
UNION OIL COMPANY OF CALIFORNIA
BULLETIN NO. 17
JULY 1922
H. Willard

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Union Oil Company of California

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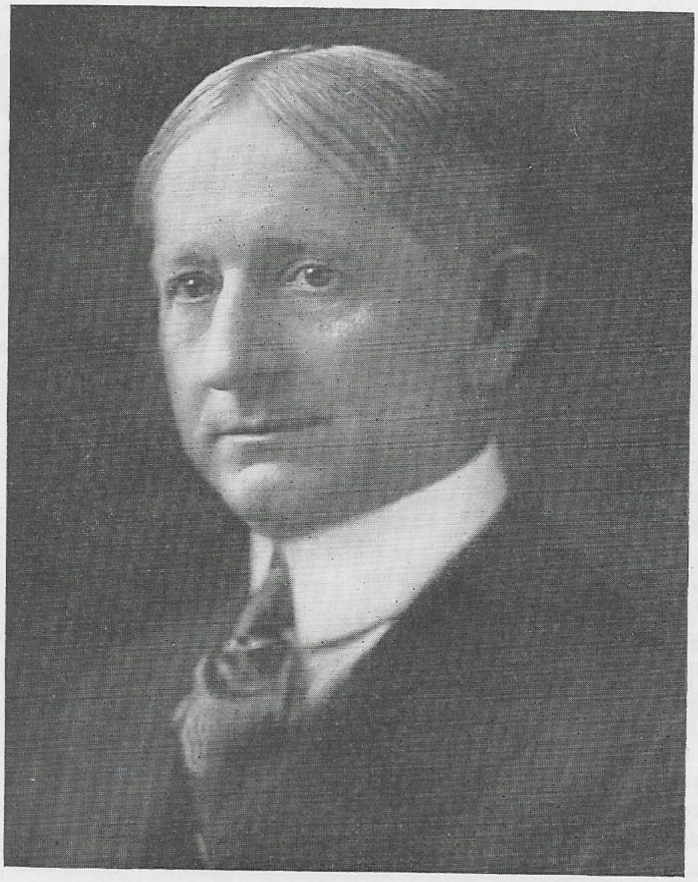
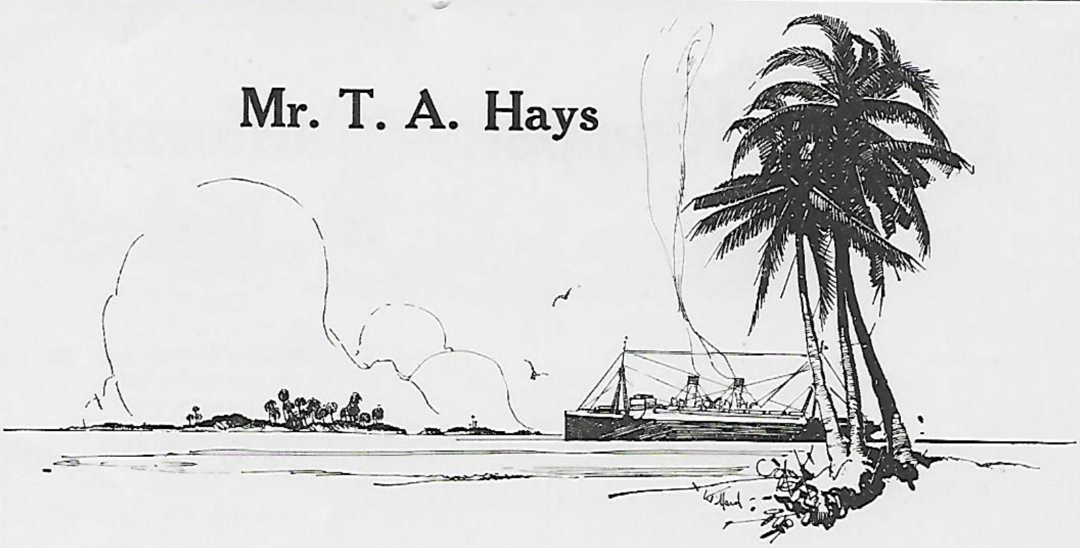


Mr. T. A. Hays



MR. T. A. HAYS, Assistant to the Executive Vice-President at San Francisco, though a native of Tennessee, has been a Californian since he was eight years old. In fact, one of the earliest memories he has embodies witnessing the opening of the old Palace Hotel at San Francisco on the day in 1874 when he first arrived in the Bay City. This first impression has often been refreshed by contrast, as he has for some years past made his home in the new hotel of this name.

Following the completion of his schooling in 1888, Mr. Hays began a long career in the steel and hardware business, entering the employ of the George W. Gibbs Company of San Francisco. For the ensuing fourteen years he traveled for this concern, his territory extending over all the western states. He has figured that the total distance covered while securing buyers of the Gibbs products was over half a million miles, all traversed without going east of the Mississippi nor west of the Pacific Coast.

In 1902 the Gibbs company consolidated with Miller, Sloss and Scott into the Pacific Hardware and Steel Company, and Mr. Hays was sent to Honolulu as manager of the Hawaiian Islands agency. As at this time there was no cable to Honolulu and the quickest time in which an answer to a letter could be obtained was three weeks, he was thrown entirely on his own initiative in developing the new firm's business in the Islands. He continued in this capacity until 1906, when he was brought back to California to assume charge of the iron and steel department of the same company in Los Angeles.

The year 1909 saw him leaving the services of the interests with which he had been connected for twenty-one years. Steel still held him, however, and in conjunction with two partners, he organized the Western Pipe and Steel Company, in a deal which involved the buying out of Thompson and Boyle. Mr. Hays was made Vice-President of the newly-formed corporation and served in this position for a period of four years.

He became associated with the Union Oil Company of California in 1913, after having followed the steel industry for twenty-five consecutive years. He has since served continuously as Assistant to the Vice-President in charge of Corporation Sales, the title being changed to the present one last year. His headquarters have always been in San Francisco.

Mr. Hays is a familiar figure in the commercial and social life of the Bay City, his genial personality having won for him a host of friends. He is a member of the San Francisco Golf and Country, Olympic, San Francisco Commercial, and Sutter Club of Sacramento.

Dusty Woods—Dean of Wildcatters

Touching as it does all the present producing fields in California and the majority of localities where oil has been sought in vain, the life of Charles L. Woods, affectionately known to the boys in the fields as Dry Hole Charley, or Dusty Woods, is a representative study of the progress of petroleum in this State—from the time when the first few derricks dotted the sides of the Newhall canyons more than thirty years ago, to the present day State-wide wonder concerning the advancement of the Signal Hill territory.

Interviewing Mr. Woods in the Long Beach headquarters of the Union Oil Company of California, whose operations in that field he directs, you first become impressed with his intimate knowledge of the oil game, the spontaneity of the man and his genial personality. As he smokes and talks, you drift back with him to the old days and can readily visualize the old fields, the old wells, the old methods of drilling; the old struggles to make the oil industry what it is today. You see big cities now that were dusty little one-street towns then; you seem to see and listen to the early and extremely discouraging struggles of the men who are now captains of the industry. Then you march onward to the development of the new fields overshadowing the first small producers; you picture the greatest gusher of all covering acres with its phenomenal flow, while an army of men labor to keep the oil under control; you travel over the different sections that were destined to prove dry-hole failures in order that the few great producing fields of today might be located.

The first few years of the career which has carried this veteran of petroleum pursuits over every oil territory and most of the prospective territories in California, were spent working on the wells whose black squatty derricks are still to be seen lining the Newhall tunnel highway. Since those early days, Mr. Woods, still as jovial in temperament, though a bit more expansive of structure, has drilled over 200 wells and has given the intervening years entirely to the oil industry.

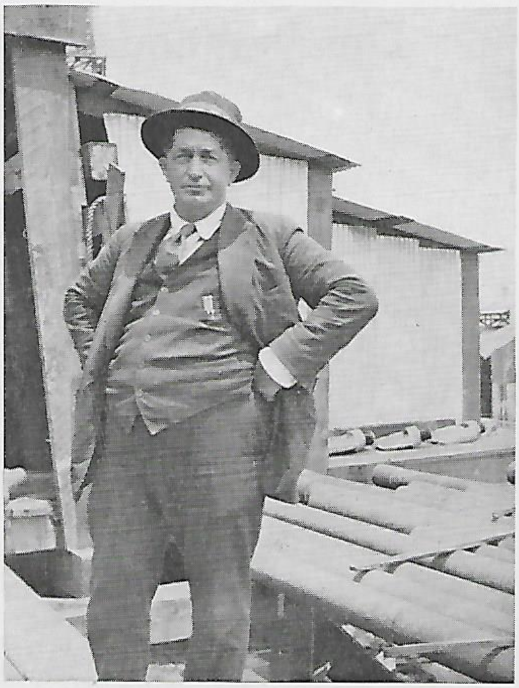
In comparison to the thousands on the payrolls of single companies today, young Charley Woods in 1890 hopefully allied himself with about thirty actually experienced oil men in California. These old-timers had come from the Pennsylvania fields and were the nucleus around which was formed the great oil fraternity of later years. The oil business was very limited in scope and the work offered no special inducements, inasmuch as death was about the only opening through which an ambitious tool dresser could attain a driller's position. Present field workers will be interested in knowing that the rate of pay for both toolies and drillers was the same. The difference in other respects is well illustrated by the figures covering the equipment with which the old-time drillers worked. The initial investment for the entire outfit, including the rig, rarely exceeded $4500.00, and consisted of a couple of old bits, a stem, bailer, manila lines, boiler and some kind of an old engine. Today an expenditure of from $30,000.00 to $40,000.00 is necessary before a wheel can be turned.

