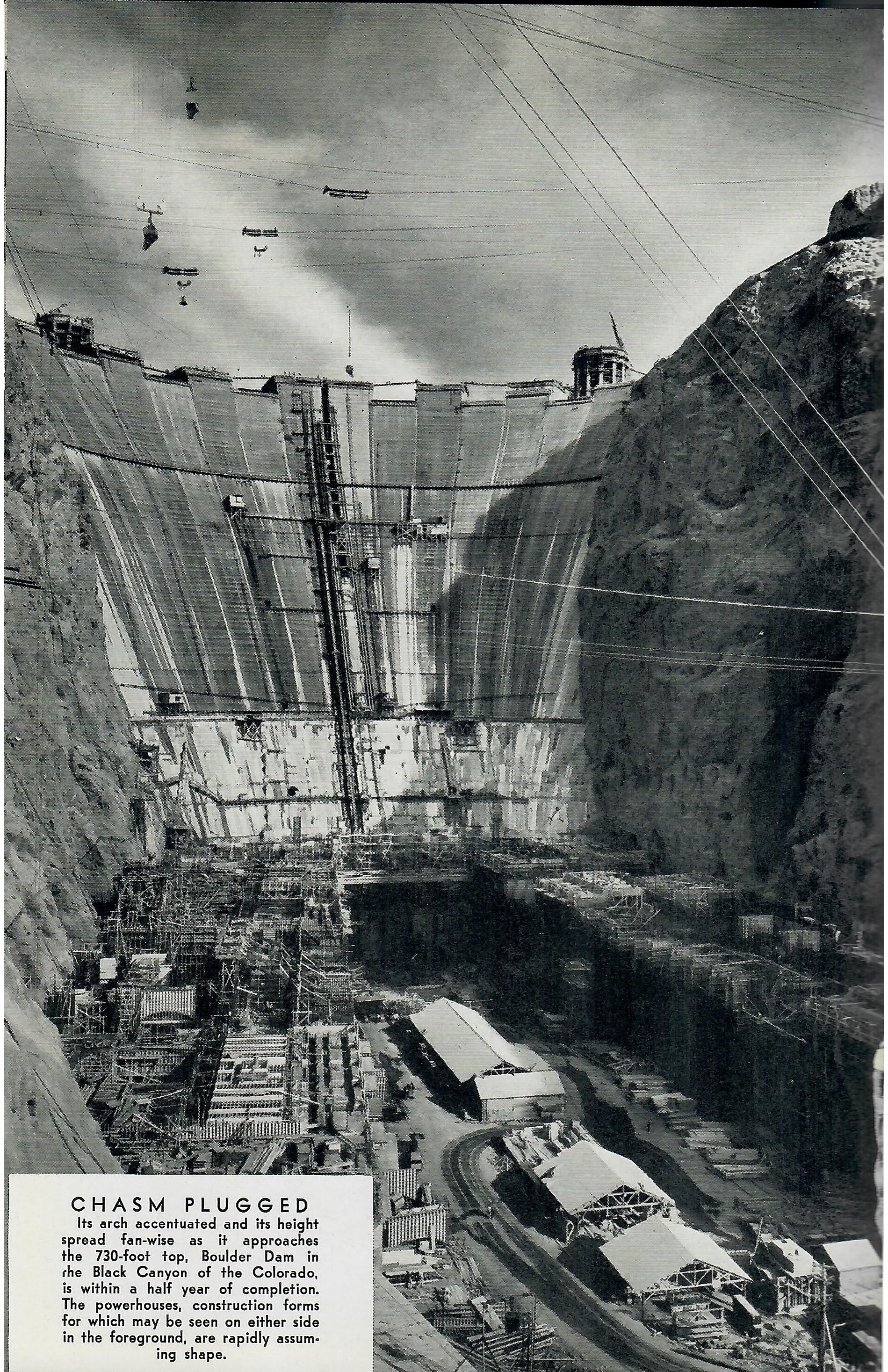
UNION OIL BULLETIN

JANUARY 1935



CHASM PLUGGED

Its arch accentuated and its height spread fan-wise as it approaches the 730-foot top, Boulder Dam in rhe Black Canyon of the Colorado, is within a half year of completion. The powerhouses, construction forms for which may be seen on either side in the foreground, are rapidly assuming shape.

UNION OIL BULLETIN

Published Monthly by the Union Oil Company of California for the information of its employees and stockholders.

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Address all communications to the "Bulletin," 709 Union Oil Building, Los Angeles, California.

Volume XVI — JANUARY — Bulletin No. 1

Union Oil Company and Curtailment

SO many serious and complex business problems have confronted the world in the last few years that even historical Solomon, were he living and conceded to be the wisest of us all, undoubtedly would prove capable of but few accurate solutions. Problems today are more far reaching than ever before. At one time, economic difficulties in some part of the world could well be termed as of intra-national character, but present day commerce and communication systems have so reduced the size of the world, and have made nations so dependent upon each other, as to destroy national independence in the old sense. As a result, national problems today, more often than not, quickly become international in scope.

This analogy is particularly applicable to the major industries of a nation, for sectional disturbances in an important industry rapidly assume considerable economic significance, not only to sections immediately involved, but to the nation as a whole, in relation to the importance of the industry.

The petroleum industry has become one of the major industries of the world, and, as the largest single producer, the United States has become a leader in world affairs. Only a few sections in the nation produce substantial quantities of oil, of which California is one of the most important for several reasons, among which are the facts that the presence of oil in the state happily replaces the utter lack of coal west of the Rocky Mountains, it permits economically operated large scale commerce, strengthens our national defenses on the Pacific seaboard, and adds millions in wealth annually to the West.

For more than five years this section of the oil industry, in common with other sections in the nation, has been attempting to reconstruct its business house to the effect that all in the industry might be returned to a prosperous condition. To do this, it was first determined a sound economic foundation of balanced supply and demand, which would permit a reasonable profit from operations to support the main structure, had to be laid. And the best practical way led to the adoption of curtailment of production.

Since 1930, all but a very few California producers have cooperated most effectively in a concerted effort to return the petroleum industry on the Pacific Coast to a favorable position. Broadly speaking, curtailment has been quite successful in California, for producers representing more than 95 per cent of all production have kept substantially within the bounds of allocation, and have made possible the progress that has occurred.

Unfortunately, however, from time to time a small percentage of producers has chosen to deny the industry full cooperation, and has produced unrestrictedly. As a result, such periods have been clearly marked with sudden disruptions of markets for both crude and refined oil products, from which losses from operations ultimately have been sustained by the industry as a whole.

In all industrial history there are periods during which distinctly drastic measures affecting an entire industry must be adopted and put to use. Usually, such measures require considerable adjustment before becoming thoroughly fair to all concerned, yet, if, for the foundation of a particular plan, the principle of fairness supercedes all else, inevitably the wisdom of the action taken is realized.

This is exactly what has taken place in the petroleum industry in recent years. In California, curtailment of production was instituted late in 1929, it was adopted throughout the state in 1930, and has been in effect since then. During this period, many adjustments have taken place, and, perhaps, others may take place from time to time, but the important result of this program, aside from the economic improvements effected, is the fact that almost all producers in the state believe curtailment to be essentially fair, and certainly in the best interests to the industry at large.

As one of the largest producers, refiners and marketers in the West, the Union Oil Company of Californa has been, and continues to remain, one of the staunchest supporters of curtailment of production. Throughout its entire history the company has been a leader in such matters as the conservation of petroleum, for it has found, through long experience, that overproduction not only wastes an irreplaceable natural resource, but eventually seriously reduces the market value for both crude petroleum and refined products. Also, it has been determined, curtailment operated on the basis of fair allocation apparently is the most effective means available for controlling the supply of the industry's base product. Under circumstances necessitating such an operating procedure, curtailment undoubtedly permits the realization of the greatest good to by far the greater majority in the industry.

Curtailment in California has been largely of a cooperative nature, subscribed to willingly by the various producers in the state. Prior to September, 1933, there was a state umpire having duties of setting the allowable production and allocating such production. In September, 1933, the Federal Government approved the code for the petroleum industry and, as represented by Secretary of State Harold L. Ickes, began allocating the nation's crude oil production among the various producing states. In California, the state umpire has continued his duties, excepting that he accepts the state's allowable production figures from Oil Administrator Ickes and, then, allocates such production to producers. At present, this procedure continues to be followed.

Substantiation of the manner in which the Union Oil Company has fostered curtailment of California production in recent years is presented in the form of charts, which accompany this article. The line chart on page 3 shows the actual percentage of the company's estimated potential crude oil production in California which has been shut in, monthly figures being given from January, 1931, to and including November, 1934—the last available at this

Percent Crude Oil Production Curtailed—California

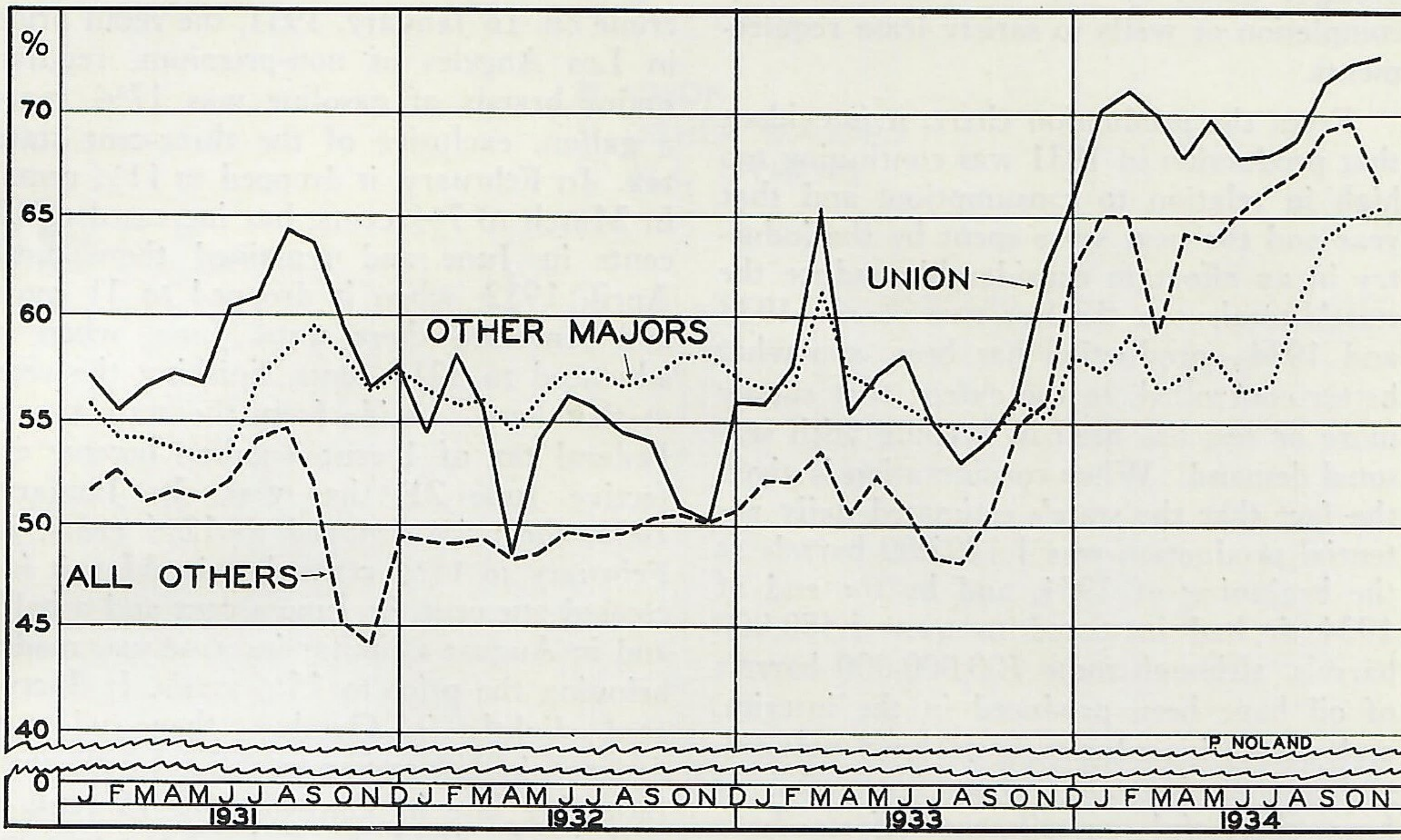


Chart indicates the actual percentage of potential crude oil production curtailed each month since January, 1931, by the Union Oil Company, other major companies, and all other producers in California, in cooperation with state-wide efforts to balance supply with demand.

writing. Other major companies, as well as all other producers, likewise are shown, according to those classifications. The bar chart on page 5 shows monthly total production for the same period as that shown in the line chart, and is broken down into crude oil produced by the Union Oil Company, other majors and all other producers.

In further explanation, it should be noted that production figures used represent clean oil, or crude oil after deducting water cut, etc. Also, in the case of the Union Oil Company, only the company's actual production is shown, and does not include production from partners, i.e., production accruing from wells in which the company has only a fractional interest. These latter figures have been taken, in order not to distort the relationship between the percentage chart on the one hand, and the production chart on the other. The year 1931 was taken as the first year, as curtailment was in full sway in every part of the state throughout the year.

It is quite apparent, from the line chart, that California production has been more than half shut in during the last four years, and it is equally apparent that the Union Oil Company has supported curtailment in every sense of the word. Considering the industry as a whole, after allowing for the small group which has failed to recognize the common good, curtailment has been substantially adhered to by the majority.

In order that a more comprehensive understanding might be had of the charts presented, several considerations should be brought to mind. As has been stated, adjustments are necessary in most every measure of such drastic nature, and so it has been in applying curtailment to production. Consequently, "peaks" have been caused by changes in allowable production for the state, new well completions, or new oil discoveries; conversely, "depressions" have been the result of production under new allowable figures, opening of previously shut in wells, or because of new well production. In any case, it is evident that the

Union Oil Company has supported curtailment in the face of a substantial increase in potential production, which has been brought about by new discoveries and by completion of wells to satisfy lease requirements.

From the production chart, it is evident that production in 1931 was continuing too high in relation to consumption, and that year and the next were spent by the industry in an effort to considerably reduce the state's total. In the last two years—1933 and 1934—production has been somewhat better controlled, to the extent that supply more or less has been in keeping with seasonal demand. When consideration is given the fact that the state's estimated daily potential production was 1,120,000 barrels at the beginning of 1931, and by the end of 1934, it had increased to over 1,480,000 barrels, although some 700,000,000 barrels of oil have been produced in the interim, and excess inventories have been reduced, rather than increased, some impression of how successful curtailment efforts have been is derived.

Any attempt to determine the monetary value which curtailment has brought about, must fall short of actual measurement, for an accurate answer cannot be computed. However, curtailment has worked in two ways: (1) it has been instrumental in minimizing gasoline price wars, and (2) it has conserved our underground crude supply by hundreds of millions of barrels, which can be raised in the future as needed at a value to the producers undoubtedly in excess of what would have been the value if raised during the past few years.

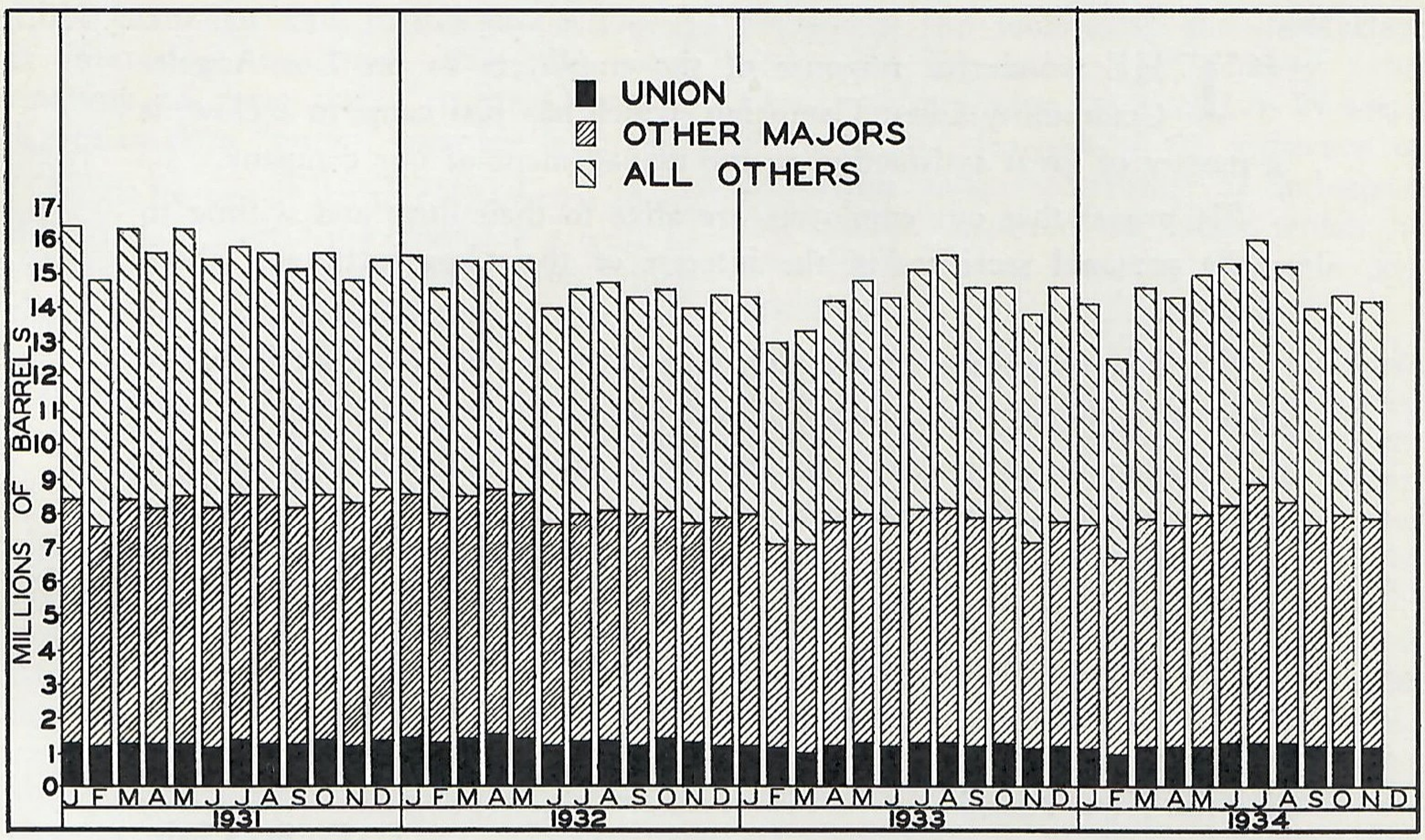
Consider the latter case. In January, 1931, the posted price for 26° gravity crude oil at Signal Hill was $1.22 a barrel. At that time, overproduction was very apparent, and in March three reductions in crude prices were made, with the posted price for this oil falling to 47 cents a barrel, and continuing until June, 1931, when it was increased to 73 cents. In June, 1932, the price was raised to 97 cents. This latter price prevailed until March, 1933, when it was reduced to 73 cents, but in June again it was increased to 82 cents. In September, 1933, the price advanced to 97 cents a barrel, which was maintained throughout 1934.

