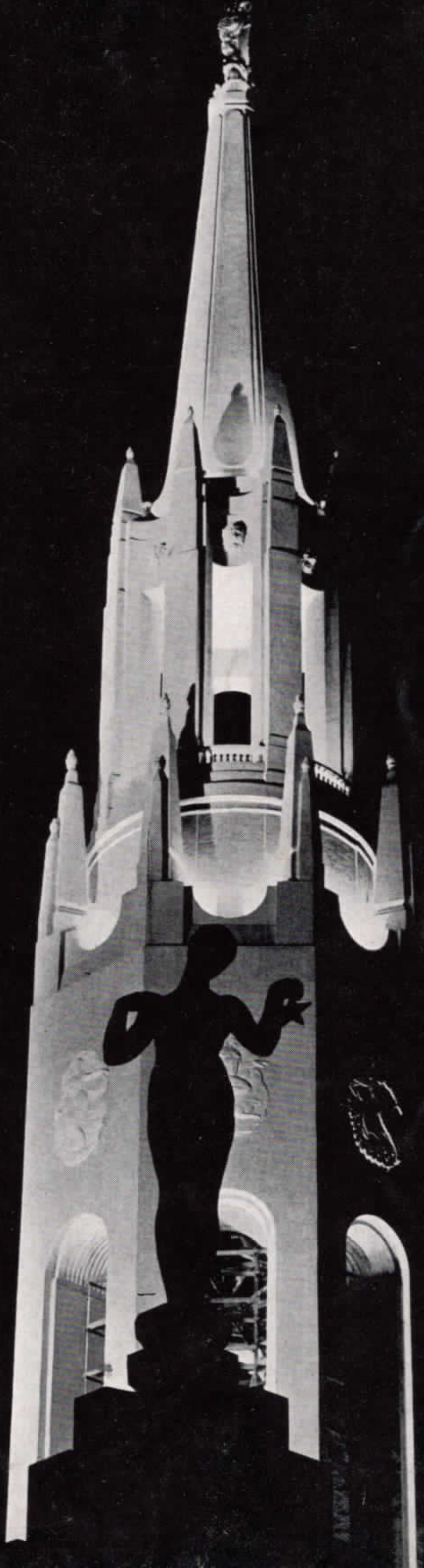
★ UNION OIL BULLETIN ★



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GAS MANUFACTURE

by

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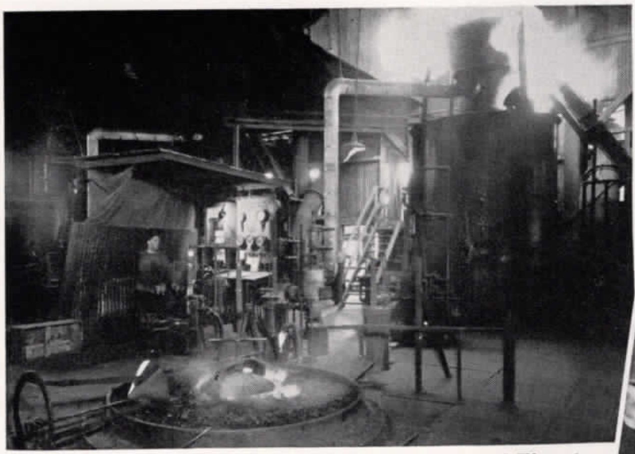
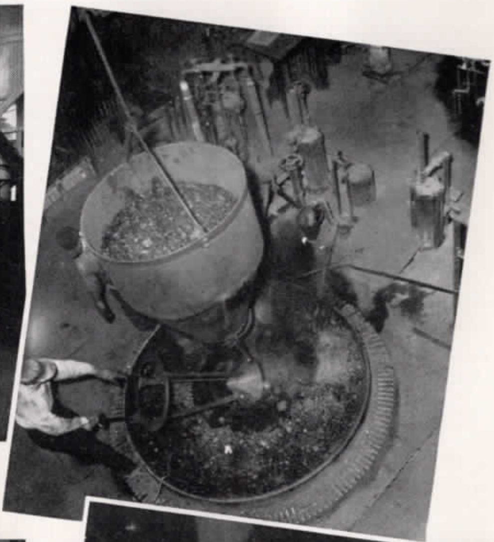
BEFORE any substance can be caused to take fire, it must be an inflammable gas, must be emitting an inflammable gas, or must be preheated to the temperature at which the emission of inflammable gas occurs. That is a law as immutable as the law of gravity, and is the law, undoubtedly, that first suggested the desirability of manufacturing gas as a high energy, easily-ignited medium for domestic and commercial use.

"The purpose of the manufactured gas business," in the words of J. J. Morgan, well-known authority on the subject, "is essentially that of converting the heat energy which exists in coal, oil or other fuels, to gas, a higher form of energy, which can be easily conveyed through pipes to the point of consumption."

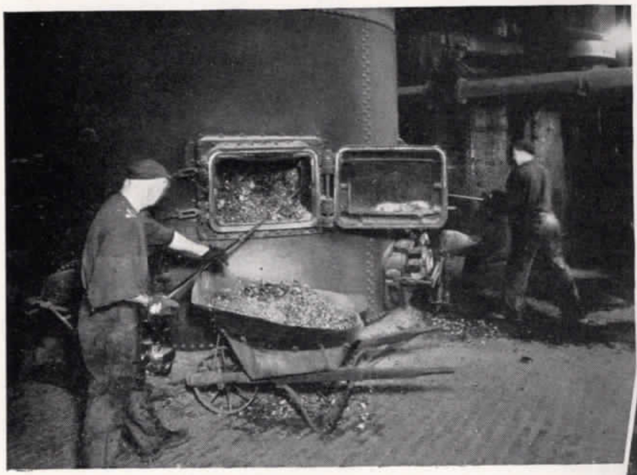
Although he may have been unaware of the fact, man has used gas ever since he first produced fire, since, as already explained, no combustion takes place without it; but the word "gas" itself, derived from a Flemish word meaning "spirit," was not known until 1609, when the Flemish chemist, Van Helmont, so entitled it to indicate its intangible quality.

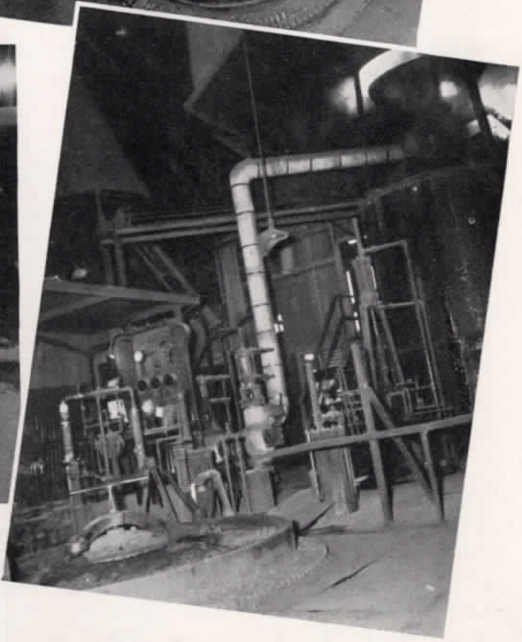
The principal types of gas manufactured for commercial and domestic heating are coal gas, oil gas, carburetted blue gas (water gas), and a mixture of air and butane. Coal gas, as the name implies, is produced from coal, and is derived by distillation in air-tight containers, through the application of external heat. The admission of air into the retorts would furnish the oxygen needed for combustion, and the valuable gases would be burned up in the process, hence the necessity of carrying on the distillation under air-tight conditions. Sometime between 1660 and 1670 this particular process was begun, although it was





Above: Operating floor at the Washington Gas and Electric plant, showing generator in foreground and super-heater behind. Right: The generator is recharged with coal.





Above: The generator must be cleaned and recharged every ten hours. This is done from the plant's lower level. Right: During a gas-making period, which recurs at four minute intervals, the top of the super-heater is closed.

not perfected until many years later. In fact, the first real application is attributed to William Murdock, a Scotch engineer, who, in 1792, lighted his home at Cornwall with coal gas. Some fifteen years later, Frederick Winsor, a German, proved its more general applicability by lighting the street lamps of Pall Mall in London with the new illuminant; and in April, 1812, a charter was obtained for the world's first gas company—the London and Westminster Gaslight and Coke Company.

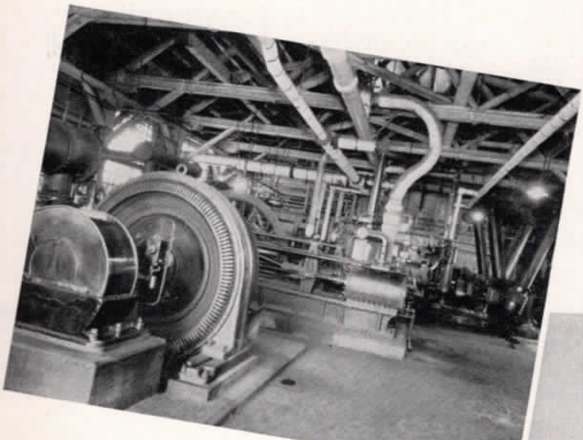
The new world was quick to recognize the advantages of gas, and by 1816 Rembrandt Pearle had organized in Baltimore, America's first unit in the young gas industry. Some conception of growth in the meantime may be gleaned from the fact that manufactured gas is now one of the most important of modern fuels, and its 9,831,600 consumers use it up at the staggering rate of 356,081,800,000 cubic feet annually.

Carburetted blue gas, commonly known as water gas, was developed in 1875, and is so-called because it is produced by spraying steam on a bed of hot carbon. A chemical reaction occurs between the oxygen and hydrogen contained in the steam, and the hot carbon. Carbon monoxide and hydrogen gases are thus formed.

It is a modification of this type of gas that the Washington Gas and Electric Company of Tacoma, Washington, furnishes to a large roster of domestic consumers, and the story of its manufacture and distribution constitutes an important factor in the industrial growth of the Tacoma area.

Preparation of the ground for the erection of the first gas works of Tacoma began on May 31, 1884, at Twenty-third and A Streets, and proceeded merrily apace, while an initial shipment of 1300 tons of pipe was being carried around the Horn for the new job. It arrived in due course, and on the completion of the plant and the three-mile distribution system, some of which, incidentally, was wooden pipe, gas was finally turned into the mains on February 1, 1885.

The company started with 26 contracts, and it is a matter of accurate record that the first residence to be connected to the mains was that of General Sprague, who had been instrumental in interesting Charles B. Wright of Philadelphia in Tacoma's need of gas service.



Above: Through this spotless compressor room the gas is pumped into pipe lines for distribution to Tacoma, Olympia, Puyallup, Sumner and Auburn.

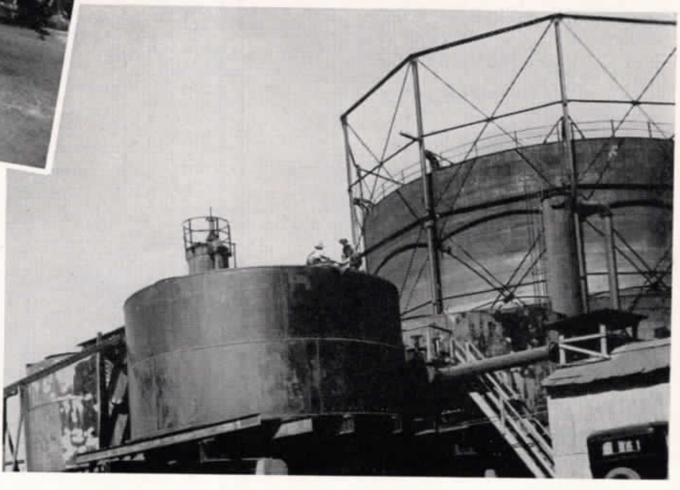
It is interesting to note that the present offices of the Washington Gas and Electric Company at Tenth and A Streets are located on the exact site formerly occupied by its first customer, General Sprague.

From the location of the original plant, the company continued to serve its patrons for 40 years, but in 1920, Mr. D. J. Young, then manager, impelled by the high cost of raw materials, began an exhaustive study of the economics of gas manufacture. In this he was aided by Professor G. E. Whitwell of the University of Washington, and the result of their efforts was the development and patenting of a new method, known as the Young-Whitwell Back Run Process. This proved highly successful. In fact, it revolutionized carburetted water-gas making to such an extent that existing apparatus has been modernized by adding the Young-Whitwell connections, and no new equipment is now installed without it.