In 1894 Mr. Woods followed the boys to the newly discovered Los Angeles field. It is in the discussion of the old Los Angeles, at the time when oil wells sprung up in the wilderness that is now the Westlake District, that he is most interesting. A greater demand for oil, coupled with the newly discovered field, had given the industry an added impetus. Drillers were accorded their first recognition, being granted a rate of $4.50 per day, as against the $4.00 rate paid tooldressers. (Remember, this was in 1894, at which time these figures represented high wages). The oil industry in California had really gotten under way.

Young Woods, already drilling, saw history made in the Los Angeles field during those six years before the 20th century opened, and which were the foundation of the California business of today. Such men as E. L. Doheny, Tom O'Donnell and the late Mr. Canfield made their start drilling these first holes in those curious early ways and under conditions vastly different from those prevailing after nearly 30 years of development.

While the roads to the fields were incomparably poor and caused long delays in getting tools, the wells, once started, were finished in the amazingly fast time of one week per well. The average depth was 700 feet, giving a daily drilling total of 100 feet. The derricks and all machinery were on skids, and each Sunday, when a hole was completed, the rigs were skidded over to a new location, and in 12 hours the old well was a closed incident and actual drilling on the new one was started. The

ROTARY MUD SLUICE — SIGNAL HILL



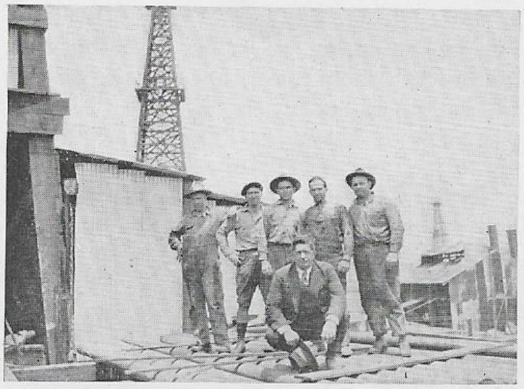
DUSTY — HIMSELF

standard rate of pay was then increased to $5.00 per day.

Mr. Woods, little showing his three decades of the hardest kind of oil work, is inclined to wax satirical in contrasting the oil worker's tasks of today with those of early periods.

"Huh—" He scratched his thick and still dark hair, "We had to work—work, I say—12 hours a day, noon to midnight, or vice versa. Eight hours abuses the boys now-a-days. And a driller and tooldresser were the whole gang. We handled the drilling, cased the wells, watched the boilers, did all the general work around the rig, and broke down the tools when the well was finished.

"Things were funny then—when you consider the advanced drilling methods now used," he went on as he looked over the thick forest of derricks at Signal Hill. "We set stovepipe about 250 feet to shut off surface water, used 7⅝ in. casing as a water string and 5⅝ in. on top of the sand for the oil string. Then the practice of cementing the casing to keep out water had not been invented. In order to make a shut-off, burlap sacks were tied around the bottom joint of the string of casing, between the first collar and the shoe, with the ends of the sacks loose, so that when the casing was lowered into the tightly fitting bottom end



DUSTY AND ONE OF HIS CREWS

of the hole, the sacks would wad up. Down the outside of the casing, wheat, beans, flaxseed, or some such material, would be poured, so that they would swell up and, for a time, perhaps, keep out the water from the oil formation.

"And close together! Why, we sunk two wells on each 25-foot lot out there near Westlake park. They aren't quite that bad now, close as the rigs are. I recall that one old driller, named Pete Holmes, found his drilling tools had dropped away from him one day and a couple of days later they were fished out of the well on the adjoining lot."

Then we mentioned the old St. Elmo Hotel on North Main street, Los Angeles, and Dusty Woods smiled reflectively.

"You can take my word, they don't have the fun around that place today that we used to have in the nineties," he said. "Saturday nights the whole field, except the boys on tour, gathered at the St. Elmo. 'Daddy Ikey' Eichenhoffer kept the place—a German-Jew, with a heart as big as all outdoors. He would stake any of the boys to grub until they got on their feet, never asked for his money, but always got it before anyone else. All the big business men of Los Angeles hung out there, too, and drilled the wells over and over again with the drillers.

"Once in a while we'd walk over to Central Park—I haven't yet got used to calling it Pershing Square—although it was considered quite a ways out in the suburbs then, and not more than six houses had been built around it. As for Hope street, with its three plank board walks, where the kids lost their pennies—you were on the extreme edge of town when you got out there. Beyond Hope there were just a few farmhouses on the dusty, bumpy old pike to Santa Monica."

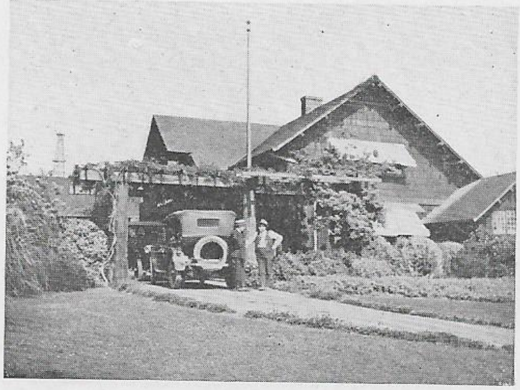
We managed to get Mr. Woods back on the subject of his own career and gathered that early in the present century he left the south for a period of drilling around McKittrick, then the scene of gun fights over claim jumping, following which excitement he engaged in miscellaneous deep dry hole drilling all over the State. He also drilled three water wells in New Mexico for the Rock Island Railway.

In 1909 Mr. Woods returned and began his long connection with the Union Oil Company of California. After drilling two holes on the Sage Lease, near Maricopa, and the Race well, on the government Pebble Lease land, he was suddenly taken off drilling work to assume charge of the most spectacular oil producer California has ever known—the Union Oil Lakeview Gusher.

This phenomenal gusher, which caused State and national excitement, broke loose in March, 1910, hurling 80,000 barrels of oil daily into the air, after the derrick had been wrecked in the first tremendous rush of petroleum.

Mr. Woods, as foreman, actively directed the memorable campaign to handle the undreamt of amount of oil which covered the land around the well.

"It was one hard job, all right," he says, thinking it over, "but after all the dry holes I had drilled in the backlands of California and other states, it gave me a satisfying feeling to see it coming out in such quantities. I guess I'm the only old-time driller who doesn't lay claim to having drilled the Lakeview gusher; but I had troubles enough



SIGNAL HILL HOME OF UNION OIL

handling the 9,000,000 barrels we had to take care of in the months that followed.

"First we built 75,000 barrel sumps, or artificial reservoirs around the well—using mountains of sand bags and offering high pay to anyone who would work for us. College boys to convicts responded, and after an hour's work around that fountain, they all looked alike. Then, to back up the sumps, which were filled as fast as they were completed, we built the "Cornfield," a reservoir covering 16 acres. We needed it, too, for shortly afterwards an earthquake broke the walls of three of the sumps, and the "Cornfield" caught every barrel of the oil. As a late summer flood would have ruined all that storage, however, we had to go back into the hills with an army of 600 men and dam up mouths of canyons with walls 20 feet high and 50 feet wide. Nine-tenths of the ten-million-barrel storage provided for was needed before that gusher calmed down."

Following the stirring days of the Lakeview gusher, Mr. Woods returned to drilling and began on a long period of dry hole after drier hole. At McKittrick he had charge of the Union's operations on the government property where four companies were drilling the Rudestill, Sheridan, O'Donnell, Hopkins Joint, Coyote and Dobe Hole wildcats, all of which proved positive "dusters."

On January 1, 1914, he put the finishing touches to the old Sunset well in the Sespe, Ventura District, being rewarded with a very small production of oil, followed, however, by the Frier well on the Newhall Ranch—another dry hole. In June of the same year he was borrowed from the company by Mr. A. P. Johnson to make tests on the Old Trader's Lease, and in August was loaned to Graham and Loftus, for whom he drilled eight holes at Gilroy without a sign of oil.

For the next several years he drilled for himself in other states, returning to the Union Oil Company of California in 1918 and celebrated his comeback by sinking casing 4500 feet at San Juan Capistrano to find nothing but the inevitable dust. Then he was delegated to the Summers well at Gardena, another dry hole abandoned at 5000 feet; then the Francis well, on the Dominguez Ranch.