The retail market for gasoline, however, fluctuated much more than the market for crude oil. Thus, at times, gasoline was selling far too low in relation to the prices for crude oil. In January, 1931, the retail price in Los Angeles of non-premium, regular major brands of gasoline was 17½ cents a gallon, exclusive of the three-cent state tax. In February, it dropped to 11½ cents, in March to 7½ cents, but increased to 13 cents in June and remained there until April, 1932, when it dropped to 11 cents and remained there until June, when it advanced to 13½ cents, finishing the year at that level. Aside from the state tax, a Federal tax of 1 cent a gallon became effective June 21, that year. In January, 1933, the price dropped to 12½ cents, in February to 11½ cents, but in May it increased one cent, in June a cent and a half, and in August a similar increase was made, bringing the price to 15½ cents. It fluctuated slightly in October, then suddenly dropped in November to as low as 9 cents, returning late in December to 15 cents a gallon. In 1933 the Federal tax was increased to 1½ cents, effective June 17, but was reduced to the present one cent the end of that year.

The year 1934 began better, so far as gasoline prices were concerned, with the 15-cent rate, not including 4 cents tax—3 cents state and one cent Federal—being maintained until late in February, when the pressure of overproduction of crude oil forced the gasoline market down to 9 cents between February 20 and March 6. However, in May there was some relief, and by the latter part of June the price was 13½ cents a gallon for regular major brands. This price level was maintained for the remaining months of the year.

The petroleum industry made substantial progress along several lines during 1934, and, of this progress, particular significance should be given the fact that there was no gasoline price war on the Pacific Coast, of any consequence, during the last half of the year—something quite unprecedented in many years. Significance also should be attached to the fact that, although gasoline prices in 1934 were considerably depressed at the beginning of the industry's best sales period, the summer months, the market improved with the advent of the Pacific Coast Petroleum Agency in mid-

Crude Oil Production Under Curtailment—California



Crude oil production in California, shown since January, 1931, and produced in accordance with curtailment efforts (see chart page 3).

year, and maintained this improved position for the rest of the year.

On the whole, the curtailment of California production has made possible the greater part of what progress has been realized. Had it not been instituted and substantially maintained, there is little doubt but what the industry would have been in a far worse position than it has experienced. In fact, prices for both crude oil and refined products might have become so low as to have made it financially impossible for many to raise crude, or to refine it if it were raised. But improvement has been accomplished, and failures in the industry have been the exception, rather than common, a condition which might have occurred.

Other industries, when it seems necessary, do not hesitate to destroy part of their annual crops, in order to establish reasonable prices for their products. This is common among some industries, but the petroleum industry cannot do this. On the contrary, it always is in the fortunate position of having only to set up a fair method whereby it can reduce the supply of its base product. Actually, the conservation of a highly important natural resource is one result, aside from the creation of a better market for petroleum products, and a "living wage" for the industry.

The petroleum industry is no different from any other industry, in that it must be returned to fundamentally sound economic operating conditions. On the Pacific Coast alone, hundreds of thousands of employees, stock and bond holders are reliant upon the industry, and are directly subjected to events affecting the industry. Many problems are yet to be satisfactorily solved, but curtailment has afforded much progress towards realizing stabilization.

Employees Over-Subscribe Community Chest

"THE wonderful response of the employees to the Los Angeles Community Chest Campaign, which has just come to a close, is a matter of great satisfaction to the management of our company.

"It proves that our employees are alive to their duty and willing to make personal sacrifices in the interest of their less fortunate fellow citizens.

"It is an expression of the high type of personnel that contributes so much to company and community welfare.

"The quota assigned to our company was $10,000.00 and pledges were made by 1,285 employees—nearly 100 per cent of the total number of employees—of $12,638.80 thereby oversubscribing the quota by $2,-638.90 or 26 per cent.

"In the accomplishment of this outstanding record many of the employees and heads of departments gave liberally of their time, and to subscribers and solicitors alike I extend congratulations and best wishes for the New Year."

L. P. St. Clair.

Progress in Petroleum Geology

MAN became curious about the origin of petroleum and its possible occurrence only after he found that petroleum was useful in many ways. Early discoveries of seepages of bitumen in Persia and Assyria thousands of years ago led to the first use of this petroleum product, and later discoveries up to the present day, along with advancement in industrial life, have brought about a condition wherein almost every human activity is dependent upon this liquid product of the earth. It is therefore natural that a science has developed which deals primarily with the discovery of additional supplies of this product—a science now known as petroleum geology. This field of study and research is a specialized branch of that broader science of pure geology, whose purpose is the solution of innumerable problems relating to the history of the earth. Because of its tremendous demand in all lines of industrial and domestic activity, petroleum now is considered one of the most valuable natural products dealt with by the science of geology.

Desaix B. Myers
Chief Geologist

The development of petroleum geology is closely linked with previous knowledge of the occurrence of oil or bitumen in seepages and wells, for it is only with a foundation based on familiarity with such occurrences and on a thorough knowledge of earth history that a specialized science could develop which could answer the question, "Where can more oil be found?"

Man's use of bitumen dates back to the

time of Abraham in Chaldea, where vessels have been found containing this material.* Extensive use of natural pitch was made by the Egyptians in embalming more than 7,000 years ago, and, in this connection, it is interesting to know that the word mummy has been traced to the Coptic or Egyptian term "mum," meaning bitumen.

In his history of the world, written about 450 B. C., Herodotus mentions a well in Ardwricca, near Susa in Persia, from which the inhabitants obtained bitumen, salt, and oil. According to this historian, the city of Babylon was surrounded by a trench filled with water and a wall "built of earthen bricks baked in a furnace and cemented with a composition of heated bitumen, which, mixed with the tops of reeds, was placed between every thirtieth course of bricks." About 5,000 years ago the Phoenicians made long journeys in circular round-bottom boats, called "Gufa," that were covered with gray-black asphalt in which were set bits of colored shells in crude designs.

Oil used as an illuminant was recorded by Pliny in the first century and, according to this Roman naturalist, was burned in the lamps of the temple of Jupiter. In the early wars fire-weapons came into general use and "naphtha" was used as the flame carrier. During the Crusades of the 12th century, naphtha fire was used most effectively by flame throwers against the Crusaders when storming the walls of Constantinople.

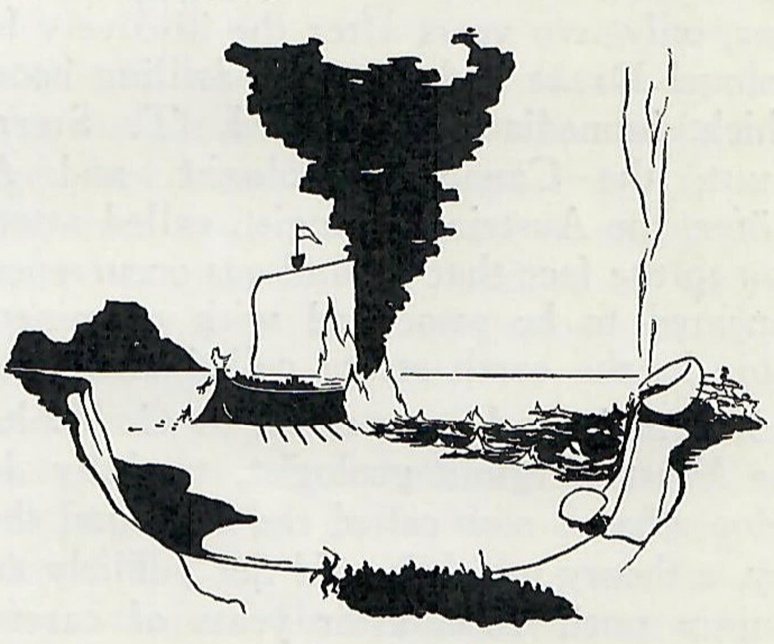
The first record of petroleum in the western hemisphere is linked with the Spaniards when, in 1527, they landed in Peru and named La Brea for the asphalt of that locality. This oil came from the ground in liquid form and is believed to have been evaporated in earthen vessels by the Incas and, then, used by the Spaniards to caulk their boats and by the Indians to mix with lime and gravel in preparing mortar for stone houses and first class roads.

The first seepage of oil in North America appears to have been reported in 1627 by a missionary priest near Cuba Lake, New York. Other seeps were reported by explorers and missionaries of the 17th century, who found that the Indians used the petroleum for toothaches and headaches, and even internally. A century later George Washington, on a visit to Western Pennsylvania, learned of the existence of petroleum and, recognizing its industrial importance, acquired oil lands which he considered among his most valuable possessions.

What appears to have been the first strike of petroleum in sizable quantity occurred in 1829 when the "American well" in Kentucky, while being drilled for salt water, encountered oil in such large quantities that "many thousand gallons" of pure oil flowed from the well and, finding its way into the Cumberland River and becoming ignited, resulted in a fire that extended for 40 miles below the well. Oil from this and other salt wells of this locality was considered a nuisance and a menace. Industry was not yet an important factor in American life, hence, there was no need for large amounts of petroleum. But it was to be only a third of a century until men with mature vision were to realize the importance of this oily inflammable substance to a rapidly changing American life, and thus, to pave the way for the development of the petroleum industry. The foundation of this in-

450 B.C.
GREEKS

USES: AN AGENT OF WAR, ("FLAMING WATER") CEMENT, WATERPROOFING. HERODOTUS MENTIONED THE "PITCH SPRING" OF ZANTE, A SEEPAGE EXISTING TODAY.



**Much of this historical information has been taken from Gustav Egloff, "Earth Oil," Williams and Wilkins Co., 1933.*

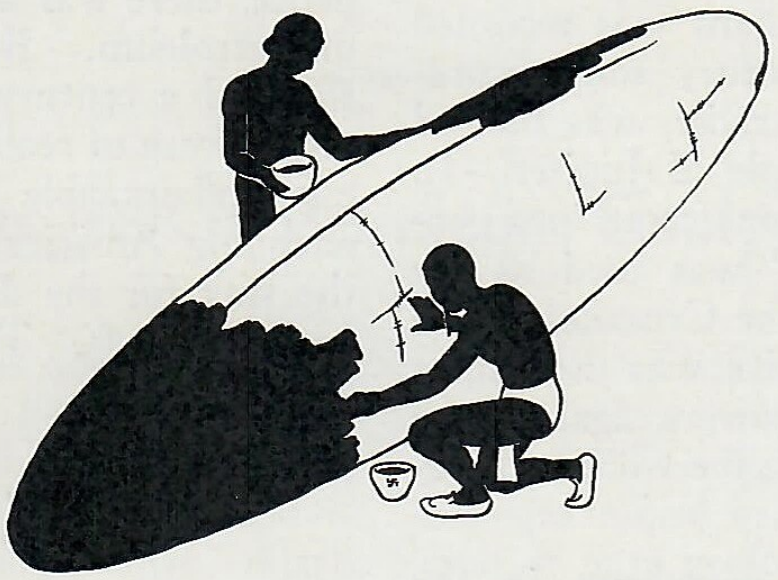
dustry had taken shape through centuries of observations and local use of seeping oil and bitumen, but the corner-stone was laid in 1859 when the famous Drake well, actually drilled for oil, obtained a production of 40 barrels a day from a depth of 69 feet.

With this modest beginning the petroleum industry, and with it the necessity for petroleum geology, developed and expanded through 75 years of America's greatest industrial growth. The tremendous and diverse requirements of petroleum products in every phase of our present activities, and the necessity for these products in innumerable new plans for future expansion in the fields of engineering, medicine and agriculture, are assurances that the petroleum industry has a bright future.

BEFORE THE WHITE MAN

INDIANS OF CALIFORNIA

USES: WATERPROOFING. HEAVY OIL OBTAINED FROM SEEPS NEAR SANTA BARBARA WAS USED TO WATERPROOF WAR CANOES, BASKETS, AND POTTERY. WHEN THE SPANIARDS CAME, THEY CALLED THE PLACE "CARPENTERIA"—THE CARPENTER SHOP.

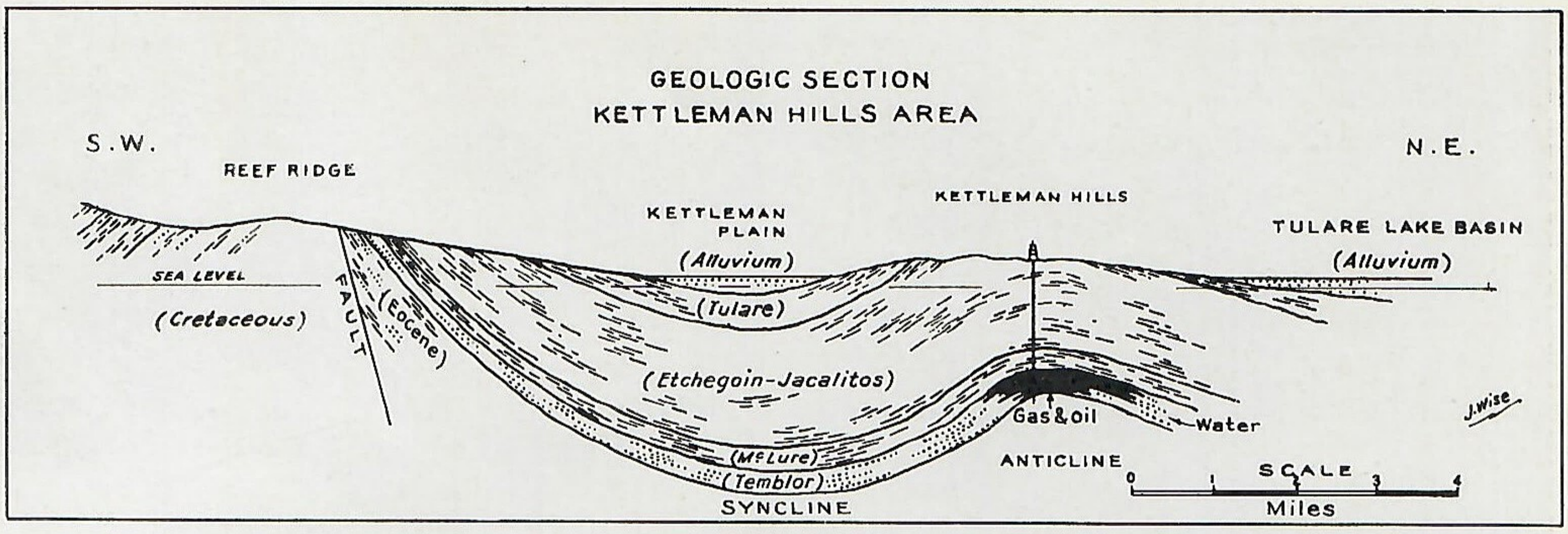


The importance of precise knowledge as to the natural conditions that control the occurrence of oil became apparent in the latter half of the 19th century. Men with various types of divining rods, wigglesticks, and doodlebugs have preyed upon capital even up to the present day, but as early as 1861 the science of geology began to devote attention to petroleum and to devise a workable theory, based on field observations and known occurrences of oil, that would satisfactorily account for these occurrences and aid in the discovery of new fields. In this year, only two years after the discovery by Colonel Drake and the wild drilling boom which immediately followed, T. Sterry Hunt, the Canadian geologist, and A. Höfer, the Austrian geologist, called attention to the fact that oil and gas occurrences appeared to be associated with prominent folds in the earth strata called anticlines.

It remained, however, for I. C. White, the West Virginia geologist, to fully develop what is now called the anticlinal theory, a theory which he did not publicly announce until 1892 after years of careful observation. Dr. White, the "father of the anticlinal theory," is actually the father of present day petroleum geology because his theory stands as the backbone of petroleum geology today. According to this theory, in areas where porous rock strata of the earth have been folded (see illustration, page 9) oil and gas collect above the water in the crests of the anticlines and the water remains in the adjoining trough-like synclines. If the rocks are dry of water, then the oil will be in the bottom of the syncline, or lowest portion of the porous bed. If the rocks are only partially saturated with water, then the oil accumulates at the upper level of saturation.

Two factors are largely responsible for the continued growth of the science of petroleum geology. The first is the inescapable fact that the demand for new oil fields has been increasing with the development of industry, and that this demand will continue and the search will become more intensive. The second is the increasing costs of drilling wells for the discovery of new fields. Colonel Drake completed his well in 1859 at a depth of 69 feet with a few dollars outlay, but the cost of carrying present-day wells to depths as great as two miles may easily exceed $200,000. Capital no longer can depend upon a hunch or a doodlebug, but must be guided by technical knowledge of the highest caliber.

We are so accustomed now to modern methods of conducting geological investigations that we forget many of the important steps in the advancement of petroleum geology through the past 75 years. Man's earliest prospecting for oil was dependent upon surface indications, such as seepages of oil or gas, asphalt and wax deposits, bad water, bituminous shales, or stunted vegetation. The earliest wells in Pennsylvania and in California were drilled



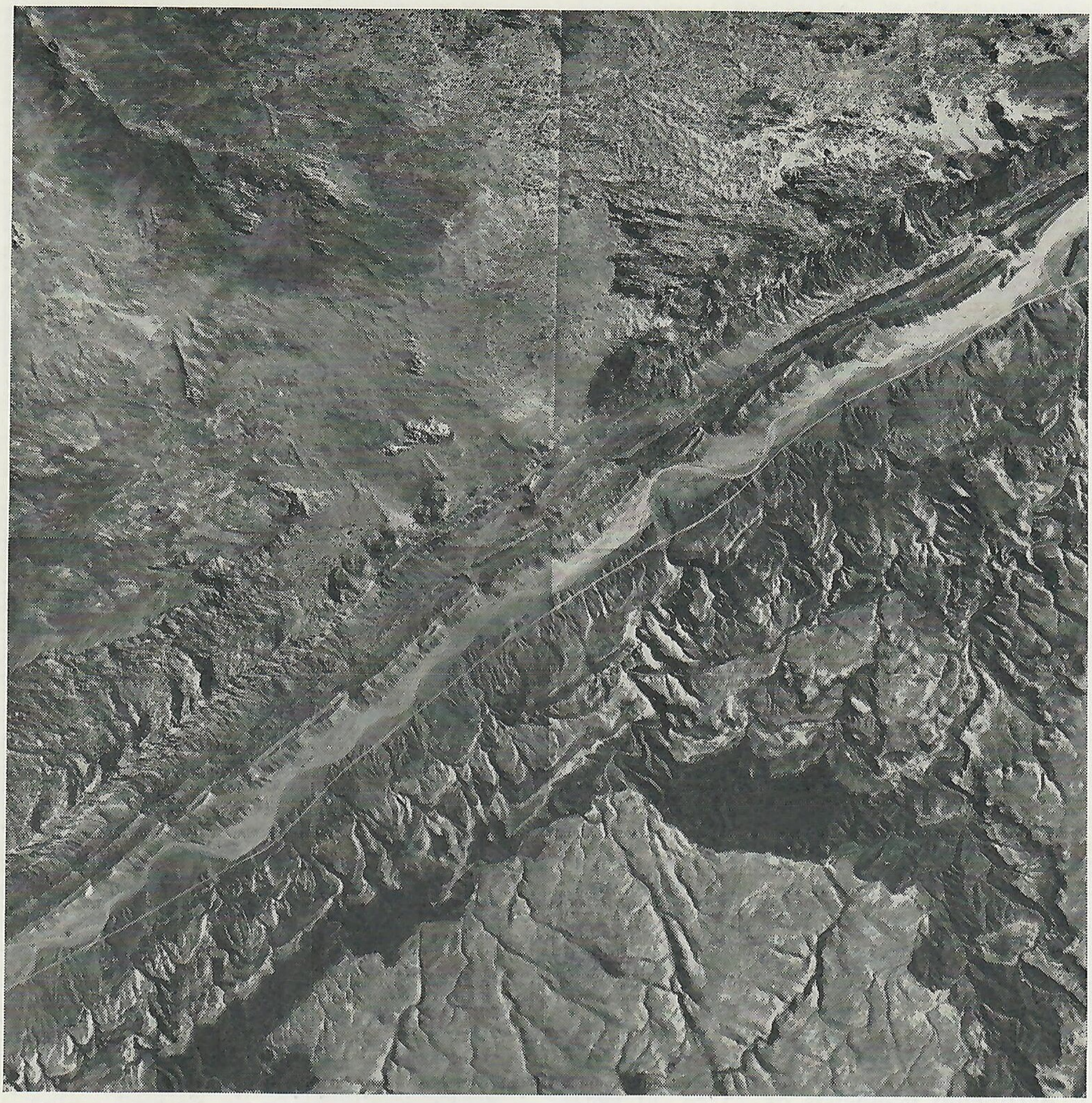
Cross section of Kettleman Hills, showing how folding of the earth's crust has formed synclines and anticlines, and where oil has been found.

near seepages, and many of them with considerable success. But, although a seepage is still considered a valuable surface indication, we know now that it may be, and commonly is, miles from any commercial oil pool, and that most of our largest oil fields have no seepages or similar surface indications. It was earlier thought that oil occurred in rivers or pools like lakes, but it is common knowledge, now, that the oil of commercial oil fields occurs in layers of porous rock and occupies the pore space between grains of sand and in small holes in limestone, or in fractures of shale and other rock. Also, we know that it is generally necessary for the porous formation to be covered by a dense impervious layer that will not allow the oil and gas to move upward and escape at the surface.

