," and thereby learns more about the superiority of California gasoline. If you are interested in gasoline we commend this article to you.

By C. C. Moore, Jr., and M. E. Reynolds

THE luring magazine and newspaper photographs of leaping trout and battling bass had stirred old angling memories in Motor Mike, and the evening of April 30 found him before the blazing fireplace at the Lodge at Lake Arrowhead contemplating the dawn of the first day of the fishing season. The assemblage of anglers in the big lounging room attested to the fact that Mike would have ample competition the next day. He was suddenly aroused from his fire gazing by a familiar voice at his elbow. He turned to see Mr. Buyer, fishing paraphernalia in hand.

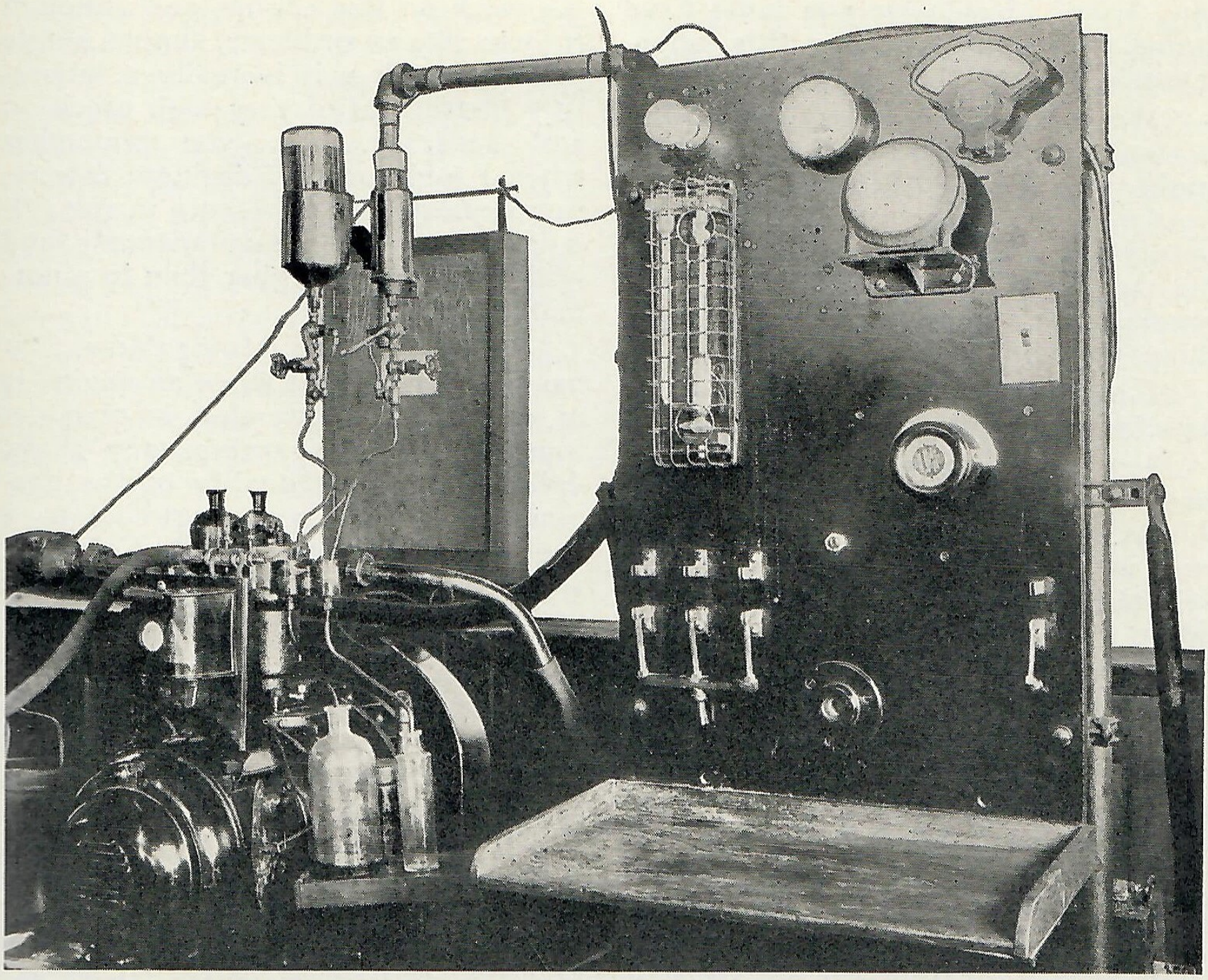
"Mike, of all people," exclaimed Mr. Buyer. "You up here with the rest of the optimists."

"And why not?" retorted Mike.

"Well, I'm glad you're here," said Mr. Buyer. "It has been a long time since I had an opportunity to pump you about oil, and I'm beginning to think you know something about it. For one thing, this Union Ethyl you recommended to me does everything you claimed for it. Just made that long grade up here in high, and it's the first time I have ever been able to do it."

"The hill climbing test is one of the most convincing you can make with Ethyl," interrupted Mike. "It has never yet failed to win over the skeptic."

"I had my eyes opened to the difference between gasolines this past summer," went on Mr. Buyer. "My wife and I made a combination business and pleasure trip through the East, dropping off first to buy a car right off the assembly line. We had a fine time, but words can't express my opinion of the gasoline they sell you there. It gave me trouble all through the East and two-thirds of the way to California. Thought my new motor would knock its head off with some of the gasoline I fed it. Even many of the premium gas-



Delco Knock Testing Engine

Every run of gasoline in the Union Oil Company refineries must pass a knock rating test before it is released for sale. This machine is the "High Compression Pete" referred to in the accompanying article.

olines that retailed at 4c a gallon above the regular price were worse than our ordinary gasoline that we buy here in California. What's the matter, Mike, does California know more about refining than the East and Middle West?"

"My natural modesty makes me somewhat reticent on that point," replied Motor Mike with a grin, "but the California refiners are certainly blessed with much better crude to start with, as far as making gasoline goes, and that accounts for a big part of the difference between East and West coast gasolines, I think."

"What do you mean, a better crude?" asked Mr. Buyer. "It's all oil, isn't it, and the eastern crude looks just like ours, I know for I saw some."

"That's all very true, but the beauty of a refining crude is a deeper matter than its complexion. When you see gasoline in the "clear glass vision" service pump you naturally think of its being a definite material, like water, but this is really not the case. The gasoline you use is a very complex substance, made up of many families or classes of chemical compounds. Each of these families have a different tendency to detonate when burned in high compression engines. It so happens that California crudes have, in the fractions which make up gasoline, a much greater content of relatively non-detonating compounds than is the case with Eastern and Mid-Continent crude oils."

"Is there really as much difference in the detonating qualities of the gasoline as my new motor tried to tell

me, Mike? I suppose you must have some means of measuring this difference."

"We certainly have, but it is rather a complicated story, and I see that right now I've got to get my stuff ready for tomorrow's fun. If you are interested, why don't you come down to the dynamometer laboratory next week, and I'll give you the whole picture, including sound effects."

"I am interested, and I'll show up the first of the week."

Monday morning, Mr. Buyer presented his credentials to the vigilant Oscar, custodian of the refinery gate, and was ushered to the dynamometer laboratory, where he found Motor Mike filling a notebook with a set of cabalistic looking figures.

"Hello, Mr. Buyer, I'll be with you in a minute, I'm just finishing a knock rating test on 15,000 barrels of Ethyl gasoline, and the refinery is waiting for my O.K. on the lot."

"Do you test all your Ethyl gasoline for anti-knock value?" asked Mr. Buyer.

"Yes, every gallon of it has to meet our standard in this respect, as well as the other control tests. I'll phone this into the superintendent and then we'll start going places and seeing things."

While Mike was talking to the superintendent, Mr. Buyer was examining the engine in one corner of the dynamometer laboratory. It looked like an ordinary Delco Light engine, but it had a few gadgets added to it, and was bolted to a huge cement block, the whole flanked by a complicated looking switchboard.

"What is this, Mike, and are you afraid that somebody will steal it?"

"That," replied Motor Mike, as he thoughtfully wiped a smudge of oil off his nose, "is perhaps the most cussed engine in the United States. In official language it is known as a Delco testing engine. Sometimes we call it 'High Compression Pete' and sometimes we call it things that are just naturally not fit to print. We do all of our knock rating or knock testing work on this engine, and although it looks like an ordinary, simple, single cylinder engine, it is really a laboratory instrument of very high precision and accuracy. Do you remember when I told you that during a detonation explosion, the pressure in the cylinder rose almost instantaneously, and was considerably higher than in a normal explosion?

"Well," went on Motor Mike, "it has been found that when an engine is of very high compression, so that detonation is quite severe, any slight differences in the quality of the gasoline being used are magnified to a considerable extent. High Compression Pete has a compression of 160 pounds per square inch, instead of the normal 90 to 110 or 120 pounds that the modern high compression automobile engine has and very naturally Pete does a first class job of knocking, even with Ethyl gasoline of normal strength. If the engine wasn't bolted to that big concrete block, it would wobble all around the room and shake off most of the small parts. Of course, the engine is built to withstand the high explosion pressures that occur when detonation is taking place, but even so you have to be a pretty good mechanic to keep it running the way it should."

"What is all the switchboard for?" Mr Buyer wanted to know.

"Well," replied Mike, "I won't go into the details of how and why, but it is essentially this: An electrical generator is built into the base of the motor, just as in the Delco Light engines, and we absorb the power from the engine by generating electricity, which in turn is absorbed by the resistance coils in the back of the switchboard. Otherwise, the engine would either run at very high speeds, or we would have to close the throttle, and run at a low compression. In actual testing, the throttle is left wide open and the speed of the engine held at exactly 100 r. p. m. by adjusting the load by means of the rheostats. This," went on Motor Mike, pointing to a peculiarly shaped glass tube, "is the recorder for the Midgley bouncing pin

apparatus that is mounted on the head of the engine. The Midgley bouncing pin, or indicator, consists of a small cylinder and piston mounted so that the explosion pressure in the engine cylinder works on the small piston. The small piston is fastened to a very heavy spring, such that even a detonating explosion only moves it a slight amount. This movement, however, is measured by an electrical system such that any differences in movement, which, of course, would mean differences in detonation pressures with a consequent difference in fuels, can be detected."