Following these operations, Mr. Woods was placed in charge of the Union Oil properties at Redondo and Signal Hill, where he is at present. Recently he was overjoyed at bringing in the Long Beach Community Well No. 1, which came in at 1600 barrels daily of 27 degree oil, the lightest production in the Signal Hill field, and which has increased its flow to over 2600 barrels daily. He has charge also of the Hart well, four other wells of the Long Beach Community, and the Wagner and Callender wells at Athens-on-the-Hill.

The outstanding feature about him is his resourcefulness. Where an especially difficult wildcat well has to be drilled in a lonely spot on the top of the hills far from any base of supplies, Charley Woods is picked out for the job. He can rustle the necessary wood, water, etc., and make hole where another tool-pusher would be at a standstill and perpetually telephoning the office for instructions. The quickness and effectiveness of his work, the harmony which characterizes the relations of himself and the crews under his jurisdiction, and the brevity of his reports are impressive. He is a specialist on wild-catting known to oil men of California as one of the best practical authorities on this species of drilling.

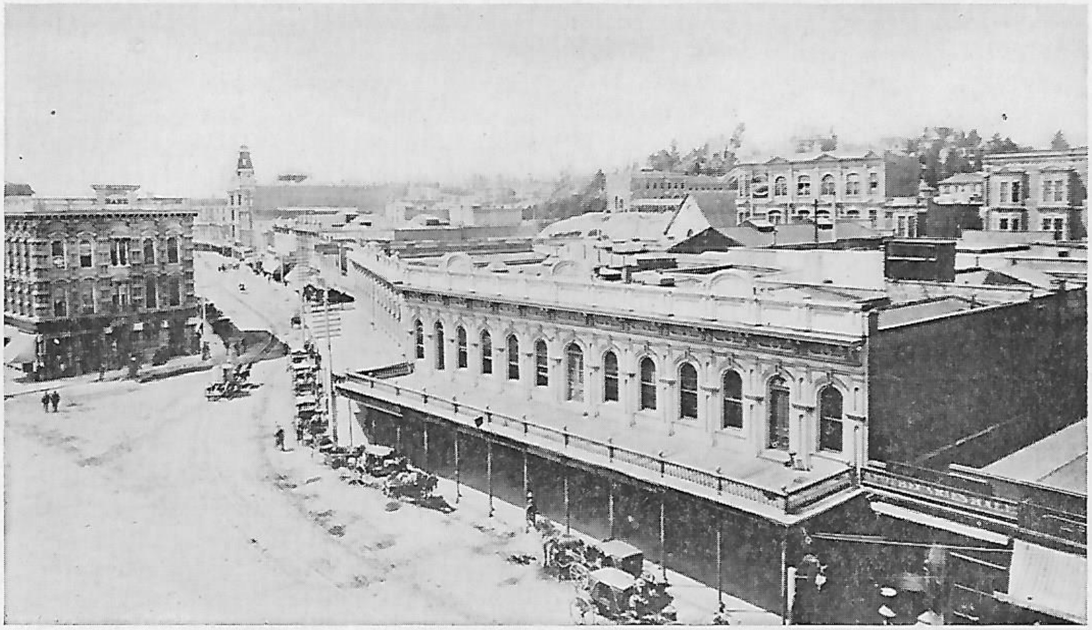
Asked if he would follow the same occupation again could he live over the past thirty years of his life, Mr. Woods creased his genial features and replied:

"Don't know what else I would do. It's a tough game, I guess, but I've met very few who weren't square shooters, both among the men and the oil operators. It's worth while, has a bearing on the whole world, and, say, for excitement, it can't be beat. There's no other game in the world like getting deep down into a forbidding looking old wildcat, with the opportunities for ingenuity and self-reliance in long and tedious fishing jobs, and always that chance of striking something. Yes—I'd take it all over again."

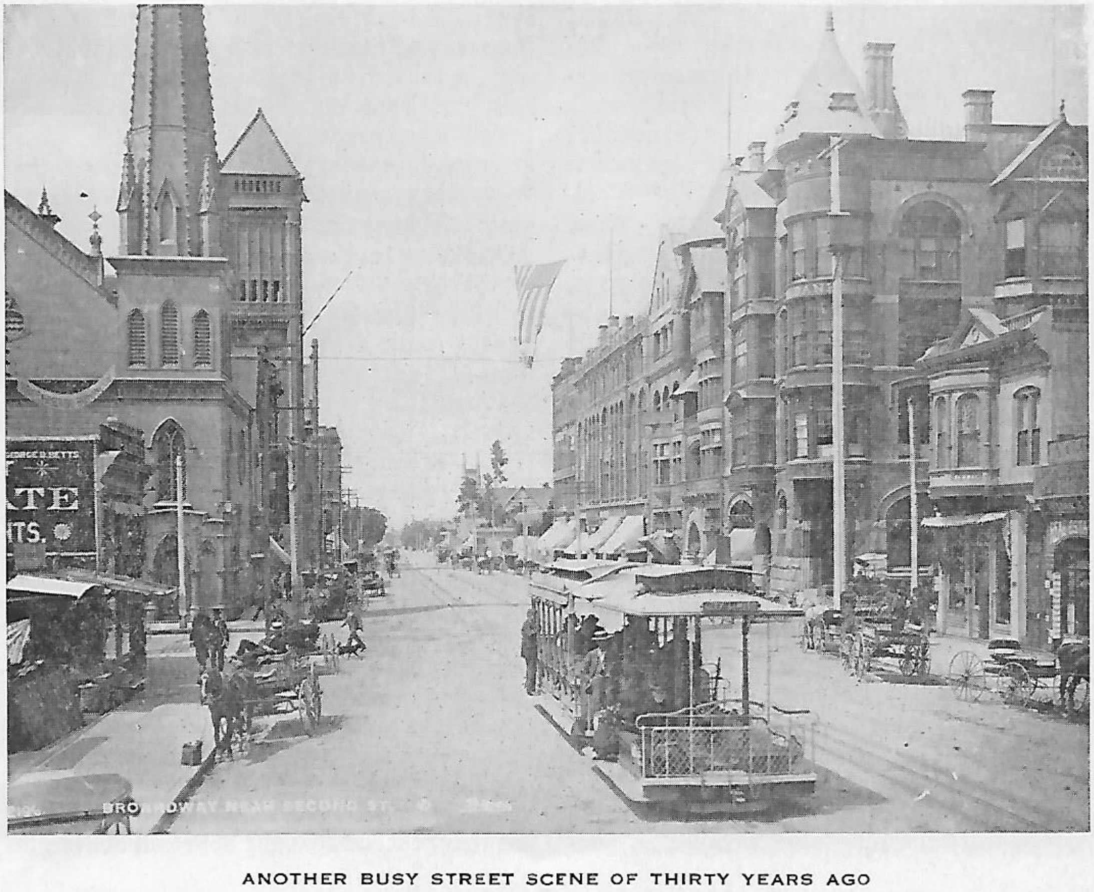
Nobody's ever whipped, or killed, or flat busted or down and out until he says so himself and believes it.

A Norfolk villager never saw a motor car until last Friday, his 89th birthday. That is one reason why he's 89.

Los Angeles at Time of First Oil Boom



SPRING, MAIN AND TEMPLE, IN 1890



ANOTHER BUSY STREET SCENE OF THIRTY YEARS AGO

Some Applications of Colloid Chemistry

BY R. C. POLLOCK
OLEUM LABORATORY

Colloid chemistry has been described by Dr. Bancroft of Cornell University as "the chemistry of bubbles, drops, grains, filaments, and films." At first sight the study of such apparently insignificant things would seem to be of little interest or importance. But further consideration leads to the conclusion that in reality such study is of tremendous importance, for, as has been said, "We live colloidal lives. Our food and even our drinks, be the latter milk, tea, coffee, or the forbidden home brew, are colloidal. We live in colloidal houses, for the materials, be they wood, brick, or cement, furnish important colloidal problems. We ride on colloidal rubber tires, on a colloidal asphalt street, in automobiles made of colloidal alloys, colloidal wood and colloidal leather." And we might add:—and which are propelled and lubricated by colloidal petroleum products.

Thomas Graham, who first introduced the subject of colloid chemistry to the attention of science, believed that the distinction between other substances and colloidal material is the same as that which exists between the material of a mineral and that of a plant or animal, as, for instance, that between salt and meat. Graham termed the substances which are related to animal or vegetable tissues, "colloids," from the Greek word meaning glue, because, in general, they resemble water soaked glue in appearance. And the substances which are related to the minerals, such as salt or rock, were called "crystalloids," because they commonly exist in the form of small particles or crystals. But it is now believed that colloids and crystalloids are not really different *kinds* of matter (as Graham believed), but rather merely different *states* of matter, and that the same substance may be obtained in the one state or the other by suitable alteration of the conditions under which it is produced. For example, it is believed that a considerable portion of the very great quantities of crystalline quartz rock which are now found throughout the world once existed (at ordinary temperatures) in the form of a soft, jelly-like material. Even the existence of gold-bearing quartz veins has been explained on this basis.

