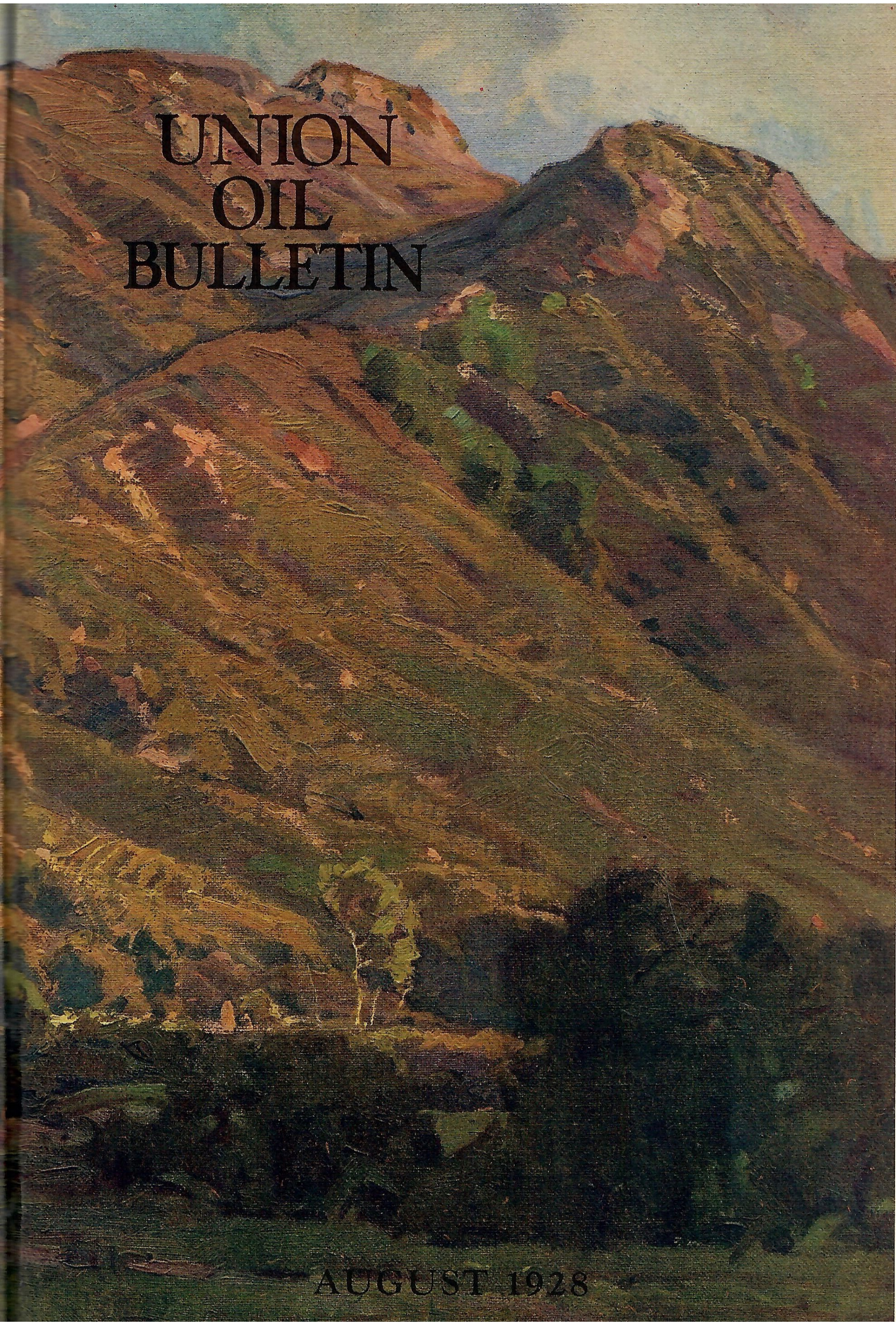
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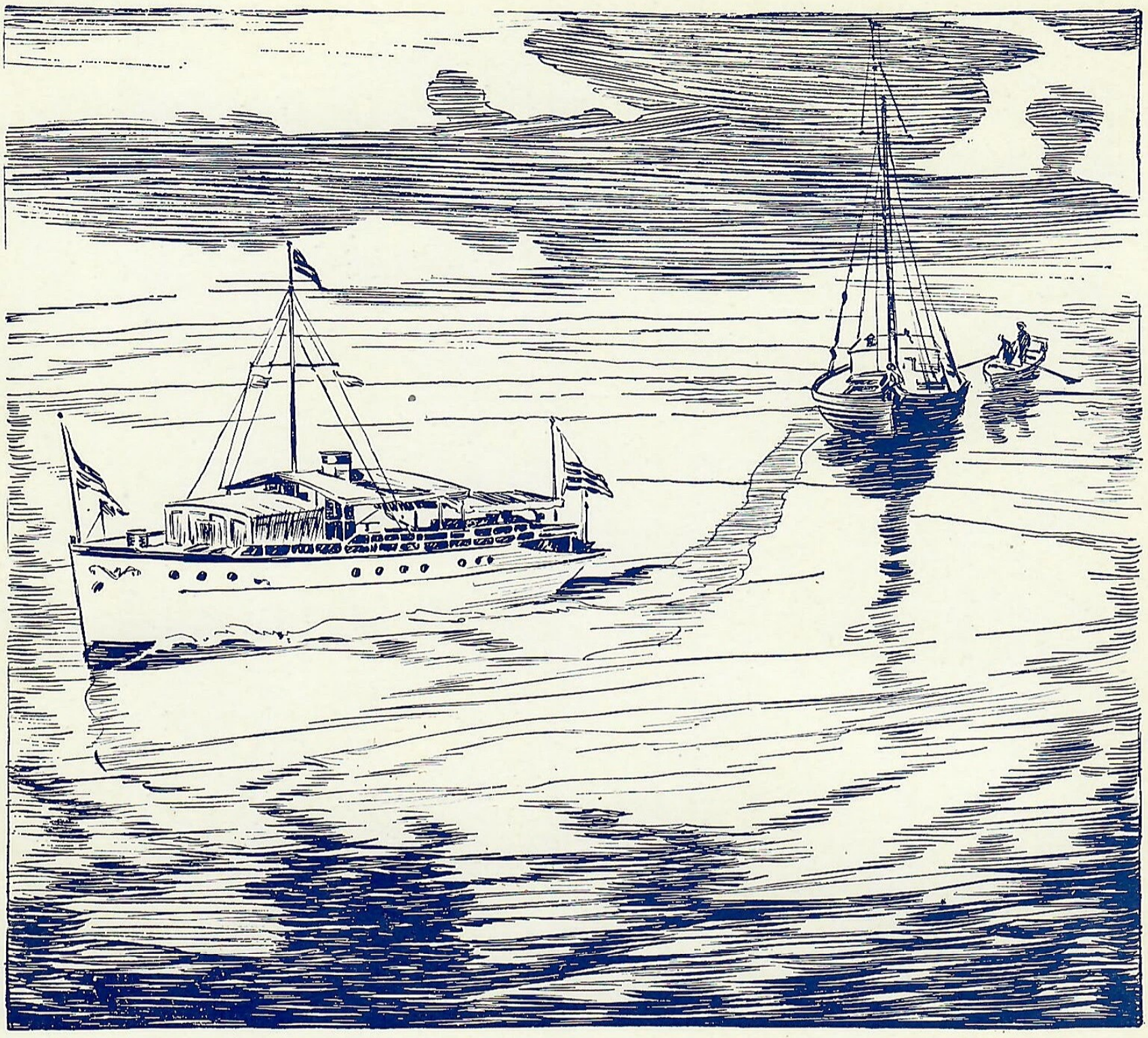

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Insures 100% Engine Efficiency

Thus crank case dilution is minimized; lubricating film on cylinder walls is prevented from dissolving; oil waste is halted; maximum power is attained. Your engine runs sweeter—smoother—surer at all times—under all conditions.

In fact, no engine failures due to faulty lubrication have yet been experienced by those who use this better motor oil. Consider what such performance means to *you* when far from land!

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UNION OIL BULLETIN

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Address all communications to the "BULLETIN," 802 Union Oil Building, Los Angeles, Calif.

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A TRIBUTE

The following letter, received from the Co-Commanders of the "Southern Cross" following the magnificent culmination of their pioneer enterprise, again expresses the confidence which Union products and service have helped to inspire.

C.E. KINGSFORD-SMITH & C.T.P ULM.

TELEPHONE
BW 2865 5 LINES.

ROOM 713, 7TH FLOOR, HERALD BUILDING.
66 PITT STREET.
SYDNEY.

Union Oil Company of California,
Union Oil Building,
LOS ANGELES CAL. U.S.A.

12th June, 1928.

Dear Sirs,

We wish to offer to your Company our sincere thanks for the excellent service which your Organisation rendered us throughout our Trans-Pacific Flight, and to congratulate you upon the exceptional quality of your Union Motor Spirit.

Throughout the most trying hours of our 7305 miles journey to Australia, through storms and extreme rise and fall of temperature, our three motors never missed a beat. Union Motor Spirit was the only fuel used, and the consumption was 32-American gallons per hour from Oakland to Honolulu, 34-gallons per hour from Honolulu to Suva, and 33-gallons per hour from Suva to Brisbane.

The abnormal flying conditions at high altitude which we encountered, were responsible for the variation in consumption.

No recommendation of ours can be too emphatic concerning the quality of your product.

Yours very truly,

.....

.....

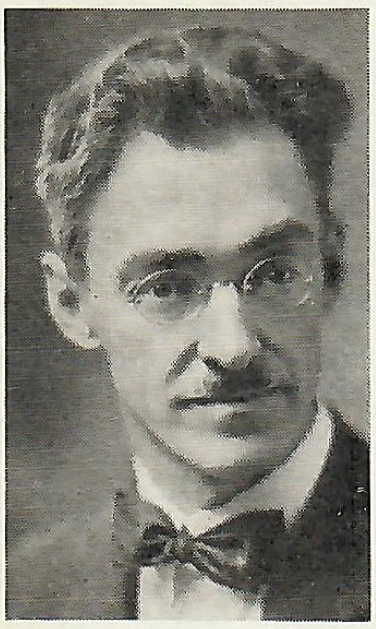
Co-Commanders -
"SOUTHERN CROSS" TRANS-PACIFIC FLIGHT.

CTPU/NR

COMMERCIAL AVIATION

By WILLIAM B. STOUT*

TWO years ago, if a speaker would mention to a public audience that there might be a chance of that audience taking an airplane ride, ninety-nine out of a hundred present would reply with the old story about keeping one foot on the ground. But in the past year there have been carried to the public so many messages of what flying has come to be, that there is a very general response to the subject of aviation.



WILLIAM B. STOUT

The fact is, that the public is very nearly ready to fly. It is true, to be sure, that there is still a lot of reluctance about taking both feet off the ground, but the ninety-nine out of a hundred are now reduced to nine out of ten, at least.

Now if flying were what the public thinks it is, big business would not be interested in it, and if flying were what the average man who has not flown visualizes, then there would be nothing to tell here; but the actual experience of flying is far different from the picture of floating through the air that the average man has in his head, and when one has once been off the ground for two minutes, his entire ideas of what flying is, will be absolutely revised.

Few people realize the amount of flying that is going on today in this country in regularly established air lines. There is an air line that runs from New York to San Francisco carrying mail, running both ways every day. There is a line from Chicago to Dallas, Texas; both ways every day. On those two lines there are about six thousand miles of night flying every night. Besides that, there is a line running from Salt Lake City to Los Angeles; from St. Paul and Minneapolis to Chicago, connecting with the line from Chicago to Dallas; a line from Boston to New York, being extended from Schenectady to Buffalo and Cleveland; a line from Cleveland to Pittsburg—and so on.