"But to what do you compare the knock rating of a gasoline?" Mr. Buyer wanted to know. "It seems to me, from my experiences back east last summer, that each gasoline is different. You are a certain number of feet and inches tall, but you can't measure the knock rating of a gasoline in terms of inches."

"That same question, Mr Buyer, has been asked by a good many people, and it is only in the last year or so that there has been a satisfactory answer. It doesn't make so much difference here in our own refinery just how we express the knock rating of a gasoline, providing we know what we are talking about and can make Ethyl gasoline of the same uniform quality. For example, we can take the highest compression automobile on the market today, make road tests, and determine experimentally just what is the proper amount of tetraethyl lead to add to a particular batch of gasoline to give satisfactory performance, saving a barrel or so of this doped gasoline for comparative purposes. When we add enough tetraethyl lead to any other batch of gasoline so that it has the same knock rating, determined with our test engine, as our barrel of test gasoline, the finished product will be satisfactory for sale as Ethyl gasoline. However, as you found on your trip through the east, gasolines from different parts of the country, and for that matter, even those produced in Southern California, have different tendencies to detonate, and very naturally the same amount of tetraethyl lead in two different gasolines will not give the same knock rating. If our barrel of standard gasoline is used up, or if we want to talk knock rating to some oil company in the east, we are up against it. In order to provide a universal knock rating language, or standard, a considerable amount of research work was done. It was found that two chemicals, known as iso-octane and normal heptane, could be prepared in the pure state and also in sufficently large quantities to make them available for testing purposes. Both of these materials are volatile, like gasoline, and can be used as a motor fuel. For some unknown reason the normal heptane is a bad knocker, while the iso-octane is a very fine anti-knock fuel. By mixing the two, practically any degree or kind of anti-knock fuel can be produced, and anybody having the two materials can duplicate the knock rating of any gasoline, if he knows the percentages of the two materials required. For example, the average California gasoline has the same knock rating as a mixture of 67% iso-octane and 33% normal heptane. These figures, then, are definite measures of the anti-knock value of a gasoline, and the exact knock rating can always be duplicated by merely blending the two materials in these proportions. It really reduces knock rating measurements to a common sense basis, and provides a sort of universal language. For normal control work here in the refinery, we generally use as a standard a gasoline that has been carefully adjusted, by the addition of tetraethyl lead, to be equal to some definite blend of normal heptane and iso-octane."

Mr. Buyer wasn't quite sure that he appreciated the full advantages of normal heptane and iso-octane as anti-knock standards, but he agreed to take Motor Mike's word for it.

"I'll show you, Mr. Buyer, why you noticed such a difference between eastern and western gasolines on your trip. It so happens that I have a gas-

oline here that was obtained in the east, where it was sold at a premium as an anti-knock gasoline. I don't know whether you noticed it or not, but there are two small gasoline reservoirs mounted above the test engine, and they are connected so that gasoline from either one may be fed to the carburetor. I'll put some of our standard Ethyl gasoline in the left-hand reservoir, and some of the eastern gasoline in the right-hand reservoir." Motor Mike then proceeded to start the test engine, and in a few minutes he announced that the engine was up to operating temperature. "You know," he told Mr. Buyer, "detonation is influenced by engine temperature, and it is necessary to hold the engine temperature at some exact point in order to secure duplicate results. We use a cooling water temperature of 180° F., and as you can hear, we have plenty of detonation."

The test engine was knocking away as though it were doing its best to blow off the cylinder head, and Mr. Buyer began to realize why an ordinary type of engine could not be used for this kind of testing work. He was very much astonished when Motor Mike told him that Ethyl gasoline was being used in the engine at the time.

"I thought Ethyl gasoline didn't knock?"

"It doesn't in an ordinary high compression motor, but this partcular motor, you will remember, has a compression of 160 pounds per square inch, because in order to get a good comparison, it is necessary that the engine knock severely. I'll switch over to the eastern gasoline now, and you can hear the difference without watching the indicator."

Motor Mike turned a valve on the carburetor, and almost immediately the engine began detonating so violently that Mr. Buyer became alarmed for his personal safety. Motor Mike turned the valve back to the Ethyl gasoline supply. "Now I'll show you how we compare a gasoline to some standard, such as our Ethyl gasoline. From the sound, I would judge that the eastern gasoline would require about 5 cubic centimeters of tetraethyl lead per gallon to equal our Ethyl gasoline, and as a trial I will make up a blend with that amount in it."

Motor Mike busied himself with a small burette, containing, as he explained to Mr. Buyer, Ethyl fluid that was diluted in known proportions, and after adding the required amount, he placed the mixture in the empty fuel reservoir. This time, when he switched the engine over to the eastern fuel, Mr. Buyer could not distinguish any difference in the sound produced, although Motor Mike said that the Midgeley indicator showed that the eastern gasoline with the tetraethyl lead in it was just slightly better than standard Ethyl gasoline. Another sample of the eastern gasoline was then blended with slightly less tetraethyl lead than was used for the first trial, and after this blend had been substituted for the fuel in the test tank, no difference, as shown by the indicator or by listening to the detonation, could be noted between the standard Ethyl gasoline and the eastern gasolinc. "We would report this eastern gasoline as requiring 4.8 c.c. of tetraethyl lead per gallon to equal our standard Ethyl gasoline." Motor Mike said, "or in our universal language, equal to about 50 per cent of iso-octane and 50 per cent of normal heptane. The exact value would have to be determined by comparing with either the two pure hydrocarbons, or with a gasoline that had been standardized against different mixtures of these two pure hydrocarbons. The average Mid-Continent gasoline would fall about half way between the eastern gasoline in its tendency to detonate."

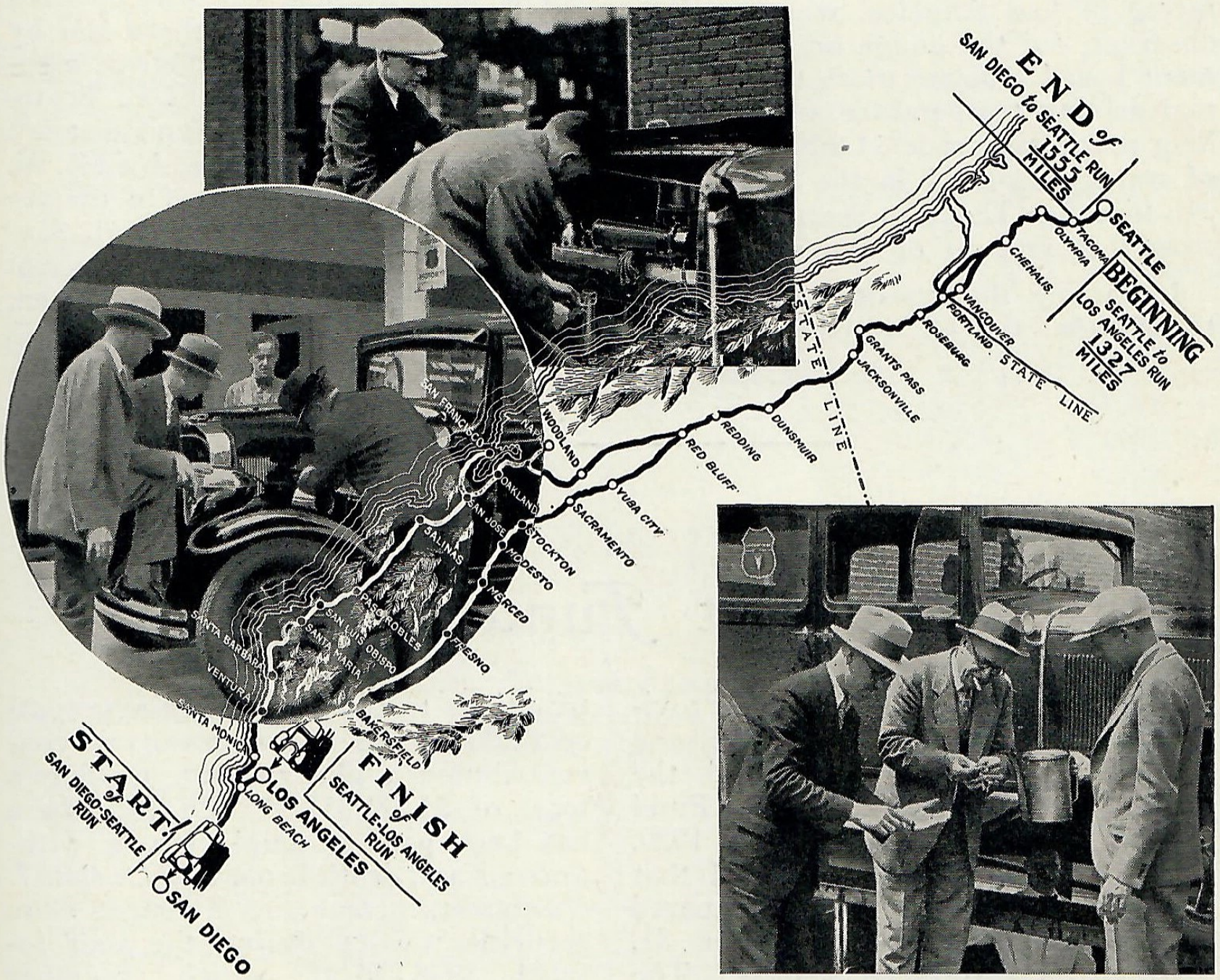
"It's no wonder my motor complained back East, and acts like a different machine out here. I thought maybe it was just the California climate."

Mr. Buyer went home with the firm conviction that St. Christopher, the patron saint of motorists, had been particularly kind to Californians.

Severe Road Tests Made With Motorite

THE staying and efficient lubricating qualities of the Union Oil Company's new extra mileage motor oil, Motorite, were demonstrated last month in two road tests of more than 1300 miles each made with a stock De Soto Straight 8 sedan with the crankcase sealed.