On placing a crystalline substance, such as salt, in water, it usually dissolves or separates into such fine particles that they cannot be seen even with the most powerful ultra microscope. These extremely fine particles are termed "molecules" or "ions." On the other hand, if a colloidal material such as glue or starch is placed in water, it does not truly dissolve, but forms what is called a colloidal solution in which the particles are much larger, and thus, in distinction to the particles in a true solution, they may be seen or detected by the ultra microscope. There are no sharp limitations to the size of particles in colloidal solutions, but it is believed that the approximate limits are from the size of one of the large crystalloidal molecules to that of a particle having a diameter slightly less than a wave length of light, *i. e.,* from one two-hundred-and-fifty-millionth of an inch to one two-hundred-and-fifty-thousandth of an inch.

The characteristic properties and the activity of substances in the colloidal state are almost entirely dependent upon their degree of subdivision. This is explained from the fact that as the subdivision of a substance proceeds, its effective surface is enormously increased, and this results in a corresponding increase in the forces which are responsible for the phenomena peculiar to colloidal chemistry.

To one who has not given the matter particular thought, the possible increase in surface which may result from subdivision is almost unbelievable. For example, if a cube, having an edge 1 cm. (approximately 0.4 of an inch) long and a total surface of less than 1 square inch were progressively subdivided until the edges of the resulting cubes were only one two-hundred-and-fifty-millionth of an inch long, the total surface would have increased to 14.83 acres.

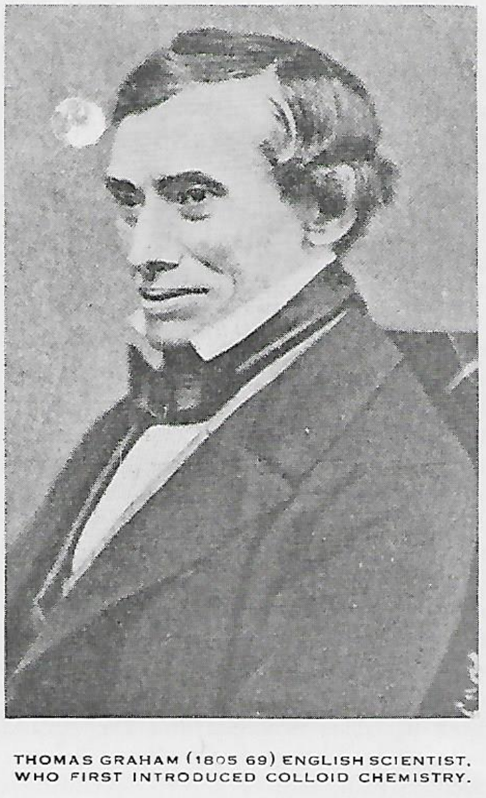
The particles which result from such great subdivisions are so small that they seem to defy the law of gravity and will remain suspended in gas or liquid indefinitely. An experiment by an English botanist, Brown, led to the discovery of what neutralizes the effect of gravity in the case of colloidal solutions. He was studying some colloidal material under the microscope and observed that some of the particles moved about in the liquid. Further experiments showed that similar results were obtained with practically all finely divided solids. These zigzag movements of suspended particles are now known as Brownian movements, and they are apparently due to the bombardment of the suspended particles by the molecules of the liquid, which are always in a state of molecular motion. Being thus kept in constant motion, it is apparent why these particles have little or no tendency to settle. It has also been found that even larger particles of such a size that they no longer show the Brownian movement may remain suspended in lighter liquids for considerable periods of time. This is explained from the fact that most insoluble particles, when placed in water, take on a negative charge of electricity. As is well known, like charges of electricity repel each other, and for this reason each particle is trying to push the others away, and thus there is little tendency for them to come together or settle out.

With many substances, the colloidal state is not stable, and they are easily changed to ordinary non-colloidal material by altering conditions, such as changing the temperature, adding a small amount of a salt, etc. But it has been found that if certain other colloids are added to those which tend to break down, the latter become much more stable and may retain their colloidal state even though subjected to marked changes of condition. Organic colloids, especially such as gelatin and albumin, bring about this increase in stability and are, therefore, termed protective colloids.

With the foregoing very brief review of colloidal chemistry in general, we may now turn to some of its applications. These applications are so nearly universal that they may be found in every department of science or manufacture, and in many cases are of such importance that a whole division of literature has grown up around a single application. From this it is apparent that in a short paper devoted to a general consideration of the subject, it will be possible to do little more than to touch upon some of the most common and interesting examples.

The weather may be selected as the first subject for discussion, but in this instance, unlike that on many other occasions, it will not be from lack of anything else to talk about. The condition of the weather is mainly dependent upon the degree of dispersion of water in the atmosphere. Warm air over a body of water takes up a large amount of the water by evaporation, and when this moisture-laden air is chilled by rising over a mountain range or by meeting with a colder air current, its water particles collect in large aggregates and assume the colloidal state which we recognize as cloud, fog or mist. And, if the chilling action is great enough, or if there are enough dust particles in the air to act as starting points for the condensation, the combining of the water particles proceeds and the colloidal condition is destroyed, the water being released as rain, hail or snow, depending on the local conditions. The professional rainmaker usually depends upon the effect of artificially-produced dust particles, and the only drawback to his profession is that he cannot draw rain from air which contains no water.

In agriculture it was long supposed that it was the chemical composition of the soil which chiefly determined its value for crop production. Hence, it was thought all that was necessary to improve a poor soil was to add a mineral fertilizer containing the particular plant food—potassium, nitrogen, or phosphorus—which might be lacking in the original soil. But it is now known that the physical condition of the soil is fully as important as its chemical composition. That is, a soil, to be highly productive, must contain the plant food materials in a very finely divided or colloidal condition. There are certain agencies, such as soluble salts or "alkali" or heat, with its drying effect, which tend to destroy this condition. Therefore, a good soil, in addition to the required mineral elements, must also contain some substance, such as humus, which acts as a protective colloid and tends to produce and maintain the necessary colloidal condition of the plant foods.



THOMAS GRAHAM (1805 69) ENGLISH SCIENTIST, WHO FIRST INTRODUCED COLLOID CHEMISTRY.

Soap is another example of a protective colloid, and its detergent or cleansing action depends upon this fact. In general, a protective colloid not only tends to maintain the protected substance in a finely divided or deflocculated condition, but also may actually promote such deflocculation. That such is the case in the cleasing action of soap has been brought out by H. Jackson, who examined microscopically the fluid resulting from washing a dirty cloth with soap and water, and observed in it innumerable particles in a state of oscillatory motion or Brownian movement which is characteristic of colloidal particles. Upon studying the action of soap and water on a single thread under the microscope, it was observed that the dirt particles gradually broke up and began to oscillate; salt solution was then added and the dirt particles grouped together again or flocculated and the Brownian movement ceased. As previously explained, the fine particles of dirt which were released from the thread by the soap solution each carried a negative charge of electricity and thus they had no tendency to group together and so become too large to be affected by the Brownian movement. But it is evident that if the like electrical charges on the dirt particles were neutralized in some way, the particles would then be able to come together and thus soon become large enough to settle out. This is exactly what happens when the salt solution is added, for just as insoluble particles, such as those of dirt or sand, take on negative charges when placed in water, there are particles in a salt solution which carry positive charges. Thus when the salt solution was added to the soapy water with the moving dirt particles, the positive charges on the particles in the salt solution neutralized the negative charges on the dirt particles. Thus they no longer repelled each other, and so were able to strike each other during the Brownian movement, and whenever this occurred they stuck together and very soon became large enough to settle out. From the results which have been discussed above, it is apparent why ordinary soap is not an effective cleansing agent when used with salt water.

Milk is another well known and valuable material which is essentially colloidal in nature. This is due to the fact that several of its constituents are present as colloids. Two of these, casein and albumin, are inherently colloidal, and the butter fat, present as an emulsion, acts as a colloidal system on account of its fine state of subdivision.

Casein is an unstable colloid and may be easily flocculated or curdled by the addition of acids or salts, but the albumin is a stable colloid and protects the casein and tends to maintain it in the colloidal state. These facts are of great importance in infant feeding, for, if a milk of high casein and low albumin content is brought into contact with the acids of the digestive juices, the relatively small amount of protective colloid is unable to maintain the casein in the colloidal state and it is soon coagulated in large, indigestible masses. The normal food of the infant contains a high ratio of protective albumin, 1.22 parts of albumin to 1.00 part of casein, while in cow's milk the ratio of the protective colloid to the casein is low, only 0.18 part of albumin to 1.00 part of casein. The deficiency of the protective albumin in cow's milk may be overcome to a large extent by the addition of other protective colloids, such as gelatin, gum arabic, cereal gruel or barley water.