A thoroughly modern plant, incorporating the new system, was promptly begun on the Tide Flats, and was completed in 1924, when the old site was abandoned.

A description of the Young-Whitwell process, and what it has accomplished under the administration of the Washington Gas and Electric Company of Tacoma, provides an interesting exposition of applied research, and its effect on industrial expansion. Its introduction marked the first real advance in the manufacture of water gas, since the recognition of this commodity as a commercially desirable and marketable product.

There are three general phases into which



Right: Raw gas is pumped into the relief holder in background. It then goes through the purifier tanks at left, which remove hydrogen sulphide, and into the washer-cooler, at right, which causes tar to condense into the "scrubbing water."

the operations of any gas manufacturing plant may be divided:

1. The actual manufacture of raw gas.
2. Purification of the gas to provide a clean, marketable fuel.
3. Recovery of the valuable residuals as by-products.

The manufacture of carburetted water gas at the Tacoma plant is carried on in three brick-lined perpendicular steel cylinders. They are known as the generator, carburetor, and superheater, and are connected together in this sequence. The top of the generator is connected to the top of the carburetor, the bottom of the carburetor to the bottom of the superheater, and the superheater outlet carries the gas finally through a wash box and seal into a tank, known as the relief holder.

Inside the generator, about three feet from the bottom, is a series of grates, on which is placed the coal or coke for gas making. The carburetor and the superheater are filled with checker brick, the former to gasify the oil, as explained later, and the latter to compound or fix the quality of the raw gas generated.

In actual operation, the first step is to heat up the system to the required temperature. This is done by blowing air up through the fuel in the generator until it reaches a temperature of about 2500° F. The producer gas thus formed discharges from the top of the generator into the top of the carburetor where it is mixed with air and ignited. The heat so developed raises the temperature of the checker bricks in the carburetor and superheater to a point somewhere between 1500° and 1550° F., whereupon the system is ready for gas generation.

During the preheating period, the spent gases are vented through a stack valve at the top of the superheater, but when the desired heat has been acquired, this valve is closed, and the actual gas-making begins. Steam is now passed through the hot fuel bed in the generator, and, combining with the carbon of the coke or coal, produces carbon monoxide and hydrogen as previously explained. The mixture, as produced, however, is not sufficiently high in available heat units for city use, and oil gas is added in the following manner: As the monoxide and hydrogen pass into the carburetor, oil is sprayed on the hot checker brick, where it is cracked to form a gas of high heat content. This newly formed gas is swept into the superheater by the gases from the generator, and here they are all reformed into one homogeneous gaseous mixture, rich enough for all the purposes of the various consumers. Thence they are carried through the wash-box to the relief holder.

The heating period and the gas-making period together are termed a cycle, and in the Tacoma plant this cycle is of about four minutes duration. The alternate heating and generating continues at four-minute intervals for nine or ten hours, at the end of which time the fuel bed is reduced to clinkers, the system is shut down, and the generator cleaned and recharged for the next run.

Next comes the purification of the raw gas. As it reaches the relief holder, the gas contains tar, hydrogen sulphide, and ammonia, all of which are impurities that must be removed before the final product passes the prescribed tests of satisfactory quality. The tar and ammonia are first eliminated by passing the gas through a series of cylindrical tanks called scrubbers, in which it is sprayed with cool water. This causes the tarry matter to condense and deposit, and at the same time dissolves the ammonia, so that two of the undesirable constituents are removed in one operation. There remains now only the hydrogen sulphide to be disposed of, and this is contrived by the simple process of passing the gas from the scrubbers through large tanks containing beds of wooden chips, coated with iron rust. The iron rust has an affinity for hydrogen sulphide gas, and forms with it a new compound, iron sulphide, which is not gaseous. This, of course, adheres to the surfaces of the wooden chips, the water gas is thus rid of the last impurity, and is now ready for distribution.

At this stage it is conducted into one of the large storage holders, which are a familiar sight at any gas plant, and thence is delivered through pipelines to homes and factories throughout the Tacoma district.

An incidental of considerable importance to the gas manufacturer is the cost of generator fuel, and the Tacoma plant has profited greatly by an extensive study of various types, as a result of which it was finally found that picking table rejects, washer rejects, and sized unwashed coal could be used satisfactorily, although the ash content of some of this material might run from 35 to 40 per cent. The size of the coal is also a pertinent matter, and study has shown that the material retained between a 4 and a 1½ inch screen produces the best yield when the Young-Whitwell system is used. When it is realized that the annual consumption of coal approximates 25,000 tons, the necessity of investigating its quality and effects will be readily conceded.

The oil used for carburetting is a mixture of Diesol and fuel oil, the latter being present to the extent of about 40 per cent, and the total yearly consumption amounting to 1,400,000 gallons for gas-making exclusively.

The residuals obtained at the Tacoma plant are tar, light oil (containing a high percentage of benzol and toluol) and cinders. These all have their respective markets, and the demand exceeds the supply, so when the cycle of operating, purifying, and marketing is completed, there is no disposition problem remaining.

And now, in conclusion, just a few interesting facts and statistics about a highly interesting industrial unit:

The original three miles of line that served the customers of Washington Gas and Electric Company, fifty-three years ago, have been replaced by some 500 miles of gas mains that distribute gas throughout Tacoma, Puyallup, Sumner, Auburn, and intervening points.

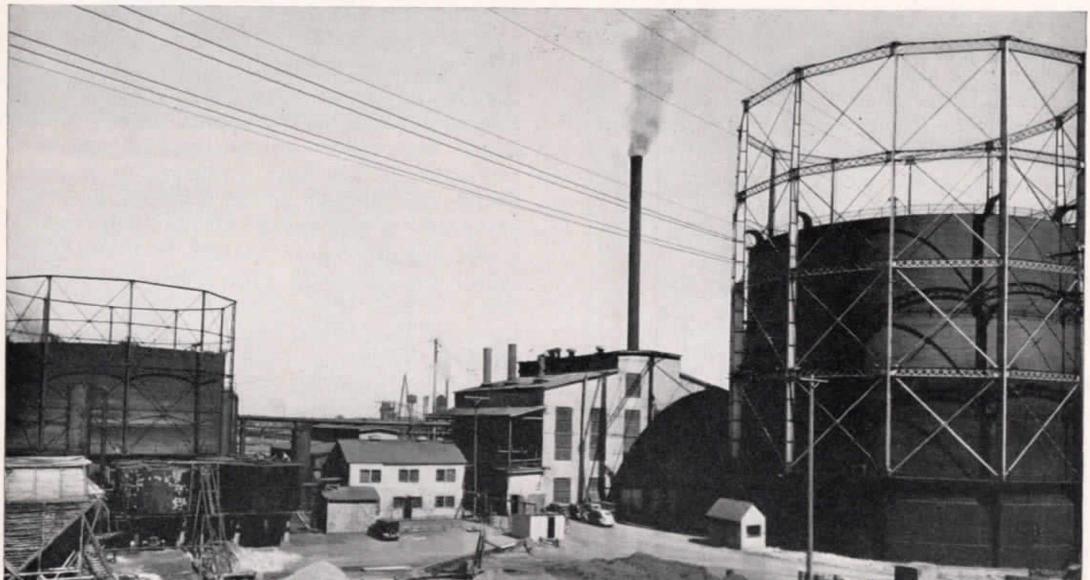
The company employs 100 men and women, of whom nineteen have been in continuous employment for more than twenty years, and over fifty have been employed for periods in excess of ten years. There has always existed between the management and these employees a fine understanding relationship that has in no small measure contributed to the success of the organization.

It is estimated that in the fifty-three years of its existence over $2,500,000 have been paid in taxes, and that its yearly consumption of coal furnishes employment for 125 miners, who, with their earnings, support 550 to 650 people.

The Tacoma property of the Washington Gas and Electric Company is one of six plants owned by the company, and all located in Washington. There is one plant in each of the cities of Aberdeen, Chehalis, and Everett, and the three together serve in addition to their own immediate environs, Hoquiam, Montesano, Centralia, and Snohomish. Longview has a power plant supplying electricity, steam, and water to local consumers, and the Morton plant furnishes electricity to another large area. In addition to the Washington group there is one more power plant operated by the company in Veronia, Oregon.

The main offices are situated in Tacoma, and the business affairs of the concern are under the capable control of Mr. T. E. Roach, president and general manager, whose belief in high quality and dependable service has brought the Washington Gas and Electric Company well into the industrial forefront, and has resulted in the best of customer satisfaction.

A general view of the Washington Gas and Electric Company plant at Tacoma.



COUPEVILLE'S INDIAN WATER FESTIVAL

By M. J. ELZINGA

COUPEVILLE, Washington, situated on Whidby Island in Puget Sound, is the seat of a county which hasn't a single mile of paved road. The average dwelling in Coupeville is nearly forty years old, and, at one time, its civic leaders fought bitterly to defeat the introduction of electric lights and telephones. Yet each year the town's three hundred inhabitants stage a celebration that attracts visitors from a thousand miles away.

Until recently, Whidby Island's only connection with the nearby mainland was by ferry, and for twenty years a faction of Coupeville's citizenry fought the construction of a bridge that would open their jealously guarded privacy to the vulgar gaze of wandering strangers. Today, however, the island is connected to the mainland by beautiful Deception Pass Bridge at the north end, and by hourly ferry service at its southern extremity. Sixty miles in length and only five miles across at its widest point, it has in lieu of paved roads fifty miles of well oiled highway over which an increasingly large number of visitors travel each year.

A stranger's first impression of Coupeville is that it is extremely old for a Western settlement. The first settlers landed at Penn's Cove in the 1850's, and there established a settlement which became Coupeville. When these people (mostly New England sea captains and their families) arrived, they found the island inhabited by more than a thousand Indians. Today there are still three ancient blockhouses on the island, although there is little indication that the Indians were ever troublesome. The restored blockhouse at Coupeville was originally built in 1858, and its leading hotel, although still neat and modern in appearance, was completed sometime during the next two years.

Whidby Island is beautiful scenically and its people are hospitable, but its chief attraction is the annual Coupeville Indian Water Festival. Although the Indian natives of the island were long since removed to mainland reservations, they have continued to worship Coupeville as their ancestral home, and that reverence is the secret of the little town's world famous water festival. For centuries before the advent of white men, the friendly tribes of the Northwest had gathered in Penn's Cove to hold canoe races. Cheered on by children, squaws and old warriors, the braves drove their huge, eleven-man dug-outs swiftly over the gentle waves of the cove. After the white man came, the Indians valiantly strove to keep this traditional event alive, but their numbers dwindled and the races were abandoned near the beginning of the century.

Then, in 1930, the business men of Coupeville staged a modest community celebration

Left: These Yakima Indians watch intently but without enthusiasm, as their brethren from the Sounty country steal the show.

Below: Andrew Joe of the Swinomish Reservation puts the finishing touches on an eleven-man war canoe, which has been carved from a cedar log.

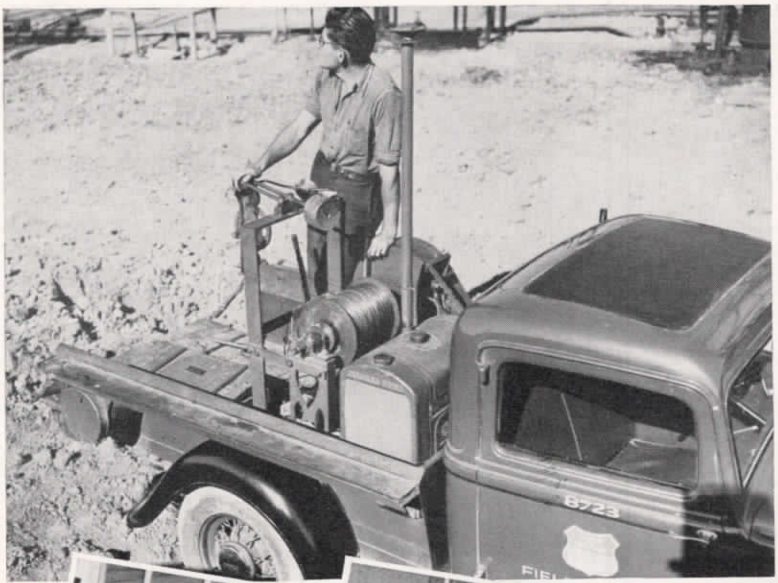
Above: The salutation of the winning crew.

which featured outboard speedboat races. A few Indians paddled over from the Swinomish Reservation at La Conner. They put on an impromptu canoe race and stole the show. Next year more Indians paddled across the water in their fifty-foot canoes, carved from huge cedar logs. Coupeville citizens quickly realized that the Indians were a potent attraction, and the Coupeville Indian Water Festival was shortly an established institution.