The first test consisted in a run up the coast from San Diego to Seattle, a distance of 1555 miles, at an average speed of 38.97 miles per hour. Eight quarts of Motorite were put in the car at San Diego by Virgil Bruschi, Jr., sealer of weights and measures of San Diego County, and the breather pipe of the crankcase sealed to prevent the addition of new oil. The seal was broken in Seattle by C. A. Heffron, service manager of the Automobile Club of Washington, and the crankcase drained and the oil submitted to Laucks Laboratories, Inc., to be analyzed. On the second test run from Seattle to Los Angeles, a distance of 1327 miles, the crankcase was again filled with eight quarts of Motorite and the breather pipe sealed by C. Y. Jared,



Testing Mettle of Motorite

The routes of the two Motorite road tests are shown on the above map. In the oval, Virgil Bruschi, Jr., sealer of weights and measures of San Diego County, is shown measuring out eight quarts of Motorite for 1555-mile, sealed-crankcase run to Seattle, while J. D. Nesbitt, district manager of San Diego, and W. V. Lord, San Diego De Soto dealer, look on. In the upper photograph, C. A. Heffron, service manager of the Automobile Club of Washington, is shown breaking the seal put on the crankcase in San Diego. In the lower right photograph, E. W. Hutton, assistant manager lubricating oil sales, Union Oil Company, and W. E. Bush, De Soto distributor, are examining oil at end of Seattle to Los Angeles run. Ted Simpson, driver of the car, is holding the can of oil.

inspector of weights and measures of the city of Seattle. On this trip the car was driven through San Joaquin Valley, where the thermometer at times registered a temperature of more than 90 degrees. The speed average for the trip was 41.26 miles per hour. When the seal was broken in Los Angeles by William E. Bush, De Soto distributor, more than four quarts of oil was drained from the crankcase.

At no time during either the run up the coast or from Seattle to Los Angeles, according to Ted Simpson, race driver, who was at the wheel of the car, and Roy De La Mare, assistant cashier of the National Bank of Commerce of Los Angeles, who acted as observer, did the gauge on the instrument board indicate more than a normal driving temperature, even on the long mountain grades. Only one quart of water was used in the car on the run from San Diego to Seattle, and less than that amount on the return trip.

Indicating the resistance of the oil to dilution, the oil drained from the crankcase of the car at the conclusion of 1555 miles of driving showed a gasoline dilution of only 1.5 per cent when analyzed by the Laucks Laboratories, Inc., Seattle. The oil drained from the crankcase in Los Angeles, when tested in the Union Oil Company's research laboratories at Wilmington, was found to contain 1.4 per cent gasoline. As in the case of the Seattle test, the viscosity of the oil was found to be heavier than it was prior to the time it was put in the crankcase. In addition it was also disclosed by the laboratory tests that the oil had somewhat flatter temperature - viscosity characteristics than the unused oil.

The Motorite test car was checked in at Oakland on the northern run by F. W. Nevitt, assistant district manager, and in Portland by C. L. Tostevin, manager of the Portland district. In Seattle the car was met by M. W. McAfee, district manager. On the return trip it was checked through Sacramento by R. W. Henderlong, special agent, and in Fresno by Otto Nissen, assistant district manager.

Provident Fund Report

TO THE members of the Provident Fund:

There is herewith submitted the financial report of the Provident Fund for the year ended December 31, 1929.

The resources of the Fund at that date totaled $6,135,987.86 as compared with $5,310,816.65 at December 31, 1928, an increase of $825,171.21. The securities owned at December 31, 1929, consisted of 17,320 shares of stock in the Union Oil Company of California and 43,255 shares in Union Oil Associates, totaling $2,737,584.96, and other common stocks, preferred stocks, bonds and mortgages aggregating $3,-154,759.69.

Since its inception, members' contributions to the Fund have aggregated $2,860,655.44, the Company having contributed a like amount, making a total of $5,721,310.88. Of this there has been paid to employees in withdrawals and death benefits, $902,469.17.

Interest, income and dividends from securities owned during the year totaled $296,746.50, which, together with profit on securities sold of $1875 makes a total income for the year of $298,621.50.

After crediting interest at 5% per annum on members' credits totaling $202,987.20, and deducting $16,246.14 expenses of administrating the Fund, and $2286.34 provision for benefit payments, leaves a net income of $77,-

BALANCE SHEET—DECEMBER 31, 1929

Assets

Cash with Union Oil Company of California at 5% and in Bank			$ 69,832.77
Securities Owned:			
Union Oil Company of California Capital Stock 17,320 Shares at $44.45		$ 769,977.53	
Union Oil Associates Capital Stock 43,255 Shares at $45.48		1,967,607.43	
		$2,737,584.96	
Common Stocks		705,350.85	
Preferred Stocks		975,542.25	
Bonds		1,138,231.14	
Mortgages		335,635.45	5,892,344.65
Loans to Members			136,661.63
Income Accrued			37,148.81
			$6,135,987.86

Liabilities

Members' Credits:			
Members' Contributions plus interest thereon Less Withdrawals and Death Benefits	$831,759.46	$2,369,286.60	
Company Contributions plus interest thereon Less Withdrawals, Death Benefits and Transfers to Reserve	831,759.46	2,369,286.60	$4,738,573.20
Calculated Liability for Benefit Payments			16,345.54
Reserve Account			1,381,069.12
			$6,135,987.86

Income Account for the Year Ended December 31, 1929

Income from Interest and Dividends	$ 296,746.50	
Profit on Securities Sold	1,875.00	$ 298,621.50
Deduct:		
Expense of Administering Fund	$ 16,246.14	
Interest at 5% credited to Members' Accounts	202,987.20	
Provision for Benefit Payments	2,286.34	221,519.68
Income for the year carried to Reserve		$ 77,101.82

Reserve Account

Credits to Reserve on Members' Withdrawals			$ 703,324.48
Difference between Cost and Stated Value of Securities			390,044.71
Income Account:			
Balance December 31, 1928		$ 210,598.11	
Add: Net Income for year as shown above		77,101.82	*287,699.93
			$1,381,069.12
*Note:			
Net Income from July 1, 1923, (date of commencement of Fund) to December 31, 1929		$ 973,463.53	
Less: Interest at 5% credited to Members' Accounts	$683,444.84		
Provision for Benefit Payments	2,318.76	685,763.60	
		$ 287,699.93	

AUDITORS' CERTIFICATE

We have examined the books and accounts of the Union Oil Company of California Provident Fund for the year ended December 31, 1929, and certify that the above Balance Sheet, Reserve and Income Accounts in our opinion fairly set forth the financial position as of December 31, 1929, and the administration of the Fund to that date.

Los Angeles, California
April 15, 1930

PRICE, WATERHOUSE & COMPANY

101.82 transferred to the Reserve Account.

The Reserve at December 31, 1929, totaled $1,381,069.12, an increase of $271,692.45 since December 31, 1928. The increase consists of the portion of Company's contributions, amounting to $194,590.63, transferred to the Reserve through members' withdrawals and income for the year of $77,101.82.

While the break in the stock market in the fall of 1929 seriously affected all securities, it was unnecessary to make an adjustment in the stated value of Securities Owned, since the total market value thereof at December 31 was in excess of the amount carried in the accounts.

The year reflected a decided increase in the membership of the Fund, 5,682 employees, representing 93.96% of those eligible, having joined the Fund at December 31, 1929, as compared with 4,995 employees and 81.76% at December 31, 1928. This indicates the growing interest on the part of the employees in the Fund and the appreciation of its merits.

By Order of the Board of Administrators,

Gerald G. Blue, Secretary.

Union Fueled Racer Sets Record

SPEEDING over an electrically timed mile straightaway course at Muroc Dry Lake, California, on April 10, Shorty Cantlon, at the wheel of a Miller "hi-speed special," established a new world's speed record for four-cylinder cars of 144.985 miles per hour, bettering the former mark set at Daytona Beach, Florida, in 1911, by Bob Burnham, by nearly three miles per hour.

Cantlon's time for the mile, 24.83 seconds, was averaged over a two-way north and south course which provided a two-mile approach to the starting line and an equal distance for slowing down beyond the finish line. His fastest time over the north course was just under 147 miles an hour, while his best time from the opposite direction was 143 miles per hour. All tests were run under the supervision of Arthur C. Pillsbury, regional member of the contest board of the National AAA, and G. F. Stephenson, representative of the technical committee.

The electrical timing device eliminated possibility of error in recording the speed run. A steel tape stretched across each end of the measured course, which closed the circuit the instant the wheels of the car touched it, recorded in split seconds the start and finish of each run.

The car in which Cantlon set the new four-cylinder record weighed less than 1700 pounds, and the 183-cubic-inch motor weighed only 386 pounds. The car with which Burnham established the mark that stood for nineteen years was of massive proportions and was powered with a motor having a displacement of 600 cubic inches.

The little racer, driven by Cantlon, is owned by W. A. White, a veteran of the racing game. It was built up entirely in the plant of Schofield, Inc., of America, Los Angeles. The motor is a stock model now available for commercial use.

In block tests before the time trials at Dry Lake, the little engine, equipped with a supercharger, developed 198 horsepower at 5000 revolutions per minute. Due to its light weight per horsepower, factory representatives declare that it will be possible to convert it into an in-line airplane engine.

Doing a Mile in 24.83 Seconds

No. 1—Record-breaking car photographed at Muroc Dry Lake as it flashed over the electrically-timed course at 144.985 miles per hour—a streak of white at the head of a mile-long column of dust. No. 2—The little motor generating 198 horsepower during a block test. No. 3—Measuring the course. No. 4—Fueling with Union Ethyl for the start of the run.