It is a logical as well as a pleasant transition to turn from the study of milk as a nutriment for infants to a consideration of ice cream as a food for adults. In the manufacture of ice cream we have another interesting example of the practical value of the action of protective colloids. It is well known that ice cream made without eggs, gelatin, or other colloidal ingredient is gritty or grainy, or becomes so after standing a short time. On the other hand, if small amounts of these colloids are added, the product is smooth and velvety and seems much richer than might be expected from the small quantity of added material.

The highly desirable results which are obtained by the addition of the above mentioned materials in the manufacture of ice cream are brought about through their action as protective colloids. The casein which is present is protected from coagulation which would otherwise result in the production of a lumpy product. Of the several materials which may be used, gelatin is especially desirable and as small an amount as 0.5% is effective in yielding a smooth, rich product. In addition to protecting the casein, the added colloids also protect the very small ice crystals which would otherwise tend to coalesce and form coarse grains. The addition of such materials has sometimes been considered an objectionable adulteration, but it is evident from the points which have been brought out that such additions are an actual improvement not only as regards taste but in the matter of digestibility. But it must be admitted that the presence of these colloids makes it possible for an unscrupulous manufacturer to add a considerable quantity of milk to his cream and to still obtain a product which is very rich in appearance.

Attention may next be directed to another but very different form of luxury and one intended for external rather than internal application. Among the most costly materials known to man are some of the precious stones, and in many instances they owe their value to their magnificent colors, which in turn are often due to minute quantities of colloidally dissolved coloring matter. The sapphire, for instance, owes its beautiful blue color to the presence of a very small amount of colloidal cobalt oxide and among the semi-precious stones the opal must be considered as wholly colloidal, *i.e.*, like some forms of quartz it is a solidified rock jelly. It may be said at this point that the jellies of the kitchen and dining room are also wholly colloidal in character and many of us have seen examples which, if they could be similarly solidified, would easily compete with the most magnificent of the precious stones.

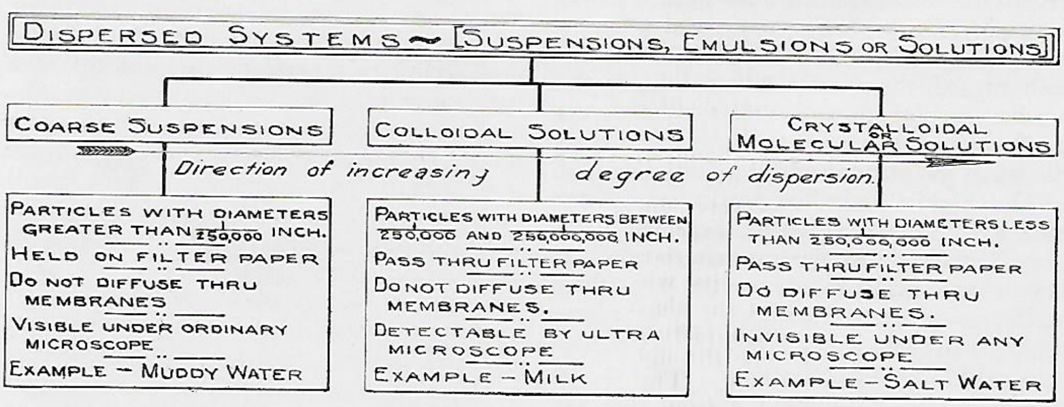
Ruby glass is an artificial material, the nature of which is closely analogous to that of the colloidal precious stones. It is especially interesting from the fact that the ruby color may be made to appear or disappear, depending on the heat treatment to which the glass has been subjected. In the manufacture of this glass a very small amount of gold is added as one of the ingredients and the mixture is then heated to the melting point. While in the fused condition it is found to be colorless and it remains colorless if it is rapidly cooled, but if cooled slowly or if reheated to a temperature considerably below the melting point it becomes red, owing to the separation of particles of colloidal gold of sufficient size to transmit red light. The rapidly cooled glass is without color because there is not time for the extremely fine particles of gold to group together or flocculate into masses large enough to have any effect upon a beam of light. But it must not be thought that particles of any great size are necessary to produce the desired effect, for it has been estimated that there are billions of such particles in a piece of ruby glass no larger than the head of a pin.

While too rapid cooling results in the production of a colorless glass, on the other hand if cooled too slowly or if maintained too long at a high temperature on reheating a violet or blue glass is produced. This is due to the fact that in this case there is sufficient time for the gold particles to flocculate into larger masses which results in the transmission of violet or blue light. It is often necessary to match different samples of ruby glass and as it is very difficult to exactly duplicate two different heat treatments, it has been found necessary to turn again to a protective colloid for assistance. In this case it has been discovered that tin oxide protects the small particles of gold against becoming too large and, therefore, makes it much easier to match colors.

In addition to the colloidal solutions which are made up of very finely divided solids suspended in liquid, there is another important class in which very small droplets of one liquid are suspended in another liquid. This form of the colloidal state is known as an emulsion. To produce a stable emulsion, in addition to the two liquids, it is necessary to have a third material or an emulsifying agent, which forms a film around the suspended globules and prevents them from coalescing.

There are many emulsions of greater practical importance, but there are few which are better known than mayonnoise; so, even at the risk of appearing overly concerned with the purely gastronomical phases of the subject, it may be interesting to consider this material in some detail. Mayonnaise is essentially an emulsion of oil in water (vinegar or lemon juice) with egg as the emulsifying agent. But, to many, the method of preparing the desired product from these simple ingredients has seemed a deep, dark mystery. They have been told that if they start to stir to the right they must continue to stir to the right or no mayonnaise will be formed. Some even go so far as to say that a left-handed person can not make an emulsion. But, as a matter of fact, the experts in domestic science departments are able to add the ingredients in any order, all at once or in separate portions, hot or cold, and the mayonnaise always forms properly. This is probably due to the fact that they agitate the mixture just sufficiently to break up the oil into fine drops and yet not enough to destroy the protective egg films which form around the drops.

It may seem that the fabrication of ice cream or salad oil emulsions is far afield from anything which has to do with petroleum technology, but the relationship is not so remote after all. In fact, some one recently has reported in the chemical literature that he has substituted petroleum oil for salad oil without any harmful effect. But the really important relations are much



A CONCEPT OF THE COLLODIAL STATE.

more fundamental than this, though they may not be apparent from a superficial consideration of the different materials. For example, petroleum oil emulsions are very similar to mayonnaise both as to the manner in which they are formed and in many of their physical properties. The similarity in the methods of producing mayonnaise and crude petroleum emulsions will be apparent if we consider that in many petroleum wells we have water present in addition to the oil and that the crude oil also usually contains greater or less amounts of mud or asphalt, *i. e.,* we have all the essentials with which to prepare a mayonnaise; the water is the equivalent of the vinegar or lemon juice, the petroleum oil, of course, takes the place of the olive or salad oil and the mud or asphalt replaces the egg; and the necessary stirring is usually thoroughly carried out either by the gas pressure of the well or by pumping of the oil. But there is a basic difference in the problems presented by the two materials; with the mayonnaise our chief concern is to form the emulsion, while with the crude petroleum product the whole effort is to destroy it. A great many methods have been tried in attempts to break down crude oil emulsions, but ultimately they all depend on destroying the protective films of mud or asphalt surrounding the very fine drops of water which are suspended throughout the oil. One of the cheapest and most effective means of destroying these emulsions is by the employment of the Cottrell electrical process. Ninety-five per cent of the crude oil emulsion treated in California is handled by this process.

The electrical treater is a galvanized steel tank, in the center of which is suspended an insulated shaft carrying a number of disks. This shaft is rotated at a slow speed and an alternating electric current of approximately 11,000 volts is impressed between the revolving shaft and the tank shell. The emulsified oil is fed continuously to the treater, passing between the edges of the disks on the shaft and the tank wall. Under the influence of the high voltage, the very fine drops of water in the oil become electrically charged, the surrounding oil acting as an insulator. Very soon these charges become so great that the protective films are ruptured, thus allowing adjacent positively and negatively charged droplets to neutralize each other by flowing together. In this way the drops of water soon become large enough to settle out and are then easily separated from the oil. It is not only in the form of emulsions that petroleum has properties in common with the materials which we have been considering, for it is now believed by well known authorities that both crude oil and its distillates are essentially colloidal in character and, therefore, that colloid-chemical processes must be given full consideration in all stages of the petroleum industry, from a consideration of its origin to the treatment of the waste liquors.

The importance of the colloidal state to all living matter has long been known or suspected. Graham, to whom we are indebted for the beginning of modern colloidal chemistry, said that colloidal material may be looked upon as the probable primary source of life itself. This statement was prophetic of what has been largely confirmed as actual fact at the present time. It has been said that so far as is known today the physical and chemical "conditions necessary for life can be accurately summarized in the statement that all life processes take place in a colloidal system, only those structures being considered as living which are at all times in a colloidal state."

There is something good in all weathers. If it doesn't happen to be good for my work today, it's good for some other man's today, and will come around for me tomorrow.—Dickens.