As many as twenty-two canoes have lined up for this unique event. In 1938 the festival drew approximately six hundred Indians from more than twenty tribes in Washington and British Columbia. This year the canoe *Lone Eagle*, manned by Nooksacks, won the first prize of $110. The braves propelled their craft over a three mile course in seventeen and one-half minutes. In addition to these big races, the celebration includes many one and two man canoe races, parades, land sports, and tribal dances.

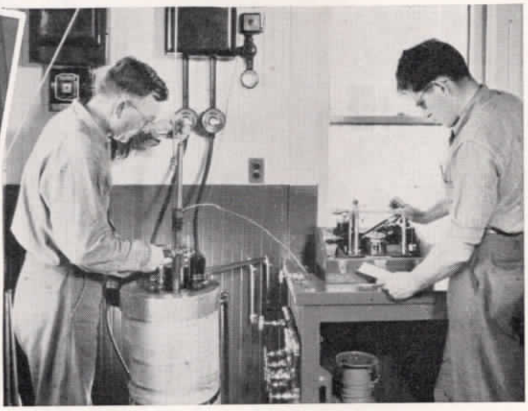
The festival is always held during the second week in August. At that time there is a lull between the berry-picking season and the fishing season, leaving tribesmen free to vacation at Coupeville for a few days. Weeks of preparation, and the united efforts of half the town, assure the success of this event, administration of which is handled by the Coupeville Indian Water Festival Association, an incorporated non-profit organization. L. H. Henley, former Union Oil agent at Coupeville, served several terms as president of this association.

Since the first informal revival of the Indian Water Festival eight years ago it has grown greatly in popularity and now attracts spectators from far afield. For three days of each year the population of quaint little Coupeville swells to twenty times its normal size. Then following the final rite, it shrinks again to normal, and its citizens start planning the details of their next year's Festival.



Left: This portable hoist is used to raise and lower the pressure bomb in the well. Basil Kantzer at the controls.

Ned Babson, left, is scaling a pressure chart. Right: A close-up of Dick Zinszer at a fluid pressure balance.

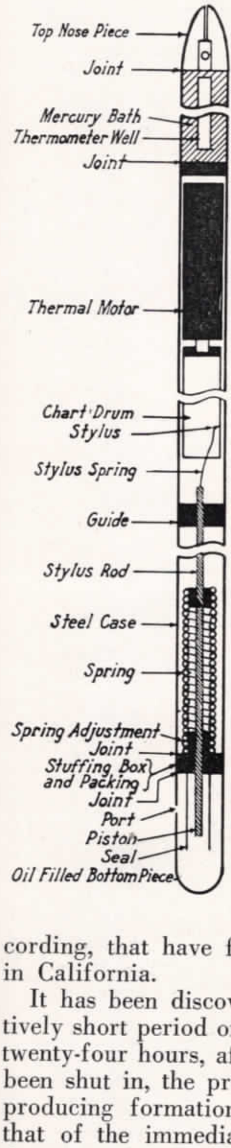


Jack Bouslog and Basil Kantzer calibrate a pressure bomb.

SCIENCE PROBES THE DEPTHS

TO THE layman, the possibility of determining with any degree of accuracy the conditions existing at the bottom of a 10,000 foot well, would seem to be somewhat remote, but to the little group of engineers and chemists down in the pressure laboratory at Dominguez, such an assignment is just a normal day's work. Under the direction of Howard Pyle, field department research engineer, this laboratory is devoted to the study of bottom hole pressures, core analyses, and the correlation of all data established by these and other incidental activities.

The scientific advance of drilling and production methods has pointed the need of basic information pertaining to the actual sands that make up oil field reservoirs, and in recent years there have been developed many new instruments for determining the various significant factors. One of the comparatively recent innovations is a gauge that, when lowered into a well, will register the pressure existing at the face of any producing horizon. Of the several types of gauges devised, there are two, self-contained and continuously re-



A section of a pressure bomb, showing the general construction. The helical spring and piston located at lower center constitutes the pressure element.

cording, that have found general acceptance in California.

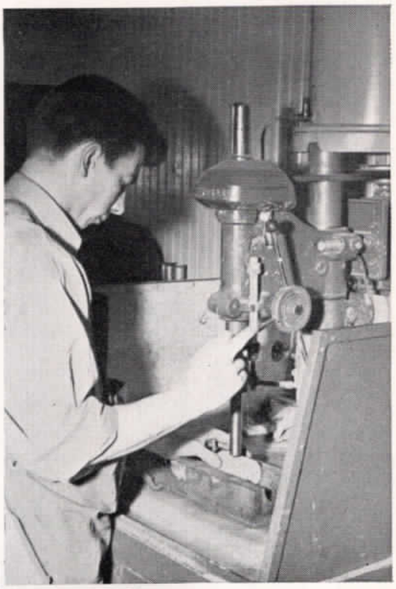
It has been discovered that within a relatively short period of time, seldom more than twenty-four hours, after a producing well has been shut in, the pressure at the face of the producing formation will have built up to that of the immediate area from which oil drainage is taking place, and a record of such shut-in or static pressures, when reduced to some common basis of comparison, is of invaluable aid to the producer.

The changes in static pressure indicate corresponding changes in reservoir condition. Variations in the texture of the producing sands, and in the rates at which gas, oil and water will move through these sands, are also disclosed by comparing the static pressures of wells in the area over a period of time.

In certain fields several oil zones may be encountered in a single well, and the comparative pressure records not only afford an accurate means of defining the vertical limits of each, but in addition determine which should be produced first, and in what order, and at what intervals, the remaining zones should be tapped. The completion of a well open to two zones with different formation pressures may under certain conditions constitute a sacrifice of available energy, and an ultimate loss of available oil, so that the value of any means of obviating such contingencies will be recognized immediately.

The producing life of a well may be divided into three distinct stages—flowing, gas lifting, and pumping, and with a fair degree of accuracy, the duration of these stages, and the desirable transition periods are defined by the pressure variations. The rush of oil to the surface in a voluntarily flowing well results in a reduced pressure at the bottom, and the well will continue to flow just so long as this reduced pressure is still greater than the pressure of the column of gas and oil contained in the hole. When the pressures tend to equalize, and voluntary flow declines or ceases, a stimulated flow may be obtained by the circulation of additional gas; which, of course, has the effect of reducing the gravity of the flow column so that oil can be raised with less formation pressure. The last stage of production is pumping. This is resorted to when gas lift is either unprofitable or impossible. Since the oil column, in this case, is lifted by the pump, the pressure against the face of the producing formation is reduced to a minimum, and a maximum differential is maintained between this facial pressure, and the pressure in the formation. A depth pressure gauge, equipped with a clock that will run for several days, installed at the pump in the bottom of the well, will show whether or not the pump in the bottom of the well is lifting the available fluid, and completely reducing the bottom hole pressure.

The applications of this type of information are many: When drilling a well into a producing formation, for instance, it is desirable to know the formation pressure to expect, in order that a blow-out may be prevented by the use of mud of just the requisite weight. While a well is actually producing at a known rate, its behavior can be studied, and its ultimate capacity or "potential" can be determined by measuring the pressure within a well at the face of the producing horizon. The rate at which a well will produce per pound drop in bottom hole pressure



Technicians at the Dominguez laboratory here illustrate modern core analysis methods. Carl Stehle, right, cuts a permeability sample from the original core with a diamond drill.

is known as the productivity index of the well, and is a measure of the relative ease with which gas, oil, and water will move through the formation into the hole.

Measurements of bottom hole pressure reductions, considered along with sand penetration and the diameter of the well, make it possible to calculate the average effective permeability of the producing sands, that is the relative resistance of the formation to the passage of fluid. Discrepancies in these results, in a well whose lithology is known to be regular, definitely indicate some faulty mechanical condition.

The whole study of bottom hole pressures is still in its infancy, but it has lead to the development of hitherto unknown subsurface factors and conditions, which are now playing an important part in the technique of drilling and production.

The activities of the Dominguez laboratory, however, are by no means confined to the determination of bottom hole pressures. There are other essential data to be acquired in order that the correlation of all essential factors may be complete, and the general function of the laboratory may be as encompassing as possible.

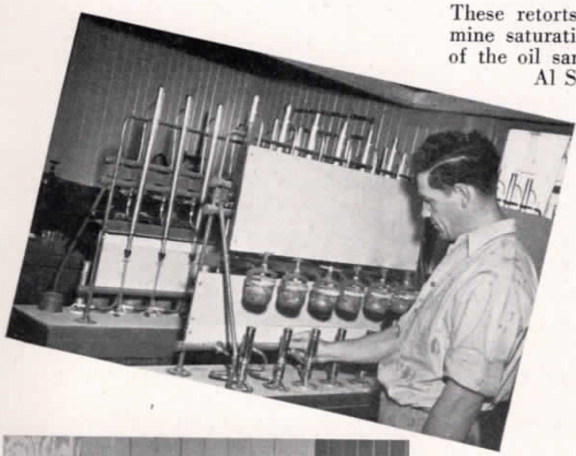
The old system of core analysis, which involved a visual examination, and an occasional oil extraction, is no longer adequate for the enquiring engineer. Continuous research has revealed the fact that core samples taken 10,000 feet underground may change markedly in character before they reach the surface, and that qualities and properties formerly ignored, exert great influences on the productivity and life of producing formations. Thus core analyses, as carried out in the Dominguez laboratory, have become a somewhat complex process, to the uninitiated at least, and involve, in addition to an already established series of routine tests, a continuous research effort that develops fresh information daily.

The taking of core samples is contrived by the use of a hollow drill, and an ingenious

Roy Wagoner then places sample in the leaching apparatus.

A salinity titration is performed by Stehle. This is a chemical test that determines the salt content.

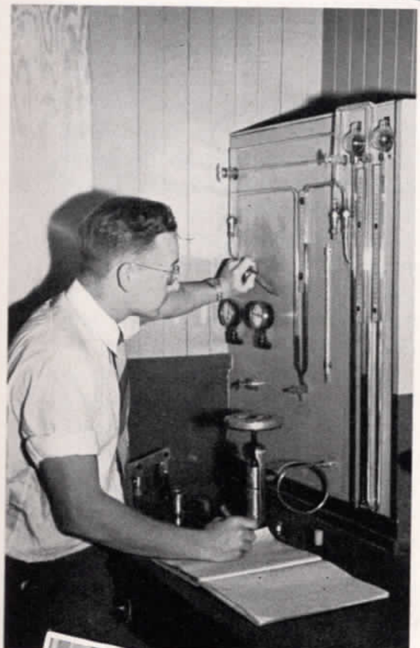
These retorts are used to determine saturation, or fluid content of the oil sand. The operator is Al Semmelroth.



device known as a core barrel, the whole process being somewhate similar to the kitchen practice of coring an apple. The drill isolates the core, and the core barrel holds it. Representative samples are taken either at regular intervals, or by sampling every visible change in sand character. As the samples are delivered from the core barrel into trays, they are wrapped in lead foil and sealed in tins to protect them against evaporation. In addition to the cores, samples of the oil and mud used while coring, and of the oil and water produced from the intervals cored, are coincidentally taken, and records are kept of every pertinent piece of information relating to the well or wells being tested.

In the laboratory the core samples are divided ordinarily into three parts, one to be tested for fluid content, one for permeability and porosity, and one for salinity, the last being also used to determine grain size, and petrographic (rock type) classification.

The sample for fluid content is treated first, and as rapidly as possible. It is broken down into small pieces, and a weighed sample is placed in a retort, where it is heated for 40 minutes at a temperature of 350° to 400° F. This drives off all the water, and all but the heaviest fractions of oil, following which the retort temperature is raised to 1100° F., and maintained there for at least 20 minutes. All of the water and oil that distills over is condensed in a cooling system, collected in a special centrifuge tube, and centrifuged until all the drops clinging to the sides have been collected with the bulk of liquid at the bottom, and a sharp boundary line exists between the oil and water. The individual volumes of oil and water are then read off directly. The sand remaining in the retort is next cooled in a dry atmosphere and weighed. Thus, a weighed quantity of the original core is separated into three constituents—oil, water, and sand, and the volumetric or gravimetric percentages of each may be easily determined. There are observed, in addition, of course, many precautionary measures and supplemen-



John Sherborne, in charge of core analyses, measures the permeability of the core sample.