Gas Automat for Late Hour Customers

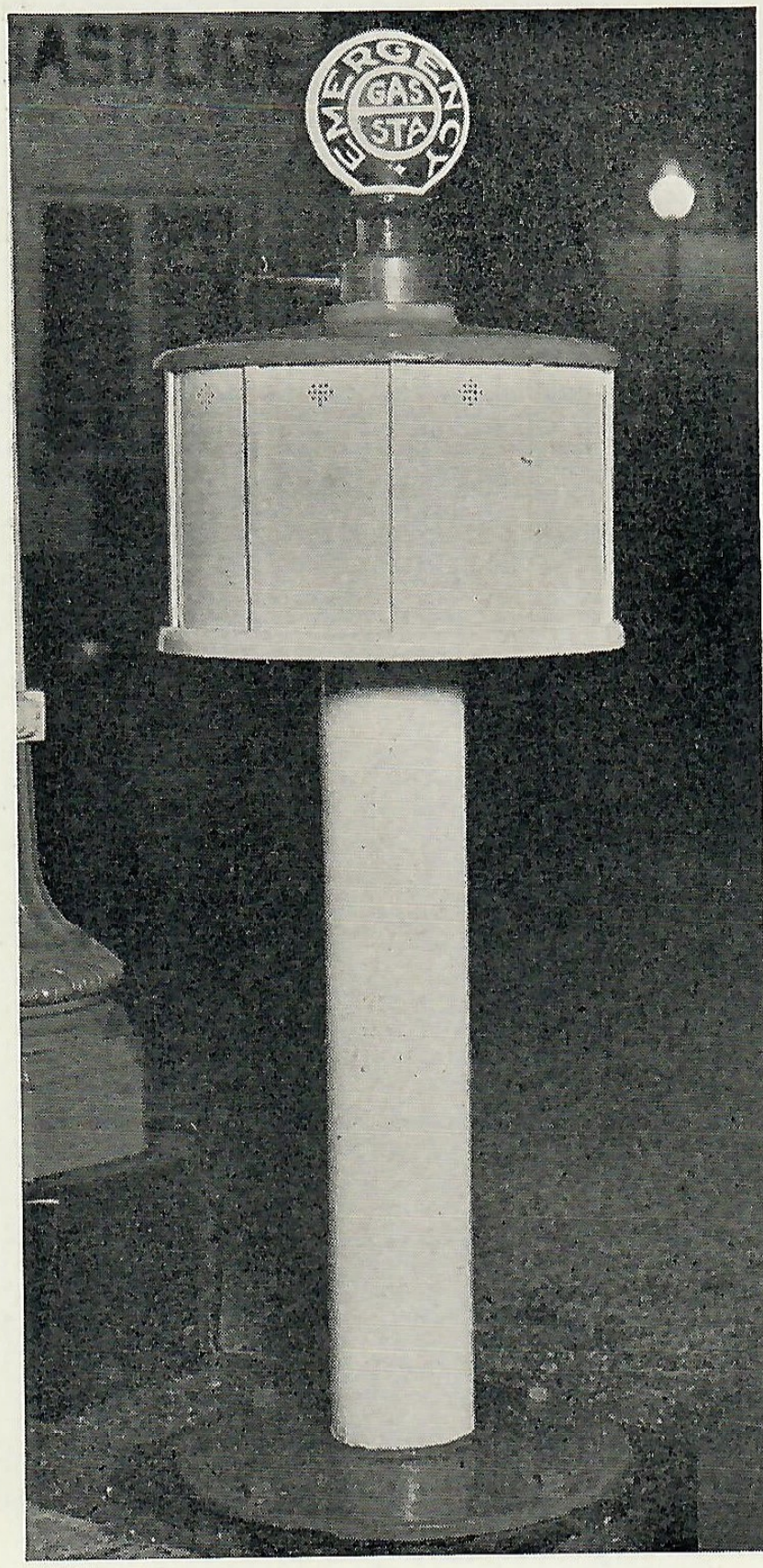
THE first emergency gas station on the coast, and possibly in the country, was placed in operation late last month by the Union Oil Company at its station at Washington boulevard and West Adams, Los Angeles. It is designed to serve the motorist at one of the lowest moments in his life, i.e., during the wee small hours when he discovers an empty gas tank with only darkened service stations and locked pumps to remind him of the futility of the situation.

Such moments are not rare in the lives of motorists. Their frequency, made doubly impressive because the passing motorists keep on passing, fearful lest their act of good Samaritanism be rewarded with foul play, caused the company to install its first emergency station, a dispensing automat loaded with one-gallon gasoline containers that are pushed forth when the necessary 50-cent piece has been dropped in the slot.

The cans are stenciled with the name and address of the service station, and carry the statement that a refund will be made when returned. It is believed that the persons returning the containers for the refund will in most cases take the precaution to fill up their gasoline tanks before leaving the station.

If the emergency station proves a success it will be placed in other company owned service stations that are strategically located to serve the after-closing-hour customers. Should these stations have a wide distribution in the future it is certain that every motorist will take the precaution to arm himself with 50-cent pieces before venturing forth for the evening.

The gasoline automat was designed and built by C. Gray of Los Angeles.



You put 50 *cents in the slot and out comes gallon can of gasoline.*

Coast and Valley Divisions Consolidated

Consolidation of the field, transportation and gas departments in the Coast and San Joaquin Valley divisions into a single operating unit, to be known as the Northern Division, with Lafe Todd as general superintendent, was announced May 1 by Chester W. Brown, director of exploration; William Groundwater, manager of transportation and R. W. Garman, manager of gas operations. The headquarters of the division will be located at San Luis Obispo.

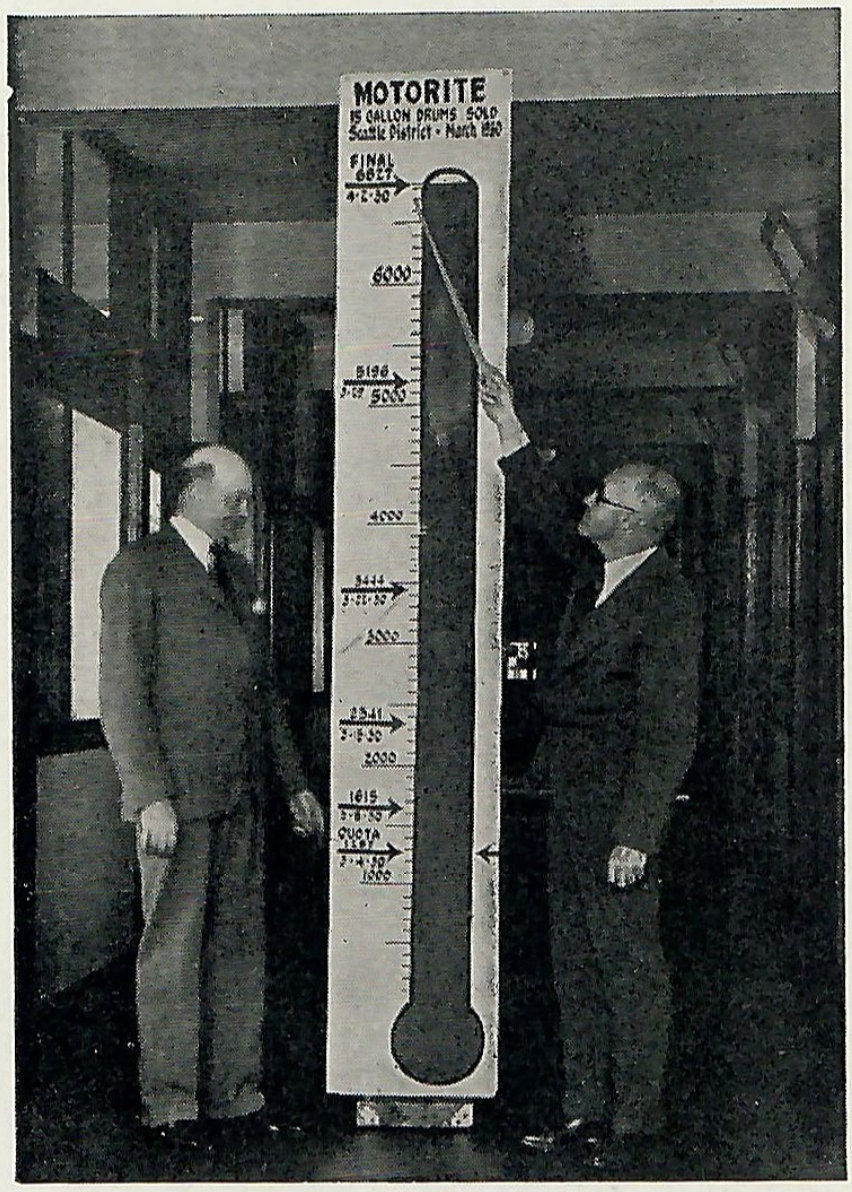
Appointments of superintendents of field, gas and transportation operations, who will work under Mr. Todd, will be completed at a later date. Mr. Todd will have general supervision of the operations within the division, subject to the direction of the department managers involved, who will, as a committee direct such work as jointly affects the several departments and will individually direct such operations as affect the particular department concerned.

Mr. Todd has been identified with the pipe line operations of the company since July, 1906, when he went to work as a roustabout on the Ventura Pipe Line. In a few months he was made foreman and continued in that capacity until about 1910, when he was transferred to the Stewart Tank Farm gang as a roustabout. After working there for about a year he applied for a three months' leave to take a position as tool dresser and driller for the Olinda Land Company, but before his leave expired it was decided to build a four-inch line from Ventura to Oxnard, and he was sent back to the Ventura Pipe Line as a foreman.

In 1914 he was transferred to Orcutt as a foreman on the Lompoc Pipe Line, and a year later to the San Luis Obispo tank farm as foreman. In 1916 he was made assistant chief engineer on the Producers and Lompoc pipe lines, under Mr. Groundwater. Two years later he was promoted to assistant superintendent. In 1922 he was transferred to the Los Angeles Pipe Line as assistant superintendent under John Burnett, and the following year, with the transfer of Mr. Groundwater to the Head Office, he was returned to San Luis Obispo as superintendent of the Producers and Lompoc pipe lines, which position he held until his recent appointment.