The best part of health is fine disposition. Nothing will supply the want of sunshine to peaches. Whenever you are sincerely pleased you are nourished. The joy of the spirit indicates its strength. All healthy things are sweet tempered.—Emerson.

The fellow who lives on a bluff deserves a good shove.

Almost every man believes in heredity until his son acts like a chump.

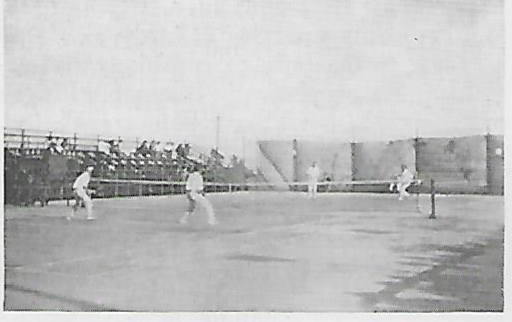
The only safe and sure way to destroy an enemy is to make him your friend.

He who has battled, were it only with poverty and hard toil, will be found stronger and more expert than he who would stay home from the battle.—Carlyle.

Fourth Annual Tennis Tournament

EXCITING PLAY IN LAST YEAR'S MATCHES

THREE PICTURES OF DOUBLES CONTESTS



Tennis players of Union Oil Company of California have one more month in which to prepare for the annual tennis tournament for the President's Cup, which will take place in Los Angeles, starting August 19th.

Interest in the tournament, which has been an annual affair since 1919, has reached a higher pitch than ever before, and an entry list of over one hundred is expected. The President's Cup, which goes to the winner of the Men's Handicap Singles, was won the first year by R. H. Hornidge, the second year by Harvey Snodgrass, and last year by Victor Indig of the Santa Fe Springs Field Department. All three will again participate this year.

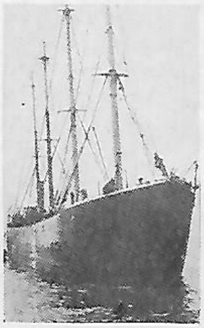
Players hailing from San Francisco, Oakland, Oleum and the Bay districts will stage a tournament of their own and arrangements are being made to have the winners journey south to argue with the Los Angeles finalists.

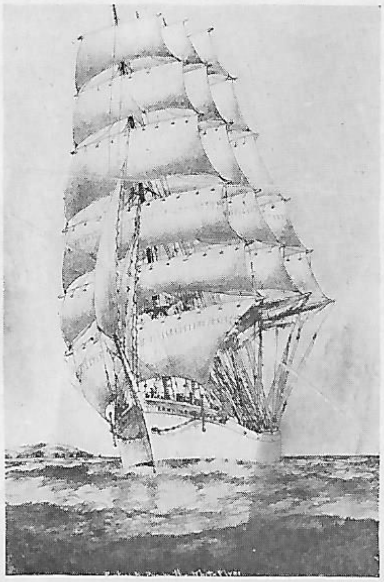
Marine Items

On the opposite page are reproduced pictures of the S. S. "Santa Maria," latest addition to the Union Oil Company of California's tanker fleet, and the Barge "Erskine M. Phelps," accompanied by two views of the latter vessel before she was converted into an oil carrier.

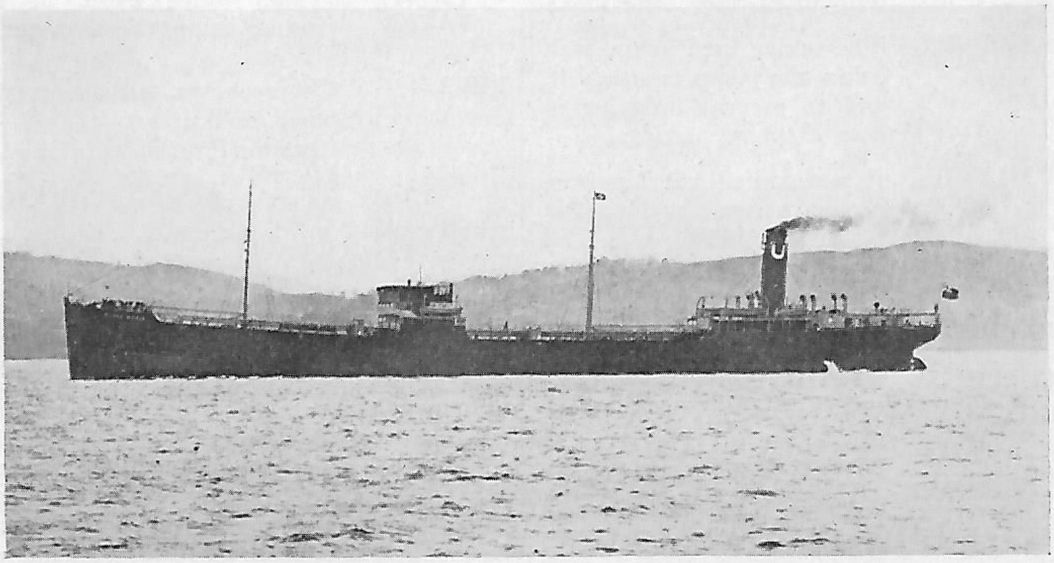
The "Santa Maria," a fitting follower to the "Montebello" and the "La Placentia," has a capacity of 80,000 barrels. Her length over all is 475 feet, beam 60 feet, depth 35 feet, displacement, on 27 ft. 6 in. draft, 12,000 tons, and speed 12 knots. She was built in Glasgow, Scotland, sailing from the Clyde on her maiden trip April 13th, bound for Tampico. At present she is plying between the Mexican port and South America.

Back in 1898 Arthur Sewell of Bathe, Maine, built a four masted square-rigged bark which was considered the finest clipper ship of her type. She was christened the "White Flyer" and shortly after beginning her sea career sailed from Norfolk, Va., to the Hawaiian Islands in 58 days, this being the fastest voyage a sailing vessel had ever made between these two points. In 1913 the Union Oil Company acquired the speedy clipper and converted her into an oil barge, cut down her lofty masts and constructed tanks in her hull to hold 32,000 barrels.





"ERSKINE M. PHELPS," IN HER YOUNGER DAYS AS A CRACK SAILING VESSEL, AND AS SHE LOOKS NOW, CONVERTED INTO AN OIL BARGE.



S. S. "SANTA MARIA" LEAVING THE CLYDE, SCOTLAND

Dialect of the Oil Fields

BY MRS. CHARLOTTE RICKENBACKER

The writer of the following article is employed in the Head Office, Field Department of Union Oil Company of California, and keeps daily records of all wells being drilled by the company. She was born within the shadow of the first oil well, sunk by Colonel Drake in Titusville, Pennsylvania, and has been connected with the pusuit of oil all her life.—Editor's Note.

ADAPTER — A tool that adapts one size of casing to another so that tools can be lowered in well without catching on casing.

ANCHOR — The tubing used in the well below the pump to steady it, and to prevent dropping in case of tubing parting.

BAILING — Removing drill cuttings from bottom of well by means of a bailer, or bailing water, oil or other substances from well.

BARREL — Forty-two gallons.

B. S. — Base Sediment—The water, sand and mud in the bottom of the receiving tanks.

BEAN — See flow nipple. Also that part of Driller's anatomy supposed to be used for thinking.

BELT HOUSE — The space between the engine house and the derrick, roofed in to protect the belts.

BIT — Rotary. There are several kinds of rotary bits, which drill the hole by rotating. Standard bits that drill by weight of tools dropping on formation.

BLEEDING — Drawing off free water from the bottom of an oil tank.

BLOW OFF BOX — Used by the toolie to wash his and the driller's dirty clothes; also known as Chinese Laundry.

BOTTOM WATER — Water which exists in a stratum below the oil zone.

BREA — Outcroppings, seepages and other indications of oil—from the Spanish word meaning, "Tar."

BREAK IN FORMATION — An abrupt change in underground conditions.

BROUGHT IN — A well is "Brought in" when it commences to produce.

BRIDGE — An obstruction placed above the bottom of the hole at any desired point on which to land casing or to build a solid plug. Also sometimes found in rotary drilling on account of caving while drill pipe is out of hole.

BULL ROPE The ropes used in raising the tools— connects band wheel with bull wheels.

BULL WHEEL The drum on which the drilling cable is wound.

CABLE The line on which the drilling tools are suspended.

CABLE "REACH" AND "TAKE-UP" The stretch and shrinkage of cables.

CALF-LINE The wire line on calf-wheel used to raise and lower casing.

CALF-WHEEL The drum in the derrick which is used for operating the casing line.

CASED-OFF The exclusion of water, gas or oil from a well by casing. Also lost tools, casing or other material side-tracked in well.

CASING The metal pipe which goes into a well to keep the walls of the hole from collapsing and also when cemented to exclude water from the oil measures.

CASING BOWL Used to connect parted casing.

(CASING) CUTTER A tool to cut off casing which is frozen to enable upper portion to be withdrawn.

CASING HEAD GAS Gas from the underground oil measures which comes to the surface in the space between the tubing and the casing.