The aggregate amount of flying that is done in this country is from twenty to twenty-five thousand miles per day; all commercial, regular air-line flying all the year round, summer and winter. The public has not realized that, because there have not been enough accidents to let the public realize what is going on.

Most people come out to a flying field,

The three-place plane—two passengers and pilot.

**This article represents the substance of a talk recently given in Los Angeles by William B. Stout, President of the Stout Airplane Division of the Ford Motor Company.*

terribly nervous. They think that they are going to have the thrill of their lives, and go out to the ship, trembling. They say: "I am scared to death, but I am going anyway," and they ask, "Isn't it dangerous? Have we got the right pilot? Has the ship been inspected?" etc. There is some danger to it, of course. There are two periods that are particularly dangerous in airplane riding: the ride out to the field, and the ride home.

Commercial flying is not what military flying is. Military flying necessitates planes which are purposely out of balance, so that they can be maneuvered, rolled and spun, etc. Those maneuvers are necessary in military work: they are done as a matter of every day risk—and yet one rarely hears of accidents, even in that work. The commercial airplane, on the other hand, is a plane that will support itself in the air financially, as well as mechanically. The first fundamental of that kind of plane is, of course, safety, because the man who pays several thousands of dollars for a ship and expects that it is going to crack up every two or three years is just a plain fool.

The three-engine plane has put a whole new aspect on commercial flying. There are now on the Ford plane, three Wright whirlwind engines of 200 horse power each, one in the nose and one on each side. There is a big metal monoplane wing of 72 foot span. Those wings are light. The whole ship is 54 feet long, and yet weighs only 5,600 pounds—just a little heavier than a Lincoln car. Yet sixteen tons of sand can be taken and piled on the wings evenly, without breaking them down, so that there is no need to worry about the wings blowing off, or disturbing any part of the structure.

"But what if an engine stops?" In a trip from Cleveland to Detroit, a valve spring broke on one of the engines. The ship could have run on, but the pilot throttled down to about a thousand revolutions—just idling away. He was flying at about a thousand foot altitude, and with the other two engines turning about 1,650 out of a possible 1,850 or 1,900—pulling less than two-thirds of their power—he started to climb. He went right up to 6,000 feet above a snow storm and above the clouds, and came in over the clouds to land on two engines, just as easily and tenderly as he would have otherwise, and right on schedule in his arrival.

Flying at the airports and among the flying group has become a very casual thing. To go anywhere, it is simply the best means of travel, the most comfortable, the fastest and the easiest. In a recent trip to

Modern service for those riding the Ford planes.

Los Angeles as seen by the air traveler.

Mexico City, the pilot flew from Detroit, had lunch in Indianapolis and dinner that night in St. Louis. He had lunch the next day in St. Louis, dinner at Tulsa, breakfast next morning at Tulsa, and dinner that night at Brownsville, Texas. Then he took off from there for Mexico City. It is a forty-three hour ride by railroad to Mexico City: he made it in less than four and one-half hours. He went on to Tampico in two and a half hours, flying about twenty feet above the surf, along the coast; then from Tampico up through a four thousand-foot stratum of clouds, right up another seven thousand feet, up to eleven thousand five hundred feet, when he crossed over the pass in the mountains and landed on the airport at Mexico City, seven thousand four hundred feet above sea level—a most marvelous trip, about twenty hours from Detroit.

From that single instance there can readily be seen the civilizing influence that flying is going to have on those countries that are a little out of touch with civilization, whose transportations are not ideal, and who need the type of education and development that this country can give them along industrial lines that will help the prosperity and better the living conditions and education of those countries.

Flying has got to a stage of development where it is the duty of everyone to find out what it is about. This is going to be a greater industry than the automobile industry: it is going to be the greatest transportation industry the world has yet seen. It will revise the world more than the automobile has revised it. This cannot be realized by staying on the ground visualizing three dimensions, when one has never lived in any but two; so that everyone who could should take to the air and learn what it is all about, first-hand.

Today we have planes that can take a ton and hop off the ground with it in a very few feet, carry it from Los Angeles to Salt Lake, non-stop, or over any similar or longer route, and carry that load at a figure that would insure a profit.

One of the big problems is traffic: people are beginning to ride. Within a very short time, passenger lines will be booked up far in advance. The plane today is a thing that can be of inestimable service to any community, and the time has come when we can all afford to take a part in developing an industry that is bound to be a tremendous influence in this country.

DIESEL FUEL PROBLEMS

T. B. DANCKWORTT *and* M. S. REYNOLDS

THE general difficulties encountered by the petroleum industry in meeting the varied demands for Diesel engine fuels have been common to both the Atlantic Seaboard and the Pacific Coast, since facilities for fuel distribution are practically identical on these two sides of the continent, but because of the fact that many Diesel engines are manufactured on the East Coast and hence designed with the use of Eastern Diesel fuel oils in mind, some further difficulties have been encountered in the application of Western oils to Diesel engine operation.

Until a few years ago, the problem of obtaining suitable fuel for Diesel engines was a simple one, but the enormous demand for gasoline, due to the rapid development of the automotive industry, has resulted in changed refining conditions so that the lighter grades of gas oil are no longer available in as large quantity for Diesel engine use. The increased number of Diesel engines operating has also been a factor in reducing the general availability of this type of fuel. The situation has become further complicated by the advent of a new type of engine, the high pressure solid-injection type, some forms of which are very susceptible to slight variations in the physical characteristics of the fuel used. The essential requirements for the complete combustion of fuel of any type are sufficient oxygen, time, and initial temperature, and for optimum operation these factors must be combined properly by the correct, timely, and rapid distribution of the fuel spray which has a penetration ability conforming to the requirements imposed by the density of the air, the shape of the combustion chamber, and the air turbulence action. As a general rule, paraffin base fuels burn somewhat more readily and rapidly than asphalt base fuels of similar characteristics. For this reason, some of the smaller sized engines of the solid-injection type manufactured in the East and particularly adapted to Eastern fuels, give unsatisfactory performance on California fuels. On investigation, it was found in each case that the design of the combustion chamber and injection system was unsuitable for the complete combustion of California fuels, and after redesigning the engines in this respect, the flexibility as to speed and permissible variation in fuel was greatly improved and in several instances the horse-power was increased 40%. Because of these experiences we consider that the engine manufacturer should feel it his duty to test each new engine type and size with both paraffin and asphalt base fuels so as to be certain that his engine will be suitable for operation on either of these types, as well as the intermediate varieties of fuel, and hence that the purchaser will not be restricted in his choice of fuel and field of operations.

At the present time, the different types of Diesel engines used on the Pacific Coast and operating on California fuels are as follows:

1. *Air-injection Type*. Air-injection engines, when properly adjusted, can obtain perfect combustion with asphaltic fuel oils, regardless of gravity, viscosity, or other characteristics within wide limits. Because of the possibility of adjusting the pressure, quantity, and temperature of the injection air to obtain the best fuel economy, fuels ranging in gravity from 12° to 40° A.P.I. can be used successfully in this type of engine, in spite of the comparatively short and late injection period, although in gen-

eral the closed type of injection valve has somewhat better atomizing characteristics for the heavier fuels. Of course, the atomization and flame propagation characteristics of the fuels change with the physical properties, such as gravity and viscosity, but the possibility of controlling the air turbulence energy by the injection pressure and timing, permits wide variation in the physical characteristics of acceptable fuels. All the conditions for efficient combustion, namely, fine and uniform atomization, air turbulence, good distribution of the fuel spray, excess air, and high compression, may be met without restricting the engine to the use of special grades of fuel.

2. *Precombustion Chamber Injection Type.* Diesel engines of the precombustion chamber injection type vary widely in their design and operating characteristics. In general, engines with small restrictive passages between the precombustion chamber and the main combustion chamber usually have insufficient air turbulence and heat conduction to the precombustion chamber, and this results in rapid carbonization unless the dimensions of such antechambers, including the injection device, have been developed especially for operation on the particular fuel. In other words, engines with such restrictive passages are usually poorly adapted to operation on fuels of varying characteristics.

The type of precombustion injection engine with a plain cylindrical neck between the precombustion and main combustion chambers gives an air turbulence before and during combustion, which is adequate for the complete combustion of asphaltic fuel oils and thus the fuel flexibility of these engines approaches that of the air-injection type. When well designed and properly adjusted, they can operate on a wide range of California fuels from 14° A.P.I. up, regardless of flash point or viscosity. This system of injection is well adapted to small or medium sized engines of low or high compression and either two or four cycle. Many engines of this general type are now operating satisfactorily on Pacific Coast fuels.

3. *High Pressure Solid Fuel Injection Type.* In this method of injection the fuel is forced directly into the cylinders through nozzles of very small diameter by means of high hydraulic pressures. Engines of this type are therefore very sensitive to variations in the physical characteristics of the fuel, since changes in the viscosity, particularly, influence the atomization and penetration characteristics of the injection spray. It is frequently found that the efficiency falls off markedly with a variation in the gravity of the fuel beyond a range of about 4° A.P.I. unless the nozzle size is changed. This sensitivity towards fuel variation is marked even in the largest sizes of engine and becomes still more serious in the small sizes.

With proper adjustment of the injection by the use of suitable nozzle types, fuel pressure, and timing, the high pressure solid injection type of engine is well suited to Pacific Coast fuels of 18° A.P.I. gravity and lighter, and the fuel economy obtained is very satisfactory. This economy, however, has been attained at the expense of sensitiveness to fuel variation with the result that the responsibility for permanently efficient operation has been placed on the oil companies instead of being assumed by the engine designers. European practice has shown that engines of the solid injection type can be designed with greater flexibility as regards variation in fuel by giving particular attention to air turbulence and the use of open combustion chambers and high injection pressures.

A tabulation of the gravities of California fuel oils which have been used successfully in engines of different types can serve only as an approximate indication of the fuel flexibility of the various engine groups, as this flexibility depends so largely upon adjustments and minor variations in the design. However, as it may serve as a

rough classification of engine characteristics with special reference to operation on Pacific Coast fuels, the following list of engine types and of fuels which have been successfully used in them is presented:

1. Air-injection engines. Large and small sizes, 2 or 4 cycle, medium fuel pressures, uniform and controlled air turbulence, high compression: 12 to 40° A.P.I. gravity.

2. Precombustion chamber engines. Two injection sprays, air or solid injection, medium fuel pressures, medium to high compression, cylindrical neck, 4 cycle, controlled air turbulence: 14° A.P.I. gravity and up, depending on type and size.

3. Precombustion chamber engines. One injection spray, air or solid injection, low and medium fuel pressures, 2 cycle, 4 cycle, open neck, controlled air turbulence; low, medium, high compression: 16° A.P.I. gravity up to gasoline, depending on type, size, speed and load conditions.

4. High pressure fuel injection engines. Two injection sprays, opposed piston types, high compression, high fuel pressures, 2 cycle, open combustion chamber, air turbulence: 18° A.P.I. gravity and up, depending on size and speed.

5. High pressure fuel injection engines. One multiple hole spray, high compression, high fuel pressures, 2 or 4 cycle, open combustion chamber, air turbulence, 20 to 22° A.P.I. gravity and up, depending on size and speed.

6. High pressure fuel injection engines. One multiple hole spray, medium or high compression, high fuel pressures, 4 cycle, 2 cycle, open combustion chamber, no air turbulence: 24° A.P.I. gravity and up, limited range for each engine, depending on size and speed.

7. Medium and low pressure fuel injection engines with restricted ante-chamber. One injection spray, high compression, 2 or 4 cycle, cups, tubes, etc., partial air turbulence: 26° A.P.I. gravity and up, depending on type and size.