Porosity of the sample is then determined by this equipment. Wagoner demonstrates the process.

tary steps that are essential to the accuracy of the method, and there are involved a number of correction factors that are necessary to render results comparable, but to avoid confusion the details of these have been omitted from this brief treatment.

For the permeability test, a small three-quarter inch core one inch long is drilled from the original sample. If the sand is too friable to permit this, a rectangular parallelepiped is cut from it with a knife or hack saw blade, and trimmed to the same volume as the small core. This test block is then placed in a leaching and drying apparatus, where it is subjected to the alternate action of hot carbon tetrachloride and hot air, until it is completely free of oil and water, and is thoroughly dry. The permeability of this small block is now determined by measuring the quantity of air that will flow through it in a direction parallel to its original depositional bedding, and under certain standard conditions of temperature and pressure. The device in which this is contrived is called a permeameter, and is simply an airflow meter in the main chamber of which the sample can be clamped tight enough to obviate the possibility of leakage between the sample and the clamp. Air is allowed to flow through the block at a prescribed pressure, and the reduction in pressure on the other side measured by a manometer, indicates the resistance to airflow, or the permeability of the sand.

The same sample is next tested for porosity, that is, the total interstitial space in the body. The bulk volume of the block is first acquired by displacement of mercury in a graduated glass measuring device. The difference between the original volume of mercury and the volume when the sample is introduced, indicating the actual cubical size of the latter. The block is next carefully reduced to grain size by grinding in a porcelain mortar, and the volume in this condition is also determined by displacement, this time using tetra-chlorethane as the liquid agent. The porosity of the sample is the difference between the bulk volume and the sand grain volume, divided by the bulk volume.

The measurement of salinity, or chloride ion content, is made by leaching a weighed quantity of the ground, dried sample, with water for a stipulated period. The water dissolves out the chloride, which is then quantitatively determined by titration with silver nitrate, using potassium di-chromate as an indicator—a method familiar to all chemists.

Another significant factor in the general scheme is grain size, and to determine this a known quantity of oil-free, dry sample is ground down carefully as before, and screened through a series of screens of various mesh on a rotating and tapping machine. The material retained on each screen is segregated and weighed, and the weight percentage calculated.

The gravity of the oil found in the sand samples is also a factor in the final correlation and interpretation of results, and since very small quantities are available for the test, the resourceful chemists have specially designed a picnometer which will yield the necessary information on as little as 2 milliliters of fluid. An interesting development in this same connection is the employment of a simple method in which a strip of filter paper 6 millimeters wide is dipped in oil to a depth of 5 millimeters. Since gravity has an empirical relationship to capillarity, the times required by various oils to creep to a specified height on the filter paper at a given temperature, is a measure of their relative gravity. With times established for oils of known gravity, it becomes a simple matter to approximate the gravities of unknowns by the test.

All of these tests, and the details of their performance, have been planned meticulously to develop essential data, from which certain correlations can be made. These correlations have made possible in many instances the prediction of the relative volumes and the nature of the fluids producible from wells. They have pointed the necessity for certain mechanical adjustments to extend the economic lives of wells.

To a large extent the work of the laboratory has rendered more positive the details of drilling and production technique, and there can be no question that as the study progresses, it will be possible to substitute accurate information for much of the guess work that has prevailed in the past. Considered along with correlative subsurface data acquired by the geologists, paleontologists and geophysicists, the results of the various tests are already of inestimable value in field development, and so, despite the fact that bottom hole pressures, and the advanced type of core analyses are comparatively new phases of petroleum activity, they give promise of growing into highly significant processes in the modern scientific scheme.

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Volume Nineteen — NOVEMBER-DECEMBER, 1938 — Bulletin No. 11

THE article in this issue of the Bulletin on bottom hole pressures and core analyses is just another indication of the transformation of the petroleum industry that is gradually being brought about by the magic of science. There is not a single phase of operation that is beyond the reach of the engineer, the chemist, the physicist or the mathematician. We can remember when the first paleontologist started trying to relate his abstruse art to the business of producing oil. Now paleontologists are as plentiful as geologists, and as indispensable to the exploration department. We have actually seen doodlebug experts seriously engaged in locating oil reservoirs several thousand feet underground, with a device which, according to Professor Stillman, was "a cheat upon those who practice it, an offense to reason and common sense, an art abhorrent to the laws of nature, and deserves universal reprobation." Yet from the efforts of these early diviners has sprung the geophysical methods of location that are now extensively used throughout the industry.

The process of natural gas and gasoline manufacture, once haphazard and inefficient, is now supervised by a brigade of scientists, whose efforts, rigidly controlled by the laws of physics and chemistry, have converted it into an economically sound procedure. Pumping stations and equipment are developed and installed by engineers, with an intimate knowledge of hydrostatics, and are so placed and spaced as to do the most work with the least effort. In the early days, evaporation losses did not cause any great concern to oil operators, but today conservation experts are constantly engaged in the business of recovering valuable volatile products, or of obviating the conditions that cause volatilization.

Methods of transportation have similarly been revolutionized by the exacting demand of science. Cost, capacity and safety are the three factors with which the investigators are concerned, and a tank truck fleet, a pipeline system, or a tanker fleet, in these modern days, is operated on a scientific basis that eliminates every known element of chance, and bases the whole procedure on a solid foundation of security, economy, and efficiency.

There is no need to recount the accomplishments of the research, development, and refining departments in comparatively recent times. Union 76, Triton, and a long list of specialties and products of equally high quality, tell the story of technical advance more vividly than words.

Day by day, this black fluid that was once such a nuisance to our forefathers, is being forced to yield new compounds, and new commodities, for the comfort and convenience of a world which it is already serving magnificiently. The past decade has seen a vast army of technicians vigorously engaged in the business of wresting from a jealous nature her long-guarded secrets. The result has been astonishing. Not so long ago a few simple routine tests constituted the work of the refinery chemist. At this moment, in research laboratories all over the country, the petroleum hydrocarbons are being resolved into their elements, and reassembled in new combinations and compounds, with a facility that is nothing short of amazing. The possible combinations are legion, and what the future holds for the oil industry we would, in consequence, hesitate to predict. It is certain, however, that the forces of science are destined to lead us into lanes of commerce, and industrial enterprise, of which no one has yet dreamed.

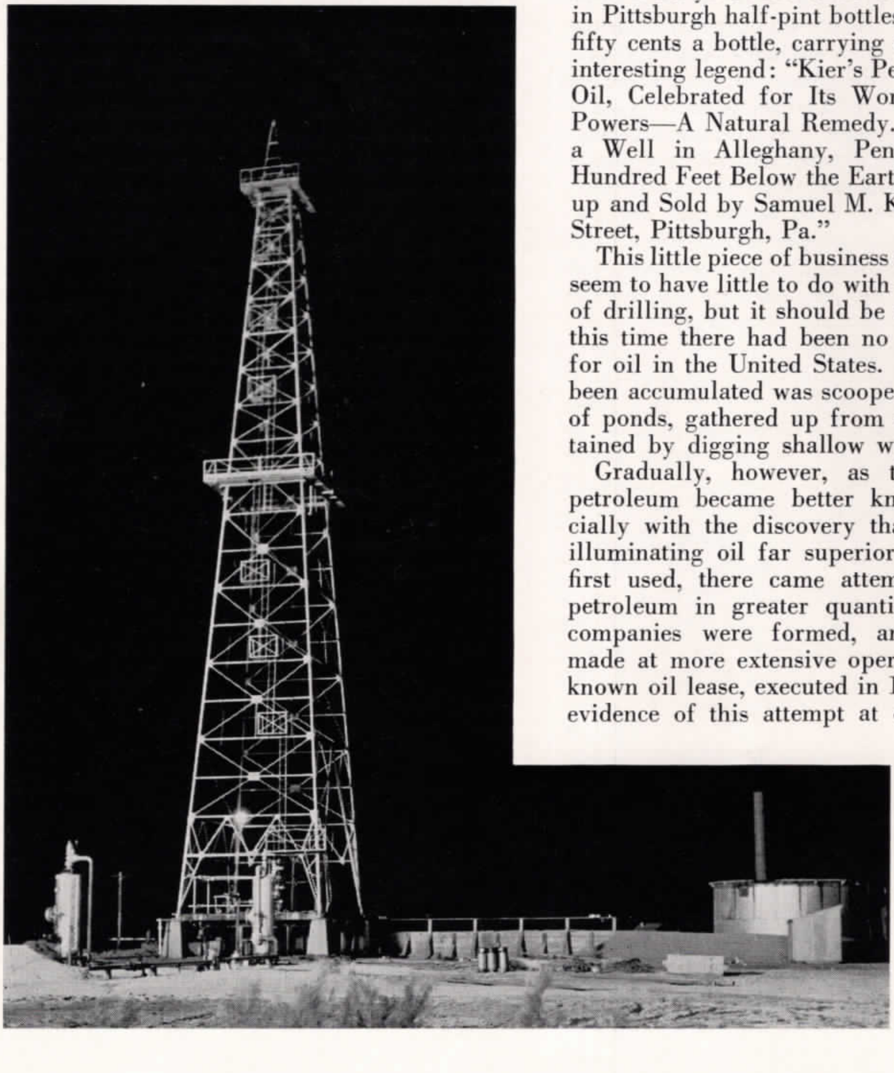
THE EVOLUTION OF DRILLING

LIKE many another substantial contribution to the progress of industry, the feasibility of drilling for petroleum was an accidental discovery. Before Colonel Drake brought in his historic well in Titusville in 1859, drillers had utilized the old spring pole method in their search for salt water for the salt works of Pennsylvania. The waters so obtained were frequently tainted with crude oil, and the removal of this annoyance was one of the big problems of the salt industry.

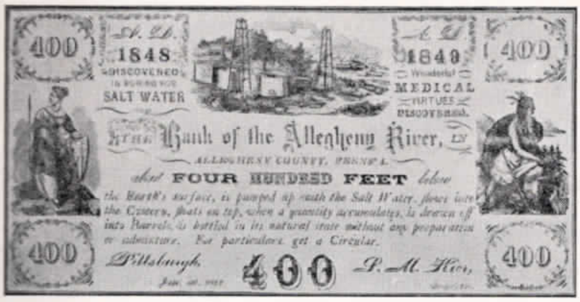
Thomas and Samuel Kier were two of the first of these salt water drillers, and as early as 1847 they drilled two wells by the spring pole process to depths of about 500 feet. In doing so, they found their salt water fouled by the presence of petroleum, and were, indeed, able to segregate considerable quantities of the bothersome black fluid. For this, initially, they were unable to devise any special use, but being somewhat ingenious individuals, they at length did find a means of marketing the new product, and it is on record that in the year 1849 there were being vended in Pittsburgh half-pint bottles of petroleum at fifty cents a bottle, carrying on the label this interesting legend: "Kier's Petroleum or Rock Oil, Celebrated for Its Wonderful Curative Powers—A Natural Remedy. Procured from a Well in Alleghany, Pennsylvania, Four Hundred Feet Below the Earth's Surface. Put up and Sold by Samuel M. Kier, 363 Liberty Street, Pittsburgh, Pa."

This little piece of business enterprise would seem to have little to do with the development of drilling, but it should be noted that up to this time there had been no attempt to drill for oil in the United States. Such oil as had been accumulated was scooped off the surface of ponds, gathered up from seepages, or obtained by digging shallow wells and ditches.

Gradually, however, as the qualities of petroleum became better known, and especially with the discovery that it yielded an illuminating oil far superior to the coal oil first used, there came attempts to produce petroleum in greater quantity. Prospecting companies were formed, and efforts were made at more extensive operation. The first known oil lease, executed in 1853, gives some evidence of this attempt at organization. It



Union's K.C.L. 1-34 pioneered the Rio Bravo field, west of Bakersfield, California. For a time, it was the world's deepest producer, penetrating more than two miles into the earth.