CASING TEST The determining of the leak proofness of the casing generally before drilling out the cement plug to make the water test. Made also in times of trying to locate source of water.

CASING A WELL The work of running the casing into the hole.

CELLAR OR CONDUCTOR SHAFT The hole dug under the center of the derrick about eight feet square and from eight to twenty feet deep to give room in starting the casing down.

CEMENTING OR CEMENT SHUT OFF The excluding of water from oil sands by means of a string of casing landed in an impervious bed with a water tight body of cement between the casing and the walls of the hole.

CIRCULATING A stream of mud which goes down the center of the rotary drill pipe and comes back to the surface between the walls of the hole, carrying with it the cuttings of the bit.

CLEANING OUT The cleaning out to the original depth of wells which have become choked with sand or clay.

COLLAPSED CASING Casing which is crushed by outside pressure.

COLLAR The coupling for casing, tools, etc.

COLLAR-BOUND Casing frozen in the hole by sediment banking up between collars.

COMBINATION RIG One adapted for drilling both by rotary and cable tools.

CONDUCTOR Large sized stove-pipe casing used when beginning a well to keep the loose surface formation from caving in.

CORE BARREL Tool used to get sample of formation by rotary cutting.

CORRELATION The determination of the relation of formations in two or more wells.

CRACKING The separation, by heat, of the heavy and light fractions of low gravity oil to facilitate pipe line transportation.

CROWN BLOCK The steel frame on the top of the derrick supporting the pulleys over which the sand line and other cables used in drilling, handling casing and tools run.

CUT Percentage of water in oil.

CUTTINGS The rock debris broken up by the bit when drilling.

DEEPENING The further drilling of a well in search of new oil zones or increased production.

DERRICK Tower of the rig.

DERRICK-MAN Does all the necessary work up in the derrick on a rotary well.

DEVIL'S PITCH-FORK Fishing tool, which has fork barbs turned in, used to get out reamer lugs, sledges, pieces of bits, etc.

DIATOM The microscopic plant with a crystal shell which is generally believed to be the source of petroleum.

DIE NIPPLE See casing bowl.

DOG HOUSE A little enclosure in the derrick where the driller and toolie alternate sleeping.

DRILL COLLAR The connection for joints of drill pipe.

DRILL PIPE Pipe used when drilling rotary method; also rotary pipe.

DRILLER Man in charge of the drilling crew. Five men on a rotary crew and two men on a standard crew.

DRIVE PIPE Extra heavy casing which can be lowered by its own weight.

DUMP BAILER Used to deposit cement or water in the bottom of the hole.

EDGE-WATER Water in the same sand as the oil and as the oil is withdrawn edgewater appears.

ELEVATORS A collar with two links which is used in raising and lowering tubing, casing and drill pipe.

EMULSION The mixture of oil and water which is pumped from wells.

FEELER Pipe which is run in the hole to see that there is no obstruction before putting in casing.

FINGER-BOARD A part of the derrick which extends out from the Eighty-Foot Board to hold the drill pipe from falling in the derrick.

FISHING Tools used in recovering casing or tools which have become detached and are "lost" in the hole.

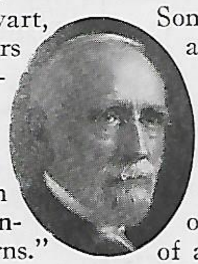
FLASH-POINT The degree of temperature at which oil ignites.

FLOW NIPPLE A section of lead line with hole of small diameter to control oil flow of well.

FLOWING WELL Produces oil or water naturally without any mechanical help.

(CONTINUED IN NEXT ISSUE)

Congratulations



On July 22nd, Mr. Lyman Stewart, Chairman of the Board of Directors and "Father of the Company," celebrated his eighty-second birthday. The entire staff of the Union Oil Company of California take this opportunity of extending to him their hearty congratulations and sincere wishes for "many happy returns." We owe much to this wonderful gentleman of keen vision and rare judgment. Some day his life may be written up as a light to the path and a guide to the feet of the young, for he has accomplished much. The passing of his eighty-second milestone finds Mr. Stewart in excellent health and brimful of good cheer, a state of mind which is indicative not alone of a faith in the future but of gratitude for the past and joy in the present. We wish him well.

CALIFORNIA OIL STATISTICS—MAY AND JUNE, 1922

District—	Gross Barrels June	Gross Barrels May	Daily Averages June	Daily Averages May	Daily Averages 1921	Daily Averages 1920	Daily Averages 1919
Kern River	621,976	635,494	20,733	20,500	18,357	20,377	20,907
McKittrick	204,464	210,615	6,816	6,794	5,672	7,106	7,773
Midway-Sunset	2,530,454	2,616,630	84,348	84,407	78,902	83,788	88,908
Elk Hills	1,102,960	1,297,313	36,765	41,849	49,549	19,853	77
Lost Hills-Belridge	258,457	254,454	8,615	8,208	8,934	11,362	12,770
Coalinga	693,035	1,086,371	23,101	35,044	34,307	42,888	44,956
Santa Maria	274,613	354,844	9,154	11,447	14,973	15,869	16,665
Ventura-Newhall	240,127	254,548	8,004	8,211	5,762	5,601	4,858
Los Angeles-Salt Lake	100,640	112,056	3,355	3,615	3,601	3,608	3,625
Whittier	61,721	62,442	2,057	2,014	2,015	2,300	2,744
Fullerton	327,398	460,392	10,913	14,851	16,334	14,309	12,017
Coyote	591,527	640,575	19,718	20,664	20,326	23,859	27,952
Santa Fe Springs	402,003	288,491	13,400	9,306	571	.....	.....
Montebello	588,038	656,143	19,601	20,166	24,838	30,395	33,153
Richfield	675,447	745,482	22,515	24,048	22,485	7,009	2,646
Huntington-Newport	755,643	695,981	25,188	22,451	6,901	104	.....
Long Beach	1,288,054	795,504	42,935	25,661	207	.....	.....
Redondo	9,176	3,941	306	127	.....	.....	.....
Summerland	4,530	4,181	151	135	148	148	148
Watsonville	1,680	1,636	56	53	.....	.....	.....
Total	10,731,942	11,146,093	357,731	359,551	313,882	288,576	279,199
June	10,731,942	....	357,731	.....	357,731	357,731	357,731
May	11,146,093	11,146,093	359,551	359,551	.....	.....	.....
April	......	10,186,081	.....	339,536	.....	.....	.....
Difference	414,151	960,012	1,820	20,015	43,849	69,155	78,532

SHIPMENTS AND STOCKS

Stocks—May 1, 1922	36,803,192	Stocks, June 1, 1922	39,038,429
Production, May	11,146,093	Production, June	10,731,942
Total	47,949,285	Total	49,770,371
Shipments, May	8,910,856	Shipments, June	9,185,576
Stocks, June 1	39,038,429	Stocks, July 1	40,584,795
Stocks, Increase May	2,235,237	Stocks, Increase June	1,546,366
Stocks, January 1, 1922	31,556,277	Stocks, January 1, 1922	31,556,277
Total 1922 Surplus	7,482,252	Total 1922 Surplus	9,028,518
1922 Daily Surplus	49,551	1922 Daily Surplus	49,882

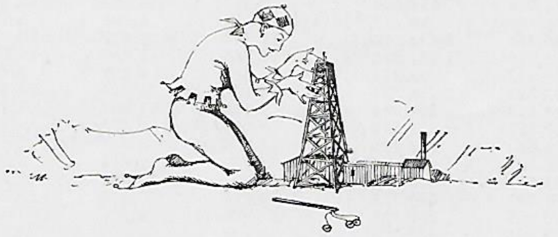
DAILY AVERAGES

Daily—	June	May	April	March	1921	1920	1919	1918
Production	357,731	359,551	339,536	330,663	313,882	288,576	279,199	281,215
Shipments	306,186	287,447	271,487	284,945	281,177	310,941	282,873	290,836
Shortage	......	......	......	......	......	22,365	3,674	9,621
Surplus	51,545	72,104	68,049	45,718	32,705	......	......	....