What has been said about the combustion difficulties encountered on the Pacific Coast with Diesel engines of medium size applies with even greater force to the small engines which are now appearing in increasing numbers, as the sensitivity towards fuel variation increases as the combustion chamber becomes smaller, the piston speed greater, and the explosion pressures higher. Although this class of engines is still in a critical stage of development, the successful operation of foreign engines of this class on the Pacific Coast for many years has established the feasibility of building small engines which will operate satisfactorily on a wide range of fuels. Much research on engine design in relation to fuel flexibility remains to be done in order to insure a permanently cheap fuel supply to the small Diesel engine users. To illustrate the type of service in which these engines are used and the economy which may be obtained, the following example is given: A 2-ton Diesel boat, 21 feet in length and equipped with a 4 h.p. engine, using regular Diesel fuel oil which costs 2¾ cents per gallon at the Los Angeles Harbor can run about 800 miles for an expenditure of only one dollar for fuel.

From our experience with Western fuels in Diesel engines, we are in complete accordance with Mr. Michler's* proposal to simplify the specifications for Diesel fuels by omitting such items as carbon residue, asphalt, surface tension, etc. As long as the functions and importance of these properties have not been established by fundamental research, definite specifications for such characteristics must be considered as premature. The elaborate specifications originating with some Diesel engine manufacturers are considered to be the result in

**This paper was written for presentation at the National Meeting of the A.S.M.E. Oil and Gas power division, at State College, Pennsylvania, June 13th and 14th, 1928, and was intended to supplement a paper on Diesel Fuel Specifications, by Mr. G. H. Michler of New York.*

most instances of experience in limited markets, rather than of careful experimental work. Mr. Michler proposes to restrict the specifications to minimum gravity, sulphur content, and flash point. In our opinion, the specifications for the ordinary grade of Diesel fuels, that is, excluding the heavy industrial fuel oil which can at present be used successfully in only a limited number of engines, should contain the following items:

1. Gravity. This is important as an index to the class or grade of oil, although fundamentally the property is of less importance than viscosity. A minimum gravity of 24° A.P.I., as proposed by Mr. Michler, should be acceptable at the present time to both the Diesel engine manufacturers and the petroleum industry.

2. Flash Point. As the flash point may be decreased by the presence of a limited amount of low boiling material in the oil, it is not as significant as regards the burning characteristics of the oil as the fire point which is the temperature at which the fuel vapor continues to burn. Until the relative efficiency of fuels of varying fire point in engines of definite compression pressure has been thoroughly determined by extensive experimental work, it is felt that no specification should be arbitrarily chosen for this property. To insure safety in handling the fuel oil, it is felt that a minimum flash point of 150° F. in the Pensky-Martens closed cup should be specified, as has been common practice in the past.

3. Water and Sediment. This test was not mentioned by Mr. Michler but it is felt that it should be specified to protect the buyer from the delivery of contaminated oils. An acceptable oil should have a water and sediment content not exceeding 1%.

4. Viscosity. The viscosity of a fuel oil is of more fundamental importance than the gravity, as it measures directly the characteristics of the oil as regards flow through nozzles or lines. While the specification of 24° A.P.I. as the lowest gravity permissible will automatically exclude oils of extremely high viscosity, it may be advisable to include a viscosity specification as a further safeguard. It is suggested that the maximum permissible viscosity be set at 100 seconds Saybolt Furol at 77° F., following government specifications for Navy Standard and Bunker Fuel Oil "A," which, according to Technical Paper 323 B, United States Government Master Specifications for Lubricants and Liquid Fuels, are both high grade fuel oils which may be used in Diesel engines. It should be understood that this applies only to the usual grade of light Diesel fuel oil and not to heavy industrial fuel oils, such as are commonly used for steam boilers, but have a restricted use in Diesel engines.

The specification for sulphur content, although not objectionable to Pacific Coast refiners if set at 1.5% maximum, as suggested by Mr. Michler, is considered unnecessary as the deleterious effect of sulphur on engine parts has been greatly exaggerated. Many Diesel installations have been operating for over twenty years and under adverse conditions on Mexican fuels containing 3 to 4% sulphur and still retain the original cylinders and pistons.

The limiting of Diesel fuel specifications to gravity, flash point, viscosity, and water and sediment, should not work any hardship upon Diesel engine manufacturers and should be satisfactory to the oil refiners. In considering the suggested figures for the specifications, it should be borne in mind that these may be subject to future modification as dictated by economic necessity. Even with this possibility of future change, however, the establishment of definite specifications at the present time will assist materially in the standardization of engine fuel requirements and available types of fuel, with benefit to the engine manufacturer and user, as well as to the oil companies, through greater economy of operation because of decreased fuel costs.

The experience of our company in common with that of other members of the petroleum industry has proved the impracticability of attempting to maintain supplies of a large variety of Diesel fuels throughout the territory in which we operate, and to a lesser extent, the inadvisability of supplying special fuels even to groups of consumers that happen to be located near a refining center.

As regards the future development of Diesel fuel specifications, there is little doubt that economic considerations will force the use of progressively heavier fuels. One of the chief factors in this development is the increasing importance of gas oil as raw material for the production of gasoline by various cracking processes. The demand for gas oil as cracking stock in competition with its use as Diesel engine fuel has already resulted in the establishment of a substantial differential in price between this commodity and heavy industrial fuel oil, and we may anticipate that this differential will tend to increase rather than decrease. The obvious remedy for the increasing cost of Diesel engine fuels of the gas oil type is the construction of engines which are suitable for operation on heavier oils.

One of the serious obstacles that the Diesel engine industry must overcome is the fear of prospective purchasers that possible future increases in the price of Diesel fuel will nullify the present economic advantage of the Diesel engine. To overcome this fear, and thus insure their own future, the manufacturers must make their engines sufficiently flexible in fuel utilization to take advantage of the grades of oil economically available. The greatest increase in the use of Diesel power will come through replacement of steam plants, and when it is considered that a steam plant uses nearly three times as much oil as a corresponding Diesel plant, it is evident that such replacement will create a considerable surplus of boiler fuel. This will tend still further to increase the differential between boiler fuel and lighter fuel of the gas oil type. With such developments, the engine that is restricted to the use of a light fuel will be severely penalized, and it is to the interest of the Diesel engine industry at this time to prepare for such a contingency not only by standardizing on a simple specification for a type of fuel which will continue to be available for a considerable time, but also by developing designs of engines adapted to the use of heavier grades of fuel.

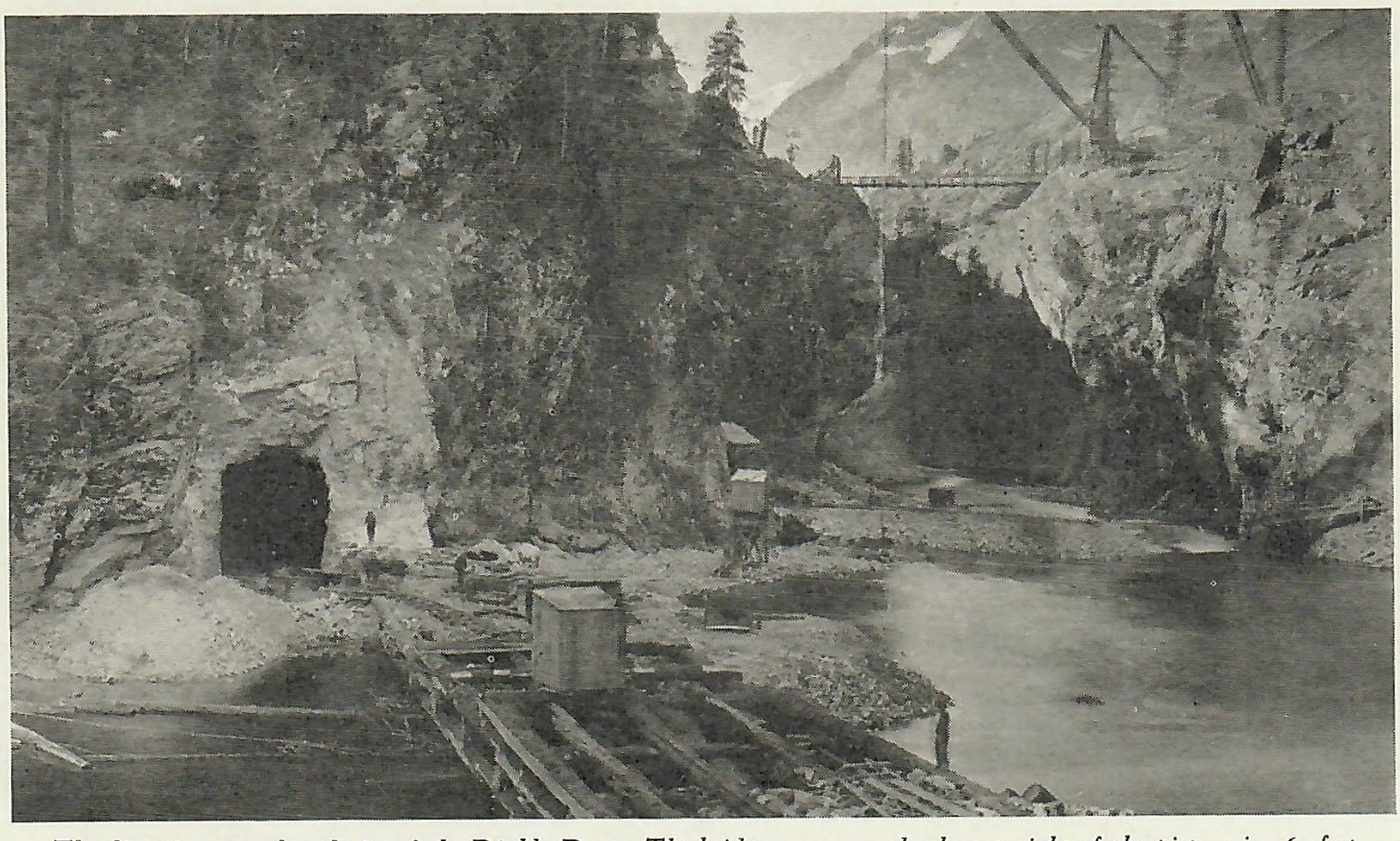
The Million Horse-Power River

By H. W. WARNE

THE City of Seattle is now actively preparing for the second step of the great Skagit River power development, which will be, when completed, one of the largest power projects in the world. With the opening of bids for Diablo Dam on September 9, 1927, and the approval of the Federal Power Commission Engineers of the city's application for permanent rights to develop all the power of the great river above the existing Gorge power house, the city is realizing its dream of a gigantic municipal power development that is to make hydro-electric energy available in unlimited quantities and at lowest rates for the development of a great industrial center in Seattle.

The Skagit River has been known to tourists and mountaineers for many years as one of the great scenic features of the Northwest and, indeed, of the whole country. With the advent of the electrical age, its steep granite canyons and mighty cascades drew the interest of hydro-electric engineers because of their wonderfully favorable characteristics for the development of water power. In 1910, the U. S. Geological Survey explored the river with a view to its power possibilities and made a profile, showing the rapid fall of the water in that part lying above the present Gorge power house. As soon as the profile was published, a number of local capitalists, under the name of the Skagit Power Company, filed water-rights on this stream and began making surveys with the intention of developing at least a part of the power available. Stream gaugings and other surveys soon indicated that the power should be developed on a magnificant scale and that capital running into millions of dollars would be needed to handle such an undertaking.

In 1910 the Stone-Webster interests purchased the Skagit Power Company's rights and secured a temporary permit from the



The diversion tunnel and site of the Diablo Dam. The bridge seen towards the top right of the picture is 165 feet above the water. The dam is to rise 200 feet above the bridge, with its foundation 30 feet below water level.

Reflector's Bar: the site of the Diablo power house, showing the construction camp which houses 450 men. The building in the center of the square is the dining room.