Petroleum geologists of 25 to 50 years ago were pioneers, for they were often called upon to investigate virgin country where no roads or trails existed and where the only means of transportation was by foot, horseback, buggy, or boat. Considerable area in the United States and foreign countries where geological work is required is still accessible only by foot or pack-train, but in most oil producing districts of this country the geologist now is able to use an automobile to material advantage. Early geologists had to make their own maps or be accompanied by a surveying crew, whereas today most of the possible oil territory in California is covered by a set of topographic maps published by the United States Geological Survey, which show all important roads, towns, and land subdivisions as well as mountains, valleys, and plains. Because of these advantages the geologist of today, by going into the field and devoting all of his time to mapping rock formations, anticlines, synclines, and faults, is able to work more efficiently.

During the time of I. C. White, the United States Geological Survey and several of the state geological surveys in the East and in the Mid-Continent employed large staffs of geologists for the purpose of mapping the geology of oil fields and other extensive areas of possible importance for oil. Their contributions proved of such tremendous value to the industry that some of the larger oil companies began employing well trained geologists to conduct independent investigations for them. It appears that the Union Oil Company of California was in the foreguard in this respect for it is credited with being the first oil company in the United States to have a geological department.

It so happened that, almost immediately after the discovery by the Drake well, a flood of oil production occurred in Pennsylvania which made oil prospecting there unprofitable and drove many of the prospectors and drillers to California where seepages had been earlier reported. It was, therefore, only a few years, in about 1865, before production was obtained in California. The importance of geology to the petroleum industry of California, an industry in which the Union Oil Company was a pioneer, was a gradual but necessary development. In 1898 this company employed W. W. Orcutt, a graduate of Leland Stanford University, to carry on geo-

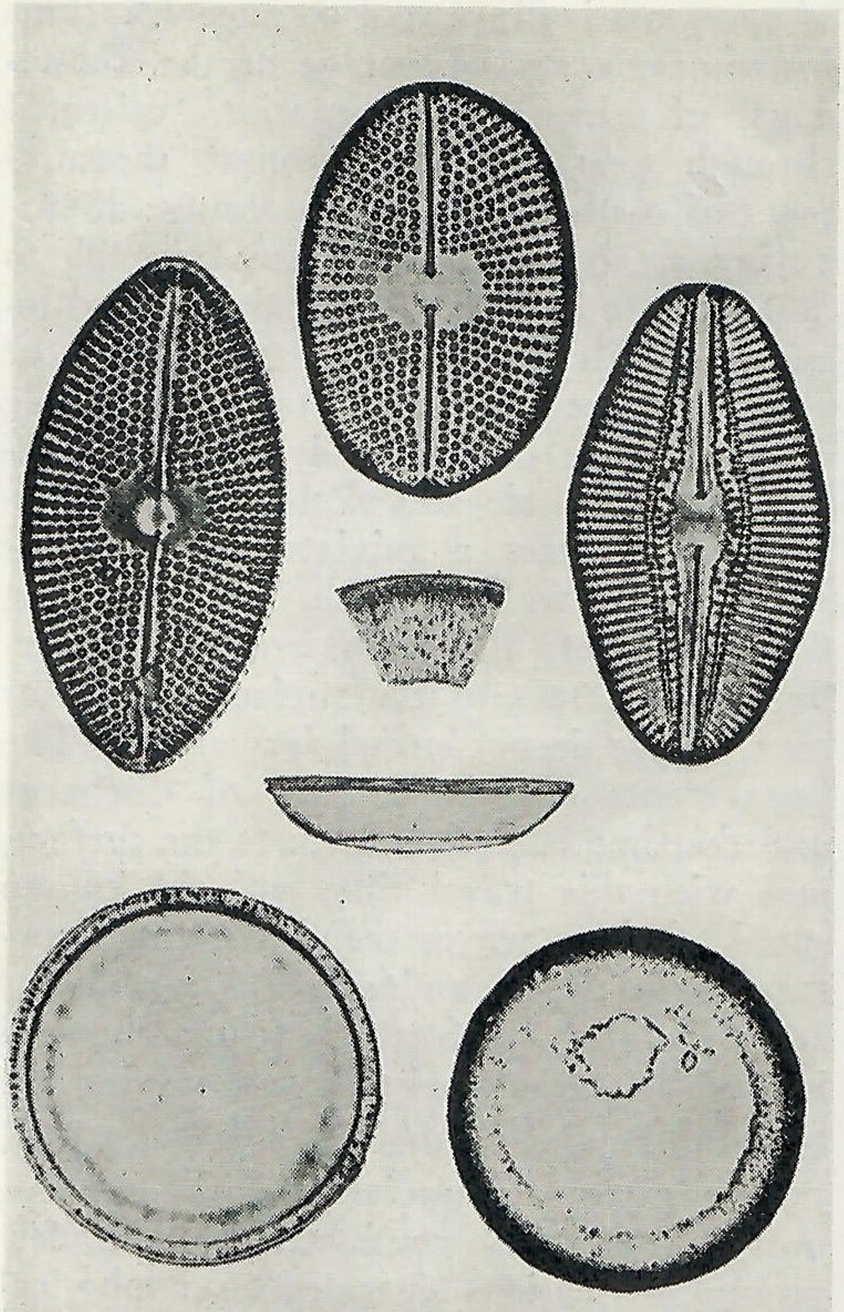


Fairchild Aerial Surveys photo.

Reduced scale aerial photograph taken with multiple lens camera (note horizontal and vertical lines passing through center). From such photographs, topographical maps are drawn, but, due to distortion, only center portions are used. In the photograph above, only the inside 2½-inch square is usable for this purpose.

logical and engineering work. Mr. Orcutt later organized a geological department which did much to extend the valuable holdings of the company, and which paved the way for the development of the present department which functions so effectively for the company.

The duties of the present geological department, headed by Desaix B. Myers as chief geologist, are extensive and the methods now used to fulfill these duties with efficiency and dispatch are far more varied than in the early days of petroleum geology. In many ways the work is not so arduous, but rapid advancement in methods during the last fifteen years has provided a new technique in determining the value of prospective oil territory. The successful geological department of today, and of tomorrow, not only must use refinements in the old methods of doing field mapping of rock formations, anticlines, synclines, and faults, but must have at its command airplane photography, an elaborate laboratory for the study of rock samples from cores and outcrops, and a geophysical laboratory or staff



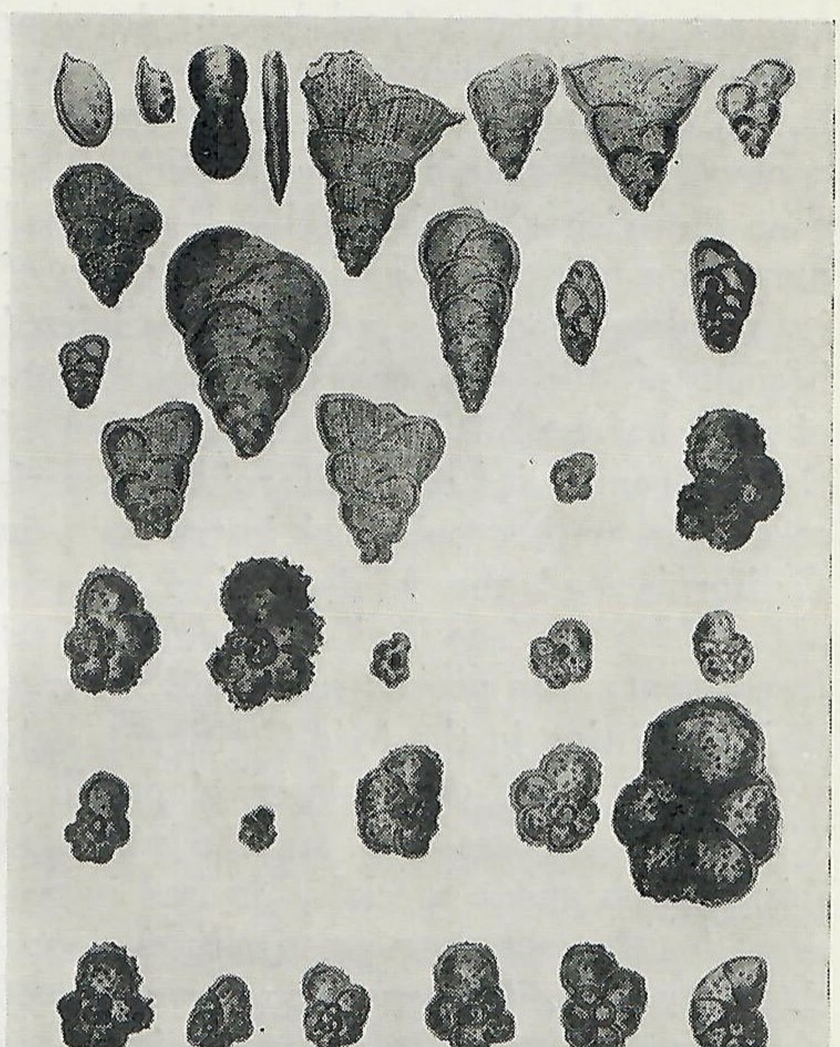
Diatoms (enlarged between 400 and 500 times) from Kettleman Hills surface. The microscopic silicious plants are thought by some to be an important source of oil.

operating under the supervision of a capable geologist.

Maps prepared by geologists in the old days were commonly rather crude, with only approximate data plotted on them without much regard to accurate scale. Present day geologists use either extremely accurate topographic maps or airplane photographs for the plotting of field observations. The photographs are taken by airplanes flying at elevations of 12,000 to 20,000 feet and are particularly useful because they show all land features such as ridges, creeks, rock outcrops, trees, and fences in their exact relation and permit the geologist to more accurately record his observations. Photographic maps of this type were first made during the World War when they were used for recording observations in enemy territory.

Prior to 1920, wells were drilled and either completed as producers or abandoned as dry holes without leaving much reliable record of the rock formations penetrated by the drill. As a result, subsequent geological investigations of the oil possibilities of these areas were seldom able to obtain from these wells any valuable information. With the inception and perfection of the core-barrel, it has become possible to core all rock formations from the grass roots to the bottom of the well and thus make available to the geologist a complete record of all rocks as they exist underground. This has permitted the geologist to correlate his formations mapped in adjoining mountain regions with those penetrated by the well.

To facilitate and make this correlation work more reliable, an important new geological "tool" has been developed recently and already has become indispensable. This "tool" is called micro-paleontology and has as its basis the occurrence in many rocks of different kinds of microscopic fossils, the most important of which are Foraminifera. It has been found that any one rock formation almost everywhere contains the same type of Foraminifera and that other rock formations contain different types. On the basis of the Foramini-



Cretaceous Foraminifera (enlarged between 15 and 20 times). These minute shells are a valuable aid in determining the age of rock layers for correlation purposes.

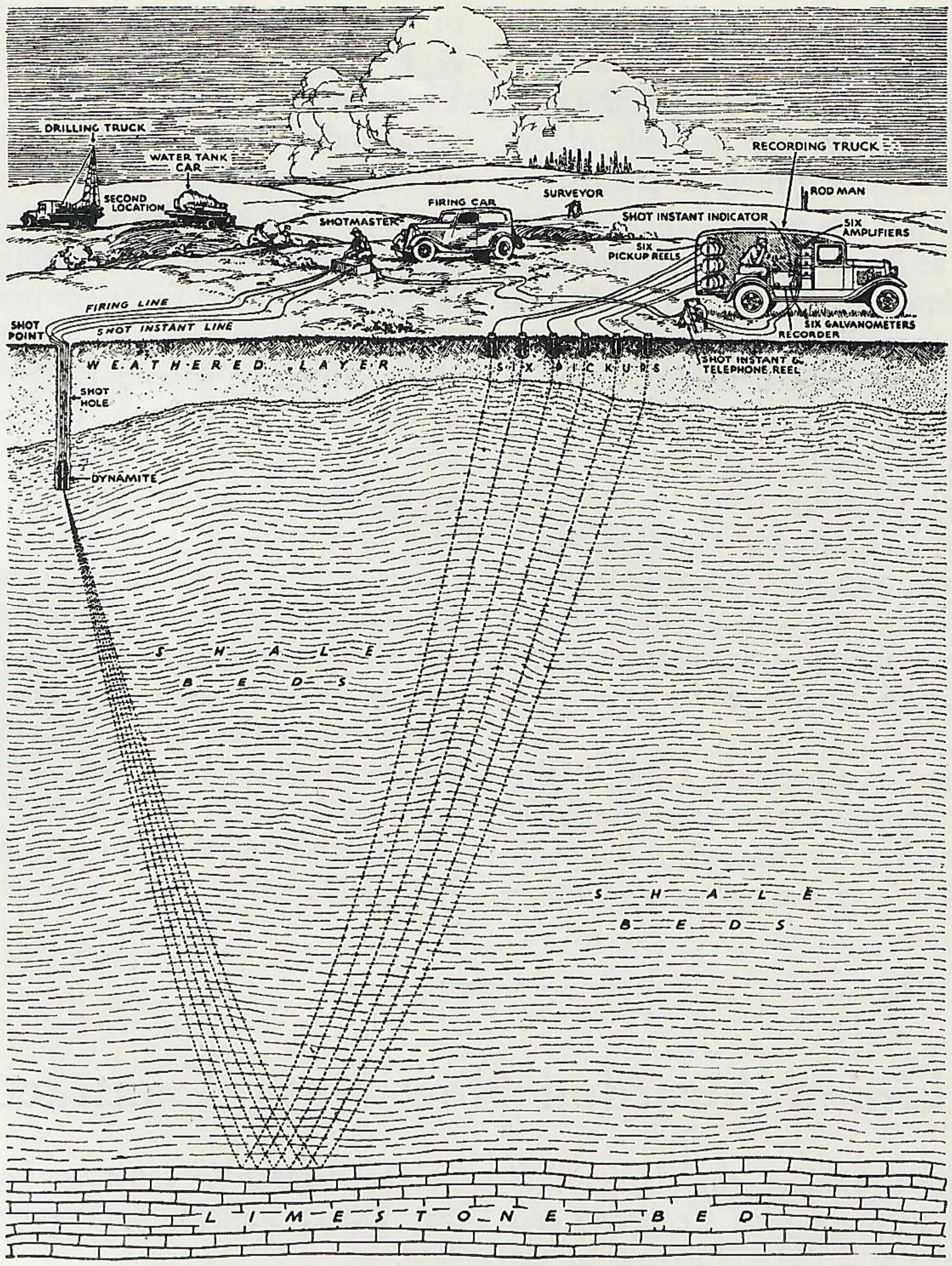
fera present, therefore, individual rock layers may be identified whether they be in the mountains or in the bottom of a well two miles deep. The Union Oil Company was among the first of the oil companies to establish a micro-paleontology laboratory and within the past few years has constructed on Dominguez Hill a new building especially designed and equipped for this specialized work.

Because of its usefulness as an aid in determining the underground geology of some of California's extensive alluvial areas, micro-paleontology is an established asset to petroleum geology. There are, however, limits to its application since it can be used in the solution of problems of underground geology only where there previously have been drilled a number of scattered wells from which cores are available. There are other extensive areas of oil possibilities in California in which either no wells have been drilled or no cores have been taken and in which no rock outcrops occur to guide the geologist in determining the potentiality of these areas as future producers of oil.

Geologists using the methods of investigation up-to-date in California three years ago are at almost a total loss in drawing reliable conclusions regarding these areas, but fortunately necessity again has fathered a new "tool" to aid the geologist. This time the science of physics has been called upon to support geology in the solution of its problems and as a result a specialized branch of the two sciences, called geophysics, has established itself with most of the oil companies of California. Experimentation with geophysical instruments in California and the Mid-Continent began about 15 years ago and, although several instruments soon proved successful for conditions existing in the Mid-Continent, only two appear to be particularly adaptable to California. These two are the reflection seismograph and a specially devised instrument for the measurement of electrical conductivity. Both instruments have proved themselves valuable to the geologist as an aid in determining the underground structure of many of California's "hidden" areas.

The reflection seismograph with its crew of operators is illustrated on page 13. This instrument takes advantage of the knowledge of the earth's interior, collected through years of instrumental measurement of earthquakes. In the course of surveying an area, shallow holes from 25 to 500 feet are drilled at selected scattered localities. The instruments are set up at some distance from the site of each hole after which a charge of dynamite is lowered into the hole and exploded. The explosion produces a miniature earthquake with shock waves which, upon passing downward into the earth, are partially reflected back toward the surface by one or more of the deeply buried formations. The instruments record the time of discharge and the time of arrival back to the surface, and with this travel time and the known speed of those waves the depth and structural attitude of underground formations are calculated. Information thus obtained is used by the geologist in determining the possibilities of the area for oil and gas.

The instrument specially devised to measure the electrical conductivity of underground formations operates on a physical principle similar to that of the reflection seismograph in that it obtains results that depend upon differences in physical characteristics of underlying formation. The reflection seismograph measures the differences in velocity of propagation of shock waves through different strata, while the electrical instrument measures the differences in the electrical conductivity of these strata. Earlier sources of error in the electrical method recently have been eliminated, so that it now is possible at moderate cost to determine much of the underground geology to depths of 3,000 feet. The field procedure is similar to that of the reflection seismograph except that no holes are required. Charges of electrical current are passed into the ground and again picked up through electrodes placed at varying distances from the instrument. When working to a depth of 3,000 feet, a large number of readings are recorded at each station. Because of the difference in the ability of different subsurface formations to conduct the electrical current, the final results permit the identification and mapping of these buried formations throughout ex-



Courtesy of American Askania Corp.

Schematic diagram showing field procedure in seismic reflection mapping. The dynamite (left) is exploded, sending "waves" down to the limestone bed, from which they rebound to wire connections with the recording truck. The time of arrival of the returned waves at the surface permits calculations of the depth and slope of the limestone.

tensive covered areas. Results of this type are of inestimable value to the petroleum geologist.

In addition to conducting geological investigations in non-productive areas for the purpose of discovering new oil and gas fields, the geological department of the Union Oil Company functions in many other ways. The many old fields throughout the state are constantly being studied in order to determine the possibilities of extending present producing areas or of discovering deeper sands. Experts in valuation of oil lands are studying producing properties so that the management may be properly advised in contemplated purchases. An experienced scout is keeping close touch with the most promising wildcat wells, and is gathering much information on all wells being drilled within the state regardless of their promise. The collection of logs, cores, and histories of wells is a routine responsibility that is never allowed to lapse.