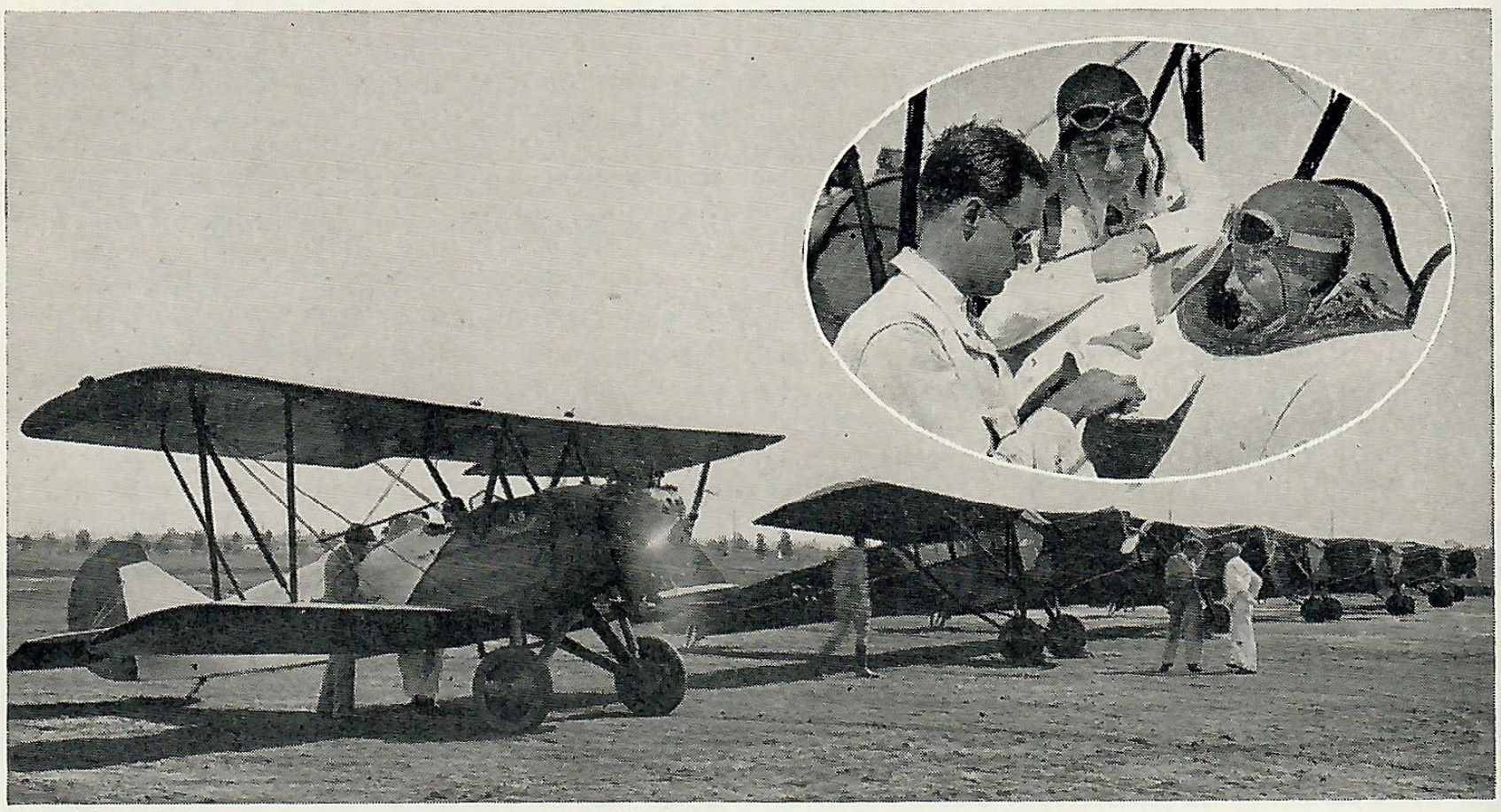
LAFE TODD

The Quota Busters



Above is shown what an enthusiastic district organization, a superior product and good advertising can accomplish. J. Federspiel, left, assistant district manager of Seattle, is pointing to the quota of 1,287 *15-gallon containers assigned the Seattle district by the head office at the outset of the Motorite sales campaign, and S. D. Herkner, right (recently appointed district manager of San Francisco) is pointing to total number of containers* (6,827) *actually sold.*

Cross-Country Hop For Fledglings



Students' Ships Lined Up for Take-off

Curtiss-Wright ship on the line for the take-off of the first student cross-country flight. In the foreground is one of the company's Travelair biplanes which, with Roy Harding at the controls, served as pathfinder for the squadron. In the insert, Capt. Peyton Gibson, in command of the flight, left; William Wagner, publicity representative of Curtiss-Wright, and Roy Harding, Union Oil Company aviation representative, discussing the route of the flight just before taking off for Taft.

OFFICERS of the Curtiss-Wright Flying Service training school in Los Angeles last month inaugurated a cross-country flight extending over 1000 miles in length, in which seven students of the school who are seeking transport pilot's rating were compelled to plot their own course, navigate and fly their ships over unfamiliar territory.

Hopping from Los Angeles Municipal Airport April 14, the fledgling squadron of eight planes, under the command of Capt. Peyton Gibson, in charge of Curtiss-Wright training and operations, crossed the Tehachapi to Taft, then hopped to Bakersfield and Visalia, where the first overnight stop was made. The flight continued up the San Joaquin Valley to Sacramento, with stops at Fresno and Stockton. Following a two-day stay at Sacramento, the students returned home, making stops at Alameda, San Mateo, Salinas, Santa Maria, and Santa Barbara.

The flight was considered a success from every angle, the students handling their ships in a most creditable manner. Heavy fog and storm was encountered in crossing the ridge, but each of the students brought his plane safely through to the landing field at Taft.

Roy Harding, Union Oil Company aviation representative, flying one of the company's planes, with William Wagner, Curtiss-Wright publicity representative, as passenger, preceded the squadron by more than an hour, making arrangements at the various airports for fueling and servicing the planes. Harding was met at Fresno by W. E. Carey, northern aviation representative of the company, who conducted the squadron over the northern part of its flight.

TO MOTOR-ITE

When your motor's running slow,
And she won't get up and go,
There's just one chance in sight,
Fill her up with MOTOR-ITE.

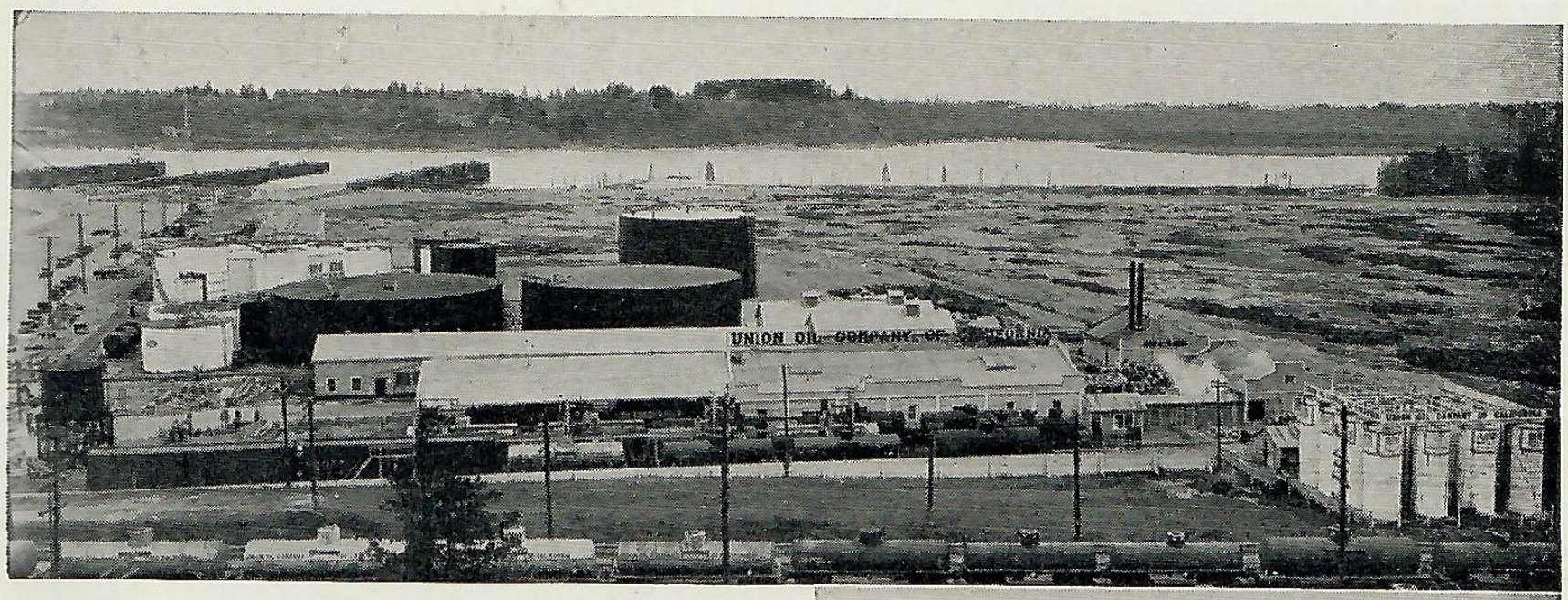
When the old bus seems to knock,
And the chassis shakes with shock,
Go home, this very night,
Give 'er a shot of MOTOR-ITE.

When you've thrown her into high,
And all others pass you by,
You *know* she's got the "fight,"
All she needs is MOTOR-ITE.

Just fill your life with smiles,
'Cause you've added extra miles,
With the motor oil delight,
That is known as MOTOR-ITE.

Donald M. Diehl,
Statistician,
Credit Dept., L. A.