Department of the Interior under the old law, which required immediate construction before permanent rights would be granted. The Stone & Webster Co. made some further surveys of the river, which again confirmed the magnificent power possibilities and the magnitude of the project. Nothing further was done until 1917 when the City of Seattle, which had been investigating all available power sites in the Northwest with a view to securing the most available one to supply the growing demand on its Municipal Light and Power plant, made a filing on the Skagit and asked the Federal Government that Stone & Webster's temporary permit be cancelled and the right of development be given to the City of Seattle. After a hearing at Washington in which the facts were brought out that Stone & Webster were developing other power sites and that they had done no construction work on the Skagit, the City was granted a temporary permit for the lowest of the three units, known as the Gorge Unit of the Skagit project.

The construction on this unit was begun, and the first 50,000 H.P. was ready for service in September, 1924, representing an investment of an even twelve million dollars, which included nearly four million dollars for preliminary work to take care of the larger, future development. A railroad 23 miles long from the end of the Great Northern R. R. Rockport branch to the Gorge intake, was necessary before materials could be taken in to the power site. The transmission line to Seattle, 100 miles long and with the right-of-way 300 feet wide, which will eventually carry 6 lines of 150,000 to 200,000 H.P. each, was all secured before the first line was built. The Gorge power house will ultimately contain 400,000 H.P. The first tunnel bringing water through the mountain two miles to this power house was made large enough to carry half the ultimate power, or 200,000 H.P.

These necessary preliminary steps of a great future project made the cost of the first 50,000 H.P. actually developed a great deal higher per H.P. than the cost of the final project. In spite of that fact, the cost of $240 per H.P. delivered to Seattle, com-

pares very favorably with any other power project developed since the World War, and is much cheaper than the average of Eastern power developments, at the present time. Conservative estimates place the final cost of the Skagit development at less than $75 per H.P., and each succeeding unit that is added to the first one will lower the cost per H.P. of the project.

The Skagit River itself is something over 125 miles long and drains approximately 3,000 square miles of water-shed, a large part of which lies among the summits of the Cascade Mountains in northern Washington and southwestern British Columbia. The rain fall in this district is heavy and the river carries an average of 4310 second feet, rising at times of flood to over 100,000 feet. It is the largest river flowing into Puget Sound. Its mighty power, however, is not a result of its size, but is due to the steep fall of the river in that part known as the Skagit Canyon, which begins at the mouth of Ruby Creek and ends abruptly at the Gorge power house. The power house is located 15 miles up stream from the town of Marblemount at a point 50 miles above the mouth of the river. This section of the river flows through a canyon with walls from two and three hundred to thousands of feet in height, and the river drops in a distance of 14 miles a vertical distance of 1200 feet.

The plan of development decided upon after years of careful study is known as the "3 Plant" plan and includes three separate units, each consisting of a power house with a dam and water conduits. The lowest of the three dams at Gorge Creek will raise the water about 100 feet above the present stream level, to an elevation 880 feet above sea level. The Gorge power house is at an elevation of 490 feet above sea level, so that the ultimate head to be developed, which determines the amount of power that can be produced, will be 390 feet for this power house. The Gorge dam will back the water up to the foot of the second, or Diablo Dam, construction on which was begun late last year in Diablo Canyon, at the narrowest and steepest part of the entire Skagit Canyon. When completed, this second dam, whose foundation is of solid granite, with a maximum depth of bedrock 30 feet below low water, will be 105 feet thick at the base and 17 feet across the crest. It will be of the arch type, with a length of crest of 1200 feet. The stream will be raised 320 feet at this point, to an elevation of 1200 feet above sea level. The reservoir back of the dam will be four miles long, with a capacity of 90,000 acre feet.

The Union Oil Company of California is furnishing most of the oils used in the construction of this massive project, and is furnishing all of the oils to the City of Seattle for maintenance work and for the Gorge power house.

The Diablo power house is to be located approximately 1700 feet down stream from Diablo Dam on a level area known as "Reflector's Bar." This power house will ultimately contain machinery to the capacity of 300,000 H.P.

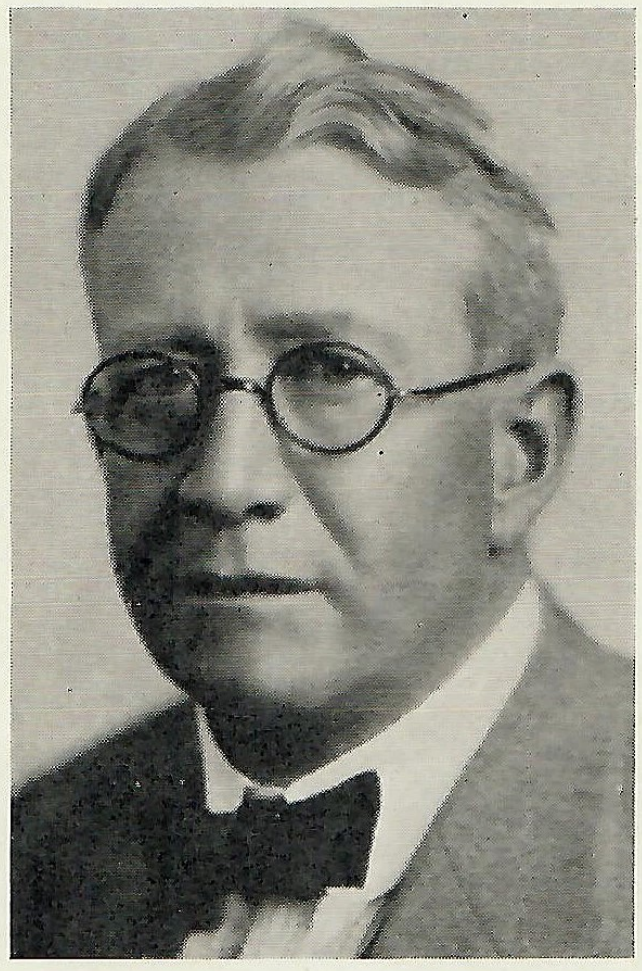
The third, or upper unit of the Skagit development, will consist of a great Ruby dam and the Ruby power house, with the necessary water conduits connecting the two. This dam will be 520 feet in height, or higher than any dam yet constructed in the world, and will create a lake larger than Lake Washington, backing the water up stream for 35 miles, or about 5 miles across the Canadian border. A dam of such extreme height requires a foundation of unquestioned stability and the Skagit Canyon of solid granite furnishes such a foundation for each of the great dams to be built there.

The Ruby power house will ultimately contain 350,000 H.P., bringing the total for the three units up to 1,050,000 H.P. based on the present load factor in Seattle of 40%. When the great Ruby Reservoir is finally completed the entire run-off of the Skagit River above that point will be conserved.

Mr. Thomas A. O'Donnell

THE NAME of another pioneer of California oil has been withdrawn from the active roster of the industry by the resignation of Mr. Thomas A. O'Donnell from his Directorship with the Texas Corporation and the Texas Company in June of this year.

The life of this kindly and respected gentleman has been one of almost continuous affiliation and service with the oil industry. Born in 1870, in Bradford, Pennsylvania, his first contacts were with oil men, and after he had learned mining in Colorado, it was the then recently organized Union Oil Company of California which gave him his first job, as pumper and tool dresser in the Ventura field, in 1890. He remained with the Union leases along the little Sespe for some four years.



MR. THOMAS A. O'DONNELL

In the fall of 1893, Mr. O'Donnell came to Los Angeles, working on the early development of the Doheny properties, then forming a five-year partnership with Mr. M. H. Whittier to become a contractor and producer in and around the Los Angeles fields. In 1902 he went into the Coalinga field, and in 1907 joined with E. L. Doheny to become Vice-President and Field Manager of the American Petroleum Company. He was also one of the principal organizers of the California Independent Oil Producers Association.

In 1916 he became President of the California Petroleum Corporation, which had been organized in 1912, and which had absorbed the American Petroleum and several other producing companies. During the war, however, he resigned, to become a "dollar-a-year man" as director of oil production for the United States, thereby rendering a signal service to the nation. It was on his return that he became Chairman of the Board of Directors of the California Petroleum Corporation, which position he held up to the time of the amalgamation of that company with Texaco. He has also served as a director of the Farmers and Merchants National Bank, and as Director of the Union Oil Company, from October 7, 1921, to February 26, 1924.

It was as first President of the American Petroleum Institute that Mr. O'Donnell rendered one of his greatest services to the oil industry. Elected in 1919, he held that position for five years, directing the work of cooperative research which has proved perhaps the greatest boon which the oil world has known. The national esteem in which his work and ability was held was reflected in his selection as one of three members from the petroleum industry to the Committee of Nine advising the Federal Conservation Board appointed by President Coolidge.

To those who remember the first rising lines of California derricks, and to all those who have known Mr. O'Donnell through association or through the signal work which he has accomplished, his name will ever be synonymous with the finest traditions of the industry.

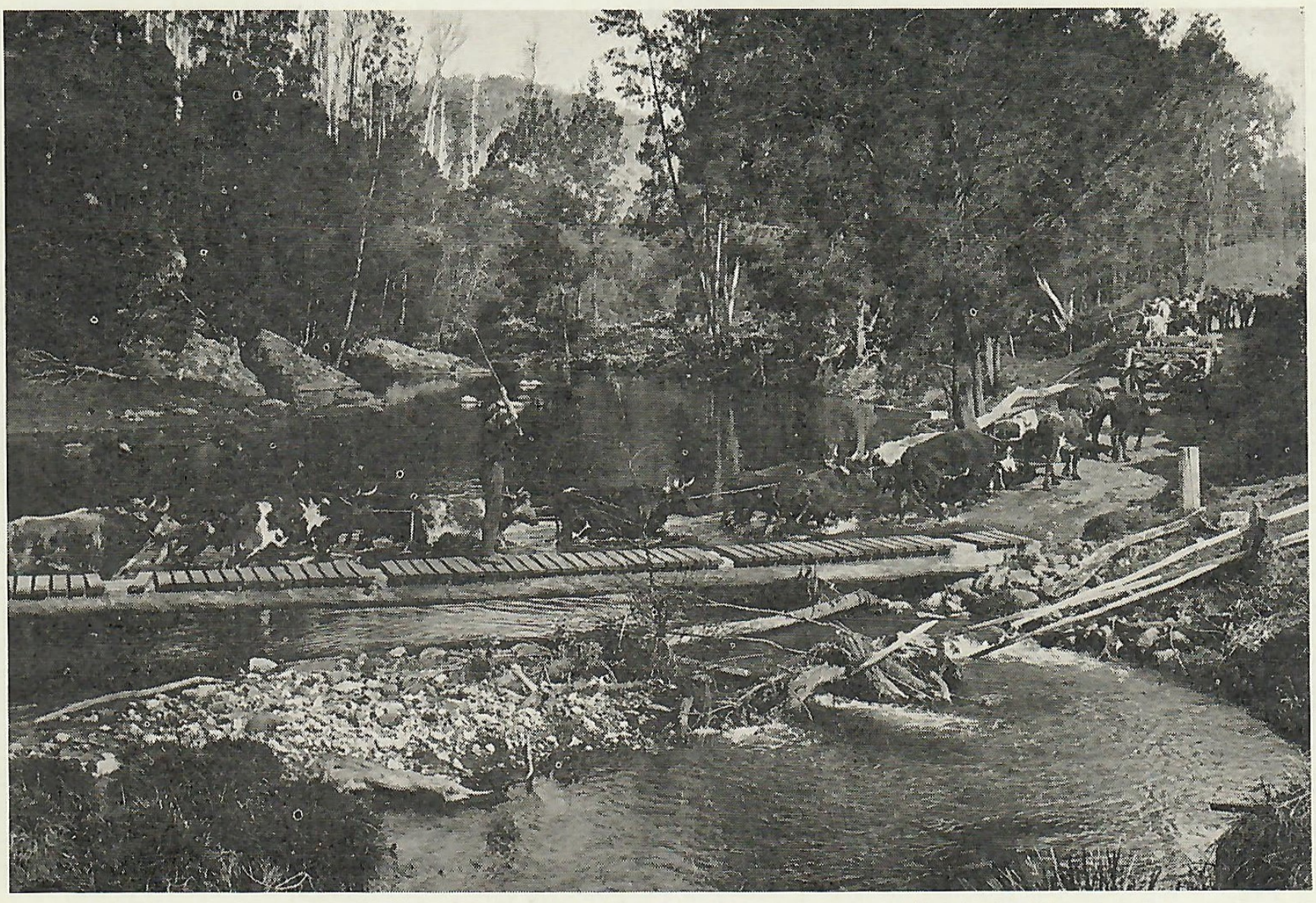
A Trip Through New South Wales

By L. C. HAMPTON

WE are off for a two-day trip through the back country of New South Wales, Australia. Mr. Adams, Mr. Hull and myself leave Sydney at 7 a.m., in a heavy rain. We are traveling in a Chrysler closed car and are taking our rugs (lap robes). Down the highway at thirty miles an hour we rapidly overhaul hundreds of motorists who have started out on a four-day holiday. It reminds one of touring fifteen years ago. As we go we find large numbers who are stalled along the road, cleaning spark plugs and changing tires, while others are trying to find out "what makes the old bus go." Some are standing in the drenching rain holding an umbrella with one hand and working with the other.