All of these duties require able and continuous supervision and the management must be immediately and accurately advised of new important developments in the way of new discoveries or new methods of improving the quality of geological results. A reference library of geological literature and maps is at hand and under the supervision of a librarian. A staff of draftsmen is constantly occupied in preparing maps and sections for geological reports, maps of new fields, and ownership maps of extensive areas of possible new production. Wildcat maps covering most of the state are revised and, most important of all, a large geological map of California containing all reliable geological information known to the department has been prepared as an invaluable reference for the chief geologist.

The question is commonly asked, "Why should any company carry on a search for new oil properties at a time when the available production is so great that the average well must be curtailed to less than one-half of its potential production?" The answer is based on easily understandable facts. First, the remaining supply of recoverable oil already discovered is a definitely limited quantity regardless of its size, and without question will be exhausted at some future date. Second, and possibly more important, is the fact that, as fields are produced, their rate of output decreases quite rapidly, so that the present potential overproduction is a temporary condition. Unless new fields and properties are opened up, it soon will be discovered that oil can not be produced at a rate sufficient to meet the domestic requirements. The company has a large investment in marketing and refining facilities that must be protected by an adequate supply of crude oil. For this reason, new production either by discovery or purchase must constantly be added to the company's reserves in order that it may continue to maintain its present important position in the oil industry.

Union Awarded New Navy Contract

As successful bidder, the Union Oil Company has been awarded a contract calling for delivery of 2,326,800 barrels of fuel oil to the United States Navy during the first six months of this year. Also, the company has received an order from the Navy for the major portion of its requirements, during the same period, for fuel for Diesel motors.

Deliveries are being made largely to the Navy and supplemental facilities at Los Angeles Harbor, San Diego and San Francisco, with the remainder to be delivered at Puget Sound, Gray's Harbor, points along the Columbia River, and the Hawaiian Islands.

Total awards, issued by the Government recently, for the Navy's half-year requirements aggregated 3,360,800 barrels of fuel oil, indicating the order placed with the Union Oil Company is equivalent to 70 per cent of these awards. The gross value of the company's contract, including fuel for Diesel motors, approximates $2,000,000.

For the past several years, the Union Oil Company has been a successful bidder for Navy contracts for petroleum supplies along the Pacific Coast, notably among which was an order awarded in 1932 for requirements for the last half of that year and the first half of 1933, totaling 5,500,000 barrels of fuel oil. This order was, and remains, the largest single contract ever awarded one company by the United States Navy. Also, a contract was awarded the company in 1934, calling for delivery of aviation gasoline to the Navy air forces on the Pacific Coast for several months last year. This was one of the largest orders of its kind ever to be placed with one company. On December 31, the company completed a previous contract for delivery of 1,003,200 barrels of fuel oil to the Navy.

Union's Field Department in 1934

ACTIVITIES of the Union Oil Company's field department during 1934 were greater than in any year since the end of the Santa Fe Springs oil field boom which was in 1929 and the early part of 1930.

F. F. Hill
Director of Production

Increased development activities, caused principally by lease obligations, accounted for the major part of the work performed last year. This resulted in the completion of 45 wells, and the reconditioning of 20 other wells, distributed in the following fields.

Field	New Wells Completed	*New Production (Barrels)
Santa Fe Springs	11	2,517
Dominguez	11	4,763
Long Beach	2	569
Playa del Rey	3	1,863
Richfield	1	448
Santa Maria	1	120
Kettleman Hills (N. D.)	4	36,010
Poso Creek	8	7,064
Mountain View	4	6,406
Total	45	59,760

NOTE: *Daily potential established in production test period for Oil Umpire's office.

Field	Recompletions	Barrels
Santa Fe Springs	4	500
Dominguez	10	3,357
Long Beach	1	51
Santa Maria	4	332
Midway Sunset	1	50
Total	20	4,290

In addition to the development in proven areas, three of the company's exploration wells were successfully completed, which added materially to the company's oil reserves.

The first of these was the Kernco No. 1 well in the Mountain View field, which extended the producing limits of that field approximately two miles, and opened up what has since become the most prolific territory in that area. The second was the Callender No. 33 well in the Dominguez field. This completion opened up, and is successfully producing from, the upper portion of the Miocene formation, the deepest production yet discovered in that field.

Several miles southwest of the Santa Maria oil field, in Santa Barbara county, is located the third of these succesful exploration wells, the Moretti No. 1, which as purely a wildcat, shows the presence of a considerable field of heavy oil at a very shallow depth.

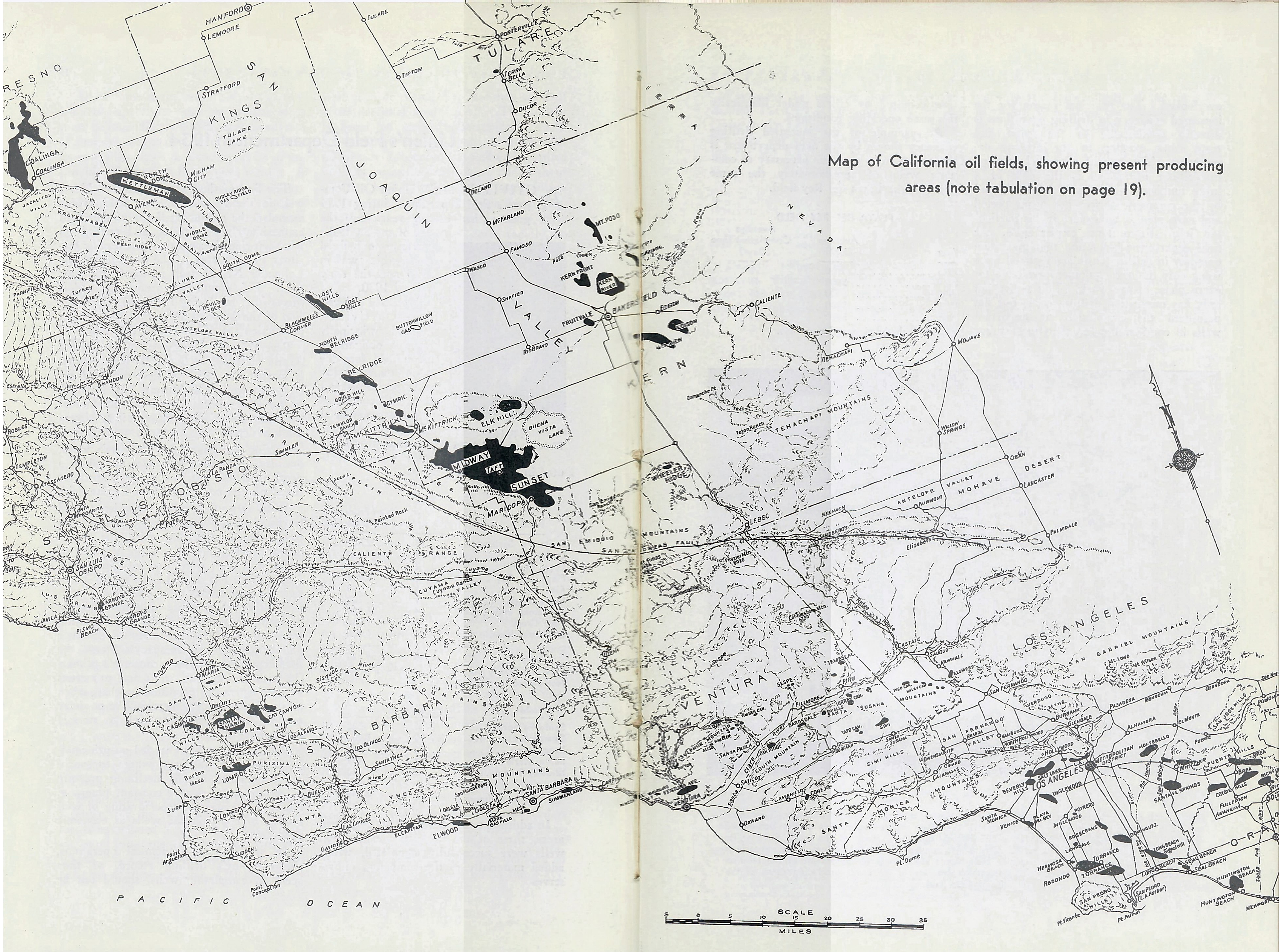
During the course of the year's work, one dry exploration hole was drilled to a depth of 6,000 feet in Orange County, at the southwest end of the East Coyote field.

With respect to other activities carried on by the field department, adherence to production curtailment, with the consequent shutting in of a large number of wells and the restriction of production from others, has offered little or no incentive for improvements in production practice, other than those directly affecting operating economies. Aside from meeting lease requirements, equalizing oil drainage and protecting the company's leases, the field department has been concerned primarily with maintaining wells and properties in good operating condition so that, when production is needed, there will be no delay or loss incurred in returning to normal production.

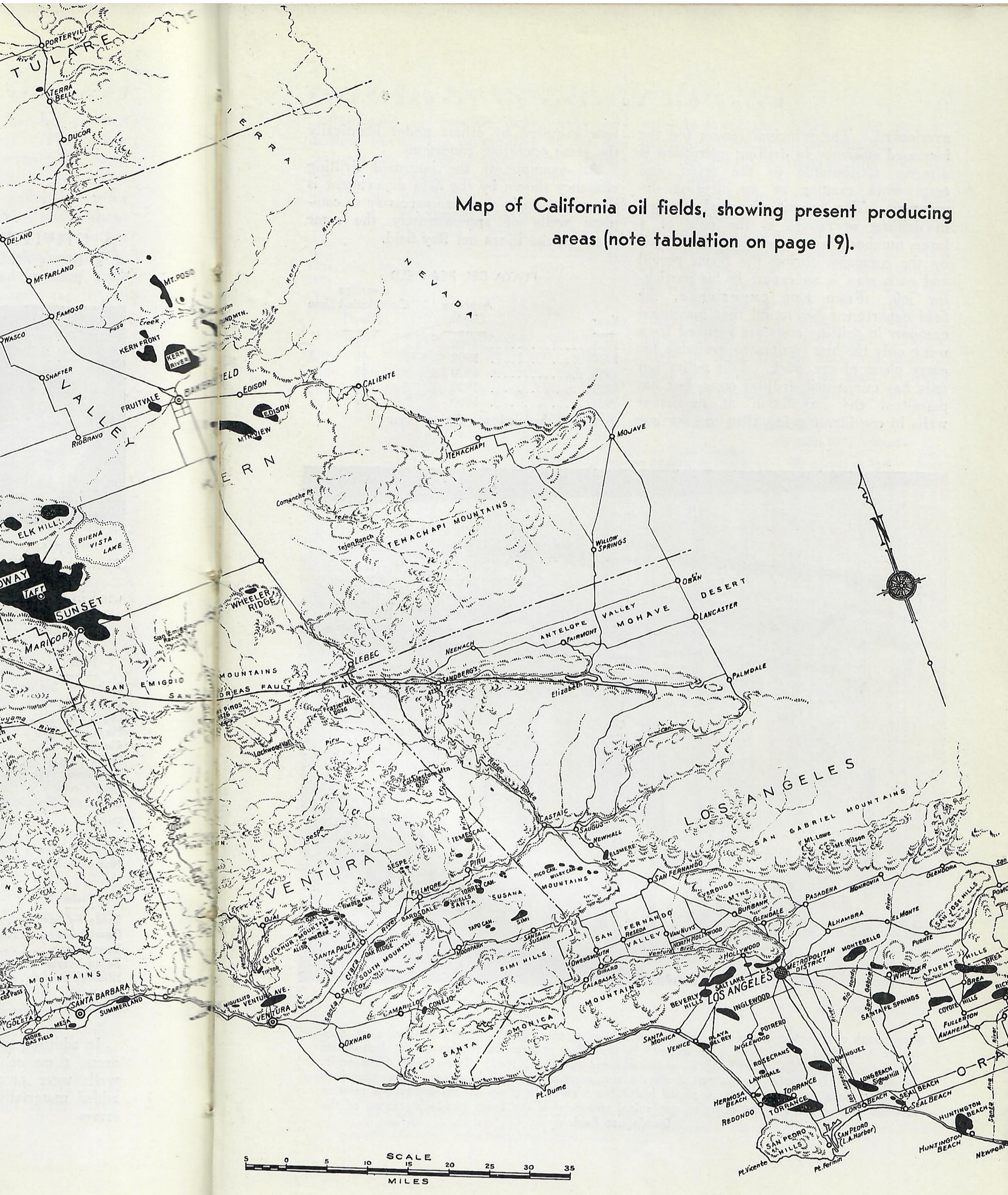
This work has been carried on principally at Santa Fe Springs, where encroaching waters and rapidly declining pressure in certain zones require constant plugging, cleaning out and the reperforating of well casing, to maintain the wells as economic producers.

In referring to economical operations, the company's drilling record, of time spent in completing wells, should not be

FRESNO
HANFORD
LEMOORE
TULARE
PORTERVILLE
TULARE
TERRA BELLA
DUCOR
TIPTON
STRATFORD
KINGS
SAN
TULARE LAKE
COALINGA
JACALITOS HILLS
KREVENHAGEN HILLS
KETTLEMAN
NORTH DOME
MIDDLE DOME
SOUTH DOME
AVENAL
KETTLEMAN PLAIN
Avenal Gap
MILHAM CITY
DUDLEY RIDGE GAS FIELD
REEF RIDGE
JOAQUIN
DELANO
McFARLAND
FAMOSO
WASCO
SHAFTER
VALLEY
RIO BRAVO
MT. POSO
ROUND MTN.
Poso Creek
KERN FRONT
KERN RIVER
BAKERSFIELD
FRUITVALE
EDISON
MTN. VIEW
CALIENTE
KERN
SIERRA
NEVADA
PARKFIELD
Turkey Flat
DEVIL'S DEN
ANTELOPE VALLEY
LOST HILLS
BLACKWELL'S CORNER
BUTTONWILLOW GAS FIELD
NORTH BELRIDGE
BELRIDGE
GOULD HILL
CYMRIC
TEMBLOR RANCH
McKITTRICK
ELK HILLS
BUENA VISTA LAKE
MIDWAY
TAFT
SUNSET
MARICOPA
SHANDON
TEMBLOR
CARRIZO
PLAIN
SIMMLER
LA PANZA
ROBLES
TEMPLETON
ATASCADERO
SANTA MARGARITA
POZO
SAN LUIS OBISPO
SAN LUIS RANGE
ARROYO GRANDE
AVILA
PISMO BEACH
Comanche Pt.
Tejon Ranch
TEHACHAPI
WHEELER RIDGE
San Emigdio Ranch
SAN EMIGDIO MOUNTAINS
SAN ANDREAS FAULT
LEBEC
Mt. Pinos 8826
Frazier Mtn. 8026
Lockwood Val.
Painted Rock
CALIENTE RANGE
Cuyama River
CUYAMA VALLEY
Cuyama Ranch
OZENA
PINE MTN.
Piru Cr.
Sespe Cr.
SESPE
VENTURA
FILLMORE
OJAI
SULPHUR MOUNTAIN
SANTA PAULA
SOUTH MOUNTAIN
BARDSDALE
Santa Clara River
SATICOY
VENTURA AVE.
VENTURA
OXNARD
CAMARILLO
Cuyama River
SANTA MARIA
SANTA MARIA VALLEY
ORCUTT
CAT CANYON
CASMALIA
CASMALIA HILLS
SOLOMON HILLS
LOS ALAMOS
SAN RAFAEL MOUNTAINS
Sisquoc River
SANTA BARBARA
HARRIS
PURISIMA HILLS
LOS OLIVOS
SANTA YNEZ
Burton Mesa
LOMPOC
SURF
BUELLTON
Santa Ynez River
SANTA YNEZ MOUNTAINS
LAS CRUCES
GAVIOTA
SUDDEN
Point Arguello
Point Conception
EL CAPITAN
ELWOOD
GOLETA
MORE GAS FIELD
MESA
SANTA BARBARA
SUMMERLAND
CARPINTERIA
RINCON
San Marcos Pass
PACIFIC OCEAN
SCALE
5 0 5 10 15 20
MILES



Map of California oil fields, showing present producing areas (note tabulation on page 19).



Map of California oil fields, showing present producing areas (note tabulation on page 19).

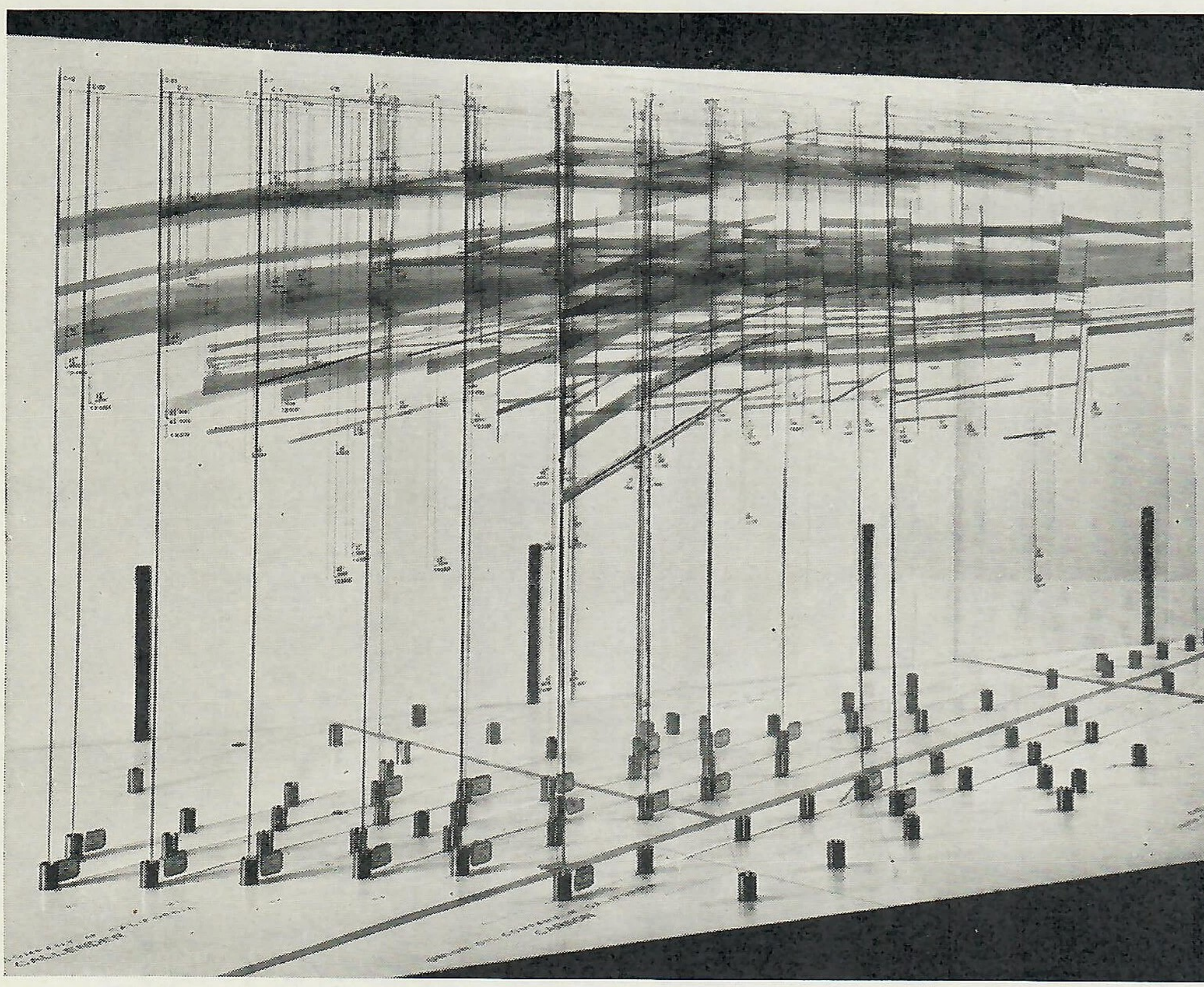
overlooked. The principal reason for the increased efficiency in drilling operations is directly attributable to the spirit and team work existing in the drilling department. The present personnel engaged in drilling operations is the pick of a large number of men who were engaged by the company during the boom period and each man is an expert in his particular job. From long experience, the field department has found that maximum economy in drilling costs are realized from using only the best equipment available for every phase of the work. This policy not only has minimized drilling costs, but has permitted the completion of important wells in considerably less than the average time required by others under identically the same operating conditions.