First Bulk Lub Oil Delivery for Portland

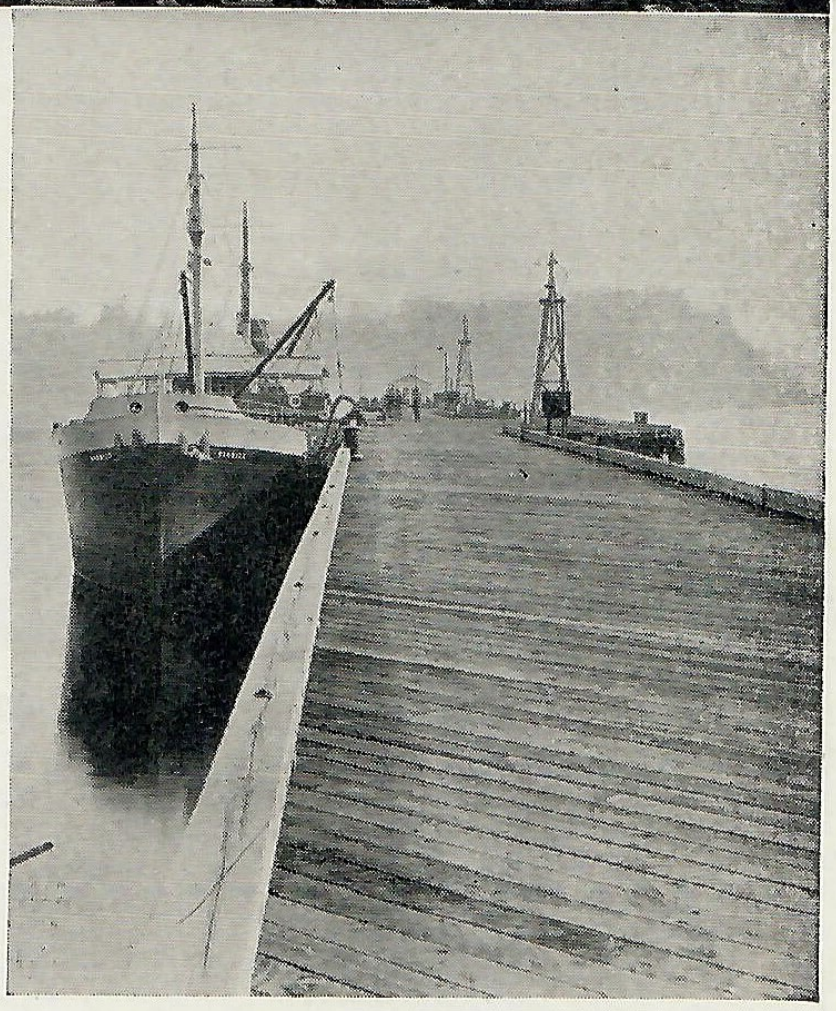


Above is general view of reconstructed plant of Union Oil Company at Willbridge, and to the right is view of new dock with the "Warwick" alongside.

The big demand for Motorite in the Portland district last month resulted in the tanker "Warwick" making the first bulk delivery of lubricating oil to the company's marine terminal at Willbridge, which has been enlarged and reconstructed during the past year. The final work on the plant is expected to be completed within the next thirty days.

A new dock, providing ample room for the unloading of tankers and freighters, constitutes one of the major improvements. It has an overall length of 650 feet.

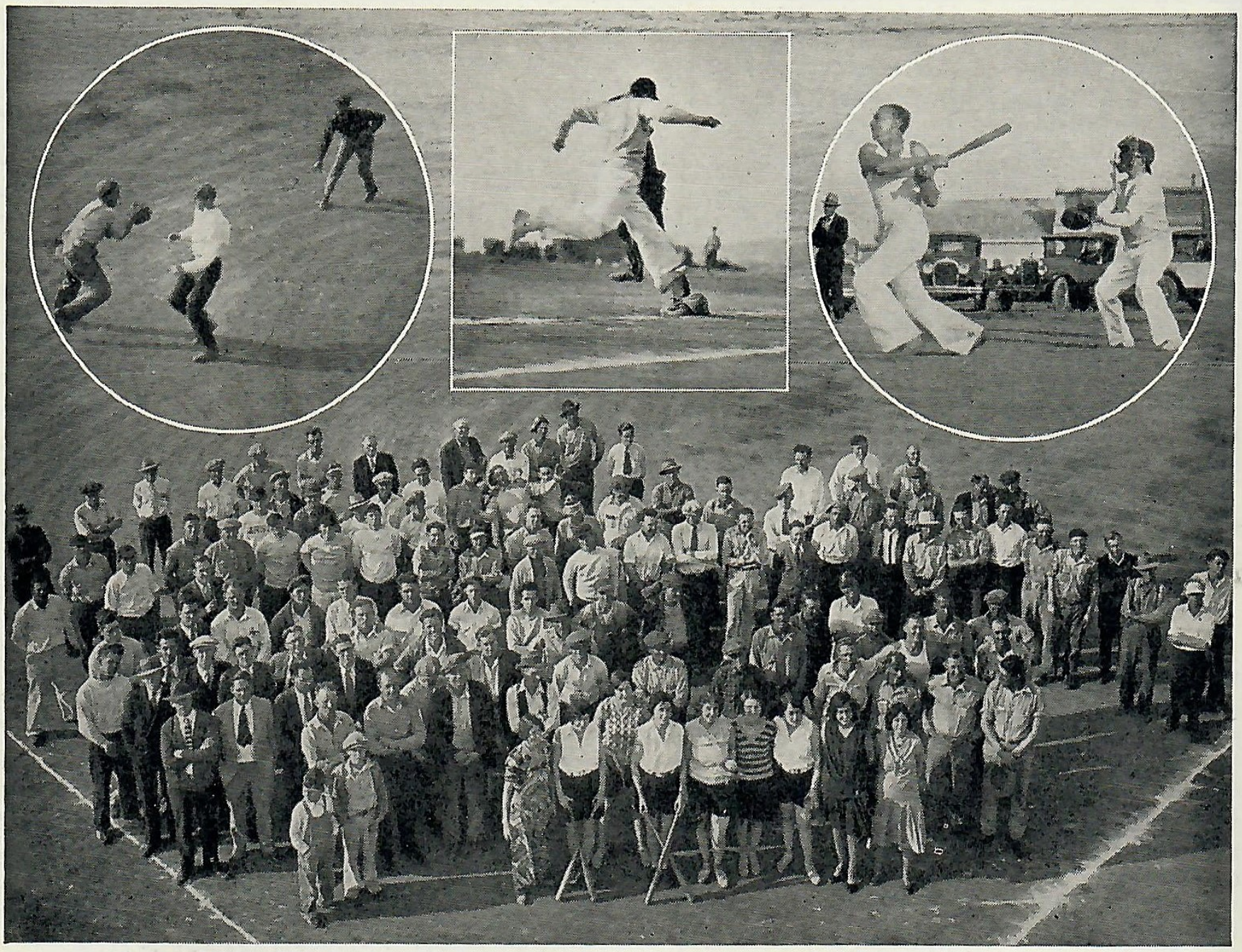
Reconstruction of the marine terminal and building the dock was started last June. The Portland plant is now in position to cope with any requirements placed upon it by the Oregon district for some time to come. However, sufficient room has been provided for further expansion whenever the necessity for it arises.



Tractor Fleet is Union Fueled

Cultivation of 3100 acres of farm land is greatly facilitated through the use of eight tractors employed on the Canejo Ranch, Camarillo, California. The property is owned by the Janss Investment Corporation. At present the tractor fleet, part of which is shown above, consists of five Best 30s, one Best 60, and two wheel tractors, all fueled and lubricated with Union products.

Southern Division Opens Ball Season



Gathering of the Southern Division Ball Tossers

In the three photographs at the top you see a few of the 160 *players in action, and in the lower picture you see an average afternoon turn-out at Santa Fe Springs.*

PLAYGROUND baseball in the Southern Division spudded in at the Santa Fe Springs playing field April 26, with foremen and superintendents acting in the capacity of head drillers. Early in the afternoon, Exploration ran through pay sand and got Production before the game was over. The second wildcat of the day was spudded in at approximately the same time and Gas, with a heavy casing head pressure, blew in over the Pipe Line. Both wells produced several hundreds errors per hour.

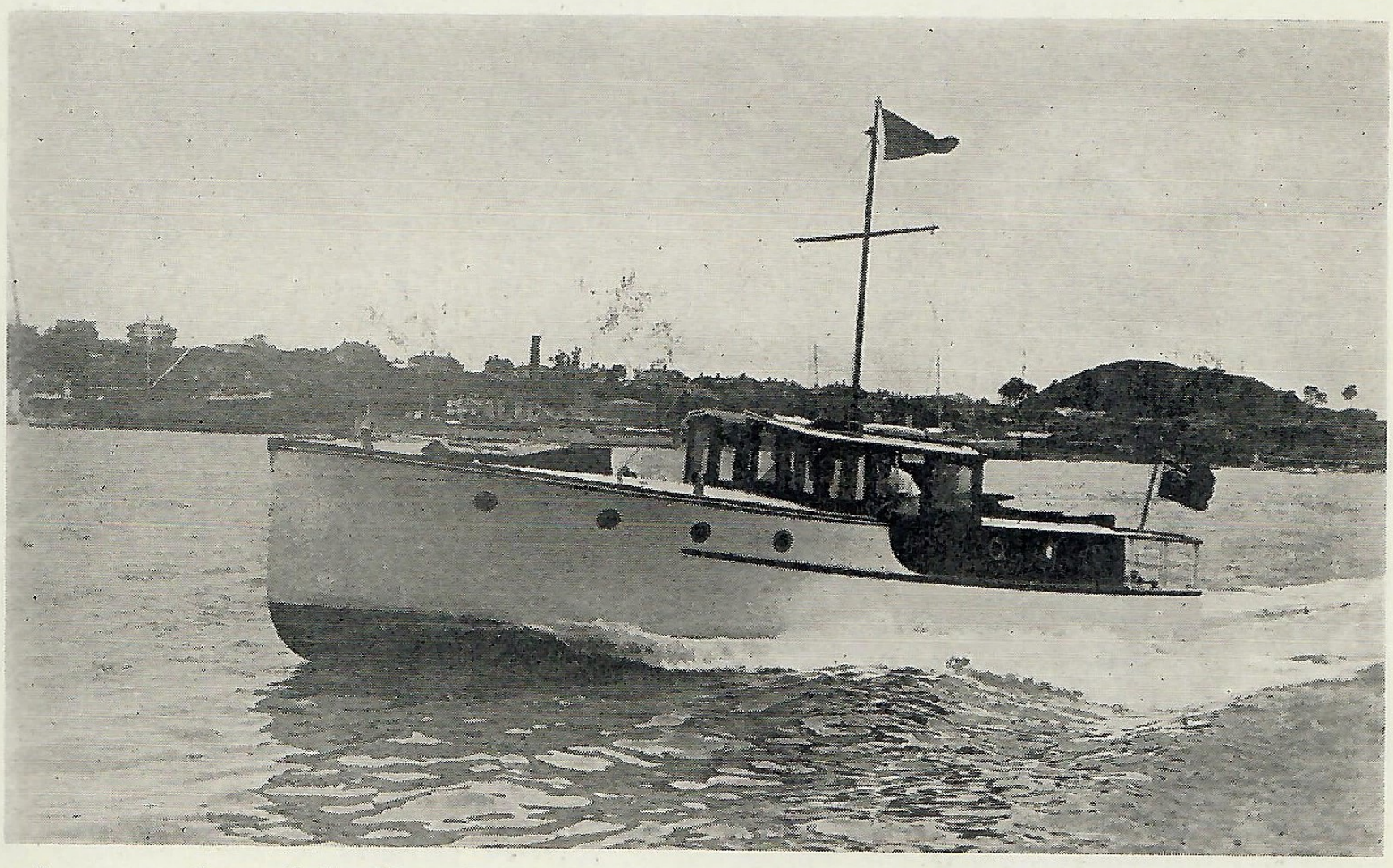
Despite crooked holes in the form of umpires and announcers, both wells cleaned up in a hurry and were producing high gravity oil in the last formation. Circulation, consisting of refreshments near the third-base line, was maintained throughout the drilling, stimulating a large number of three-base cores.