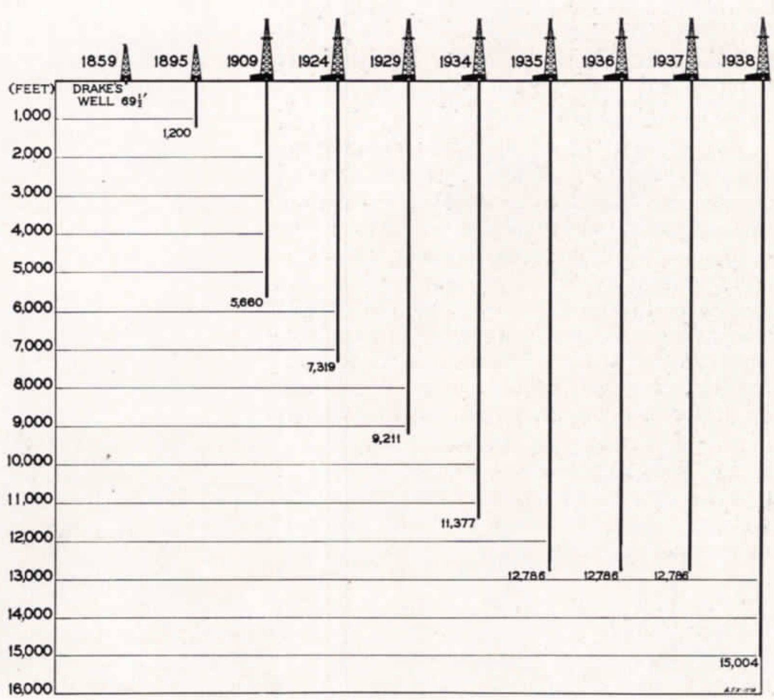
Oil was first thought to possess remarkable curative powers, as this early ad attests.

was as follows: "Agreed this fourth day of July A.D. 1853, with J. D. Angier, of Cherrytree township, in the County of Venango, Pa., that he shall repair up and keep in order the old oil spring on land in said Cherrytree township, or dig and make new springs, and the expenses to be deducted out of the proceeds of the oil, and the balance, if any, to be equally divided, the one half to J. D. Angier and the other half to Brewer Watson & Co., for the full term of five years from this date. If profitable. Signed: Brewer Watson & Co., J. D. Angier."

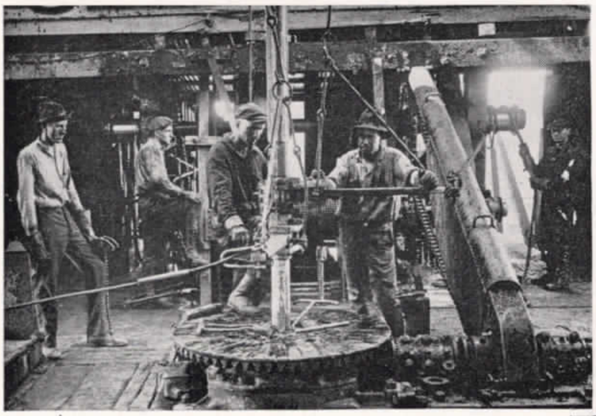
The "If Profitable" was a significant phrase, because actually, we are told, "the expenses consumed the profits, and . . . the experiment was abandoned."

In 1854, the deed of the first property actually sold for oil prospecting was made by the same Brewer Watson & Company who were parties to the lease already mentioned. This land was purchased for the purpose of producing oil through extensive ditching and surface development, and there was apparently no thought of drilling in the beginning. It was not until the summer of 1856 that one of the purchasers, reading Samuel Kier's advertisement, and particularly the part announcing the recovery from "Four Hundred Feet Below the Earth's Surface," became excited over the idea of drilling into the earth for oil.

A lease was secured from the Pennsylvania Rock Oil Company, organized in 1855, and a producing company known as the Seneca Oil Company was formed for the purpose of drilling the lease. A contract was let to E. E. Bowditch and E. L. (Colonel) Drake, and the success of Colonel Drake's venture is now known to every student of petroleum development. Drake, himself, was not a driller—he was a railroad man and an organizer, so having secured the services of "Uncle Billy" Smith and his two sons, to do the actual drilling, he bought the necessary machinery, and



Deeper and deeper go drills in search of oil. The chart at right traces the history of drilling from Drake's well, the first successful attempt to find oil, up to the present depth record of nearly three miles.



Rotary drilling is a comparatively modern technique. Photograph at left shows equipment used fifteen years ago. Today's equipment, shown below, is essentially the same, although far more efficient and less cumbersome. Note that members of the drilling crew wear "hard hats" to prevent head injuries.

Below: Operating the brake on a modern rig.

Below: Removing a core sample for inspection.

work was commenced. As a result, about six months later the well came in for an initial flow of 40 barrels a day at 69½ feet, and the American petroleum industry was born.

Information about that first drilling is very scanty, but it was, without question, what we now call a cable tool job. A steam engine with an auxiliary crank on the flywheel raised and lowered the "walking beam," to which the drill was attached by a hempen rope. Propelled by this mechanism, which had been developed by the salt well drillers, the bit pounded its tedious way through the earth at the rate of about 3 feet per day, to bottom at 69½ feet. The fact seems to have no particular place in this story, but it is significant, nevertheless, that the oil produced found a ready sale at 50 cents a gallon.

The prospect of oil at $22 a barrel was a definite stimulus to other operators, and it is no wonder that for the next few years in Pennsylvania, practically every man in the state devoted himself to the search for this remunerative commodity. The methods employed in location, however, were somewhat haphazard, and sites were selected near seepages or other surface indications, without any consideration or knowledge of the underground structure. Equipment was crude, and in use followed very closely the primitive spring pole procedure, excepting that power to raise and lower the bit was furnished by a steam engine instead of a crew of men. But as production increased, prices dropped, and the preliminary excitement died down, the more enquiring operators began to examine the new industry. Feeble attempts were made to standardize and economize, and some thought was devoted to the underground source of petroleum and the methods of bringing it to the surface.

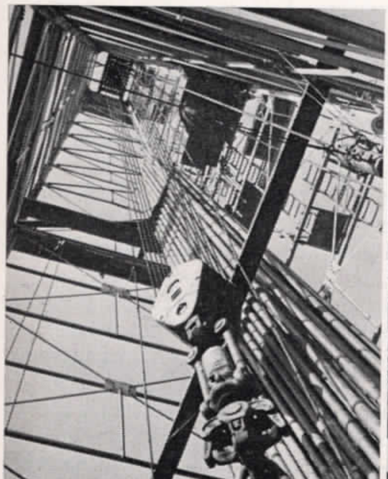
Geologists developed the anti-clinal theory of deposition, which was finally clinched by Dr. White, after years of debate and argument. As chief geologist of the West Virginia Geological Survey, Dr. White not only proved the theory by the accumulation of data on already producing wells, but showed in addition that it could be employed successfully in the location of new wells.

Up to about 1880 there had been no great change in drilling method. Some improvement had taken place in the equipment, but in general, with minor refinements, the type of apparatus used by Colonel Drake was still the vogue. With the passing of time, and the growing knowledge of sub-surface conditions, however, operators were in a much better position to go at the business of drilling systematically. Engineering began to play a part in the development of drilling technique, and by the end of the 19th Century we see the first radical change from the old methods in the introduction of the rotary drill. It must not be inferred that in the interim the original cable tool system had remained static. Basically there was no change. The drilling tool was still raised, and dropped by power from some prime mover, but equipment had been substantially improved, and numerous refinements and modifications had transformed the "standard" or cable tool system of drilling into a highly scientific operation. It had its limitations, however, and in locations where the formations overlying the oil zone were loose, crumbly sands and shales, it was found that cave-ins were all too frequent. In 1901, however, this particular problem was solved by the first use of the rotary system.

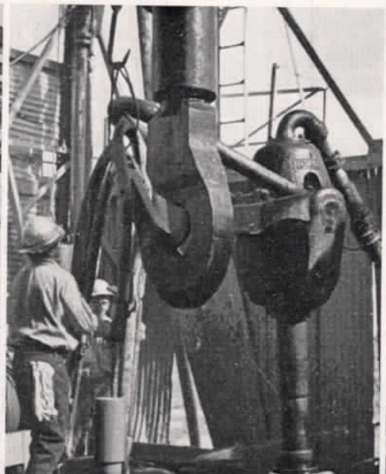
The rotary method had been developed some years before for drilling water wells, and had proved very satisfactory. The power at that time was mostly derived from horses, which walked around in a circle, turning the drill as they went, but a Texas prospecting company was sufficiently intrigued with the possibilities of the system to spend some time and effort on its mechanization and adaptation to the petroleum producers' needs. It was first employed on an oil well in the Texas Spindletop field, but has since been widely adopted, in fact is exclusively used in many oil states, particularly where soft formations are encountered, or where deep drilling has become a factor in the production scheme.

Thus we have two general methods of drilling: cable tool or standard, and rotary, the essential difference between the two being that in the former the drill literally pounds its way through the formations, whereas in the latter, as the name implies, the bit progresses by a rotary motion, and so bores its way down. In recent years the principal development in

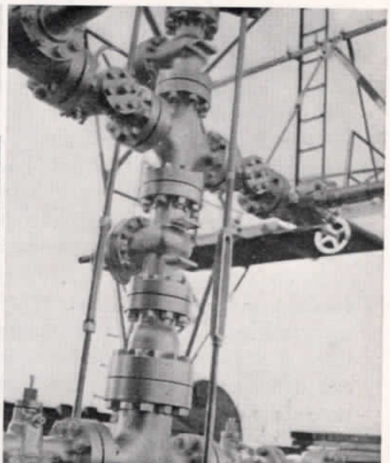
It's a long trip to the top of a deep well rig.



Oversize equipment is required for deep drilling.



Huge fittings are needed to check high pressures.



the standard method has been towards heavier equipment to permit the drilling of deeper holes, but the rotary system, offering greater diversity of application, has been the subject of much more experimentation, and it has been modified and adapted so that it can be used to drill under practically any conditions. It may be mentioned that in California the rotary system is used almost exclusively, although in other oil states the standard system is still somewhat extensively used in drilling wells to depths of 4000 feet or less, and in some locations, where conditions have been right, to considerably greater depths.

To the development of the rotary method may be attributed the advances in drilling technique that have enabled producers to penetrate the earth to seemingly impossible depths, to revive fields that have apparently been exhausted, and to provide more accurate information of sub-surface conditions.

In the year 1895, the deepest well was 1200 feet. In 1909, eight years after the introduction of rotary, the record had risen to 5660 feet, and through the intervening period has slowly increased until the beginning of this year, when the deepest well in the world stood at the astonishing depth of 15,014 feet—almost three miles. Union Oil Company has held the record on several occasions. The Gardena Syndicate Well No. 1, drilled by Union in 1924, and bottomed at 7,319 feet, was the deepest well of its time, and K. C. L. 1-34, the Rio Bravo discovery well at 11,302, was for some time the deepest producing well in the world.

Faster and deeper drilling by the rotary system has not only resulted in the discovery of new fields and a tremendous increase in production, but has also, as intimated, brought new life to dwindling territories, notable examples of which are Santa Fe Springs and Signal Hill. These two fields had apparently passed their zenith, and were falling off markedly when deep drilling penetrated new zones, and brought the boom days back.

In the amplification of data relating to subsurface conditions, the rotary system has been invaluable. It is true that punch cores of underground formations can be taken by the cable tool system, but the tendency to fracture is much greater than with the rotary, which yields a solid continuous core, and with recent improvements will be able within a short time to deliver a core on the surface under the identical conditions of temperature and pressure at which it exists in the subterraneous formations. The value of positive information of this sort is inestimable. Since the rate of influx of oil into the well depends on the difference between the pressure at the hole and the pressure back in the formation, it provides at least one very essential factor in the determination of production rates. In addition, of course, the core offers the geologist an opportunity to substitute visual evidence for theory, and the paleontologist a similar opportunity to determine by actual separation and determination the fossil remains at significant depths. The correlation of the joint findings of these two groups of scientists is daily presenting a more accurate picture of what we may expect to encounter as we bore deeper and deeper into the earth's crust.

Crooked holes can be drilled by either system of drilling, but it is probable that an uncontrolled rotary bit will wander much more wildly astray than will a cable tool. In any case, it was the rotary drill that first brought the crooked hole into national prominence, and offered an interesting problem to the petroleum industry's engineers and scientists. They were quite equal to the occasion, however, and beginning with the development of accurate devices for surveying the holes, were soon able to keep the bit on the vertical and narrow path. Evidence of this may be found in the fact that Union Oil Company's Rio Bravo well, K.C.L. 1-34, was carried to 11,302 feet without at any point veering from the perpendicular more than two degrees.