We are headed for Goulbourn, and do not find the roads nearly as good as those in New Zealand. Bankstown, Camden, and Liverpool are good old English names, but when we strike Yerinbool, Mittagong, and Marulan we know we are in a foreign land. This ninety miles to Goulburn is over an easy winding grade, the road crossing many small streams of water, and passing through lovely farming land.

We inspect a country depot site and have lunch. The rain has stopped and we have now left the good roads and are off through the Australian Bush for Tuena, Orange, and Parkes. Eucalyptus trees are native to this country, usually growing only to about one-third the size of those in California. They are "thick as the hair on a dog's back," mile after mile, uphill and down, in the valleys, along the streams, or in the hills among the rocks—nothing but



Fording a stream—a typical scene of the New South Wales country. Photo by "Sydney Mail."

Grape-picking for the Australian wine market. Photo by "Sydney Mail."

gum trees as far as the eye can see, and as far as we traveled. Occasionally a few pine trees, cedar, and jarrah, but about 99% of the time it is eucalyptus.

Sixteen miles from Goulburn "we come to a river and can't get across." It is the Wollondilly. We "dilly-dally" here for a short time until a Digger comes along with some dry gunny sacks. One over the spark plugs, one around the carburetor, and one over the radiator: Mr. Hull at the wheel, Hampton and Adams on the opposite bank registering anxiety. Into the river and across in low gear, water a foot above the running board; engine stops in the middle of the stream: a quick foot on the starter and Hull comes out triumphantly. The road map assures us "that the road is good going with many open water crossings that occasion no difficulty except after heavy rains." As we are traveling after heavy rains we hold our breath every time we start across the "open water crossings." We reach Tuena in a couple of hours. Tuena was once a very prosperous gold mining town with many thousand inhabitants. Now a few hundred are all that are left. We are traveling down grade most of the time now, with an occasional level spot. We see an Australian wild dog (dingo) down the road, and speeding up, we chase him for the best part of a mile before he turns and desperately climbs the rabbit fence which lines both sides of the road.

The trees are now swarming with wild birds. These birds are parrots—parrots of every color! Once in a while the small love birds fly parallel to the road. The most beautiful are the "lory birds." These have red heads and breasts, purple backs, black tails and yellow beaks and ears. My, how these birds could fly! A mile a minute was their estimated speed. The strangest bird is the kookaburra or "laughing-jackass." His cry would make a California burro take a back seat.

It is now getting dark and the roads are awful. Grades are steep and the elevation is about 3000 feet, which is very high for Australia.

Now we are lost in the Australian bush. We find a road sign: six miles to Barry or nine to Newbridge. Our maps inform us that the latter is in line with our destination. Down the road in the dark towards Newbridge we see a lantern being swung

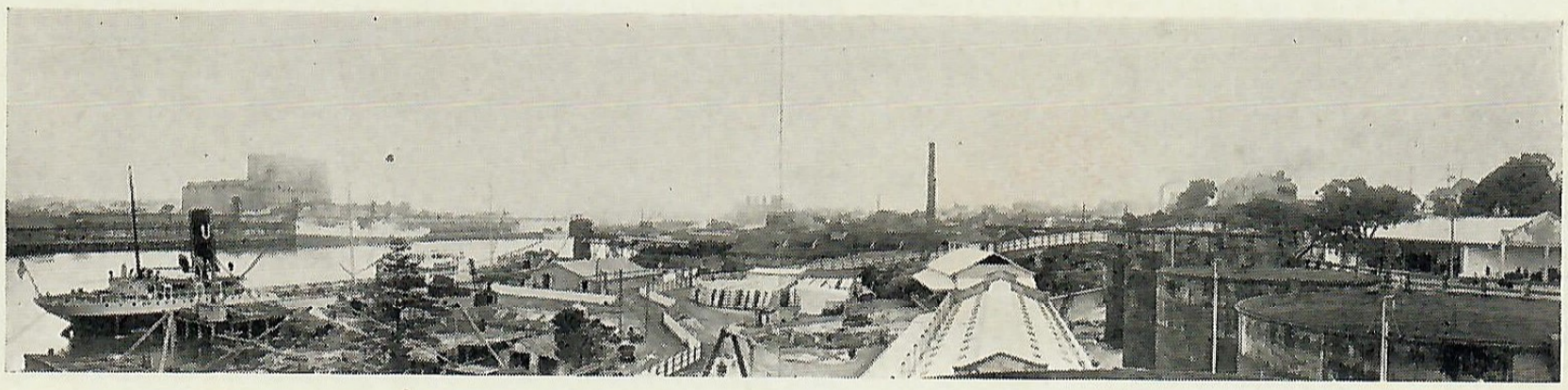
across the road. We stop, to find a poor man and his family stranded. Their only horse has taken "French leave," and "would we please tell their brother, who is a carrier (transfer man) at Blayney, where they are, so that they can be picked up in the morning." With assurances on our part that we will deliver the message, we are off. Arriving at Blayney we go to the inevitable "Fishmarket" and have our steak and eggs. Parkes, our destination, and location of our hotel, is only 90 miles further on, and off we go.

A beautiful moonlight night in the Australian bush! After several hours' ride, Mr. Adams calmly informs yours truly, who is driving, that we must be on the wrong road, as the mountains should be on our right hand and not on our left. As we three are all engineers, and we have traveled sixty miles from Blayney, we figure out where we ought to be on the map, and then decide to drive back about eight miles, where we passed a party alongside the road at midnight. They inform us that we are on the wrong road, but that if we will go back another twenty-five miles to Eugowra, and then turn to our right and trust in Providence and our springs, traveling through the bush another thirty miles from Eugowra, we shall arrive at Parkes. We do, and we did! What a ride! The crookedest road, the roughest road with the most open water to cross, ever traveled by us! Twenty miles an hour was our highest speed, yet the driver will never forget the beauty of it all with the moonlight streaming through the eucalyptus trees, the wonderful odor, and the stillness. We had been following a trail, which might have been called a road, and suddenly no trail, no road, and just as suddenly, at 2 a.m., NO PETROL! We awakened the guide of the party, who had found the trip monotonous, and asked him "where we were?" He stated: "six miles from Parkes." He also stated that he had a tin of petrol in the back with him. So with a newspaper for a funnel we emptied the tin, and arrived in Parkes at 2:30 p.m. At 6:30 a.m. the maid awakens us for our early morning tea. "D——!" But, being awake, off we go to inspect the country depot site at Parkes. On to Orange, where we stop for another inspection; then on to Bathurst, where still another depot is located.

Leaving Bathurst we are heading for the Jenolan Caves. We pass through level mixed farming country, and finally start down hill around a series of elbow turns, dropping 1800 feet in a little over a mile, then start up again.

We arrive at Hampton, 3800 feet elevation. We have supper, and then are off up Mount Victoria, then Mitchell's Pass, Katoomba, Emu Plains, Parramatta, and Sydney. We are two miles from home, eleven p.m., and "Bang!"—a blowout from a defective tube!

Six hundred and seventy-one miles in two days. We enjoyed every minute. Mr. Adams, who has lived here over sixty years, brought up reminiscences. Mr. Hull told how the "Aussie" was taught to ride horseback in Palestine by the "Pommey," and Hampton bragged about the wonders of California, while he knew that he was passing through some of the most interesting country it had ever been his lot to see.



The Sydney terminal—and the end of the journey.

Air Law Course Sponsored at U. S. C.

THE FIRST lecture course in Air Law ever to be offered in the United States, will be given at the second half of the summer session of the University of Southern California Law School by Dr. Otto H. Schreiber, head of the Institute of Air Law at the University of Koenigsberg, Germany, who comes to fill a special lectureship established by the Union Oil Company of California.

Dr. Schreiber will lecture five days a week for three weeks, beginning Monday, August thirteenth, and will also head a series of six special lectures on "Legal Problems of Governmental Control of Aircraft" in the Division of Public Administration, a one-week institute to be attended by city and county officers, August thirteenth to eighteenth, according to announcement by President R. B. von Kleinsmid.

A committee responsible for the opportunity afforded by the special lectureship, and instrumental in bringing Dr. Schreiber to this section, includes the following representatives of the legal profession and the educational activities of Southern California:

Gurney E. Newlin, Chairman of the Minerals Section of the American Bar Association, a Commissioner from California to the National Conference of Commissioners on Uniform State Laws, and a Director of the Union Oil Company of California; Col. W. Jefferson Davis, San Diego attorney and a member of the Section on Air Law of the American Bar Association; Dean Justin Miller of the Law School of the University of Southern California; Dean Reid L. McClung of the College of Commerce of Southern California; Professor Earl W. Hill, faculty member of the Commerce College and Vice-President of the International Institute of Traffic; Emery E. Olson, Director of Coordination, University of Southern California.

"Koenigsberg University is the only seat of learning which has so far developed a special professoriate on the laws governing aeronautics," states Colonel Davis of San Diego. "Dr. Schreiber was appointed to the chair in 1924. At the present time there are more than two thousand air laws in force in various countries of the world, from Albania to Venezuela, and Dr. Schreiber plans to codify these laws, a task which he estimates will take him at least ten years. He has served on various aeronautical commissions in Europe, and has been on the program of many meetings of the Comite Juridique Internationale d'Aviation. The library of the Institute of Air Law at Koenigsberg has a unique collection of volumes in all languages relating to the legal side of aviation. I consider Dr. Schreiber the outstanding authority on aeronautic legislation in Europe."

Mr. W. L. Stewart, President of the Union Oil Company, in commenting on the establishment of the Air Law lectureship, states:

"Coincident with the incredibly rapid growth of aviation as every-day commercial transportation, particularly on the Pacific Coast, comes the immediate necessity of developing our knowledge of aeronautic legislation so that it may meet our own growing needs. As we have sponsored laboratory research and scientific experimentation in aeronautic motors, plane construction, fuels, and flying conditions, so must we now turn our attention also to equally imperative demands in the field of aeronautic law. We are happy to be able to bring to the Pacific Coast, where conditions are so favorable to the development of aviation, such a man as Dr. Schreiber, who is to head a comprehensive and intensive course of lectures in this latest legal problem."

NEWS *OF THE* MONTH

PROMOTIONS

Mr. A. J. Dickson, formerly Assistant Chief Station Accounts Division, Comptroller's Department, Head Office, has been appointed District Accountant, Honolulu, succeeding Mr. F. C. May, deceased. Mr. Dickson left July 14th, on the S.S. City of Los Angeles, arriving in Honolulu July 20th, the latter date being the official time of his appointment to his new duties.

Mr. W. Falconer, Drilling Foreman, Coast Division, has been appointed Assistant Division Superintendent, under Mr. E. C. Critchlow, Division Superintendent.

The following changes in Sales Department organization also became effective in July.