An example of the increased drilling efficiency shown by the field department is the reduction in the time necessary to complete wells of approximately the same depth in the Playa del Rey field.

PLAYA DEL REY FIELD

Year	Average Depth	Average Completion Time (Days)
1935	5900	35*
1934	5900	41
1933	5900	45
1932	5900	50
1931	5900	59

Note: *Scheduled completion time.



This model, constructed under the direction of E. Jussen, chief development engineer, is an innovation in oil field models and is an adjunct to the other progressive studies of the Dominguez field. Its construction, embodying a sectional base, permits a study of the whole field or its various areas separately. A system of glass plates connect the well locations. The subsurface geological data depicted on these plates facilitates a study in three dimensions of the relation between production and the complex geological structure in the lower producing zones of the Dominguez field.

Expressed in another way, increased drilling efficiency is exemplified by the increase in the average number of feet drilled per crew day in the Dominguez field during the last few years.

DOMINGUEZ FIELD

Year	Average Number Feet Per Crew Day
1934	122.0
1933	100.5
1932	90.7
1931	79.2

Despite present improved equipment, however, difficulties arise from time to time. In the past few months, two mechanical jobs have occurred that have severely taxed the ability of the field department, these being the Belridge No. 18 and the North Kettleman Oil and Gas No. 1 wells.

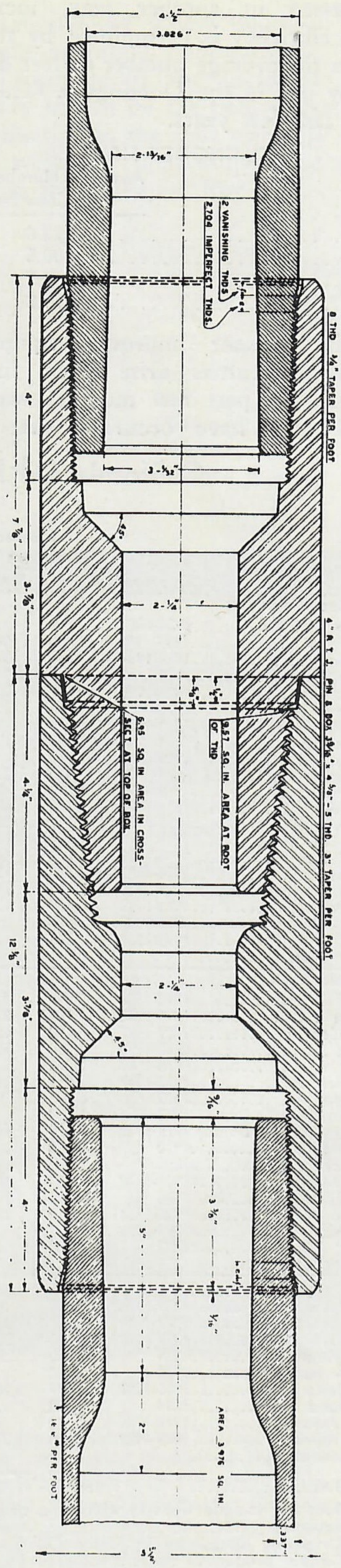
The Kettleman Oil and Gas No. 1 well has been drilled and redrilled for the past two years and ten months. The Union Oil Company contributed money for its initial drilling, then took over the operations of the well in March, 1934. Originally, 11¾-inch casing had been set at 6,710 feet, and 7-inch casing set at 9,642 feet, with the bottom of the hole at 10,947 feet. The last thirty or forty feet of hole was made in what was considered an oil sand, probably capable of making commercial production.

California Oil Fields and Union's Position

		Estimated Prod. Acr'ge		% Union to	‡Union Wells Since Acquisition			†Union Wells		Allowable Daily Production (Barrels) for December, 1934				Aver. Grav. Union	
Name of Field	xDiscovered	Field	Union	Fld.	Prod.	Dry Holes	Total	Prod.	Shut In	Field	% State	Union	% Union	Lt	Hvy
Los Angeles Basin:										222,693	48.8	29,297	72.5		
Alamitos Heights	1926-1927	110	...	..						2,104	.5	...	...		
Brea-Olinda	1897-1899	1,410	900	64	79	35	114	11	42	10,573	2.3	3,496	8.7	25	14
*Dominguez	1923-1934	665	325	49	68	6	74	36	28	17,583	3.9	8,048	19.9	30	..
**East Coyote	1911	580	480	83	59	15	74	24	13	2,622	.6	1,380	3.4	22	15
West Coyote	1909-1930	1,107	...	..	..	..	..	..	..	8,805	1.9	...	..	..	..
Huntington Beach (New)	1926	665	...	..	..	..	..	..	..	23,578	5.2	...	..	..	..
Huntington Beach (Old)	1920-1922	1,175	85	7	31	..	31	15	13	12,829	2.8	651	1.6	24	..
Inglewood	1924	865	...	..	..	..	..	..	..	9,012	2.0	...	..	..	..
Lawndale	1928	13	...	..	..	..	..	..	..	139	..	...	..	..	..
Los Angeles	1892-1909	440	...	..	..	..	..	..	..	687	.2	...	..	..	..
Montebello	1917-1924	1,078	23	2	28	..	28	..	..	6,172	1.4	481	1.2	24	18
Long Beach	1921-1929	1,305	21	2	30	1	31	5	10	59,993	13.1	792	2.0	26	..
**Playa del Rey	1929-1934	335	300	90	20	1	21	11	7	6,947	1.5	1,302	3.2	23	..
Potrero	1928	113	...	..	..	..	..	..	..	413	.1	...	..	..	..
**Richfield	1918-1920	1,278	413	32	109	3	112	71	20	7,959	1.7	2,545	6.3	21	..
*Rosecrans	1924-1932	310	199	64	53	8	61	25	5	2,990	.7	1,179	2.9	37	..
*Santa Fe Springs	1921-1929	2,495	240	10	124	17	141	58	52	35,384	7.7	9,423	23.3	33	..
Seal Beach	1926-1928	330	...	..	..	..	..	..	..	6,683	1.5	...	..	..	..
Torrance-Hermosa	1922-1932	3,835	...	..	..	..	..	..	..	6,928	1.5	...	..	..	..
Whittier	1898-1903	575	...	..	..	..	..	..	..	1,082	.2	...	..	..	..
Miscellaneous					..	..	..	..	..	210	..	...	..	..	..
San Joaquin Valley:					..	..	..	..	..	188,361	41.2	6,872	17.0	..	..
Belridge	1920-1930	2,415	113	5	25	3	28	4	21	6,835	1.5	41	.1	29	13
Coalinga	1896-1930	14,669	275	2	33	6	39	..	..	19,145	4.2	306	.8	..	15
Coffee Canyon	1927	100	...	..	..	..	..	..	..	1,730	.4	...	..	..	..
Elk Hills	1919-1920	9,850	150	2	19	..	19	13	2	8,025	1.4	306	.8	..	15
Fruitvale	1928-1929	1,220	...	..	..	..	..	..	..	3,493	.8	...	..	..	..
Kern Front	1913-1932	3,050	40	1	7	..	7	6	1	6,685	1.5	129	.3	..	14
Kern River	1899	6,973	40	1	16	..	16	..	16	4,425	1.0	...	..	..	..
Kettleman (Middle Dome)	1932	1,280	...	..	..	..	..	..	..	255	.1	...	..	..	..
Kettleman (North Dome)	1928-1930	17,610	160	1	7	..	7	7	..	57,380	12.6	3,223	8.0	38	..
Lost Hills	1910	2,310	...	..	..	..	..	..	..	4,540	1.0	...	..	..	..
McKittrick	1898	1,710	...	..	..	..	..	..	..	2,987	.7	...	..	..	..
Midway-Maricopa	1901-1928	48,600	450	1	60	5	65	32	27	53,692	11.8	902	2.2	24	15
Mount Poso	1926	1,360	210	15	24	1	25	18	5	9,883	2.2	1,557	3.8	..	16
**Mountain View	1930-1934	1,250	250	20	4	..	4	3	1	5,655	1.2	408	1.0	28	..
Round Mountain	1927-1928	901	...	..	..	..	..	..	..	2,471	.5	...	..	..	..
Wheeler Ridge	1922	320	...	..	..	..	..	..	..	435	.1	...	..	..	..
Miscellaneous					..	..	..	..	..	725	.2	...	..	..	..
Coastal:					..	..	..	..	..	45,800	10.0	4,253	10.5	..	..
Capitan	1929	120	...	..	..	..	..	..	..	626	.1	...	..	..	..
Elwood	1927-1931	400	...	..	..	..	..	..	..	8,728	1.9	...	..	..	..
Rincon	1927-1928	350	...	..	..	..	..	..	..	1,414	.3	...	..	..	..
San Miguelito	1931	200	...	..	..	..	..	..	..	580	.1	...	..	..	..
Santa Barbara (Mesa)	1929	50	...	..	..	..	..	..	..	1,789	.4	...	..	..	..
**Santa Maria	1901-1931	10,687	5,266	49	202	51	253	71	126	5,302	1.2	3,745	9.2	23	..
Summerland	1894	120	...	..	..	..	..	..	..	60	..	...	..	..	..
Ventura Avenue	1916-1931	1,760	...	..	..	..	..	..	..	22,824	5.0	...	..	..	..
**Ventura-Newhall	1875-1929	4,685	1,221	26	214	40	254	79	5	4,178	.9	508	1.3	26	16
Miscellaneous					..	..	..	..	..	299	.1	...	..	..	..
TOTAL		150,674	11,161	7	1,212	192	1,404	489	394	456,854	100.0	40,422	100.0		

NOTE: ‡ Does not include wells in which the company has a participating interest.
† November, 1934.
* Originally discovered by Union Oil Company.
** Certain productive zones discovered by Union Oil Company.
x First year denotes original discovery of field, and years following to last year noted cover periods in which extensions or new zones have been discovered.

Old type rotary drill pipe with flow restrictions, done away with by new type.

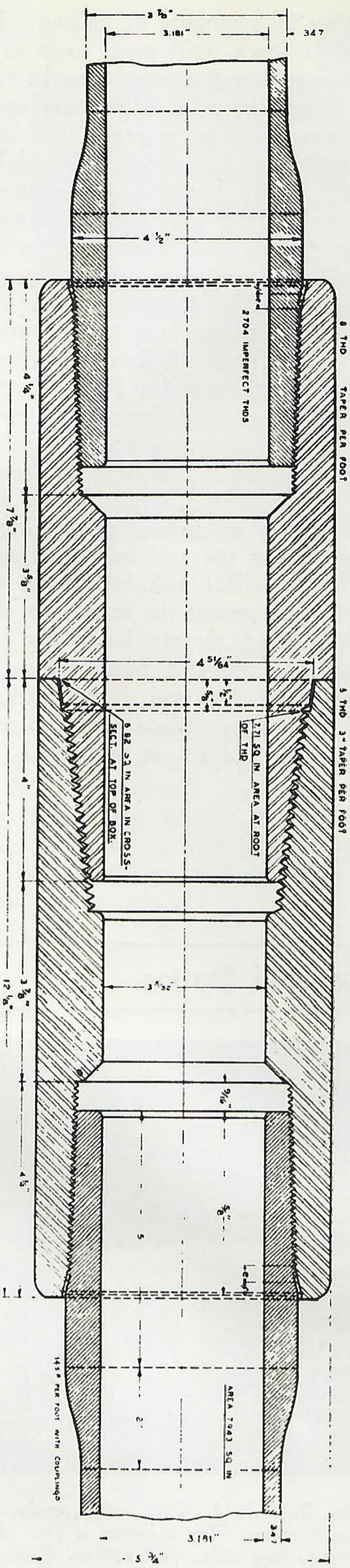


At this depth, the drill pipe became stuck and could not be removed. Several attempts to redrill were made, but without success. In order that the well might be put in the best possible mechanical condition for redrilling, the company started to take out the 7-inch casing. This was removed to 7,846 feet, where a whipstock (drill deflector) was placed and sidetracking operations were begun. Redrilling progressed satisfactorily to a depth of 9,030 feet, where the drill pipe again became stuck. In endeavoring to shoot the pipe off near the bit, a shot exploded prematurely—due to high well temperature—1,300 feet up the hole, and redrilling again was started at 7,743 feet. Again, progress was made, but, recently, once more difficulties have been encountered.

In the case of the Belridge No. 18, the drill reached a depth of 8,521 feet, where it was completed. The hole was being underreamed, preparatory to setting a combination string of 6⅝-inch casing, and bringing the well on production. The reamer became stuck at 8,301 feet, and the 4½-inch drill pipe was cut out to 8,212 feet. It, then, was decided to whipstock the well and redrill. Thirty-five feet of whipstock was inserted, but it stopped above the point designated for sidetracking. To redrill from this point would have left open to entry, gas and possibly water from the original hole into the redrilled hole.

The top of the whipstock was found to be in the center of the hole, and the job was undertaken to remove the whipstock. This was done successfully. Then, it was decided it would be best to try and remove the lost drill collars and reamer as, without the original hole being properly plugged and in the event of encrouchment of water into the oil producing sands at a later date, the old hole might become a channel for water infiltration into the producing sands.

A "washing over" and "milling job" was started, to reduce the size of the underreamer body and its blocks and cutters, to permit their removal. While this operation was being carried on, an 18-foot piece of 4½-inch drill pipe on top of the drill collars became distorted, making it impossible to get back over the "fish." This piece of



New type drill pipe, designed by the Union Oil Company to remove flow restrictions.

drill pipe had to be broken up and trapped out, before the milling job could be resumed. The underreamer cutters were milled off, and the body of the underreamer for approximately three feet was reduced from 7¼ inches to 6 inches, and the hole cleaned out down to the diamond point bit below the underreamer, which was at 8,301 feet. The fish was thoroughly loosened and moved down the hole five feet.

Upon going in the hole with the fishing tool to bring out the fish, due to a changed position it was impossible for fishing tools to go over and take hold of the drill collars, so a rewashing over process was started and, because of the broken up steel from the whipstock, drill pipe or broken shoes which previously had become embedded in the walls came into the hole and down alongside the fish. With the broken up metal crowding down ahead of the mills, the drill collars were held over tightly against the wall of the hole, which is of hard sand. After considerable work, this situation finally was cleared up, and redrilling was commenced, which had progressed down to approximately 7,950 feet at this writing.

During 1934, a new design of rotary drill pipe was developed entirely by the Union Oil Company, and was accepted by the American Petroleum Institute as a tentative A.P.I. standard. It is a full hole, or flush inside diameter drill pipe, contrasting from the old type in that the new pipe has a uniform bore from top to bottom, whereas the old pipe had a restricted inside diameter on each end of each joint by reason of "upsetting" to increase strength. In addition, at about every forty feet on the drill pipe, there was a further restriction from the old type by reason of the small bore through the tool joints, the latter joints being made on a taper for quick breaking out and screwing together, in running in and out of the hole.

As an example of the differences between the two types, the old type drill pipe of 4½ inches outside diameter had an inside diameter at the upset (threaded) ends of 2-13/16 inches, the bore through the tool joints was 2¼ inches and the outside diameter of the tool joint was 5½ inches. The new drill pipe has an inside diameter of 3.181 inches with external upset, which is 4½ inches in outside diameter. This latter dimension is the same as the original 4½-inch outside drill pipe, thus permitting the use of the same thread gauges for couplings and tool joint pipe threads that originally were used on the old 4½-inch pipe. The accompanying drawings on pages 20 and 21 show the differences in the two types.

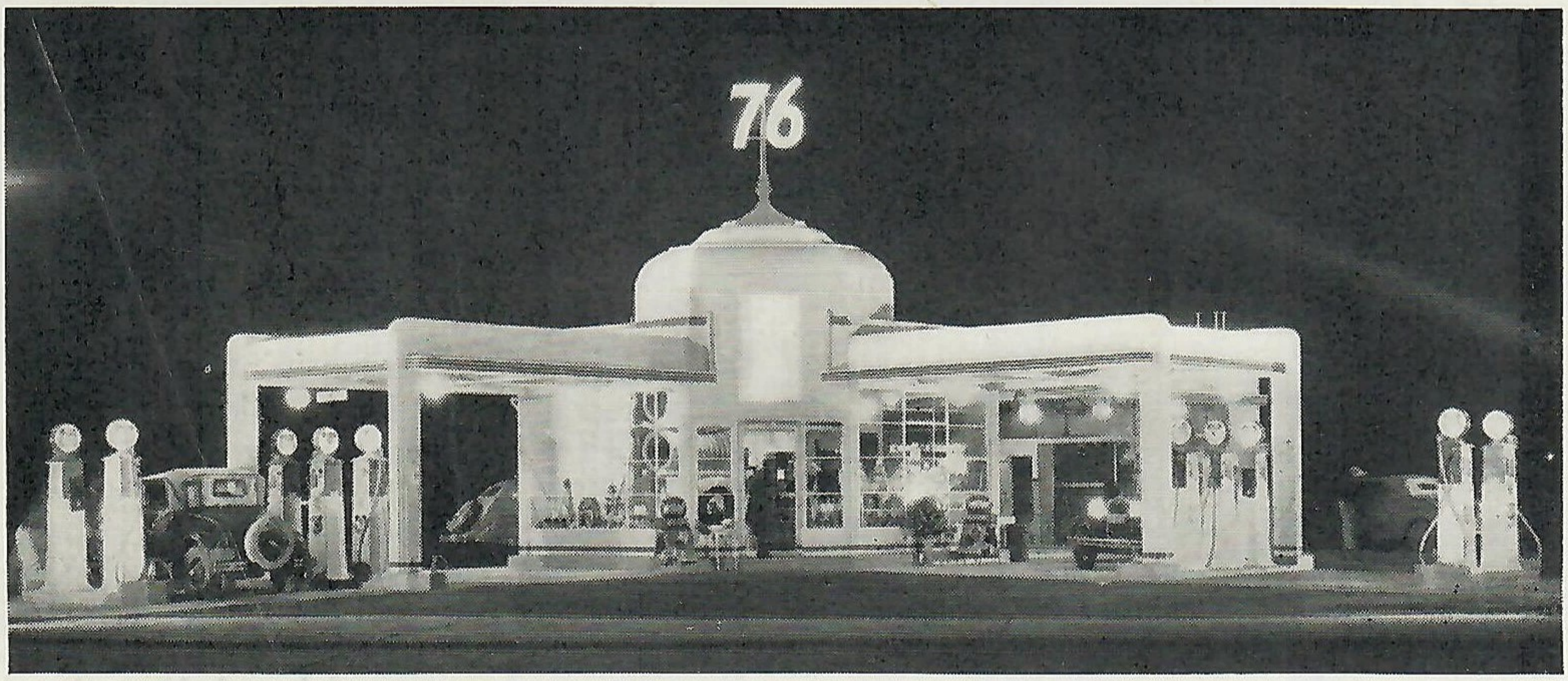
The same relative differences follow through on all sizes of pipe, by simply transferring the upset from within to the outside, utilizing the same pipe thread gauges now in use in internal upset drill pipe. The new flush inside diameter drill pipe has many uses, not only as a drill stem for making hole, but for all manner of testing, cementing and recementing where, formerly, it has been largely the practice to bring in a string of tubing when making water tests, or recementing or doing remedial work.