After the opening game between teams composed of foremen and superintendents, the fourteen teams which comprise the Southern Division league, got under way April 29. Approximately 160 men from the Southern Division are listed on the fourteen teams. A girls' employee team has also been formed.

UNION OIL CHAMPS

Winners in the Southern Division, the above aggregation of basketeers trimmed the Wilmington Refinery 27-25, *earning the right to play Oleum, whom they subsequently defeated* 29-26, *for the company championship.*

Fast Yacht Built by New Zealander

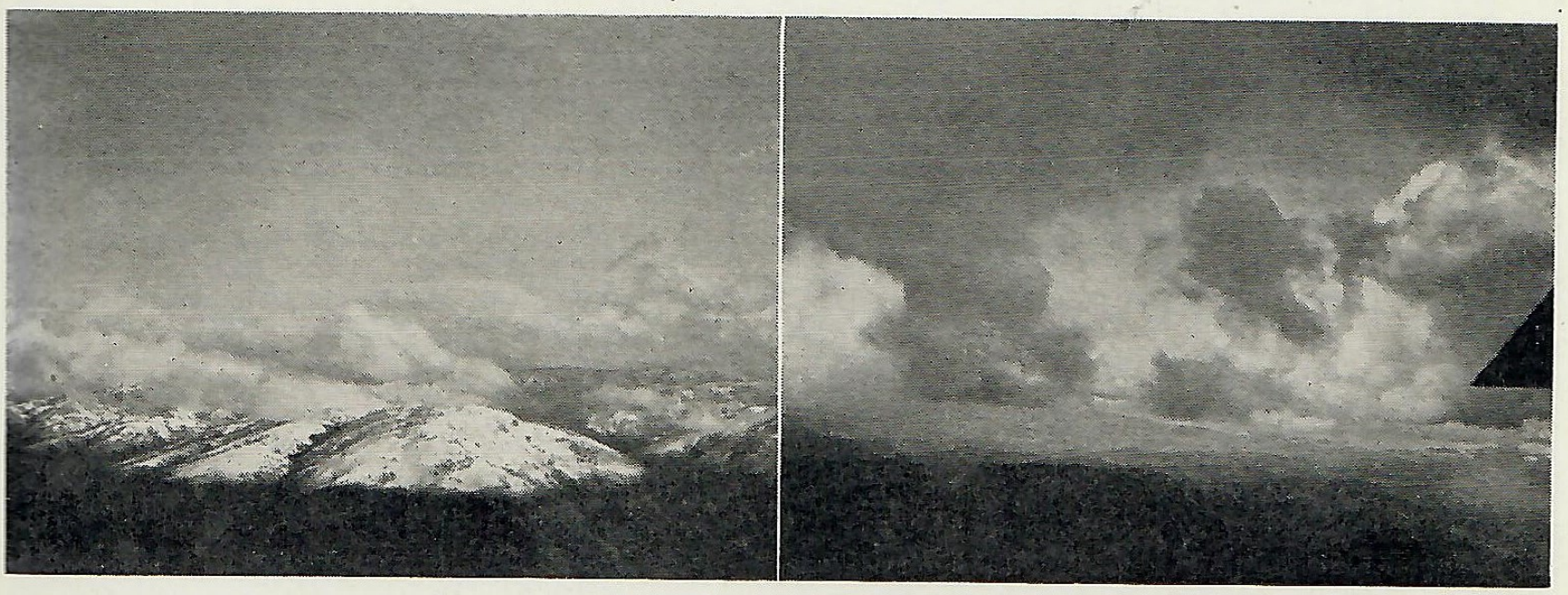


As commodore of the New Zealand Power Boat Association, Harold O. Wiles, manager of the Atlantic Union Oil Company, Ltd., at Auckland, has had many opportunities to study yacht craftsmanship, and as a result, his cruiser "Lady Margaret," completed last year, embraces many of the latest developments in beauty of line and utility of construction and layout for pleasure-craft.

The speed capabilities of "Lady Margaret" were revealed when, on January 29, with Wiles at the helm, she won the Auckland Regatta, averaging seventeen knots per hour over an eight-knot course consisting of eight turns, which materially reduced her maximum speed possibilities.

Yachting is intensely popular in New Zealand, and it is not unusual to see more than 300 entries in the opening and closing races of the season. Water and weather conditions are ideal. Admirable shelter can be reached within a radius of 300 miles.

Wiles' craft is 42 feet long, has a 10-foot 6-inch beam, and draws three feet of water. Her power plant is a Stearns 6-cylinder engine which develops 160 horsepower.

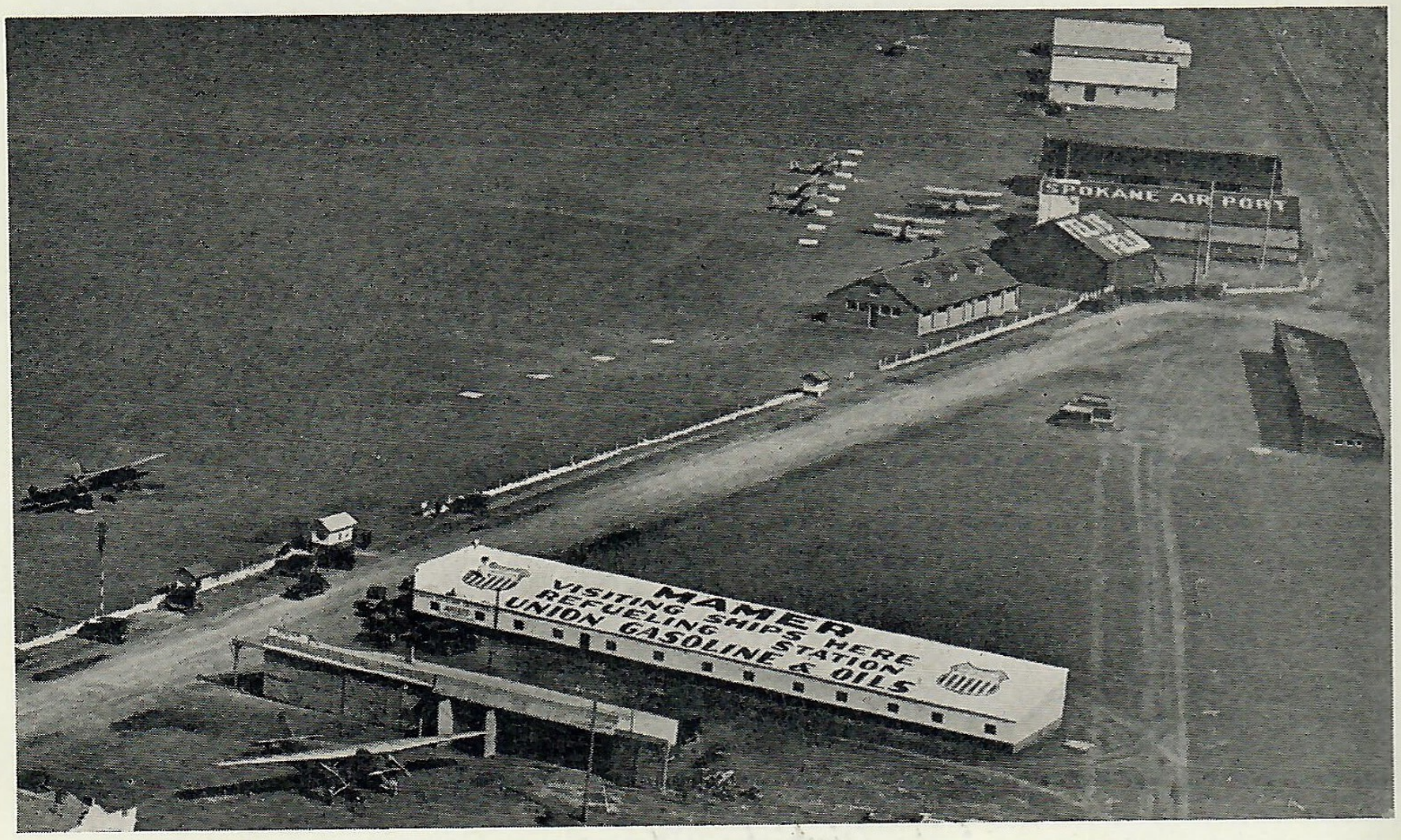


Over the "Ridge"

These two interesting views of the Tehachapi range were taken by a representative of the company during a recent flight over the "Ridge." The photograph on the left was taken from the north, looking south over Tejon Pass, and the one on the right was taken from the south at about Saugus, looking north over the same pass.

College Grid Players Operate Union Station

Headed by Ed Solomon, quarterback and capt.-elect, fourteen members of the University of California at Los Angeles football team are manning the gas pumps and grease hoists at the company's new service station on Wilshire boulevard near Westwood, Los Angeles. Above, F. H. Oster, lessee of the station and assistant football coach at the Bruin institution, drilling some of his player-attendants du ring slack hours at the station.



Advertises Union Aero Products

Nick Mamer's hangars at Spokane airport advertise Union aero products to visiting flyers. Mamer is one of the best known airmen of the Northwest. He operates the Mamer Air Transport line as well as the Spokane airport.