Mr. F. W. Tucker, Assistant District Sales Manager, Portland District, to District Sales Manager, Stockton.

Mr. A. L. Harmon, Lubricating Sales Engineer, Oakland District, to Assistant District Sales Manager, Stockton.

Mr. G. W. Schattner, Assistant District Sales Manager, San Francisco District, transferred to Fresno in the same capacity.

Mr. M. B. Webber, Assistant District Sales Manager, Sacramento District, transferred to San Francisco District in the same capacity, succeeding Mr. Schattner.

Mr. C. S. Myer, Office Manager, Sacramento, to Assistant District Sales Manager, Sacramento District, succeeding Mr. Webber.

Mr. J. E. Schmidt, Salesman, Oakland District, to Assistant District Sales Manager, Oakland.

Relieving Mr. F. E. Albright, resigned, Mr. J. D. Nesbitt has succeeded to the position of District Sales Manager at San Diego.

Mr. D. P. Condit has been appointed Assistant District Sales Manager, Los Angeles, succeeding Mr. E. J. Munn, recently appointed Fresno District Sales Manager.

In all the above-mentioned appointments, recognition has again been accorded to merit, rather than to seniority alone.

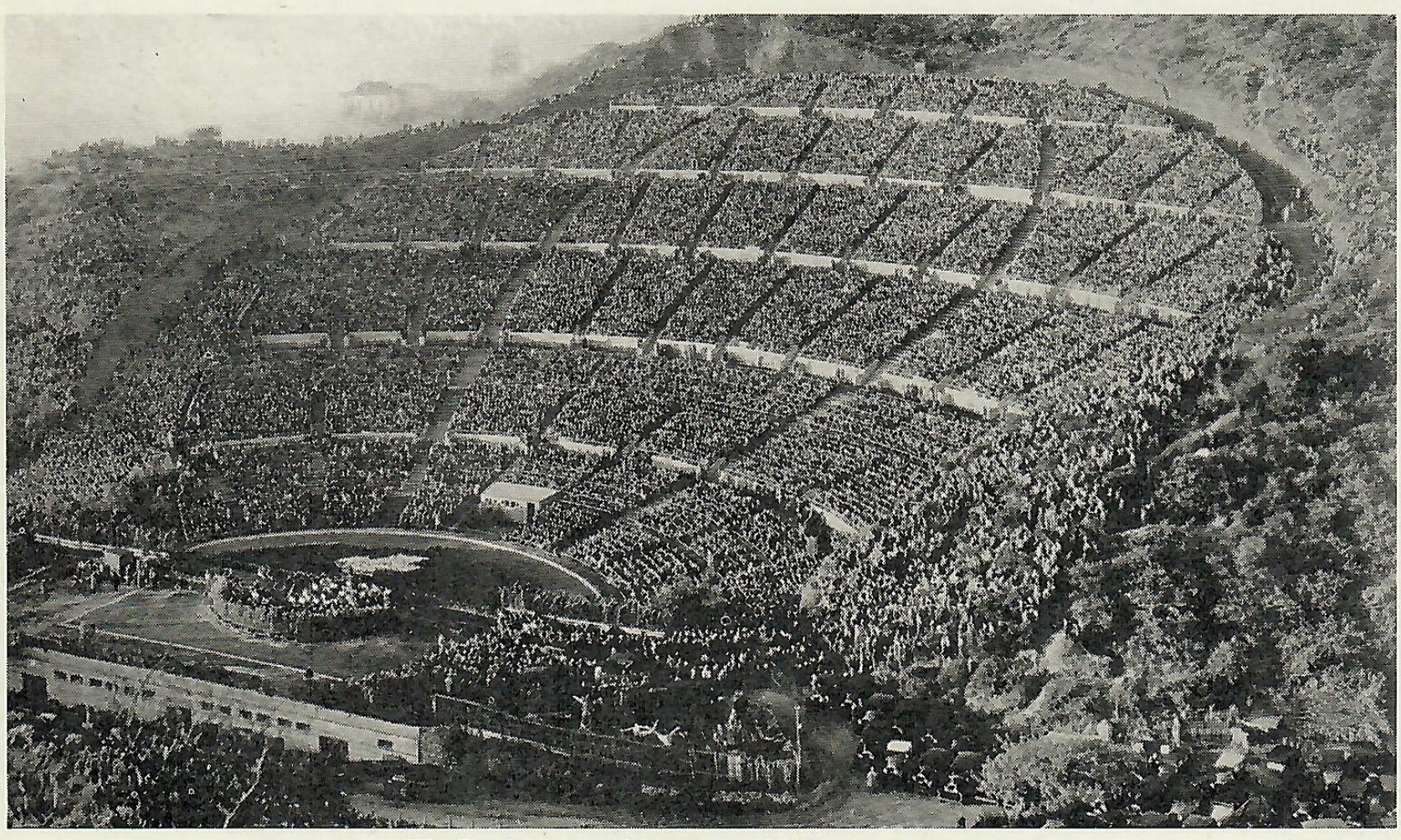
FIRST OF BOWL CONCERTS PRESENTED

Pacific Coast music lovers received the first three of eight weekly, Saturday-evening programs from the Hollywood Bowl "Symphonies Under the Stars" this month, through the Union Oil Company's broadcast over the Pacific Coast network.

With Albert Coats, internationally known conductor, wielding the baton, the series was ushered in on Saturday evening, July 14th, the program consisting of some of the better-known selections from Rimsky-Korsakow, Tschaikowsky, Wagner, Mendelssohn, Johann Strauss, and other composers. This popular note was continued in the second program, July 21st, and is to be kept throughout the remainder of the broadcast series.

That the music audience was intensely appreciative of the Company's making the broadcast possible was evidenced in the flood of letters received from all parts of the Coast, relative to the fineness of the presentation, the clearness of reception, and the artistry of the world-famous talent presented.

Programs for the remaining five concerts are still obtainable at the Company's stations and at independent dealers handling Company products.



The Bowl as seen this year at the Easter sunrise services.

The above photograph is of the new Company service station opened this month at Mesa Drive and Vernon Avenue. Its modified Spanish design offers a further example of the Company's policy of harmonizing the appearance of its stations with the architectural surroundings of the neighborhood in which they operate, instead of constructing all stations from a standardized design which may conflict with civic development. This station is an adaptation of the best features of one of the prize-winning designs submitted in last year's contest.

NEW SALES PLANT FOR OAKLAND

Plans were approved and construction started this month on a new sales distributing station and office building at Oakland, with completion scheduled for the early part of September.

Erected on property owned by the Company, the new sales plant will cover an entire city block, and will supplant the present distributing station which has served the Oakland district for the past fourteen years but which is now considered inadequate for present needs. The most modern equipment and ideas in marketing facilities are to be incorporated in the construction. Pipe lines will connect the station with the water front so that stocks can be delivered direct into storage from barges that receive their cargoes at the Oleum refinery. Storage will be provided for approximately 16,000 barrels of gasoline, lubricating oils, and other refined petroleum products.

Among other facilities provided for in the plans are a garage, 32 by 234 feet; warehouse, 50 by 160 feet; pump house, and a six-truck loading rack. Erection of the new plant is under the direct supervision of Company engineers.

PLANE WELCOMES AVIATORS HOME

Piloted by Mr. C. F. Lienesch, the Company plane which served as sole escort for the Southern Cross when the Australian-bound plane left the Golden Gate on the start of its historic flight, was once more on hand to welcome home Lieutenant-Commander Harry Lyon, navigator, and James Warner, radio operator, as the liner from Sydney brought them back into San Francisco harbor, July 11th.

As the ship's siren shrilled acknowledgment, Lienesch circled and dipped, then escorted the liner to the dock, and later met the flyers when they landed. He returned to Los Angeles the following day to participate in the reception accorded the flyers there.

GIRLS' CLUB PROGRESSES

Having successfully inaugurated the first social program, a combined bridge-bunko-luncheon at the Elks' Club, the Girls' Social Club of the Company scheduled its second program of the season for July 28th, a luncheon, swimming and card party at the Pacific Coast Club at Long Beach. The fifth floor handled this second affair, the first having been in charge of the ninth floor.

With 110 members, and still growing, the Club is planning a set program of skating, horseback riding, and other sports and entertainment. Through the City Playground Department, the girls have been offered a weekly schedule of sports in which they may participate, as follows:

Monday—Baseball—Echo Park Playground
Tuesday—Swimming—Exposition Park
Wednesday—Canoeing—Westlake Park
Thursday—Golf—Griffith Park
Friday—Riding—DuBrock's Riding Academy
Saturday (2. p. m.)—Tennis—Griffith Park

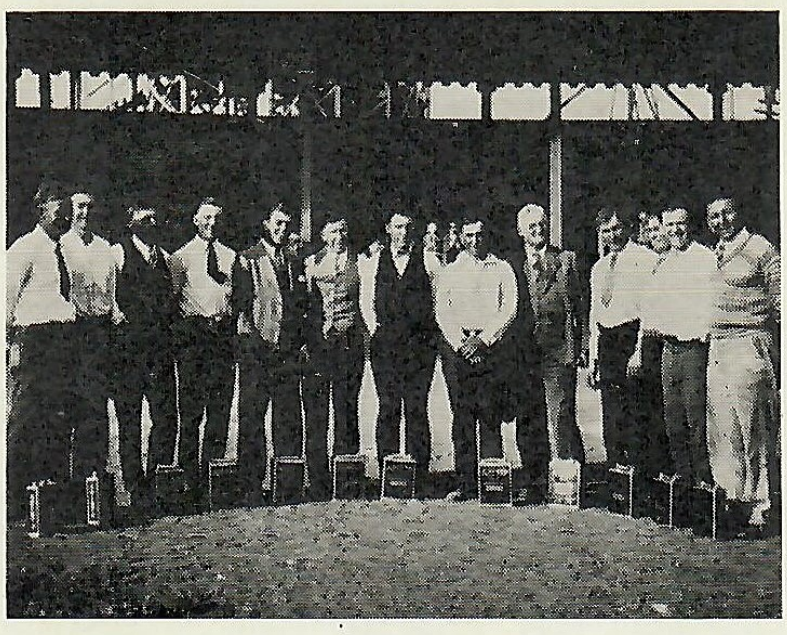
Expert instruction is offered in each of the above sports free of charge, except in the case of golf, where a nominal fee is collected.

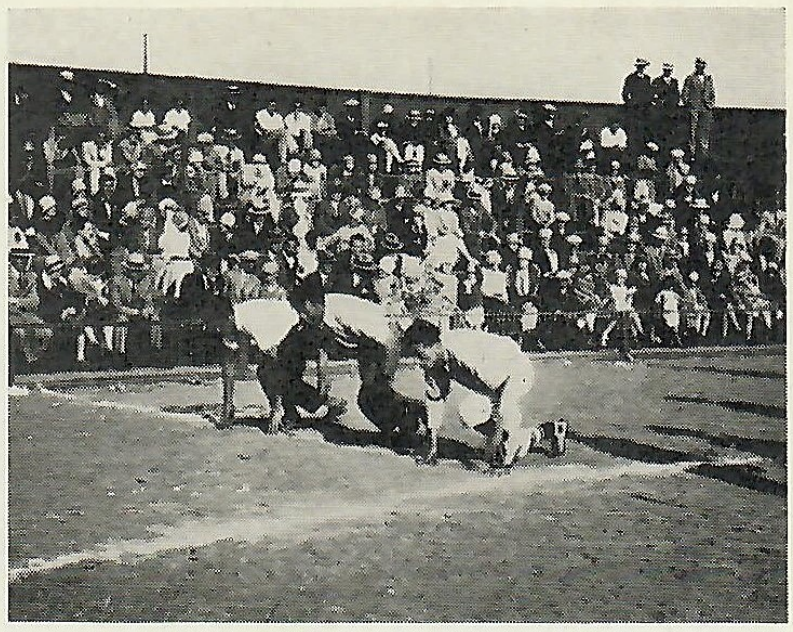
Many of the girls have already signed up for participation in these sports after work each evening.