SUMMARY OF FIELD OPERATIONS FOR MAY AND JUNE

	New Rigs Up June	New Rigs Up May	Active Drilling June	Active Drilling May	Completed June	Completed May	Active Producing June	Active Producing May	Abandoned June	Abandoned May
Kern River	..	5	8	8	2	1	2,194	2,207	..	..
McKittrick	2	..	10	14	..	..	300	302	3	..
Midway-Sunset	8	15	84	76	11	17	2,509	2,511	1	2
Elk Hills	5	4	39	37	3	7	162	156	1	1
Lost Hills-Belridge	1	..	8	8	1	..	491	489	..	..
Coalinga	3	4	18	24	..	..	848	1,133	..	1
Santa Maria	..	1	10	11	..	..	331	331	1	..
Ventura-Newhall	2	3	14	44 ..	..	1	559	563	1	2
Los Angeles-Salt Lake	..	..	2	2	..	..	673	674	..	..
Whittier	..	5	5	87	..	3	175	1,118	..	1
Fullerton	..	..	8	..	..	..	379	...	1	..
Coyote	2	..	6	..	2	..	231	...	1	..
Santa Fe Springs	31	28	83	61	3	3	10	7	..	..
Montebello	..	..	25	..	..	..	150	...	..	..
Richfield	..	..	37	..	9	..	154	...	..	..
Huntington-Newport	14	22	110	108	10	17	116	105	..	3
Long Beach	29	23	80	70	10	13	46	36	1	1
Redondo	5	..	5	6	1	1	2	1	..	..
Summerland	..	..	..	..	..	..	135	135	..	..
Watsonville	..	..	..	..	..	..	8	8	..	..
Miscellaneous Drilling	6	4	59	55	..	..	...	...	..	4
Total, June	108	...	641	...	52	..	9,473	....	10	..
Total, May	114	114	611	611	63	63	9,776	9,776	16	16
Total, April	...	86	...	599	..	38	....	9,951	..	18
Difference	6	28	30	12	11	25	303	175	6	2
Average, Year 1921	90		536		57		9,425		14	
Average, Year 1920	77		403		49		9,299		13	
Average, Year 1919	58		340		47		8,774		18	
Average, Year 1918	50		362		50		8,210		13	

Refined and Crude



Live your life, do your work, then take your hat.—*Thoreau.*

Many a man stays young at seventy laughing at the old folks of twenty.

He (confidently)—I believe I have this dance?

She (coolly)—Well, don't let me interfere then.

Prof.—Give me a good example of a coincidence.

Frosh—My father and mother were married the same day.

Nob—I lost an opportunity of kissing Peggy in the conservatory last night during the dance I had with her.

Lick—Well, don't worry about it; I found it later.

Cheerfulness means a contented spirit, a pure heart, a kind and loving disposition; it means humility and charity, a generous appreciation of others, and a modest opinion of self.—*Thackeray.*

Whatever is past is over, and I'm thinking you have no more to do with it than a butterfly has with the empty chrysalis from which he came. The law of life is growth, and we cannot linger—we must always be going on.—*Myrtle Reed.*

Mealing—So the Youngweds are going to separate. What caused the trouble?

Day—Her cooking, I understand. She entered the dining room one day and found him feeding the dog with one of the biscuits she'd made and coaxing him to give up a dog biscuit in exchange.

A foolish optimism is better than a wise pessimism.

Praising yourself to the skies is not going to get you there.

She—Can you read lips?

He—Yes, by the touch system.

Laffin' is the sensation of feelin' good all over but showin' it particularly in one spot.—*Josh Billings.*

Doctor—Ah, your cough is much better today.

Patient—Yes. I have practiced it all night.

Swish—Gee, that's a wicked-looking pair of shoes.

Swash—They are. Both soles gone to Hades already.

"Darling, my love for you is greater than the world! Larger than creation! Wider than the ocean! Let me pour it into your ear!"—*Awgwan.*

Editor—Why, this story is written by Convict 97423.

Ex-convict — Yeah! Dat's my pen name.

Dan—How is Jack coming along in his affair with your sister?

Ann—Sorry—I can't say a word about it. I promised not to tell that they were engaged.

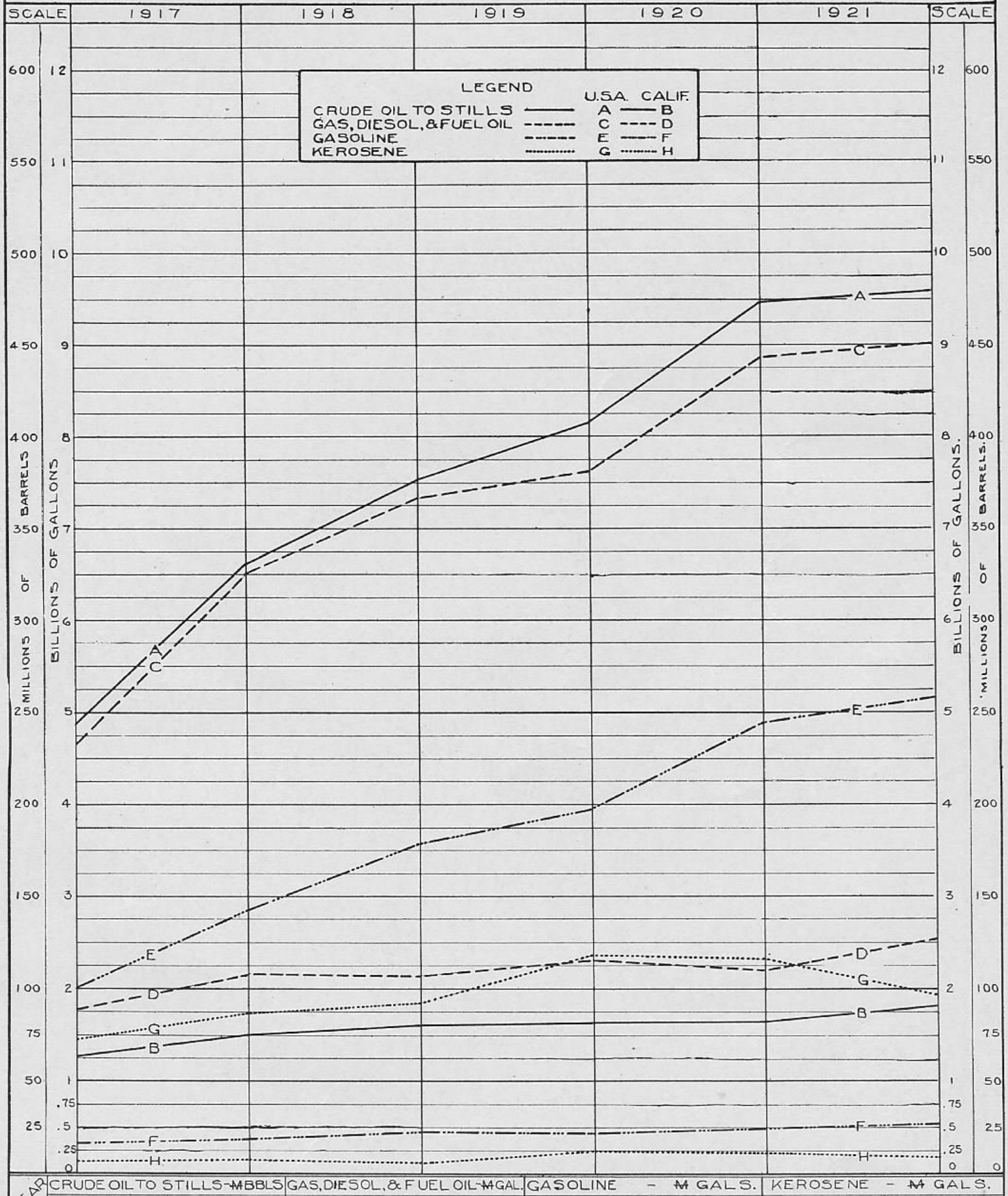
Dora—You know Gertie's got a new hat?

Nora—Is it becoming?

Dora—Well, it just matches her face.

Nora—Oh, is it as plain as all that?

COMPARATIVE REFINERY PRODUCTION STATISTICS - U.S.A. & CALIF.



YEAR	CRUDE OIL TO STILLS - M BBLS		GAS, DIESOL, & FUEL OIL - M GAL.		GASOLINE - M GALS.		KEROSENE - M GALS.	
	UNITED STATES	CALIFORNIA	UNITED STATES	CALIFORNIA	UNITED STATES	CALIFORNIA	UNITED STATES	CALIFORNIA
1916	245,065	63,457	4,663,895	1,776,812	2,058,881	309,481	1,455,496	129,187
1917	330,030	75,624	6,513,324	2,169,808	2,850,546	386,822	1,726,769	139,193
1918	376,590	80,133	7,321,398	2,133,784	3,570,313	434,392	1,825,360	102,580
1919	407,283	81,055	7,627,289	2,300,540	3,957,857	417,793	2,341,632	203,662
1920	474,150	82,454	8,861,452	2,205,956	4,882,547	496,426	2,320,095	208,463
1921	479,856	90,300	9,663,816	2,532,817	5,153,518	515,236	1,945,126	161,995

REFINERY PRODUCTION PERCENTAGES - TO CRUDE OIL RUN -

YEAR	GAS, DIESOL, & FUEL OIL		GASOLINE		KEROSENE		MISCELLANEOUS	
	UNITED STATES	CALIFORNIA	UNITED STATES	CALIFORNIA	UNITED STATES	CALIFORNIA	UNITED STATES	CALIFORNIA
1916	45%	67%	20%	12%	14%	5%	21%	16%
1917	49	71	22	13	13	5	16	11
1918	53	76	26	16	13	4	18	4
1919	50	75	26	14	15	7	19	4
1920	48	62	26	14	13	6	13	18
1921	48	73	26	15	10	5	16	17