Also, the new pipe is bored true to gauge and reamed so that it can be used for swabbing or a pumping test when necessary. It can be used for formation or casing testing, either by swabbing or bailing. In the event of a stuck drill pipe, tools of sufficient diameter and strength can be run inside to locate the point of friction and help in the removal or loosening of drill pipe.

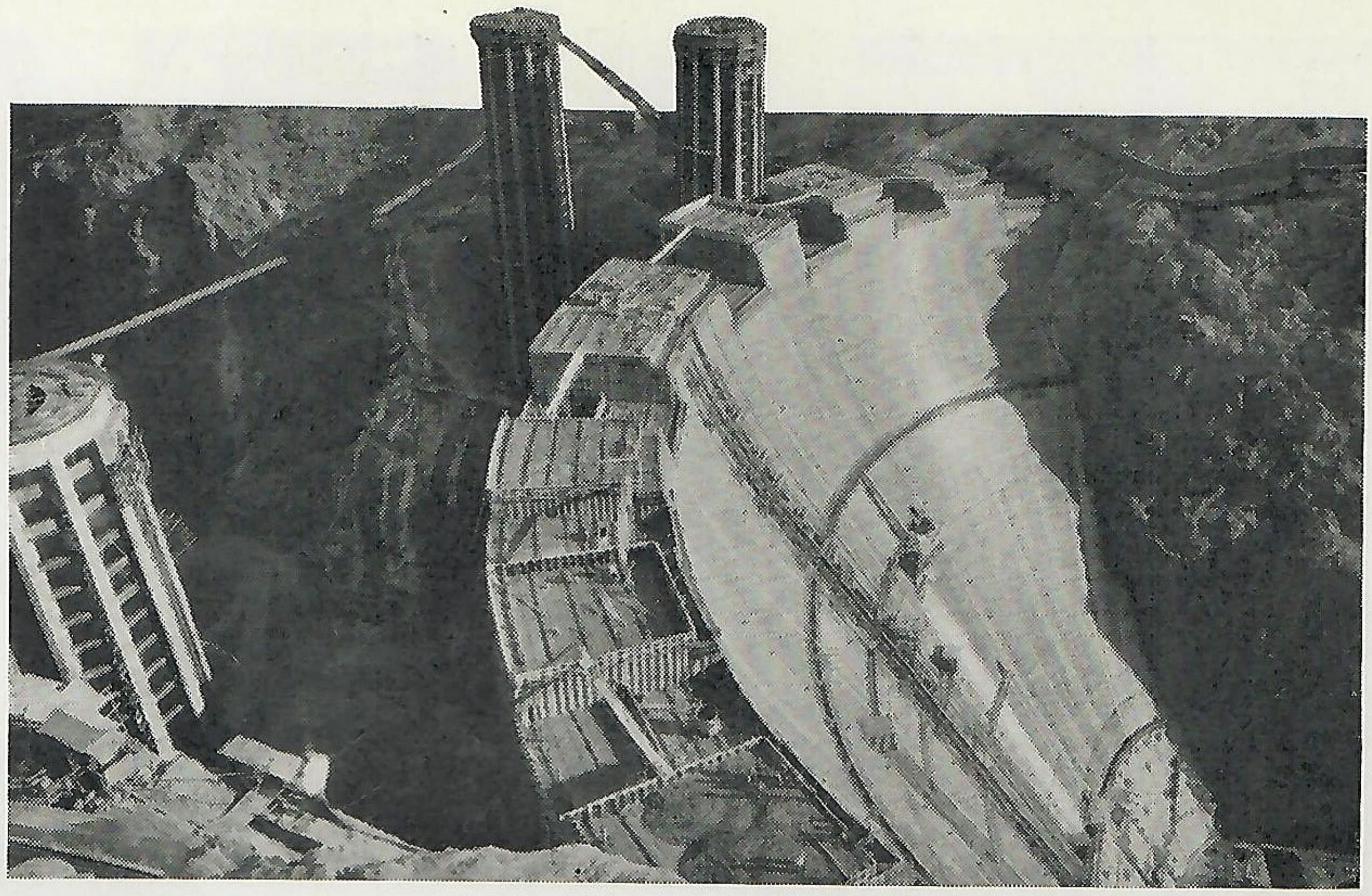
A further use is its ready adaptability to coring. A core barrel has been designed whereby the inner barrel, or core retainer, is pumped down the hole to the bottom of the drill pipe projecting out through the coring shoe. The inner barrel is held in place, either by pump pressure or mechanical means. After the desired amount of core has been taken, mud circulation is reversed and the core retainer brought to the surface, thus permitting as frequent examination of the cores as is desired, without first removing the drill pipe until such time as it is necessary to replace the coring shoe.

In designing the full hole drilling pipe, the primary object was to remove the restrictions and permit the maximum flow of circulation fluid, thereby increasing drilling efficiency and reducing pump maintenance. In general use, however, it will reduce the cost of drilling by from a few hundred to a few thousand dollars on each well.

Opens New Strategically Located Station



On the new civic circle at the northern entrance into Bakersfield, Calif., this modernistic, 10-pump station was opened last month by Union Service Stations. The location is one of the most strategic on the entire inland route from San Francisco bay cities to Southern California. Initial gallonage exceeded expectations.



Viewing Boulder Dam from Nevada, with the Arizona-side intake towers reaching skyward.

Boulder Dam Nearing Completion

STANDING more than an eighth of a mile above bedrock, the mightiest of all water control units ever to be built by man—the $110,000,000 Boulder Dam—is nearing completion. In fact, it is anticipated this summer autoists will be driving over its top, which will be part of Highway 66.

Three years ahead of schedule, Six Companies Inc., has built the dam close to its ultimate height of 590 feet above the former water line and 730 feet above bedrock, and from a width of 600 feet at the base to about the width of a city street on top. When completed, three and a quarter million cubic yards of concrete will have been poured. The dam will impound thirty and a half million acre feet of water.

Aside from the dam proper, workmen now are laying the 30-foot steel penstocks—an $11,000,000 job alone—and are completing the foundations for power units. It will be some time before these units are installed, but, when operating, they will generate 1,835,000 horse power of electrical energy.

Viewed from Observation Point, higher than the dam and several hundred feet downstream, at first the observer is not particularly impressed with the massiveness of the structure. But when moving objects on the dry river bed are identified as huge cranes, tractors or trucks, and much smaller objects as men, the whole perspective seems suddenly to change and the enormity of the work becomes apparent.

The Colorado River development project will cost $408,000,000: $165,000,000 for Boulder Dam and power units, and the All-American Canal; $220,000,000 for the Colorado Aqueduct, being built by the Metropolitan Water District of Southern California; and $22,800,000 for the city of Los Angeles' transmission line.

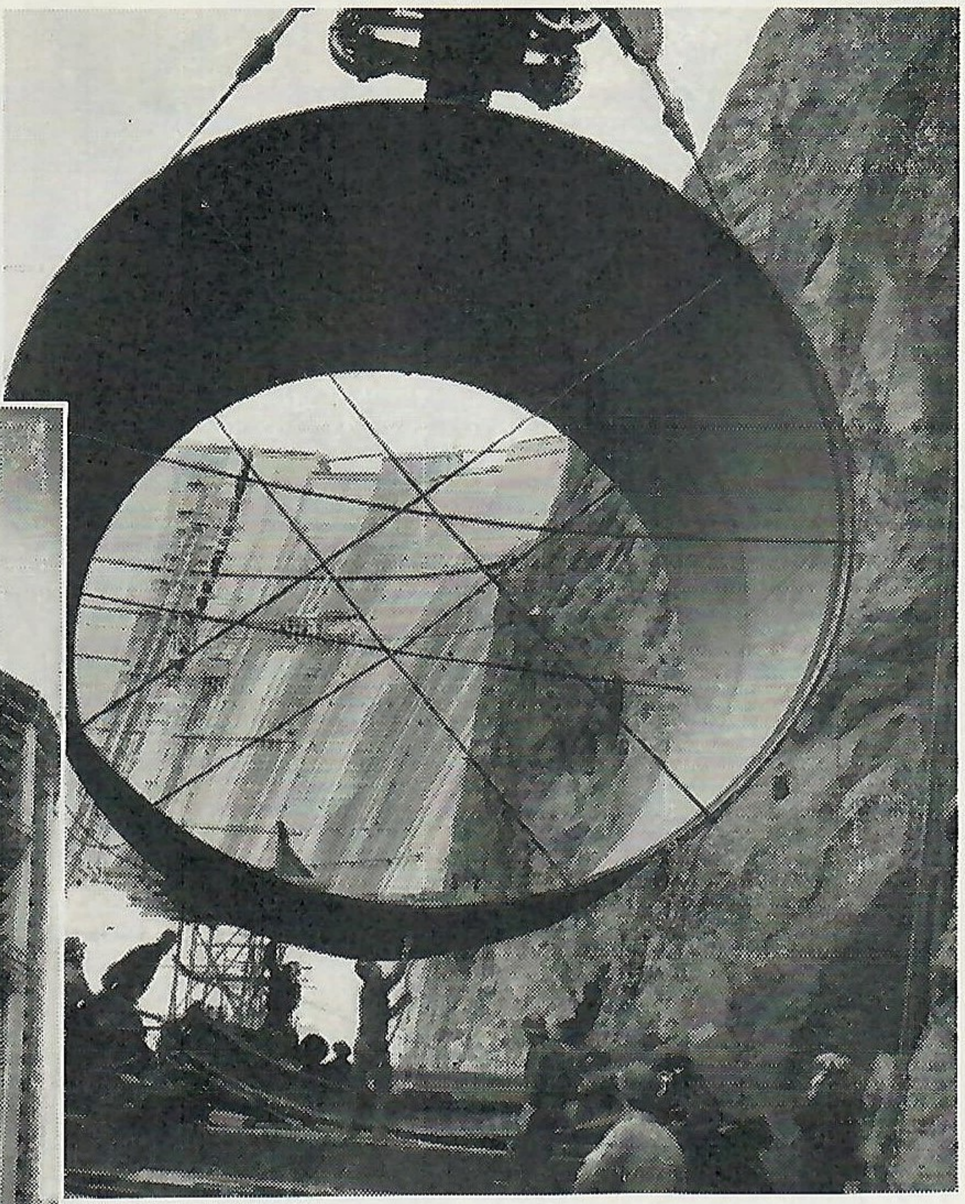
***A FEW MAJOR PUBLIC WORKS PROJECTS SERVED BY UNION**

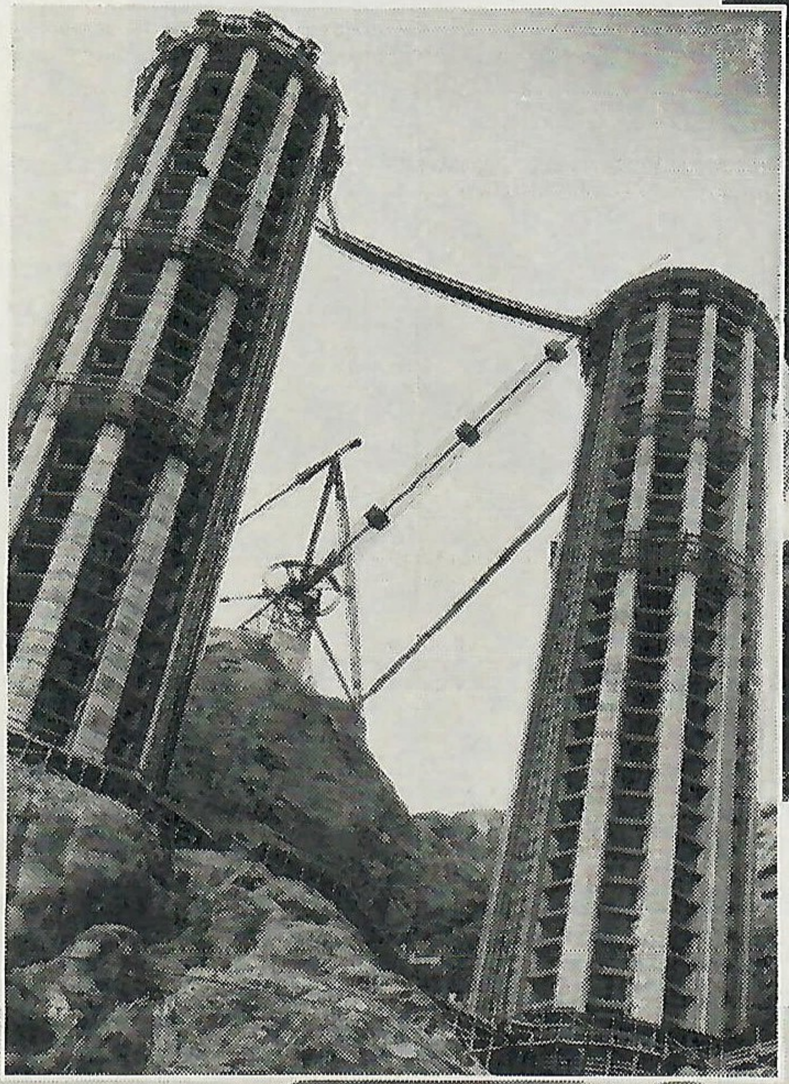
- All-American Canal—California.
- Bonneville Dam—Oregon.
- Boulder Dam—Nevada-Arizona.
- Broadway Low Level Tunnels—Oakland.
- Calaveras Tunnels (Hetch Hetchy)—San Francisco Bay District.
- Columbia River Power Houses.
- Metropolitan Water District Aqueduct—Southern California.
- San Francisco-Oakland Bay Bridge.
- Ventura Sea Wall and Causeway.

*NOTE: *Does not include innumerable road construction, improvement and paving jobs served in all sections of Pacific Coast territory, and elsewhere.*

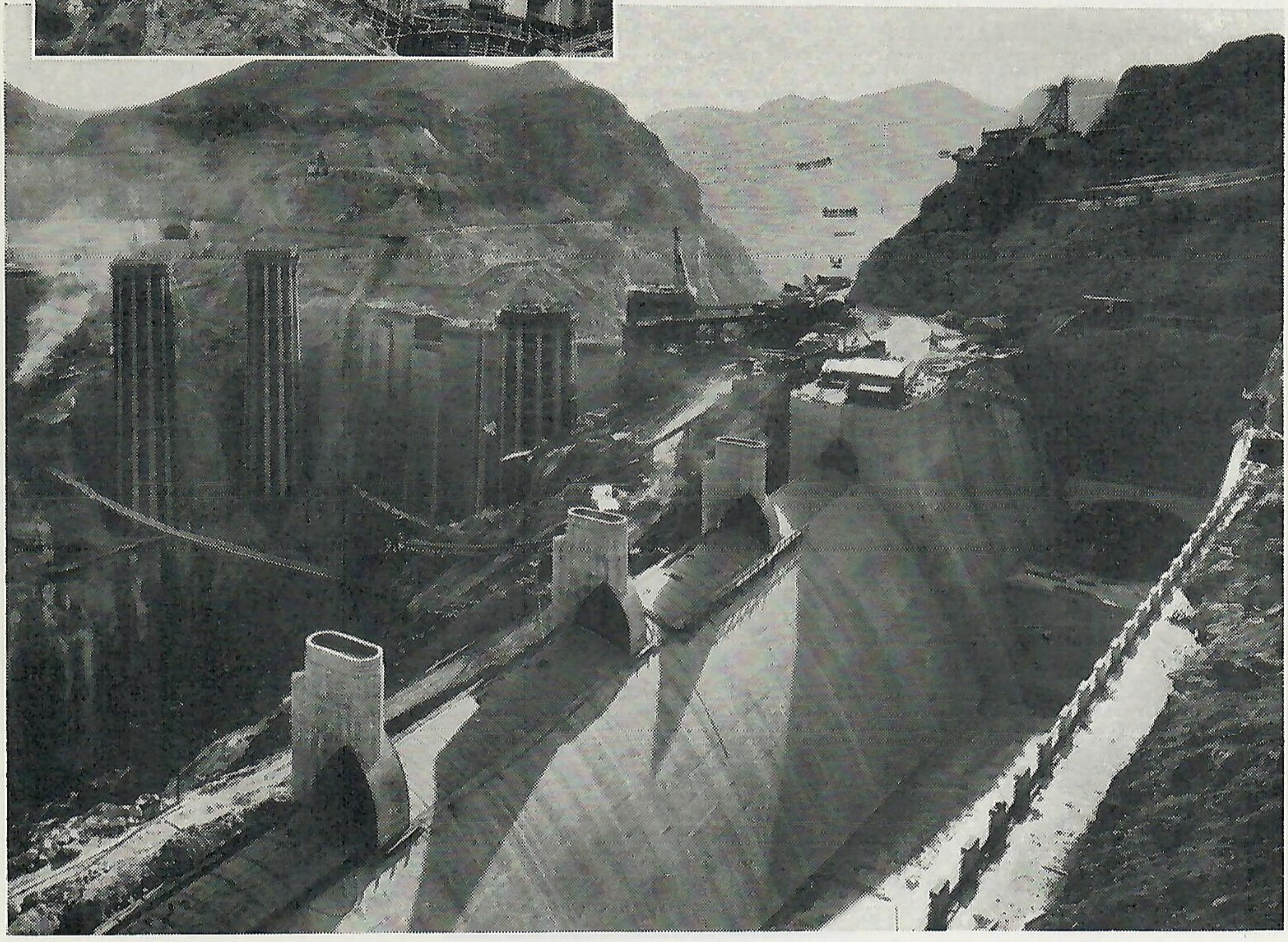
Editor's Note: Subsequent issues of the Bulletin will contain articles relative to other major projects served by the company.