To drill deep holes it has been necessary to develop much new equipment. The tremendous strings of drill pipe, casing and tubing that have to be handled require correspondingly powerful machinery, and the problem has been to acquire the power without adding too much to the weight or to the hazard of operation. The high pressures of mud pumps circulating vast quantities of heavy fluid in the hole exert tremendous strains on the machinery and parts, and demand heavy duty equipment of all sorts. Deep wells develop hitherto unexperienced casing and tubing pressures, and necessitate the use of pipes, valves, and fittings of fabulous strength. All of these things, however, have been forthcoming when they were needed, and the technical brigade that is responsible for the drilling of present-day wells will apparently brook no obstacle. Deeper and deeper goes the quest, and the array of scientific gadgets that are designed to make oil drilling more positive, more productive, more economical, and less hazardous, grows longer as the wells go deeper. No one can predict to what depths the drill will eventually go in this battle to wrest from a jealous earth her rich hoarding, but it is certain that the present record will not stand for long. There have been times when it seemed we had reached the ultimate depths at which economic production was possible, but the inexorable march of science was not to be denied, and some new instrument, some adaptation of equipment, some modification of system, has led the way to renewed attack, and another record has fallen. The oil industry in America has traveled far in the 79 years of its existence, and he would be a daring individual who would attempt to predict how far we might travel in the next 79 years.

THOSE CAMELS AGAIN

IN THE August, 1938, issue of UNION OIL BULLETIN there appeared an article entitled *Camels In The Southwest,* which stirred up considerable comment.

The author, Dennis H. Stovall, indicated in his article that the camels imported by the U. S. Government had been difficult to handle and therefore of no great value in traversing the desert wastes of the Southwest. After many vicissitudes, therefore, most of them were allowed to break away and wander through the desert. Twenty-five were reputedly released in Arizona, by private mining interests, because they had proved ineffectual in transporting silver ore, and subsequently wandered through Arizona for nearly twenty years. This fact is corroborated by Vic H. Householder of Phoenix, Arizona. Mr. Householder is a civil engineer by profession, and in 1922, during construction of the Cave Creek Dam 22 miles north of Phoenix, he came upon several small bones, uncovered in a buttress excavation. These were sent to the Museum of Natural History at the University of Kansas, where they were identified as ankle bones of a camel. A year later, while engaged in field work fifty miles southwest of Phoenix, he found other skeletal fragments, which were identified as parts of a camel's foreleg.

These interesting discoveries led Mr. Householder to inquire further, and after considerable research, he is convinced that only a few of the camels freed in Arizona ever perished there. His authority for this opinion is "Uncle Dan" Noonan of Gila Bend, Arizona. In 1894, according to this doughty pioneer, a Mr. Smith, representing the Sells Brothers Circus, came to Gila Bend to investigate the story that camels were roaming the territory. Soon convinced of the fact, Smith engaged "Uncle Dan" to round up as many of the animals as possible, at twenty-five dollars a head. Dan hired several Papago Indians to assist him and, in the course of the unique round-up, captured twenty-five of the beasts, the exact number brought into Arizona. There was undoubtedly a certain amount of propagation among the camels, during their twenty years of freedom, for some of the animals captured by Noonan appeared to be youngsters. This seems, at least, to be the only logical explanation of the unearthing of skeletal remains by Mr. Householder and others. "Uncle Dan" believes that none of the animals lived to see the twentieth century.

Cover Illustrations

Buildings of the Golden Gate International Exposition, as they will appear at night, provide interesting cover subjects for this issue of the BULLETIN. The illumination of the fair grounds and architecture cost $1,000,000, and, judging from these photographs made during experimental tests, the results well justify the expenditure. Statuary, heroic in size if not subject, is part and parcel of the fair's architectural scheme. "The Evening Star," silhouetted against the 400-foot "Tower of the Sun," is shown on our front cover, and a Polynesian figure from the "Fountain of Western Waters" occupies the inside page. The towering entrance to Treasure Island's "Palace of Mines, Metals and Machinery" may be seen on the back cover.

Above: M. H. Irvine, manager of road oiling operations at Paulsen & March, points out an interesting phase of the job to F. E. Alderman, assistant city engineer at South Gate, California.

Above: Swampers must be nimble for their perch on the rear of the spreader truck is none too secure. Right: Having spread the heavy road oil on both shoulders of the road, the truck returns slowly, spreading a final coat upon the crown.

PETROLEUM PAVES THE WAY

CREATING good roads at moderate cost is one of the petroleum industry's innumerable contributions to this motor age in which we live. The use of special road oils has made rural areas and localities far removed from main line of travel easily accessible. Many residential streets and secondary highways are also paved with asphaltic macadam. Farming, mining, lumbering and other essential industries which, because of their nature, must operate in remote locations have been able to carry on profitably as a result of low cost transportation facilities made possible by oiled roads. Airports, too, use road oils to control dust and pave runways. The spreading of billions of gallons of oil each year over the roads, highways, and airports of our highly mobile nation is a specialized job, and oil companies do not, as a rule, attempt to perform this task. Private contractors are usually employed by state and local governments, or individual interests to do this work. The contractors, of course, obtain their road oils directly from the refinery.

Such an organization is Paulsen & March of Los Angeles. This company, one of southern California's largest consumers of Union Oil products, has engaged in the road oil surfacing business since 1931, and, in this comparatively short period of time, has spread millions of gallons of oil throughout the lower half of the State. Their larger undertakings include the Navy Air Base at San Diego, which required 1,250,000 gallons, and three

Death Valley contracts, which together required more than three million gallons. Paulsen & March cannot tell you how many million gallons of Union road oils they have spread over the highways and byways in this area, but they say it is impossible to leave southern California without driving over a section of macadam or oiled highway which they have surfaced.

Although S. D. March had engaged in the oil trucking business since 1923, the firm of Paulsen & March was not incorporated until 1927 when Fred R. Paulsen, a former mining engineer, joined the enterprise. By 1931 their trucking business had grown considerably in scope and they decided to add a road oil service department. To aid them in this new phase, they engaged the services of M. H. Irvine, a former State Highway engineer, who was at the time an executive in another road oil company. Today the firm consists of F. R. Paulsen, president; S. D. March, vice-president; M. H. Irvine, manager of the road oil department; Dick Morton, sales; R. G. Dronberger, accountant; Walter Robson, shop superintendent; and twenty-six other employees.

Some idea of the firm's rapid expansion can be gathered from the steadily increasing magnitude of its rolling equipment. The first trucks, used for hauling gasoline and oil, were Sterlings, powered with Waukesha gasoline engines. In 1936 their first Cummins Diesel engine was installed in a special Kenworth chassis of their own design. The company now employs four Diesel-powered trucks and four gasoline-powered trucks in the oil spreading work, as well as a fleet of trucks and trailers for gasoline transfer service. Since the advent of Triton Motor Oil, this product has been used exclusively in all engines and has demonstrated appreciable savings over the Pennsylvania oil formerly used. One Waukesha engine was still using the original bearings, after 380,000 miles of service. Three sets of pistons and three engine blocks were used during this period. Paulsen & March is said to be the first company in the United States to mill cylinder heads. The resultant compression increase necessitated the use of Ethyl gasoline, but increased power and mileage commensurately.

The actual process of spreading road oil is not complicated, but neither is it as simple as the uninitiated might suppose. In the first place, there are many types of surfaces, from the temporary oiled dirt road to permanent asphaltic macadam streets and highways. Likewise there are many grades of oil used to meet the rigid requirements of each type of surface. Roughly speaking, these oils are divided into two main categories: S.C., which means "slow curing," and R.C., which, as you've already surmised, means "rapid curing." The former is graded by number according to asphaltic content, which ranges from 32% to 94% in volume. Rapid curing oils are simply pure, D grade asphalts, "cut back" or diluted with cleaner's naphtha, which evaporates soon after spreading.

The so-called S.C. oils of high asphaltic content are heavy and must be spread "hot." In practice, the refinery delivers these oils into the truck tanks at a temperature of about 450 degrees Fahrenheit. To flow properly, the oil temperature must not be less than 350 degrees

Left: F. R. Paulsen and S. D. March discuss the operation of cab-controlled spreaders.

Right: This huge, Diesel powered Kenworth truck has a special spreader operated from the cab by air pressure.

when spread. The actual job of surfacing may be as much as 300 miles from the refinery and therefore special double-walled tanks, insulated with rock-wool, have been developed to retain the heat. So effective is this insulation that, on at least one occasion, Paulsen & March were able to spread oil in freezing temperature twenty hours after receiving the oil at Union's Los Angeles Refinery.

In order to facilitate their work, Paulsen & March have developed many items of specialized equipment. The spreader mechanisms on the big Kenworth trucks, for instance, are completely air-controlled from the cab. The smaller trucks, used chiefly for local jobs, are not equipped with these cab-operated spreaders and so require the services of a second man, known as a "swamper," who mounts a platform on the rear of the truck and controls the valves manually. Spreaders on all trucks are so designed that they can be adjusted to spread to various required widths. They are also adjustable to various viscosities and are equipped with guards to prevent oil from blackening the curb. In spite of the elaborate precautions taken to insure ease of operation, spreading oil is no job for the novice, and good men are scarce.

Generally speaking, oiled macadam surfaces are built up, layer by layer. Coarse rock is applied first and coated with oil. Subsequent layers are of finer rock and each is covered with oil. The finishing spread or "seal coat" of medium S.C. is dusted with fine gravel, which is usually allowed to imbed itself by traffic impaction—in other words, you and I finish the job by driving over the new road. All of this creates a smooth and highly durable road surface. Less expensive roads, in rural areas, can be manufactured by simply applying a penetration coat of light oil, a seal coat of heavier body, and finishing layer of gravel. Road oil companies do not apply the crushed rock or gravel. This work is done by rock companies, who supply their products to meet certain specifications.

Spreading road oil is not Paulsen & March's only activity. They also seal-coat reservoirs and frog-ponds, pump oil for motion pictures, and are still engaged in the gasoline transfer business to the tune of three million gallons a month. It is significant that this progressive organization uses Union Oil gasoline and lubricants exclusively.

To Stockholders, Friends, and
Employees of
Union Oil Company
and All
Readers of the Bulletin
We Again Extend
Season's Greetings and
Best Wishes for
The Coming Year.

J. W. Sinclair

W. H. Geis

NEW APPOINTMENTS ANNOUNCED

A recent executive bulletin announces the appointment of J. W. Sinclair as manager of Union Oil Company's newly created automotive department. This department will have complete control of all automotive equipment with respect to design, acquisition and maintenance, and all incidental activities, facilities and personnel. It is also charged with the responsibility of administering the use of employee cars on company business, and of establishing schedules of compensation and policies governing such use.

J. W. Sinclair has long enjoyed the reputation of an expert in the various phases of automotive transportation. He is a past president of the Automotive Council of Southern California, is vice-chairman of the American Petroleum Institute's central committee on automotive transportation, and a member of the California State Technical Advisory Sub-Committee on Motor Vehicle Legislation.

Starting out in life with the idea of becoming a lawyer, he studied law for three years, but his preparations for the bar were interrupted by a term of overseas service during the war, and were never resumed. Finishing his education at the University of Illinois, he acquired 5 years of production experience in mid-continent oil fields and thereafter joined the automotive staff of Union Oil Company sales department, and in February, 1927, was appointed supervisor of automotive equipment.

During the years that have since elapsed, he has played a large part in the drafting and adoption of the present automotive policies of the Company, and his latest elevation to the managerial post of the new department is in definite recognition of his valuable contributions towards the economical and efficient operation of Union Oil Company's mobile stock.

W. H. Geis, newly appointed special representative in the field and exploration departments, is a widely-known individual in the petroleum industry. Graduating from the University of California in 1915, he spent some time in the mining business, and was employed as an engineer by various mining interests. His first contact with the oil business took place in 1917, when he joined the firm of Douglas and Moody, consulting geologists at Casper, Wyoming. Since that time, excepting for a brief period of war service, his efforts have been entirely devoted to petroleum geology and related activities. He has engaged in consulting work for many clients in the Rocky Mountain oil field, has surveyed the oil fields of Kentucky, and the possibilities of Missouri, and for a number of years held the position of chief geologist for Consolidated Royalty Oil Company and the Western Exploration Company at Casper. During the seven years he was so engaged, his activities carried him into practically every producing field in the United States. In 1926 he was elected vice-president of the Continental Oil Company, and was instrumental in establishing that company in California. He has organized several petroleum companies, and from 1931-1933 was employed as manager for the Italo Petroleum Company, and managed its affairs until it was returned to the stockholders. He was chairman of the "Code and Allocation Committee" under the N.R.A., and was a member of the small group which, in Washington, drafted the "Supplemental Code" for California. In addition, Mr. Geis has been active on various committees of the American Petroleum Institute, is president of the California Oil and Gas Association, and was recently elected chairman of the petroleum section of the American Institute of Mining Engineers.