SAFETY *IN THE* UNION

MARKETING ACCIDENTS SHOW DECLINE

There was a reduction of about ten per cent in the accident frequency of the Company's marketing forces during the first quarter of 1930 as compared with the 1929 average. The figures are interesting because a frequency figure of 15 accidents per million man hours has been set as the goal for 1930. The standing of various Company marketing units as of March 31, 1930, is given in the following table:

	1929	1930
Sacramento	24.5	0.0
L. A. Garage	31.9	0.0
Cen. Div. Garage	43.2	0.0
Portland	27.2	8.1
Spokane	20.4	11.0
Fresno	19.6	12.1
San Francisco	18.5	16.4
Oakland	52.9	18.0
Vancouver	9.8	23.9
Seattle	15.3	30.6
Phoenix	12.6	33.6
Los Angeles	23.7	36.0
San Diego	26.5	44.4
Group Average	23.1	20.7

A. J. Martinson, Safety Supervisor for the marketing stations, made the following comment on the accident situation:

"Handling drums and barrels is the most prolific source of personal injuries at the present time. Barrels are less of a hazard than drums, because the bilge of a barrel aids in up-ending it. Also there are far more drums handled than barrels. We have, therefore, been making a study of the handling of the 50-gallon drums so that we can teach the men who handle them how they can avoid the hernias, strains, and sprains from which they have been suffering. In addition to these more serious ones there are also numerous hand and leg injuries.

"Carelessness is not the cause of these injuries. They come apparently as the result of not knowing the right way of doing the job. Trained men have fewer accidents. Our task in accident prevention is therefore one of education. Take a look at this photograph of a man lifting a barrel of mineral spirits (Fig. 1). The barrel weighs nearly 500 pounds. In the position this man is lifting, he stands a good chance of rupturing himself. Certainly his feet are too far apart

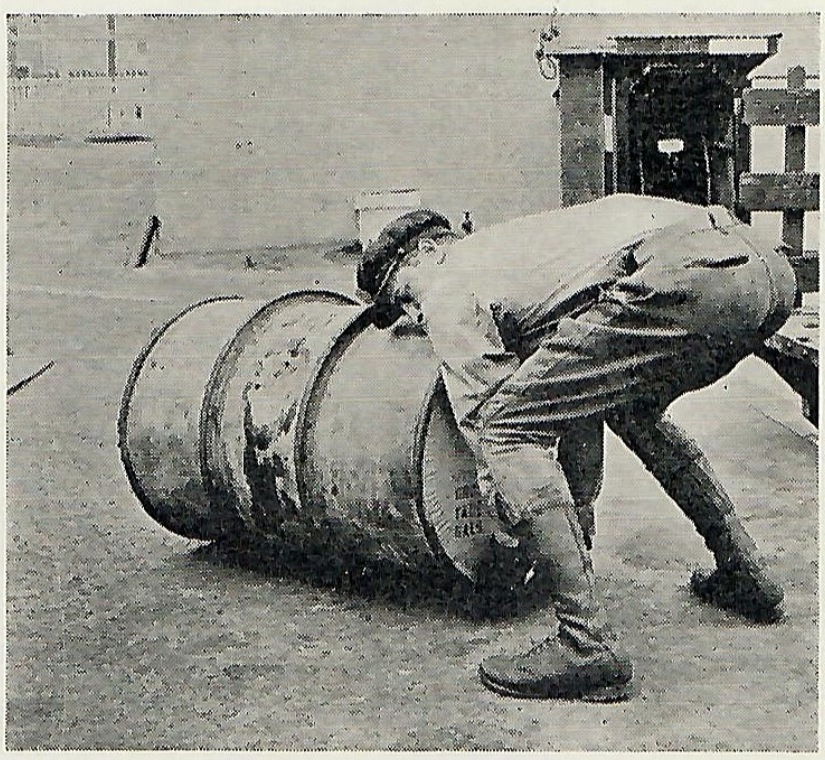


Figure 1

and he is too far from the barrel to get a good purchase. Strained muscles come from these awkward lifts. When the barrel is lifted from such a position, it gets into the situation shown in the next picture (Fig. 2). Here the back and arm muscles are doing the work which should be done by the legs. The man is off balance and liable to slip.

"All such awkwardness means extra work, for the safe way is always easier. The third

Figure 2

Figure 3

photo shows the right position of the body when up-ending a drum. There is sufficient room to complete the job without having the chime of the drum catch on the rolling hoop of another drum. The man has his feet close together and close to the drum. (This prevents over-straining abdominal muscles). His hands are about 8 inches apart. Leather gloves protect against steel slivers, from which infections can so easily follow. His knees are bent, which assures us that he will lift with the strong, short muscles of the legs and thighs. His hips are lower than his shoulders. The long flat muscles of the back are not involved. His arms will not be called on for any effort until the drum is nearly balanced on its chime, when the impetus needed to up-end it will be furnished by a slight bending of the arms at the elbows.

"Thus far we have succeeded only in establishing certain definite ways of performing those operations which seem to cause most injuries. We have yet to get the men trained to follow the safe methods. Many, of course, do this already and it remains to get everyone in line. The responsibility for education of the personnel in safe practices has in most districts been delegated to the assistant manager of operations. Through them the educational work will be carried to every man in the marketing organization."

FIRE!

Ever since that day, seventy years ago, when Colonel Drake made the oil industry commercially possible, the industry has been fighting fires. This is not strange, when one considers that the flammability of petroleum is one of its most valuable characteristics. We no longer have the hazard of thousands of barrels of gasoline dumped onto navigable streams in an effort to get rid of this annoying by-product of the manufacture of kerosine. There is very little liquid petroleum thrown away these days, and the effort of the industry to conserve the natural gas supply will soon make the blowing of gas to the air just as reprehensible. The industry's attitude toward fires has undergone a similar change in point of view. Fires are wasteful of property and frequently accompanied by loss of life; fires can be very largely prevented by good engineering and efficient management; fires can be controlled in their incipient stages by trained forces equipped with modern chemical apparatus—therefore a fire which gets out of control is evidence of bad management. So the industry reasons today and as a result the fire incidence and fire loss among the better organized companies is being reduced far beyond the experience of the general mercantile world. Today a modern oil storage tank is a far less hazardous neighbor than a dwelling house or a factory.

The great conflagrations of the industry have been confined to a relatively few simple auses. The fires which swept the rivers of Pennsylvania and Ohio in the early days, when gasoline was thrown away, were quickly overcome by the growing demand for motor fuel. They never should have happened. The really serious fire problem developed when the search for oil took men into the Mid-Continent and Pacific Coast states. There oil was found under pressures that made control difficult and the blazing "gusher" was not an uncommon sight. Later when flush production made necessary the storage of vast quantities of oil, tank farms began to dot the landscape. With the building of the tank farms a new menace made itself felt. Lightning attacked the tanks of oil and sometimes entire groups of tanks were burned. On the Pacific Coast, underground reservoirs of concrete were built and for twenty years proved to be immune to lightning. Then, as though laughing at man's effort, lightning started its havoc among the reservoir farms. 1925 and 1926 saw six ignitions from that source. More than ten million barrels of oil were burned in those two years.

The control of lightning through the efforts of the electrical scientists is one of the romances of our day. Bringing the discoveries of Franklin and Faraday up to date, these modern wizards have made the oil industry safe from lightning, though they conservatively estimate the efficiency of their devices as "somewhere near 90%". Perhaps the most important discovery in connection with lightning fires was the fact that the wood roof and not the steel tank was the "attractive" feature of the oil container. Modern construction immediately adopted the vapor tight steel roof, but the scientists offered a cure for the hazards of the thousands of wood roofed tanks still in use. With tall steel towers to guard against direct hits and a light network of wires over the roof to shield the wood roofs, even the older tank farms are now considered safe.

REFINED AND CRUDE

The world is not *becoming* air-minded, it *is* air-minded.

* * *

If your proposition has nothing to do with flying these days, you'll never get past the girl in the reception room.

* * *

On the other hand, you will remember the Graf Zeppelin went over big.

* * *

The only persons who are content to remain on the ground now are the few benighted divot elevators who can't get away from their golf.

* * *

Union Oil Company employees have just formed a Glider Club, and the inception of this organization has been greeted with loud and prolonged cheers.

* * *

Proving again, that this gliding business is no "fly by night" affair.

* * *

Incidentally, the report that the Glider Club is simply another name for the hockey team is entirely erroneous.

* * *

Also, remember, it is quite proper to open your parachute even when it isn't raining.

* * *

"Are you cutting weeds?" we absently inquired of the budding pipe-liner, who was obviously cutting weeds. Disgustedly, he replied: "Yes, sir, that's about the scythe of it."

* * *

Beggar: "I've asked for money, begged for money, and cried for money."
Man: "Why don't you try working for money?"
Beggar: "I'm going through the alphabet, and I haven't reached the 'W's' yet."—Orcadian.

* * *

The stenographer who spelled pneumatic "neumatic" had a perfectly good explanation after all. The "k" on her typewriter was out of order.

* * *

And it doesn't require an intense study of geometry to reveal the fact that polygons are not dead parrots.

The rumor that we are the victim of another attack of hay fever is nothing but a-tishoo of lies.

* * *

Perhaps the most flagrant example of bad grammar we have run across in the course of a long and hectic career, is that contained in the following announcement: "Your coffee is on the table, sir, and the Rolls is outside."

* * *

Central: "Number, please."
Inebriate: "Number, nothing. I put a nickel in this thing, and I want my gum."

* * *

"You seem to have a lot of intelligence for a man in your position," said the cross-examining lawyer, sneeringly. "Thank you," replied the witness, "I'm on oath, or I would return the compliment."

* * *

Then there was the professor's son who forgot it was Saturday and played truant.

* * *

It is said that sleep improves the complexion. On that basis, some of our friends must be training for a beauty contest.

* * *

But as the Chrysler owner said to the garage attendant, "Why bring that Hupp?"

* * *

The lady: "Who broke your window?"
Her neighbor: "My husband. He ducked."

* * *

This anti-freeze mixture, which is seemingly so essential in all parts of the United States outside of California, is potent stuff. A friend of our accidentally drank some a few days ago, and it knocked him cold.

* * *

From the Union Oil Bulletin of July, 1921, we cull the following:

"Hey, McCarthy," yelled Casey, "Dugan just hung himself with a halter strap."

"Did you cut him down?" inquired McCarthy.

"Oi did not," replied Casey. "He wasn't dead yet."

* * *

And still, with the help of Motorite, the world goes smoothly on its way.

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Granville Redmond