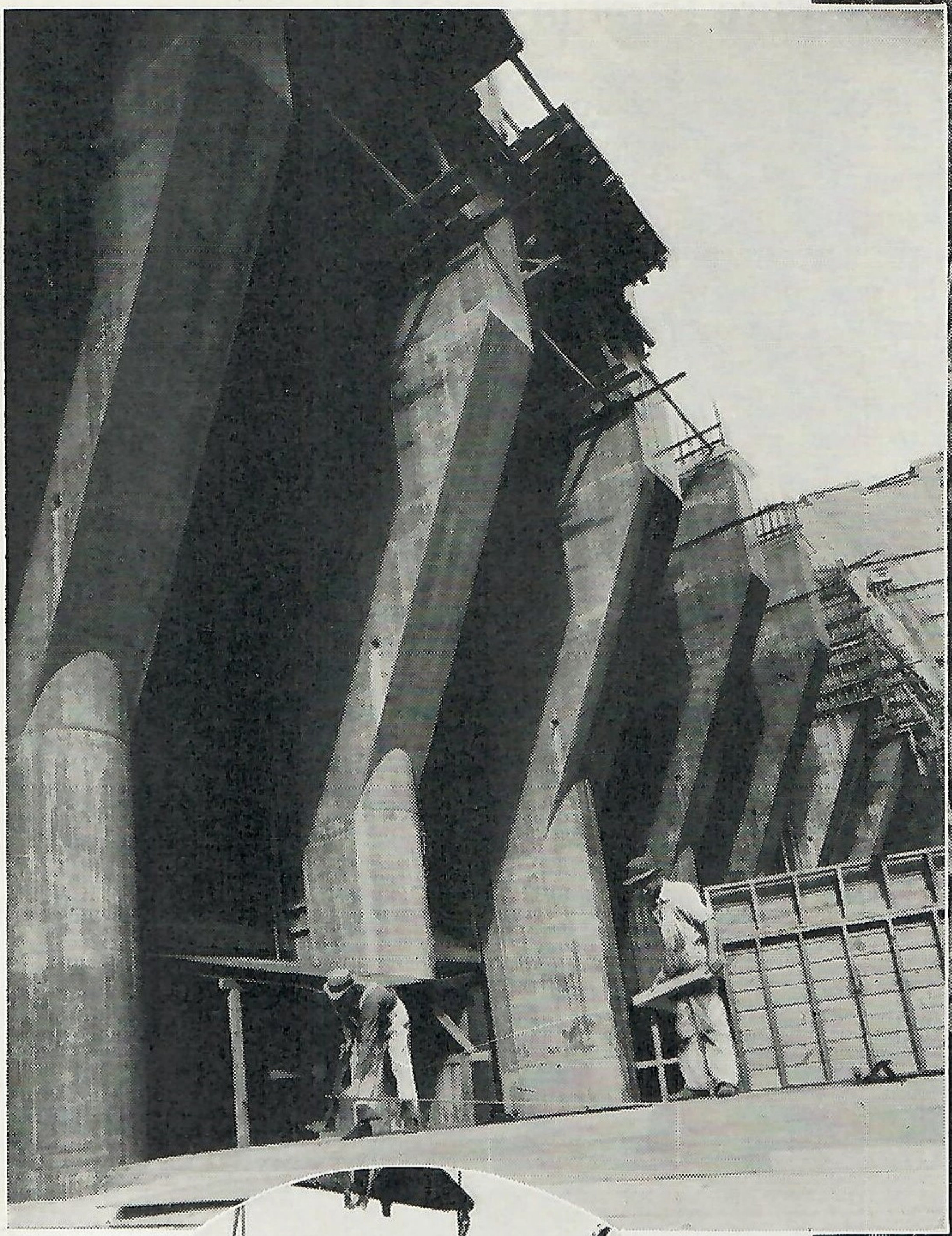
Right: 130-ton section of 30-foot steel penstock pipe being lowered by highline cables, preparatory to entering tunnel. Below: Arizona-side intake towers, from whence waters of the Colorado River will go through penstocks to power units.

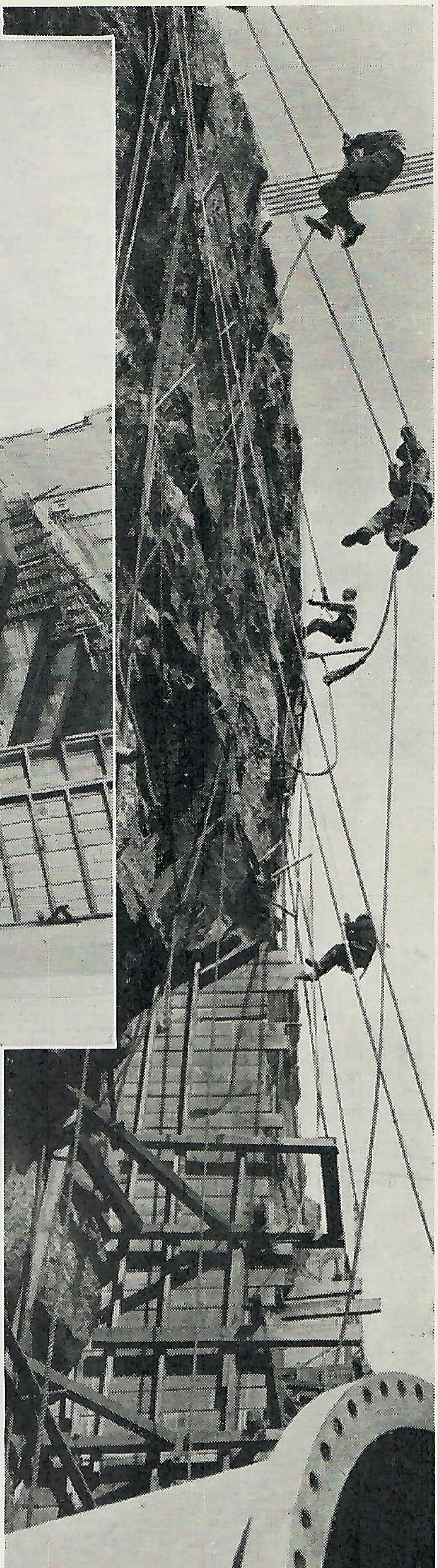


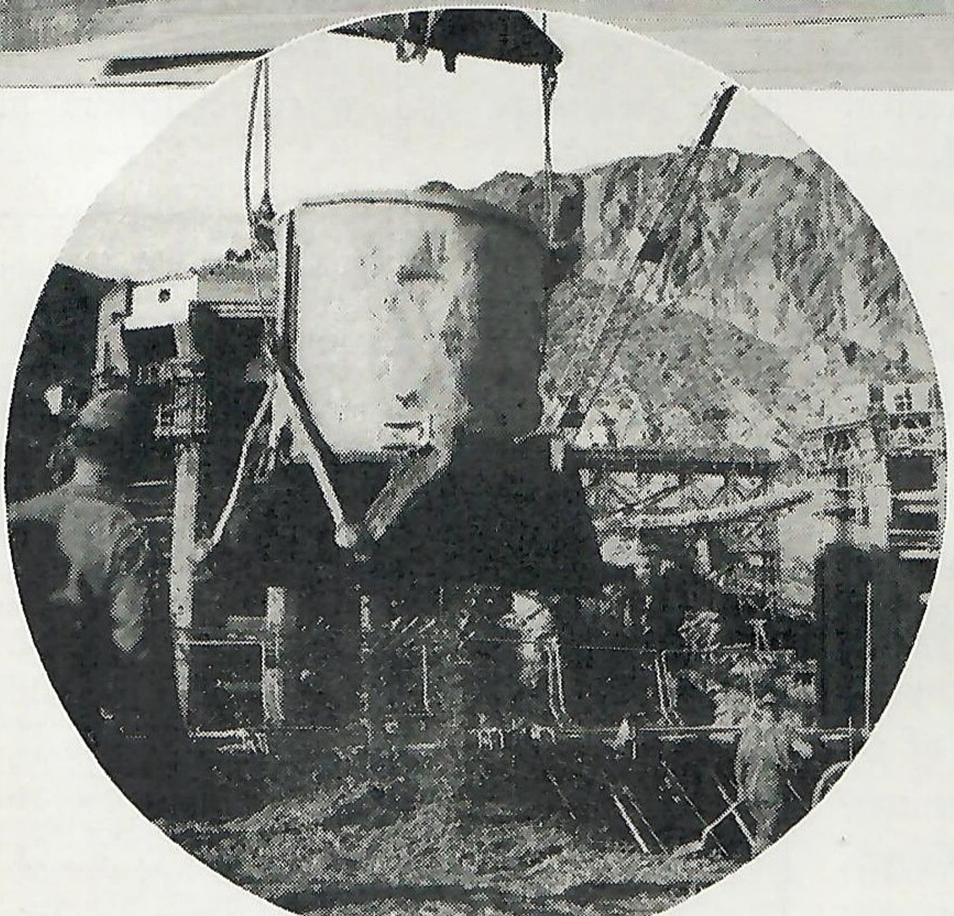


Below: Upstream view, from the Nevada side, of Boulder Dam, showing the dam, intake towers, spillways, and highline cables.









Upper left: Base of power plant. Lower left: Dumping concrete on top the dam. Right: Workmen "grouting" the canyon side. In the extreme upper right can be seen the largest high-line, composed of six $3\frac{1}{2}$-inch cables, each with 25-ton capacity.

"First 100% Pure Paraffin-Base Oil—"

ON this month's cover of the *Bulletin* is a reproduction of the key illustration used in current newspaper and billboard advertising, emphasizing the point that Triton Motor Oil is the first 100% pure paraffin-base oil to be refined from California or Western crudes. As a matter of fact, it is the first 100% pure paraffin-base motor oil to be commercially produced from any crude to date, as far as we know. All of the Eastern "paraffin-base" lubricants that have so far been tested in the company's research laboratory have contained a small percentage of low gravity materials, that are classed as carbogens and naphthenes, which prevent them from being declared "100 per cent pure paraffin-base." In other words, an oil may be "100% Pennsylvania" and still not be 100% pure paraffin-base."

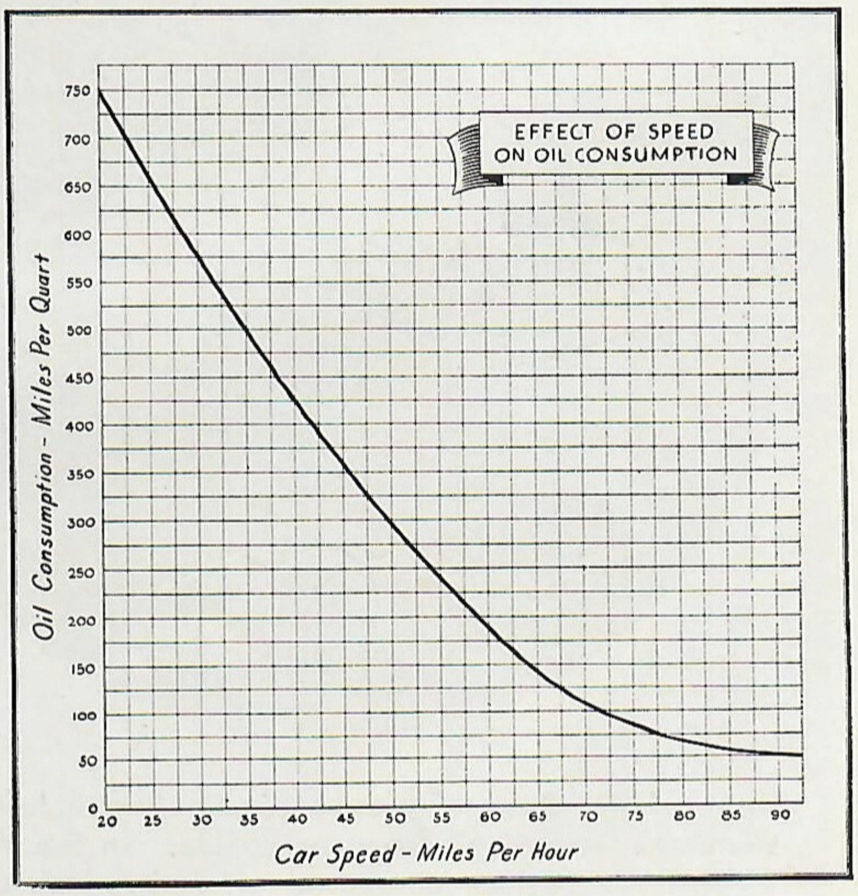
The PROPANE solvent process by which Triton is refined removes all of the low-gravity, low-grade hydrocarbons from the lubricating stock, leaving only the pure paraffin-base oil. This is the basis of Triton's superiority and the reason for its high resistance to oxidation, greater stability in service, and for the fact that it reduces engine wear.

Since November 22, when it was first introduced to Pacific Coast motorists, Triton has taken its place among the finest of the premium motor oils. Thousands of persons are reporting its performance superior to the "Eastern" or "Western" oils they previously used, and assert the company has been conservative in its advertised claims for it. Hundreds of new car dealers, in addition to several thousand resellers, have stocked the new oil and are recommending its use over other premium oils.

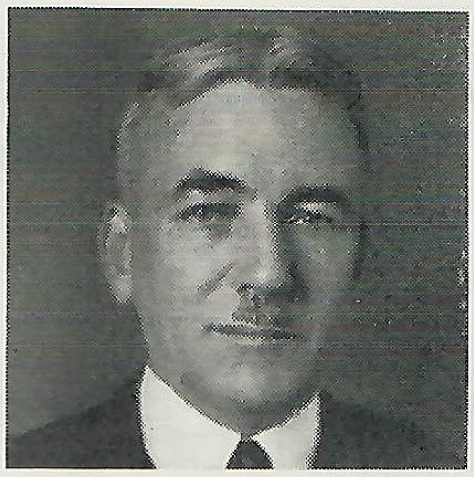
Effect of Speed on Oil Consumption

THERE are many factors which affect the consumption of a motor oil, and speed is one that a motorist may check for himself. From the accompanying chart, it may be observed that while a car may consume only a quart of oil in 750 miles at a speed of 20 miles per hour, the same car, traveling at a speed of 90 miles an hour, will consume a quart of oil every 50 miles, an increase in consumption of 1,400 per cent, due to speed alone. Few motorists will drive 90 miles per hour, but many on the open highway will hold a speed of 60 miles per hour, and the average consumption of oil at that pace, as the chart shows, is less than 200 miles per quart.

Among the other factors which will affect consumption are mechanical leakage at the crankcase gasket and at the front and rear main bearings, and worn cylinders and piston rings.

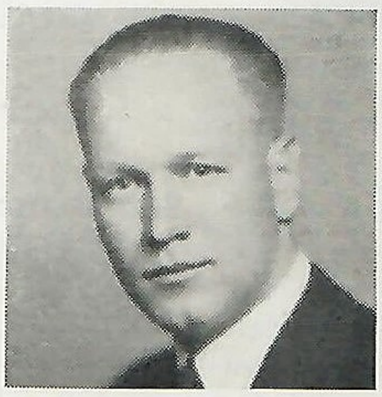


Changes in Comptroller's Office



G. H. Forster
Comptroller

A. B. Mason
Assistant Comptroller



A. H. Hand
Assistant Comptroller

M. G. Kerr
Assistant Comptroller

ON December 28, last, M. G. Kerr was elected an assistant comptroller of the Union Oil Company. Coincidental with this election, G. H. Forster, comptroller, announced the following realignment of the organization of the comptroller's office.

A. B. Mason, assistant comptroller, will now be in charge of the company's general and financial accounts, disbursements and payrolls, subsidiary companies' accounts, and personnel and office management. Reporting to Mr. Mason are W. H. Steele, auditor of general accounts, and C. L. Craig, auditor of disbursements.

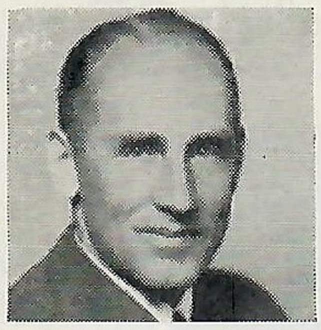
A. H. Hand, assistant comptroller, is in charge of statistics, reports and estimates, the Provident Fund, and the mail and duplicating division. In this work, he will follow closely the activities of the petroleum industry and handle special assignments. C. R. Erb, statistician, reporting to Mr. Hand, heads the statistical division.

M. G. Kerr, assistant comptroller, now has charge of operating accounts, crude oil production, purchases, stocks and exchanges, pipe line accounts, refinery and gas department accounts, sales and marketing station accounts, purchasing department and stores division accounts, garage accounts, and forms and printing. Reporting to Mr. Kerr, R. H. Hornidge is auditor of production and transportation accounts and in charge of field accounting offices; H. H. Hannah is auditor of marketing station accounts and has supervision of division auditing offices; and H. A. Lapham is auditor of refinery accounts.

J. R. Hearle is auditor of taxes, with L. C. Glendenning as assistant auditor.

Mr. Forster was elected comptroller on February 26, 1929. He first became associated with the company in 1913 as an acountant. Within a year, he was advanced to the position of chief accountant, and, on June 28, 1920, was elected assistant comptroller. In the past ten years, Mr. Forster has been very active in national accounting circles, particularly in connection with the American Petroleum Institute. He has been a member of the Institute's Committee on Uniform Methods of Oil Accounting since 1925, and since 1927 chairman of the Pacific Coast Regional Committee of that committee. He was chairman of the final revising committee of the Committee on Uniform Methods of Oil Accounting, and, as such, largely responsible for the charts of accounts and text in the original publication in 1929 of the Institute's present manual of uniform oil accounting, which includes the recommended general balance sheet, capital assets and reserve accounts, general income account and earned surplus analysis, and income and cost and expense accounts. At the present, Mr. Forster is a member of the Accounting Committee of the Planning and Coordination Committee under the Code for the Petroleum Industry, and also chairman of the Sub-Committee of Oil Accountants, and a member of the Committee on Uniform Tank Measurements and Gauge Tables, of the A.P.I. Central Committee on Standardized Procedure for Measuring, Sampling and Testing Crude Oil. For several years he has been chairman of the Auditing

J. R. Hearle



R. H. Hornidge

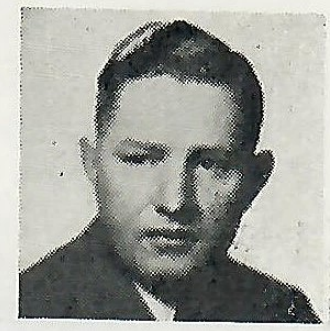
W. H. Steele

H. H. Hannah

C. L. Craig

H. A. Lapham

C. R. Erb



L. C. Glendenning

Committee of the California Oil and Gas Association.

Mr. Mason first became associated with the company in 1914 as chief traveling auditor. Within a year he was made auditor of station accounts, and, later, was named auditor of refining and marketing accounts. On April 26, 1926, he was elected to his present position. Before coming with the company, Mr. Mason was with Price, Waterhouse and Company, certified public accountants. He is a member of the British Society of Incorporated Accountants and Auditors.

Beginning his career with the company as a junior clerk in 1911, Mr. Hand held various positions in the comptroller's department until, in 1920, he was promoted to the general accounts division. In 1924, he was made assistant to auditors, in 1926 he was advanced to chief of general accounts, and two years later became auditor of general accounts. In March, 1931, he was made assistant to the comptroller, and, on January 8, 1934, was elected an assistant comptroller. His present work involves, principally, the presentation of various analyses pertaining to the company and the industry in general. For some years he has been active in petroleum industry matters, and has been largely responsible for the origination of much of the work carried on by the company's statistical division. Mr. Hand is a member of the Research and Statistics Committee, Los Angeles Chamber of Commerce, and of the A.P.I. Pacific Coast Statistical Advisory Committee. He was District Allocator for the Regional Refining Committee of District 8 for October and November, 1934.

In 1910, Mr. Kerr came with the company as clerk in the crude oil division. Later, he was transferred to the Los Angeles sales office, was made cashier at Santa Paula in 1914, and chief clerk in the crude oil division in 1917, after which he became traveling auditor until 1924, when he was made auditor of production and transportation accounts. In 1930, he was promoted to auditor of refining and marketing accounts, which position he has just left to become an assistant comptroller. Mr. Kerr was president of the Petroleum Accountants Society of Los Angeles in 1929-30.

After some years with the Tri-State Railway and Electric Company in Ohio, W. H. Steele came with the company in 1913 as a clerk in the crude oil division. After filling various positions, he was named chief of the crude oil division in 1926. Shortly afterward, he was instrumental in consolidating the pipe line, steamship and field divisions to form the present production and transportation accounts. In October, 1928, Mr. Steele was promoted to chief of general accounts, and, in March, 1931, he assumed his present position as auditor of general accounts.