This handsome super-service unit, recently opened in San Francisco by McKale's Inc., occupies the historic Barbary Coast site where the renowned Commercial Hotel once stood.

Right: These early photos show the Barbary Coast as it looked in its heyday. At extreme right is the original Commercial Hotel.

Below: Official opening of the new McKale unit was attended by R. E. Graf, Jr., local manager for McKale's Inc.; by Union Oil men G. W. Schattner, W. G. Cornelius, A. O. Anderson and W. B. Ring; and by Mr. Groves, superintendent for McKale's Inc.

TIME MARCHES ON!

ONCE the center of the rip roaring Barbary Coast, whose lusty roisterings echoed into every corner of the world, and whose uncouth but colorful capers formed a skein from which was woven many a wild tale of the west, the junction of Columbus Avenue and Pacific and Kearney streets, San Francisco, has figuratively stepped out of a street brawl into a dignified minuet.

Where once the old Jenny Lind theatre trembled as the Forty-Niners raucously voiced their approval of the heroes and their scorn of the villains, there now stands serene, efficient and dignified, an up-to-the-minute unit in the McKale chain of modern service stations. Where once husky bartenders literally threw their messy wares at an indiscriminate custom, now smart, clean, uniformed attendants minister pleasantly and capably to a meticulous clientele.

On the very spot now occupied by this McKale station No. 22, there once stood the historic Commercial Hotel, first built in 1870—a popular and highly-respectable hostelry, until the days following the great fire of 1906. Razed by the flames that practically consumed the city, a second Commercial Hotel was later built on the same site. This for a time enjoyed the elevated patronage of its predecessor, but slowly succumbed to environmental influence, and finally became a popular target for the slings and arrows of the reformers.

But the Barbary Coast is gone, and the area once so designated is rapidly becoming the Latin Quarter of San Francisco. Italian street names, Italian cafes, music clubs and night spots have transformed the territory surrounding the new McKale station into a veritable Bohemia.

This latest venture of a progressive organization is an expression of real confidence in the future of the district, for its construction represents an investment of more than $125,000. It represents also the latest development in media for public service, since many unique features have been incorporated in its design.

Built on two levels with a floor space in excess of 30,000 feet, it is completely covered by a cantilevered roof, so that motorists' cars,

while being serviced, are protected at all times, and the roof is so supported that no impeding walls are necessary. Thus unusually easy access is provided, to the gasoline aisles and to the various service units.

Gasoline, oil, tires, batteries, lubrication, brake adjustments, washing and polishing, and every driving need receive the attention of the operators on the street level, where complete visibility from all angles assures immediate service. On this floor also are provided thoroughly sanitary and well-appointed waiting rooms for the convenience of the customer.

The lower floor is distinctive in the fact that it offers to McKale patrons one of the first air-conditioned automobile storage rooms in the west. A constant stream of fresh air keeps this space free from exhaust gases, and in consequence adds definitely to the comfort of employees and customers alike.

In addition to the structural features of the new station, it should be pointed out that the various service departments are equipped with the latest machinery and tools, and can thus care adequately and quickly for the most recent model cars.

R. E. Graf, Jr., local manager for McKale's Incorporated, is justly proud of the newest link in the McKale chain, which will bring to motorists of San Francisco and the North Beach section, the most modern and complete service station on the Pacific Coast, the highest type of service salesmen, and such fine quality products as Union 76, Union Ethyl, and Triton.

S. O. S.

Help to Build Libraries for Union Oil Company's Sea-Going Personnel

CHECK OVER YOUR BOOKSHELVES
AND
SEND US YOUR DISCARDS

They Mean Relaxation, Entertainment and Education

They Mean Happiness During Off-Duty Hours for the Men Who Sail Our Ships

Send them in to "The Bulletin"
Room 320, Union Oil Building, 617 West Seventh Street
LOS ANGELES, CALIFORNIA

Monterey Fishing Fleet Active Again

A steady stream of boats draw up before the Union Oil Company dock station at Monterey these days as the Monterey fishing fleet begins full-time operations with the opening of the winter fishing season. As the boom period approaches for the fleet, the sale of Union Oil products also increases, for the company at that point provides the gasoline and lubricants for many of the boats.

Among the outstanding boats of the fleet served by the company are the Western Maid, the Marretimo, the St. Anthony, and the Star of Monterey, all well known for their records in the West Coast fishing industry.

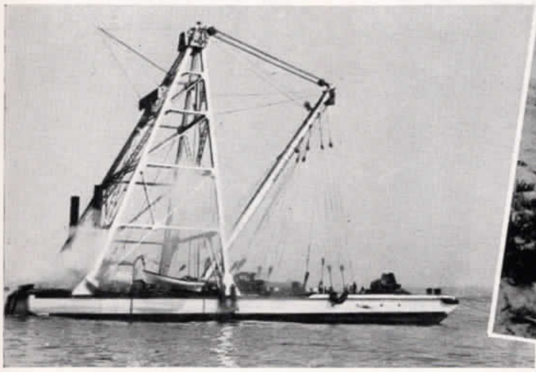
COMPANY BUILDS MARINE TERMINAL AT MONTEREY

IN ORDER to transfer oil stocks from tanker to shore, Union Oil Company recently installed a unique marine terminal at Monterey, California, providing storage for 25,000 barrels of gasoline. The storage tanks of this new plant connect with tankers by means of an eight inch submarine pipe line.

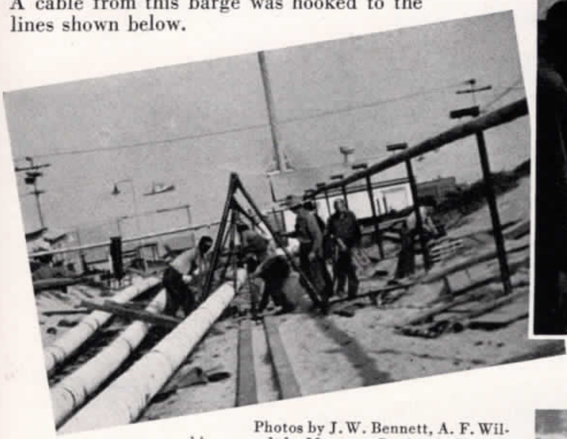
This line measures 2,200 feet in length, and its installation in the bed of Monterey Bay presented an interesting engineering problem. Preliminary work consisted of constructing a number of wooden saddles and a wooden skidway, extending to the bay's low-water mark, both skidway and saddles being greased in the same manner as are ship skidways prior to a launching. Regulation lengths of pipe were then welded together to form three sections of 730 feet each, and the sections were dressed, wrapped with special Pabco asphaltic pipeline felt to prevent corrosion, and lifted to the skidway saddles.

To pull the unwieldly line into position, a huge barge anchored off-shore and hooked a one-and-a-half inch steel cable to the sealed end of the first section. At a signal from shore, the barge's powerful winch started the line on its way. As the shore end of each section of pipe neared the water-line, the winch stopped while a crew of workmen hoisted another section onto the skid saddles.

Right: With a "heave ho" the line was launched.

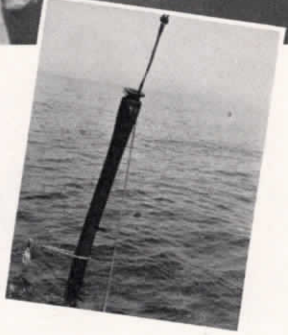


A cable from this barge was hooked to the lines shown below.



Three 730-foot sections were welded together to form the line.

Photos by J. W. Bennett, A. F. Wilkinson, and the Monterey Peninsula Herald.



The diver above descended to the bottom of Monterey Bay to couple the hose, shown at right, to the submerged pipe line.

At this point the sections were welded together, and again the winch went into action. Thus, without a hitch, the three sections were pulled into position. When fully assembled, a valve on the seaward end of the line was opened, allowing water to enter and settle the pipe to its designated position. After this had been done, a diver removed the seal and attached a 150 foot hose in its place. Two buoys, to one of which is tied the end of the hose, and to the other the end of the line itself, enable tankers to raise either one to the surface when necessary. The line is protected from corrosion by a Cathodic Electric System, installed at the time of launching, and telephone wires paralleling the pipe, permit the transmission of orders or messages back and forth from ship to shore during unloading periods.

The new facilities are thoroughly modern in every respect, and should enable Union Oil Company to expand its service to the residents of the Monterey area.

HERE AND THERE WITH UNION OIL EMPLOYEES

Above: Russell Sage and Ronald Macauley, Southern Division Pipe Line dispatchers, consult the dope sheet.

Above: Candid camera addict Carl Steiner, district engineer at Bakersfield, gets a dose of his own medicine.

Left: Ralph Oppenshaw, assistant foreman Coast Division Gas, Jack Reed, Valley Division drilling foreman, and Clarence Peck, division accountant Southern Division Field, at a company outing at Bakersfield.

Right: Walter L. Drake, fireman, and F. W. "Bill" Marston, senior engineer, discuss operations at the Stewart Pump Station, near Brea, California.

Below: A. P. "Pat" Bennett, division sales manager at Vancouver, B. C., and Brownie finished the fishing season with this fine specimen.

Below: E. J. Munn, personnel supervisor So. Div. Sales, W. S. Grant, Santa Ana D.S.M., and J. S. Swanson, accountant, So. Div. Sales, inspect a sales sheet.

LETTERS TO UNION OIL COMPANY

Unsolicited letters of commendation are sweet music to any organization that makes a point of serving its public to the best of its ability. Two such letters found their way to the BULLETIN editorial desk last month, and both were so obviously sincere that we take pleasure in passing them along to our readers, many of whom take a personal interest in this California company.

OAKLAND, CALIF.

August 20, 1938

Union Oil Co.
Oakland, Calif.

Gentlemen:

We are not in the habit of supplying testimonials, but in the present instance feel that our recent experience of fine 76 and Triton performance and exceptional Union Service Station Courtesy, should be brought to your attention.

Your Mr. Walters recently switched us to the National Credit Cards and overcame our prejudice in favor of a fine Pennsylvania lubricant for a trial of Triton.

We have just put the cards and particularly your products and Retail Service facilities to a fairly severe test. A party of five of us covered over 2000 miles in four days actual driving time to Boulder Dam, Mexico and back by way of San Diego. We were driving a 1938 De Soto at high speed in the recent sizzling hot spell. The car performance on 76 and Triton was all we could ask, the oil check on our return indicating but one quart consumed and crank case contents in fine shape.

Our experience at your Service Stations was very satisfactory in every respect. In fact, your operator at Boulder City was so exceptionally helpful and courteous we took a picture of him Dry Icing our car in the extreme heat 120°, for our comfort, as a typical example of Union Oil Company service.

Very sincerely yours,

Albert Paladini

WALNUT CREEK, CALIF.

Union Oil Co. of Calif.
Los Angeles, California

Gentlemen:

We would like to report a very courteous service which we received from one of your Service Station attendants. The station is located on Sequel Avenue, just across the bridge from the main part of Santa Cruz.

Our small lad, whose tiny legs get too tired if he has to do much walking, resorts to the use of a three-wheeled bicycle. After using the bike all summer, it was squeeking so loudly that the people at the end of the block could hear us coming.

We stepped into this station to see if we could have the bike serviced. The attendent playfully had the little boy back his bike up to the door and dismount as though he was getting out of an automobile. The man then went at the business of oiling the machine as though he were working on an expensive car, which made the child feel very important.

When asked the price of the service, the attendant grinningly waved his hand and said, "No charge Sir, call again."

In all of the paid for service that we have ever received, we have never had one more courteously, or more cheerfully given, we fully and freely advise Union Oil Company.

Sincerely,

B. Frembling
Box 201
Walnut Creek, Calif.

Mr. Albert Paladini's letter, reproduced above, should mightily please our company's research engineers, who toil long and arduously to make 76 Gasoline and Triton Motor Oil unexcelled motor *musts*. Mr. Paladini goes farther to compliment the Service Station organization's helpful and courteous attention. The Frembling letter, at right, vividly tells the story of a little boy, a squeaky bike, and the courteous minstrations of a good-humored Service Station attendant, who won for the company another life-long friend. Thanks, Messrs. Paladini and Frembling for your generous acknowledgments.