As yet the club has no official name. Suggestions as to a name, and as to future programs and policies will be welcomed.

THIS MONTH'S COVER

The Malibu Hills offer the subject for Hanson Puthuff's canvas, their regal sunlit color bespeaking the lure which has induced their recreator to choose his favorite setting once more. Mr. Puthuff has before been mentioned in these pages as the "master moulder of hills"; the title which he has won himself through the virility of his landscapes.





The above two "shots" are of the Neptune Beach party held by employees in the Bay District, along with their families and friends, in the afternoon and evening of June 23rd. To the left, the winning tug-of-war team of the Construction Department, Oleum Refinery; to the right, the start of the relay race, which was won by the Oakland Office team. The other winners were as follows: Fat man's race, F. Del Monte; 100-yard dash, R. Ramponi, Oakland District Office; Ethyl Girl contest, Mildred Wallace. The enthusiasm with which the day was received gave promise of making the affair an annual event.

JUNE CRUDE PRODUCTION

According to figures collected by the American Petroleum Institute, Pacific Coast office, the total production of Crude Oil in California for June amounted to 19,164,244 barrels, an average of 638,808 barrels per day. This is an increase of 15,199 barrels per day over May production.

Total stocks of crude and all products in Pacific Coast territory increased during the month 928,228 barrels. The total stocks at the end of the month were 140,105,561 barrels. The total stock increase for 1928, up to June thirtieth, was 765,211 barrels. Comparative figures as of June 30, 1928, May 31, 1928, and June 30, 1927, are shown in detail on page 23.

Fifty-four wells were completed during the month with an initial daily production of 41,866 barrels, compared with sixty-four wells completed during May, with an initial production of 66,117 barrels.

HALF-YEARLY STATEMENT ISSUED

Issuing its financial statement covering operations for the first six months of the year, the Company shows net profits of $5,800,000 as against $5,600,000 for the same period last year. Sales for the six months show an increase in value of $2,000,000 over the same period last year, the total for the half year amounting to $40,100,000.

The report shows that the current assets of the Company approximate $57,000,000 consisting of cash, bonds, oil inventories, materials and supplies. The company has in storage about 25,400,000 barrels of oil at the present time.

Production for the six months shows a decrease of about 100,000,000 barrels, occasioned by a continuance of the Company's policy of shutting in production and curtailing new drilling in proven territory wherever possible.

The quarterly dividend of fifty cents per share has been declared, payable August 10th to stockholders of record at the close of business July 19th.

The report, which was signed by President W. L. Stewart and Vice-President R. D. Matthews, is the first to be issued by any major oil company in the West, covering operations for the first six months of the year.

UNION OFFERS POWER BOAT TROPHY

In connection with the Pacific Southwest Exposition, which opened at Long Beach, California, July 27th, the annual regatta of the Southern California Yachting Association is being held in the Long Beach-Los Angeles harbor, from August 4th to 12th. Events are scheduled for almost every type of sailing craft, a record fleet being expected.

For the 510 hydroplane class, the Union Oil Company is offering a handsome trophy, both heats for this trophy being run off on Sunday, August 11, over a ten-mile course. The entrants in this race are the Miss Houston IV of Frank H. Robertson, Houston, Texas; the Miss Ferncreek II of R. G. Jones, Louisville, Kentucky; the Miss Kemah of Henry Falk, Houston, Texas; and another entry as yet unnamed. Points will be scored on the basis of the rules of the Mississippi Valley Power Boat Association.

NEW S. F. SERVICE STATION

Station No. 513 was opened during July at Diamond, Joost, and Monterey Streets, San Francisco.

PHOENIX WELCOMES AUDITOR

Honoring Mr. Paul Baxter, newly-arrived District Auditor, some forty employees of the Phoenix Main Station, together with their friends and families, enjoyed their annual Watermelon Bust at Riverside Park on the evening of July 11th.

Swimming and dancing featured the program, the *piece de resistance* consisting of some of the best watermelons ever grown in the Southwest.

NEW CALIFORNIA DISTRIBUTING STATIONS

A new distributing station at Lower Lake was opened for business July 18th, operating as a sub-station of San Francisco district. This station is under the supervision of Mr. L. F. Colton, Agent at Calistoga.

On the same date, a new distributing station was opened at Monterey, operating as a sub-station of San Jose District. Mr. K. E. Trefts has been appointed Agent in charge.

SAFETY *IN THE* UNION

"DOWN TO THE SEA IN SHIPS"

There is something so romantic about the very thought of the sea and those who spend their lives upon it, that to the landsman the impression comes quite naturally that romance is all there is to it. Romance there is, in retrospect, as the story is told of adventures and misadventures, but let no man get the impression that romance is anything more than a point of view applied to the lives of courageous men.

The tanker fleet of the Union Oil Company of California is made up of some millions of dollars invested in ships, both large and small. The men who sail these ships over the oceans of the world now number close to five hundred. They carry, individually, the heaviest investment responsibility, per man, of any of our groups of employees. Perhaps that is why one almost invariably finds those in responsible charge of bridge and engine room men of strong individuality—"characters"— to whom vigilance, courage and loyalty seem to come naturally. The habit of realizing the dangers of their calling and the dependence which is placed upon their judgment has developed these men into something just a shade different from anything one finds in landsmen.

To talk of safety to such men would seem futile and uncalled for. Their very existence implies regard for safety. Yet so complicated has become this great business of handling petroleum that an interchange of ideas at times proves valuable. Safety is a combination of experience, technical knowledge, education and good discipline, and no one man can think of everything. A week of daily contact with the oldest men in the service brings forth many points of mutual interest.

Fire will always be the single greatest catastrophe hazard in the oil business. On the sea, this is combined with the hazards of navigation common to all shipping. If the fire hazard on tank ships has not been given the study which it has deserved, this has been due principally to the fact that fires aboard tank ships are rare. Looking back over the combined experience of all tanker fleets during the past twenty years, there have been very few fires aboard these ships, and such as have occurred have as a rule been directly traceable to two general causes. The two great hazards have been the loading of ships at their docks and the cleaning and repair of ships in shipyards or dry docks. Recognizing these dangers, the Pacific Coast operators have gone about their cure in vigorous fashion.

"Regulations for the Safe Loading and Discharge of Oil Tankers" were adopted more than a year ago by the tank ship operators on the Pacific Coast. They are the outgrowth of an effort to give the entire industry the benefit of the combined experience of its individual members. They deal with those hazards over which the oil company employees on ships and at the terminals have control, and where enforced conscientiously, they have been the means of controlling the situation. More than that, they have established uniformity of practice among ship employees who, by the very nature of their employment, have to move from ship to ship and often from one employer to another. One year of operation is not enough to establish the value of the "Regulations" nor will five years' success change the minds of skeptics. It is a fact, nevertheless, that thus far the only change proposed has been to amplify the scope of their application.

This change in the "Regulations," if adopted officially (as it has been already unofficially), will place responsibility for "gas-freeing" vessels upon the owner rather than upon the shipyard. No governmental regulations could possibly achieve what the industry has thus done for the protection of its men.

Recently much technical thought and experimentation has been devoted to the problem of completely eliminating the explosion and fire hazard on tank ships. This ambitious program naturally divides itself into the solution of several separate problems. First of these is the discharge of the air and gas in ships' tanks as cargo is taken aboard. Trial installations of vapor discharge systems, venting into one of the tubular masts, indicate that it is feasible to load ships with hatches and ullage plugs closed. The gas discharged through the mast is dissipated and made harmless. While loading progresses, ships' tanks are gauged through gauging wells that extend to the tank bottoms and are thus effectively sealed against vapor discharge. The vapor discharge system acts also as a means of "breathing" while the vessel is at sea, so that at no time can vapors lie upon the vessel's deck or find their way into living quarters. Another point of attack has been the displacement of the cargo with some inert gas at time of discharge. This has been successfully accomplished by one Pacific Coast operator through use of gases taken from the vessel's boiler stacks. The theory is of course obvious—stack gas contains little or no oxygen and hence cannot support combustion. While the technical problem of utilizing stack gas is rather intricate, it has apparently been solved.

The technique of freeing a vessel of gas prior to making repairs is well known and is practiced successfully every day. With the use of good fresh air masks, men can work in petroleum vapors with no discomfort or danger. A recently developed vapor-indicating device is used to show when tanks are safe.

There still remains the hazard on the sea from every and all causes that conspire to outwit man's ingenuity. And fires have occurred on tankers, in crews' quarters and elsewhere, from those very causes that we have long recognized on land. Smoking, that prolific source of fires, has taken its toll, as have spontaneous combustion, defective electric wiring and the rest. Such fires can only be guarded against by vigilance and painstaking supervision. When they do occur, they place a high premium on the "first aid" hand extinguishers that are part of every ship's equipment.

Problem fire drills, such as are now part of every Union Oil refinery and gas plant operation, could well be adopted on shipboard. They have taught men what to do by doing it and have eliminated panic, hysteria and waste effort.—*On board S.S. "La Placentia," June 19, San Pedro to Ioco, B. C.*

FORT COLLINS ENTERS TEAM

A team from Fort Collins will represent the Union Oil Company in the International First Aid and Mine Rescue Contest at Butte, Mont., August 20, 21 and 22. Training was given the men by representatives of the Bureau of Mines and later by A. J. Martinson, Company first aid instructor. Great interest was manifest and nearly one hundred competed for the privilege of representing the Company in the contest. Team members were selected by elimination and two full teams are now training. From these, eight men will be selected to make the trip.

NO ACCIDENTS

June in the drilling and producing fields was a pretty safe month, apparently. No lost time accidents were reported by C. H. Sherman, Rocky Mountain Division; A. H. Brown and F. W. Lake, Orange; A. C. Rubel, Dominguez; C. L. Woods, Maricopa; Geo. W. Gosline, Ventura; or R. G. Hilsinger, Truck Dispatcher. E. C. Critchlow would have been listed with the foregoing had it not been for poison oak attacking three of his men. While not strictly an accident, poison oak is legally considered so.

WELL PULLING

The first attempt at writing a safe practice pamphlet for the oil industry has proved very popular. It covers the "pulling" of wells. Men like Chas. L. Woods, Superintendent of the Valley Division, have endorsed it as highly practical and have adopted it for instruction of new men. Old timers can also get good ideas from it, as it combines what many men have learned. It is available for distribution upon request of the Department Managers' Safety Committee, Room 411, Union Oil Building, Los Angeles.

SERVICE STATION SAFETY

How much would it be worth to get from one hundred leading marketers of petroleum products, their individual experience in preventing accidents to service station salesmen? This has actually been gotten together and condensed and is published by the National Safety Council, Petroleum Section. The pamphlet containing this information is well illustrated and very readable. Already in its second printing, it is destined to be one of the most widely circulated publications of the Council. District Sales Managers may secure copies for their Service Station Salesmen by addressing the Department Managers' Safety Committee, Room 411, Union Oil Building, Los Angeles.

HOW TO DO IT

I asked Henry, a young, up-and-coming foreman, keen on preventing accidents, what his prevention recipe was, for in the last seven months there were only two minor accidents in his section. And his, a transportation section with a lot of big trucks which load the heaviest of portable machinery in all kinds of weird places, could easily have a large casualty list.

Henry said, "I keep after them"—and he does. You can't train a man with one telling or two or maybe a dozen, but if you keep telling him often enough, eventually the big idea gets into his noodle.