C. L. Craig came with the company in 1917 as chief clerk at the Avila refinery, but a few months later was made chief of the insurance division. He remained in this capacity until June, 1923, when he was advanced to the position of chief clerk of disbursements, and, in 1926, was promoted to auditor of disbursements.

R. H. Hornidge first was employed as a clerk in general accounts in 1915. In 1917 he was transferred to station accounts, and, in 1919, he became a traveling auditor. In 1926, he was made auditor of refining and marketing accounts, and assumed his present position as auditor of production and transportation accounts in January, 1930. Mr. Hornidge, at present, is a vice-president of the Petroleum Accountants Society of Los Angeles.

In 1919, H. H. Hannah associated with the company as a traveling auditor in San Francisco. After several years in this capacity, he was named auditor of general accounts in 1926, and, from January, 1928, to May, 1930, he was secretary of the Atlantic Union Oil Company, Ltd., in Australia, in which the Union Oil Company owned a half-interest. Since returning to Los Angeles, Mr. Hannah has acted in various capacities until he was promoted to his present position as auditor of marketing station accounts.

H. A. Lapham's first position with the company was that of accountant in the manufacturing department at the head office in 1921. Late in 1923, he went to Baltimore as special representative for the company, remaining there until March, 1926, when he returned to Los Angeles to assume his previous position. In August, 1931, Mr. Lapham was made chief of refinery accounts, and, the first of 1935, was advanced to auditor of refinery accounts.

J. R. Hearle was first employed by the company in 1912 as an accountant, keeping the books of subsidiary companies. In 1914, he handled general accounts, federal and miscellaneous tax matters. Ten years later, he was appointed auditor of general accounts. Owing to developments in federal and state taxation, and because of his experience, his work has been confined solely to tax matters since 1926, at which time he became auditor of taxes.

Coming from the American Telephone and Telegraph Company in Oakland, Mr. Erb entered the employ of the company in 1920 as an accountant in San Diego. He was transferred to general accounts in 1923, where he became a senior accountant. In March, 1931, he was promoted to the position of chief of general accounts, and, a few months later was advanced to the newly created position of statistician. He is a member of the Fact Finding Committee of the Regional Refining Committee for the Pacific Coast territory, which operates under the provisions of the petroleum industry code. As a commissioned officer in the A.E.F., Mr. Erb was in France in 1918-1919.

L. C. Glendenning was first with the company in 1916, but left in 1918. During the next several years he worked in the oil fields in Mexico. In 1926, he returned to the company as clerk of miscellaneous accounts, but shortly afterward was made a traveling auditor. For a time, in 1928, he was an accountant in general accounts, and, in April, 1928, was transferred to the tax division.

Effective the first of the year, O. D. Houx was appointed Northern Division auditor, with headquarters at Seattle. Mr. Houx has been with the company since 1922, first as a district auditor before transferring to marketing station accounts, Head Office, which position he left to assume his new duties in the north.

Turkey Shoot Held

A most successful and enjoyable Turkey Shoot recently was held in Brea Canyon for Union Oil employees and friends. Sponsored by the newly formed Union Oil Rifle and Pistol Club, with Edmund Jussen, U.S.R.A. governor and head of the club, acting as general chairman, approximately 400 were attracted by the event.

Participants had their choice of .30 calibre rifle, small bore rifle, pistols of any calibre or trap shooting. A novel moving target on the pistol range provided very interesting competition in one event.

There were 38 events of ten entrants each, held during the day. Twenty-four turkeys, six sides of bacon and $22 in cash were the prizes won by the various contestants. Hot "Java" and barbecued beef sandwiches staved off hunger.

It is the purpose of the club to hold an annual pistol shoot, and to develop a pistol and small bore rifle range for shooting throughout the year. Incidentally, the first shoot was a financial success.

Christmas Baskets Delivered

Christmas cheer again was spread by Union Oil employees recently, when the Girls' Club delivered 130 Christmas baskets to families and individuals aggregating approximately 500 persons. Each basket contained twenty-three items of staple food in sufficient quantity to last a week. For families where there were small children, rubber toys were included. Also, some clothing was distributed. As each basket was being delivered, a cheerful "Merry Christmas" greeted the recipient.

Members of the Girls' Club wish to express their appreciation for the work of the purchasing, warehouse, sales and field departments in packing and distributing the baskets, and for the contributions and cooperation of every one who so cheerfully made possible a little Christmas cheer to so many.

1934 Tennis Finals Held

Finals in in the 1934 annual Union Oil Company Tennis Tournament were played at the L. A. Tennis Club late in November, climaxing six strenuous weeks of competition. More than 60 contestants participated.

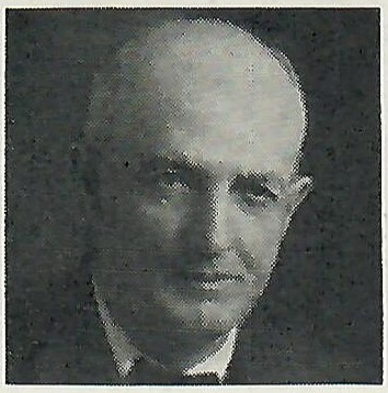
Lee Spencer, L. A. Refinery, won the men's singles championship for the third consecutive year by defeating Ralph Nevens, Head Office, thus becoming the permanent possessor of the "President's Cup."

The doubles' championship was won by Lloyd Morgan and Bill MacPherson who defeated W. H. Martin and Johnny Hallinen. Miss Stella Fitchett, Santa Fe Springs, defeated Mrs. Bernice Bateman in the women's singles. Ray Gale, L. A. Refinery, won the men's singles consolation by defeating J. E. Koogle, Geological Department.

J. W. Bennett

H. C. Farquhar

25 Years



G. C. Woodhams

James A. Lakeman

Service Emblem Awards

IN 1934, there were 509 employees who received service emblem awards for having been with the company for ten years or more. This increased the number of employees wearing the emblems to 2,253.

The number of employees receiving emblems during 1934, and the total number of employees having received the awards by the end of last year, are broken down into classifications to show the respective lengths of service. No employee is eligible to receive a service emblem before completing ten years' continuous service.

Years' Service	Employees Receiving Awards in 1934	Total Employees Receiving Awards
10	224	1,347
15	204	611
20	56	215
25	21	69
30	4	9
35	....	2
Total	509	2,253

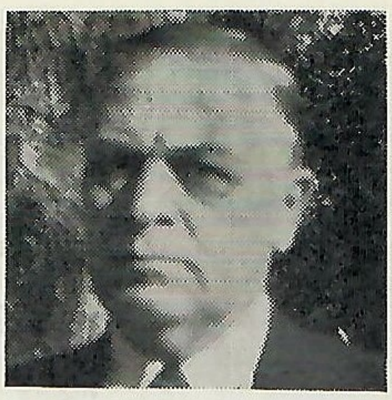
During the two months, November and December, five employees, J. W. Bennett, H. C. Farquhar, G. C. Woodhams, James A. Lakeman and Frank E. Beltz, completed twenty-five years' service.

In the same period, seven employees completed twenty years' service, while the fifteen-year group was joined by forty-six, and the ten-year group by thirty-two employees.

On November 1, 1909, J. W. Bennett entered the engineering department of the company, and almost immediately began constructing the Seattle main station. In 1911, he erected a fuel oil plant in Victoria, B. C., for the Esquimalt and Nanaimo Railway, and, shortly afterward, was in Honolulu for four months altering the fuel oil plant. In 1913, he was made resident engineer at Seattle, remaining there until 1926, when he was appointed to his present position of engineer of the Central Division, with headquarters in San Francisco. In the 25 years spent with the company, Mr. Bennett has supervised innumerable jobs, including the construction of the Seattle, Spokane, Vancouver, San Francisco and Oakland main stations, several bulk storage plants, scores of substations and service stations, and considerable alteration work.

J. D. Nesbitt

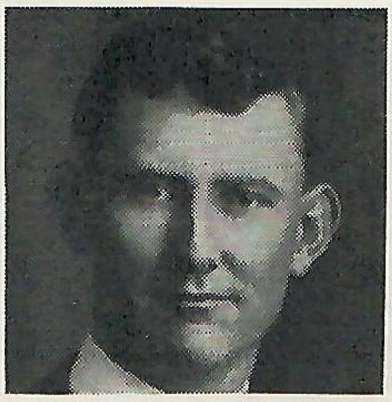
C. E. Van Marter



E. E. Pendleton

T. E. Harrison

20 Years



F. G. Tatjes

H. C. Farquhar came with the company on November 1, 1909, as price clerk for the Union Well Supply Company, a subsidiary of the Union Oil Company. Later, he became purchasing agent for the supply company and, upon its dissolution, became assistant purchasing agent for the Southern Division purchasing department, operating in conjunction with the Northern Division department previously established at San Francisco. Later, the two departments were combined, Mr. Farquhar continuing as assistant agent until 1922, when he became purchasing agent for the company. In 1924, he assumed his present title, that of manager of purchases, and, in addition, was given jurisdiction over all company warehouses.

Entering the employ of the company as freight clerk in the auditor's office on November 4, 1909, G. C. Woodhams later became chief clerk in the same office. In 1912, he was named chief clerk in the Los Angeles yards, and, from 1915 to 1919, served as superintendent of deliveries. During the next few years, he was bookkeeper in the Orcutt division. then was appointed head bookkeeper of the Brea-Santa Fe Springs-Dominguez districts. Early in 1925, Mr. Woodhams was transferred to the general accounts division at the head office, where he took charge of control records. In September, 1932, he was transferred to his present position in the station accounts division.

First employed by the company as a helper in the boiler shop at the Oleum refinery on December 1, 1909, J. A. Lakeman became a pipe fitter's helper, and then, in 1916, a first class pipe fitter, in which position he now is occupied. In the eighteen years he has worked as a pipefitter, Mr. Lakeman has worked on every major pipe replacement or installation at the Oleum refinery, and, in his entire 25 years' service, has never experienced a lost time accident—a real safety record for one engaged in such work.

F. E. Beltz came with the company on December 27, 1909, as a driver of a four-mule team, hauling fuel oil in San Francisco. As increased business enlarged the loads, he had six mules for a time. In 1913, he was assigned a motor delivery truck. At present, he is driving the largest fuel oil truck operated in San Francisco. The truck has a capacity of sixty barrels—more than 2,500 gallons.

On November 1, 1914, J. D. Nesbitt began with the company as clerk in the San Diego office. In 1917, he resigned to join the aviation corps, but returned with the company the next year. In 1923, he was a salesman for the San Diego district, and, shortly afterward, was made an assistant sales manager. In 1928, he was promoted to district sales manager at San Diego.

C. E. Van Marter entered the employ of the company on November 6, 1914 as an electrician at the Oleum Refinery. The next year he was made electrician foreman, and has held that position ever since.

As a gauger and yardman, E. E. Pendleton entered the service of the company on December 1, 1914 at the Stewart pump station. Three years later, he became an engineer at that station, which position he holds at the present time.

Coming with the company on December 4, 1914, T. E. Harrison began as a tank wagon driver in Camarillo. In 1916, he was transferred to Santa Paula to work in the same capacity, and in 1917 returned to Camarillo as agent. After holding various sales positions during subsequent years, he was promoted to agent at Santa Paula the first of 1929, which position he now holds.

A. F. Hamberg joined the company on December 7, 1914, as a warehouseman at the Potrero Plant, San Francisco. He has spent his entire period of employment with the Union Oil Company at that plant. Sometime after first being employed, he acted in the capacity of package truck salesman, and in 1924 was given his present position of plant engineer and gauger.

On December 16, 1914, F. G. Tatjes came with the company as a worker at the San Luis Obispo tank farm. In 1915, he was transferred to Santa Margarita pump station to install cement floors in the boiler house and pump station, after which he traveled from station to station along the Producers Transportation Line as general repairman. In 1918, he was transferred to the engineering department as pipefitter at the Oleum Refinery, later becoming foreman of that work. After 11 years in the engineering department, he was transferred to the Los Angeles Refinery as carpenter, at which plant he is now carpenter and painter foreman.

Starting at the Orcutt absorption plant on December 21, 1914, H. G. Dickerson entered the employ of the company as an auxiliary engineer. In 1921, he became pumper and, in 1927, an operator at the same plant. In 1930, he was transferred to the Producers Transportation Line as a foreman, but returned in 1931 as an operator at the Orcutt absorption plant, where he now is stationed.

Fifteen Years—November

Barnhart, W. I., Sales, Southern Division
Bosanko, T. C., Mfg., Los Angeles Ref.
Brown, H. A., Pipe Line, Southern Division
Bultmann, Robt. A. W., Gas, Southern Division
Coffey, L. D., Mfg., Los Angeles Ref.
Collins, C., Sales, Northern Division
Cummins, Michael, Mfg., Oleum Refinery
Donovan, Robt. E., Sales, Northern Division
Fitzgerald, Jasper, Mfg., Oleum Refinery
Fletcher, Lynn W., Field, Southern Division
Grant, James C., Mfg., Los Angeles Ref.
Hemmerling, Ben, Field, Southern Division
Hill, Emmett, Field, Southern Division
Hoskins, E. H., Sales, Central Division
Jesson, R. H., Transp., Head Office
Johnson, Harry, Mfg., Oleum Refinery
Lane, G. S., Transp., Head Office
Lienesch, C. F., Sales, Head Office
Millar, Ira B., Field, Southern Division
Neubauer, Simon, Field, Southern Division
Oliver, H. M., Field, Southern Division
Parry, Sam E., Field, Southern Division
Plaskett, L., Field, Northern Division
Rosenbrock, Wm. H., Sales, Central Division
Speer, C. T., Field, Southern Division
St. Mars, Dall, Mfg., Oleum Refinery
Stockton, E. S., Transp., Head Office
Teal, R. M., Compt., Head Office
Wheeler, Vester, Field, Southern Division
Wise, J. L., Mfg., Oleum Refinery

Ten Years—November

Bassett, J. S., Sales, Northern Division
Boston, L. C., Field, Southern Division
Carlson, V. J., Sales, Northern Division
Collins, Tom, Transp., Producers Pipe Line
Crandall, F. G., Auto., Central Div. Garage
Crosse, L. J., U. S. S., Northern Region
Frey, C. W., U. S. S., Southern Region
Kunz, H. F., Sales, Central Division
Fleming, Mary Agnes, Sect., Head Office
McKim, R. W., Jr., Sales, Central Division
Nolan, H. E., Sales, Southern Division
Simerly, R. B., Auto., Central Div. Garage
Small, Pauline, Sect., Head Office
Tunstill, Wm. O., Pipe L., Southern Division
Vale, Wm., Auto, Los Angeles Garage

Fifteen Years—December

Davenport, W. E., Sales, Northern Division
Dodge, V. K., Sales, Southern Division
Earnhart, C. C., Pipe Line, Southern Division
Fearon, Wm. E., Field, Southern Division
Grierson, J. C., Cashier, Head Office
Hannah, H. H., Compt., Head Office
Haugh, G. W., Transp., Producers Pipe Line
Hearn, D. L., Field, Southern Division
Hoag, C. M., Mfg., Head Office—L. A. Ref.
Humberg, H. A., Sales, Southern Division
Meador, L. A., Sales, Central Division
Schlagenhauff, G., Field, Southern Division
Scott, Mabel E., Sales, Southern Division
Thedens, G. J., Sales, Central Division
Trook, P. W., Field, Southern Division
Voorhees, Fred, Field, Southern Division

Ten Years—December

Adkins, P. L., Mfg., Los Angeles Ref.
Bernon, L., Const., Southern Sales
Edwards, M. H., Bldg., Union Oil
Enrietta, E. P., Mfg., Los Angeles Ref.
Eye, Harvey, Mfg., Oleum Refinery
Frisbey, C. G., Jr., Mfg., Oleum Refinery
Fritch, Louise, Sales, Head Office
Hawthorne, Otha A., Mfg., Los Angeles Ref.
Leahy, T. J., Mfg., Oleum Refinery
Lydick, Wm. S., Sales, Southern Division
Lyons, E. E., Field, Southern Division
McAllaster, M., Gas, Southern Division
Moran, Vivian I., Credit, Head Office
Moresi, Irene L., Sales, Central Division
Potter, Asa F., Transp., Producers Pipe Line
Scholz, J. R. Sales, Southern Division
Theisen, A. L., Sales, Northern Division

Bulletin Article Reprinted

The article, "Field Development Operations Go Scientific," which appeared in the September, 1934, issue of the Bulletin, has been reprinted by several trade journals, scientific magazines, etc., and has been translated into French, German, Russian and Rumanian languages.

The Bulletin attempts to present all articles in an authentic and factual manner, and the company is interested in as broad a dissemination of such facts about the petroleum industry as is possible to obtain.

Consequently, the Union Oil Company is willing, at all times, to cooperate with reputable publishers in every way possible. In pursuit of this policy, the company's files and materials which go to make up the Bulletin always are open for inspection. and may be borrowed for use in reproductions.

REFINED AND CRUDE

By RICHARD SNEDDON

The only Triton complaint developed to date is that the empty cans are piling up so fast, the dealers don't know what to do with them. Any small boy will tell you such things are bound to a cur.

It has been pointed out, too, that there is a striking similarity between our educational system and the method of manufacturing coffee. In both procedures a large percentage of the active ingredient is extracted from the bean.

In the same connection, statisticians tell us that if all the college boys who sleep in class were placed end to end, they would be very much more comfortable.

And it is a peculiar circumstance that most of our information regarding ancient married life has been gleaned from broken pottery.

Life, after all, is a queer old business. The average individual first loses his health trying to become wealthy, and then loses his wealth trying to become healthy.

In many respects, however, modern man distinctly resembles his primitive ancestor. Today when the women folks talk too much he goes to his club. In ancient times he simply reached for it.

So perhaps Junior wasn't very far wrong when he stated that men and women sprang from monkeys, but women sprang the farthest.

Which recalls the fact that a jazz band recently played before the monkey house in an eastern zoo, since when we understand the simians have been all burned up over the evolution idea.

And in all probability, two million years from now the inhabitants of this old globe will get mad when the scientists try to convince them they are descended from man.

Returning now to the arts, we are informed that some genius has invented a new musical instrument which is a combination of the violin and saxophone. We have always been afraid that this would happen some day.

And if, as we are told, there is music in heaven, then the other place must be where the musicians go to tune their instruments.

We are still at a loss to determine, however, where the people who live beyond their incomes get the money to live beyond their incomes.

And how on earth money ever came to be termed dough. You know dough sticks to the fingers.

The mint makes it first, and it's up to us to make it last.

Then there was the foolish young man who told his girl that her nose was a shining example of old fashioned simplicity.

We understand that in a big "better English" campaign, just about to be launched, the first move will be the extermination of all owls—these stupid birds that keep yelling "to who", when everybody knows the correct expression is "to whom."

And while George Washington never told a lie, it is probable that his wife never had any occasion to ask him how much retroactive pay he received.

"Can you believe it," expostulated the rousty's wife, "that Mrs. Jones actually had the impudence to ask me how much back money my husband got?" "Well, of all the nerve," said her solicitous neighbor, "how much did you tell her?"

We have just read an item to the effect that certain members of the British royal family recently went up to Scotland to shoot pheasants. The lower classes always do get it in the neck.

And that a well known movie star is now in Reno signing the Declaration of Independence.

You have heard, of course, about the poor chap who fought all through the first three years of the Great War, but was finally forced to join the army.

Also that about ninety-eight per cent of our oil men are working their sons' way through college.

In conclusion, remember that pride goeth before the photograph is taken for the passport.

PRINTED IN U. S. A. WOLFER PRINTING CO., LOS ANGELES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