30 Years

J. W. Steele
Field, So. Div.

25 Years

H. F. Black
Mfg., Oleum

Service Emblem Awards

A PLAIN gold service award pin is presented to every employee who completes ten years with Union Oil Company. Each five years, thereafter, a ruby is affixed to the emblem, and when the wearer passes the thirty-five year mark a diamond is added. Of course these pins never attain any great intrinsic value, but each additional jewel makes them mean ever-so-much more to the wearer.

JAMES W. STEELE

James Willis Steele was born and raised on a farm in Armstrong County, Pennsylvania. During his youth he worked part time in nearby oil fields, helped his father with the farming, hired out as a thresher in the fall, and operated a sawmill in the winter months. After twelve years of such activity, he came to California in hope of finding a position in either the lumber or the oil industry. The latter won out for, on November 29, 1908, he started work for Union Oil Company as a pipe line department employee at the Brea canyon pump station. On January 1, 1909, however, he was transferred to the production department as a pumper and repairman on the Stearns lease. His next job, while at the Stearns lease, was that of tool dresser and, after serving in that capacity for about two years, he was again transferred to the Stearns Reduction Works No. 2, where he cleaned oil for shipment. After four years at this job, he was placed in charge of repair work on rigs, houses and roads. In 1917, when the Montebello Field started, he was appointed production foreman there, and has spent the last twenty-one years in this district.

Willis enjoys competitive target pistol shooting, at every opportunity, and when not engaged in his favorite sport, spends his days off at a fine mountain cabin above Camp Baldy.

HENRY F. BLACK

Henry Black started his twenty-five year career with Union Oil Company on November 4, 1913, at Oleum Refinery. He first worked in the shipping gang, handling asphalt barrels, and after serving there for seven months, was moved to the refined oil canning department, where he spent the next two years. On October 1, 1916, he was transferred to the distillation department as a fireman on the asphalt stills. Two years later he was promoted to stillman, and, after seven years in this capacity, was made a refinery foreman, which position he holds today.

Quiet and pleasant, Henry Black is well liked by the men who work under him. He owns a large tract of mountain property in Lake County and maintains a summer retreat there. He spends his spare time hunting and fishing in the area near his cabin, occasionally breaking this routine with a camping trip into the High Sierra country.

Twenty Years


C. R. Wagnon
Field, Coast Div.


H. P. Campbell
Sales, Cent. Div.


J. E. Blanchard
Field, So. Div.


R. M. Cosbie
Purchasing, S. F.


F. Pyle
Gas, So. Div.

CLARENCE R. WAGNON

Clarence Wagnon entered the service of Union Oil Company at Orcutt, California, on November 2, 1918, as a roustabout on the road construction crew. He served in this capacity for approximately a year and a half, then was assigned to the position of field pumper on the Fox lease. Since then he has been employed as a field pumper and has worked on practically every lease in the district. At present he is a field pumper on what is known as the California Coast String.

During the early days at Orcutt, about the only sports available to residents of the area were hunting and fishing. At that time, Clarence recalls, the fields abounded with dove, quail, duck, and other small game. The Santa Ynez river was well stocked with trout and, during season, deer were plentiful not far afield. He remembers those days with fond yearning, for game is not so plentiful today. Although he still enjoys hunting and fishing, his main diversion today is motoring up and down the Monterey Coast.

HENRY P. CAMPBELL

First employed by Union Oil Company on November 4, 1918, as a yardman at the Potrero Plant in San Francisco, Henry Patrick Campbell has been a part of the sales organization in that area ever since. In January of 1919 he was made a refined oil and fuel salesman. Thereafter he drove fuel oil tank wagons, distributed refined oil and today is one of the best known tank truck salesmen operating out of Potrero. He has a keen sense of humor and has made many friends during his twenty years in the sales field.

Henry's chief diversion is managing a small ranch at Mountain View, California. He hopes to retire some day and specialize in prune raising. Thinks maybe he can perfect a prune without wrinkles, if given enough time for research and development.

JOSEPH E. BLANCHARD

Joseph Blanchard was born in New Richmond, Ohio. As he grew up there, he learned the blacksmithing trade. He came to California in 1911 and began work for Union Oil Company as a blacksmith at the Brea Refinery. Not long thereafter the sales plant at Sixth and Mateo needed a blacksmith and Joe was given the job of keeping more than a hundred horses shod. In 1918, when trucks replaced the hay-burners, he was transferred to the Los Angeles garage.

During the World War Pacific Coast shipyards needed experienced blacksmiths and were paying big wages, so Blanchard left the company to accept a job at San Pedro, in 1918. He was soon drafted by the Government, however, and was on his way to camp when the Armistice was signed. Seven days later, on November 18, he returned to the company and his present term of employment dates from that time. Blanchard stayed at the L. A. garage until 1927, when he was transferred to the Southern Division shops at Santa Fe Springs, his present location.

A blacksmith and acetylene welder by profession, Joe Blanchard's hobby is woodworking and woodturning. He has a very complete little shop of his own, and can usually be found there on his day off.

RUTH M. COSBIE

After graduating from the Cogswell Polytechnical School in San Francisco, Ruth Cosbie obtained a job at Union Oil Company's office in that city on November 25, 1918. She started as a file clerk in the Purchasing Department, but studied shorthand and typing at night school and was soon promoted to stenographic work. She is still employed in the purchasing office at San Francisco.

Being of an artistic temperament, Miss Cosbie has been an ardent student of Russian ballet dancing for many years. Today she devotes a large share of her leisure time to music and literature.

FORD PYLE

Ford Pyle was employed by Union Oil Company on November 29, 1918, as a roustabout at the Orcutt Absorption Plant. He continued in this capacity until May 16, 1922, when he was transferred to the Southern Division as a welder during construction of the Richfield Absorption-Compressor Plant. Upon completion of the Richfield unit early in 1923, Ford was sent to the Bell Absorption Plant as repairman. He stayed there until 1929 and during this period received several promotions culminating in an appointment as plant mechanic. In 1929 he was transferred to the Rosecrans Absorption-Compressor Plant in that capacity, and has served there continuously up to the present time. He is now rated as senior mechanic.

Ford resides near Compton with his wife and two children. His hobbies are deep sea fishing, and home gardening, and at either one he can usually produce results that well justify his efforts.

Thirty Years—November, 1938

Steele, J. W., Field, So. Div.

Twenty-five Years—November, 1938

Black, H. F., Mfg., Oleum Ref.

Twenty Years—November, 1938

Blanchard, J. E., Field, So. Div.
Campbell, H. P., Sales, Central Div.
Cosbie, R. M., Purchasing, S. F.
Pyle, F., Gas, So. Div.
Wagnon, C. R., Field, Coast Div.

Fifteen Years—November, 1938

Ashton, H. B., Sales, Central Div.
Blackwood, W., Mfg., Oleum Ref.
Forquer, A. M., Field, So. Div.
Gibbs, E. M., Mfg., L. A. Ref.
Grainger, R., Transp., No. Div. P. L.
Keans, H. F., Gas, So. Div.
Maddy, M. M., Mfg., L. A. Ref.
Mortizia, N. G., Mfg., Oleum Ref.
Sneddon, R., IRP, Head Office
Vanderburgh, A. E., Sales, Central Div.
Vogt, F., Bldg., Union Oil Bldg.

Ten Years—November, 1938

Adams, L. L., Sales, Head Office
Badger, E. H., Advt., Head Office
Bardin, J. A., Sales, So. Div.
Cakebread, R. E., Mfg., L. A. Ref.
Cattran, B. M., Sales, Central Div.
Crook, W. W., Sales, No. Div.
Hamilton, L. J., Sales, So. Div.
Heyer, H., Auto., Central Div.
Koehler, L. T., USS, So. Region
Nightingale, A. J., Field, Valley Div.
Panick, J. L., Sales, Central Div.
Ralph, D. M., Sales, So. Div.
Rood, L. V., Field, Valley Div.
Roberts, M. I., Field, So. Div.
Scanlon, H. M., Gas, So. Div.
Smith, H., Sales, So. Div.
Tebbs, W. Z., Transp., So. Div. Telephone
Vanderlin, C., Auto., So. Div.

Wetter Water

Any time that proverbial duck wants to get his back wet the petroleum chemist is ready to help him. At least, the chemist has succeeded in wetting raw wool, which is supposed to resist water like a duck's back.

Sulphonic substances derived from petroleum and known as detergents are being used to make wetter the water used for scouring and cleaning wool. Softer woolens in prettier shades are the result.

REFINED AND CRUDE

By Richard Sneddon

Our Caledonian friend, Angus McBagpipes, took his new girl to the show in a taxi the other night, and found her so unusually attractive that he could scarcely keep his eye on the meter.

And while we are in Scotland, the master of the sloop, "Annie Laurie," ordered seaman Sandy McDonald to climb out on the bowsprit and haul in a trailing halyard. "Ah'll do nothin' o' the sort," protested Sandy, "Ah signed on tae sail before the mast, no' before the ship."

Which recalls an interesting war story that developed during the battle of the Marne: A Scotch regiment was storming a front line position in the face of a terrific bombardment, and word was eagerly awaited by the general staff as to the outcome. At the peak of the excitement a carrier pigeon arrived back at headquarters, and was caught and conveyed to the senior officer. With trembling fingers he untied the little slip of paper from its leg, smoothed it out on the table, and read, "I'm sick and tired carrying this bird around."

On the subject of war, during this season of peace and good will, it is mighty comforting to reflect that outside of our immediate families there has been no major conflict in the United States since 1865.

"It's just ten years this Christmas since my wife went out to buy a loaf of bread, and she has never come back," said the old fellow sadly. "What do you think I ought to do?" With deep sympathy, his boyhood buddy replied, "Guess ye'll jest have to go out an' buy one yourself, Jim."

And said the light housekeeping inmate of the boarding house, "Imagine that cat cutting the butter with a knife to make it look as if the landlady had stolen it."

It was at the Christmas party that one of these perennial mimics had been making a perennial nuisance of himself. "I can imitate any kind of an animal," he chortled, "What shall I do next?" From over in the far corner came a voice, "How about doing a groundhog that has just seen his shadow?"

By the way, every time the Christmas season rolls around we recall the glorious days of our childhood, when we used to sit around the blazing Yule log roasting chestnuts. Now we sit around the gas stove roasting the neighbors, and the chestnuts all go in this column.

These were the good old days of charades and conundrums. You remember: Take away my first letter. Take away my last letter. Take away all my letters, and what am I? A postman.

There is no more joyous sound in all the world than the unrestrained merriment of a group of young folks on Christmas Eve, unless perhaps it's the call of "Next" in the barber shop on Saturday night.

Oh, they were happy times. What did we care if the grass turned green in the spring, and our Christmas jewelry did the same thing two months earlier.

How we tore open the bright parcels on Christmas morning, and scattered excelsior (they called it "long sawdust" then) all over the living room, as we yanked out the beautiful toys, and dad kept on showing us how to work them until they were broken.

But the whole situation has changed. Where once we were an eligible receiver, we are now a passer. As a somewhat undersized Santa Claus, we hold the sack for a pair of offspring whose tastes run to ties with dots in them, suits with stripes in them, and envelopes with checks in them.

We know a boy who received a pair of military brushes last year, and has been trying to get into West Point ever since.

And our own biggest problem at the moment is to find something for a girl who doesn't smoke.

In passing, the assurance of the present day crop of youngsters is something at which we never cease to wonder. Imagine our surprise when over the long distance phone a few days ago came this cheerful salutation, "Hi pop! Guess who's been kicked outa college?"

Wherewith we diverge to catch up on the world news. First we have received the astonishing report that a San Francisco man lived all summer in a trailer, and when he returned home became hopelessly lost in his own dining room.

Then there was the lad whose trailer broke down, requiring him to rough it in a hotel for two nights.

After a long dissertation on the Old Masters, the art teacher asked the class, "If the Huntington Library were to take fire while you were there, which three paintings would you attempt to save?" From the far end of the third row piped a voice, "The three nearest the door."

And says the stern parent, "Tell Johnny he can mow the lawn today if he feels like it . . . and tell him he'd better feel like it."

Now reaching out to the columns of the Los Angeles Times we find this classic, "A British motor car of new design is without a clutch or transmission. If it has no brakes, no horn, and no light, we think we have seen it."

Saying which we return to the main topic just long enough to wish our readers a Merry Christmas and the best of everything in 1939.

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