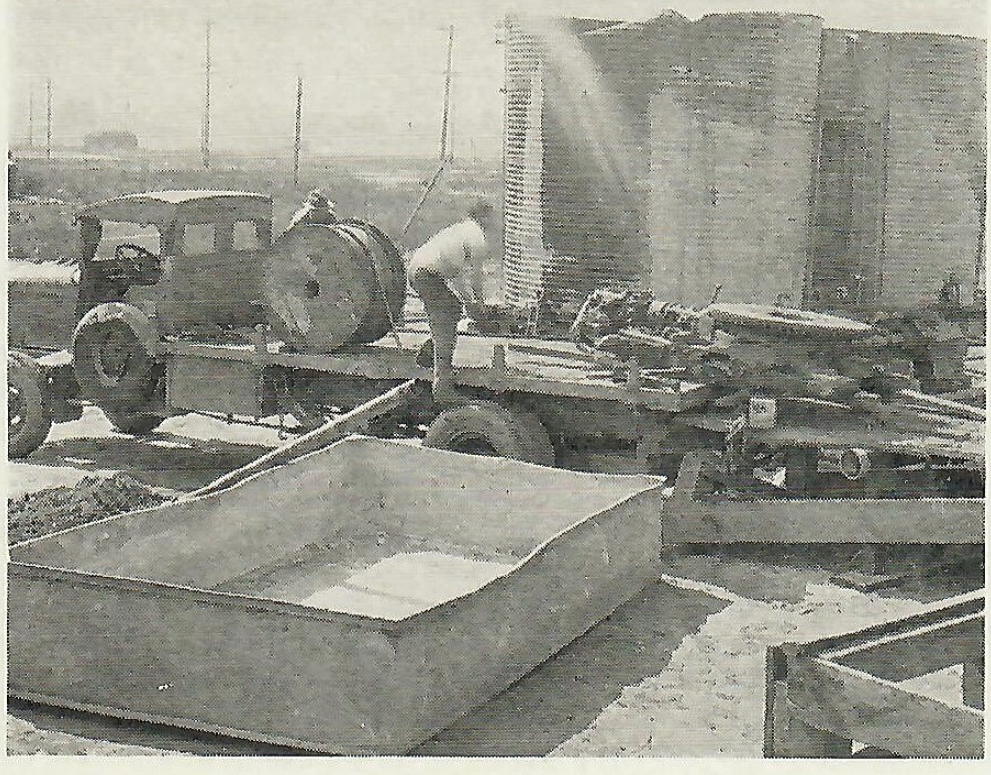
Henry showed me a photograph which had been taken of one of his new cathead trucks loading rotary table and gears. When he got a print he noticed the swamper standing on the wheel, a very dangerous practice, since when the heft of the load is taken on the wire line there is always a jump of the truck no matter how well it is spragged. In addition, there was a crowbar lying on the reel which could knock the man off the wheel, and right behind him on the ground was a cement mixing box in just the right position to break his back when he fell.

So Henry gave every truck driver a copy of this photograph to nail up on the cab of his truck, accompanying the donation with an appropriate talk.

Another interesting thing which Henry told me—it was his best men who got hurt. The good driver acts quickly—sometimes too quickly for the other fellow whom he generously credits with the same mental alacrity which he himself has. So Henry says it takes training to be able to think.

And Henry said to me, "When you are working there is always one man who hands you the tool you want before anyone else can do it and this is the guy that gets hurt."

A new angle to the safety business—but one worth a little reflection—as Henry is no fool, and in this case was not talking for publication.



How not to do it.

California Oil Statistics, June, 1928

Prepared by American Petroleum Institute, Pacific Coast Office

PRODUCTION

(Figures of production and stocks are in barrels of 42 Gals.)

DISTRICT	BARRELS PER MONTH	DAILY AVERAGE June, 1928	May, 1928	June, 1927
Kern River	199,534	6,651	6,876	15,664
Mount Poso	4,077	136	47	61
Round Mountain	13,245	442	121	180
McKittrick	147,070	4,902	5,065	5,195
Midway-Sunset	2,125,371	70,846	70,593	89,651
Elk Hills	706,899	23,563	23,344	25,012
Lost Hills-Belridge	124,185	4,140	4,066	3,797
Coalinga	318,916	10,630	10,492	19,842
Wheeler Ridge	27,917	930	977	1,039
Watsonville	1,775	59	58	58
Santa Maria	162,487	5,417	5,753	5,563
Summerland	3,690	123	123	141
Goleta	2,523	84	97	369
Rincon	121,826	4,061	2,904	....
Ventura Avenue	1,459,371	48,646	48,207	37,497
Ventura-Newhall	168,569	5,619	5,770	5,960
Los Angeles-Salt Lake	46,498	1,550	1,495	1,783
Whittier	51,695	1,723	1,687	1,775
Fullerton (Brea Olinda)	470,929	15,698	16,340	16,903
Coyote	403,051	13,435	13,595	13,742
Santa Fe Springs	1,116,402	37,213	36,924	42,006
Montebello	364,499	12,150	12,130	15,193
Richfield	573,359	19,112	18,947	21,988
Huntington Beach	1,602,423	53,414	54,101	73,147
Long Beach	5,830,671	194,356	181,264	93,461
Torrance	527,011	17,567	17,738	23,343
Dominguez	366,353	12,211	12,501	15,914
Rosecrans	197,059	6,569	6,256	9,350
Inglewood	906,067	30,202	29,401	34,371
Newport	865	29	11	39
Seal Beach	1,105,041	36,834	36,177	66,338
Potrero	14,866	496	550	....
TOTAL	19,164,244	638,808	623,609	639,381
May	19,331,866	623,609		
Increase	*167,662	15,199		

*Decrease

STOCKS	June 30, 1928	May 31, 1928	June Stock Increases	June 30, 1927
Heavy Crude, heavier than 20° A. P. I., including all grades of fuel	95,284,117	94,889,736	394,381	93,326,393
Refinable Crude, 20° A. P. I., and lighter	19,955,030	19,875,112	79,918	27,175,071
Gasoline	13,626,875	13,307,666	319,209	13,578,382
Naphtha Distillates	1,595,566	1,745,312	*149,746	3,517,038
All Other Stocks	9,643,973	9,359,507	284,466	9,716,166
TOTAL ALL STOCKS	140,105,561	139,177,333	928,228	147,313,050

DEVELOPMENT	New Rigs Up	Active Drilling	Completed	Daily Initial Output	Active Producing	Abandoned Wells Drillers	Abandoned Wells Producers
Kern River	1	7	2	400	1,208	....	....
Mount Poso	7	8	1	300	4	2	....
Round Mountain	....	4	....	3	3	....	....
McKittrick	....	1	....	....	290	....	....
Midway-Sunset	12	14	6	1,110	2,525	....	6
Elk Hills	....	1	....	....	223	....	....
Lost Hills-Belridge	....	1	1	50	299	....	....
Coalinga	1	3	2	26	793	....	....
Wheeler Ridge	....	2	....	....	32	....	....
Watsonville	....	....	1	20	7	....	....
Santa Maria	....	3	2	225	224	....	....
Summerland	....	....	....	....	89	....	....
Goleta	....	1	....	....	2	....	1
Rincon	3	15	2	975	15	....	....
Ventura Avenue	8	32	2	5,605	119	....	....
Ventura-Newhall	....	20	1	115	507	2	....
Los Angeles-Salt Lake	....	....	....	....	323	....	....
Whittier	....	....	....	....	173	....	....
Fullerton (Brea Olinda)	....	5	2	460	382	....	....
Coyote	1	1	2	285	210	....	....
Santa Fe Springs	2	1	1	297	300	....	....
Montebello	....	2	....	....	167	....	....
Richfield	2	7	2	855	265	2	....
Huntington Beach	....	6	3	1,080	567	1	3
Long Beach	31	178	21	29,372	727	....	1
Torrance	....	....	....	....	634	1	22
Dominguez	....	3	....	....	72	1	....
Rosecrans	....	1	1	412	103	....	....
Inglewood	3	2	....	....	220	....	....
Newport	1	2	....	....	2	....	....
Seal Beach	....	3	2	279	138	....	1
Potrero	2	2	....	....	1	....	....
Miscellaneous Drilling	4	138	....	....	....	6	....
June	78	463	54	41,866	10,624	15	36
May	99	450	64	66,117	10,531	19	38
Increase	21*	13	10*	24,251*	93	4*	2*
Average for year 1927	97	404	75	39,992	11,276	23	21
Average for year 1926	95	422	76	32,635	11,288	24	17
Average for year 1925	105	417	79	42,247	11,393	28	12
Average for year 1924	103	510	103	42,412	10,903	28	21
Average for year 1923	111	759	82	114,690	8,928	24	

*Decrease

REFINED *AND* CRUDE

In the army, they get the raw material first and then drill. In the oil game we drill first and get the raw material later—sometimes.

* * *

And, Al Smith notwithstanding, many a perfectly good Democrat has contributed his effort to the development of a dry hole.

* * *

A knowledge of first aid is a fine thing.

* * *

But it is infinitely better to be able to eliminate the necessity of applying this knowledge by recognizing the value of the safety measures that are laid down for our protection. It doesn't really do any good to blow out the match after your gas tank has exploded.

* * *

Now that flying has become so popular, the old expression "a bolt from the blue" may take on an entirely different meaning.

* * *

And the Government may finally be able to unload its surplus stock of trench helmets.

* * *

Any salesman who is familiar with the game of golf must realize the necessity of making the right approach.

* * *

So also must any individual who has survived an argument with a freight train at the grade crossing.

* * *

The care of Company equipment is a responsibility that needs no emphasis. Yet a certain employee is known to be driving a Company car with the horn out of order. He obviously doesn't give a hoot.

* * *

Reverting again to the subject of golf, it is apparent that the game is pie to a good many people, if we are to judge by the number of slices they get.

* * *

However, cheer up! The kangaroo is always on his last legs, but he keeps on going.

Scientists all over the world are engaged in an effort to find some method of dividing the atom. Why can't they be magnanimous and agree among themselves to let one of their number have the whole thing?

* * *

The atom was long believed to be the smallest thing known. Then came the hit-and-run driver.

* * *

Be that as it may, all that glitters isn't gold, and if you are inclined to disagree with this statement, kindly take a look at the seat of your blue serge pants.

* * *

Rod Burnham informs us that it is always easy to pick out the Americans at a bull fight. They invariably cheer for the bull.

* * *

Then there was the Scotchman who gave a penny to a blind man. He needed the pencil.

* * *

It has been discovered that fish eat mosquitoes, but then who wants to take a fish to bed with him?

* * *

Life is more or less of a trial, but participation in the benefits of the Provident Fund for a year or two should enable most of us to pass the asset test.

* * *

Petroleum has been variously and poetically described as "liquid gold," "black gold," etc., but when smeared on the shirt front it is simply called "crude oil."

* * *

That is, if the victim has sufficient control over his language.

* * *

And speaking of language, the use of bad grammar is something we vastly deplore, and we have just had a terrible time trying to learn our boy to say "teach."

* * *

Observe the dentist. To get a good job, he must first make the right impression.

* * *

He invariably goes to the root of the trouble.

* * *

And is always ready to get on the stump, and pull for the other fellow.

The Road to Arcady

By Mary Louise Hemphill

The road that runs to Arcady winds through a summer way,
A way you take at morning-tide, and follow all the day.
Some say you'll never find it, though you search the
summer through;
That the tales we learned of Arcady were never, never true.

But you have almost reached it when you hear a
startling trill,
Or glimpse a white dream-city set on a glad green hill,
Or find blue, starry blossoms in the grass beside the trail—
Then follow where the bee flies beyond the pasture rail,
And run between the corn-rows where they rustle overhead;
Then rest among the clover-blooms to eat your
knapsack bread.

And save a little piece for me, should I chance to meet
you there—
For cupboard shelves in Arcady they say are often bare!
But there's honey in the clover, red berries in the wood,
And the hillside spring's clear waters are very, very good.
And should the road to Arcady just circle round the hill
And bring us home by sunset, when the world is
sweet and still,
We've started on the journey, and we're nearer by a day—
'Tis the setting out to find it that makes Arcady, they say!

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